



**Rockwell  
International**

# **HF-80 Solid-State 1-kW Power Amplifier- Power Supply**

**supplement**

Collins Defense Communications Division

Printed in USA

523-0773609-001211

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## **GENERAL**

The purpose of this supplement is to provide a general description of HF-8023 1-kW Power Amplifier, part number 622-3490-207, and HF-8031 Power Supply, part number 622-3491-203. When used with the HF-80 Solid-State 1-kW Power Amplifier-Power Supply Instruction Book (part number 523-0771296), this supplement provides the user with a complete instruction book for the two equipments.

## **INTRODUCTION**

The introduction is applicable to the power amplifier-power supply with the addition of the following design features:

HF-8023 1-kW Power Amplifier:

- Improved rfi filtering to reduce the transmitted noise spectrum generated by switching converters in the power amplifier.
- Class A operation available at low power.

HF-8031 Power Supply:

- Improved filtering to prevent interference in the power amplifier.

## **DESCRIPTION (523-0771492-001218)**

### **2. EQUIPMENT SUPPLIED/CONFIGURATION**

Replace tables 1, 2, and 3 with the table of the same number supplied.

Table 1. HF-80 Solid-State 1-kW Power Amplifier-Power Supply, Equipment Supplied/Configuration.

ASSEMBLY		DESCRIPTION/FUNCTION
TITLE	PART NUMBER*	
HF-8023 1-kW Power Amplifier	622-3490-001	Solid-state 1-kW power amplifier. Operates from 1.600 to 29.999 MHz. Tr relay not installed.
	622-3490-002	Solid-state 1-kW power amplifier. Operates from 1.600 to 29.999 MHz. Tr relay installed.
	622-3490-207	Solid-state 1-kW power amplifier. Operates from 1.600 to 29.999 MHz. Tr relay installed. Class A operation selectable.
HF-8031 Power Supply	622-3491-001	Power supply capable of supplying all voltages required by HF-8023. Operates from 208, 220, 230, 240 V ac, single-phase, 43- to 67-Hz input power.
	622-3491-203	Power supply capable of supplying all voltages required by HF-8023. Operates from 208, 220, 230, 240 V ac, single-phase, 43- to 67-Hz input power.
HF-8032 Power Supply	622-3512-001	Power supply capable of supplying all voltages required by HF-8023. Operates from 208, 220, 230, 240 V ac, 3-phase, 43- to 67-Hz input power.
	622-3512-002	Power supply capable of supplying all voltages required by HF-8023. Operates from 208, 220, 230, 240 V ac, 3-phase, 47- to 63-Hz and 380- to 420-Hz input power. This unit provides automatic changeover between 47 to 63 Hz and 380 to 420 Hz, with no operator or installation changes required.

\*Unless otherwise specified, all part numbers are Rockwell-Collins.

Table 2. HF-8023 1-kW Power Amplifier, Equipment Supplied/Configuration.

SUBASSEMBLY/CIRCUIT CARD		HF-8023 1-kW POWER AMPLIFIER 622-3490-( )			DESCRIPTION/FUNCTION
TITLE	PART NUMBER*	-001	-002	-207	
Chassis A1	646-6433-001	X	X		Contains subassemblies not considered plug-in cards or modules.
	646-6433-004			X	
Directional coupler A1A1	642-2634-002	X	X	X	Measures forward and reflected power at rf output connector.
Card cage backplane A1A2	642-3588-001	X	X		Provides mount and interconnect for digital control A9, analog control A10, exciter interface A11, and optional processor interface A12. Provides additional interconnect to the front panel (J5), rf backplane (J6), rear chassis (J7), and low-pass filter and options (J8).
	642-3588-002			X	

Table 2. HF-8023 1-kW Power Amplifier, Equipment Supplied/Configuration (Cont).

SUBASSEMBLY/CIRCUIT CARD		HF-8023 1-kW POWER AMPLIFIER 622-3490-( )			DESCRIPTION/FUNCTION
TITLE	PART NUMBER*	-001	-002	-207	
Rf backplane assembly A1A3	646-6435-001	X	X		Provides mount and interconnect for driver module A2, and pa output modules A3, A4, A5, A6.
	646-6435-003			X	
Rf backplane A1A3A1	646-3295-001	X	X		Printed circuit card used in rf backplane assembly A1A3.
	646-3295-003			X	
Wiring harness A1A3W3	646-6438-001	X	X		Provides additional interconnect to the rear chassis (W3J5), card cage backplane (J11), and power combiner (J7, J8, J9, J10).
	646-6438-002			X	
Front panel card A1A4	642-3586-001	X	X	X	Contains front panel indicators, controls, and adjustments.
Relay filter assembly A1A5	652-2254-002			X	Switches rf to digital card in tune step 2 to set up low-pass filter and filters dc voltage inputs.
Wiring harness A1W1	646-6436-001	X	X		Interconnects chassis A1 with connectors J1, J2, J3, J4, P8, and terminal board TB1.
	646-6436-003			X	
Wiring harness A1W2	646-6437-001	X	X		Interconnects chassis A1 with connectors P1, P2, P3, P9, and P10.
	646-6437-003			X	
Driver module A2	646-6407-001	X	X		Amplifies 100-mW exciter rf to four equal amplitude 20-W signals for the pa module inputs.
	646-6407-003			X	
Predriver card A2A1	642-3234-001	X	X		Contains the first two stages of amplification (part of A2).
	642-3234-002			X	
Driver output card A2A2	642-3233-001	X	X		Contains driver output stage and 4-way power splitter (part of A2).
	642-3233-002			X	
Power splitter A2A2A1	278-0508-010	X	X	X	Splits driver output signal into four 50-ohm outputs (part of A2A2).
Power amplifier output module A3	646-6406-001	①	①		Amplifies nominal 20-W rf input to a nominal 280-W level. Includes pc assembly 642-3116-001.
	646-6406-002	②	②		
	646-6406-003			X	

Table 2. HF-8023 1-kW Power Amplifier, Equipment Supplied/Configuration (Cont).

SUBASSEMBLY/CIRCUIT CARD		HF-8023 1-kW POWER AMPLIFIER 622-3490-( )			DESCRIPTION/FUNCTION
TITLE	PART NUMBER*	-001	-002	-207	
Pc assembly A3A1	642-3116-001	①	①		Pc card assembly for pa module (part of A3, 622-6406-001).
	642-3116-002	②	②		Pc card assembly for pa module (part of A3, 622-6406-002). Includes rf feedback circuit to prevent driver spurious oscillations when used with an external tuning device.
	642-3116-003			X	
Power amplifier output module A4	646-6406-001	①	①		Same as A3.
	646-6406-002	②	②		
	646-6406-003			X	
Pc assembly A4A1	642-3116-001	①	①		Same as A3A1, except part of A4.
	642-3116-002	②	②		
	642-3116-003			X	
Power amplifier output module A5	646-6406-001	①	①		Same as A3.
	646-6406-002	②	②		
	646-6406-003			X	
Pc assembly A5A1	642-3116-001	①	①		Same as A3A1, except part of A5.
	642-3116-002	②	②		
	642-3116-003			X	
Power amplifier output module A6	646-6406-001	①	①		Same as A3.
	646-6406-002	②	②		
	646-6406-003			X	
Pc assembly A6A1	642-3116-001	①	①		Same as A3A1, except part of A6.
	642-3116-002	②	②		
	642-3116-003			X	

Table 2. HF-8023 1-kW Power Amplifier, Equipment Supplied/Configuration (Cont).

SUBASSEMBLY/CIRCUIT CARD		HF-8023 1-kW POWER AMPLIFIER 622-3490-( )			DESCRIPTION/FUNCTION
TITLE	PART NUMBER*	-001	-002	-207	
Power combiner A7	646-7120-001	X	X	X	Combines outputs from four pa modules into one output.
Low-pass filter assembly A8	646-6400-002	X	X	X	Attenuates harmonics of the four combined pa modules.
Low-pass filter card A8A1	638-6964-002	X	X	X	Pc card assembly of low-pass filter (part of A8).
Directional coupler A8A2	642-2634-001	X	X	X	Measures forward and reflected power at the output of the low-pass filter (part of A8).
Digital control card A9	642-3592-001	X	X	X	Tune cycle, faults, and monitoring logic circuits.
Analog control card A10	642-3593-001	X	X		Pa protection circuits.
	642-3593-002			X	
HF-80 interface card A11	635-0745-001	X	X	X	Provides interface between HF-8023 1-kW Power Amplifier and HF-80 type exciters or receiver-exciters.
Coaxial jumper module A13	646-6430-001	X			Provides rf connection from directional coupler A1A1 rf output to ANT RF (J8).
Tr relay module A13	622-3505-001		X	X	Provides antenna switching to allow transmit and receive capabilities using the same antenna. Used in place of coaxial jumper module 646-6430-001.
Rf cable W1	646-6439-001	X	X	X	Interconnects power combiner A7 rf output and low-pass filter assembly A8 RF INPUT.
Rf cable W2	651-4426-001	X	X	X	Interconnects directional coupler A8A2 RF OUTPUT and directional coupler A1A1 RF RETURN when an external tuning unit is not used.
<p>Notes:</p> <p>*Unless otherwise specified, all part numbers are Rockwell-Collins.</p> <p>① Effective through 622-3490-001, -002 REV G.</p> <p>② Effective through 622-3490-001, -002 REV H and above.</p>					

Table 3. HF-8031/8032 Power Supply, Equipment Supplied/Configuration.

SUBASSEMBLY/CIRCUIT CARD		HF-8031 POWER SUPPLY 622-3491-( )		HF-8032 POWER SUPPLY 622-3512-( )		DESCRIPTION/FUNCTION
TITLE	PART NUMBER*	-001	-203	-001	-002	
Chassis A1	646-6884-001	X				Wired for single-phase, 43- to 67-Hz, 208-, 220-, 230-, or 240-V ac power.
	646-6884-002			X		Wired for 3-phase, 43- to 67-Hz; 208-, 220-, 230-, or 240-V ac power.
	646-6884-003				X	Wired for 3-phase, 43- to 67-Hz and 380- to 420-Hz, 208-, 220-, 230-, or 240-V ac power.
	646-6884-005		X			Wired for single-phase, 43- to 67-Hz, 208-, 220-, 230-, or 240-V ac power.
Wiring harness A1W1	646-7000-001	X				Wired for single-phase, 43- to 67-Hz, 208-, 220-, 230-, or 240-V ac power. Interconnects J1, J2, J3, J4, J5, J6, J7, J8, J9, J10, P1, and P2.
	646-7000-002			X	X	Wired for 3-phase, 43- to 67-Hz or 380- to 420-Hz, 208-, 220-, 230-, or 240-V ac power. Interconnects J1, J2, J3, J4, J5, J6, J7, J8, J9, J10, P1, and P2.
	646-7000-004		X			Wired for single-phase, 43- to 67-Hz, 208-, 220-, 230-, or 240-V ac power. Interconnects J1, J2, J3, J4, J5, J6, J7, J8, J9, J10, P1, and P2.
Power cable A1W2	009-1840-060	X	X	X	X	Interconnects blower B1 to 230-V ac line.
1000-watt con- verter module A2	646-6883-001	X	X	X	X	Converts rectified ac power line voltage to program- mable dc power (50/40 V).
Control card A2A1	642-3513-002	X	X	X	X	Control logic for 1000-watt converter (part of A2).
Base driver card A2A2	642-3232-001	X	X	X	X	Base driver power for converter bridge (part of A2).
Wiring harness A2A2P1	647-7241-001	X	X	X		Interconnects base driver card and control card (part of A2).
1000-watt con- verter module A3	646-6883-001	X	X	X		Same as A2.
Control card A3A1	642-3513-002	X	X	X		Same as A2A1, except as part of A3.
Base driver card A3A2	642-3232-001	X	X	X	X	Same as A2A2, except part of A3.

Table 3. HF-8031/8032 Power Supply, Equipment Supplied/Configuration (Cont).

SUBASSEMBLY/CIRCUIT CARD		HF-8031 POWER SUPPLY 622-3491-( )		HF-8032 POWER SUPPLY 622-3512-( )		DESCRIPTION/FUNCTION
TITLE	PART NUMBER*	-001	-203	-001	-002	
Wiring harness A3A2P1	647-7241-001	X	X	X	X	Same as A2A2P1, except part of A3A2.
500-watt converter module A4	646-6882-001	X	X	X	X	Converts rectified ac power line voltage to 35 V dc.
Control card A4A1	642-3513-001	X	X	X	X	Control logic for 500-watt converter (part of A4).
Base driver card A A2	642-3232-001	X	X	X	X	Same as A2A2, except part of A4.
Wiring harness A4A2P1	647-7241-001	X	X	X	X	Same as A2A2P1, except part of A4A2.
Low-voltage mod- ule A5	646-6812-001	X	X	X	X	Series regulators: +28 V, +5 V, +15 V, +12 V, and -12 V.
Regulator card A5A1	642-3561-001	X	X	X	X	Control logic for series regulators (part of A5).
Digital voltmeter card A6	642-3197-001	X	X	X	X	Digital readout of dc voltages.
Crowbar/logic card A7	642-3579-001	X	X	X	X	Control logic for crowbars and monitors.
400 to 57 Hz con- verter module A8	651-4140-001				X	Converts 400-Hz input power to 57-Hz blower power.
Power line cable	647-2547-001	X	X			Wired for single-phase ac power. Includes strap for voltage selection.
	647-2547-002			X	X	Wired for 3-phase ac power. Includes strap for voltage selection.

\*Unless otherwise specified, all part numbers are Rockwell-Collins.

**INSTALLATION (523-0771493-001218)**

**3.2.1 Power Requirements**

Add the following paragraph between the second and third paragraphs:

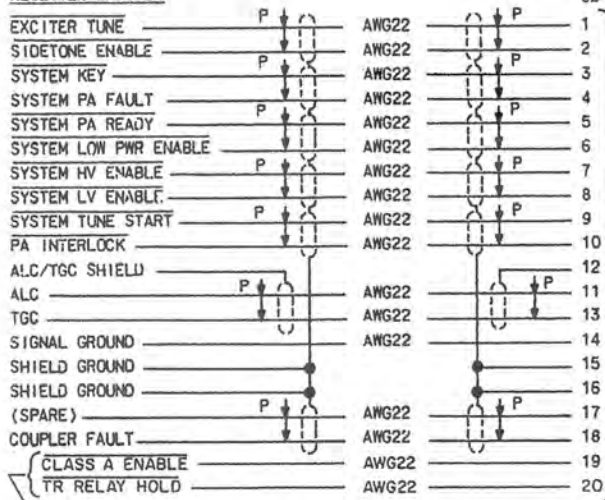
The HF-8031 Power Supply, 622-3491-203, operates from 208/220/230/240 V ac, single-phase, 47 to 63 Hz.

4. CABLING

Replace figure 4 with figure 4 included in supplement.

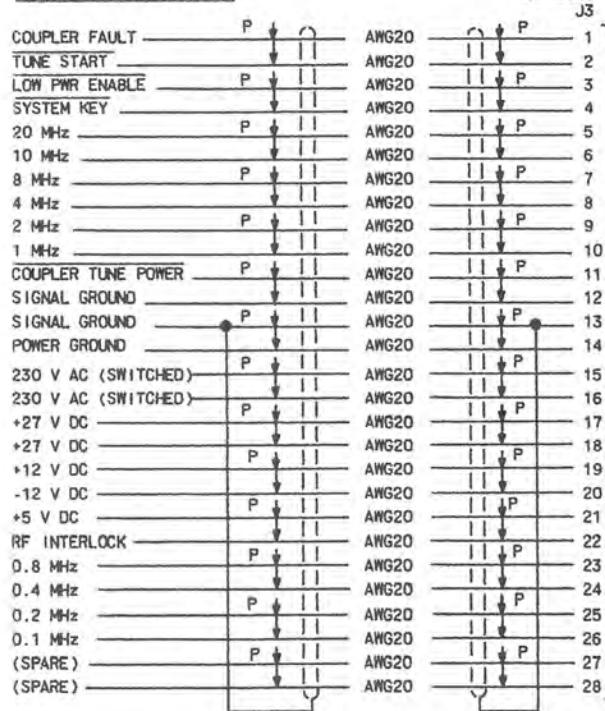


FROM EXCITER OR  
RECEIVER-EXCITER



NOTE:  
USED IN 622-3441-207 ONLY.

TO/FROM ANTENNA COUPLER



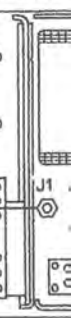
HF-8023  
J2

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20

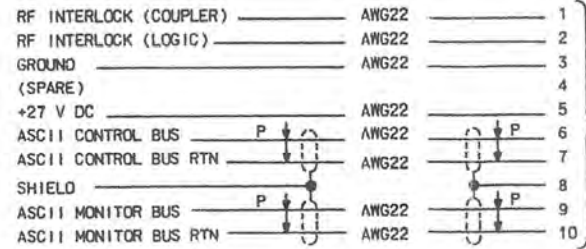
FROM EXCITER OR  
RECEIVER-EXCITER

EXCTR RF

HF-8023  
REAR PAN



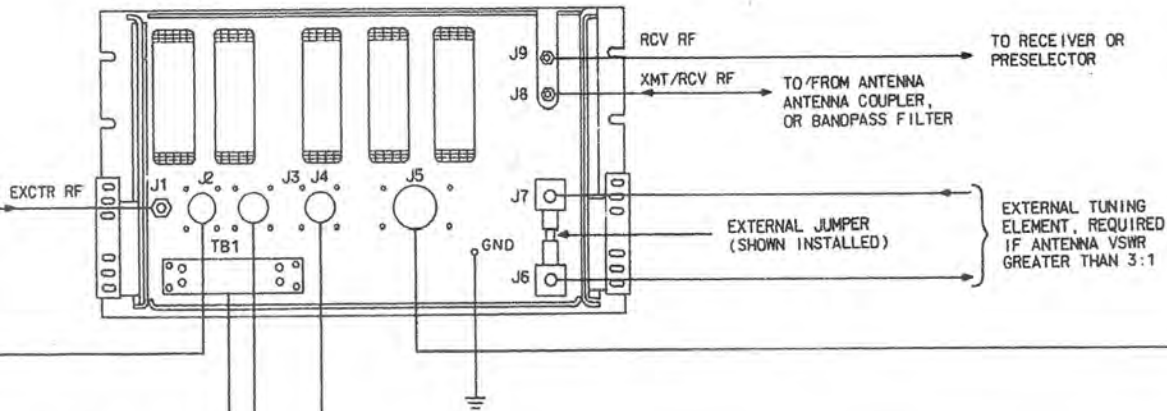
TO/FROM PROCESSOR CONTROL/MONITOR



HF-8023  
TB1

1  
2  
3  
4  
5  
6  
7  
8  
9  
10

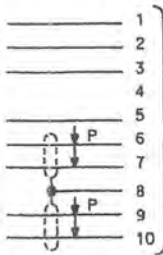
HF-8023 1-kW POWER AMPLIFIER  
REAR PANEL



HF-8023  
J5

- 1 — +5 V DC
- 2 — +12 V DC
- 3 — +27 V DC
- 4 — +12 V DC
- 5 — -12 V DC
- 6 — +5 V DC
- 7 — +35 V DC
- 8 — +35 V DC
- 9 — +REMOTE SENSE (35 V)
- 10 — -REMOTE SENSE (35 V)
- 11 — +35 V DC RTN
- 12 — +35 V DC RTN
- 13 — +28 V DC
- 14 — +50/40 V DC A
- 15 — +50/40 V DC A
- 16 — +REMOTE SENSE A
- 17 — +50/40 V DC RTN A
- 18 — +50/40 V DC RTN A
- 19 — -REMOTE SENSE A
- 20 — +50/40 V DC B
- 21 — +50/40 V DC B
- 22 — +REMOTE SENSE B
- 23 — +50/40 V DC RTN B
- 24 — +50/40 V DC RTN B
- 25 — -REMOTE SENSE B
- 26 — +50/40 V DC C
- 27 — +50/40 V DC C
- 28 — +REMOTE SENSE C
- 29 — +50/40 V DC RTN C
- 30 — +50/40 V DC RTN C
- 31 — -REMOTE SENSE C
- 32 — +50/40 V DC D
- 33 — +50/40 V DC D
- 34 — +REMOTE SENSE D
- 35 — +50/40 V DC RTN D
- 36 — +50/40 V DC RTN D
- 37 — -REMOTE SENSE D

HF-8023  
TB1

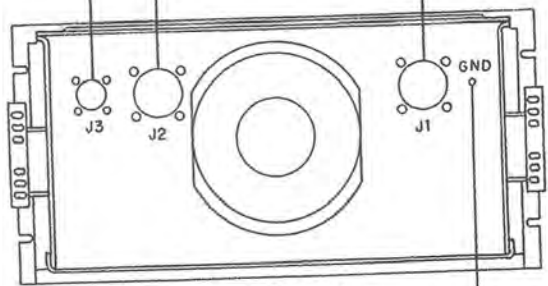
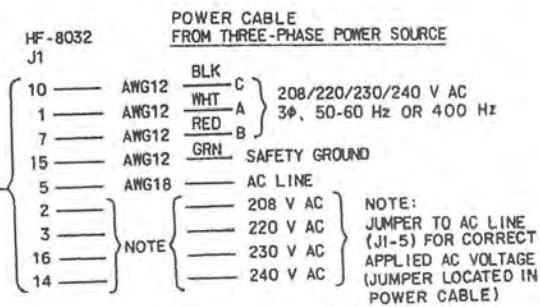
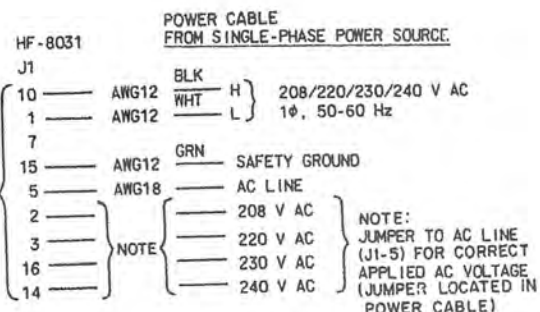
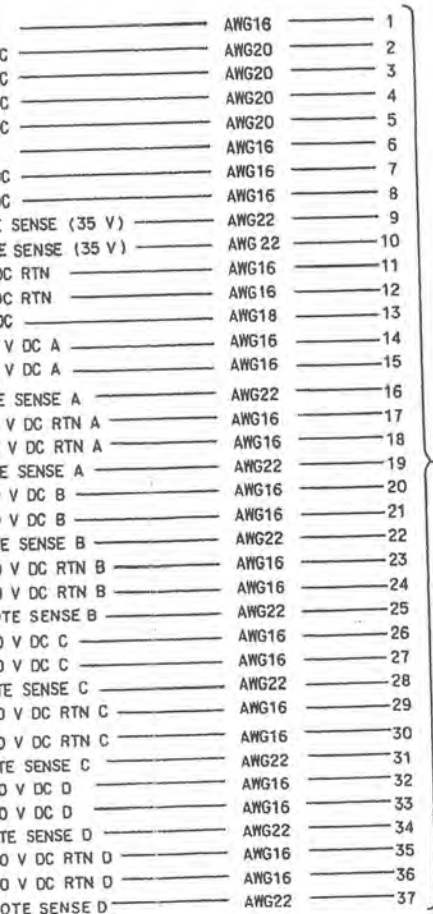


HF-8023  
J4

- |                          |       |         |
|--------------------------|-------|---------|
| 1 — GROUND               | AWG18 | 1 — 1   |
| 2 — GROUND               | AWG18 | 2 — 2   |
| 3 — +27 V DC             | AWG18 | 3 — 3   |
| 4 — GROUND               | AWG18 | 4 — 4   |
| 5 — +5 V DC              | AWG18 | 5 — 5   |
| 6 — +5 V DC              | AWG18 | 6 — 6   |
| 7 — -12 V DC             | AWG22 | 7 — 7   |
| 8 — -12 V DC             | AWG22 | 8 — 8   |
| 9 — +12 V DC             | AWG22 | 9 — 9   |
| 10 — +12 V DC            | AWG22 | 10 — 10 |
| (KEY)                    |       |         |
| 11 —                     |       | 11 — 11 |
| 12 — +27 V DC            | AWG18 | 12 — 12 |
| 13 — +27 V DC            | AWG18 | 13 — 13 |
| 14 — 230 V AC (SWITCHED) | AWG22 | 14 — 14 |
| 17 — 230 V AC (SWITCHED) | AWG22 | 17 — 17 |
| 18 — GROUND              |       | 18 — 18 |
| 15 — 230 V AC (SWITCHED) | AWG22 | 15 — 15 |
| 16 — 230 V AC (SWITCHED) | AWG22 | 16 — 16 |
| 19 — GROUND              |       | 19 — 19 |
| 20 — REMOTE CROWBAR A    | AWG22 | 20 — 20 |
| 21 — REMOTE CROWBAR B    | AWG22 | 21 — 21 |
| 22 — REMOTE CROWBAR C    | AWG22 | 22 — 22 |
| 23 — REMOTE CROWBAR D    | AWG22 | 23 — 23 |
| 24 — 40 V ENABLE         | AWG22 | 24 — 24 |
| 25 — DC POWER ON         | AWG22 | 25 — 25 |
| 26 — +27 V DC            | AWG22 | 26 — 26 |

HF-8031, -8032  
J3

HF-8031, -8032  
J2



HF-8031, 8032 POWER SUPPLY  
REAR PANEL.

TPA-3983-015

HF-80 Solid-State 1-kW Power  
Amplifier-Power Supply,  
Interconnect Diagram  
Figure 4

**OPERATION (523-0771494-001218)**

**3.2 Remote (Normal Operation)**

Add the following step following step c of paragraph 3.2.2:

- d. Class A operation is performed as follows:
  - 1. Select class A operation on the remote processor or ground pin 19 of J2 on the HF-8023.
  - 2. On MULTIMETER
    - (a) FWD PWR (1500 W) indicates  $75 \pm 20$  watts

Replace table 3 with table 3 provided.

TUNE STEP	VOLTMETER SWITCH POSITION	FREQUENCY (MHz)									
		1.6	2.0	3.0	4.0	6.0	8.0	12.0	18.0	24.0	29.9
LOW POWER											
3	(BAND INDICATION)	1	1	2	3	4	5	6	7	8	8
	FWD PWR (1500 W)										
4	FWD PWR (1500 W)										
	TOTAL PA (50 AMP)										
5	(key not applied)										
	FWD PWR (1500 W)										
5	(key applied)										
	FWD PWR (1500 W)										
	TOTAL PA (50 AMP)										
	PA MOD A (15 AMP)										
	PA MOD B (15 AMP)										
	PA MOD C (15 AMP)										
	PA MOD D (15 AMP)										
	DRIVER (15 AMP)										
	DRIVER RF (50 VOLT)										
	PRE-DRVR RF (15 VOLT)										
	INPUT RF (5 VOLT)										
	VSWR (5.0:1)										
REFLD PWR (500 W)											
HIGH POWER											
3	(BAND INDICATION)	1	1	2	3	4	5	6	7	8	8
	FWD PWR (1500 W)										
4	FWD PWR (1500 W)										
	TOTAL PA (50 A)										
5	(key not applied)										
	FWD PWR (1500 W)										
5	(key applied)										
	FWD PWR (1500 W)										
	TOTAL PA (50 AMP)										
	PA MOD A (15 AMP)										
	PA MOD B (15 AMP)										
	PA MOD C (15 AMP)										
	PA MOD D (15 AMP)										
	DRIVER (15 AMP)										
	DRIVER RF (50 VOLT)										
	PRE-DRVR RF (15 VOLT)										
	INPUT RF (5 VOLT)										
	VSWR (5.0:1)										
REFLD PWR (500 W)											
CLASS A (NOTE)											
3	(BAND INDICATION)	1	1	2	3	4	5	6	7	8	8
	FWD PWR (150 W)										
4	FWD PWR (150 W)										
	TOTAL PA (50 A)										
5	(key not applied)										
	FWD PWR (150 W)										
5	(key applied)										
	FWD PWR (150 W)										
	TOTAL PA (50 AMP)										
	PA MOD A (15 AMP)										
	PA MOD B (15 AMP)										
	PA MOD C (15 AMP)										
	PA MOD D (15 AMP)										
	DRIVER (15 AMP)										
	DRIVER RF (50 VOLT)										
	PRE-DRVR RF (15 VOLT)										
	INPUT RF (5 VOLT)										
	VSWR (5.0:1)										
REFLD PWR (500 W)											

NOTE: CLASS A OPERATION IS ONLY AVAILABLE WITH HF-8023 1 KW POWER AMPLIFIER, PART NUMBER 622-3490-207.

HF-80  
HF-80  
HF-80  
Driver  
Power  
Power  
Power  
Power  
Low-P  
Digital  
Analog  
HF-80  
Date



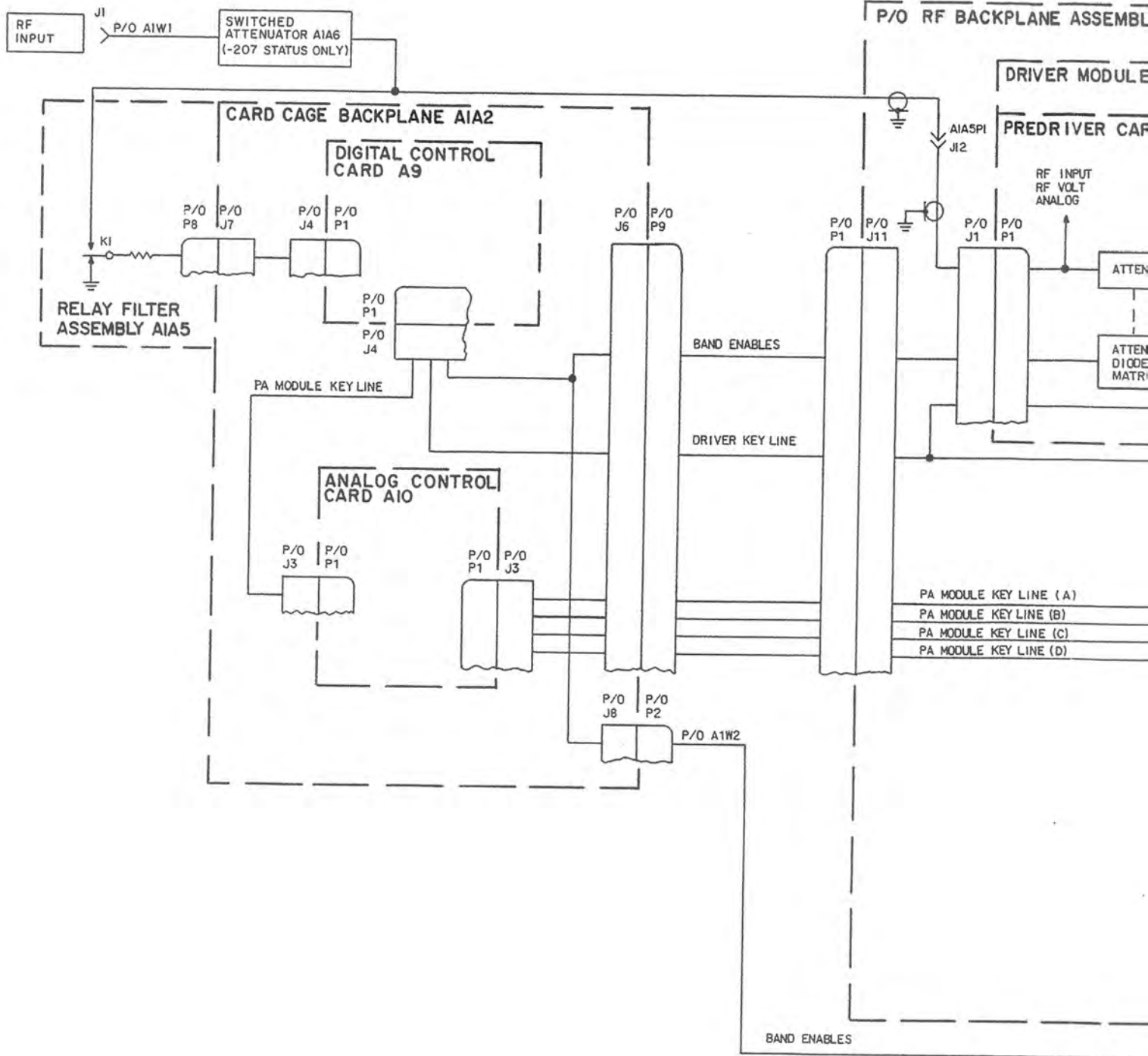
**THEORY (523-0771495-001218)****2.2 HF-8023 1-kW Power Amplifier, RF Power (Refer to figure 2)**

Replace paragraphs 2, 3, and 4 with the following paragraphs. Replace figure 2, sheet 1 with figure 2, sheet 1 provided.

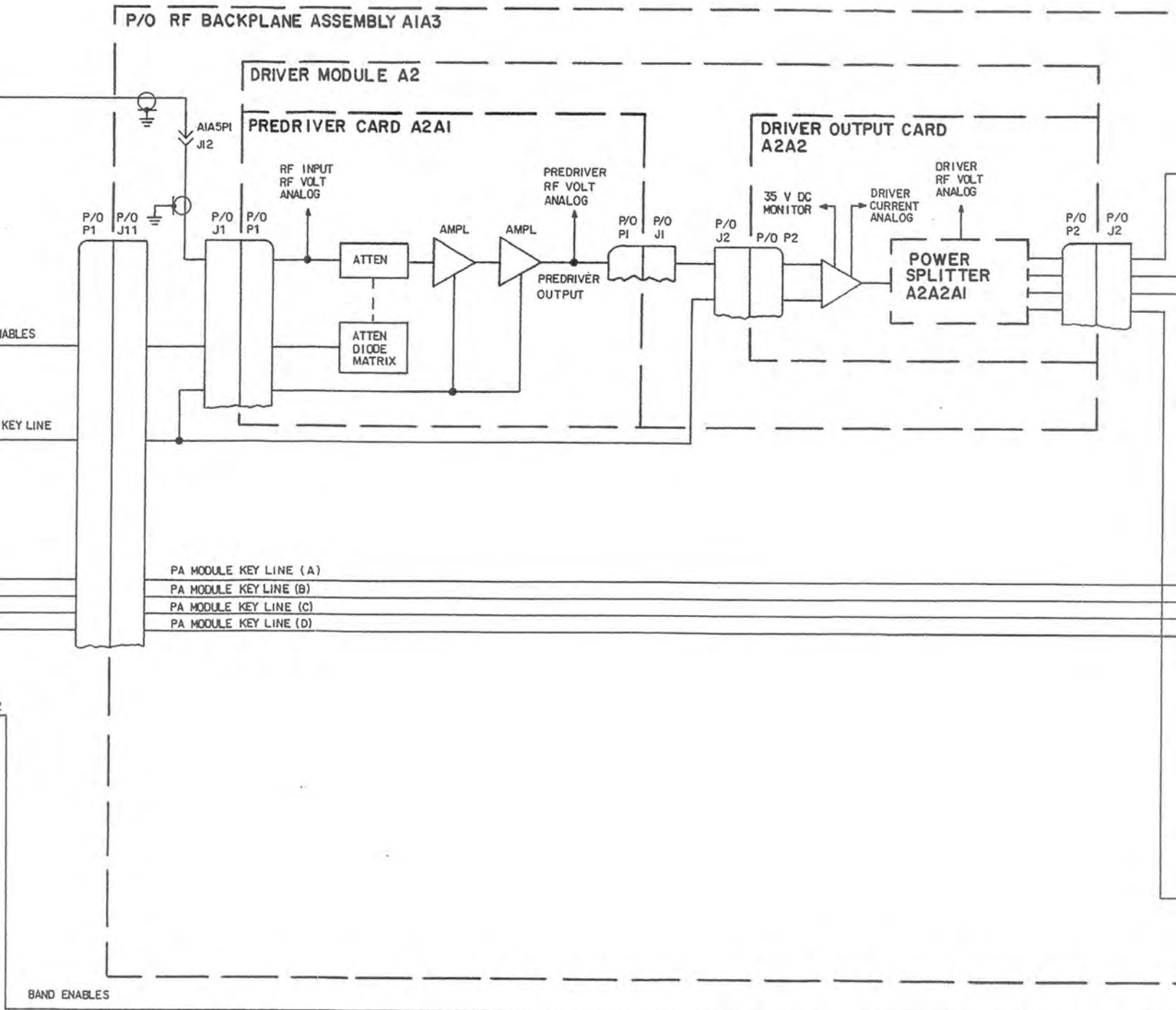
With appropriate dc power, rf power, and cooling air supplied, the HF-8023 1-kW Power Amplifier will supply a full-power output of 1000 watts (high-power mode), or 150 watts (class A/low-power mode). Switched attenuator A6 attenuates the rf input by 8 dB when in class A mode.

With rf input power applied at RF INPUT jack J1, the rf power is supplied through relay filter assembly A1A5 to digital control card A9 in tune step 2 and driver module A2 in all other tune steps. In digital control card A9, the rf signal is sampled to develop a band control signal. Band enable signals are generated and are supplied to predriver card A2A1 and low-pass filter assembly A8.

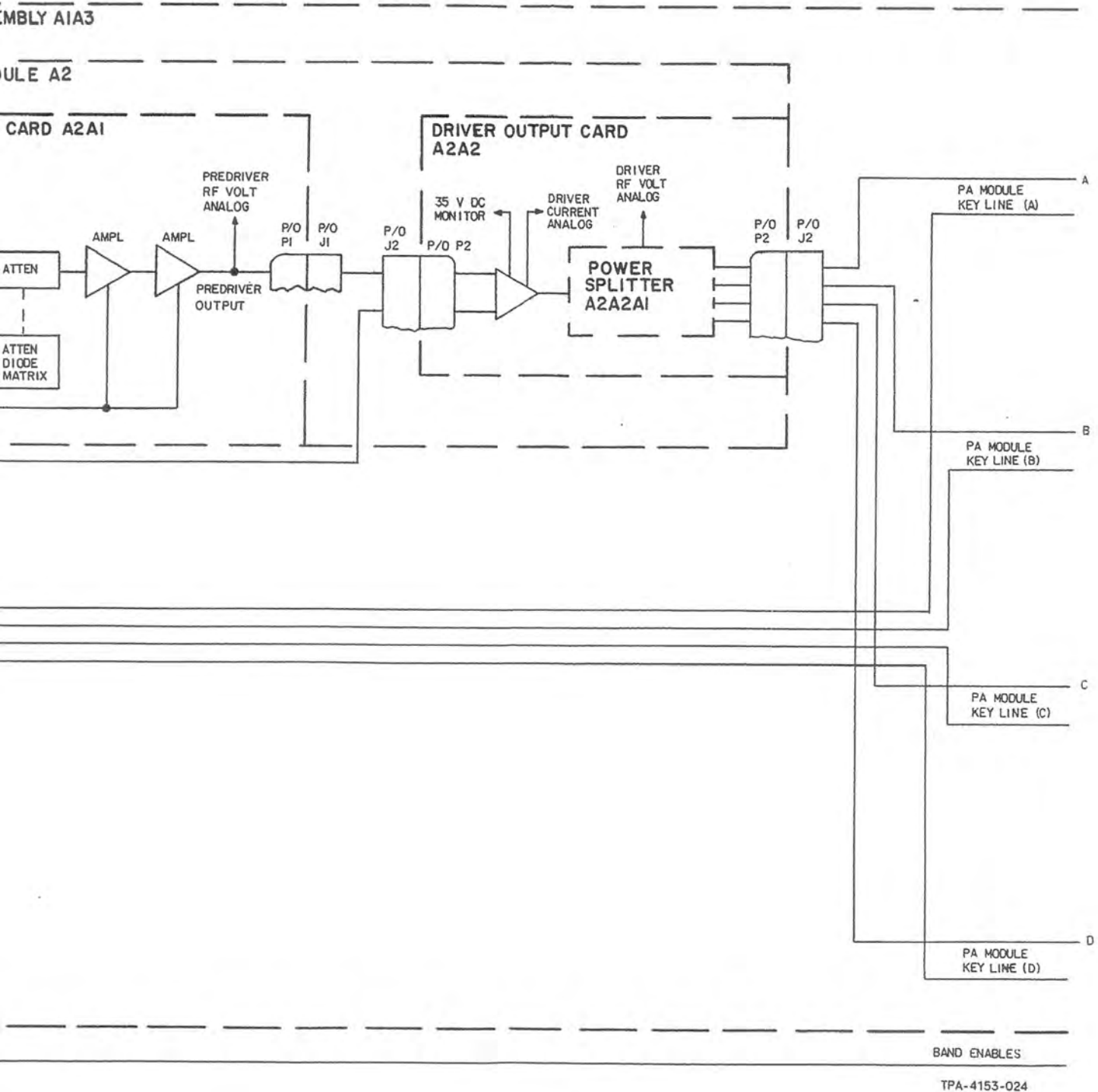
Rf power from relay filter assembly A1A5 is supplied to predriver card A2A1. In the predriver, the rf input level is adjusted across the frequency range by use of an attenuator network. This attenuator network is controlled by the band enable signals and a diode matrix, and achieves a near equal response to all rf input signals in the power amplifier range. The attenuated rf input is amplified by the predriver and supplied to driver output, where it is amplified again and supplied to power splitter A2A2A1. The four equal rf outputs from the power splitters are supplied in parallel to power amplifier output modules A, B, C, and D. These rf signals are amplified again and supplied to power combiner A7. In power combiner, these rf signals are combined to produce the full-power output. The output of the power combiner is supplied through low-pass filter A8, directional coupler A8A2, an external tuning element (if used), directional coupler A1A1, and rf option module A13 to the transmit antenna circuit (coupler or antenna) at J8.







HF-8023, 1-kW Power  
 Power, Simplified B  
 Figure 2 (Shee



HF-8023, 1-kW Power Amplifier, RF Power, Simplified Block Diagram  
Figure 2 (Sheet 1 of 2)

**THEORY (523-0771496-001218)****2. FUNCTIONAL THEORY**

Replace figure 1 with figure 1 provided. Place paragraphs 2.7 and 2.8 after paragraph 2.6.

**2.2 RF Circuits (Refer to figure 2)**

Replace figure 2, sheet 1 with figure 2, sheet 1 provided. Replace paragraph 2 with the following paragraph:

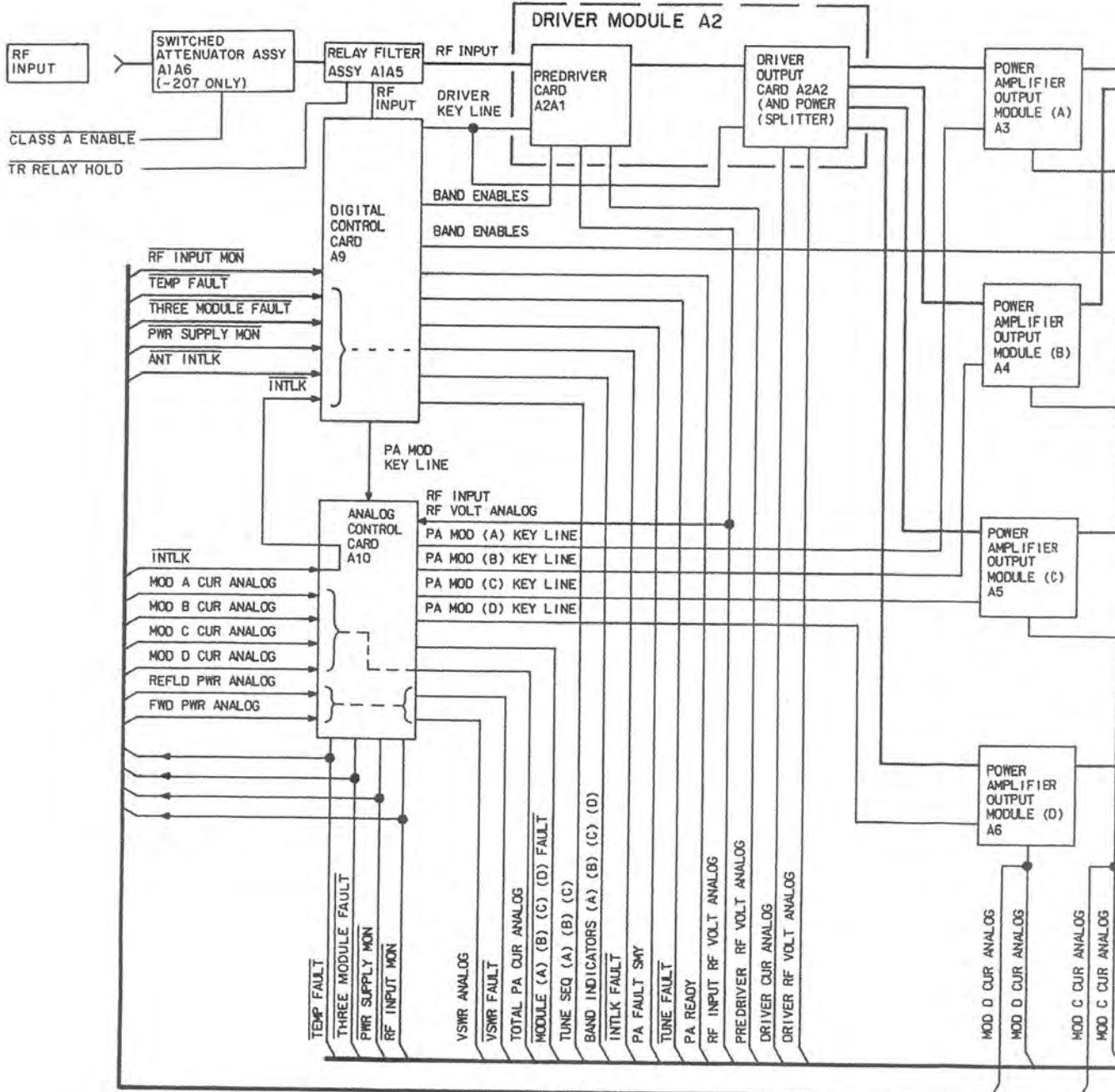
Input to RF INPUT J1 is passed through switched attenuator A1A6, where it is attenuated by 8 dB (if in class A mode), to relay filter assembly A1A5. The rf drive is applied through relay filter assembly A1A5 to digital control card A9 in tune step 2 and to driver module A2 in all other tune steps. In driver module A2, the rf input signal is attenuated to maintain a low overall power amplifier gain variation across the frequency range. This is accomplished using a diode matrix to enable/disable the attenuators. An attenuation of 0 to 15 dB can be selected in each frequency band.

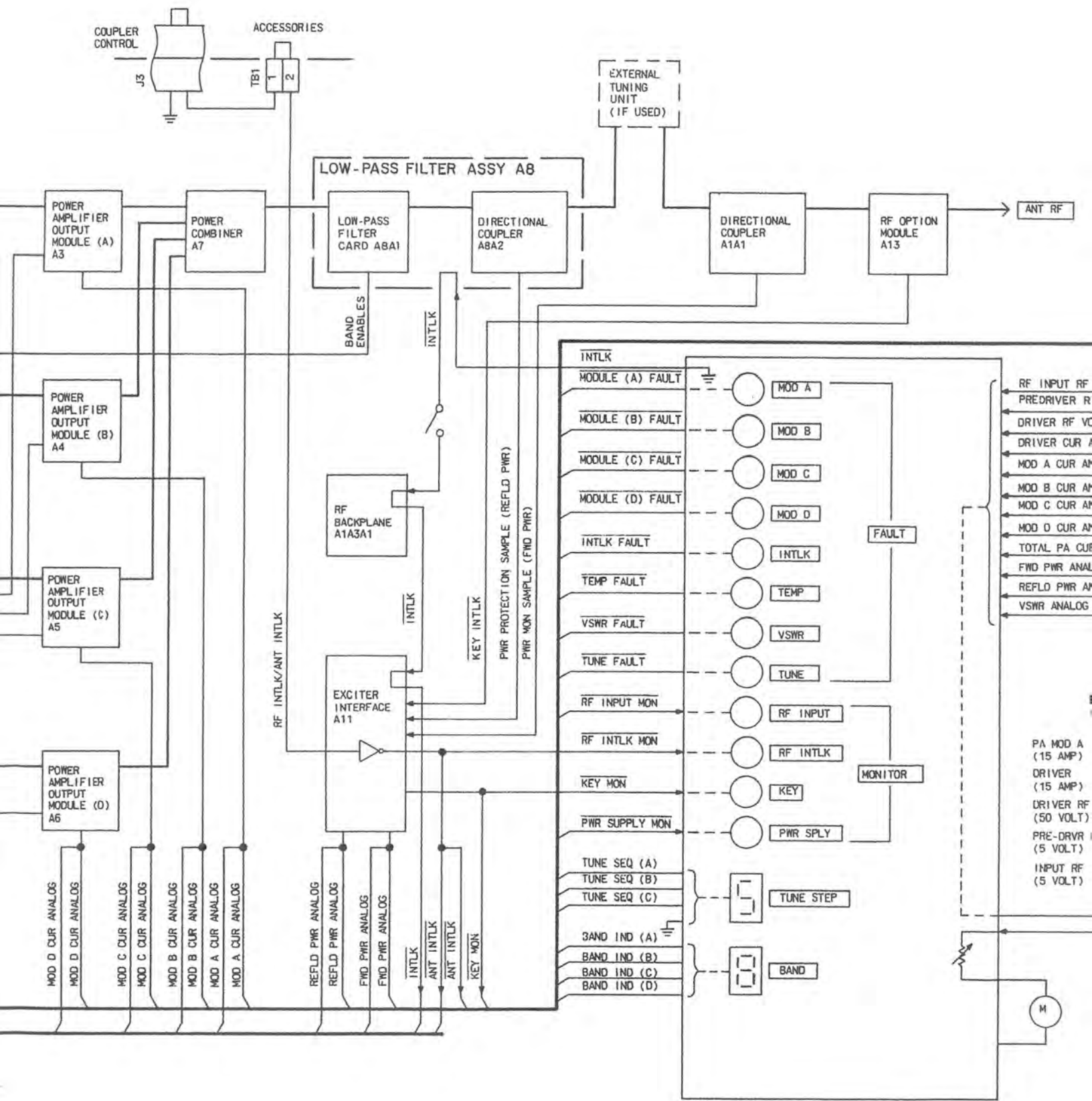
**2.7 Class A Circuits**

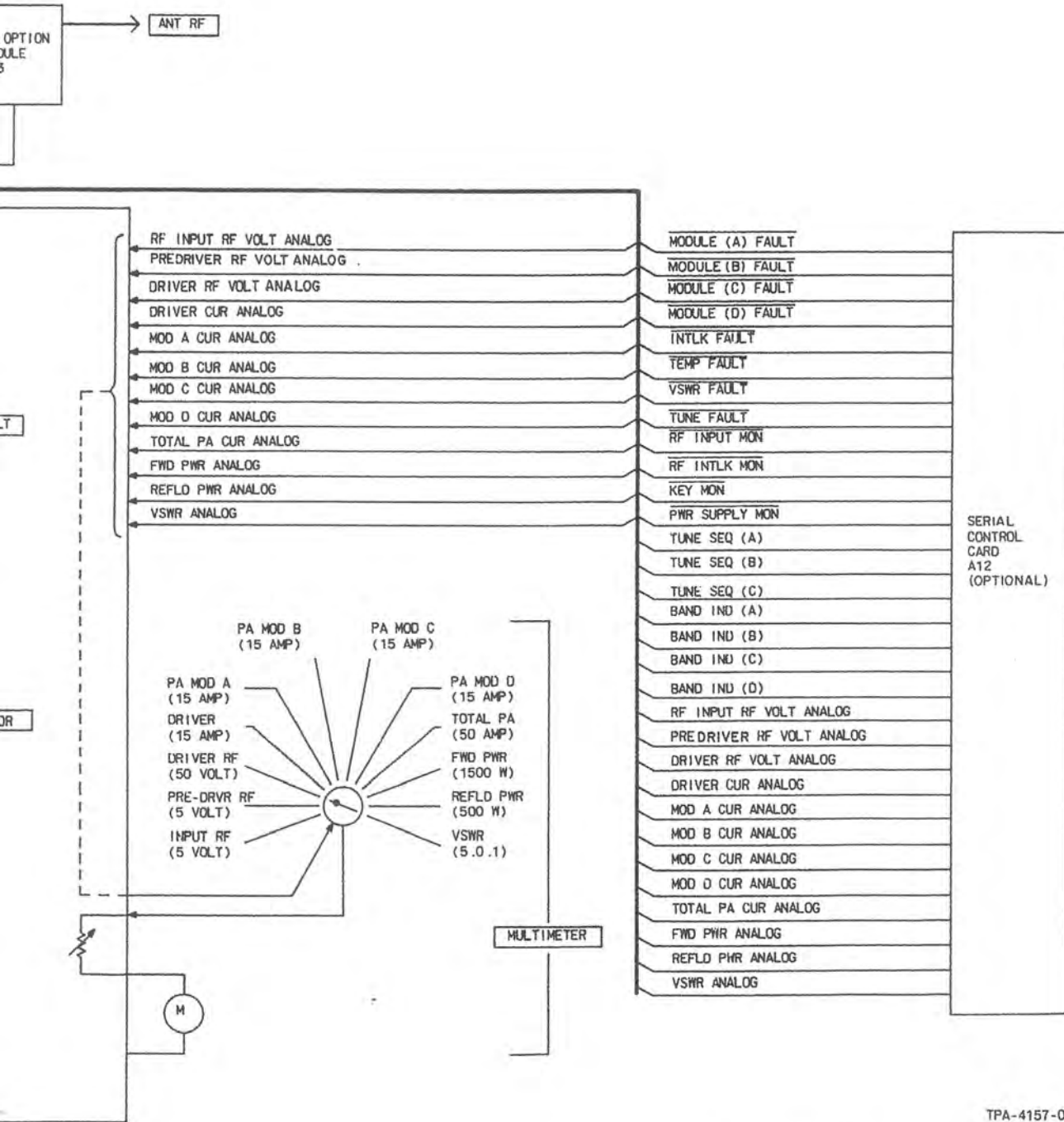
When the class A enable line is grounded (logic 0), the circuits in driver module A2 and power amplifier modules A3, A4, A5, and A6 are biased into class A operation. Class A operation puts the power amplifier in low power and decreases output power to 150 watts. The bias for class A operation is adjustable at each individual module. When the class A enable line is ungrounded (logic 1), the circuits in the driver module and power amplifier modules revert back to class AB operation and the output power returns to the control of the PA PWR switch.

**2.8 TR Relay Control Circuits**

When the HF-8023 1-kW Power Amplifier is equipped with the optional tr relay module (part number 646-6432-001), the tr relay hold line enables the remote processor control to hold the tr relay energized, negating the necessity of waiting for the relay action when switching between receive and transmit.







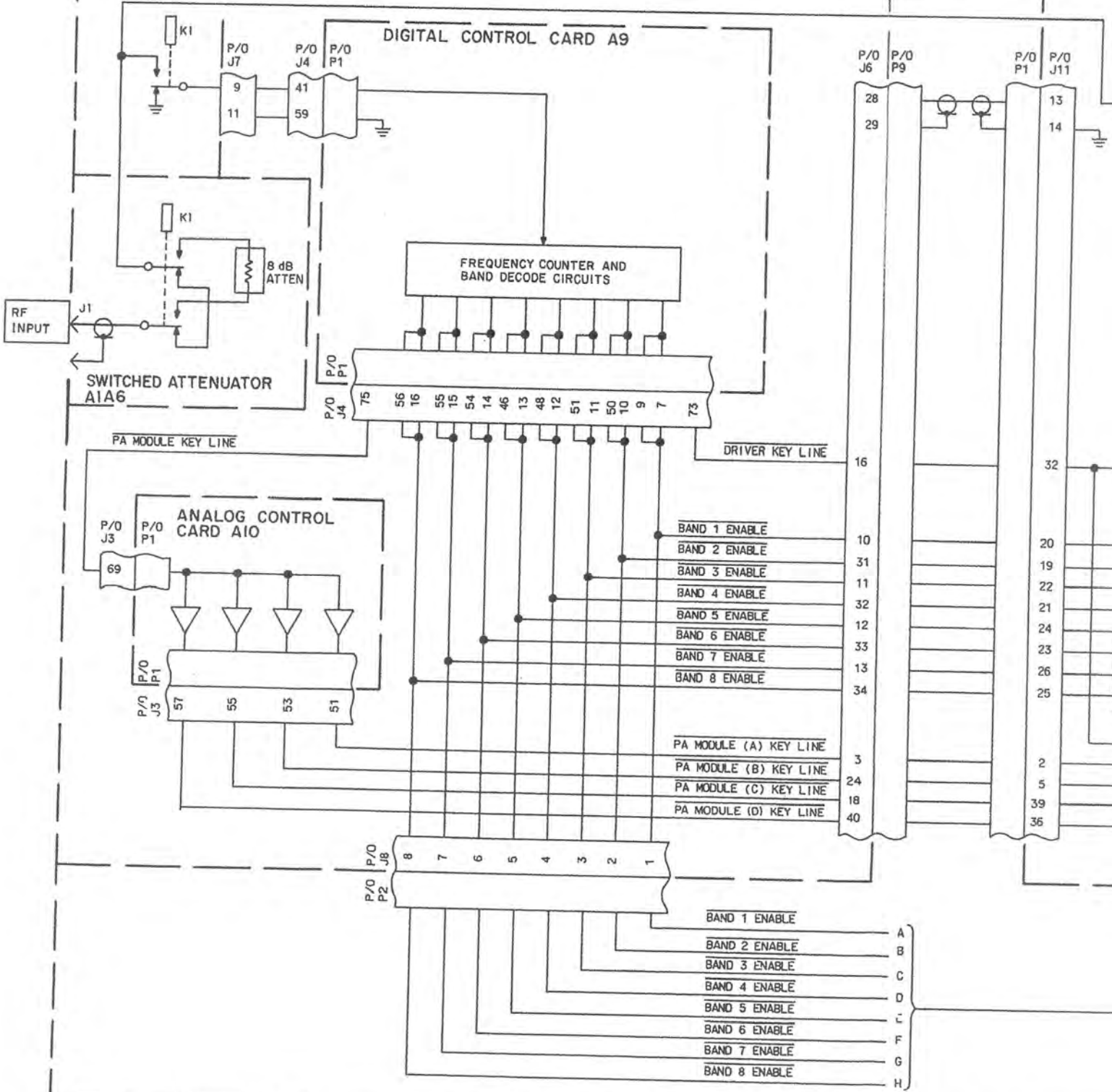
TPA-4157-015

HF-8023 1-kW Power Amplifier,  
Block Diagram  
Figure 1

RELAY FILTER ASSEMBLY A1A5

CARD CAGE BACKPLANE A1A2

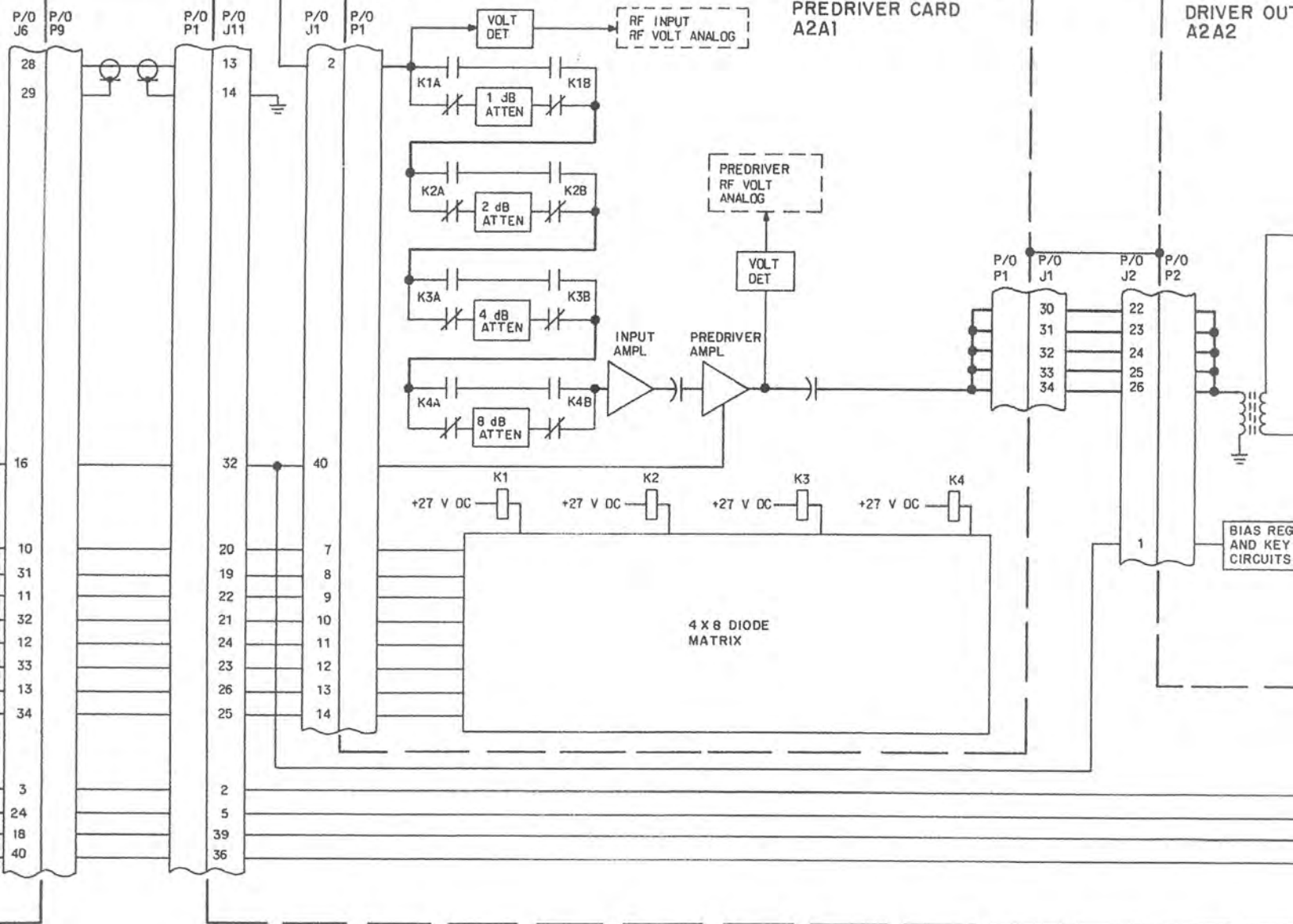
P/O AIW2



P/O AIW2

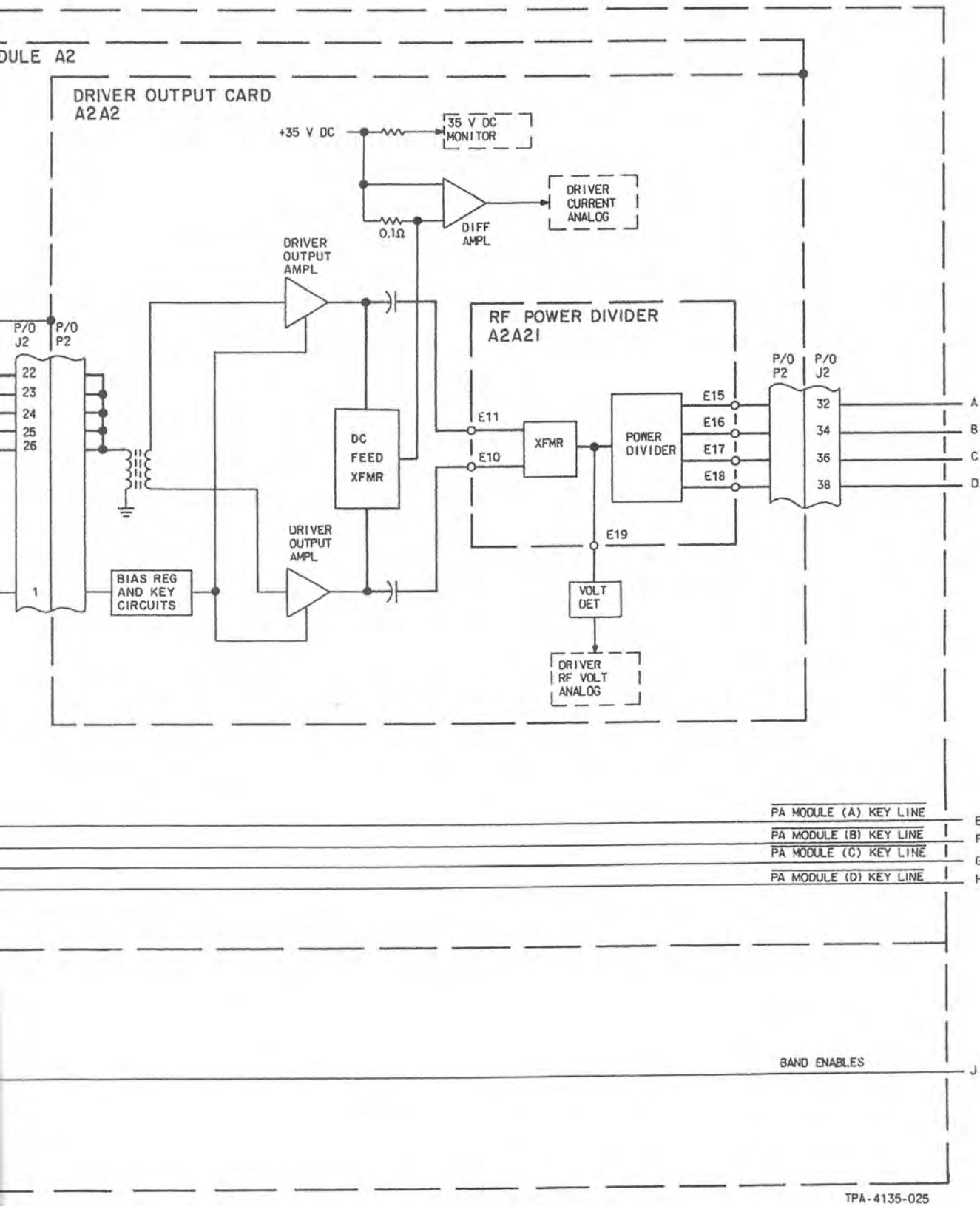
P/O RF BACKPLANE ASSY A1A3

DRIVER MODULE A2



- A
- B
- C
- D
- E
- F
- G
- H



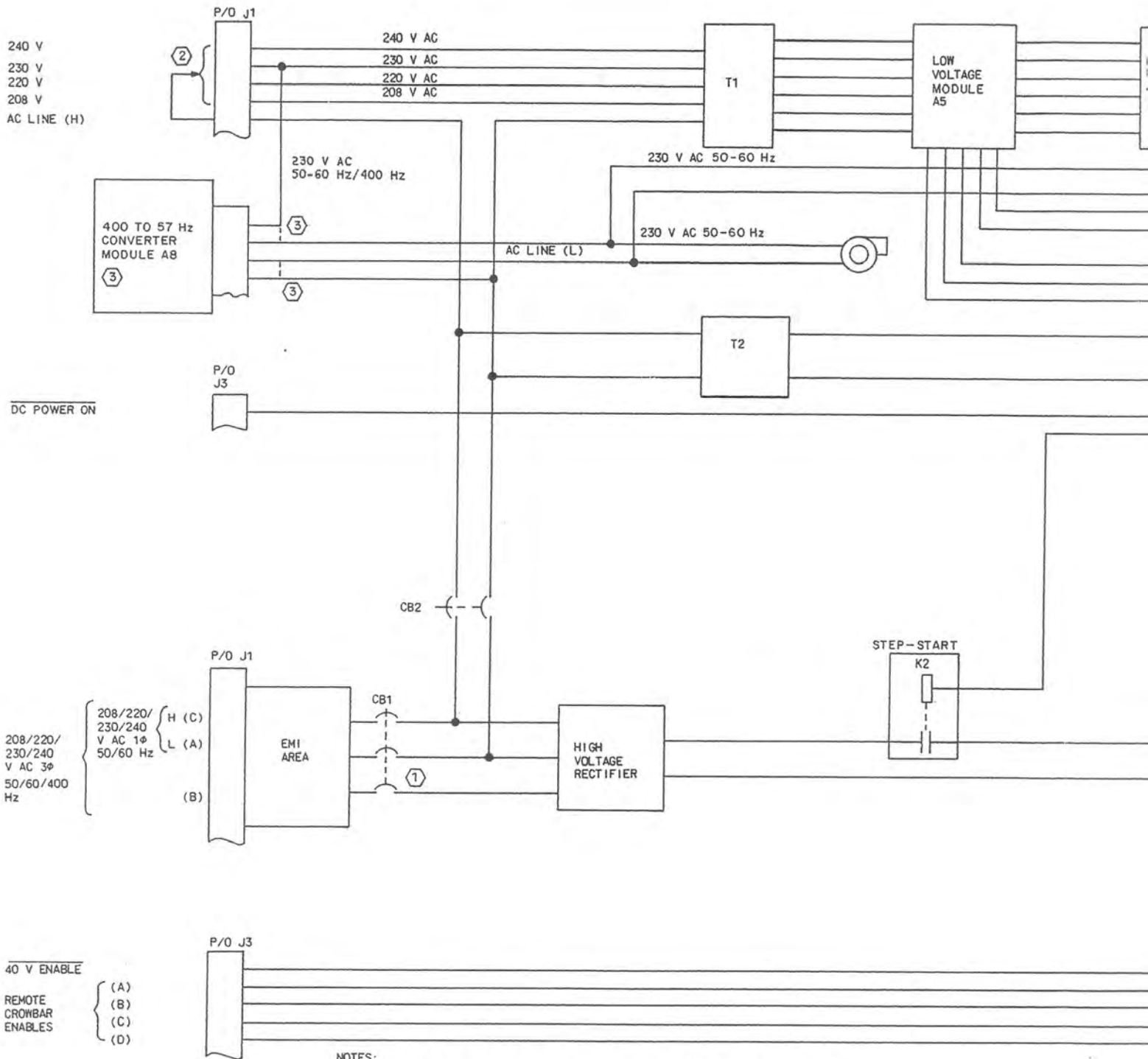


RF Circuits, Block Diagram  
Figure 2 (Sheet 1 of 2)

**THEORY (523-0771497-001218)**

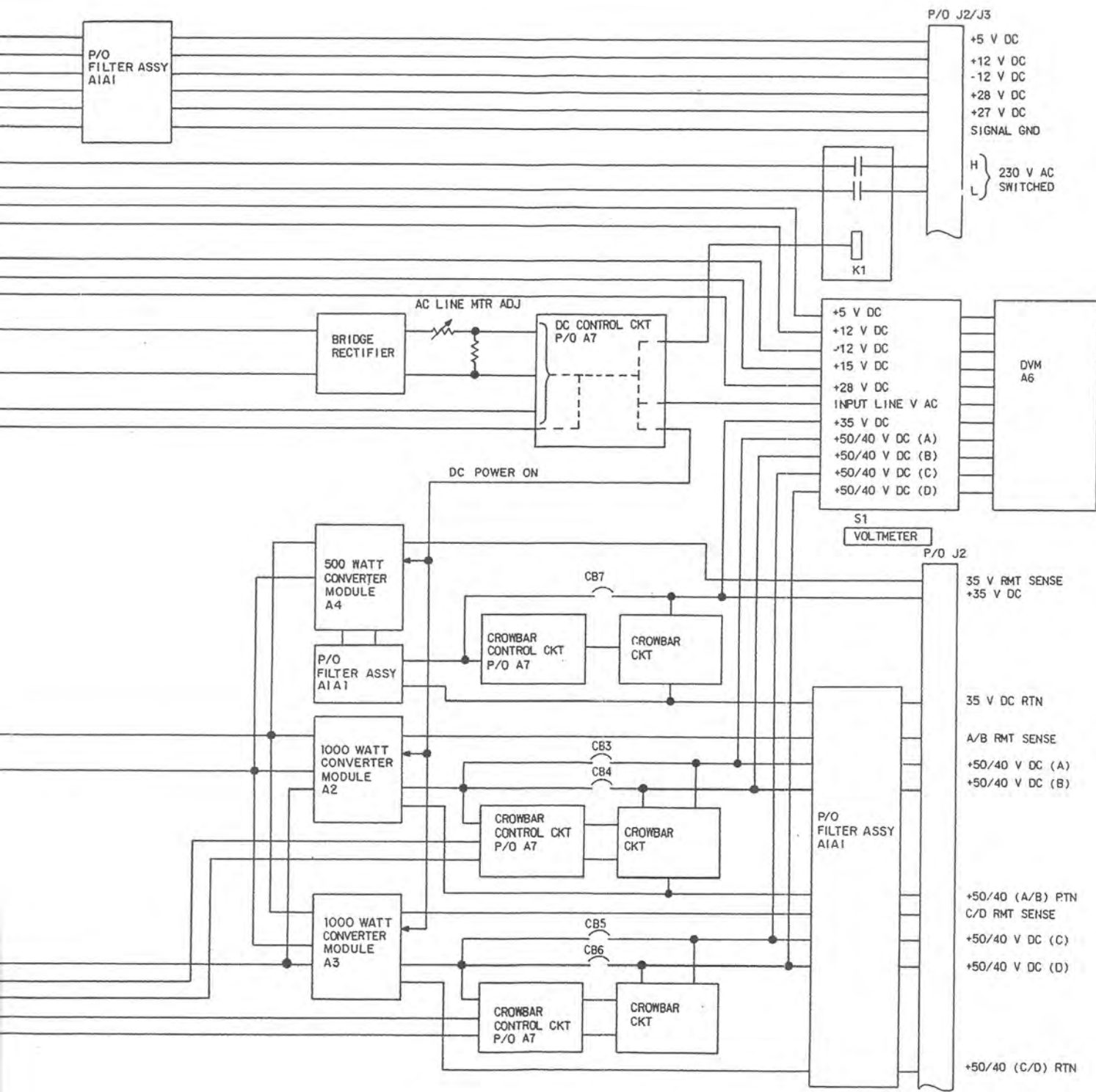
**2. FUNCTIONAL THEORY**

Replace figures 1 and 4 with figures 1 and 4 supplied.



NOTES:

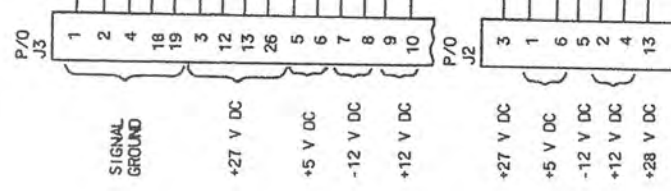
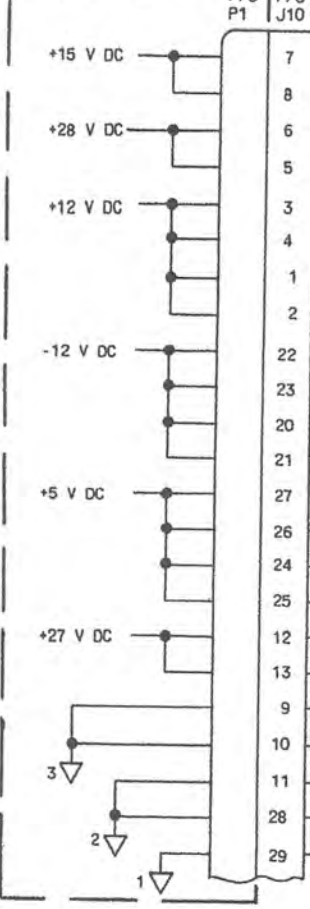
- ① TWO POLE CB1 IS USED FOR 1 $\phi$  POWER, THREE POLE CB1 USED FOR 3 $\phi$  POWER.
- ② AC LINE STRAPPED TO APPROPRIATE LINE FOR AC POWER BEING USED.
- ③ 400 Hz TO 60 Hz CONVERTER USED ONLY BY HF-8032 POWER SUPPLY 622-3512-002.



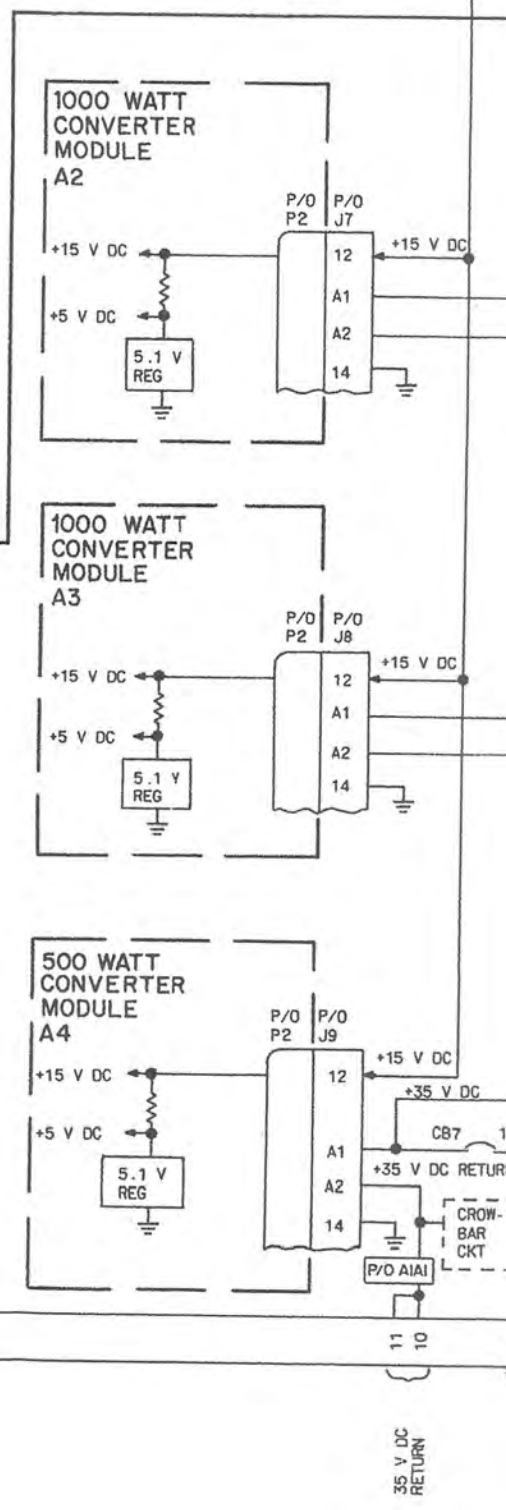
TPA-4163-014

HF-8031, HF-8032 Power Supply,  
Block Diagram  
Figure 1

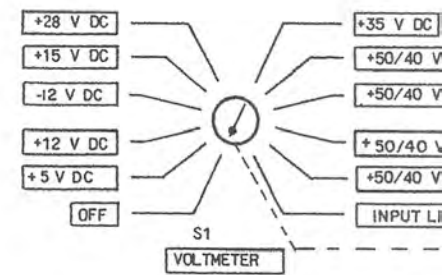
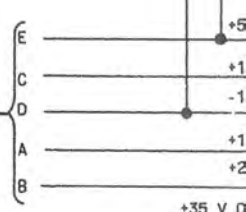
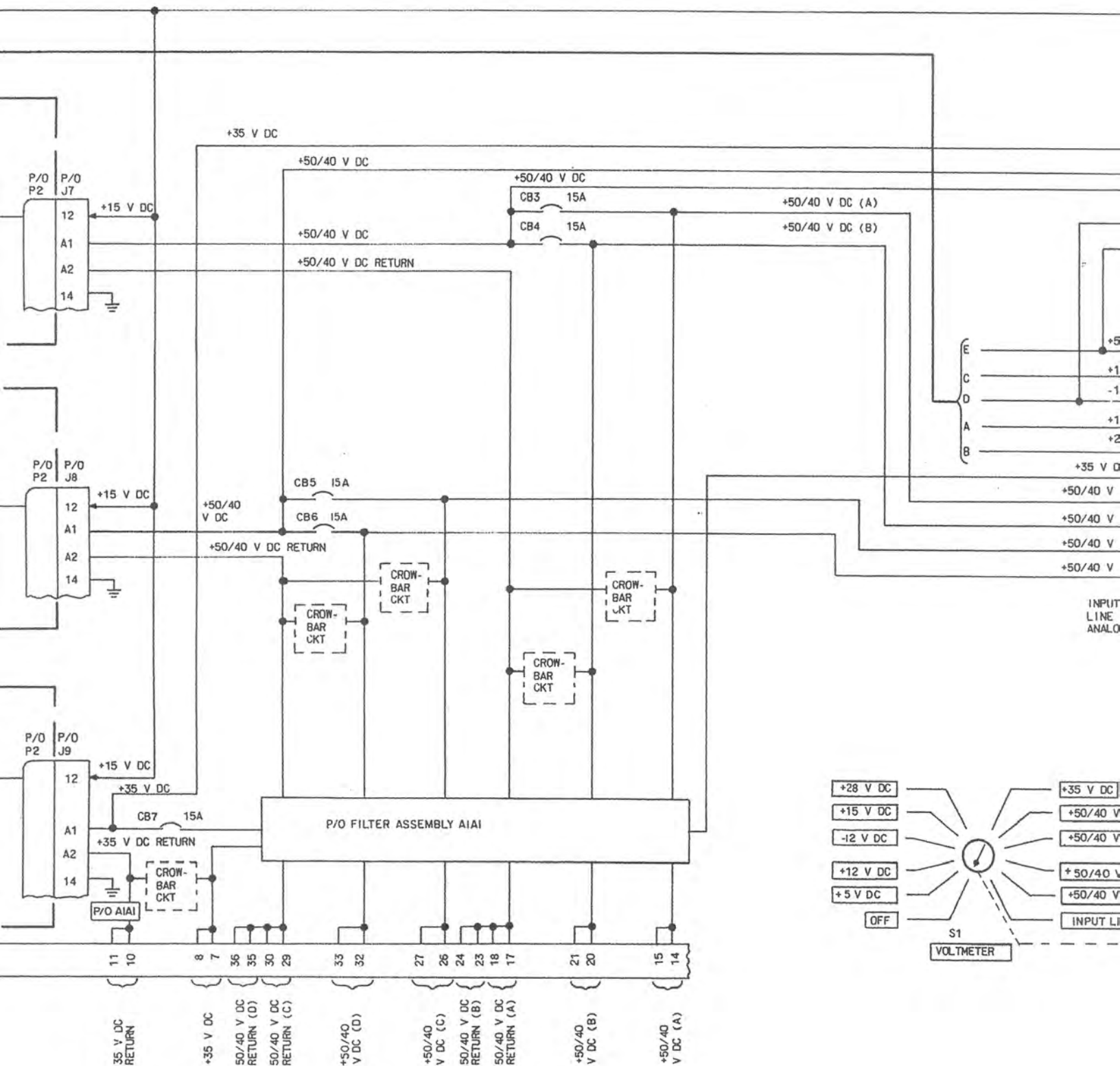
**LOW VOLTAGE MODULE A5**

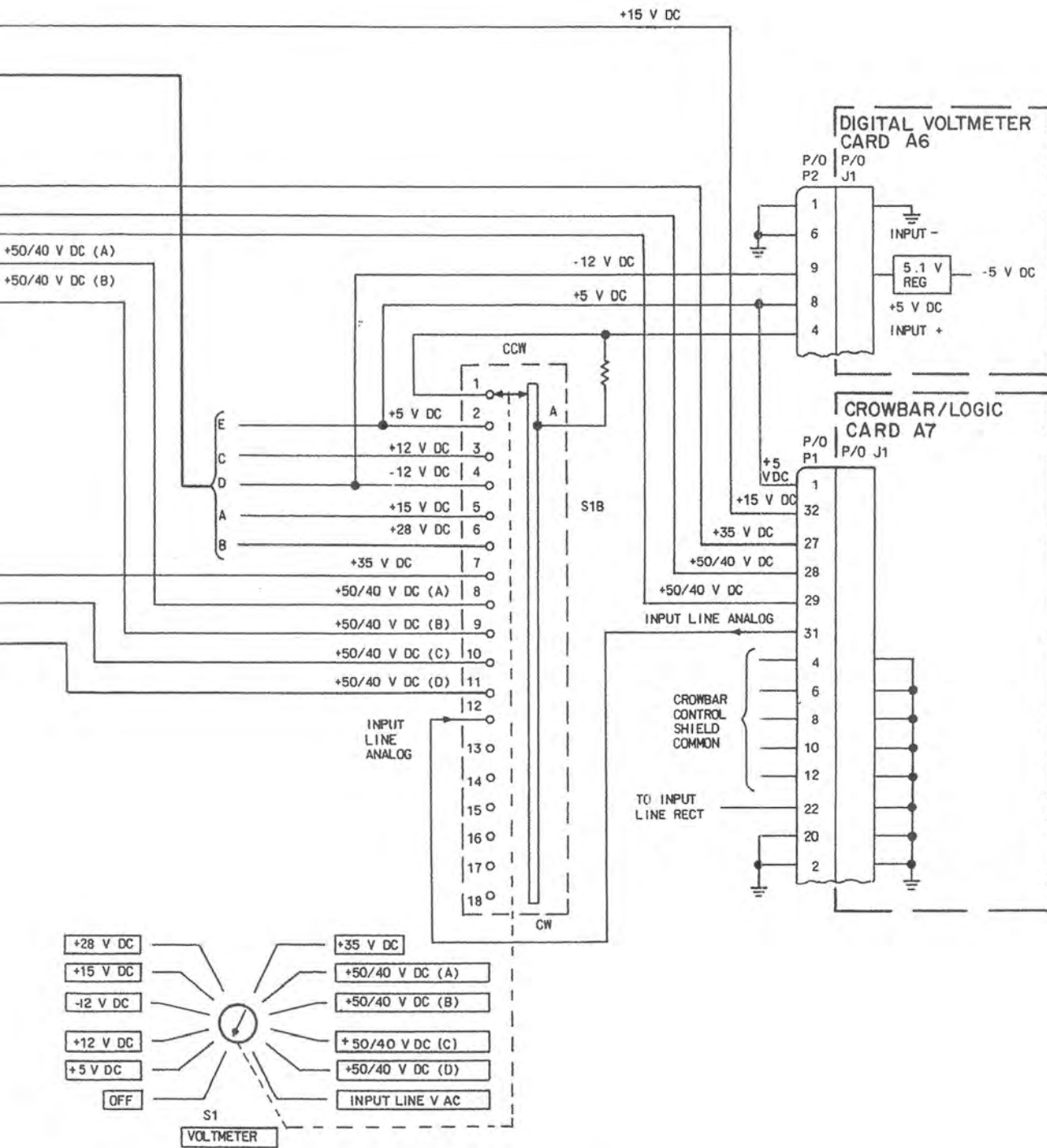


+15 V DC



35 V DC RETURN





TPA-4224-015

DC Output Power Distribution,  
Block Diagram  
Figure 4

## MAINTENANCE (523-0771498-001218)

## 4.3 Testing/Troubleshooting Procedures

Add tests 6 and 7 to table 5.

Table 5. Performance Test Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
6. Class A enable	<p>a. Set exciter or receiver-exciter PA PWR switch to LOW. Ground pin 19 of J2 on rear panel of HF-8023.</p> <p>b. Using VOLTMETER (HF-8031, HF-8032 front panel), measure the following power supply voltages:</p> <p>+5 V dc +12 V dc -12 V dc +15 V dc +28 V dc</p> <p>+35 V dc</p> <p>+50/40 V dc (A) +50/40 V dc (B)</p> <p>+50/40 V dc (C) +50/40 V dc (D)</p> <p>c. Using MULTIMETER (HF-8023 front panel), measure the following power amplifier signals:</p> <p>INPUT RF (5 VOLT) PRE-DRVR RF (15 VOLT) DRIVER RF (50 VOLT) DRIVER (15 AMP)</p> <p>PA MOD A (15 AMP)</p> <p>PA MOD B (15 AMP)</p> <p>PA MOD C (15 AMP)</p> <p>PA MOD D (15 AMP)</p> <p>TOTAL PA (50 AMP)</p> <p>FWD PWR (1500 W) REFLD PWR (500 W)</p> <p>VSWR (5.0:1)</p>	<p>+5.0 ±0.5 V dc +12.0 ±0.5 V dc -12.0 ±0.5 V dc +15.0 ±0.15 V dc +28.0 ±0.5 V dc</p> <p>+35.0 ±0.7 V dc</p> <p>+46.0 ±1.3 V dc +46.0 ±1.3 V dc</p> <p>+46.0 ±1.3 V dc +46.0 ±1.3 V dc</p> <p>0 V rms 0 V rms 0 V rms 0 A</p> <p>0 A</p> <p>0 A</p> <p>0 A</p> <p>0 A</p> <p>0 A</p> <p>0 W 0 W</p> <p>0</p>	<p>Replace HF-8031, HF-8032 modules as indicated:</p> <p>Low-voltage module A5</p> <p>500-watt converter module A4</p> <p>1000-watt converter module A2</p> <p>1000-watt converter module A3</p> <p>Replace HF-8023 cards and modules as indicated:</p> <p>Driver module A2</p> <p>Pa output module A3</p> <p>Pa output module A4</p> <p>Pa output module A5</p> <p>Pa output module A6</p> <p>Analog control card A10</p> <p>Exciter interface card A11</p> <p>Analog control card A10</p>
(Cont)			



Table 5. Performance Test Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
6. (Cont)	<p>d. Observe that the FAULT indicators on the HF-8023 1-kW Power Amplifier front panel are as follows:</p> <p>MOD A MOD B MOD C MOD D</p> <p>INTLK</p> <p>TEMP VSWR</p> <p>TUNE</p> <p>e. Observe that the MONITOR indicators on the HF-8023 1-kW Power Amplifier front panel are as follows:</p> <p>RF INPUT</p> <p>KEY RF INTLK</p> <p>PWR SPLY</p> <p>f. Observe that the EQUIPMENT STATUS indicators on the exciter or receiver-exciter front panel are as follows:</p> <p>EXCTR FAULT, EXCITER FAULT, or R/E FAULT</p> <p>PRESEL FAULT</p> <p>PA FAULT</p> <p>COUPLER FAULT</p> <p>PA READY</p> <p>KEY</p> <p>RF OUT</p> <p>g. Observe the TUNE STEP indicator on the power amplifier front panel.</p>	<p>Unlit Unlit Unlit Unlit</p> <p>Unlit</p> <p>Unlit Unlit</p> <p>Unlit</p> <p>Unlit</p> <p>Unlit</p> <p>Unlit</p> <p>Unlit Lighted</p> <p>Lighted</p> <p>Unlit</p> <p>Unlit</p> <p>Unlit</p> <p>Unlit</p> <p>Unlit</p> <p>Unlit</p> <p>Unlit</p> <p>Unlit</p> <p>Indicates TUNE STEP "1".</p>	<p>Replace HF-8023 cards as indicated:</p> <p>Analog control card A10</p> <p>Digital control card A9 or check that interlocked cards and modules are secured (reference test 2.d)</p> <p>Analog control card A10</p> <p>Digital control card A9</p> <p>Replace HF-8023 cards as indicated:</p> <p>Analog control card A10</p> <p>Exciter interface card A11</p> <p>Analog control card A10</p> <p>Check associated unit or replace HF-8023 cards, as indicated:</p> <p>Exciter or receiver-exciter</p> <p>Preselector</p> <p>Exciter interface card A11 or digital control card A9</p> <p>Antenna coupler</p> <p>Exciter interface card A11 or digital control card A9</p> <p>Exciter or receiver-exciter</p> <p>Exciter interface card A11</p> <p>Replace HF-8023 digital control card A9 or front panel card A1A4.</p>
(Cont)	h. Observe the BAND indicator.	Indicates BAND "0".	Same as step 6.g

Table 5. Performance Test Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
6. (Cont)	<p>i. Momentarily set the KEY switch on the exciter or receiver-exciter to LOCK. (Return it to NORM position.)</p> <p>j. Observe the TUNE STEP indicator.</p> <p>k. Observe the BAND indicator.</p> <p>l. Set the KEY switch on the exciter or receiver-exciter to LOCK.</p> <p>m. Observe the TUNE STEP indicator.</p> <p>n. Using VOLTMETER (HF-8031 front panel), measure the following power supply voltages:</p> <p>+5 V dc  +12 V dc  -12 V dc  +15 V dc  +28 V dc  +35 V dc</p>	<p>Flashes through all 5 tune steps and stops on TUNE STEP "5".</p> <p>Indicates BAND "1".</p> <p>Indicates TUNE STEP "5".</p> <p>+5.0 ±0.5 V dc  +12.0 ±0.5 V dc  -12.0 ±0.5 V dc  +15.0 ±0.15 V dc  +28.0 ±0.5 V dc  +35.0 ±0.7 V dc</p>	<p><b>Note</b></p> <p>Rf power is not, and has not yet been, applied.</p> <p><b>Note</b></p> <p>This momentarily applies rf power to power amplifier.</p> <p>If unit fails to tune (remains in TUNE STEP "1"), key signal was not received; check control connections or replace HF-8023 exciter interface card A11.</p> <p>If unit fails (TUNE) in TUNE STEP "3", rf power was insufficient; check rf connections, exciter or receiver-exciter rf out, or replace HF-8023 digital control card A9.</p> <p>If band "0" is indicated, rf power was insufficient; check rf connections, exciter or receiver-exciter rf out, or replace HF-8023 digital control card A9.</p> <p>If band other than band "1" or "0" is indicated, replace HF-8023 digital control card A9 or front panel card A1A4.</p> <p>Replace HF-8023 digital control card A9 or front panel card A1A4.</p> <p>Replace HF-8031, modules as indicated:</p> <p>Low-voltage module A5</p> <p>500-watt converter module A4*</p>
(Cont)			

Table 5. Performance Test Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
6. (Cont)	+50/40 V dc (A) +50/40 V dc (B)  +50/40 V dc (C) +50/40 V dc (D)	+46.0 ±1.3 V dc +46.0 ±1.3 V dc  +46.0 ±1.3 V dc +46.0 ±1.3 V dc	1000-watt converter module A2*  1000-watt converter module A3*
<p>*Before replacing these modules, set the KEY switch on the exciter or receiver-exciter to OFF. If voltage recovers, replace associated HF-8023 module:</p> <p>+ 35 V dc — Driver module A2</p> <p>+ 50/40 V dc (A) — Pa output module A3</p> <p>+ 50/40 V dc (B) — Pa output module A4</p> <p>+ 50/40 V dc (C) — Pa output module A5</p> <p>+ 50/40 V dc (D) — Pa output module A6</p> <p>If voltage does not recover, remove associated HF-8023 module and check voltage again. If voltage still does not recover, replace the associated HF-8031, HF-8032 module.</p>			
(Cont)	<p>o. Using MULTIMETER (HF-8023 front panel), measure the following power amplifier signals:</p> <p>INPUT RF (5 VOLT)                      PRE-DRVR RF (15 VOLT)                      DRIVER RF (50 VOLT)                      DRIVER (15 AMP)</p> <p>PA MOD A (15 AMP)</p> <p>PA MOD B (15 AMP)</p> <p>PA MOD C (15 AMP)</p> <p>PA MOD D (15 AMP)</p> <p>TOTAL PA (50 AMP)</p> <p>FWD PWR (1500 W)                      REFLD PWR (500 W)</p> <p>VSWR (5.0:1)</p>	<p>For reference only                      For reference only                      For reference only                      4.0 A nominal</p> <p>5.5 A nominal</p> <p>5.5 A nominal</p> <p>5.5 A nominal</p> <p>5.5 A nominal</p> <p>22.0 A nominal</p> <p>150 W nominal                      0 W nominal</p> <p>1.0:1 nominal</p>	<p>Replace HF-8023 cards and modules as indicated:</p> <p>If no readings, driver module A2</p> <p>Pa output module A3</p> <p>Pa output module A4</p> <p>Pa output module A5</p> <p>Pa output module A6</p> <p>Analog control card A10</p> <p>Exciter interface card A11, directional coupler A1A1, or calibrate directional coupler A1A1</p> <p>Analog control card A10, front panel card A1A4, or adjust vswr overload A1A4R12</p>

Table 5. Performance Test Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL	
6. (Cont)	p. Observe that the FAULT indicators on the HF-8023 1-kW Power Amplifier front panels are as follows:  MOD A MOD B MOD C MOD D  Replace module, card, and/or repair circuit breaker associated with indicated fault.			Unlit Unlit Unlit Unlit	See chart below.	
	FAULT	HF-8023	HF-8031	CIRCUIT BREAKER	HF-8023 (-207)	
	MOD A	Pa output module A3	1000-watt converter A2	CB3	Analog control card A10	Front panel card A1A4
	MOD B	Pa output module A4	1000-watt converter A2	CB4	Analog control card A10	Front panel card A1A4
	MOD C	Pa output module A5	1000-watt converter A3	CB5	Analog control card A10	Front panel card A1A4
	MOD D	Pa output module A6	1000-watt converter A3	CB6	Analog control card A10	Front panel card A1A4
(Cont)	INTLK			Unlit		Replace HF-8023 digital control card A9 or check that interlocked cards and modules are secured (reference test 2.d.).
	TEMP			Unlit		Replace HF-8023 analog control card A10 or pa output module A3, A4, A5, or A6.
	VSWR			Unlit		Replace HF-8023 analog control card A10, exciter interface card A11, directional coupler A1A1, or front panel card A1A4; adjust vswr overload A1A4R12; or calibrate directional coupler A1A1.
	TUNE			Unlit		Replace HF-8023 digital control card A9, analog control card A10, or exciter interface card A11.

Table 5. Performance Test Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
6. (Cont)	<p>q. Observe that the MONITOR indicators on the HF-8023 1-kW Power Amplifier front panel are as follows:</p> <p>RF INPUT</p> <p>KEY</p> <p>RF INTLK</p> <p>PWR SPLY</p> <p>r. Observe that the EQUIPMENT STATUS indicators on the exciter or receiver-exciter front panel are as follows:</p> <p>EXCTR FAULT, EXCITER FAULT, or R/E FAULT</p> <p>PRESEL FAULT</p> <p>PA FAULT</p> <p>COUPLER FAULT</p> <p>PA READY</p> <p>KEY</p> <p>RF OUT</p> <p>s. Set KEY switch on the exciter or receiver-exciter to NORM.</p>	<p>Lighted</p> <p>Lighted</p> <p>Lighted</p> <p>Lighted</p> <p>Unlit</p> <p>Unlit</p> <p>Unlit</p> <p>Unlit</p> <p>Lighted</p> <p>Lighted</p> <p>Lighted</p>	<p>Replace HF-8023 cards as indicated:</p> <p>Analog control card A10</p> <p>Exciter interface card A11</p> <p>Analog control card A10</p> <p>Check associated unit or replace HF-8023 cards, as indicated:</p> <p>Exciter or receiver-exciter</p> <p>Preselector</p> <p>Exciter interface card A11 or digital control card A9</p> <p>Antenna coupler</p> <p>Exciter interface card A11 or digital control card A9</p> <p>Exciter or receiver-exciter</p> <p>Exciter interface card A11</p>
7. Tr relay	<p>a. Set exciter or receiver-exciter PA PWR switch to LOW.</p> <p>b. Connect ohmmeter between J8 and J9.</p> <p>c. Ground pin 20 of J2 on rear panel of HF-8023.</p> <p>d. Connect ohmmeter between J7 and J8.</p> <p>e. Turn all power off.</p>	<p>Continuity present</p> <p>Continuity present</p>	<p>Replace tr relay A13.</p> <p>Replace tr relay A13.</p>

**MAINTENANCE (523-0771499-001218)**

**5.3 TGC Adjustment (Refer to figure 2)**

Substitute the following step e for current step e when adjusting a -207 status power amplifier.

- e. Set power amplifier to low-power mode at 14.0000 MHz. Adjust rf input level to produce 150-watt rf output.

**PARTS LIST (523-0771501-001218)**

Differences in parts list for HF-80 Power Amplifier, part number 622-3490-001 and 622-3490-207 are described below.

**1.7 Manufacturer's Code, Name, and Address**

Correct the name and address for manufacturer's code 13499 and add the remaining manufacturer's codes, names, and addresses.

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>	<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876	17117	ELECTRONIC MOLDING CORP 96 MILL ST WOONSOCKET RI 02895
04213	CADDELL-BURNS MFG CO INC 40 E SECOND ST MINEOLA NY 11501	49956	RAYTHEON CO EXECUTIVE OFFICES 141 SPRING ST LEXINGTON MA 02173
13499	ROCKWELL INTERNATIONAL CORP DEFENSE ELECTRONICS OPERATIONS COLLINS DEFENSE COMMUNICATIONS DIV 350 COLLINS ROAD NE CEDAR RAPIDS IA 52498	80205	NATIONAL AEROSPACE STANDARD
		98291	SEAELECTRO CORP 225 HOYT MAMARONECK NY 10544

**1.8 Reference Designation Prefixes**

Add the following prefix to the existing list.

<u>PREFIX</u>	<u>UNIT PART NUMBER</u>	<u>FIG-ITEM</u>
A1	646-6433-004	2
A1A5	652-2254-003	2A
A1A6	652-7804-001	2B
A2	646-6407-003	1-9
A3	646-6406-003	1-6

**1.9 Configuration Identifiers**

Add the following configuration identifiers, part numbers and figure references to the existing list.

<u>PREFIX</u>	<u>UNIT PART NUMBER</u>	<u>FIG-ITEM</u>
R	622-3490-207	1
R	646-6433-004	2
B	652-2254-003	2A
—	652-7804-001	2B

## 2. GROUP ASSEMBLY PARTS LIST

Make the following changes at the locations specified.

Differences between part numbers 622-3490-001 and 622-3490-207 are:

Figure 1, Top Level Indent 1 — Replace part number 622-3490-001 with 622-3490-207.

Figure 1, Item 9, Indent 2 — Replace part number 646-6407-001 with 646-6407-003.

Figure 1, Item 6, Indent 2 — Replace part number 646-6406-001 with 646-6406-003.

Figure 1, Item 11, Indent 2 — Replace part number 642-3593-001 with 642-3593-002.

Figure 1, Item 42, Indent 2 — Replace part number 646-6433-001 with 646-6433-004.

The following provides information on the differences between 646-6433-001 and 646-6433-004:

Figure 2, Sheets 3 and 4 — Replace with new illustration to show placements of additional parts.

Figure 2, Item 37, Indent 2 — Replace part number 646-6437-001 with 646-6437-003.

Figure 2, Item 44, Indent 2 — Replace part number 642-3588-001 with 642-3588-002.

Figure 2, Item 54, Indent 2 — Replace part number 646-6436-001 with 646-6436-003.

Figure 2, Add Item 60A, Indent 2 — 353-3644-010, A1CR1, Semicond device, 1N4454 Sheet 3 of Illustration

Figure 2, Add Item 67A, Indent 2 — 652-2254-002 Relay-Filter Assembly A1A5. (AP) 343-0132-000 Qty 4, 343-0125-000 Qty 4. This figure and illustration will follow as figure 2A.

Figure 2, Item 105, Indent 3 — Replace part number 646-6438-001 with 646-6438-002.

Figure 2, Add Item 108A, Indent 3 — Wiring Harness A3W1 part number 652-2253-001. (AP) 310-0093-000 Qty 1 Lockwasher 310-0053-001, Qty 1 Flat Washer, 343-0299-000 Qty 1 Screw.

Figure 2, Add Item 108B, Indent 4 — Connector A3W1J12 part number 357-7753-010

Figure 2, Item 109, Indent 3 — Replace part number 642-3295-001 with 642-3295-003.

Figure 2, Item 37A, Indent 3 — Change quantity of contacts from 104 to 105 372-2501-040.

Figure 2, Item 59, Indent 3 — Change quantity of contacts from 41 to 43, 372-0514-080.

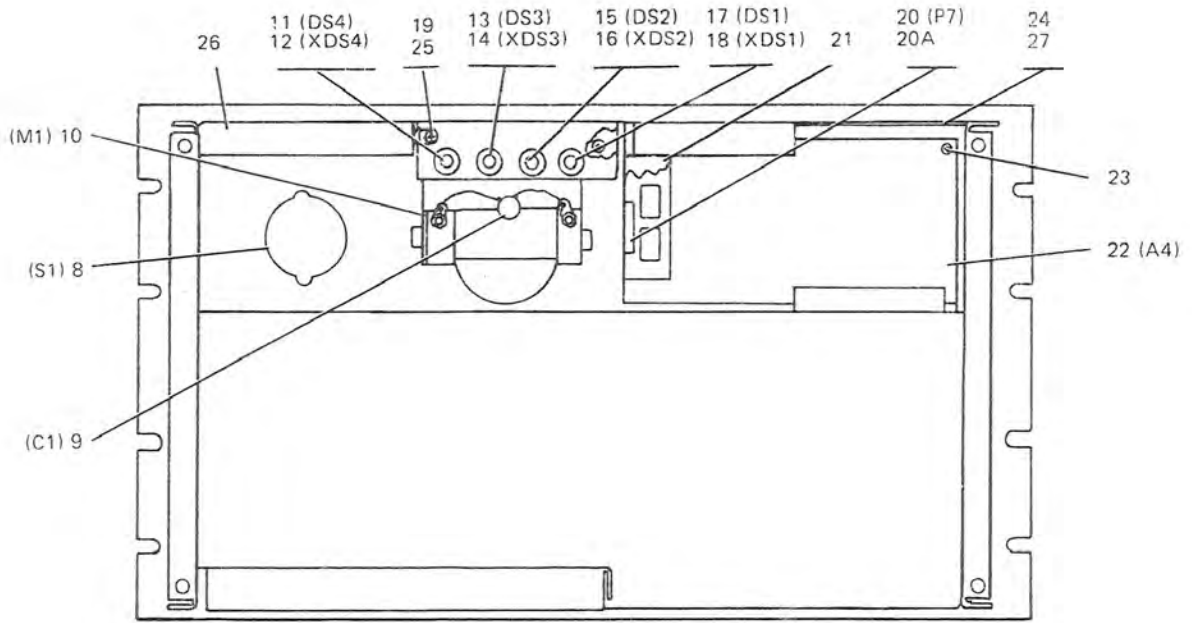
Figure 2, Item 66A, Indent 2 — Add 652-7804-001 Switched Attenuator A1A6. This figure and illustration will follow as figure 2B.

Figure 2, Item 66B, Indent 2 — Add 201-0002-000 Grommet.

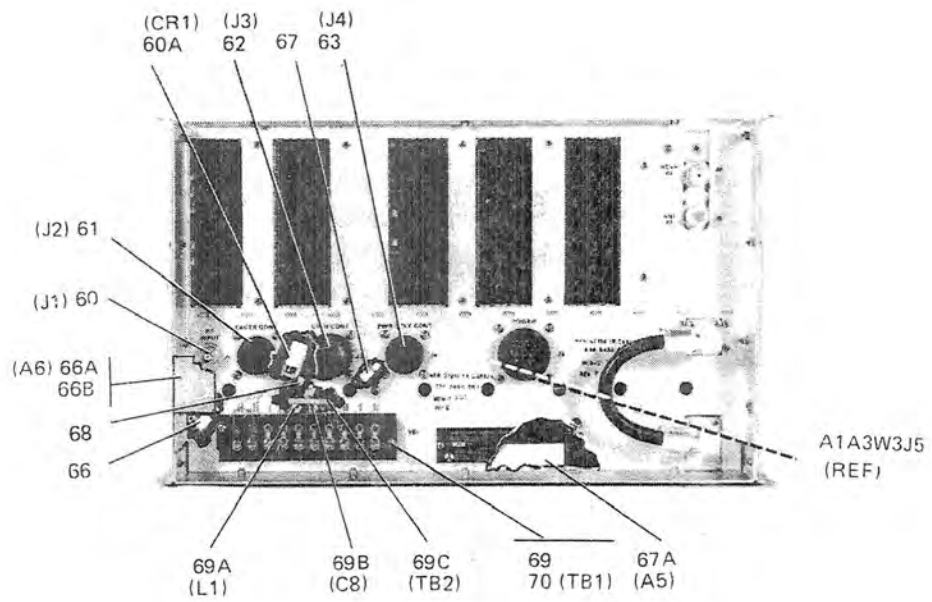
Figure 2, Item 69A, Indent 2 — Add 240-2715-310 Inductor, 33 mH A1L1.

Figure 2, Item 69B, Indent 2 — Add 913-5019-440 Capacitor .1 uF A1C8.

Figure 2, Item 69C, Indent 2 — Add 306-9033-001 Terminal Strip TB2.



BACK OF FRONT PANEL - DETAIL A

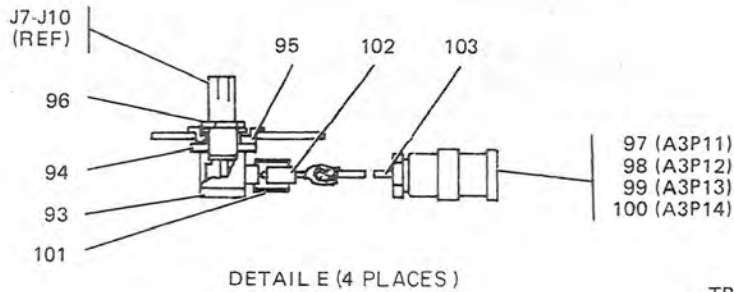
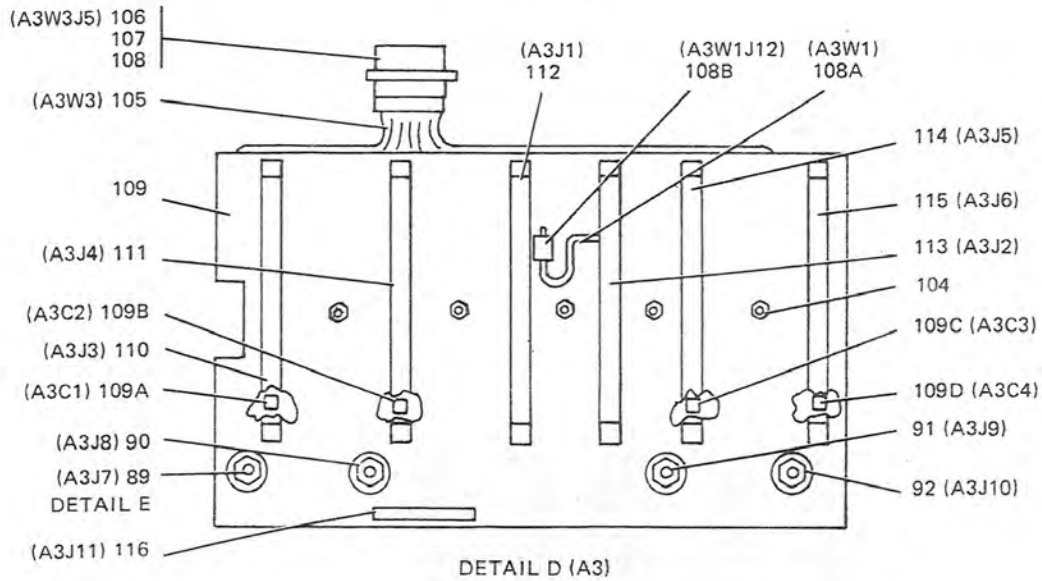
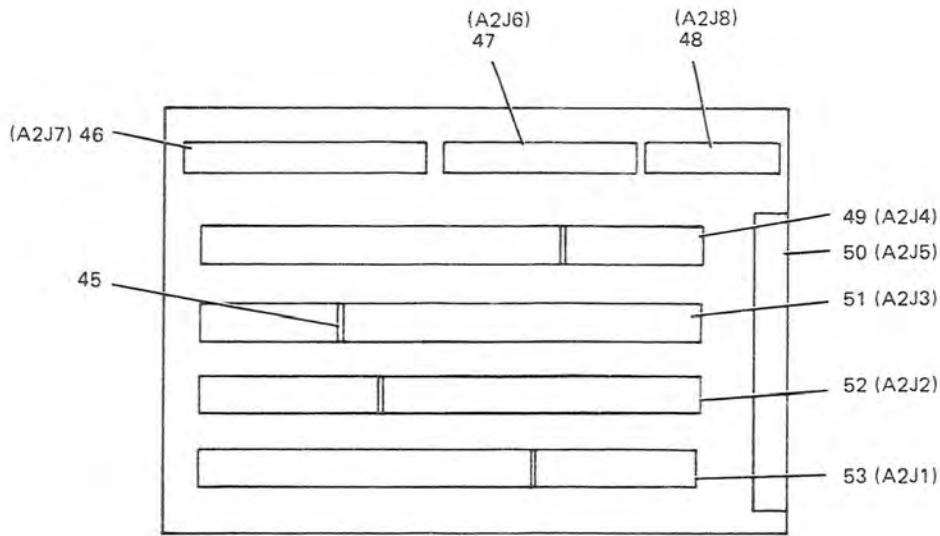


REAR PANEL VIEW - DETAIL B

TPA 7734-027

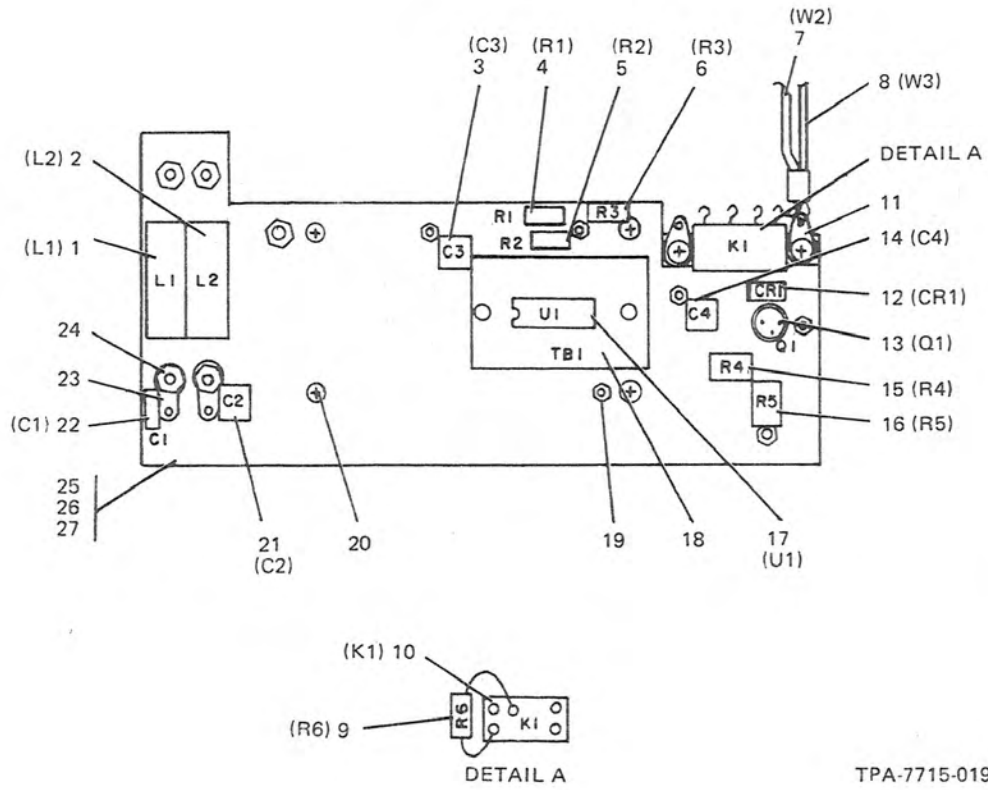
Chassis A1  
Figure 2 (Sheet 3)





TPA-7734-027

Chassis A1  
Figure 2 (Sheet 4)

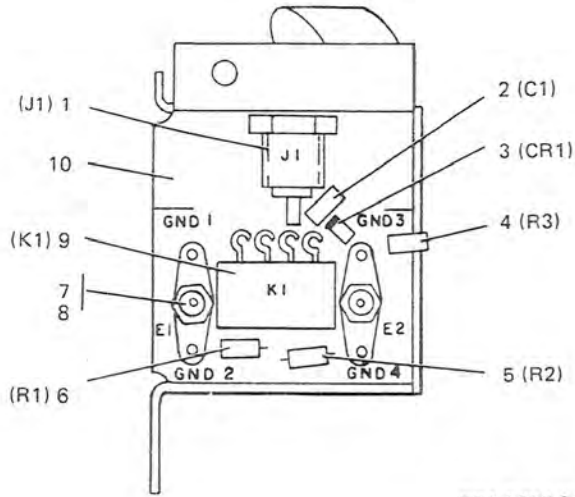


TPA-7715-019

Relay Filter Assembly A1A5  
Figure 2A

GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
2A-	652-2254-002	1	RELAY FILTER ASSY A1A5 (SEE FIG 2-67A FOR NHA)		
1	6150-3	2	CHOKE,RF (04213) 240-0871-030 A1A5L1 OR	1	
1	6268-3	2	CHOKE,RF (04213) 240-0871-100 A1A5L1	1	
2	6150-3	2	CHOKE,RF (04213) 240-0871-030 A1A5L2 OR	1	
2	6268-3	2	CHOKE,RF (04213) 240-0871-100 A1A5L2	1	
3	CK06BX104K	2	CAPACITOR,FIXED CER DIEI, 0.1UF, 10%, 100VDC (81349) 913-5019-440 A1A5C3	1	
4	RCR05G104KS	2	RESISTOR,FIXED CMPSN, 100K, 10%, 1/8W (81349) 745-2413-000 A1A5R1	1	
5	RCR05G104KS	2	RESISTOR,FIXED CMPSN, 100K, 10%, 1/8W (81349) 745-2413-000 A1A5R2	1	
6	RCR05G104KS	2	RESISTOR,FIXED CMPSN, 100K, 10%, 1/8W (81349) 745-2413-000 A1A5R3	1	
7	652-2253-003	2	CABLE,RF A1A5W2	1	
8	652-2253-002	2	CABLE,RF A1A5W3	1	
9	RCR05G680KS	2	RESISTOR,FIXED CMPSN, 68 OHMS, 10%, 1/8W (81349) 745-2298-000 A1A5R6	1	
10	M39016/6-207L	2	RELAY,ARMATURE (81349) 974-1076-080 A1A5K1	1	
11	4007-4HTD	2	TERMINAL,LUG (77147) 304-0015-000	2	
	NAS671C4	2	NUT,PLAIN,HEXAGON CD PL STL, 0.112-40 (80205) 313-0132-000 (AP)	2	
	MS35338-135	2	WASHER,LOCK SST, 0.115 ID X 0.209 OD (96906) 310-0279-000 (AP)	2	
	MS51957-13	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP)	2	
12	1N4454-1	2	SEMICONV DEVICE (31433) 353-3644-010 A1A5CR1	1	
13	2N2222A	2	TRANSISTOR (49956) 352-0661-020 A1A5Q1	1	
	119-0507-000009	2	HOLDER,TRANSISTOR (98291) 352-9509-000 (AP)	1	
14	CK06BX104K	2	CAPACITOR,FIXED CER DIEI, 0.1UF, 10%, 100VDC (81349) 913-5019-440 A1A5C4	1	
15	RCR07G103KS	2	RESISTOR,FIXED CMPSN, 10K, 10%, 1/4W (81349) 745-0785-000 A1A5R4	1	
16	RCR07G102KS	2	RESISTOR,FIXED CMPSN, 1K, 10%, 1/4W (81349) 745-0749-000 A1A5R5	1	
17	CD4028BE	2	INTEGRATED CIRCUIT DIGITAL MOS (ESDS) (02735) 351-8159-270 A1A5U1	1	
18	652-2395-001	2	BOARD, COMPONENT MOUNTING A1A5TB1	1	
	NPBR50.086-56	2	NUT,PLAIN,HEXAGON NP BRS, 0.086-56 (77250) 313-0050-000 (AP)	2	
	MS35338-96	2	WASHER,SPRING CD PL BRZ, 0.088 ID X 0.172 OD (96906) 310-0093-000 (AP)	2	
	MS51957-3	2	SCREW,MACH CD PL STL, 2-56 X 1/4 (96906) 343-0124-000 (AP)	2	
19	229-5001-000550	2	TERMINAL,FEEDTHRU (98291) 306-1314-000	6	
	NPBR50.086-56	2	NUT,PLAIN,HEXAGON NP BRS, 0.086-56 (77250) 313-0050-000 (AP)	6	
	MS35338-96	2	WASHER,SPRING CD PL BRZ, 0.088 ID X 0.172 OD (96906) 310-0093-000 (AP)	6	
20	540-9035-003	2	POST,ELEC-MECH	4	
	MS51957-12	2	SCREW,MACH STL, 4-40 X 3/16 (96906) 343-0132-000 (AP)	4	
	MS35338-135	2	WASHER,LOCK SST, 0.115 ID X 0.209 OD (96906) 310-0279-000 (AP)	4	
21	CK06BX104K	2	CAPACITOR,FIXED CER DIEI, 0.1UF, 10%, 100VDC (81349) 913-5019-440 A1A5C2	1	
22	CK06BX104K	2	CAPACITOR,FIXED CER DIEI, 0.1UF, 10%, 100VDC (81349) 913-5019-440 A1A5C1	1	
23	2104-04-01-2520M	2	TERMINAL,LUG (78189) 304-0317-000	2	
24	2308-4-1	2	TERMINAL STANDOFF (17117) 306-0234-000	5	
	MS51957-13	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP)	5	
	MS35338-135	2	WASHER,LOCK SST, 0.115 ID X 0.209 OD (96906) 310-0279-000 (AP)	5	
25	652-2182-001	2	BOARD, TERMINAL	1	
26	002-3405-000599	3	TERMINAL,FEEDTHRU (98291) 306-2510-100	10	
27	652-2182-002	3	BOARD, TERMINAL	1	



TPA-8097-019

Switched Attenuator A1A6  
Figure 2B

GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
2B-	652-7804-001	1	SWITCHED ATTENUATOR A1A6 (SEE FIG 2-66A FOR NHA)		
1	M39012-23-0007	2	CONNECTOR,RCPT ELEC (81349) 357-9258-000 A1A6J1	1	
2	CM05ED220J03	2	CAPACITOR,FIXED MICA DIEI, 22PF, 5%, 500V (81349) 912-2768-000 A1A6C1	1	
3	1N4454-1	2	SEMICONV DEVICE (31433) 353-3644-010 A1A6CR1	1	
4	RN60D1210F	2	RESISTOR,FIXED FILM, 121 OHMS, 1%, 1/4W (81349) 705-6552-000 A1A6R3	1	
5	RL42S121G	2	RESISTOR,FIXED FILM, 120 OHMS, 2%, 2W (81349) 745-7068-000 A1A6R2	1	
6	RL42S510G	2	RESISTOR,FIXED FILM, 51 OHMS, 2%, 2W (81349) 745-7046-000 A1A6R1		
7	4007-4HTD	2	TERMINAL,LUG (77147) 304-0015-000	4	
8	RTMT12M	2	TERMINAL,STUD (91663) 306-0976-000	2	
	MS51957-13	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP)	2	
	MS35338-135	2	WASHER,LOCK SST, 0.115 ID X 0.209 OD (96906) 310-0279-000 (AP)	2	
9	M39016/6-114L	2	RELAY,ARMATURE (81349) 974-1076-130 A1A6K1	1	
10	652-7803-001	2	CHASSIS	1	

## **PARTS LIST (523-0771502-001218)**

Differences in parts list for HF-8031 Power Supply, part number 622-3491-001 and 622-3491-203 are described below.

### **1.8 Reference Designation Prefixes**

Add the following prefix to the existing list.

<u>PREFIX</u>	<u>UNIT PART NUMBER</u>	<u>FIG- ITEM</u>
A1	646-6884-005	2

### **1.9 Configuration Identifiers**

Add the following configuration identifiers, part numbers and figure references to the existing list.

<u>PREFIX</u>	<u>UNIT PART NUMBER</u>	<u>FIG- ITEM</u>
N	646-6884-005	2

## **2. Group Assembly Parts List**

Make the following changes at the locations specified.

The following provides information on the differences between 622-3491-001 and 622-3491-203.

Figure 1, Top Level. Add part number 622-3491-203 Power Supply, HF-8031.

Figure 1, Item 11, Indent 2 — Replace part number 646-6884-001 with 646-6884-005, A1.

The following provides information on the differences between 646-6884-001 and 646-6884-005, A1.

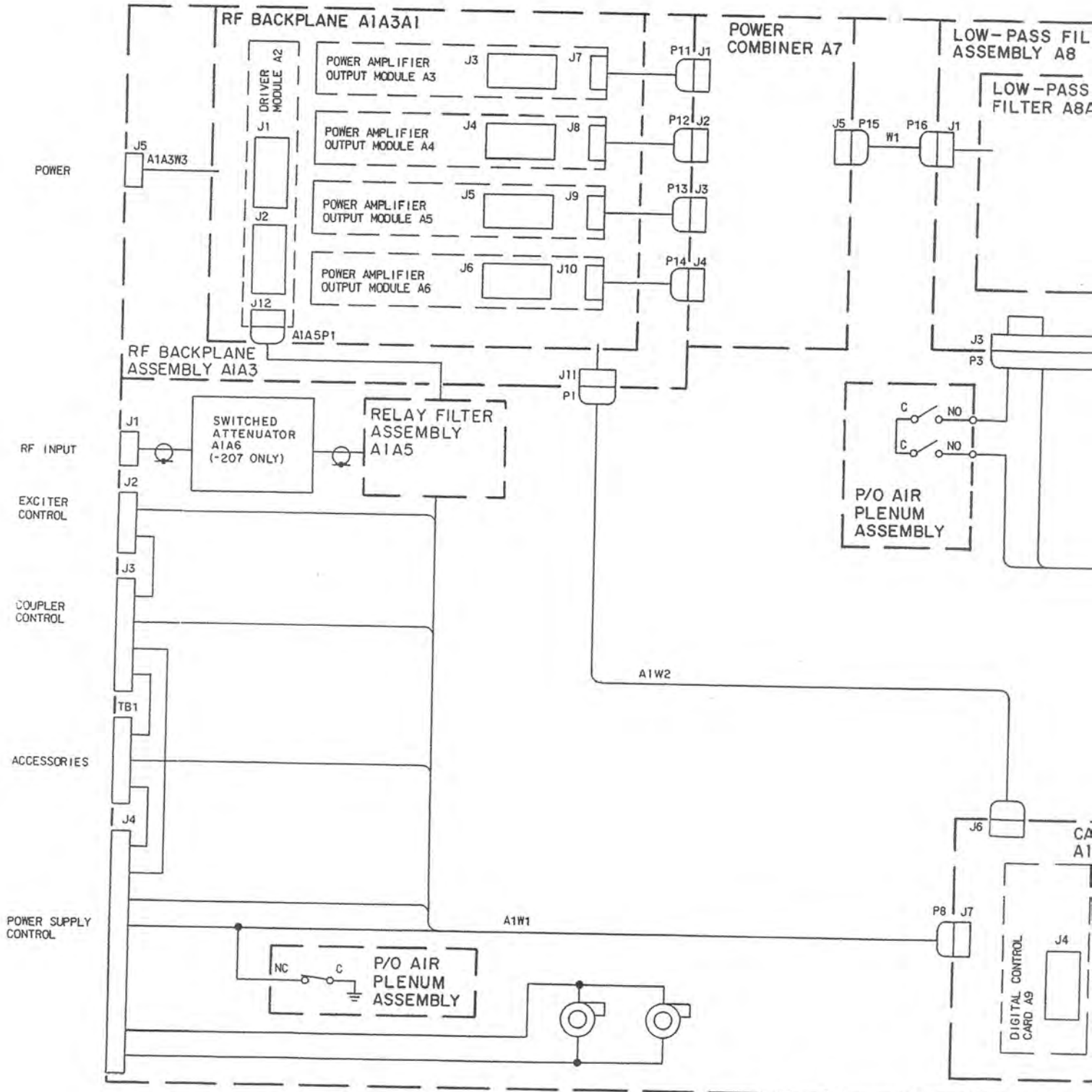
Figure 2, Item 142, and all its attaching parts are not used in 646-6884-005.

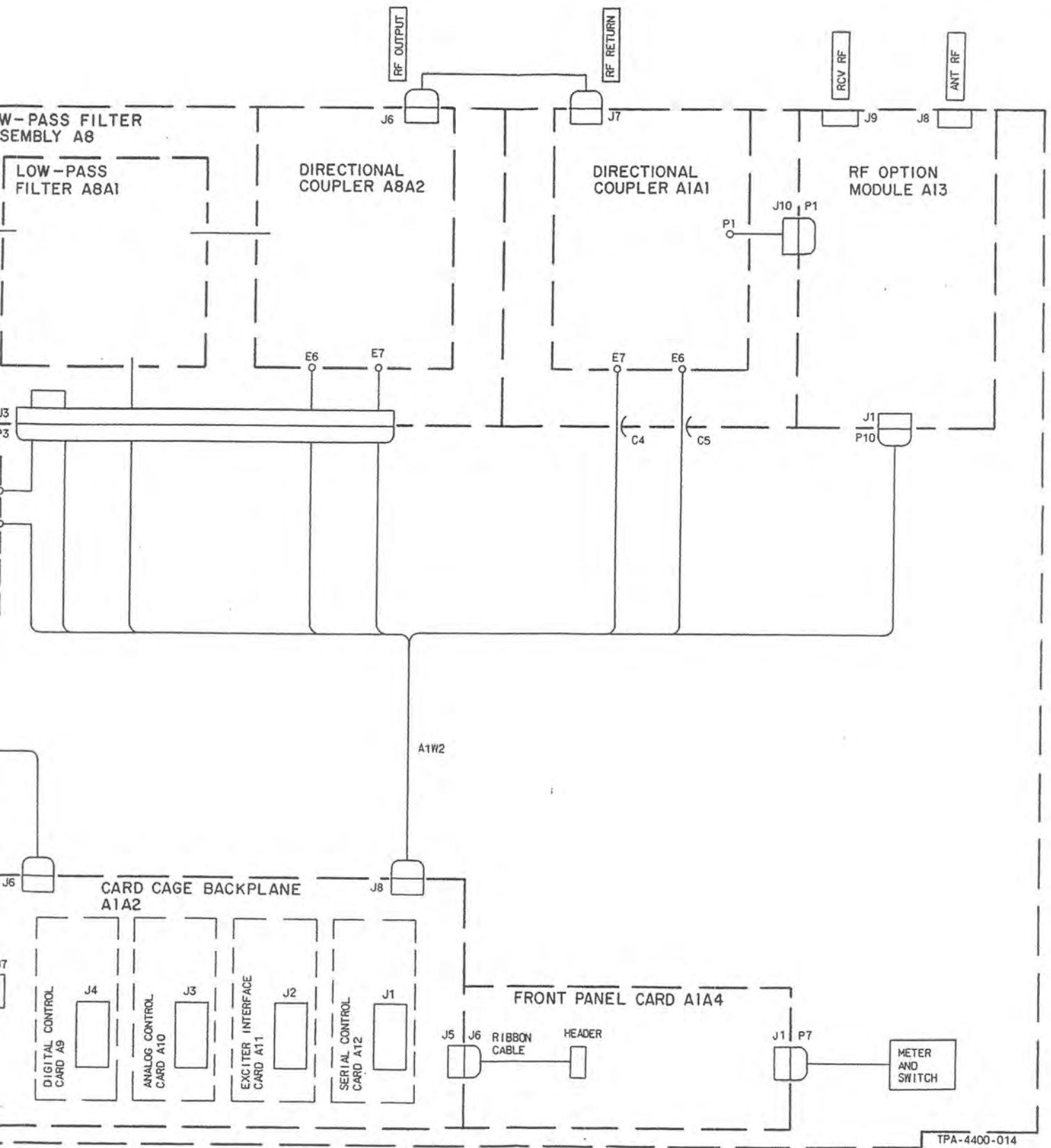
Figure 2, Item 143, and all its attaching parts are not used in 646-6884-005.

## **DIAGRAMS (523-0771504-001218)**

Replace figure 1 with figure 1 provided. Add figure 2A behind figure 2. Add the following entry to the List of Illustrations between figures 2 and 3:

2A HF-8023 1-kW Power Amplifier (622-3490-207), Schematic Diagram





TPA-4400-014

HF-8023 1-kW Power Amplifier,  
Chassis Cabling Diagram  
Figure 1

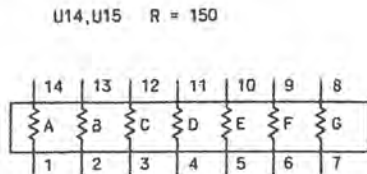
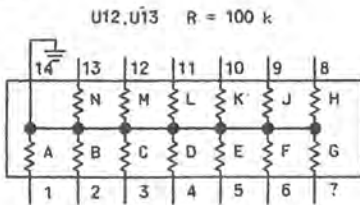
NOTES:

- ① UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS. CAPACITANCE VALUES ARE IN MICROFARADS AND INDUCTANCE VALUES ARE IN MICROHENRYS. LED'S A1A4CR1 THROUGH A1A4CR4 ARE TYPE MV5253 AND A1A4CR5 THROUGH A1A4CR12 ARE TYPE MV5053.
- ② PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
- ③ RF INTERLOCK JUMPER-CONSULT INSTRUCTION BOOK FOR APPLICATION INFORMATION.
- ④ RF CABLE W2 USED UNLESS EXTERNAL TUNING UNIT USED IN SYSTEM.
- ⑤ RF OPTION MODULE A13 MAY BE ANY OF THE FOLLOWING:  
 (1) COAXIAL JUMPER MODULE (CPN 646-6430-001)  
 (2) TR RELAY (CPN 646-6432-001)

- ⑥ MODULE CONNECTOR PINS GROUNDED BUT NOT SHOWN ON DRAWING:  
 DRIVER MODULE:  
 J1-1, 3, 6, 16-29, 35 AND 41-80  
 J2-6, 12-21, 29-31, 33, 35, 37, 39 AND 41-80  
 PA MODULE A:  
 J3-6, 8, 12-32 AND 41-80  
 PA MODULE B:  
 J4-6, 8, 12-32 AND 41-80  
 PA MODULE C:  
 J5-6, 8, 12-32 AND 41-80  
 PA MODULE D:  
 J6-6, 8, 12-32 AND 41-80

- ⑦ REFER TO PARTS LIST FOR CPN OF L1-L24 (FABRICATED COILS) ON LOW-PASS FILTER (638-6964-002)

- ⑧ U12, U13, U14 AND U15 ARE RESISTOR ARRAYS SHOWN BELOW:



- ⑨ TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.

- ⑩ THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.

- ⑪ JUMPER PLUG MUST BE USED WHEN NO SYSTEM CABLE IS CONNECTED TO J3.

- ⑫ S2, S3, S4, AND S5 ARE MECHANICAL INTERLOCK MICROSWITCHES WHICH ARE OPEN WHEN THE PA MODULE HOLDDOWNS ARE IN PLACE AND SECURED AS FOLLOWS:

- S2, PA MODULE A A3
- S3, PA MODULE B A4
- S4, PA MODULE C A5
- S5, PA MODULE D A6

- ⑬ S6 AND S7 ARE MECHANICAL INTERLOCK MICROSWITCHES WHICH ARE CLOSED WHEN THE DRIVER MODULE AND RF OPTION MODULE HOLDDOWNS ARE IN PLACE AND SECURED AS FOLLOWS:

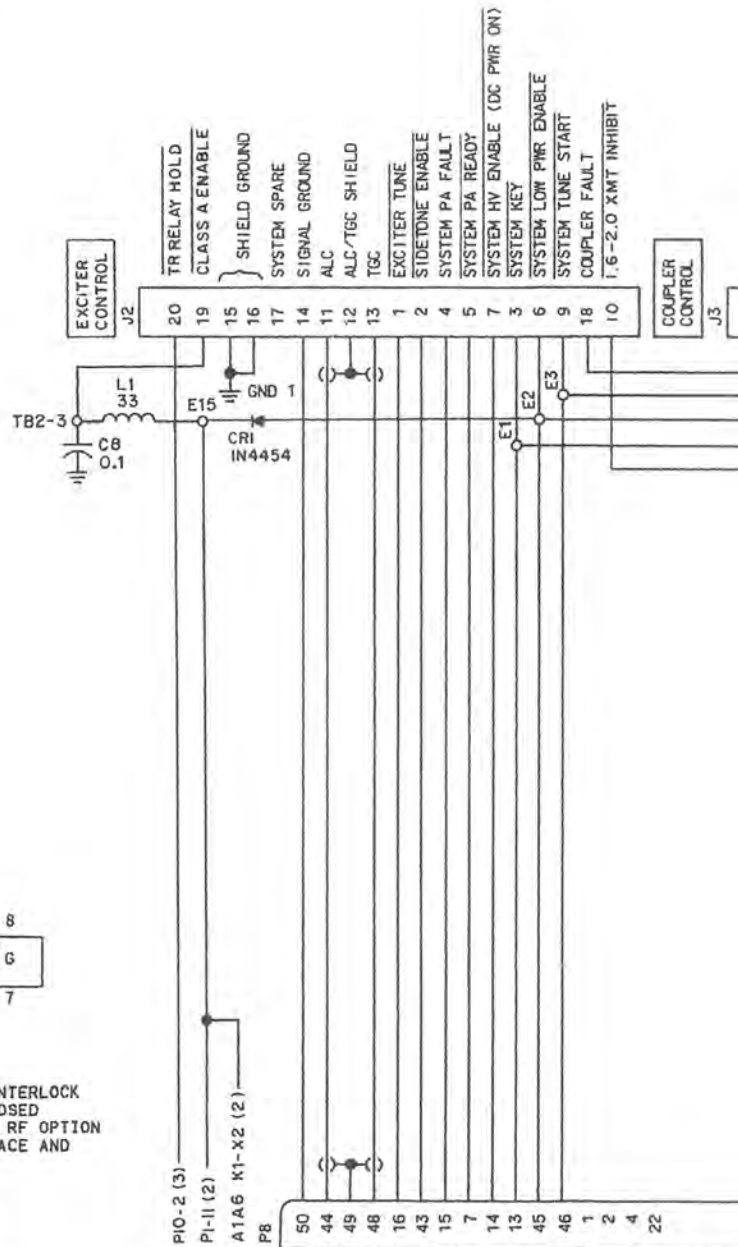
- S6, DRIVER MODULE A2
- S13, RF OPTION MODULE A13

A4A4 MICROCIRCUIT INFORMATION

U NO	TYPE	POWER (V DC)		
		+5	+12	GND
U1	4011		14	7
U2	4528		16	8
U3	7447	16		8
U4	7447	16		8
U5	NOT USED			
U6	NOT USED			
U7	4050	1		8
U8	4049	1		8
U9	4049	1		8
U10	7406	14		7

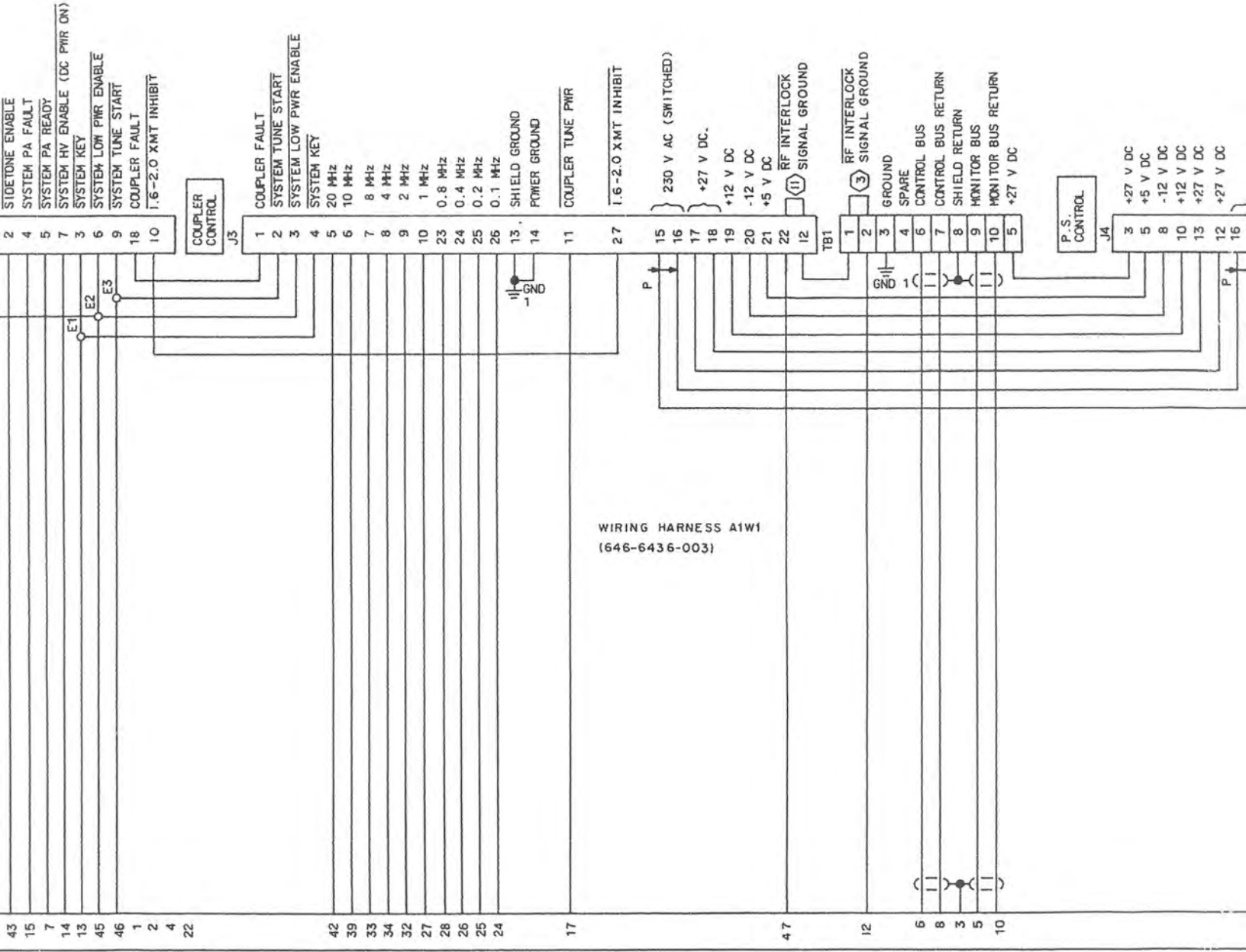
A4A4 MICROCIRCUIT INFORMATION

U NO	TYPE	POWER (V DC)		
		5	12	GND
U11	7406	14		7
U12	ARRAY			
U13	ARRAY			
U14	ARRAY			
U15	ARRAY			
U16	4066		14	7
U17	4066		14	7



- ⑧
- ⑧
- ⑧
- ⑧

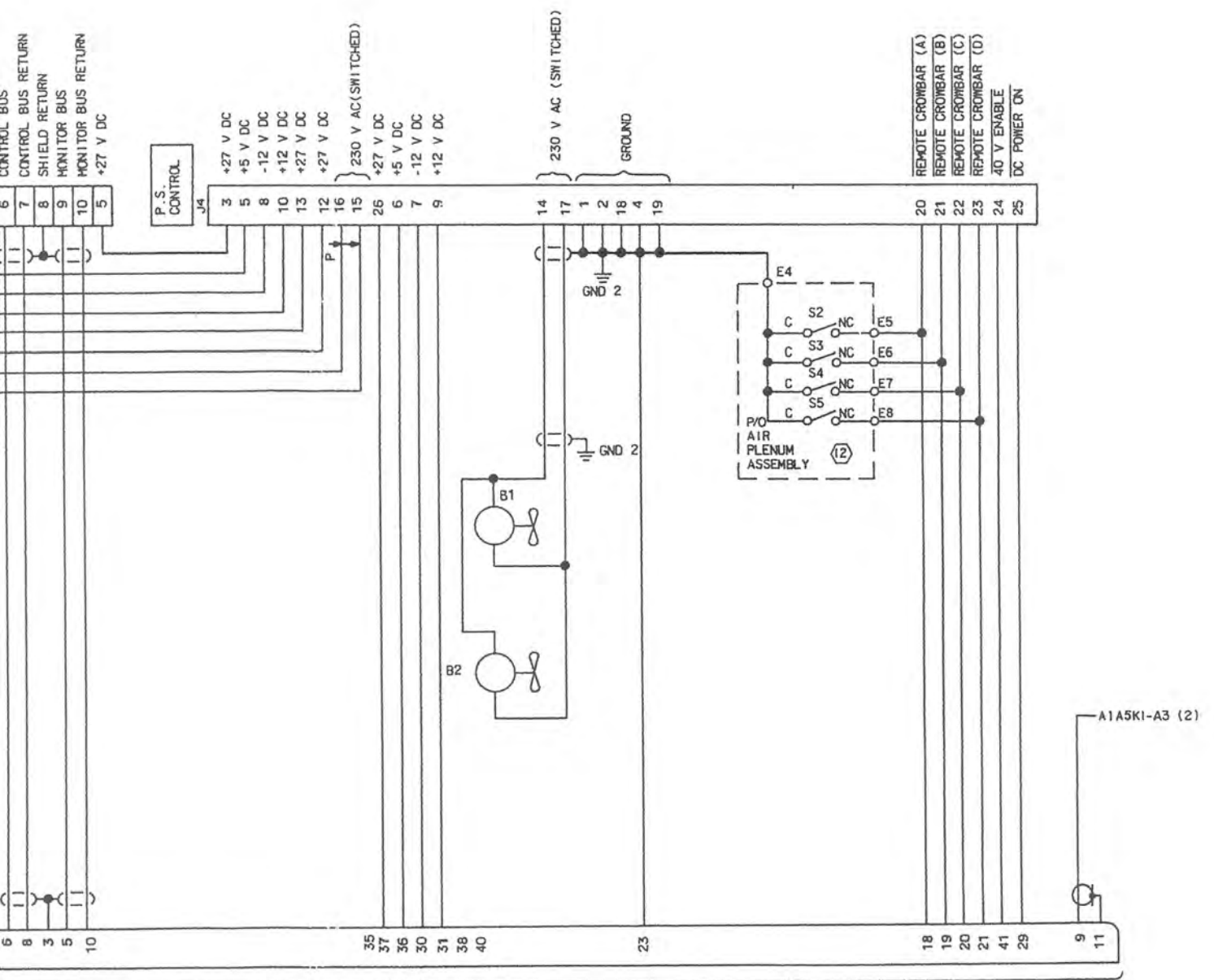




WIRING HARNESS A1W1  
(646-6436-003)

TO CARD CAGE BACKPLANE, A1A2  
(642-3588-001) MATES WITH A1A2J7

(C)
GND
7
7
7

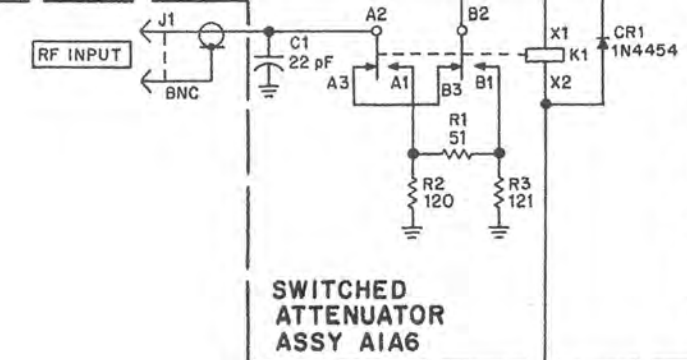
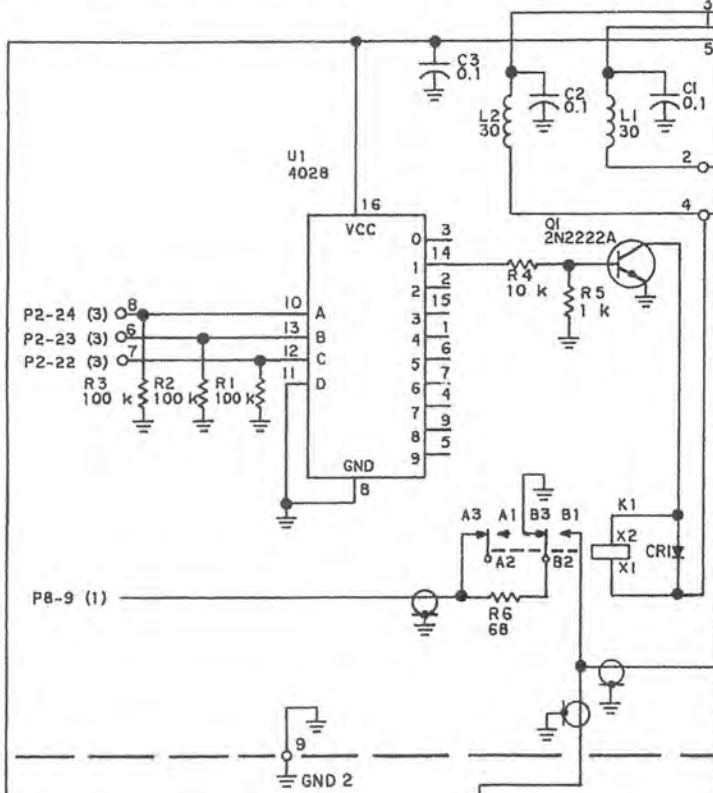


AGE BACKPLANE, A1A2  
-001) MATES WITH A1A2J7

65I-5399-001  
TPA-6736-045

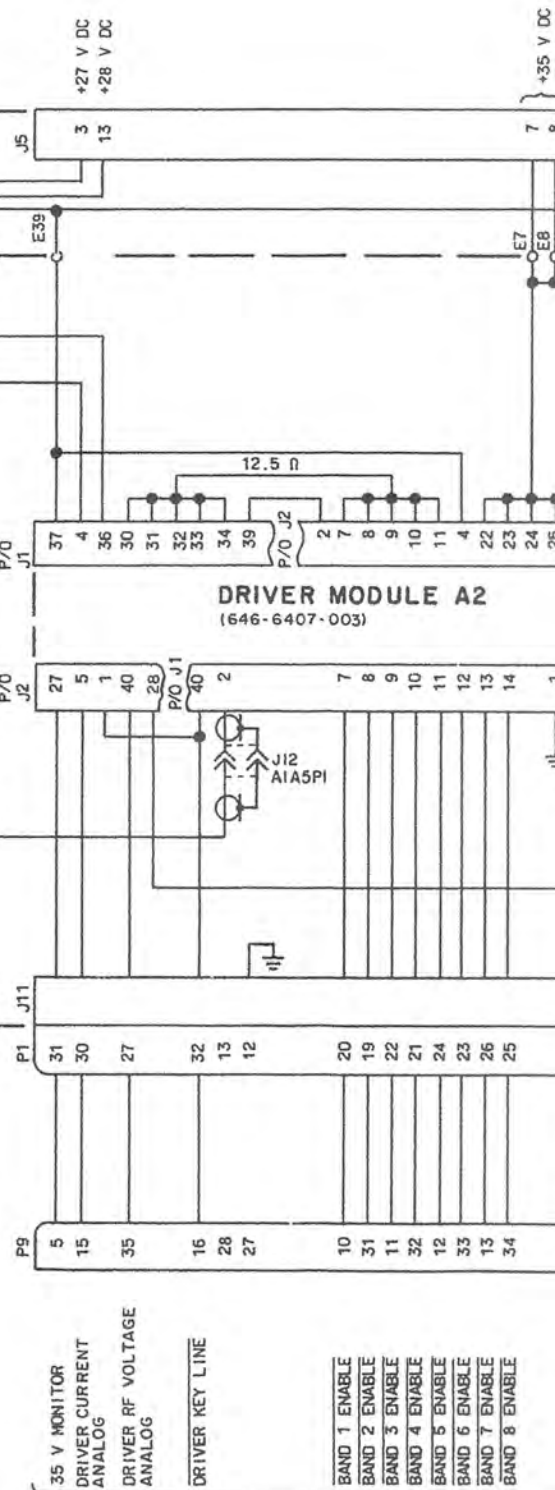
HF-8023 1-kW Power Amplifier  
(622-3490-207), Schematic Diagram  
Figure 2A (Sheet 1 of 4)

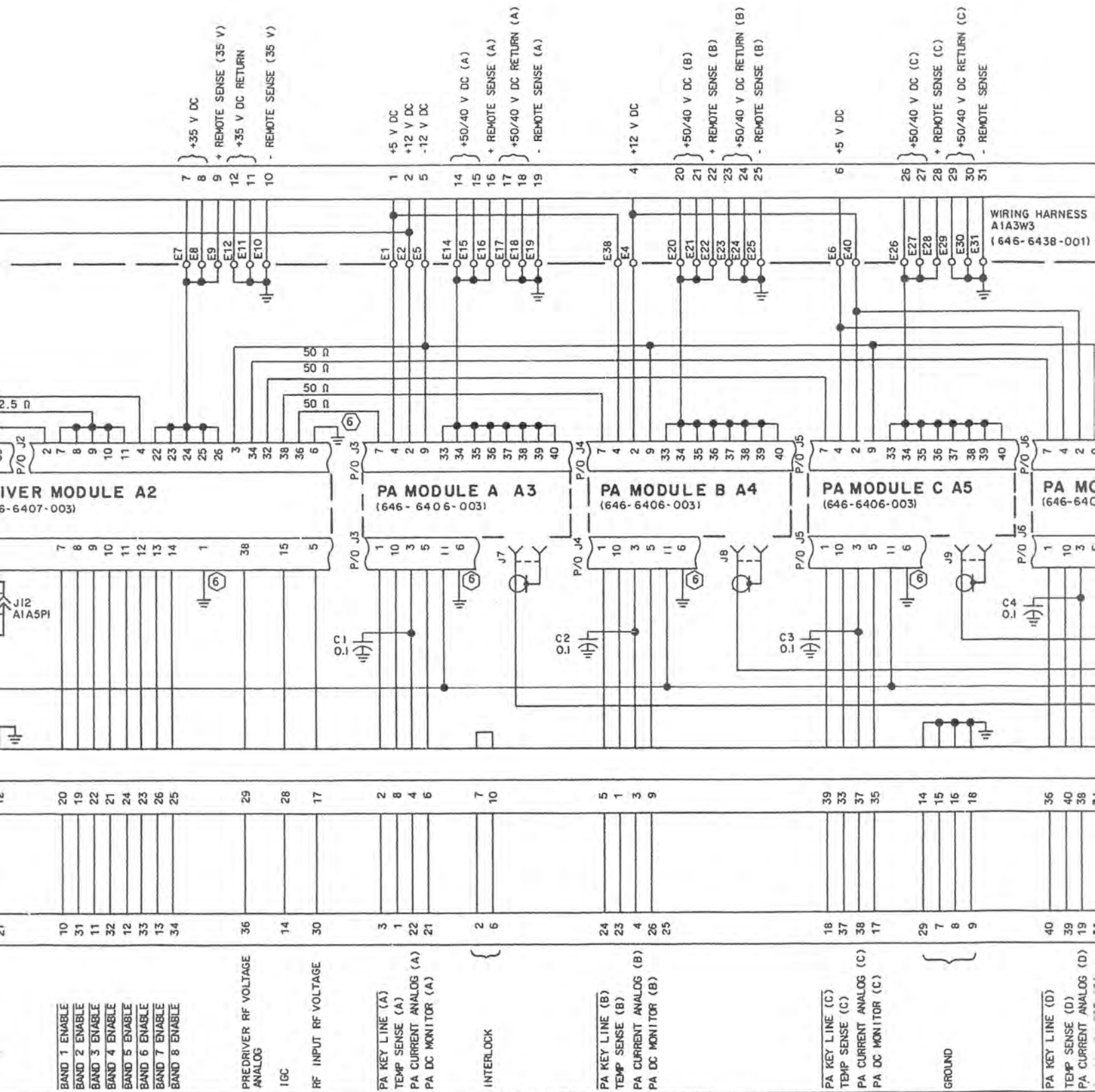
**RELAY FILTER ASSY AIA5**



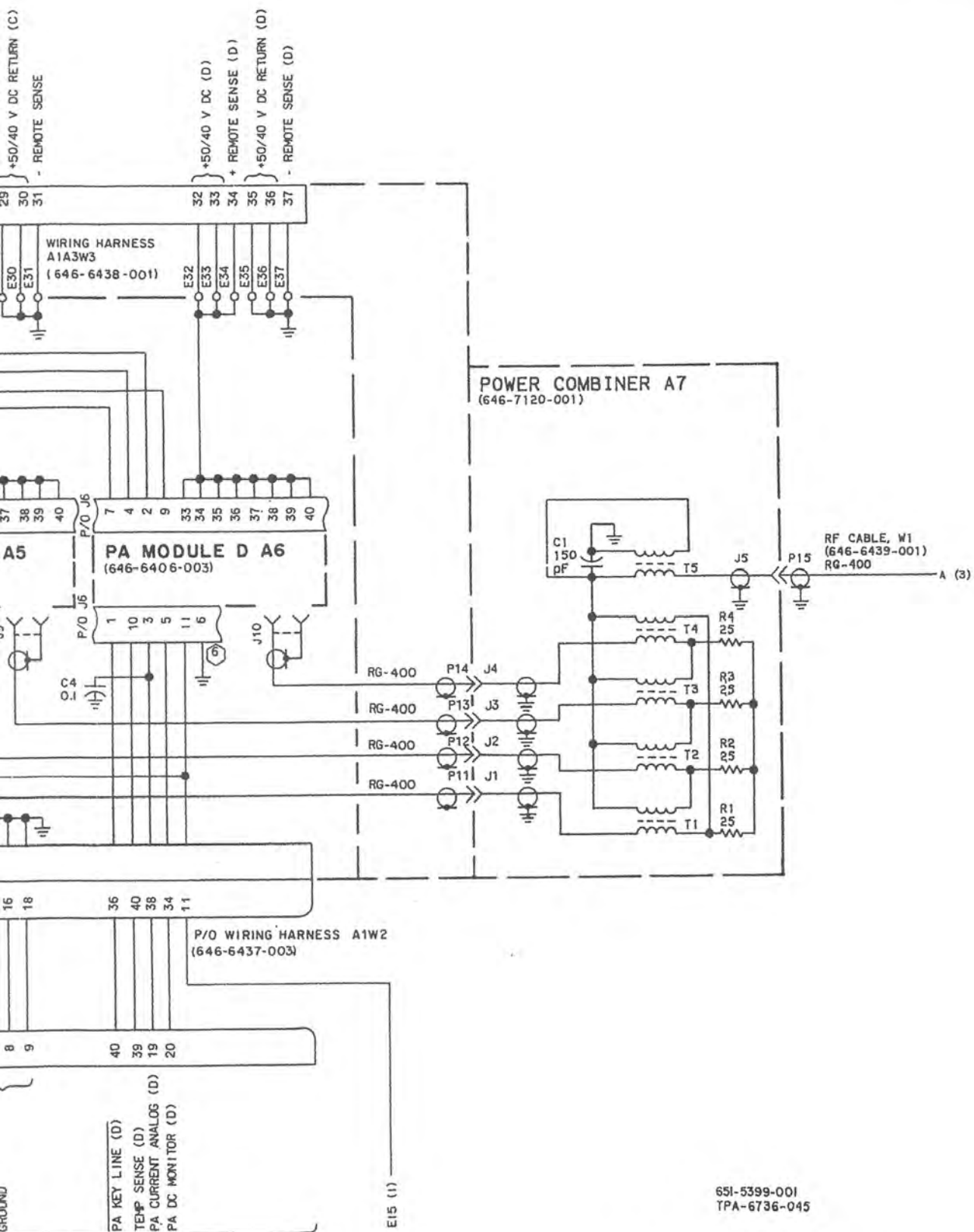
**RF BACKPLANE ASSEMBLY AIA3**  
(646-6435-003)

**RF BACKPLANE AIA3A1**  
(642-3295-003)





TO CARD CAGE BACKPLANE, A1A2 (642-3588-001) MATES WITH A1A2J6

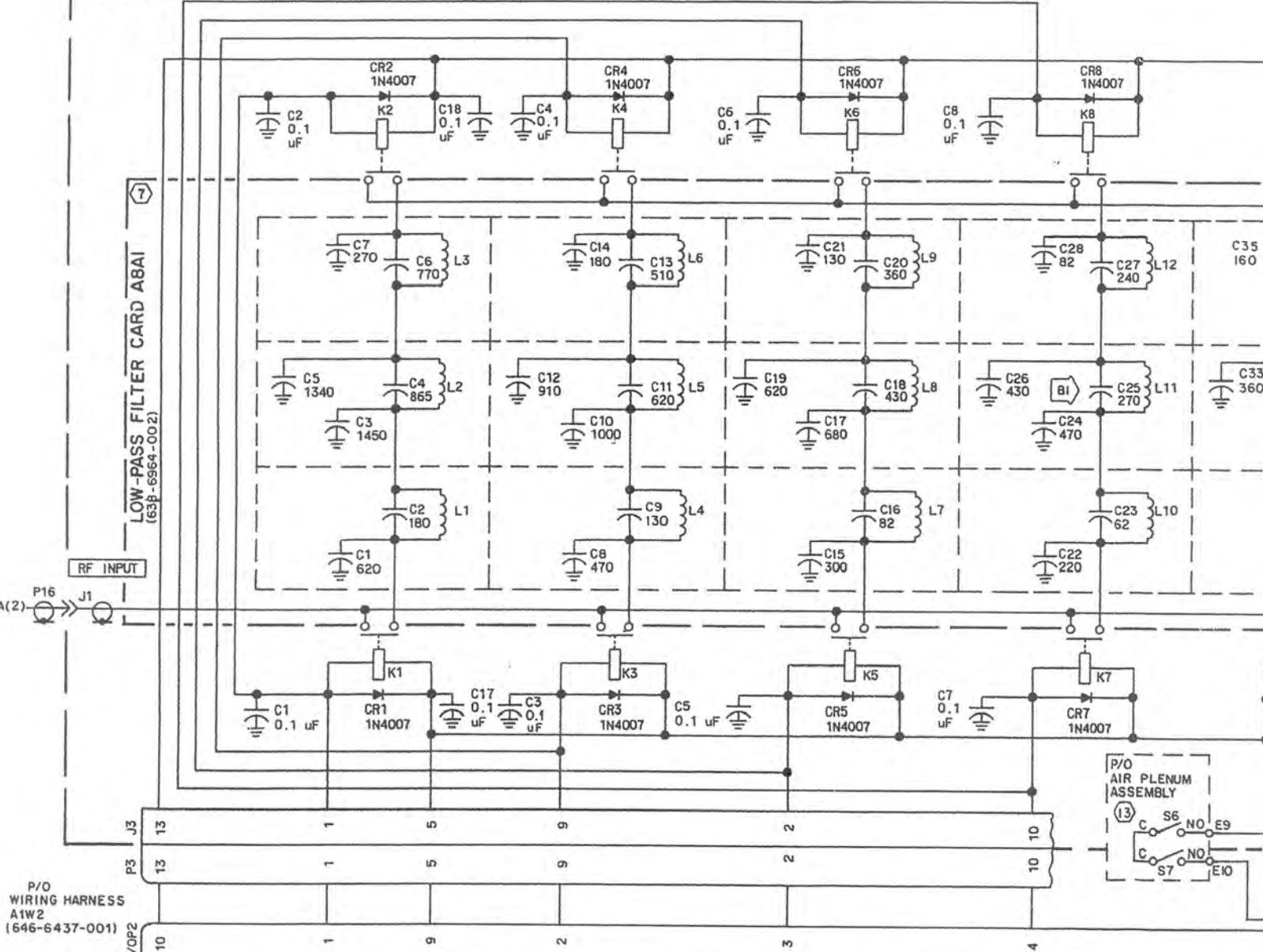


651-5399-001  
TPA-6736-045

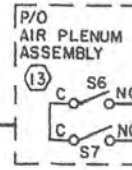
HF-8023 1-kW Power Amplifier  
(622-3490-207), Schematic Diagram  
Figure 2A (Sheet 2)

**LOW-PASS FILTER ASSEMBLY A8**  
(646-6400-002)

LOW-PASS FILTER CARD AB41  
(638-6964-002)



P/O WIRING HARNESS  
A1W2  
(646-6437-001)



P/OP2	10	1	9	2	5	4
P3	13	1	5	9	2	10
J3	13	1	5	9	2	10

+27 V DC

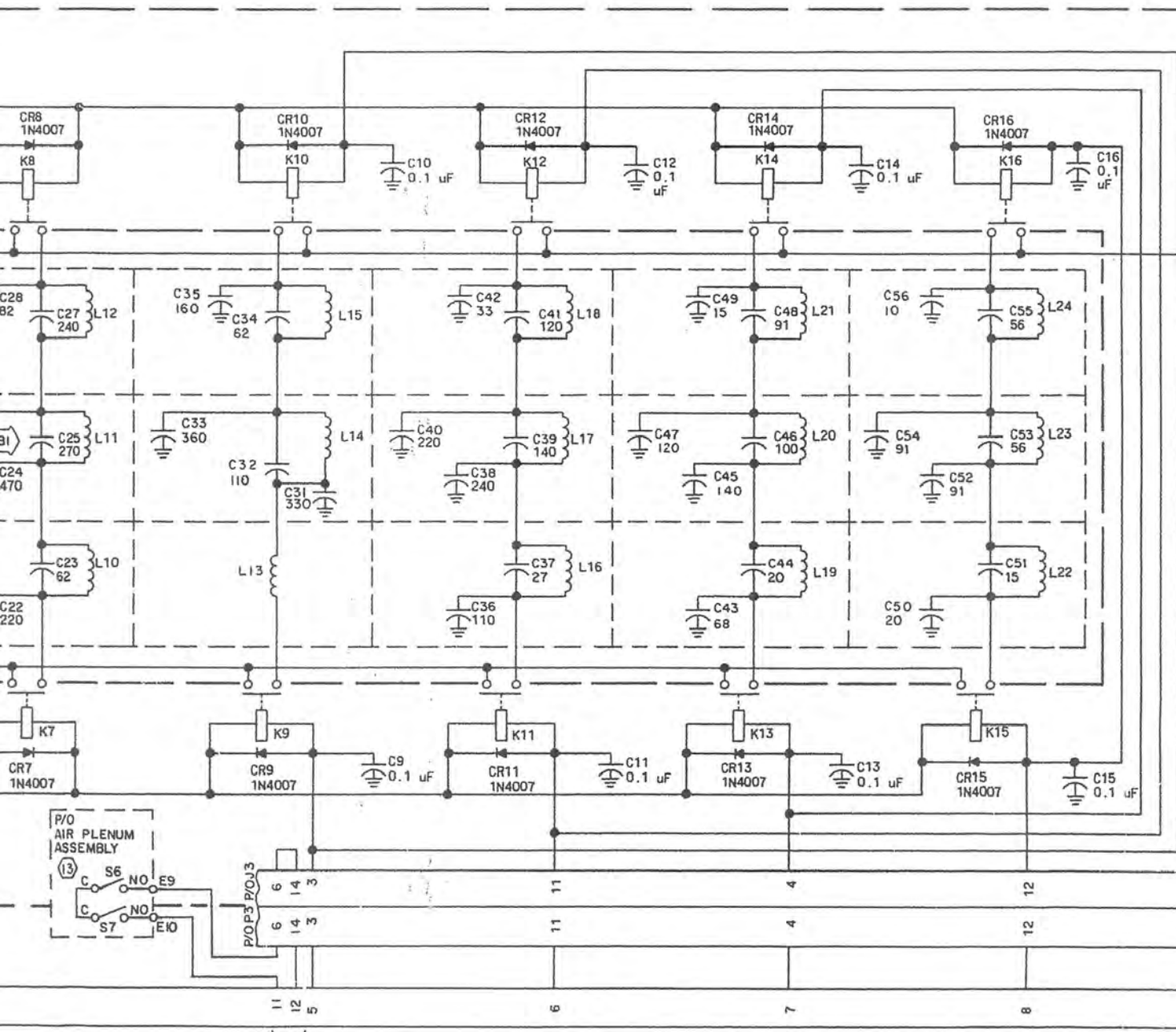
BAND 1 ENABLE

+27 V DC

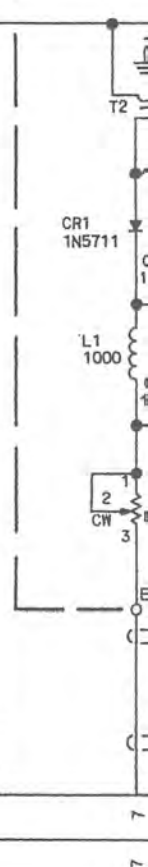
BAND 2 ENABLE

BAND 3 ENABLE

BAND 4 ENABLE



RF C  
**DIRECTIONAL COUPLER A8A2**  
 (642-2634-00)



**INTERLOCK BAND 5 ENABLE**

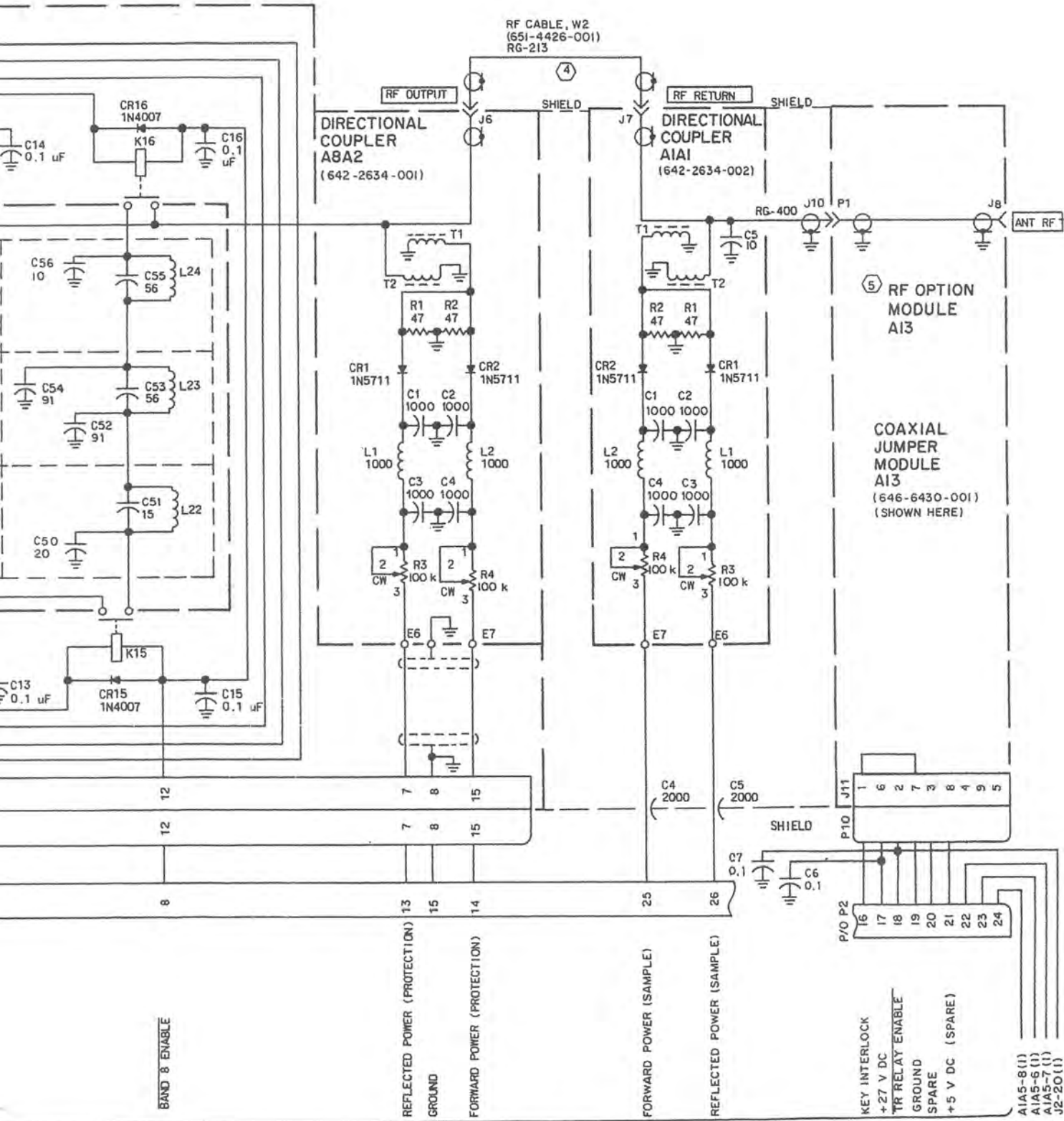
**BAND 6 ENABLE**

**BAND 7 ENABLE**

**BAND 8 ENABLE**

**REFLECTED POWER (PROTECTION) 13**

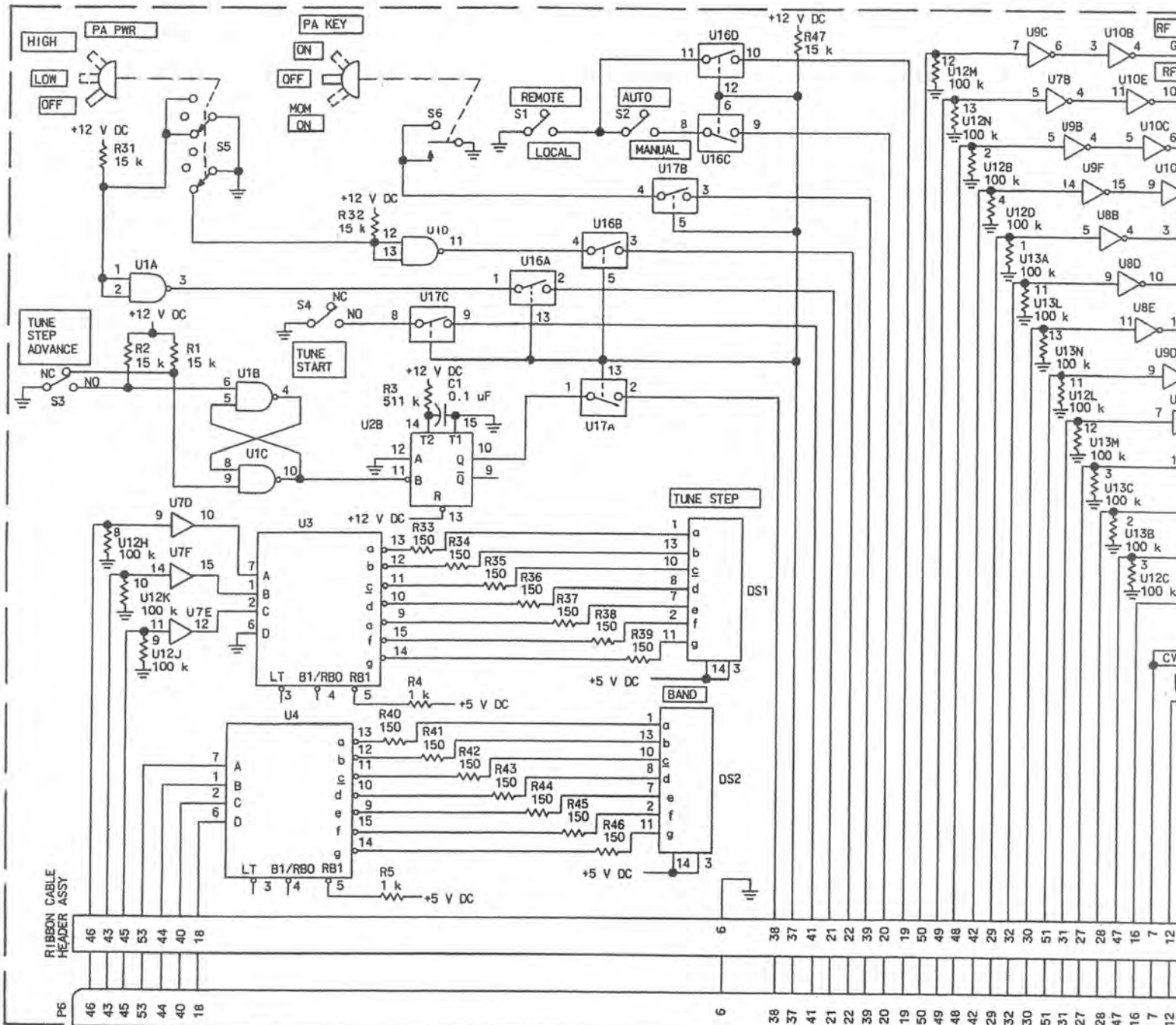
TO CARD CAGE BACKPLANE A1A2  
 (642-3588-001) MATES WITH A1A2J8



TPA-6736-045  
651-5399-001

HF-8023 1-kW Power Amplifier (622-3490-207), Schematic Diagram Figure 2A (Sheet 3)





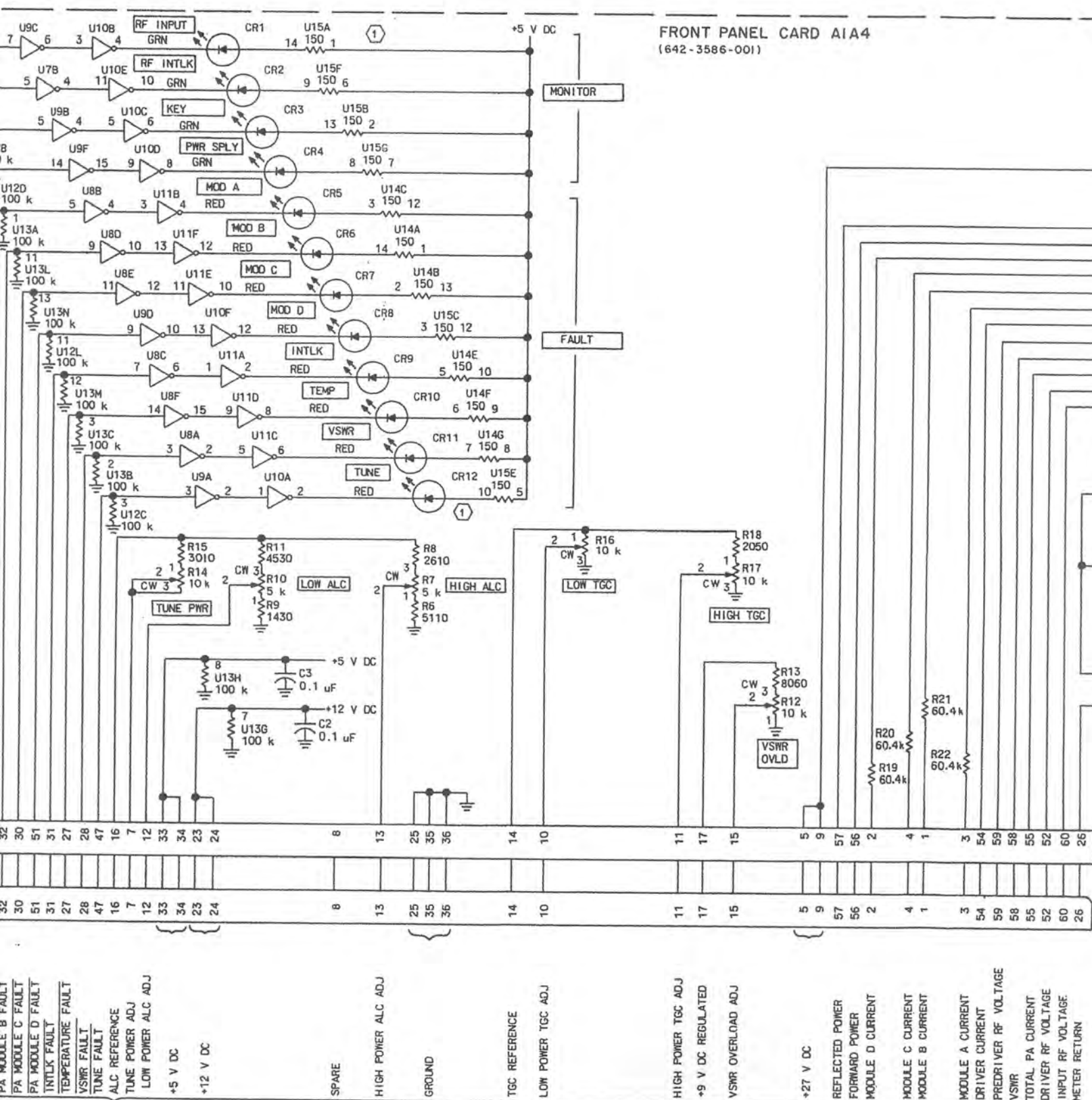
- TUNE SEQUENCE CONTROL A
- TUNE SEQUENCE CONTROL B
- TUNE SEQUENCE CONTROL C
- BAND INDICATOR A
- BAND INDICATOR B
- BAND INDICATOR C
- BAND INDICATOR D

INTERLOCK

- LOCAL TUNE STEP ADV
- CONTROL DISABLE
- LOCAL TUNE START
- LOCAL LOW POWER ENABLE
- LOCAL DC POWER ENABLE
- LOCAL KEY
- MANUAL/AUTOMATIC
- LOCAL/REMOTE
- RF INPUT MONITOR
- RF INTERLOCK MONITOR
- KEY MONITOR
- POWER SUPPLY MONITOR
- PA MODULE A FAULT
- PA MODULE B FAULT
- PA MODULE C FAULT
- PA MODULE D FAULT
- INTLK FAULT
- TEMPERATURE FAULT
- VSWR FAULT
- TUNE FAULT
- ALC REFERENCE
- TUNE POWER ADJ
- LOW POWER ALC ADJ

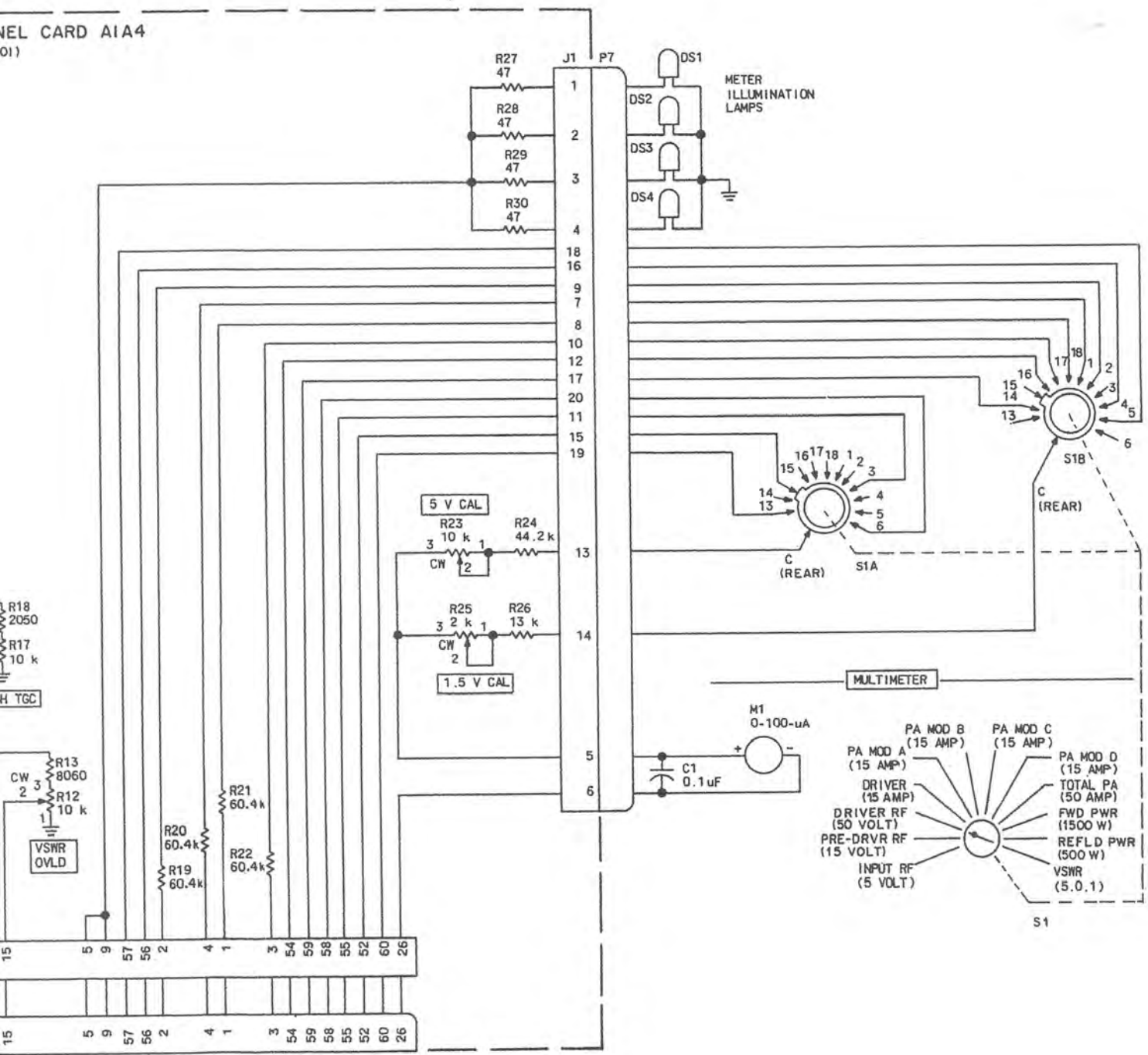
TO CARD CAGE BA

FRONT PANEL CARD A1A4  
(642-3586-001)

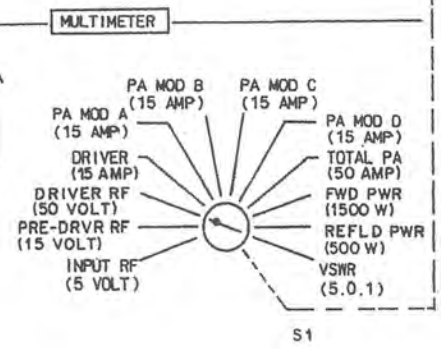


TO CARD CAGE BACK PLANE A1A2 (642-3588-001) MATES WITH A1A2J5

ANEL CARD AIA4  
01)



- VSWR OVERLOAD ADJ
- +27 V DC
- REFLECTED POWER
- FORWARD POWER
- MODULE D CURRENT
- MODULE C CURRENT
- MODULE B CURRENT
- MODULE A CURRENT
- DRIVER CURRENT
- PREDRIVER RF VOLTAGE
- VSWR
- TOTAL PA CURRENT
- DRIVER RF VOLTAGE
- INPUT RF VOLTAGE
- METER RETURN

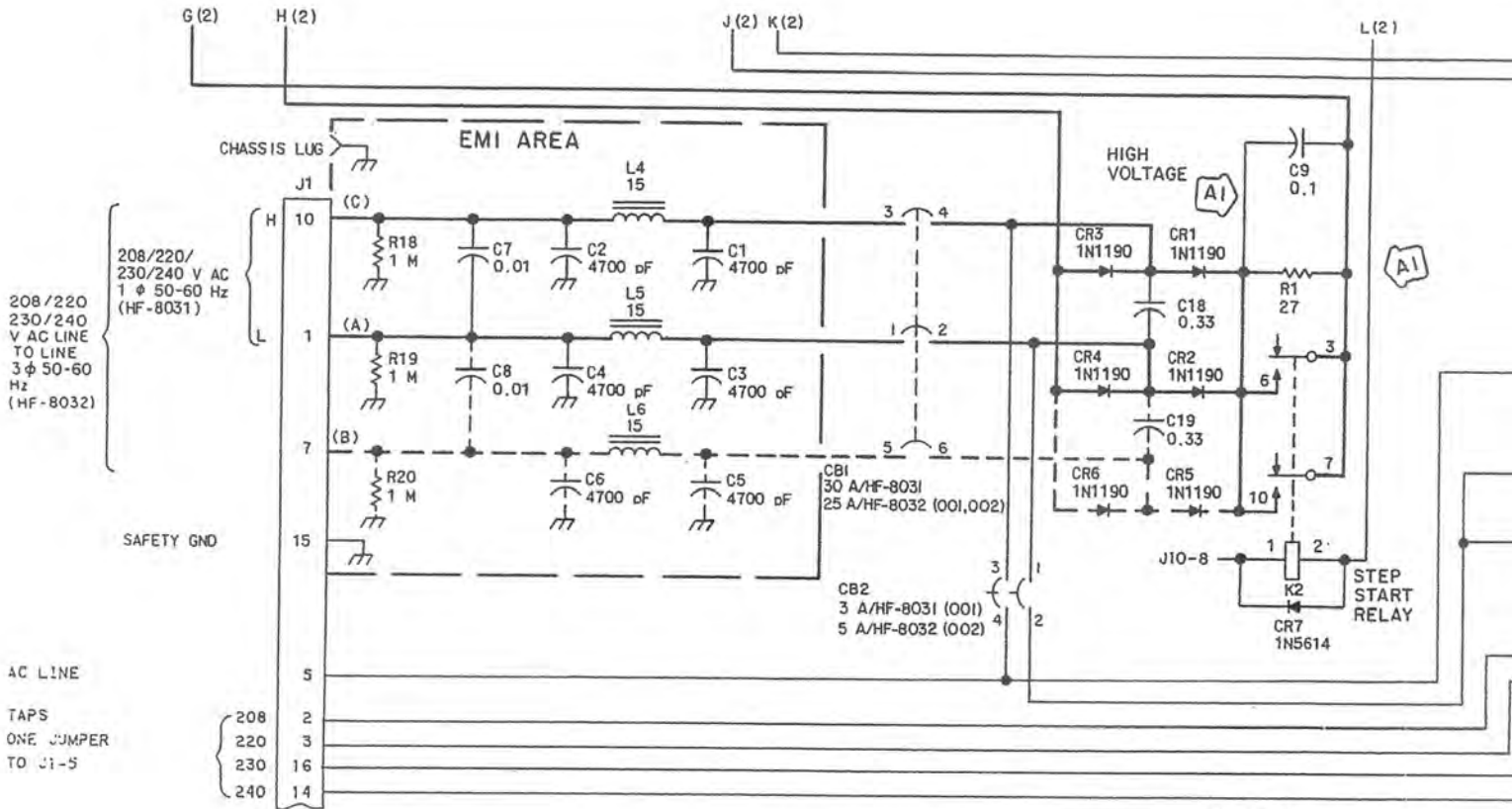


651-5399  
TPA-6736-045

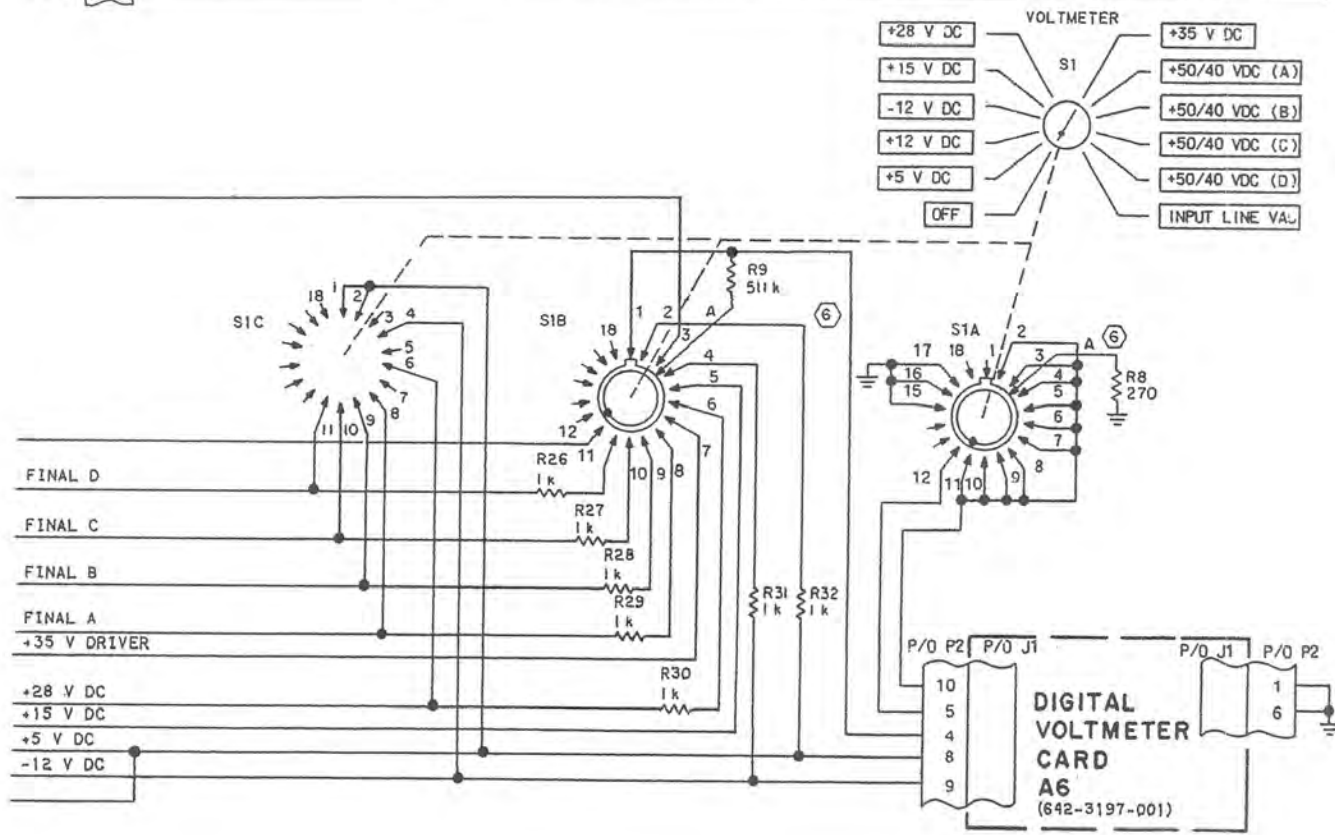
HF-8023 1-kW Power Amplifier  
(622-3490-207), Schematic Diagram  
Figure 2A (Sheet 4)

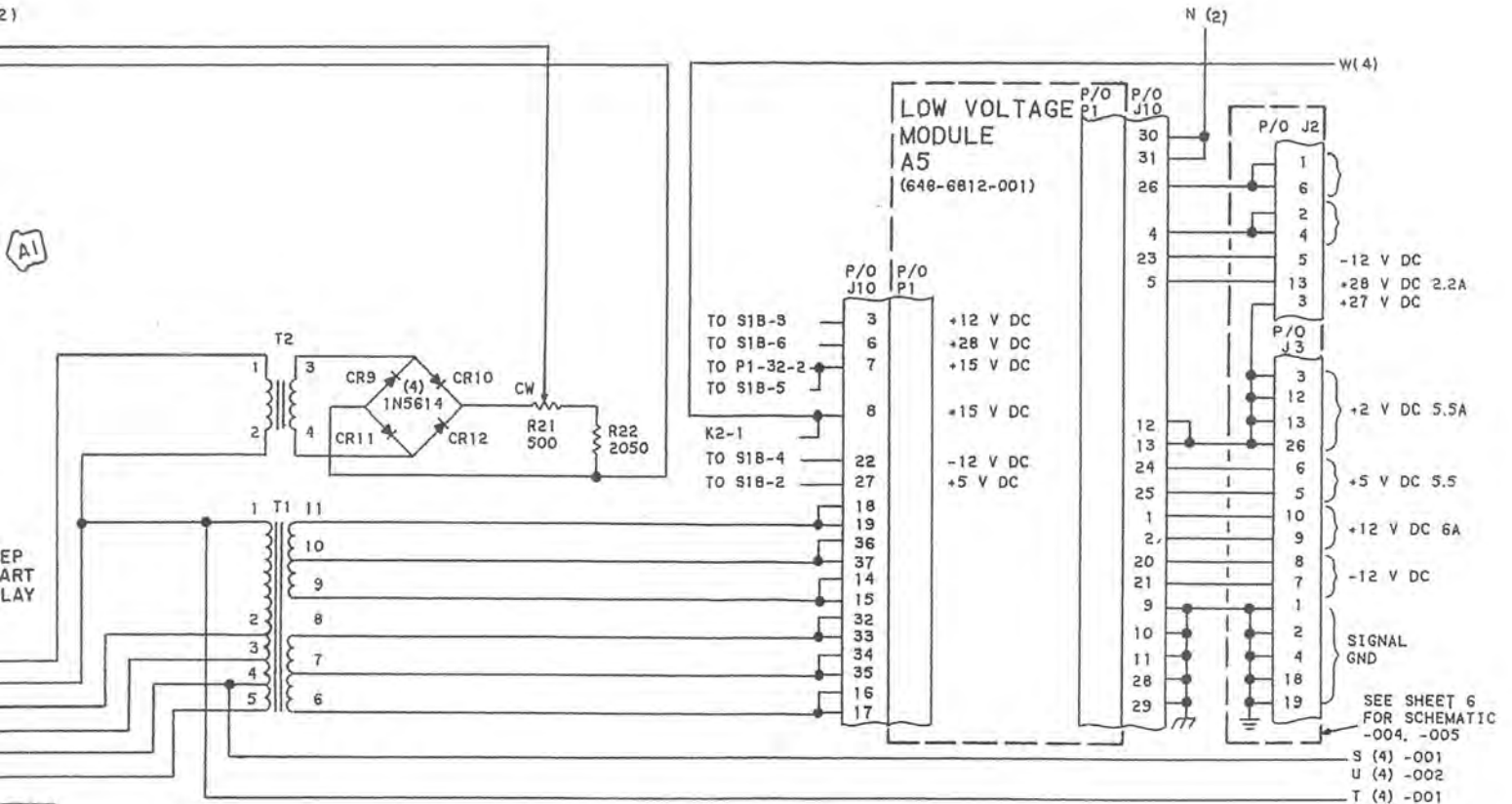
**DIAGRAMS (523-0771505-001218)**

Replace figure 1 with figure 1 provided.



- TO J10-3
- TO P1-31 (2)
- TO J2-33 (3)
- TO J2-27 (3)
- TO J2-21 (3)
- TO J2-15 (3)
- TO J2-8 (2)
- TO J10-6
- TO J10-7
- TO J10-27
- TO J10-22
- TO P1-1 (2)





NOTES:

- ① UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS AND INDUCTANCE VALUES ARE IN MICROHENRYS.
- ② PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
- ③ TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.
- ④ THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.
- ⑤ PARTS USED ON THREE PHASE VERSION (HF-8032) ONLY: CS, C6, C8, C19, CB1 (THREE GANG BREAKER), L6, R20, J1-7, CR5.
- ⑥ PIN A ON S1A AND S1B ARE LOCATED ON THE KNOB OR DRIVEN SIDE, ALL OTHER PINS ARE ON THE REAR. ROTOR, FRONT AND REAR, ARE ELECTRICAL.

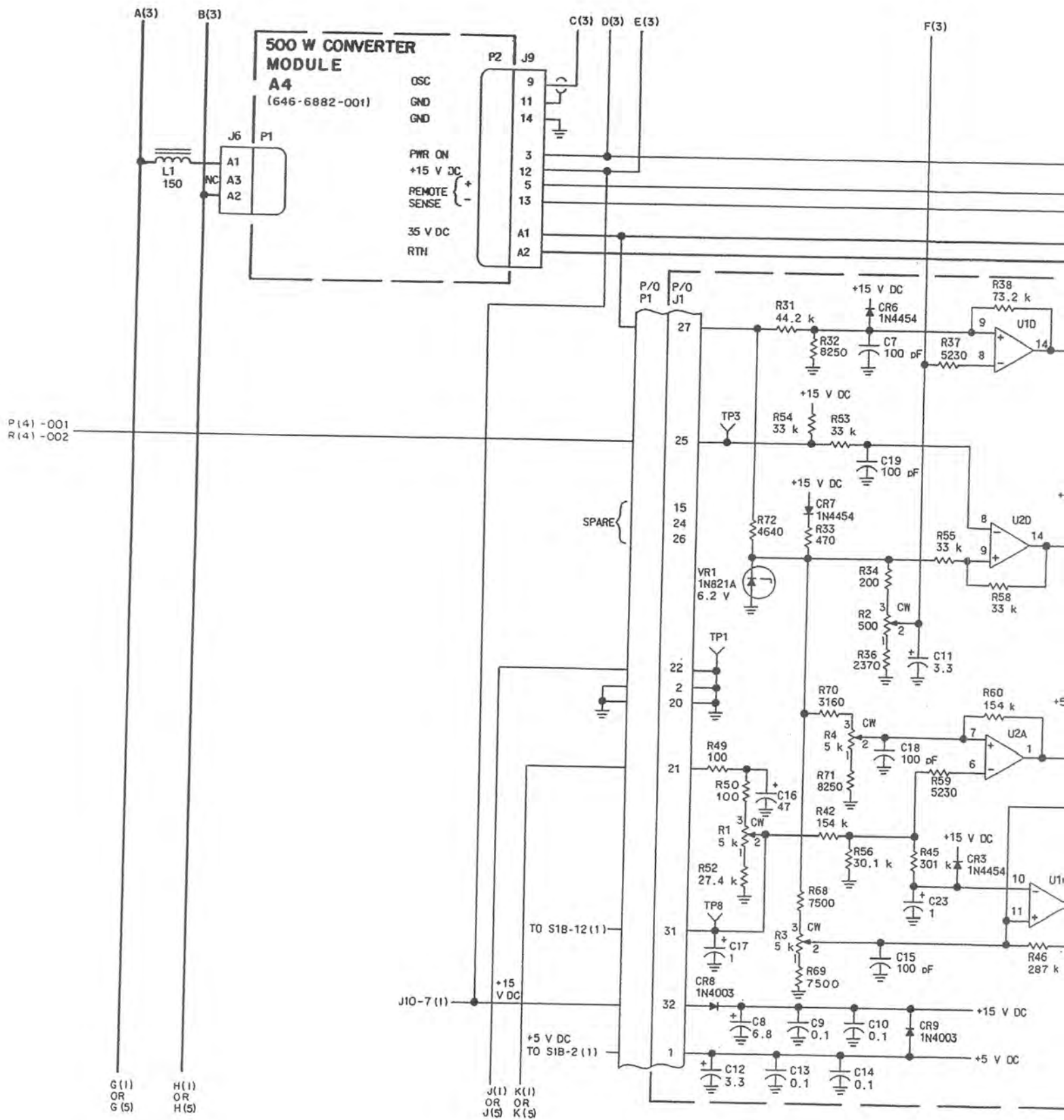
DESCRIPTION	UNIT	SCHEMATIC DASH NO.
1φ, 50/60 Hz, 230 V AC LINE-NEUT	HF-8031 (001)	-001
1φ, 50/60 Hz, 230 V AC LINE-NEUT LOW NOISE	HF-8031 (003)	-004
1φ, 50/60 Hz, 230 V AC LINE-NEUT LOW NOISE	HF-8031 (203)	-004
3φ, 50/60 Hz, 230 V AC LINE-LINE	HF-8032 (001)	-001
3φ, 50/60/400 Hz, 230 V AC LINE-LINE	HF-8032 (002)	-002
3φ, 50/60 Hz, 380 V AC LINE-LINE	HF-8032 (003)	-003
3φ, 50/60 Hz, 230 V AC LINE-LINE LOW NOISE	HF-8032 (004)	-004
3φ, 50/60/400 Hz, 230 V AC LINE-LINE LOW NOISE	HF-8032 (005)	-005

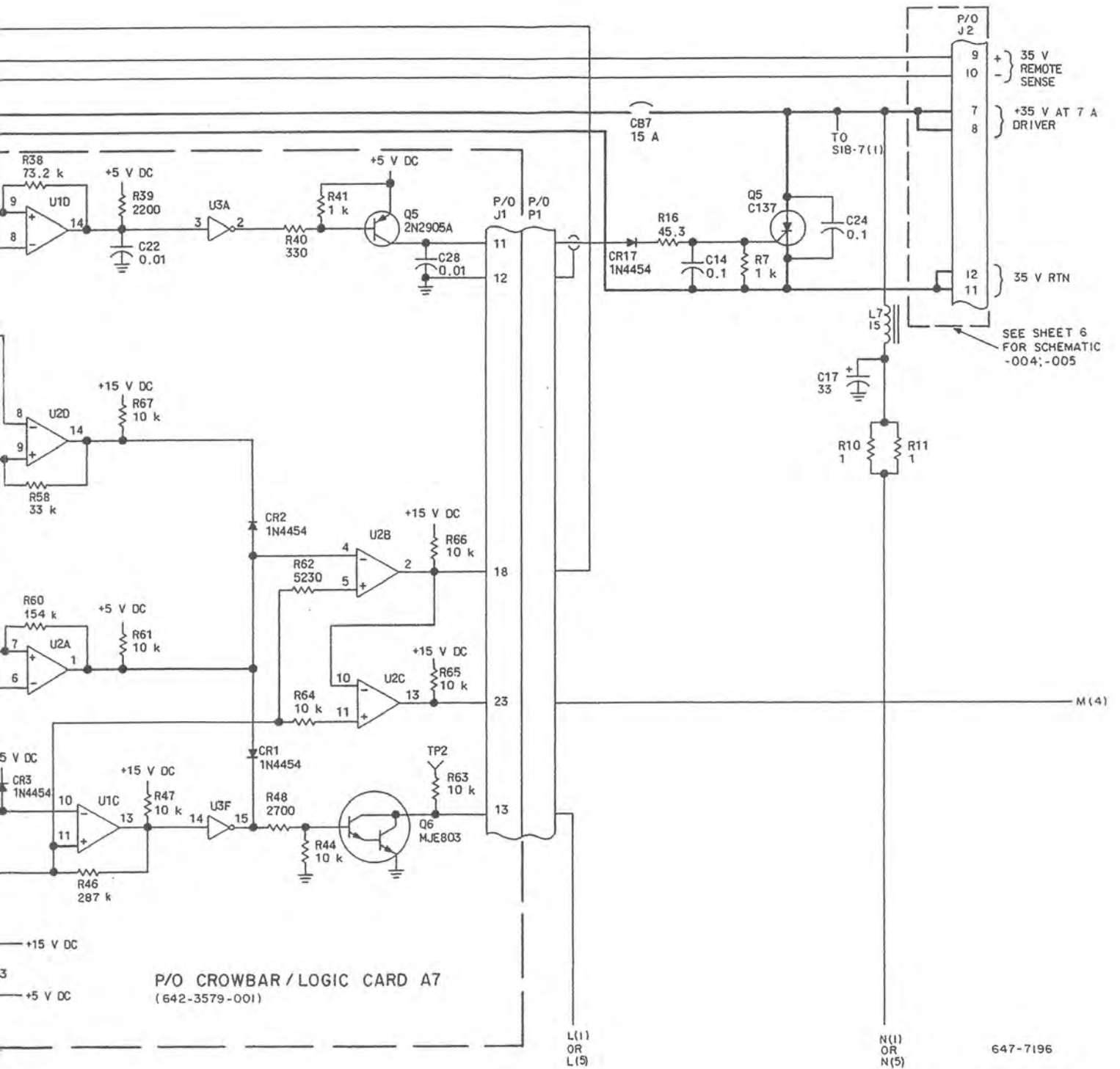
MICROCIRCUIT INFO FOR A7

REF DES	COMMON DEVICE	PWR (V DC)		
		+5	+15	GND
U1	LM239		3	12
U2	LM239		3	12
U3	4049	1		8
U4	54LS28	14		7

647-7196

HF-8031, HF-8032 Power Supply, Schematic Diagram Figure 1 (Sheet 1 of 6)



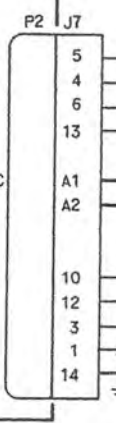


HF-8031, HF-8032 Power Supply,  
Schematic Diagram  
Figure 1 (Sheet 2)



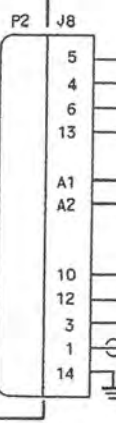
**1000 W CONVERTER  
MODULE  
A2**  
(646-6883-001)

- REMOTE SENSE
  - A+
  - A-
  - B+
  - B-
- 40/50 V DC
- RTN
- 40 V ENBL
- +15 V DC
- PWR ON
- EXT SYNC
- GND



**1000 W CONVERTER  
MODULE  
A3**  
(646-6883-001)

- REMOTE SENSE
  - C+
  - C-
  - D+
  - D-
- 40/50 V DC
- RTN
- 40 V ENBL
- +15 V DC
- PWR ON
- EXT SYNC
- GND



- P/O J3
- REMOTE CROWBAR
  - A 20
  - B 21
- 40 V ENBL 24
- SPARE
  - 27
  - 28
- KEY PIN 11

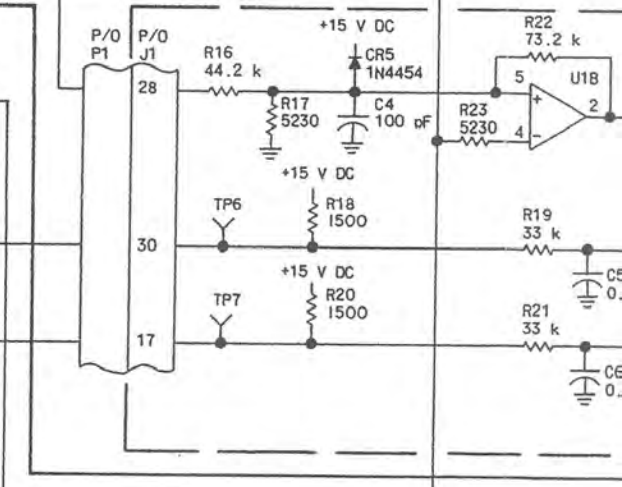
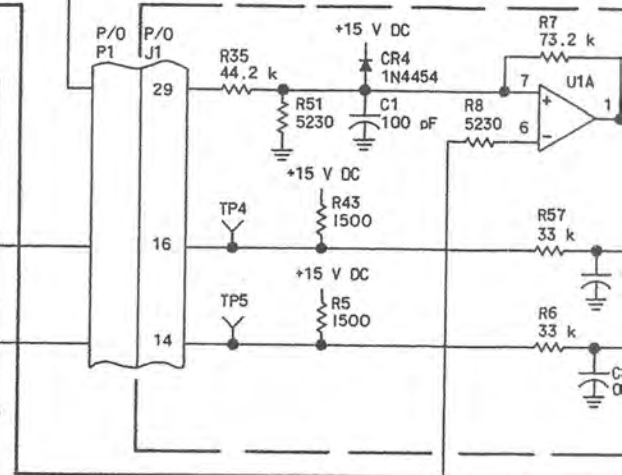
- REMOTE CROWBAR
  - C 22
  - D 23

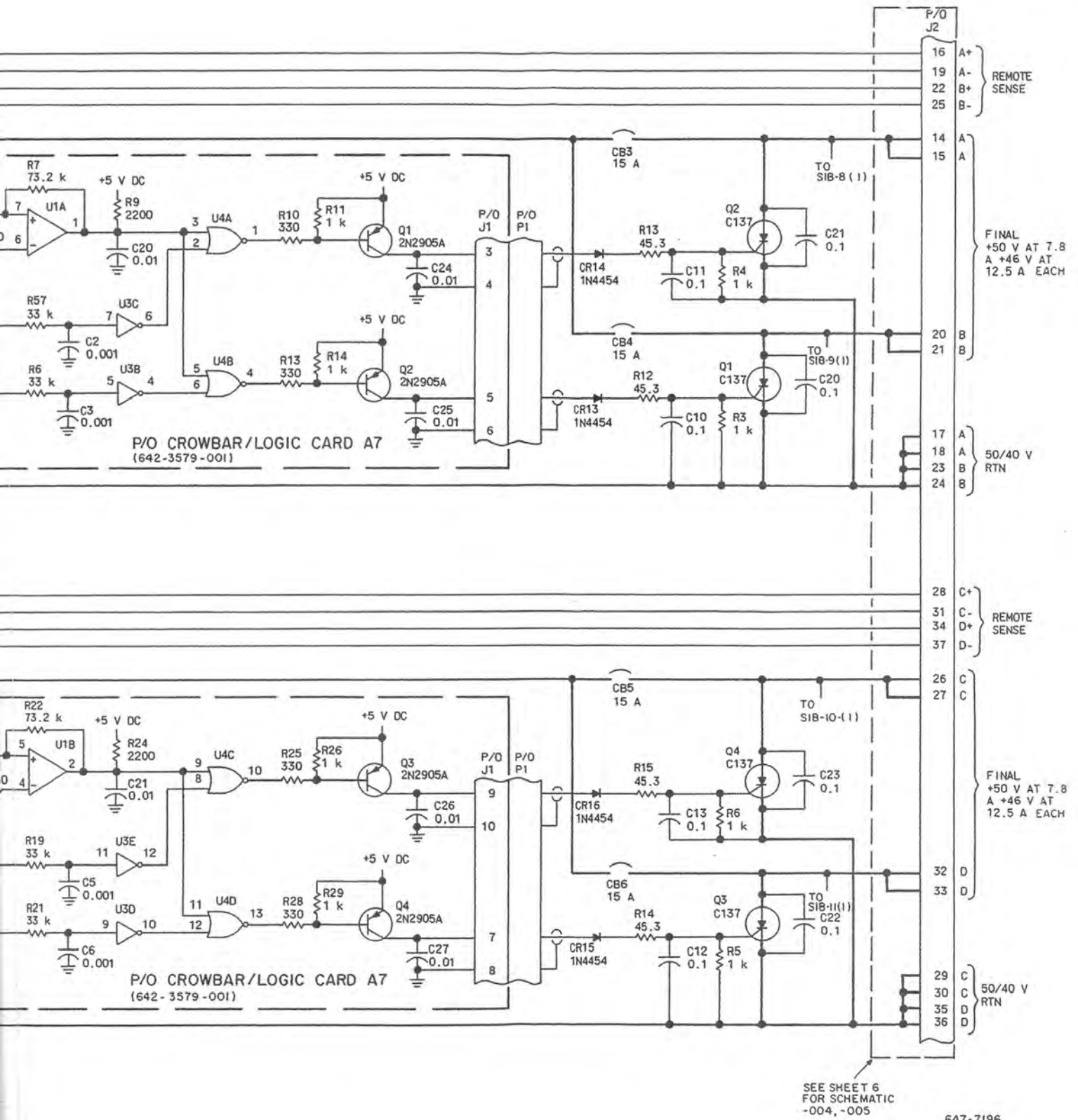
SEE SHEET 6  
FOR SCHEMATIC  
-004, -005

A(2) B(2)

C(2) D(2) E(2)

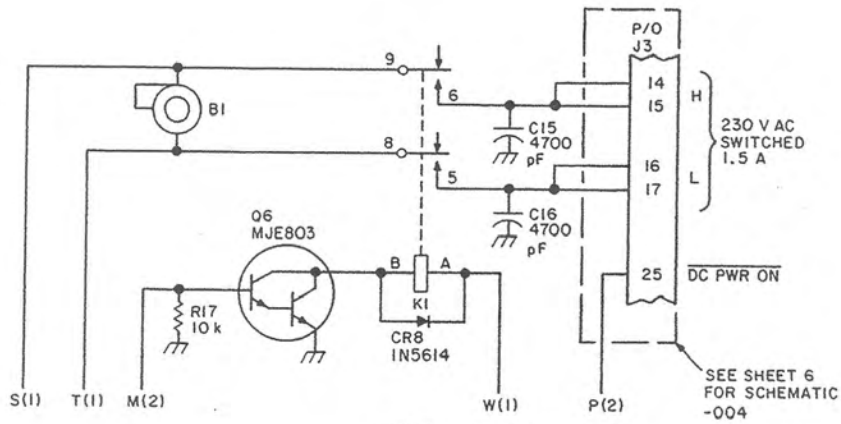
F(2)



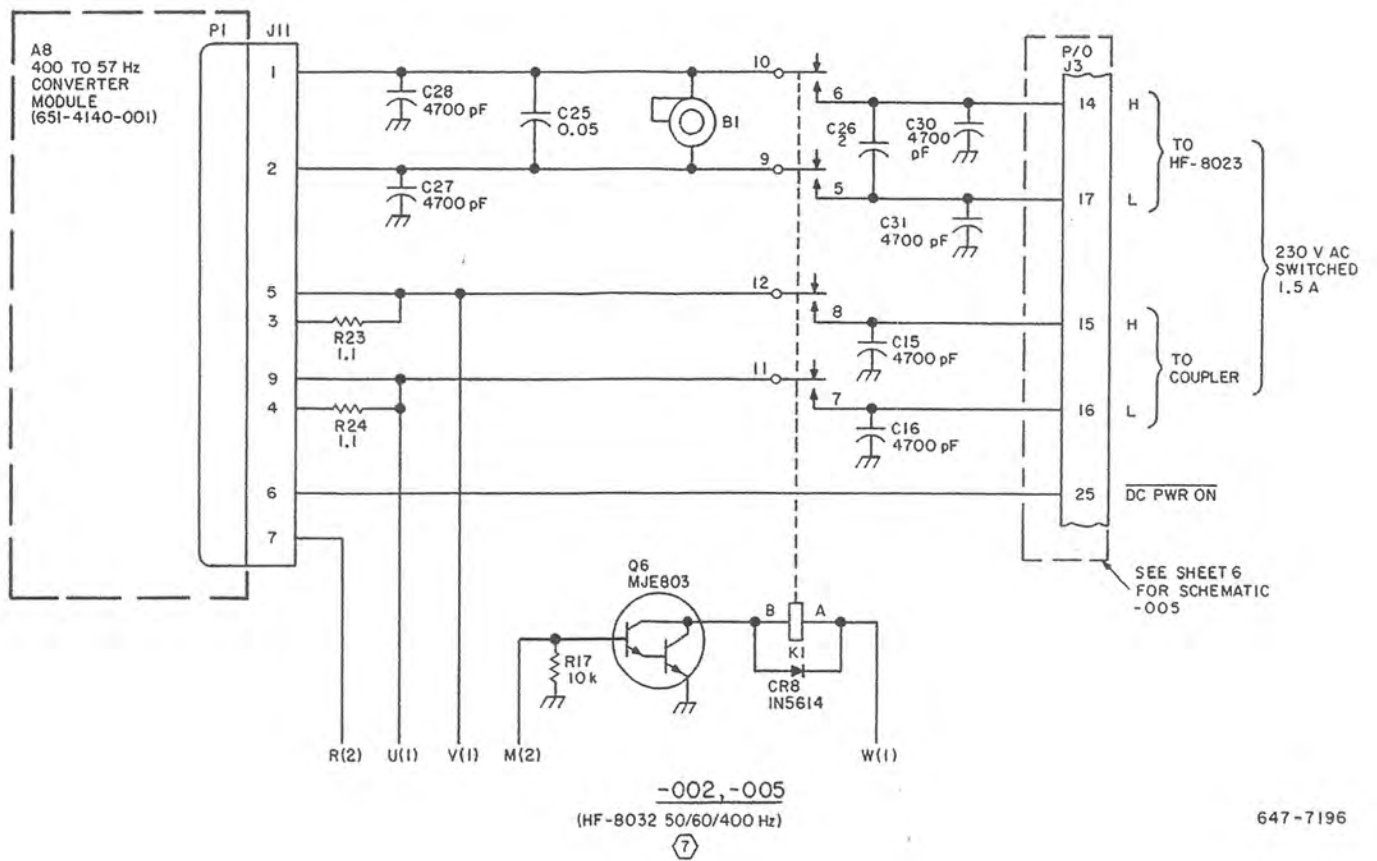


HF-8031, HF-8032 Power Supply,  
Schematic Diagram  
Figure 1 (Sheet 3)

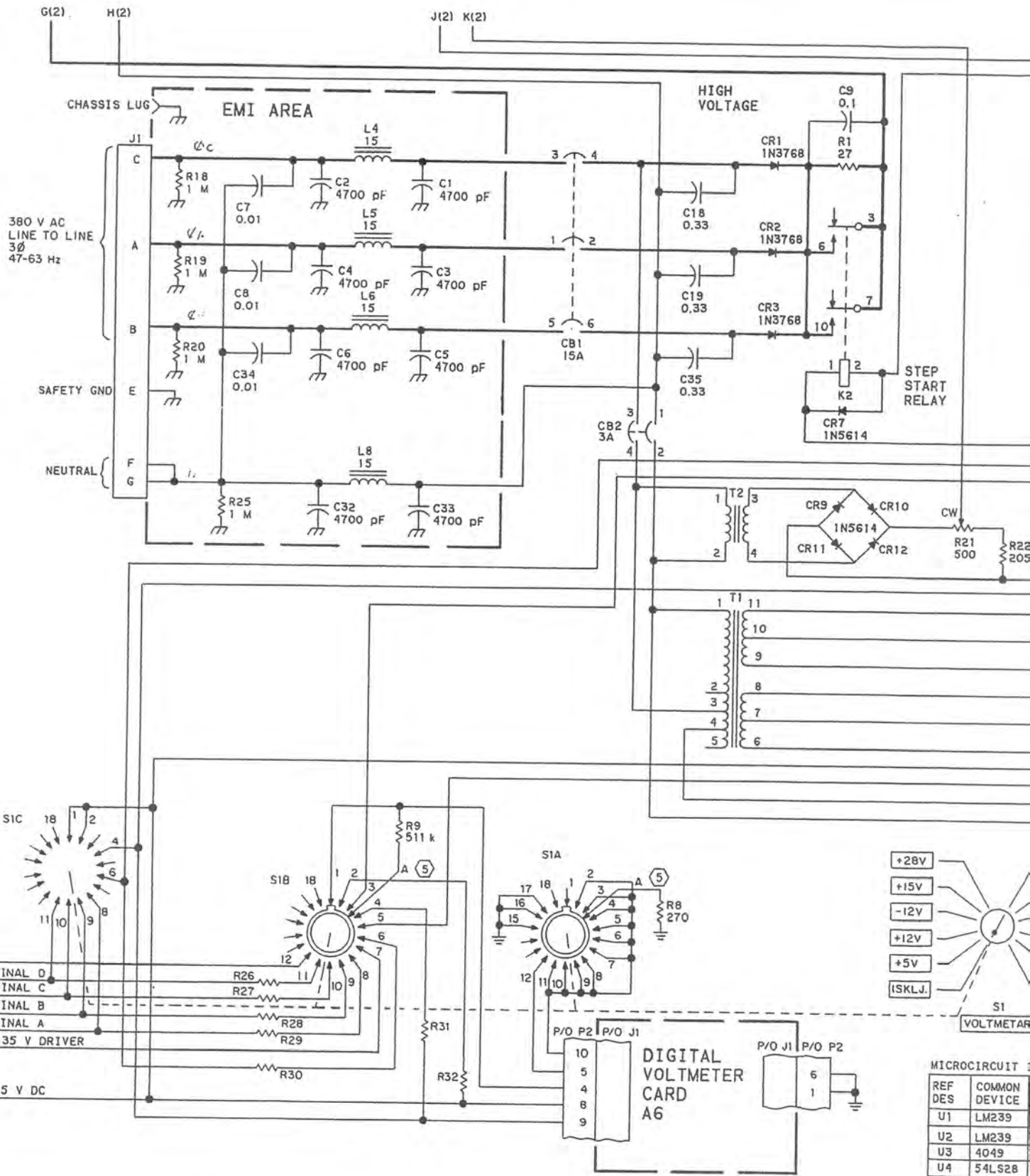
A8  
400 1  
CONVI  
MODU  
(651-4



-001, -003, -004  
(HF-8031/HF-8032 50/60 Hz)  
7

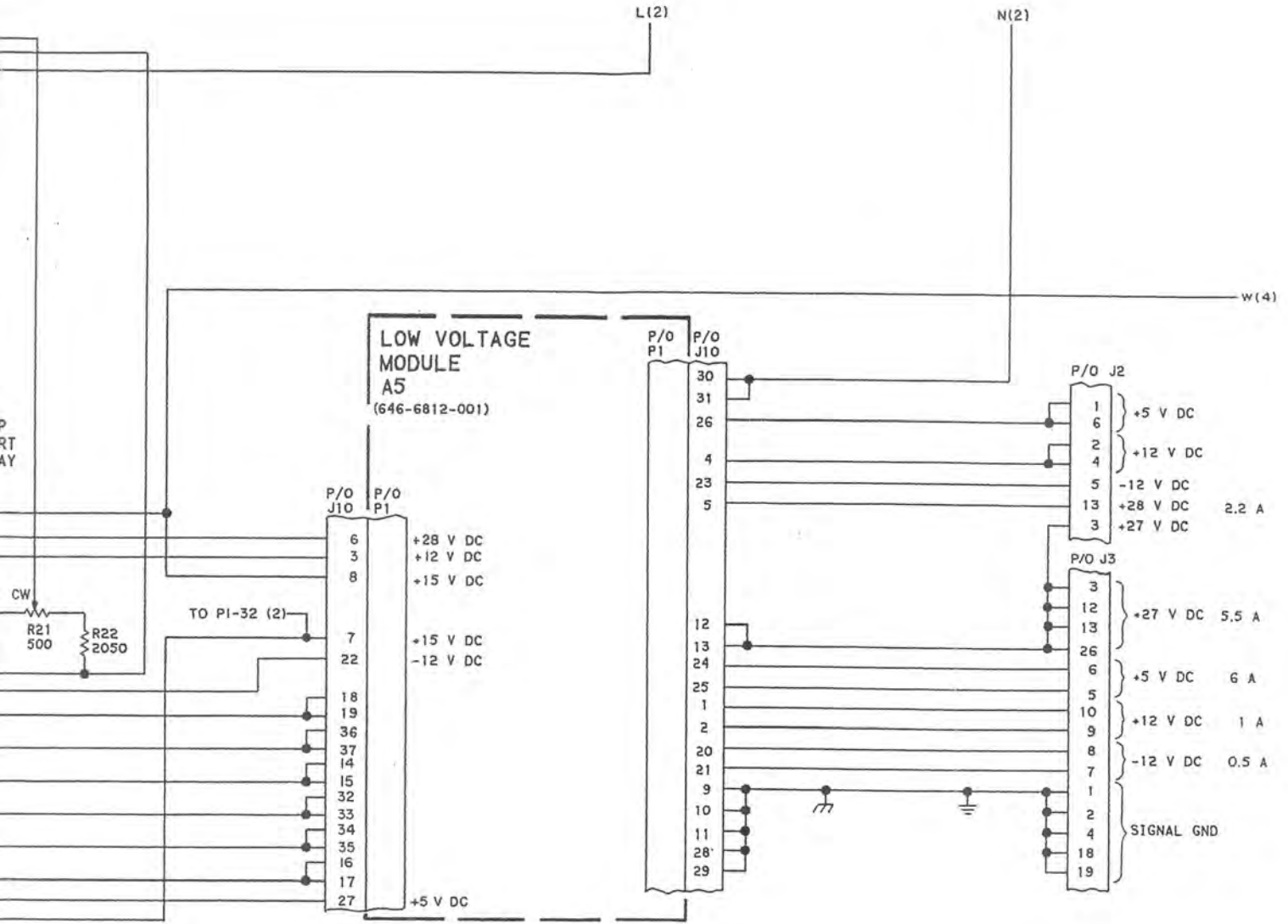


HF-8031, HF-8032 Power Supply,  
Schematic Diagram  
Figure 1 (Sheet 4)

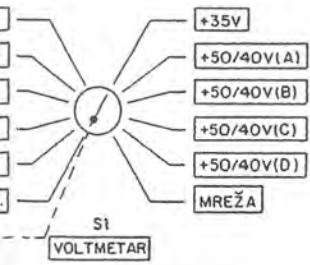


- TO P1-31 (2)
- TO J2-33 (3) FINAL D
- TO J2-27 (3) FINAL C
- TO J2-21 (3) FINAL B
- TO J2-15 (3) FINAL A
- TO J2-8 (2) +35 V DRIVER
- TO P1-1 (2) +5 V DC

REF DES	COMMON DEVICE
U1	LM239
U2	LM239
U3	4049
U4	54LS28



S(4) -003  
T(4) -003



NOTES:

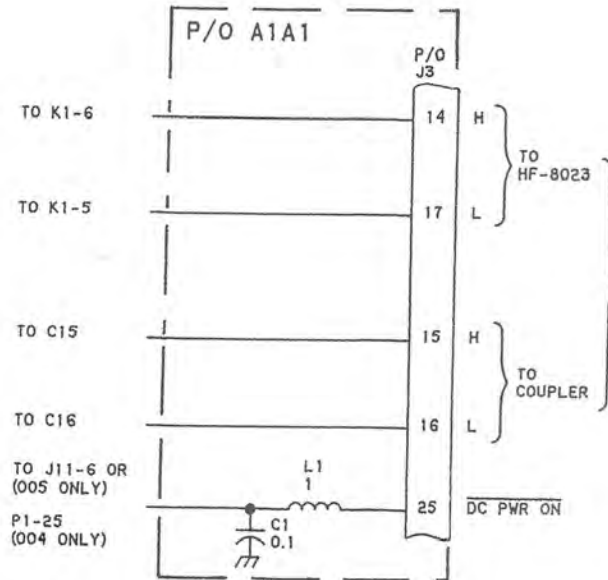
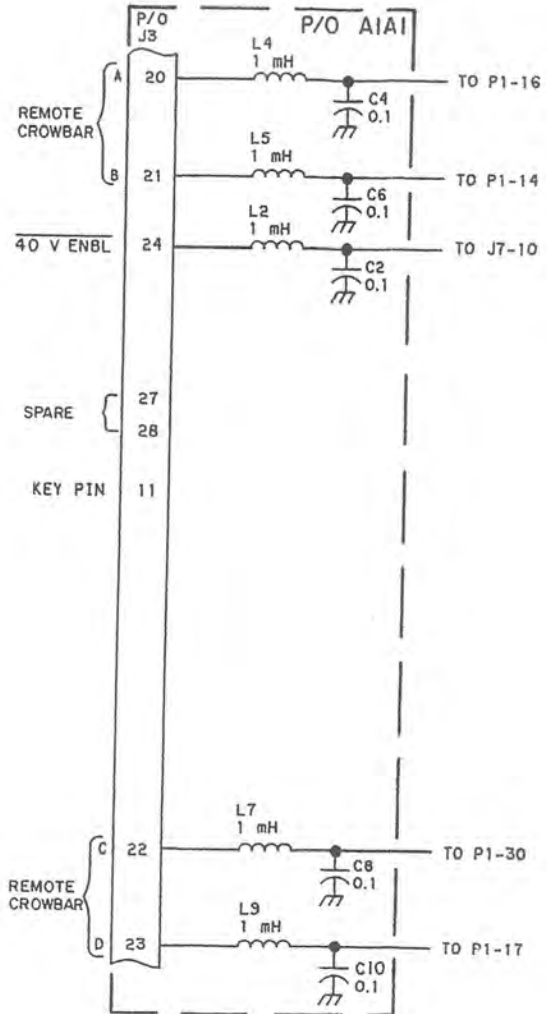
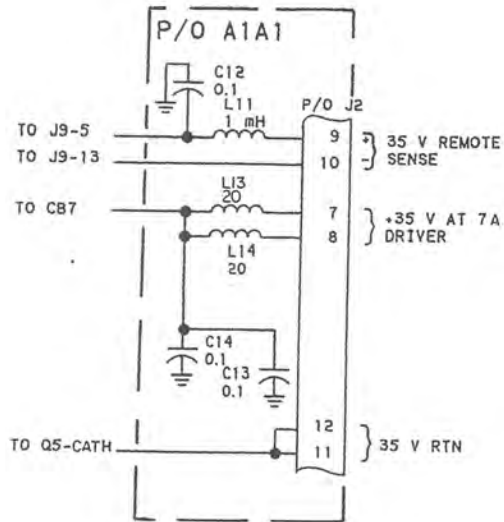
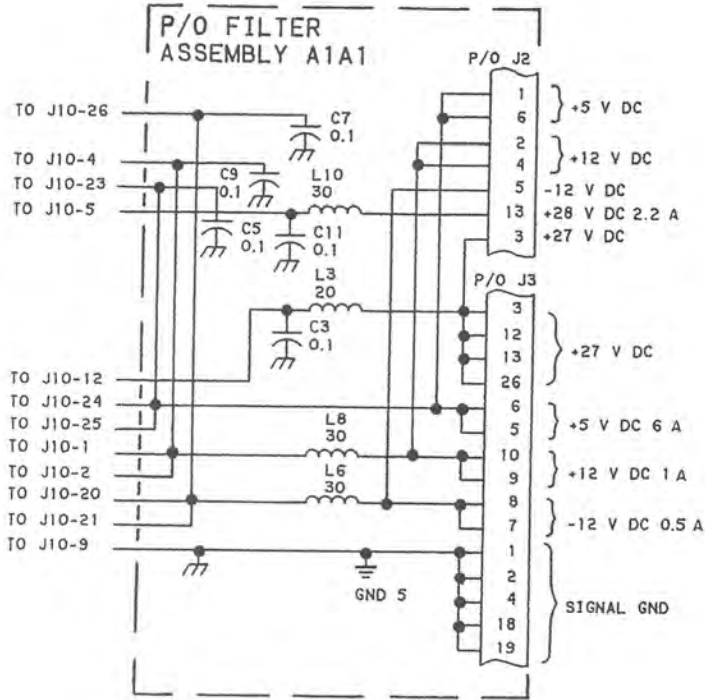
- ① UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS AND INDUCTANCE VALUES ARE IN MICROHENRYS.
- ② PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
- ③ TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.
- ④ THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.
- ⑤ PIN A ON S1A AND S1B ARE LOCATED ON THE KNOB OR DRIVEN SIDE, ALL OTHER PINS ARE ON THE REAR. ROTOR, FRONT AND REAR ARE ELECTRICALLY CONNECTED.
- ⑥ HF-8032 (622-3512-003) USES -003 SCHEMATIC FOR 3Ø 50/60 Hz YUGOSLAVIAN VERSION.

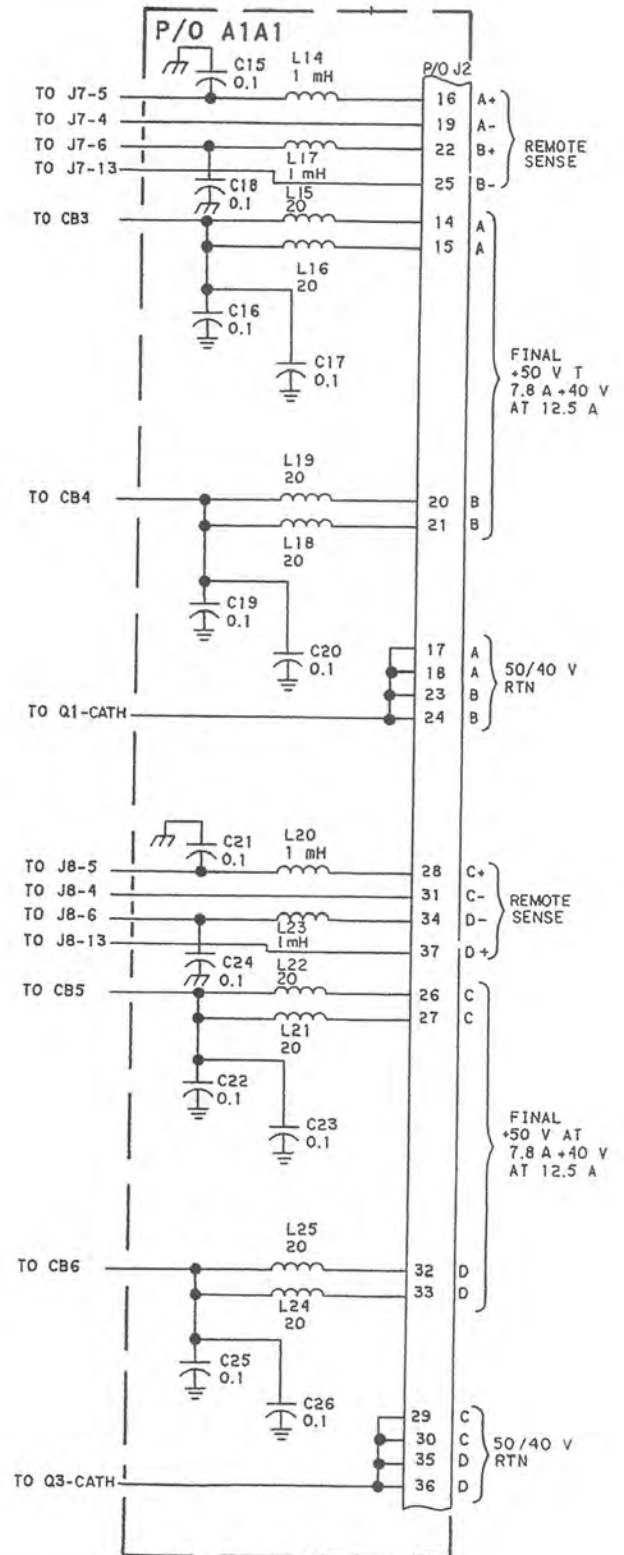
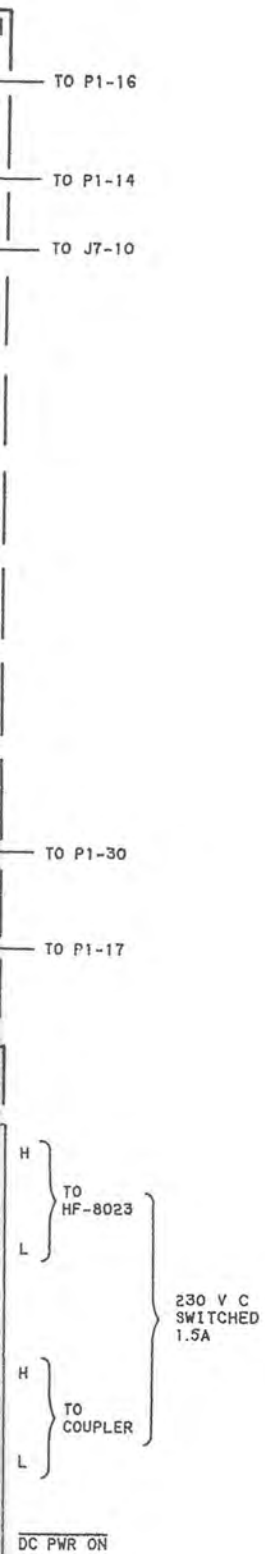
MICROCIRCUIT INFO FOR A7

REF DES	COMMON DEVICE	PWR (V DC)		
		+5	+15	GND
U1	LM239		3	12
U2	LM239		3	12
U3	4049	1		8
U4	54LS28	14		7

647-7196

HF-8031, HF-8032 Power Supply,  
Schematic Diagram  
Figure 1 (Sheet 5)





647-7196

HF-8031, HF-8032 Power Supply,  
Schematic Diagram  
Figure 1 (Sheet 6)



HF-8023 1-kW POWER AMPLIFIER (622-3490-003)  
CHASSIS A1 (646-6433-002)  
FRONT PANEL CARD A1A4 (642-3586-001)

## SERVICE BULLETIN NO 141

### 1-kW TUNE POWER CONVERSION

This service bulletin applies to HF-8023 (622-3490-003) units with serial numbers 459 and below.

Production cut-in is serial number 460. When this modification is installed the part number of front panel card A1A4 changes from 642-3586-001 to 642-3586-002.

Systems that use the AC-8114 tune power pad require that tune power be adjusted to 1 kW. Front panel card A1A4, part number 642-3586-002, must be used to obtain 1-kW tune power.

This modification converts front panel card A1A4 part number 642-3586-001 to 642-3586-002 by changing the value of resistor R15.

Estimated time required to perform the modification is 1.0 man-hour.

The modification parts are itemized in the material information paragraph. For additional information concerning parts, contact Collins Defense Communications, Rockwell International Corporation, Service Parts Department, Cedar Rapids, Iowa 52498. Reference HF-8023 Service Bulletin No 141 in all correspondence.

No special tools or equipment are required.

The HF-80 Solid-State 1-kW Power Amplifier-Power Supply Instruction Book, part number 523-0771296, can be used as a reference while installing this bulletin.

#### MODIFICATION PROCEDURE

- A. Disconnect primary power from the power amplifier.

**CAUTION:** THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.

- B. Remove the four hex insert screws that secure the front panel handles in place.
- C. Lay the front panel on its face to gain access to front panel card A1A4.
- D. Disconnect A1P7 from A1A4J1 and A1A4P6 from A1A2J5.

E. Remove the five screws, flat washers, and lockwashers that secure the front panel card to the five standoffs. Lift front panel card A1A4 from the chassis.

NOTE: Refer to figure 1 for location of resistor R15.

F. Remove 3010-ohm resistor R15 and replace it with a 845-ohm resistor (705-3600-930).

G. Change the last digit of the front panel card part number from 1 to 2. The part number should now be 642-3586-002.

H. Reassemble the power amplifier in the reverse order of disassembly.

I. Mark SB 141 on the service bulletin information chart. If the unit is not equipped with an information chart (280-3778-010), order one and attach it near the nameplate.

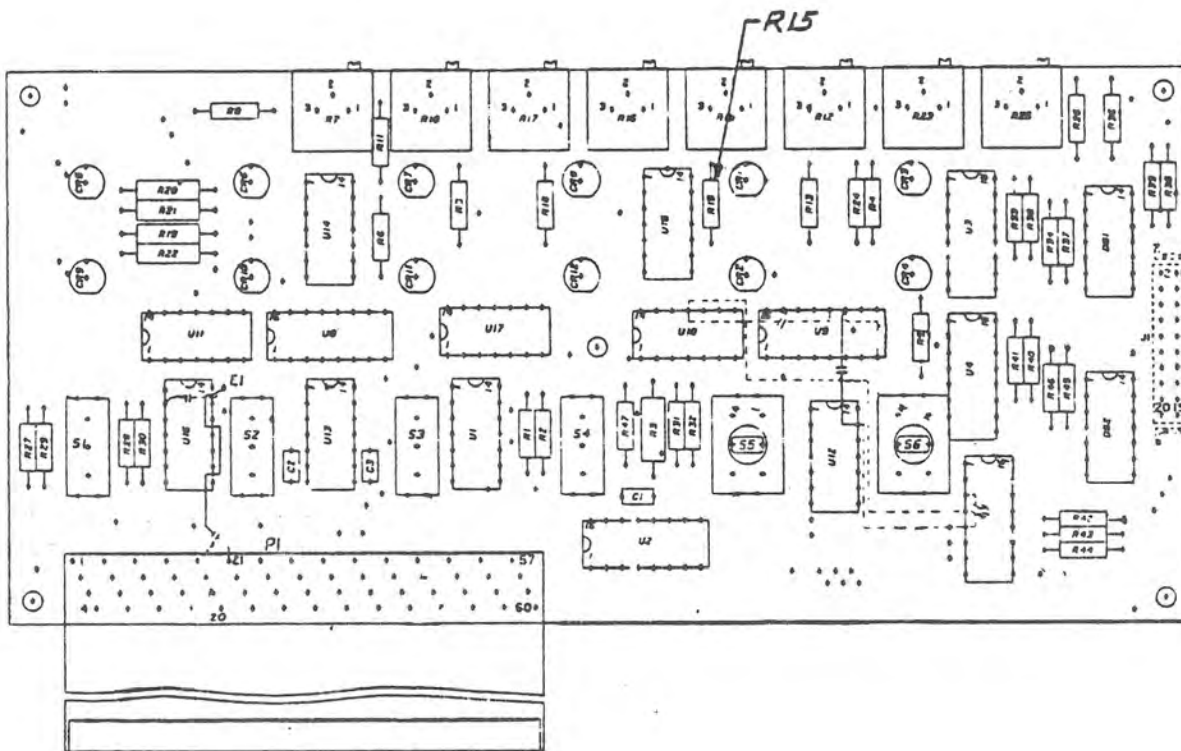
#### MATERIAL INFORMATION

The parts listed below are required to modify one HF-8023.

<u>PART NUMBER*</u>	<u>QTY</u>	<u>UNIT PRICE</u>	<u>DESCRIPTION</u>
705-3600-930	1		Resistor, 845 Ohm, R15
**280-3778-010	1		Chart, information

\*Unless otherwise indicated, all part numbers are Rockwell International.

\*\*Order if needed.



Front Panel Card A1A4  
Figure 1



**Rockwell  
International**

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**Collins instruction book**

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**HF-80  
Solid-State  
Power Amplifiers  
and Power Supplies**

**Depot Maintenance**

---

*This instruction book includes:*

*Power Amplifier Cards and Modules*

<i>Front Panel Card</i>	<i>523-0771669</i>
<i>Driver Module</i>	<i>523-0771670</i>
<i>Power Amplifier Output Module</i>	<i>523-0771671</i>
<i>Power Combiner</i>	<i>523-0771762</i>
<i>Low-Pass Filter Assembly</i>	<i>523-0771763</i>
<i>Digital Control Card</i>	<i>523-0771672</i>
<i>Analog Control Card</i>	<i>523-0771673</i>
<i>HF-80 Interface Card</i>	<i>523-0767976</i>

*Power Supply Cards and Modules*

<i>1000-Watt Converter Module</i>	<i>523-0771674</i>
<i>500-Watt Converter Module</i>	<i>523-0771675</i>
<i>Low Voltage Module</i>	<i>523-0771676</i>
<i>Digital Voltmeter Card</i>	<i>523-0771677</i>
<i>Crowbar/Logic Card</i>	<i>523-0771678</i>
<i>400 to 57 Hz Converter Module</i>	<i>523-0771764</i>

---

**Collins Telecommunications  
Products Division  
Defense Electronics Operations  
Rockwell International  
Cedar Rapids, Iowa 52498**

**LIST OF EFFECTIVE PAGES**

Please be advised that completion and return of the enclosed Customer Service Information Card to Rockwell International ensures you of manual revisions and service bulletin modifications to your equipment. Without the return of this card, Rockwell International bears no responsibility to forward this information to you.

**Caution**

The material in this manual is subject to change. Before attempting any maintenance operation on the equipment covered in this manual, verify that you have a complete and up-to-date publication applicable to your equipment.

We welcome your comments concerning this instruction book. Although every effort has been made to keep it free of errors, some may occur. When reporting a specific problem, please describe it briefly and include the instruction book part number, the paragraph or figure number, and the page number.

Send your comments to Logistics  
 Collins Telecommunications  
 Products Division  
 Rockwell International  
 Cedar Rapids, Iowa 52498

ATTN: Quality Control-Support  
 Engineering 120-120

<i>Page No</i>	<i>*Change No</i>	<i>Page No</i>	<i>*Change No</i>
Title/Introduction (523-0772715-00121A) 1st Ed — 15 Sep 82		Power Amplifier Output Module (646-6406-001, -002) (523-0771671-001211) 1st Ed — 15 Sep 82	
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A thru C .....	0	4 Blank .....	0
i thru iv .....	0	5 thru 9 .....	0
Front Panel Card (642-3586-001) (523-0771669-001211) 1st Ed — 15 Sep 82		10 Blank .....	0
1 thru 7 .....	0	11 .....	0
8 Blank .....	0	12 Blank .....	0
9 thru 11 .....	0	Power Combiner (646-7120-001) (523-0771762-001211) 1st Ed — 15 Sep 82	
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13 .....	0	5 Blank .....	0
14 Blank .....	0	6 thru 7 .....	0
Driver Module (646-6407-001) (523-0771670-001211) 1st Ed — 15 Sep 82		8 Blank .....	0
1 thru 3 .....	0	9 .....	0
4 Blank .....	0	10 Blank .....	0
5 .....	0	Low-Pass Filter Assembly (646-6400-001) (523-0771763-001211) 1st Ed — 15 Sep 82	
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7 .....	0	6 Blank .....	0
8 Blank .....	0	7 thru 9 .....	0
9 thru 11 .....	0	10 Blank .....	0
12 Blank .....	0	11 thru 15 .....	0
13 thru 17 .....	0	16 Blank .....	0
18 Blank .....	0	17 .....	0
19 .....	0	18 Blank .....	0
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13 thru 15 .....	0
16 Blank .....	0
17 thru 19 .....	0
20 Blank .....	0
21 .....	0
22 Blank .....	0

Analog Control Card (642-3593-001)  
(523-0771673-001211)  
1st Ed — 15 Sep 82

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19 .....	0
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21 .....	0
22 Blank .....	0

HF-80 Interface Card (635-0745-001)  
(523-0767976-302211)

2nd Ed — 1 Jun 78  
Chg 1 — 1 Apr 80  
Chg 2 — 1 Oct 80  
Chg 3 — 15 Nov 81

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5 thru 6 .....	1
7 thru 19 .....	0
20 .....	3

<i>Page No</i>	<i>*Change No</i>
21 thru 22 .....	0
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26 thru 27 .....	3
28 .....	0
29 thru 30 .....	3
30A thru 30B .....	2
31 .....	2
32 Blank .....	2

1000-Watt Converter Module (646-6883-001)  
(523-0771674-001211)  
1st Ed — 15 Sep 82

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500-Watt Converter Module (646-6882-001)  
(523-0771675-001211)  
1st Ed — 15 Sep 82

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Low-Voltage Module (646-6812-001)  
(523-0771676-001211)  
1st Ed — 15 Sep 82

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Digital Voltmeter Card (642-3197-001, -002)  
(523-0771677-001211)  
1st Ed — 15 Sep 82

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**LIST OF EFFECTIVE PAGES**

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Crowbar/Logic Card (642-3579-001) (523-0771678-001211) 1st Ed — 15 Sep 82			
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400 to 57 Hz Converter Module (651-4140-001) (523-0771764-001211) 1st Ed — 15 Sep 82			
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13 .....	0		
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# introduction

## PURPOSE

This instruction book includes instructions to support repair of circuit cards and modules related to HF-80 type solid-state power amplifiers and associated power supplies.

## RELATED PUBLICATIONS/EQUIPMENT

The circuit cards and modules included in this instruction book are only the circuit cards and modules which are contained in the equipments covered in the following related publications.

<u>PUBLICATION TITLE</u>	<u>PART NUMBER</u>
HF-80 Solid-State 1-kW Power Amplifier-Power Supply Instruction Book	523-0771296

## TEST EQUIPMENT AND TOOLS

Following is a composite list of test equipment and tools required to maintain the circuit cards and modules included in this instruction book. The table includes the minimum required specifications and recommended type. Following the table of test equipment and tools are usage tables that indicate which circuit card/module uses each piece of test equipment.

Table of Test Equipment and Tools.

TEST EQUIPMENT	MINIMUM SPECIFICATIONS	RECOMMENDED TYPE
(To be supplied as field repair is made available)		



Power Amplifier Circuit Cards and Modules, Test Equipment Usage Table.

TEST EQUIPMENT / CIRCUIT CARD/MODULE	FRONT PANEL CARD	DRIVER MODULE	POWER AMPLIFIER OUTPUT MODULE	POWER COMBINER	LOW-PASS FILTER ASSEMBLY	DIGITAL CONTROL CARD	ANALOG CONTROL CARD	HF-80 INTERFACE CARD
(To be supplied as field repair is made available)								

Power Supply Circuit Cards and Modules, Test Equipment Usage Table.

TEST EQUIPMENT / CIRCUIT CARD/MODULE	1000-WATT CONVERTER MODULE	500-WATT CONVERTER MODULE	LOW-VOLTAGE MODULE	DIGITAL VOLTME-TER CARD	CROWBAR/ LOGIC CARD	400 TO 57 HZ CONVERTER MODULE
(To be supplied as field repair is made available)						

**SERVICE BULLETINS/SERVICE  
INFORMATION LETTERS**

**Note**

The following listed service bulletins (SB) and service information letters (SIL) are those that are applicable to the HF-80 Solid-State Power Amplifiers and Power Supplies and are included in the text of this instruction book. Other applicable SB/SIL released before the instruction book was shipped are included in the front of the instruction book.

Service bulletins/service information letters are written in numerical sequence against the whole HF-80 family; therefore, all SB/SIL numbers are not included in the listing. Service bulletins are numbered in sequence for the life of the equipment. Service information letters are numbered in sequence starting at 1 for each calendar year.

<u>SB/SIL</u>	<u>DESCRIPTION</u>	<u>ISSUE DATE</u>
SB 100	Prevents transients on vswr analog line from producing VSWR fault. Added capacitor on Analog Control Card 642-3593-001.	9-15-82
SB 102	Eliminates possible driver spurious oscillation when used with an external tuning device. Replaced Power Amplifier Output Modules 646-6406-001 with ones that have an rf feedback circuit 646-4606-002.	9-15-82



**Rockwell  
International**

**instructions**

# Front Panel Card (642-3586-001)

Collins Telecommunications Products Division

523-0771669-001211

15 September 1982

Printed in USA

(642-3586-001)

## 1. DESCRIPTION

Front Panel Card 642-3586-001 (figure 1) is a plug-in circuit card consisting of the printed circuit card, one board mounted connector assembly, and one pendant

cable connector. All connections for meter switching and a meter circuit are made through the board-mounted connector. All control, display, and power inputs are supplied through the pendant cable connector.

(To be supplied)

Front Panel Card  
Figure 1

523-0771669-001211

## 2. PRINCIPLES OF OPERATION

### 2.1 General

The front panel card consists of local control circuits, monitor and fault displays, and signal interface circuits for adjustment, control, and metering.

### 2.2 Local Control (Refer to figure 2)

Local control of a power amplifier using the front panel card consists of a LOCAL/REMOTE switch and four function switches: MANUAL/AUTO, TUNE STEP ADVANCE, TUNE START, PA PWR, and PA KEY.

With a logic 0 applied at P6-37, the local controls are inhibited. With a logic 1 applied at P6-37, the local control signals are enabled and can be applied to the associated power amplifier. (These local control signals are normally inhibited in the power amplifier unless the LOCAL/REMOTE switch is also in the LOCAL position.)

With a logic 1 control disable at P6-37, all front panel local controls can be enabled. Setting LOCAL/REMOTE switch to LOCAL provides a logic 0 local signal at P6-19.

Setting MANUAL/AUTO switch to the MANUAL position provides a logic 0 manual signal at P6-20 if the LOCAL/REMOTE switch is in the LOCAL position.

Pressing the TUNE STEP ADVANCE switch applies a 10-ms logic 1 pulse at P6-38.

Pressing the TUNE START switch applies a logic 0 local tune start signal at P6-41 for as long as the TUNE START switch is pressed and held.

Setting PA PWR switch to OFF, LOW, or HIGH provides a bcd control signal for control of power amplifier output power. Refer to table 1 for the logic level outputs.

Setting the PA KEY switch to ON applies a logic 0 local key signal at P6-39. In the up ON position, the key is set on. The down ON position is a momentary position and will return to OFF when the KEY switch is released.

Table 1. PA PWR Switch, Truth Table.

SWITCH POS	P6-21	P6-22
OFF	1	1
LOW	0	0
HIGH	0	1

### 2.3 TUNE STEP and BAND Indicators

The TUNE STEP and BAND indicators use a bcd to 7-bar decoder/driver and a 7-bar LED display circuit. Refer to figure 3.

The TUNE STEP indicator uses only inputs A, B, and C; therefore, only digits 0 through 7 can be displayed (input D strapped to logic 0).

The BAND indicator uses all inputs (A, B, C, and D); thus, digits 0 through 9 can be displayed as well as the error signals of 10 through 15.

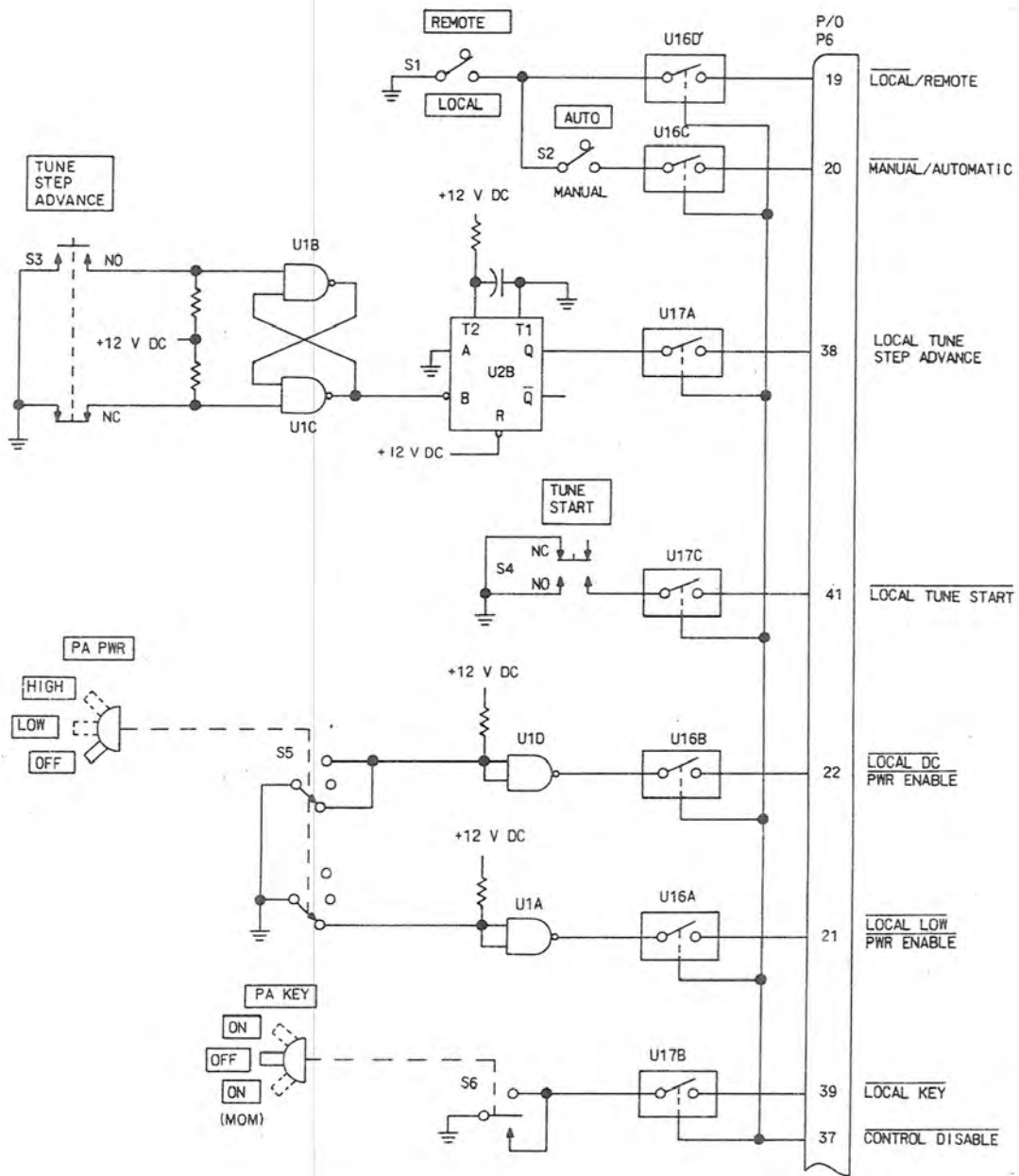
The TUNE STEP indicator, as installed in the front panel card, cannot be blanked since no input is applied to the blanking input and input D is strapped to logic 0 (ground). The BAND indicator, as installed in the front panel card, can be blanked only by applying all logic 1's to inputs A, B, C, and D.

### 2.4 FAULT and MONITOR Indicators (Refer to figure 5)

The fault and monitor indicators each consist of two inverters in series with an LED display device. A logic 1 input is required to extinguish the LED's. With a logic 0 or no input, the buffer/drivers (two series inverters) provide a logic 0 (ground) output to cause the LED to light.

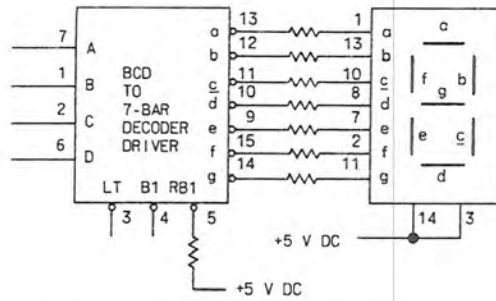
The following monitors and faults are included on the front panel card:

<u>MONITOR</u>	<u>FAULT</u>
RF INPUT (P6-50)	MOD A (P6-29)
RF INTLK (P6-49)	MOD B (P6-32)
KEY (P6-48)	MOD C (P6-30)
PWR SPLY (P6-42)	MOD D (P6-51)
	INTLK (P6-31)
	TEMP (P6-27)
	VSWR (P6-28)
	TUNE (P6-47)



TPA-4562-014

Local Control Switches, Simplified Schematic  
Figure 2



TRUTH TABLE

INPUTS								OUTPUTS							
LT	B1	RB1	A	B	C	D		a	b	c	d	e	f	g	DISPLAY
1	1	1	0	0	0	0		0	0	0	0	0	0	1	0
1	1	X	1	0	0	0		1	0	0	1	1	1	1	1
1	1	X	0	1	0	0		0	0	1	0	0	1	0	2
1	1	X	1	1	0	0		0	0	0	0	1	1	0	3
1	1	X	0	0	1	0		1	0	0	1	1	0	0	4
1	1	X	1	0	1	0		0	1	0	0	1	0	0	5
1	1	X	0	1	1	0		1	1	0	0	0	0	0	6
1	1	X	1	1	1	0		0	0	0	1	1	1	1	7
1	1	X	0	0	0	1		0	0	0	0	0	0	0	8
1	1	X	1	0	0	1		0	0	0	1	1	0	0	9
1	1	X	0	1	0	1		1	1	1	0	0	1	0	A
1	1	X	1	1	0	1		1	1	0	0	1	1	0	B
1	1	X	0	0	1	1		1	0	1	1	1	0	0	C
1	1	X	1	0	1	1		0	1	1	0	1	0	0	D
1	1	X	0	1	1	1		1	1	1	0	0	0	0	E
1	1	X	1	1	1	1									F
1	0	0	0	0	0	0		1	1	1	1	1	1	1	BLANK
X	0	X	X	X	X	X									
0	1	X	X	X	X	X		0	0	0	0	0	0	0	BLANK

1=LOGIC 1; 0=LOGIC 0; X= EITHER LOGIC 1 OR LOGIC 0

TPA-4561-013

BCD to 7-Bar Decoder and LED Display  
Figure 3

### 2.5 ALC Adjustments (Refer to figure 5)

An ALC reference signal is received at P6-16 and three outputs are supplied from this ALC reference. Tune power adjust output is supplied by P6-7 and controlled by the ALC reference and TUNE PWR adjustment R14. Low-power ALC adjust is supplied at P6-12 and controlled by the ALC reference and LOW ALC adjustment R10. High-power ALC adjust is supplied at P6-13 and controlled by the ALC reference and HIGH ALC adjustment R7.

### 2.6 TGC Adjustments (Refer to figure 5)

A TGC reference signal is received at P6-14 and two outputs are supplied from the TGC reference. Low-power TGC adjust is supplied at P6-10 and controlled by TGC reference and LOW TGC adjustment R16. High-power TGC adjust is supplied at P6-11 and controlled by TGC reference and HIGH TGC adjustment R17.

### 2.7 VSWR Overload Adjustment (Refer to figure 5)

A +9-V dc regulated input is received at P6-17 and vswr overload adjust is supplied at P6-15. The vswr overload adjust is controlled by the +9-V dc regulated input and VSWR OVLD adjustment R12.

### 2.8 Meter Adjustments (Refer to figure 5)

Two meter adjustments are provided on the front panel card, 5 V CAL adjust R23 and 1.5 V CAL adjust R25. Both are used to adjust for full-scale deflection on a 0-100  $\mu$ A meter when a 5-volt or 1.5-volt analog signal is received.

## 3. TESTING/TROUBLESHOOTING PROCEDURES

A defective front panel card can be returned to a Rockwell-Collins authorized repair facility for repair. Contact the nearest Rockwell-Collins office or

Collins Telecommunications Products Division  
Attention: HF Products  
400 Collins Road, NE  
Cedar Rapids, Iowa 52498

for information and instructions.

## 4. ALIGNMENT/ADJUSTMENT

The following adjustments are available on the front panel card; however, due to the nature of these adjustments, they are adjusted at the next higher assembly.

- a. HIGH ALC (R7)
- b. LOW ALC (R10)
- c. VSWR OVLD (R12)
- d. TUNE PWR (R14)
- e. LOW TGC (R16)
- f. HIGH TGC (R17)
- g. 5 V CAL (R23)
- h. 1.5 V CAL (R25)

## 5. REPAIR

Repair is accomplished using standard shop practices.



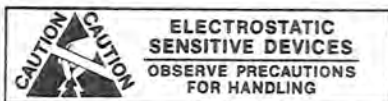
## 6. PARTS LIST/DIAGRAMS

### 6.1 Introduction

**Caution**

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All parts list illustrations containing ESDS items are shown with the following symbol:



This paragraph assists in identification and requisition of parts. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included. The parts location illustration shows component placement on the circuit cards.

### 6.2 Parts List

REF DES Column — Reference designators and/or item numbers for each part/subassembly are listed in alphanumeric or numeric sequence. These are the reference designators and/or item numbers shown on the parts location illustration. Only the reference designators are shown on the schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modification.

Modifications are identified by two methods: An alphanumeric identifier is assigned to each electrical design change and listed in the REVISION IDENT column of the modification history. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change.

NA (not applicable) in the REVISION IDENT column indicates a documentation change and/or mechanical

change. This revision activity will be noted in the DESCRIPTION column of the parts list only. This change does not affect the circuit card/subassembly components or the schematic. Each change relates to the REV (revision identifier) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history. Dash (—) denotes original; letter A first change; letter B second change, etc.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

### 6.3 How To Use This Parts List

To locate a part number, locate the part and its item number and/or reference designator on the illustration. Turn to the parts list page and find the item number and/or reference designator to determine its description and part number.

To locate the illustration for a part, if the reference designator and/or part number are known, refer to the parts list and find the figure and item number indicated in the parts list for location on the illustration.

### 6.4 Manufacturer's Code, Name, and Address

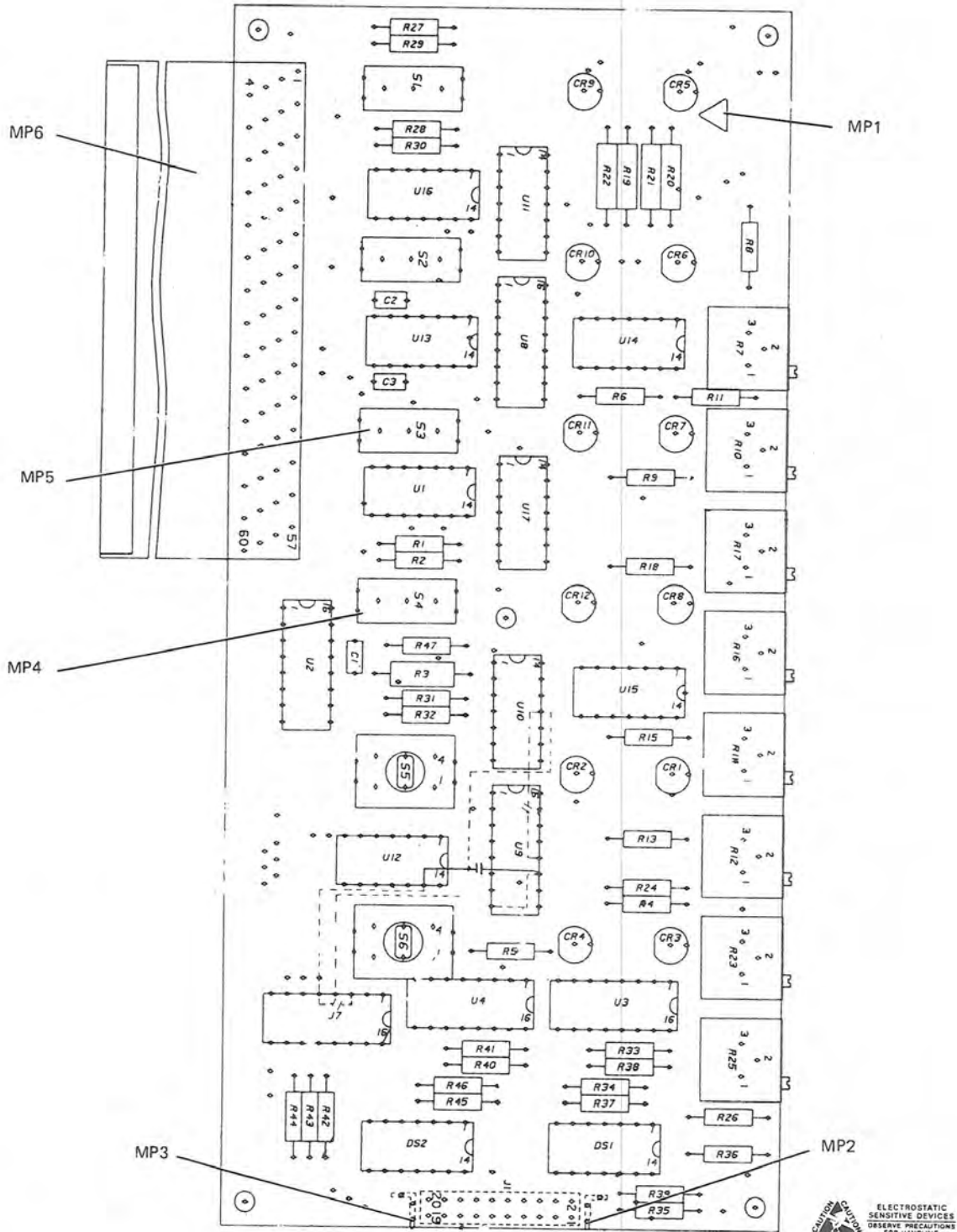
MFR CODE	MANUFACTURER'S NAME AND ADDRESS
01121	ALLEN-BRADLEY CO 1201 SOUTH 2ND ST MILWAUKEE WI 53204
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
04713	MOTOROLA INC SEMICONDUCTOR GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV SUB OF SCHLUMBERGER LTD NORTH AMERICAN SALES MAIL STOP 14-1053 401 ELLIS ST P O DRAWER 7284 MOUNTAIN VIEW CA 94042
09353	C AND K COMPONENTS INC 15 RIVERDALE AVE NEWTON MA 02158
12998	QUALITY NAME PLATE INC MILL ROAD EAST GLASTONBURY CT 06025
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV 855 35TH ST NE P O BOX 728 CEDAR RAPIDS IA 52498
14936	GENERAL INSTRUMENT CORP DISCRETE SEMI CONDUCTOR DIV 600 W JOHN ST HICKSVILLE NY 11802
31019	SOLID STATE SCIENTIFIC INC COMMERCE DR MONTGOMERYVILLE PA 18936
50522	MONSANTO INDUSTRIAL CHEMICALS CO 755 PAGE MILL RD PALO ALTO CA 94304
52072	CIRCUIT ASSEMBLY CORP 3169 REDHILL AVE COSTA MESA CA 92626
73803	TEXAS INSTRUMENTS INC METALLURGICAL MATERIALS DIVISION 34 FOREST ST ATTLEBORO MA 02703
81349	MILITARY SPECIFICATIONS

### 6.5 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions. Configuration history before 1 April 1982 is not recorded in this section.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Front Panel Board	642-3586-001	REV E



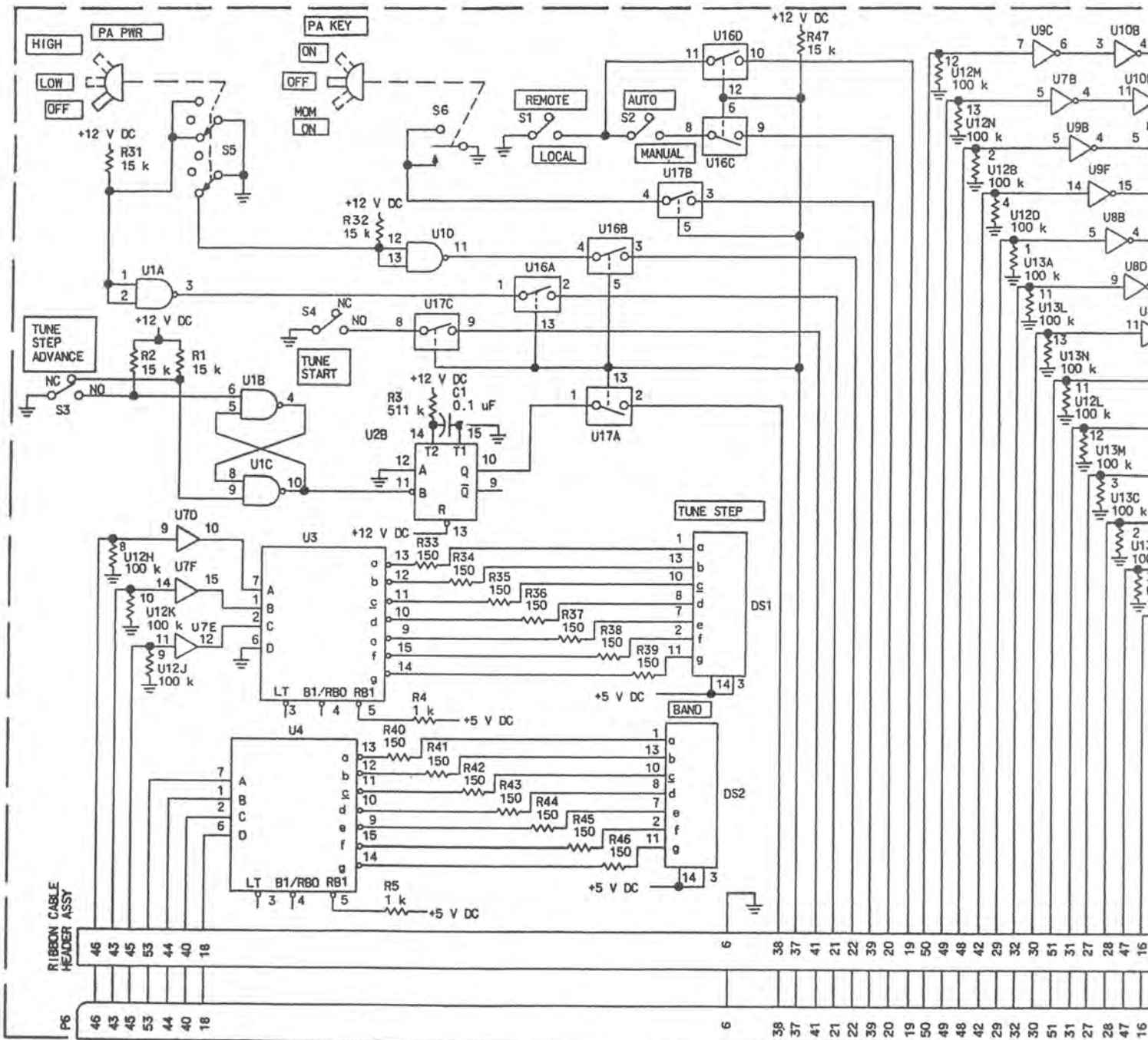
Front Panel Card, Parts Location Diagram  
Figure 4 (Sheet 1 of 2)

TPA-4781-019

## PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	FRONT PANEL CARD (ESDS)	642-3586-001			642-3586-001
CR1-CR4	DIODE, LIGHT EMI	353-0293-010		14936	MV5253
CR5-CR12	DIODE, LIGHT EMI	353-0293-040		14936	MV5053
C1-C3	CAPACITOR, FIXED CER DIEI, 0.1UF, 10%, 50VDC	913-5019-320		81349	CK05BX104K
DS1, DS2	SEMICONO DEVICE	262-1453-010		50522	MAN4610A
J1	CONNECTOR, HDR	372-2656-090		52072	CAD20SP100-230-4 30
MP1	LABEL, PRESS SENS (ESDS)	260-2745-040		12998	280-2745-040
MP2	SHIELD, PIN-LEFT	635-8609-002			
MP3	SHIELD, PIN-RIGHT	635-8609-001			
MP4	SWITCH, PUSH BUTTON	266-5404-070		09353	7089-3
MP5	SWITCH, PUSH BUTTON	266-5404-050		09353	7089-1
MP6	CABLE ASSY, RIBBON	651-3057-001			651-3057-001
R1, R2	RESISTOR, FIXED CHPSN, 15K, 10%, 1/4W	745-0791-000		81349	RCR076153KS
R3	RESISTOR, FXD FILM, 511K, 1%, 1/4W	705-6726-000		81349	RM6005113F
R4, R5	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR076102KS
R6	RESISTOR, FIXED FILM, 5.11K, 1%, 1/8W	705-1030-000		81349	RM5505111F
R7	RESISTOR, VARIABLE MM, 5K, PORM5%, 3/4W	381-1721-060		81349	RT22C2P502
R8	RESISTOR, FXD FILM, 2.61K, 1%, 1/8W	705-1016-000		81349	RM5502611F
R9	RESISTOR, FXD FILM, 1.43K, 1%, 1/8W	705-3605-070		81349	RM5501431F
R10	RESISTOR, VARIABLE MM, 5K, PORM5%, 3/4W	381-1721-060		81349	RT22C2P502
R11	RESISTOR, FXD FILM, 4.53K, 1%, 1/8W	705-3605-310		81349	RM5504531F
R12	RESISTOR, VARIABLE MM, 10K, PORM5%, 3/4W	381-1721-130		81349	RT22C2P103
R13	RESISTOR, FXD FILM, 8.06K, 1%, 1/8W	705-3605-430		81349	RM5508061F
R14	RESISTOR, VARIABLE MM, 10K, PORM5%, 3/4W	381-1721-130		81349	RT22C2P103
R15	RESISTOR, FIXED FILM, 3.01K, 1%, 1/8W	705-1019-000		81349	RM5503011F
R16, R17	RESISTOR, VARIABLE MM, 10K, PORM5%, 3/4W	381-1721-130		81349	RT22C2P103
R18	RESISTOR, FXD FILM, 2.05K, 1%, 1/8W	705-1011-000		81349	RM5502051F
R19-R22	RESISTOR, FXD FILM, 60.4K, 1%, 1/8W	705-3605-850		81349	RM5506042F
R23	RESISTOR, VARIABLE MM, 10K, PORM5%, 3/4W	381-1721-130		81349	RT22C2P103
R24	RESISTOR, FIXED FILM, 44.2K, 1%, 1/8W	705-1075-000		81349	RM5504422F
R25	RESISTOR, VARIABLE MM, 2K, PORM5%, 3/4W	381-1721-050		81349	RT22C2P202
R26	RESISTOR, FIXED FILM, 13K, 1%, 1/8W	705-3605-530		81349	RM5501302F
R27-R30	RESISTOR, FIXED CHPSN, 47 OHMS, 10%, 1/4W	745-0701-000		81349	RCR076470KS
R31, R32	RESISTOR, FIXED CHPSN, 15K, 10%, 1/4W	745-0791-000		81349	RCR076153KS
R33-R46	RESISTOR, FIXED CHPSN, 150 OHMS, 10%, 1/4W	745-0719-000		81349	RCR076151KS
R47	RESISTOR, FIXED CHPSN, 15K, 10%, 1/4W	745-0791-000		81349	RCR076153KS
S1	SWITCH, TOGGLE	266-5433-010		09353	7101KV40BE
S2	SWITCH, TOGGLE	266-5415-130		09353	7101P3PD9V40B
S3, S4	SWITCH, PUSH BUTTON	266-5404-140		09353	8125V40
S5	SWITCH, TOGGLE	266-5415-150		09353	7203P3PD9V40B
S6	SWITCH, TOGGLE	266-5415-170		09353	7207P3PD9V40B
U1	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-040		31019	SCL4011LUBE
U2	INTEGRATED CIRCUIT MULTIVIBRATOR (ESDS)	351-8421-020		07263	4528BPC
U3, U4	INTEGRATED CIRCUIT DECODER	351-7544-020		07263	7447APC
U5, U6	NOT USED				
U7	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-220		31019	SCL4050BE
U8, U9	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-210		31019	SCL4049UBE
U10, U11	INTEGRATED CIRCUIT LOGIC GATE	351-7632-010		04713	MC7404P
U12, U13	RESISTOR NETWORK DUAL-IN-LINE, 100K, 2%, 125V	350-4027-140		01121	314A104
U14, U15	RESISTOR NETWORK DUAL-IN-LINE, 150 OHMS, 2%, 125V	350-4027-010		01121	314B151
U16, U17	INTEGRATED CIRCUIT SWITCH (ESDS)	351-8252-010		02735	CD4066BE
XDS1, XDS2	SOCKET, IC	220-0049-030		73803	C93-14-00

Front Panel Card, Parts Location Diagram  
Figure 4 (Sheet 2)

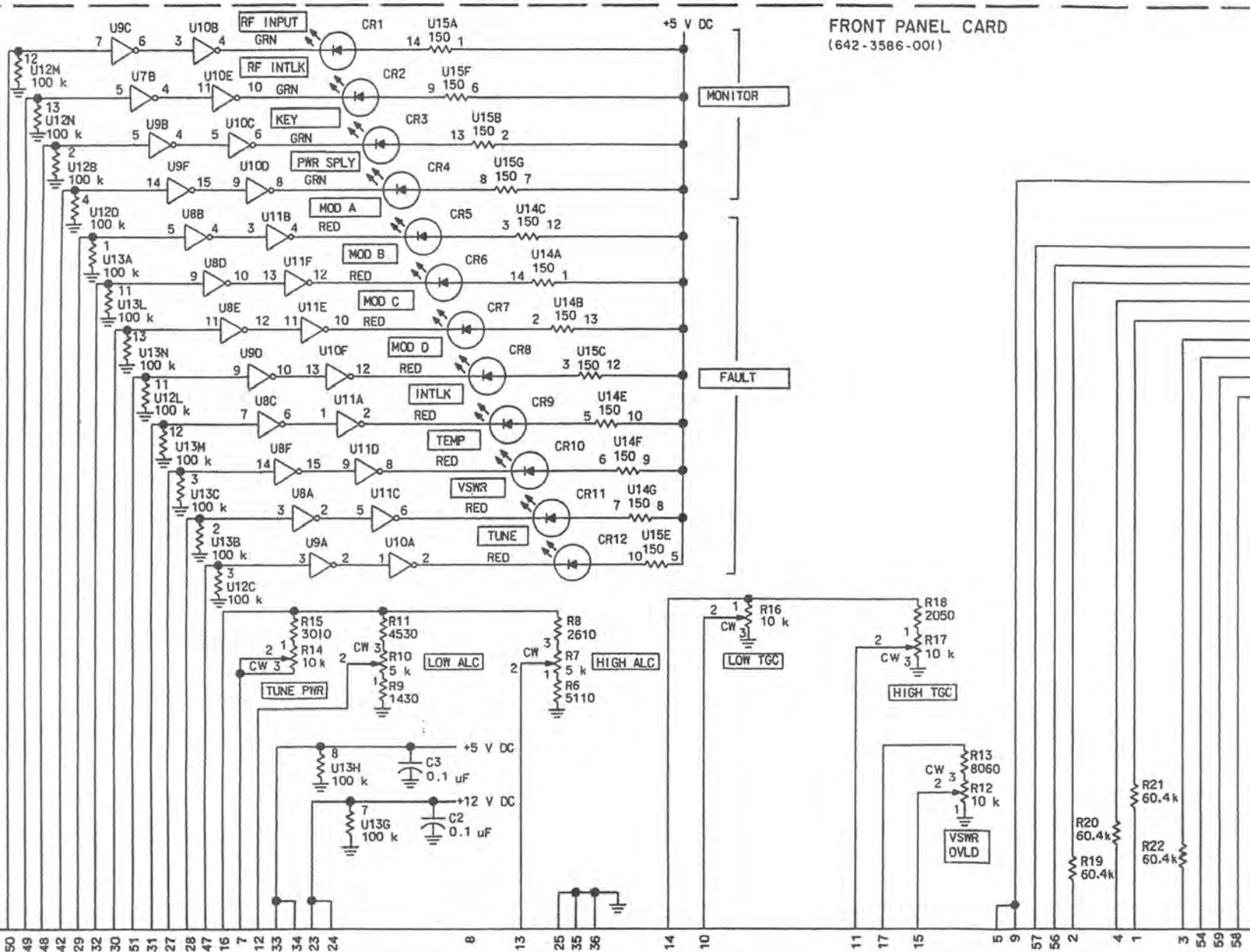


TUNE SEQUENCE CONTROL A  
 TUNE SEQUENCE CONTROL B  
 TUNE SEQUENCE CONTROL C  
 BAND INDICATOR A  
 BAND INDICATOR B  
 BAND INDICATOR C  
 BAND INDICATOR D

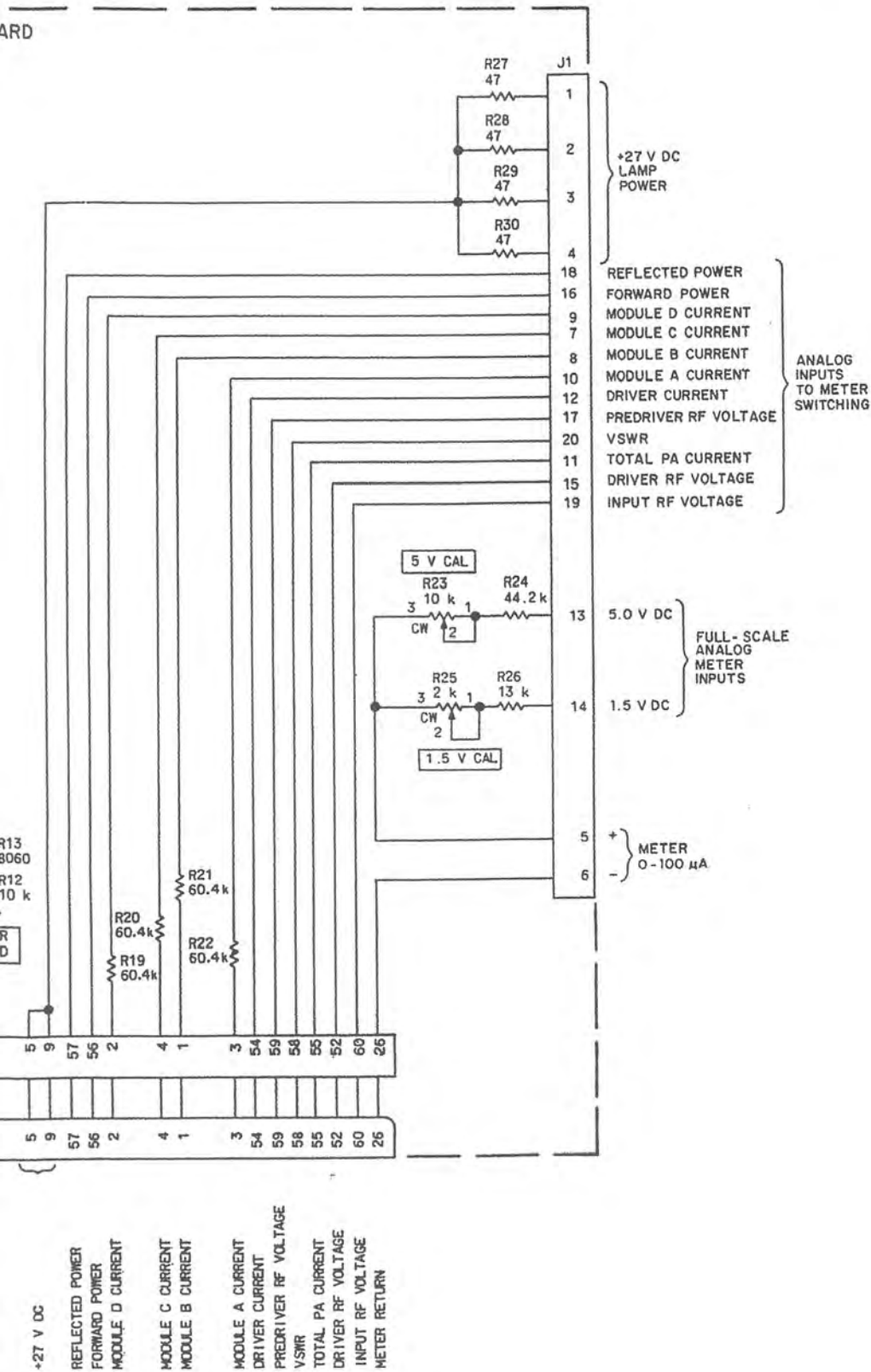
INTERLOCK

LOCAL TUNE STEP ADV  
 CONTROL DISABLE  
 LOCAL TUNE START  
 LOCAL LOW POWER ENABLE  
 LOCAL DC POWER ENABLE  
 LOCAL KEY  
 MANUAL/AUTOMATIC  
 LOCAL/REMOTE  
 RF INPUT MONITOR  
 RF INTERLOCK MONITOR  
 KEY MONITOR  
 POWER SUPPLY MONITOR  
 PA MODULE A FAULT  
 PA MODULE B FAULT  
 PA MODULE C FAULT  
 PA MODULE D FAULT  
 INTLK FAULT  
 TEMPERATURE FAULT  
 VSWR FAULT  
 TUNE FAULT  
 ALC REFERENCE

FRONT PANEL CARD  
(642-3586-001)



- 50 RF INPUT MONITOR
- 49 RF INTERLOCK MONITOR
- 48 KEY MONITOR
- 42 POWER SUPPLY MONITOR
- 29 PA MODULE A FAULT
- 32 PA MODULE B FAULT
- 30 PA MODULE C FAULT
- 31 PA MODULE D FAULT
- 27 INTLK FAULT
- 28 TEMPERATURE FAULT
- 47 VSWR FAULT
- 16 TUNE FAULT
- 7 ALC REFERENCE
- 12 TUNE POWER ADJ
- 34 LOW POWER ALC ADJ
- 33 +5 V DC
- 34 +12 V DC
- 8 SPARE
- 13 HIGH POWER ALC ADJ
- 25 GROUND
- 35 GROUND
- 36 GROUND
- 14 TGC REFERENCE
- 10 LOW POWER TGC ADJ
- 11 HIGH POWER TGC ADJ
- 17 +9 V DC REGULATED
- 15 VSWR OVERLOAD ADJ
- 5 +27 V DC
- 9 REFLECTED POWER
- 57 FORWARD POWER
- 56 MODULE D CURRENT
- 2 MODULE C CURRENT
- 4 MODULE B CURRENT
- 1 MODULE A CURRENT
- 3 DRIVER CURRENT
- 54 PREDRIVER RF VOLTAGE
- 59 VSWR
- 58 VSWR



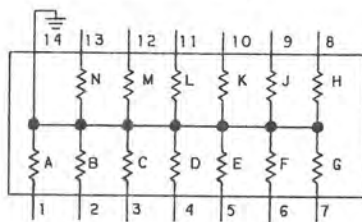
TPA-4594-025

Front Panel Card, Schematic Diagram  
Figure 5 (Sheet 1 of 2)

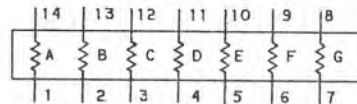
NOTES:

- ① UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN PICOFARADS, LED'S CRI THROUGH CR4 ARE TYPE MV5253, AND LED'S CR5 THROUGH CR12 ARE TYPE MV5053.
- ② PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATIONS, PREFIX WITH UNIT NUMBER AND/OR ASSEMBLY DESIGNATION.
- ③ TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.
- ④ THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.
- ⑤ U12, U13, U14, AND U15 ARE RESISTOR ARRAYS SHOWN BELOW.

U12, U13 R = 100 k



U14, U15 R = 150

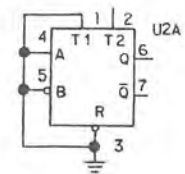
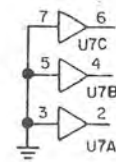
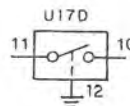


MICROCIRCUIT INFORMATION

U NO	TYPE	POWER (V DC)		
		+5	+12	GND
U1	4011		14	7
U2	4528		16	8
U3	7447	16		8
U4	7447	16		8
U5	NOT USED			
U6	NOT USED			
U7	4050	1		8
U8	4049	1		8
U9	4049	1		8
U10	7406	14		7
U11	7406	14		7
U12	ARRAY			
U13	ARRAY			
U14	ARRAY			
U15	ARRAY			
U16	4066		14	7
U17	4066		14	7

- ⑤
- ⑤
- ⑤
- ⑤

NOT USED:



TPA-4594-025

Front Panel Card, Schematic Diagram  
Figure 5 (Sheet 2)



# Driver Module (646-6407-001)



Rockwell  
International

instructions

Collins Telecommunications Products Division

Printed in USA

523-0771670-001211

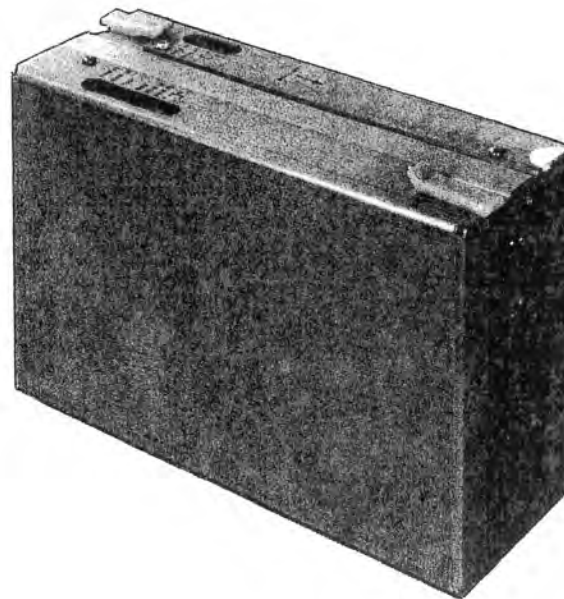
15 September 1982

646-6407-001

## 1. DESCRIPTION

Driver Module 646-6407-001 (figure 1) is a plug-in modular assembly consisting of two printed circuit cards mounted to a common assembly. Cooling air required by these circuit cards is supplied over the components to the outside of the assembly and through the heatsinks in the common assembly. The

cooling air is supplied by blowers in the power amplifier assembly. Two 40-pin pinfields (one on each circuit card) provide power and control connections to the driver module. All connections between the two printed circuit cards (predriver card A1 and driver output card A2) are made through these 40-pin fields using external connections provided by the power amplifier assembly.



TPA-4672-017

Driver Module  
Figure 1

523-0771670-001211

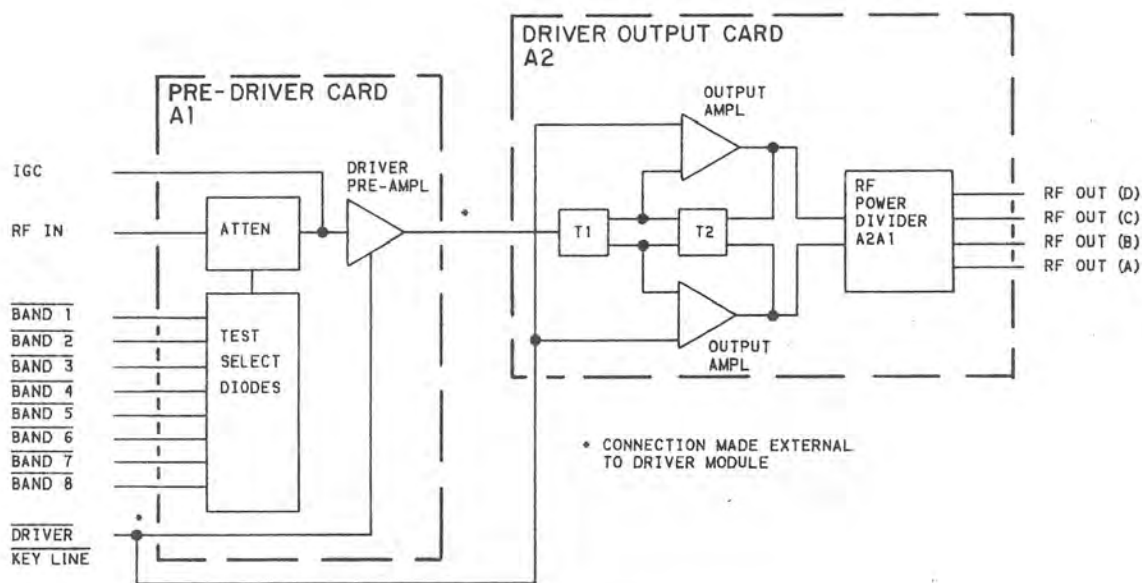
## 2. PRINCIPLES OF OPERATION

### 2.1 General (Refer to figure 2)

The driver module consists of an input attenuator network, a driver preamplifier, a driver output amplifier, and an rf power divider.

The rf input is supplied through the attenuator network (test selected for equal rf gain across power amplifier frequency band) to the driver preamplifier.

A key signal at the driver preamplifier keyline controls bias to transistors Q1 and Q2. When keyed, the rf output of the driver preamplifier is supplied to the driver output card input rf transformer (T1). The output of T1 is supplied to driver output amplifiers. Rf feedback is supplied to T1 from output power transformer (T2). Output rf voltage is supplied to rf power divider where it is split and supplied as four separate rf outputs to the associated output power amplifier modules.



TPA-5479-013

Driver Module, Simplified Block Diagram  
Figure 2

## **2.2 Attenuator Network and Driver Preamplifier (Refer to figure 3)**

The predriver card A1 consists of an attenuator network and a driver preamplifier.

Rf input voltage is sampled at the input to the attenuator network (predriver rf in rf analog).

The rf input is band attenuated by test selecting diodes in power amplifier final test to enable/inhibit loads in each band. Each band gain is adjusted (through the complete power amplifier) for near level gain of all frequencies in the power amplifier range. At the output of the attenuator network, IGC voltage can be applied to further control the gain of the power amplifier.

After attenuation and application of IGC (as required), the rf input is applied to the driver preamplifier circuit where the driver keyline enables or inhibits the bias for predriver transistors Q1 and Q2.

Rf output voltage is sampled at the output of the driver preamplifiers (predriver rf analog).

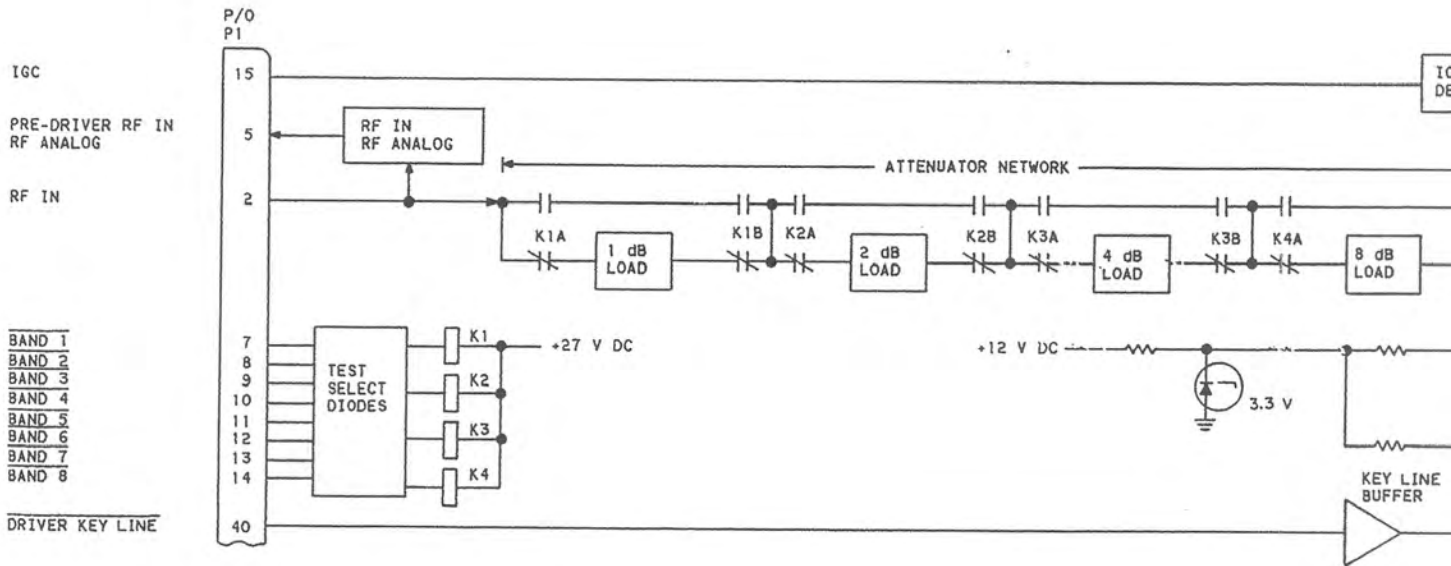
The rf output of the predriver card A1 is supplied to the rf input of the driver output card A2.

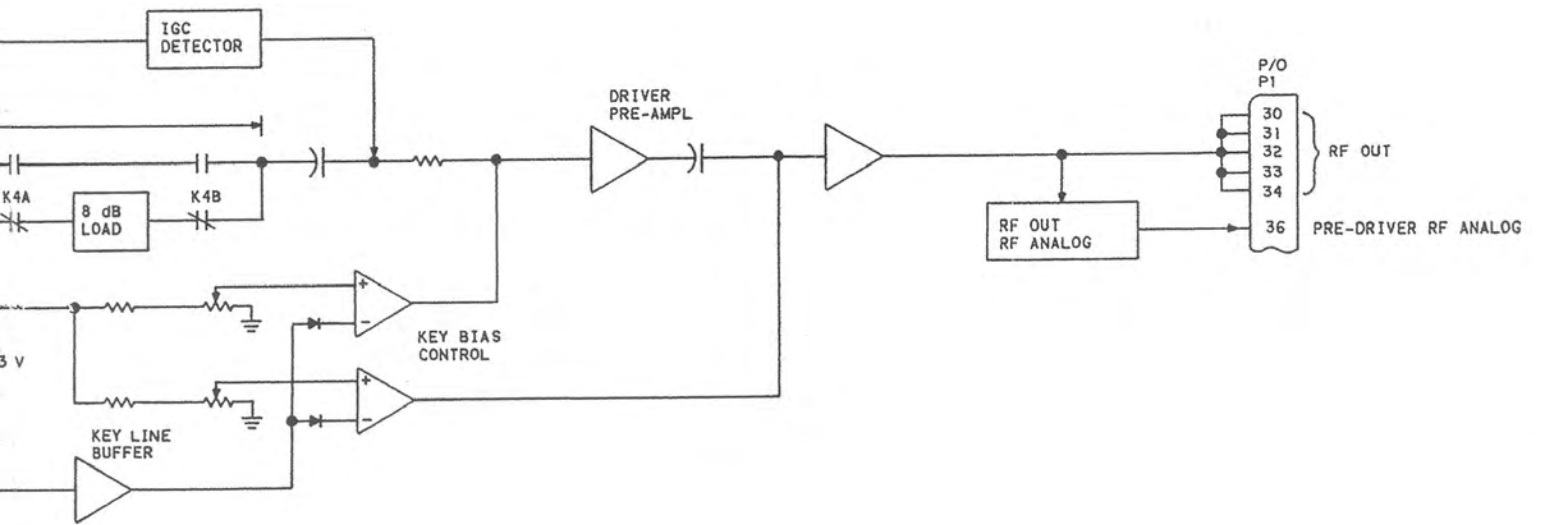
## **2.3 Driver Amplifier and Power Divider (Refer to figure 4)**

The driver output card A2 consists of the driver output amplifier and an rf power divider (A2A1).

The rf input is supplied to input rf transformer, amplified by Q1 and Q2 (when biased on by key), and supplied to rf power divider A2A1. Output amplifiers are current-monitored by current analog circuit (U2A), which supplies a driver current analog signal for control and protection.

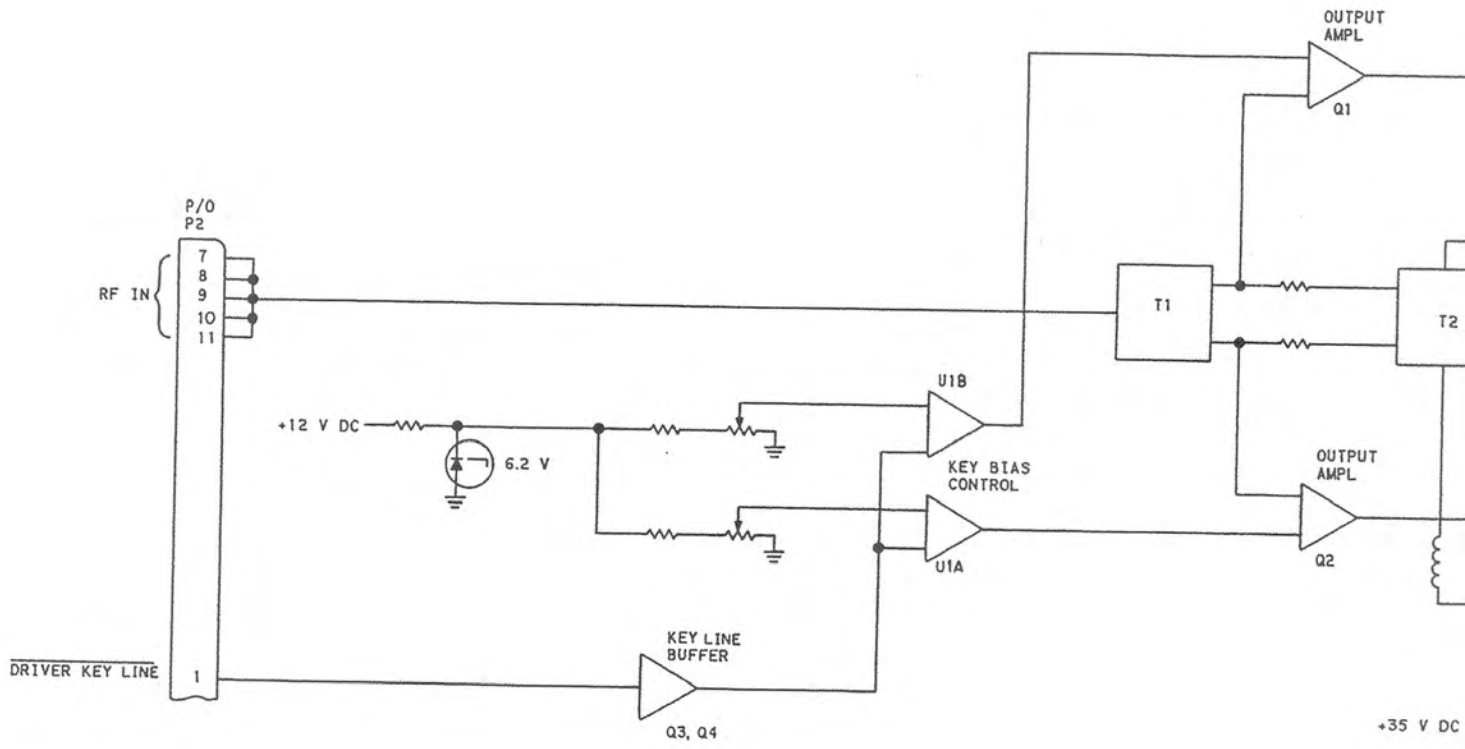
The input to the rf power divider A2A1 is divided and provides four equal rf outputs for use by output power amplifiers. The input of the rf power divider is sampled by the rf output rf analog circuit and provides a driver rf voltage analog signal for control and protection.

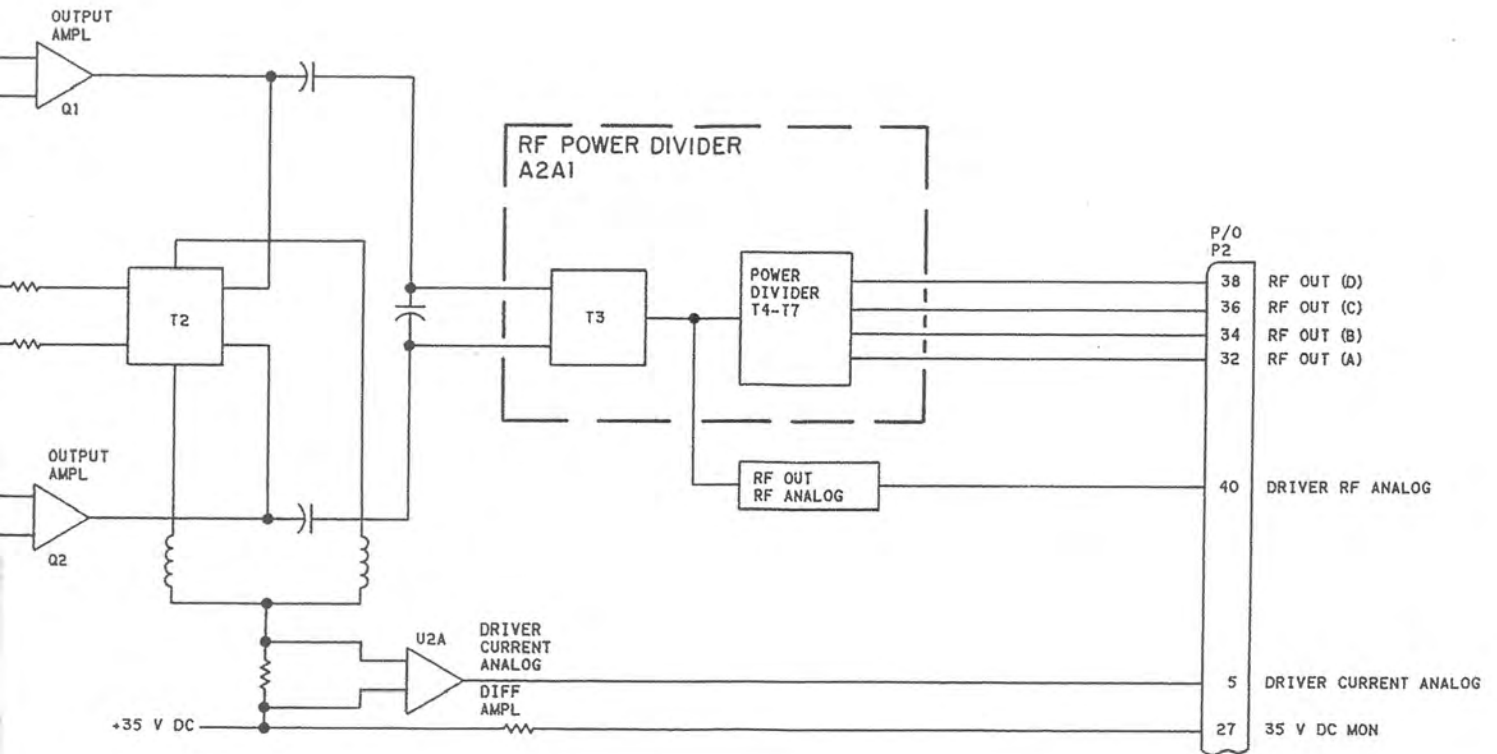




TPA-5478-014

Attenuator Network and Driver Preamplifier, Block Diagram  
Figure 3





TPA-5477-014

Driver Amplifier and Power Divider,  
Block Diagram  
Figure 4

**3. TESTING/TROUBLESHOOTING PROCEDURES**

A defective driver module can be returned to a Rockwell-Collins authorized repair facility for repair. Contact the nearest Rockwell-Collins office or

Collins Telecommunications Products Division  
Attention: HF Products  
400 Collins Road, NE  
Cedar Rapids, Iowa 52498

for information and instructions.

**4. ALIGNMENT/ADJUSTMENT**

Alignment/adjustment is performed in conjunction with testing/troubleshooting.

**5. REPAIR**

Repair is accomplished using standard shop practices.



## 6. PARTS LIST/DIAGRAMS

### 6.1 Introduction

**Caution**

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All parts list illustrations containing ESDS items are shown with the following symbol:



This paragraph assists in identification and requisition of parts. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included. The parts location illustration shows component placement on the circuit cards.

### 6.2 Parts List

REF DES Column — Reference designators and/or item numbers for each part/subassembly are listed in alphanumeric or numeric sequence. These are the reference designators and/or item numbers shown on the parts location illustration. Only the reference designators are shown on the schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modification.

Modifications are identified by two methods: An alphanumeric identifier is assigned to each electrical design change and listed in the REVISION IDENT column of the modification history. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change.

NA (not applicable) in the REVISION IDENT column indicates a documentation change and/or mechanical change. This revision activity will be noted in the DESCRIPTION column of the parts list only. This

change does not affect the circuit card/subassembly components or the schematic. Each change relates to the REV (revision identifier) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history. Dash (—) denotes original; letter A first change; letter B second change, etc.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

### 6.3 How To Use This Parts List

To locate a part number, locate the part and its item number and/or reference designator on the illustration. Turn to the parts list page and find the item number and/or reference designator to determine its description and part number.

To locate the illustration for a part, if the reference designator and/or part number are known, refer to the parts list and find the figure and item number indicated in the parts list for location on the illustration.

### 6.4 Manufacturer's Code, Name, and Address

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
01121	ALLEN-BRADLEY CO 1201 SOUTH 2ND ST MILWAUKEE WI 53204
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
04713	MOTOROLA INC SEMICONDUCTOR GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07387	BIRTCHEK CORP THE MEDICAL DIV 4501 N ARDEN DR P O BOX 4399 EL MONTE CA 91734

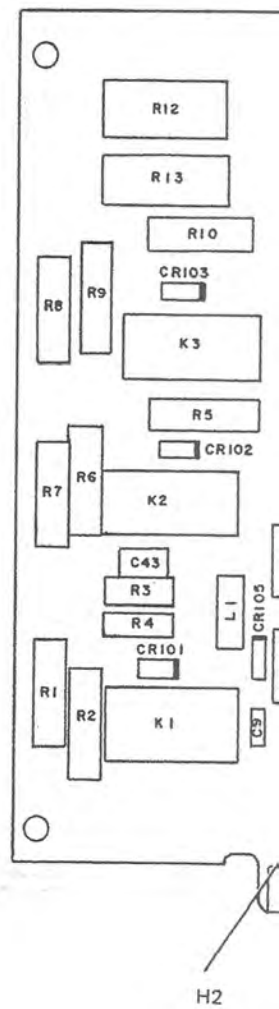
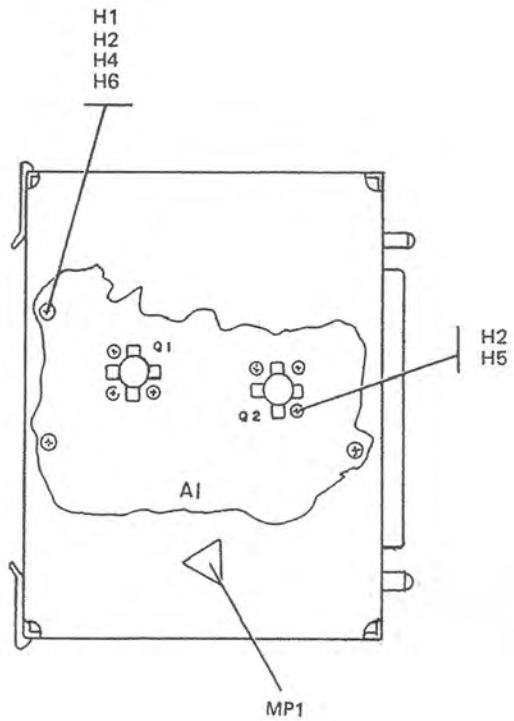
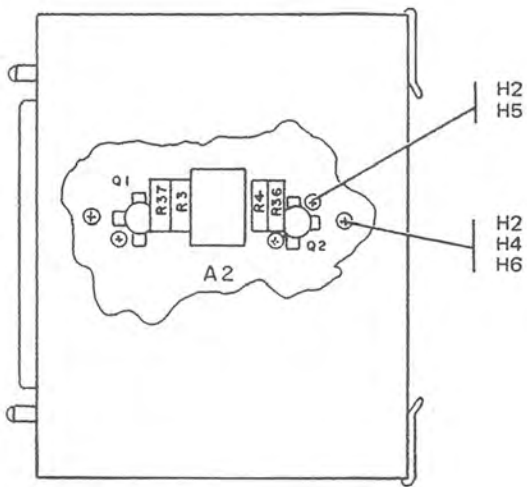
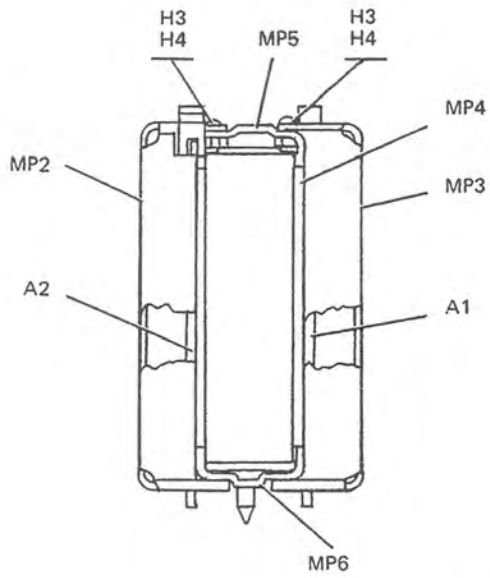
<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
11375	ACCURATE ELECTRONICS CORP 169 S ABBE RD P O BOX R ELYRIA OH 44035
12954	SIEMENS CORP COMPONENTS GROUP 8700 E THOMAS RD P O BOX 1390 SCOTTSDALE AZ 85252
12969	UNITRODE CORP 580 PLEASANT ST WATERTOWN MA 02172
12998	QUALITY NAME PLATE INC MILL ROAD EAST GLASTONBURY CT 06025
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV 855 35TH ST NE P O BOX 728 CEDAR RAPIDS IA 52498
19080	ROBISON ELECTRONICS INC 3580 SACRAMENTO DR P O BOX Y SAN LUIS OBISPO CA 93406
20462	PREM ENTERPRISES INC 3519 N CHAPEL HILL MC HENRY IL 60050
28480	HEWLETT-PACKARD CO CORPORATE HQ 3000 HANOVER ST PALO ALTO CA 94304
49956	RAYTHEON CO EXECUTIVE OFFICES 141 SPRING ST LEXINGTON MA 02173
50155	VARIAN ASSOCIATES INC COMMUNICATIONS TRANSISTOR DIV 301 INDUSTRIAL WAY SAN CARLOS CA 94070
56289	SPRAGUE ELECTRIC CO 87 MARSHALL ST NORTH ADAMS MA 01247
72656	INDIANA GENERAL ELECTRONIC PRODUCTS A DIV OF ELECTRONIC MEMORIES AND MAGNETICS CORP CROWS MILL ROAD KEASBY NJ 08832
77250	ALLIED PRODUCTS CORP PHEOLL MFG CO DIV 5700 W ROOSEVELT RD CHICAGO IL 60650
80205	NATIONAL AEROSPACE STANDARD
80294	BOURNS INSTRUMENTS INC 6135 MAGNOLIA AVE RIVERSIDE CA 92506

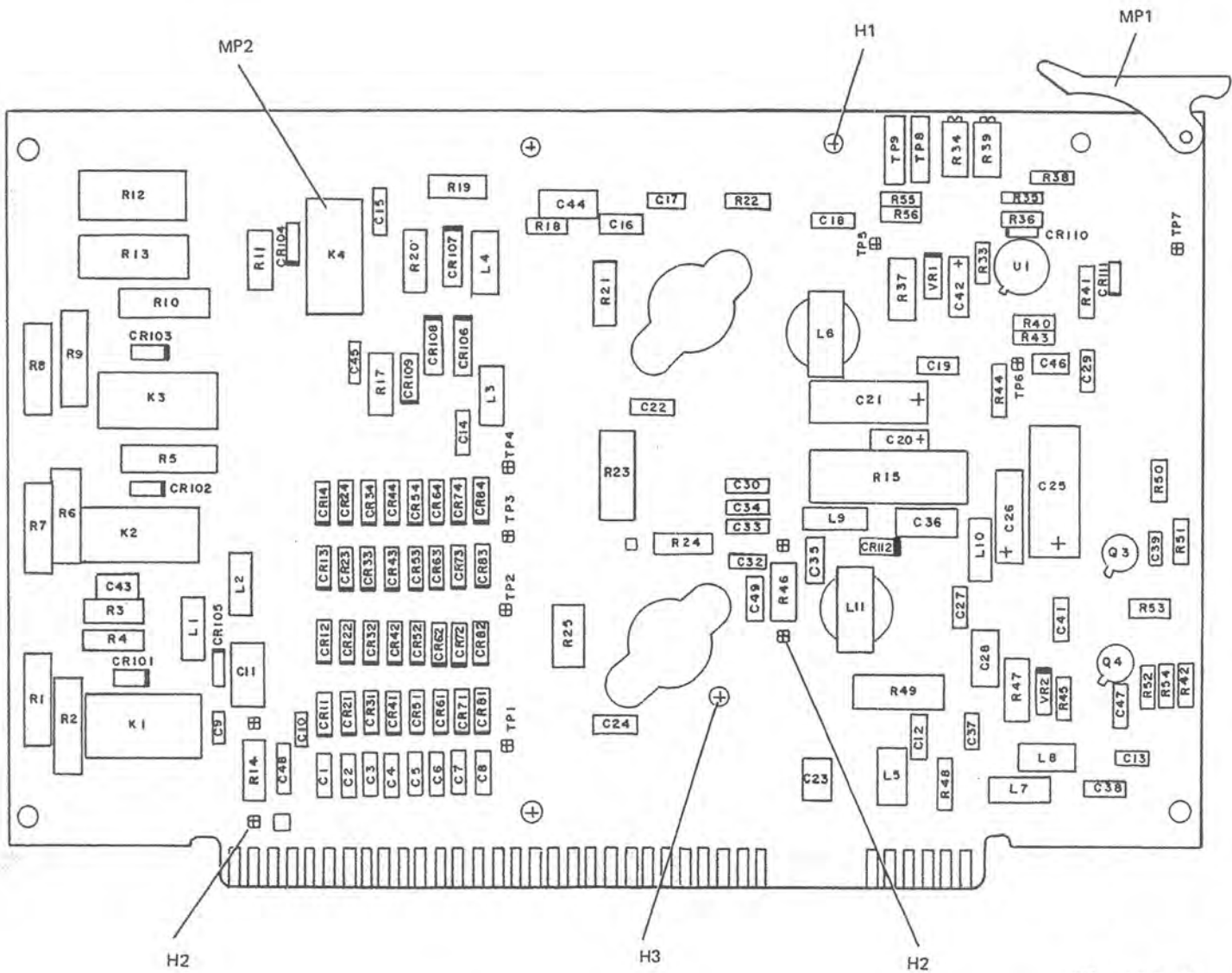
<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
81349	MILITARY SPECIFICATIONS
81483	INTERNATIONAL RECTIFIER 9220 SUNSET BLVD P O BOX 2321 TERMINAL ANNEX LOS ANGELES CA 90054
81815	COMMUNICATION COIL CO 2839 NORTH NARRAGANSETT AVE CHICAGO IL 60634
91637	DALE ELECTRONICS INC P O BOX 609 COLUMBUS NE 68601
93790	CORNELL-DUBILIER ELECTRONICS DIV FEDERAL PACIFIC ELECTRIC CO 1605 ROONEY FRENCH BLVD NEW BEDFORD MA 02741
96906	MILITARY STANDARD

*6.5 Equipment Covered*

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions. Configuration history before 1 April 1982 is not recorded in this section.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Driver Module	646-6407-001	REV D
Predriver Card A1	642-3234-001	REV G
Driver Amplifier Card A2	642-3233-001	REV E





A1



TPA-4520-028

Driver Module, Parts Location Diagram  
Figure 5 (Sheet 1 of 4)

## PARTS LIST

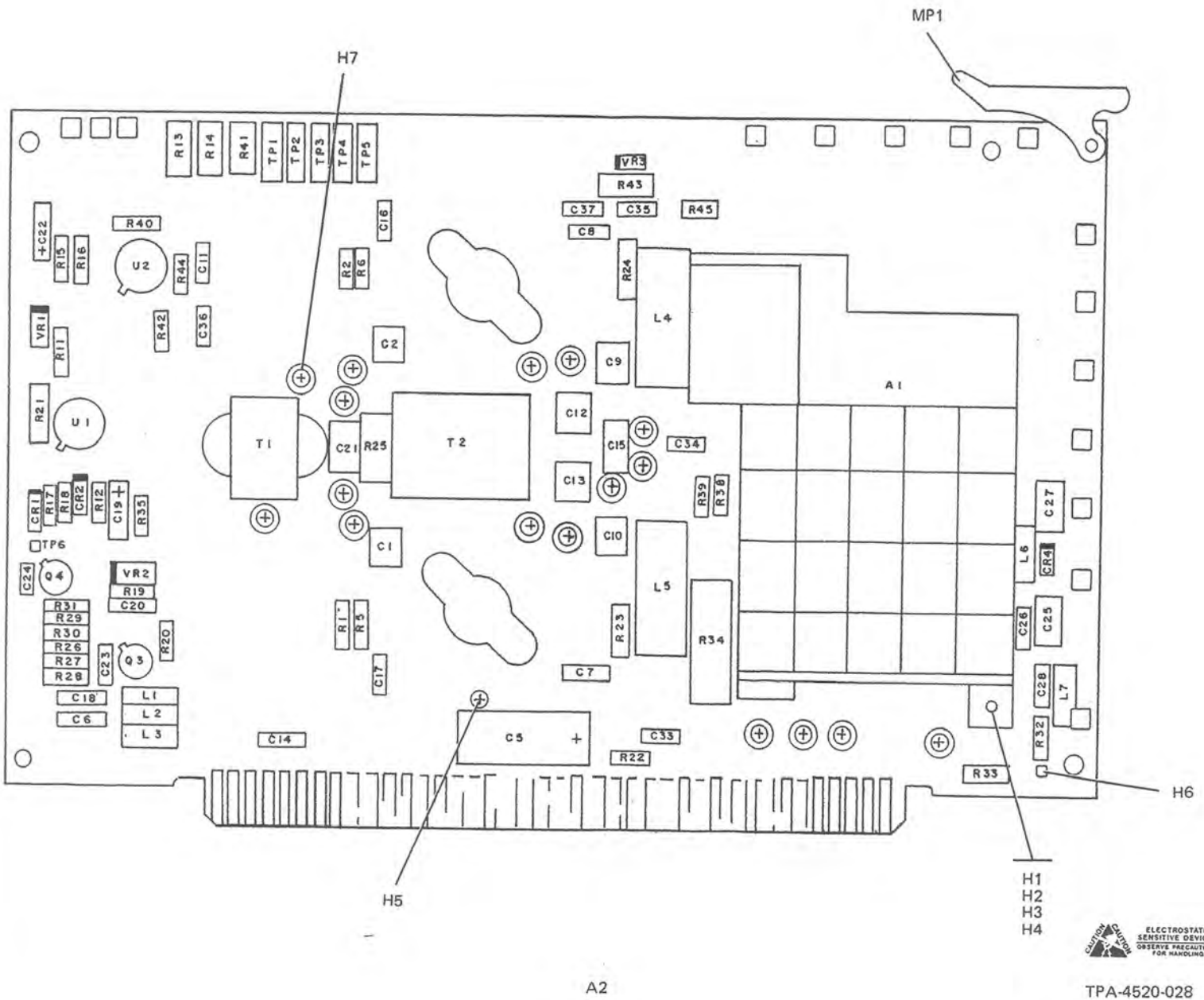
## PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	REF DES	DESCRIPTION	COLLINS PART NUMBER
	DRIVER MODULE (ESDS)	646-6407-001			646-6407-001	C32	CAPACITOR, FIXED CER DIEI., 1000PF, 10%, 200V	913-4018-000
A1	PRE-DRIVER CARD	642-3234-001				C33	CAPACITOR, FIXED CER DIEI., 0.01UF, 10%, 100VDC	913-5019-200
A1Q1	TRANSISTOR, RF POWER (ESDS)	352-7901-010		50155	BF25-35	C34, C35	CAPACITOR, FIXED CER DIEI., 1000PF, 10%, 200V	913-4018-000
A1Q2	TRANSISTOR, RF PWR (ESDS)	352-7902-010		50155	BF50-35	C36	CAPACITOR, FIXED MICA DIEI., 220PF, 5%, 500V	912-3903-000
A2	DRIVER OUTPUT CARD	642-3233-001				C37	CAPACITOR, FIXED CER DIEI., 1000PF, 10%, 200V	913-4018-000
A2Q1,	TRANSISTOR, RF PWR (ESDS)	352-7903-010		50155	352-7903-010	C38	CAPACITOR, FIXED CER DIEI., 0.1UF, 10%, 100VDC	913-5019-440
A2Q2						C39	CAPACITOR, FIXED CER DIEI., 0.01UF, 10%, 100VDC	913-5019-200
M1	NUT, PLAIN, HEX SST, 4-40 (QTY 16) (EFF TO REV LTR D)	313-0132-000		77250	P313-0132-000	C40	NOT USED	
H1	NUT, PLAIN, HEX SST, 4-40 (QTY 14) (EFF REV LTR D)	313-0132-000		77250	P313-0132-000	C41	CAPACITOR, FIXED CER DIEI., 0.1UF, 10%, 100VDC	913-5019-440
H2	WASHER, SPRING CD PL BRZ, 0.115 ID X 0.209 OD (QTY 31) (EFF TO REV LTR D)	310-0095-000		96906	MS35338-97	C42	CAPACITOR, FIXED ELCTLT, 1UF, 10%, 50V	184-9087-030
H2	WASHER, SPRING CD PL BRZ, 0.115 ID X 0.209 OD (QTY 19) (EFF REV LTR D)	310-0095-000		96906	MS35338-97	C43	CAPACITOR, FIXED MICA DIEI., 47PF, 5%, 50V	912-4141-280
H3	SCREW, MACH SST, 4-40 X 5/16 (QTY 4)	342-0045-000		96906	MS51959-14	C44	CAPACITOR, FIXED MICA DIEI., 220PF, 5%, 500V	912-3903-000
H4	SCREW, MACH SST, 4-40 X 5/16 (QTY 19)	343-0134-000		96906	MS51957-14	C45	CAPACITOR, FIXED CER DIEI., 0.01UF, 10%, 100VDC	913-5019-200
H5	SCREW, CAP, SCH CD PL STL, 4-40 X 1/4 (QTY 8)	324-2603-000		96906	MS16997-9	C46	CAPACITOR, FIXED CER DIEI., 0.01UF, 10%, 100VDC	913-5019-440
H6	WASHER, FLAT PSVT CRES, 0.115 ID X 0.209 OD (QTY 15)	310-0740-200		80205	MS620C4L	C47	CAPACITOR, FIXED CER DIEI., 0.1UF, 10%, 100VDC	913-5019-200
MP1	LABEL, PRESS SENES (ESDS)	280-2745-040		12998	280-2745-040	C48	CAPACITOR, FIXED MICA DIEI., 47PF, 5%, 50V	912-4141-280
MP2	COVER, DRIVER	642-2650-001				C49	CAPACITOR, FIXED MICA DIEI., 47PF, 5%, 50V	912-4141-280
MP3	COVER, PRE-DRIVER	642-2649-001				H1	BUSHING (QTY 5)	642-1773-001
MP4	HEATSINK	642-2640-001				H2	CONTACT, ELECTRICAL (QTY 6)	372-2601-037
MP5	CHASSIS, TOP	642-2636-001				H3	CONTACT, ELECTRICAL (QTY 8)	372-2601-033
MP6	CHASSIS, BOTTOM	642-2635-001				K1-K4	RELAY, ARMATURE	974-1076-040
R1, R2	NOT USED					L1, L2	COIL, RF 2200UH	240-2715-530
R3, R4	RESISTOR, FXD CHPSN, 10 OHMS, 5%, 1W	745-3267-000		81349	RCR32G100JS	L3, L4	COIL, RF 27UH	240-2715-300
R5-R35	NOT USED					L5	BEAD, ATTN, FERR	288-0915-020
R36, R37	RESISTOR, FIXED CHPSN, 10 OHMS, 10%, 1W	745-3268-000		81349	RCR32G100KS	L6	CHOKE	248-2757-060
	PRE-DRIVER CARD A)	642-3234-001				L7	COIL, RF 1000UH	240-2715-400
CR1-CR10	NOT USED					L8	BEAD, ATTN, FERR	288-0915-020
CR11-	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	L9, L10	COIL, RF 2200UH	240-2715-530
CR14	NOT USED					L11	CHOKE	248-2757-030
CR15-	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	MP1	EXTRACTOR	150-0815-010
CR20	NOT USED					MP2	INSULATOR (QTY 4)	150-0684-010
CR21-	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	Q1, Q2	(MOUNTED ON NHA)	
CR24	NOT USED					Q3	TRANSISTOR	352-0661-020
CR25-	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	Q4	TRANSISTOR	352-0551-010
CR30	NOT USED					R1, R2	RESISTOR, FIXED FILM, 11.5 OHMS, 1%, 1/2W	705-7003-000
CR31-	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	R3, R4	RESISTOR, FXD FILM, 866 OHMS, 1X, 1/4W	705-6593-000
CR34	NOT USED					R5	RESISTOR, FIXED FILM, 442 OHMS, 1%, 1/2W	705-7079-000
CR35-	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	R6	RESISTOR, FIXED FILM, 11.5 OHMS, 1%, 1/2W	705-7003-000
CR40	NOT USED					R7	RESISTOR, FIXED FILM, 442 OHMS, 1%, 1/2W	705-7079-000
CR41-	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	R8	RESISTOR, FXD FILM, 220 OHMS, 2%, 1W	745-3900-000
CR44	NOT USED					R9	RESISTOR, FIXED FILM, 24 OHMS, 2%, 1W	745-3643-000
CR45-	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	R10	RESISTOR, FXD FILM, 220 OHMS, 2%, 1W	745-3900-000
CR50	NOT USED					R11	RESISTOR, FXD FILM, 121 OHMS, 1%, 1/4W	705-6552-900
CR51-	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	R12	RESISTOR, FXD FILM, 51 OHMS, 2%, 2W	745-7046-000
CR54	NOT USED					R13	RESISTOR, FXD FILM, 120 OHMS, 2%, 2W	745-7060-000
CR55-	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	R14	RESISTOR, FXD FILM, 562 OHMS, 1%, 1/4W	705-6584-000
CR60	NOT USED					R15	RESISTOR, FXD 0.1 OHMS, 1%, 5W	747-9441-000
CR61-	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	R16	NOT USED	
CR64	NOT USED					R17	RESISTOR, FXD CHPSN, 1 OHM, 5%, 1/2W	745-1670-010
CR65-	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	R18	RESISTOR, FIXED CHPSN, 47 OHMS, 10%, 1/4W	745-0701-000
CR70	NOT USED					R19	RESISTOR, FXD FILM, 78.7 OHMS, 1%, 1/4W	705-6543-000
CR71-	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	R20	RESISTOR, FXD FILM, 68.1 OHMS, 1%, 1/4W	705-6540-000
CR74	NOT USED					R21	RESISTOR, FXD CHPSN, 820 OHMS, 5%, 1/2W	745-1348-000
CR75-	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	R22	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000
CR80	NOT USED					R23	RESISTOR, FXD CHPSN, 15 OHMS, 5%, 1W	745-3274-000
CR81-	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	R24	RESISTOR, FXD CHPSN, 4.7 OHMS, 5%, 1/2W	745-1542-000
CR84	NOT USED					R25	RESISTOR, FXD CHPSN, 100 OHMS, 5%, 1/2W	745-1309-000
CR85-	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	R26-R32	NOT USED	
CR100	NOT USED					R33	RESISTOR, FXD FILM, 40.2K, 1%, 1/8W	705-1073-000
CR101-	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	R34	RESISTOR, VARIABLE NON-MH, 10K, 10%	382-0052-280
CR104	NOT USED					R35	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000
CR105	SEMICOND DEVICE (ESDS)	353-3691-010		20480	1MS711	R36	RESISTOR, FIXED FILM, 20.5K, 1%, 1/8W	705-1059-000
CR106-	SEMICOND DEVICE 2 TO 3PF, 100V	922-6120-010		12969	UM9137	R37	RESISTOR, FXD FILM, 715 OHMS, 1%, 1/4W	705-6589-000
CR109	NOT USED					R38	RESISTOR, FIXED FILM, 10K, 1%, 1/8W (A2)	705-1044-000
CR110,	SEMICOND DEVICE	353-3644-050		03508	DA2779GE	R39	RESISTOR, VARIABLE NON-MH, 10K, 10%	382-0052-280
CR111	NOT USED					R40	RESISTOR, FIXED FILM, 20.5K, 1%, 1/8W	705-1059-000
CR112	SEMICOND DEVICE (ESDS)	353-3691-010		20480	1MS711	R41	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W (A3)	745-0773-000
C1-C8	CAPACITOR, FIXED CER DIEI., 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K	R42	RESISTOR, FIXED CHPSN, 4.7K, 10%, 1/4W	745-0785-000
C9, C10	CAPACITOR, FIXED CER DIEI., 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K	R43	RESISTOR, FXD FILM, 40.2K, 1%, 1/8W	705-1073-000
C11	CAPACITOR, FIXED MICA DIEI., 220PF, 5%, 500V	912-3903-000		81349	CM04FD22J03	R44	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000
C12, C13	CAPACITOR, FIXED CER DIEI., 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K	R45	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000
C14	CAPACITOR, FIXED CER DIEI., 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K	R46	RESISTOR, FXD FILM, 562 OHMS, 1%, 1/4W	705-6584-000
C15-C19	CAPACITOR, FIXED CER DIEI., 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K	R47	RESISTOR, FXD FILM, 1K, 1%, 1/4W	705-6596-000
C20	CAPACITOR, FIXED ELCTLT, 6.8UF, 20%, 35V	184-9086-650		81349	H39003/01-2305	R48	RESISTOR, FXD FILM, 150K, 1%, 1/8W	705-3604-100
C21	CAPACITOR, FIXED ELCTLT, 47UF, 10%, 35V	184-9086-720		81349	CK06BX104K	R49	RESISTOR, FXD CHPSN, 47 OHMS, 10%, 1W	745-3296-000
C22	CAPACITOR, FIXED CER DIEI., 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K	R50	RESISTOR, FIXED CHPSN, 2.7K, 10%, 1/4W	745-0744-000
C23	CAPACITOR, FXD CER DIEI., 0.1UF, 10%, 100VDC	913-5019-440		81349	CK05BX103K	R51, R52	RESISTOR, FIXED CHPSN, 680 OHMS, 10%, 1/4W	745-0743-000
C24	CAPACITOR, FIXED CER DIEI., 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K	R53, R54	RESISTOR, FIXED CHPSN, 4.7K, 10%, 1/4W	745-0773-000
C25	CAPACITOR, FIXED ELCTLT, 47UF, 10%, 35V	184-9086-720		81349	CK06BX104K	R55, R56	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000
C26	CAPACITOR, FIXED ELCTLT, 6.8UF, 20%, 35V	184-9086-650		81349	H39003/01-2312	TP1-TP7	CONTACT, ELECTRICAL	372-2601-033
C27	CAPACITOR, FIXED CER DIEI., 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K	TP8	JACK, TIP GRA	360-0167-000
C28	CAPACITOR, FIXED MICA DIEI., 100PF, 5%, 500V	912-3879-000		81349	925C10240	TP9	JACK, TIP MHT	360-0159-000
C29	CAPACITOR, FIXED CER DIEI., 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K	U1	INTEGRATED CIRCUIT OF AMP	351-1211-010
C30	CAPACITOR, FIXED CER DIEI., 0.01UF, 10%, 100VDC	913-5019-200		81349	H39003/01-2305	VRI	SEMICOND DEVICE	353-3262-000
C31	NOT USED					VR2	SEMICOND DEVICE	353-3591-000

PARTS LIST (Cont)

MFR CODE	MFR PART NUMBER	REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	646-6407-001	C32	CAPACITOR, FIXED CER DIEI., 1000PF., 10%, 200V	913-4018-000		81349	CK05BX102K
		C33	CAPACITOR, FIXED CER DIEI., 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K
		C34, C35	CAPACITOR, FIXED CER DIEI., 1000PF., 10%, 200V	913-4018-000		81349	CK05BX102K
50155	BF25-35	C36	CAPACITOR, FIXED MICA DIEI., 220PF., 5%, 500V	912-3903-000		81349	CM04FD221J03
50155	BF50-35	C37	CAPACITOR, FIXED CER DIEI., 1000PF., 10%, 200V	913-4018-000		81349	CK05BX102K
		C38	CAPACITOR, FIXED CER DIEI., 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K
50155	352-7903-010	C39	CAPACITOR, FIXED CER DIEI., 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K
		C40	NOT USED				
77250	P313-0132-000	C41	CAPACITOR, FIXED CER DIEI., 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K
		C42	CAPACITOR, FIXED ELCTLT., 1UF, 10%, 50V	184-9087-430		81349	H39003/01-2356
77250	P313-0132-000	C43	CAPACITOR, FIXED MICA DIEI., 47PF., 5%, 50V	912-4141-280		93790	CDSEY470J0
		C44	CAPACITOR, FIXED MICA DIEI., 220PF., 5%, 500V	912-3903-000		81349	CM04FD221J03
96906	MS35338-97	C45	CAPACITOR, FIXED CER DIEI., 0.01UF, 10%, 100VDC	913-5019-700		81349	CK05BX103K
		C46	CAPACITOR, FIXED CER DIEI., 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K
96906	MS35338-97	C47	CAPACITOR, FIXED CER DIEI., 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K
		C48	CAPACITOR, FIXED MICA DIEI., 180PF., 5%, 50V	912-4141-280		93790	CDSEY180J0
96906	MS11959-14	C49	CAPACITOR, FIXED MICA DIEI., 47PF., 5%, 50V	912-4141-280		93790	CDSEY470J0
96906	MS11957-14	H1	BUSHING (QTY 5)	642-1773-001			
96906	MS16997-9	H2	CONTACT, ELECTRICAL (QTY 6)	372-2601-037		372-2601-037	
80205	MSA520C4L	H3	CONTACT, ELECTRICAL (QTY 8)	372-2601-033		372-2601-033	
		K1-K4	RELAY, ARMATURE	974-1076-040		81349	H39016-6-209L
12998	280-2745-040	L1, L2	COIL, RF 2200UH	240-2715-530		96906	MS75089-27
		L3, L4	COIL, RF 27UH	240-2715-300		96906	MS75089-4
		L5	BEAD, ATTN, FERR	288-0915-020		72654	AR9102
		L6	CHOKE	240-2757-040		81815	240-2757-040
		L7	COIL, RF 1000UH	240-2715-490		96906	MS75089-23
		L8	BEAD, ATTN, FERR	280-0915-020		72654	AR9102
		L9, L10	COIL, RF 2200UH	240-2715-530		96906	MS75089-27
81349	RCR326100JS	L11	CHOKE	240-2757-030		81815	240-2757-030
		MP1	EXTRACTOR	150-0815-010		07307	60-2-2
81349	RCR326100KS	MP2	INSULATOR (QTY 4)	150-0684-018		19000	RC-RP600090-1A
		Q1, Q2	(MOUNTED ON MIA)				
		Q3	TRANSISTOR	352-0661-020		49956	2N2222A
		Q4	TRANSISTOR	352-0551-010		04713	2N2907A
		R1, R2	RESISTOR, FIXED FILM, 11.5 OHMS, 1%, 1/2W	705-7003-000		81349	RN65011R5F
03508	DA2779GE	R3, R4	RESISTOR, FXD FILM, 866 OHMS, 1%, 1/4W	705-6593-000		81349	RN6008660F
		R5	RESISTOR, FIXED FILM, 442 OHMS, 1%, 1/2W	705-7079-000		81349	RN6504420F
		R6	RESISTOR, FIXED FILM, 11.5 OHMS, 1%, 1/2W	705-7003-000		81349	RN65011R5F
		R7	RESISTOR, FIXED FILM, 442 OHMS, 1%, 1/2W	705-7079-000		81349	RN6504420F
03508	DA2779GE	R8	RESISTOR, FXD FILM, 220 OHMS, 2%, 1W	745-3900-000		81349	RL3252216
		R9	RESISTOR, FIXED FILM, 24 OHMS, 2%, 1W	745-3043-000		81349	RL3252406
		R10	RESISTOR, FXD FILM, 220 OHMS, 2%, 1W	745-3900-000		81349	RL3252216
03508	DA2779GE	R11	RESISTOR, FXD FILM, 121 OHMS, 1%, 1/4W	705-6552-000		81349	RN6001210F
		R12	RESISTOR, FXD FILM, 51 OHMS, 2%, 2W	745-7046-000		81349	RL4235106
		R13	RESISTOR, FXD FILM, 120 OHMS, 2%, 2W	745-7068-000		81349	RL4231216
		R14	RESISTOR, FXD FILM, 562 OHMS, 1%, 1/4W	705-6584-060		81349	RN6005620F
03508	DA2779GE	R15	RESISTOR, FXD 0.1 OHMS, 1%, 5W	747-9441-000		91637	R55-70-0R100
		R16	NOT USED				
		R17	RESISTOR, FXD CHPSM, 1 OHM, 5%, 1/2W	745-1870-010		01121	EB1065
		R18	RESISTOR, FIXED CHPSM, 47 OHMS, 10%, 1/4W	745-0701-000		81349	RCR076470KS
03508	DA2779GE	R19	RESISTOR, FXD FILM, 78.7 OHMS, 1%, 1/4W	705-6543-000		81349	RN6007807F
		R20	RESISTOR, FXD FILM, 68.1 OHMS, 1%, 1/4W	705-6540-000		81349	RN6006801F
		R21	RESISTOR, FXD CHPSM, 820 OHMS, 5%, 1/2W	745-1348-000		81349	RCR206801J3
		R22	RESISTOR, FIXED CHPSM, 1K, 10%, 1/4W	745-0749-000		81349	RCR076102KS
03508	DA2779GE	R23	RESISTOR, FXD CHPSM, 15 OHMS, 5%, 1W	745-3274-000		81349	RCR326150J3
		R24	RESISTOR, FXD CHPSM, 4.7 OHMS, 5%, 1/2W	745-1542-000		81349	RCR206487J3
		R25	RESISTOR, FXD CHPSM, 100 OHMS, 5%, 1/2W	745-1309-000		81349	RCR206101J3
		R26-R32	NOT USED				
		R33	RESISTOR, FXD FILM, 40.2K, 1%, 1/8W	705-1073-000		81349	RN5504022F
03508	DA2779GE	R34	RESISTOR, VARIABLE NON-MM, 10K, 10%	382-0052-280		80294	3292X-CE8-RC103
		R35	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
		R36	RESISTOR, FIXED FILM, 20.5K, 1%, 1/8W	705-1059-000		81349	RN5502052F
03508	DA2779GE	R37	RESISTOR, FXD FILM, 715 OHMS, 1%, 1/4W	705-6589-000		81349	RN6007150F
		R38	RESISTOR, FIXED FILM, 10K, 1%, 1/8W (A2)	705-1044-000		81349	RN5501002F
		R39	RESISTOR, FXD FILM, 6.81K, 1%, 1/8W	705-1036-000		81349	RN5506811F
03508	DA2779GE	R40	RESISTOR, VARIABLE NON-MM, 10K, 10%	382-0052-280		80294	3292X-CE8-RC103
		R41	RESISTOR, FIXED FILM, 20.5K, 1%, 1/8W	705-1059-000		81349	RN5502052F
		R42	RESISTOR, FIXED CHPSM, 1K, 10%, 1/4W (A3)	745-0749-000		81349	RCR076102KS
28480	1N5711	R43	RESISTOR, FIXED CHPSM, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR076472KS
12969	UM9137	R44	RESISTOR, FXD FILM, 40.2K, 1%, 1/8W	745-0785-000		81349	RCR076103KS
03508	DA2779GE	R45	RESISTOR, FIXED CHPSM, 1K, 10%, 1/4W	745-1073-000		81349	RN5504022F
		R46	RESISTOR, FIXED CHPSM, 1K, 10%, 1/4W	745-0749-000		81349	RCR076102KS
		R47	RESISTOR, FIXED CHPSM, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS
		R48	RESISTOR, FXD FILM, 562 OHMS, 1%, 1/4W	705-6584-000		81349	RN6005620F
		R49	RESISTOR, FXD FILM, 1K, 1%, 1/4W	705-6596-000		81349	RN6001001F
		R50	RESISTOR, FIXED FILM, 158K, 1%, 1/8W	705-3604-100		81349	RN5501580F
		R51, R52	RESISTOR, FXD CHPSM, 47 OHMS, 10%, 1W	745-3296-000		81349	RCR326470KS
		R53, R54	RESISTOR, FIXED CHPSM, 2.7K, 10%, 1/4W	745-0764-000		81349	RCR076272KS
		R55, R56	RESISTOR, FIXED CHPSM, 680 OHMS, 10%, 1/4W	745-0743-000		81349	RCR076681KS
		TP1-TP7	CONTACT, ELECTRICAL	372-2601-033		372-2601-033	
		TP8	JACK, TIP BR	360-0167-000		81349	H39024-11-09
		TP9	JACK, TIP WH	360-0159-000		81349	H39024-11-01
		U1	INTEGRATED CIRCUIT OP AMP	351-1211-010		04713	LM158H
		VR1	SEMICOND DEVICE	353-3262-000		12954	1N825A
		VR2	SEMICOND DEVICE	353-3591-060		04713	1M4106

Driver Module, Parts Loc  
Figure 5 (Sheet



Driver Module, Parts Location Diagram  
Figure 5 (Sheet 3)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	DRIVER OUTPUT CARD A2	642-3233-001			
A1	SPLITTER,POWER	276-0508-010		01015	276-0508-010
CR1,CR2	SEMICONO DEVICE	353-3644-050		03508	DA2779GE
CR3	NOT USED				
CR4	SEMICONO DEVICE (ESDS)	353-3691-010		26460	1NS711
C1,C2	CAPACITOR,FXD CER DIEI, 0.10%, PORH20%, 100V	913-3314-020		56289	925C10240
C3,C4	NOT USED				
C5	CAPACITOR,FXD ELCTLT, 22UF, P75%H10%, 50V	183-1277-020		56289	6000226G050K05
C6-C8	CAPACITOR,FXED CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K
C9,C10	CAPACITOR,FXD CER DIEI, 0.10%, PORH20%, 100V	913-3314-020		56289	925C10240
C11	CAPACITOR,FXED CER DIEI, 100PF, 10%, 200V	913-4006-000		81349	CK058X101K
C12,C13	CAPACITOR,FXD CER DIEI, 0.10%, PORH20%, 100V	913-3314-020		56289	925C10240
C14	CAPACITOR,FXED CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK058X103K
C15	CAPACITOR,FXD MICA DIEI, 82PF, 5%, 500V	912-3673-000		81349	CM04ED020J03
C16-C18	CAPACITOR,FXED CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K
C19	CAPACITOR,FXED ELCTLT, 1UF, 10%, 50V	184-9087-430		81349	H39003/01-2356
C20	CAPACITOR,FXED CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K
C21	CAPACITOR,FXED MICA DIEI, 330PF, 5%, 100V	912-3915-000		81349	CM04FA331J03
C22	CAPACITOR,FXED ELCTLT, 1UF, 10%, 50V	184-9087-430		81349	H39003/01-2356
C23,C24	CAPACITOR,FXED CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK058X103K
C25	CAPACITOR,FXED MICA DIEI, 100PF, 5%, 500V	912-3679-000		81349	CM04FD101J03
C26	CAPACITOR,FXED MICA DIEI, 10PF, PORH 0.5PF, 300V	912-4141-020		93790	CD5CC10000
C27	CAPACITOR,FXED MICA DIEI, 220PF, 5%, 500V	912-3903-000		81349	CM04FD221J03
C28	CAPACITOR,FXED CER DIEI, 1000PF, 10%, 200V	913-4018-000			
C29-C32	NOT USED				
C33,C34	CAPACITOR,FXED CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK058X103K
C35-C37	CAPACITOR,FXED CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K
H1	NUT,PLAIN,HEX SST, 4-40 (QTY 3)	313-0132-000		77250	P313-0132-000
H2	WASHER,LOCK SST, 0.115 ID X 0.209 OD (QTY 3)	310-0279-000		96906	MS35330-135
H3	WASHER,FLAT CRES, 0.125ID X 0.250 OD (QTY 3)	310-0779-030		96906	MS15795-003
H4	SCREW,MACH STL, 4-40 X 3/8 (QTY 3)	343-0135-000		96906	MS15757-15
H5	BUSHING (QTY 2)	642-1773-001			
H6	CONTACT,ELECTRICAL (QTY 1)	372-2601-037			372-2601-037
H7	TERMINAL,STUD (QTY 19)	306-2723-010		11375	Z11-622-2
L1-L3	COIL,RF 1000UH	240-2715-490		96906	MS75089-23
L4,L5	BEAD,ATTEN,FERR	288-0915-020		72656	AR9102
L6,L7	COIL,RF 2200UH	240-2715-530		96906	MS75089-27
MP1	EXTRACTOR	150-0815-010		07367	60-2-2
Q1,Q2	(MOUNTED ON NHA)				
Q3	TRANSISTOR	352-0551-010		04713	ZM2907A
Q4	TRANSISTOR	352-0661-020		49956	ZM222A
R1,R2	RESISTOR,FXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103K5
R3,R4	NOT USED				
R5,R6	RESISTOR,FXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR076102K5
R7-R10	NOT USED				
R11,R12	RESISTOR,FXD FILM, 40.2K, 1%, 1/8W	705-1073-000		81349	RN5504022F
R13,R14	RESISTOR,VARIABLE NON-MM,10K, 10%	362-0052-260		80294	3Z92X-CER-RC103
R15,R16	RESISTOR,FXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103K5
R17,R18	RESISTOR,FXED FILM, 20.5K, 1%, 1/8W	705-1059-000		81349	RN5502052F
R19	RESISTOR,FXED CHPSN, 1K, 10%, 1/4W (A4)	745-0749-000		81349	RCR076102K5
R19	RESISTOR,FXED CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR076472K5
R20	RESISTOR,FXED CHPSN, 390 OHMS, 10%, 1/4W	745-0734-000		81349	RCR076391K5
R21	RESISTOR,FXD FILM, 715 OHMS, 1%, 1/4W	705-6509-000		81349	RN6007150F
R22	RESISTOR,FXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103K5
R23,R24	RESISTOR,FXD CHPSN, 15 OHMS, 10%, 1/2W	745-1275-000		81349	RCR206150K3
R25	RESISTOR,FXD CHPSN, 150 OHMS, 10%, 1W	745-3317-000		81349	RCR326151K3
R26	RESISTOR,FXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103K5
R27	RESISTOR,FXED CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR076472K5
R28	RESISTOR,FXED CHPSN, 600 OHMS, 10%, 1/4W	745-0743-000		81349	RCR076601K5
R29	RESISTOR,FXED CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR076472K5
R30	RESISTOR,FXED CHPSN, 2.7K, 10%, 1/4W	745-0764-000		81349	RCR076272K5
R31	RESISTOR,FXED CHPSN, 600 OHMS, 10%, 1/4W	745-0743-000		81349	RCR076601K5
R32	RESISTOR,FXED FILM, 1K, 1%, 1/8W	705-0966-000		81349	RN5501001F
R33	RESISTOR,FXD FILM, 1.96K, 1%, 1/8W	705-1010-000		81349	RN5501961F
R34	RESISTOR,FXD 0.1 OHMS, 1%, 5W	747-9441-000		91637	R55-70-0R100
R35	RESISTOR,FXED CHPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349	RCR076271K5
R36,R37	NOT USED				
R38,R39	RESISTOR,FXED FILM, 20.5K, 1%, 1/8W	705-1059-000		81349	RN5502052F
R40	RESISTOR,FXED FILM, 19.6K, 1%, 1/8W	705-1058-000		81349	RN5501962F
R41	RESISTOR,VARIABLE NON-MM,2K, 10%	382-0052-260		80294	3Z92X-CER-RC202
R42	RESISTOR,FXED FILM, 20.5K, 1%, 1/8W	705-1059-000		81349	RN5502052F
R43	RESISTOR,FXD CHPSN, 600 OHMS, 10%, 1/2W	745-1345-000		81349	RCR206601K5
R44,R45	RESISTOR,FXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103K5
TP1	JACK,TIP BRN	360-0162-000		81349	H39024-11-04
TP2	JACK,TIP RED	360-0160-000		81349	H39024-11-02
TP3	JACK,TIP ORN	360-0164-000		81349	H39024-11-06
TP4	JACK,TIP YEL	360-0166-000		81349	H39024-11-08
TP5	JACK,TIP GRN	360-0163-000		81349	H39024-11-05
TP6	CONTACT,ELECTRICAL	372-2601-033			372-2601-033
T1	TRANSFORMER,RF	278-0428-090		20462	278-0428-090
T2	TRANSFORMER,RF	278-0428-080		20462	278-0428-080
U1,U2	INTEGRATED CIRCUIT OP AMP	351-1211-010		04713	LM150M
VR1	SEMICONO DEVICE	353-3262-000		12954	1M825A
VR2	SEMICONO DEVICE	353-2708-000		81403	1M750A
VR3	SEMICONO DEVICE	353-6481-390		04713	1M747A

Note

Configuration history before 1 not recorded in this section.

MODIFICATION HISTORY

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE
NA	Changed quantities of H1 and H2 (not shown schematic)
A2	Changed A1R38 from 10K to 6810Ω
A3	Changed A1R41 from 1K to 4700Ω
A4	Changed A2R19 from 1K to 4700Ω



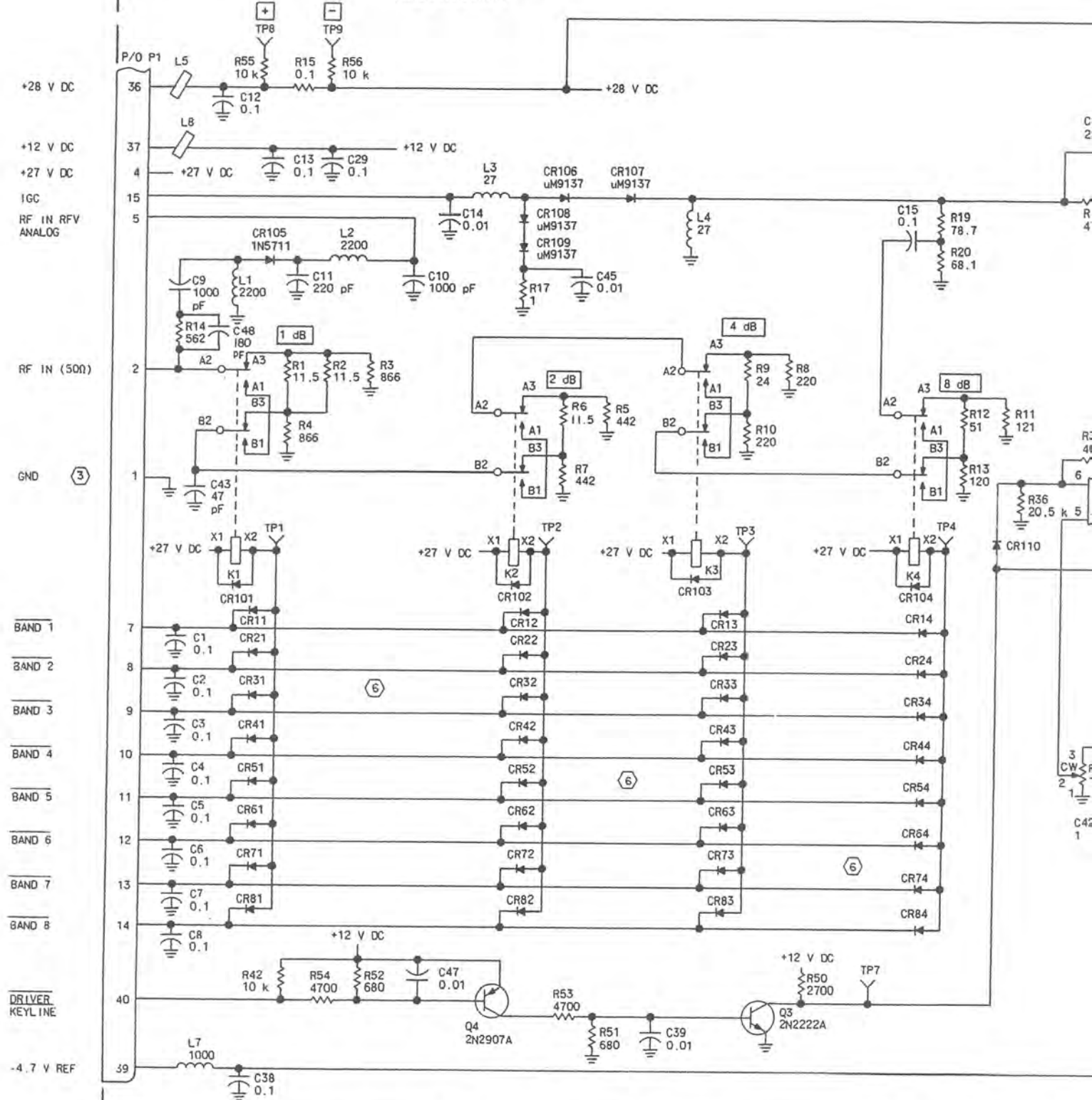
**Note**

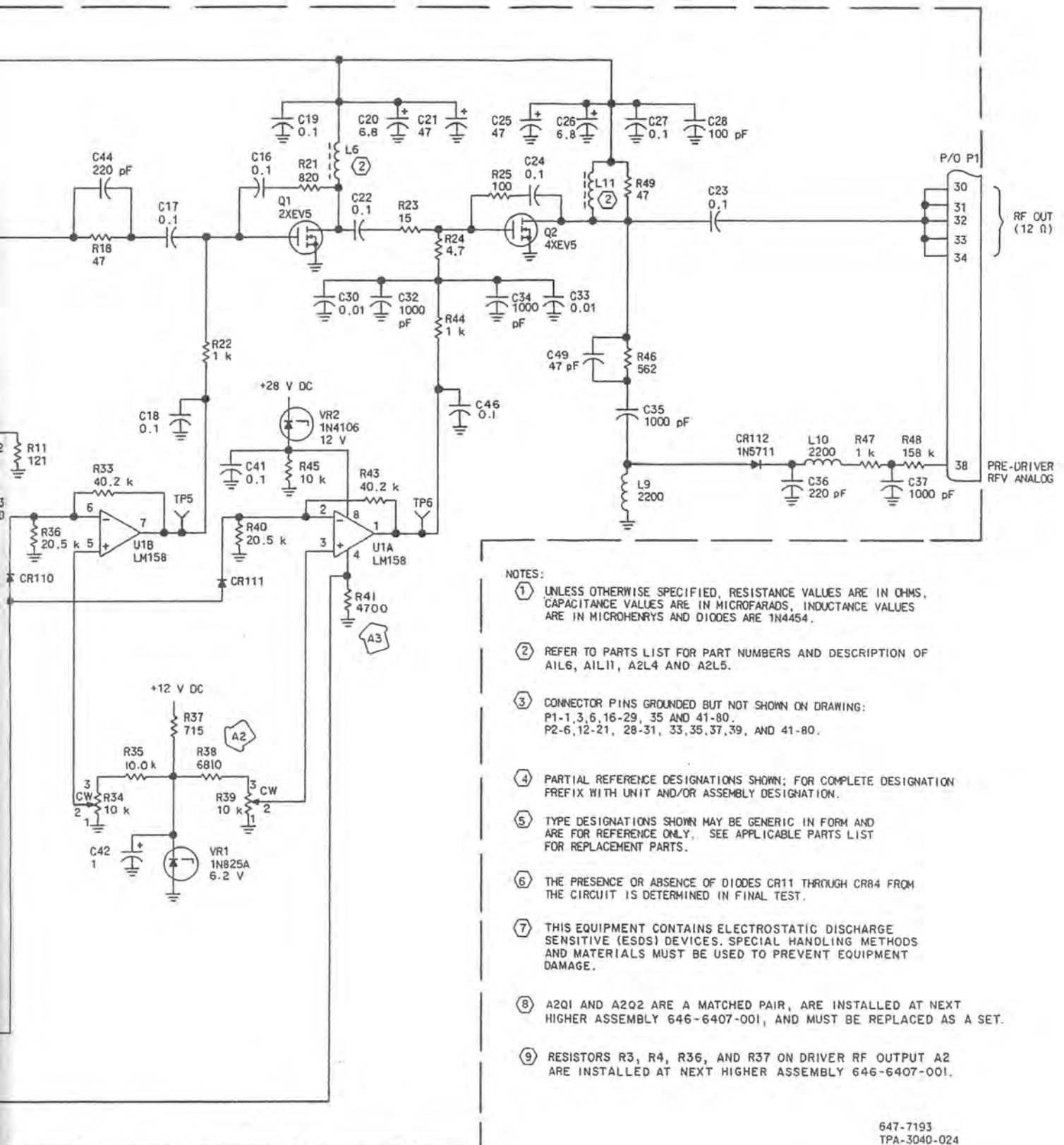
Configuration history before 1 April 1982 is not recorded in this section.

**MODIFICATION HISTORY**

<b>REVISION IDENT</b>	<b>DESCRIPTION OF REVISION AND REASON FOR CHANGE</b>	<b>EFFECTIVITY</b>
NA	Changed quantities of H1 and H2 (not shown on schematic)	646-6407-001 REV D and above
A2	Changed A1R38 from 10K to 6810 $\Omega$	642-3234-001 REV F and above
A3	Changed A1R41 from 1K to 4700 $\Omega$	642-3234-001 REV G and above
A4	Changed A2R19 from 1K to 4700 $\Omega$	642-3233-001 REV E and above

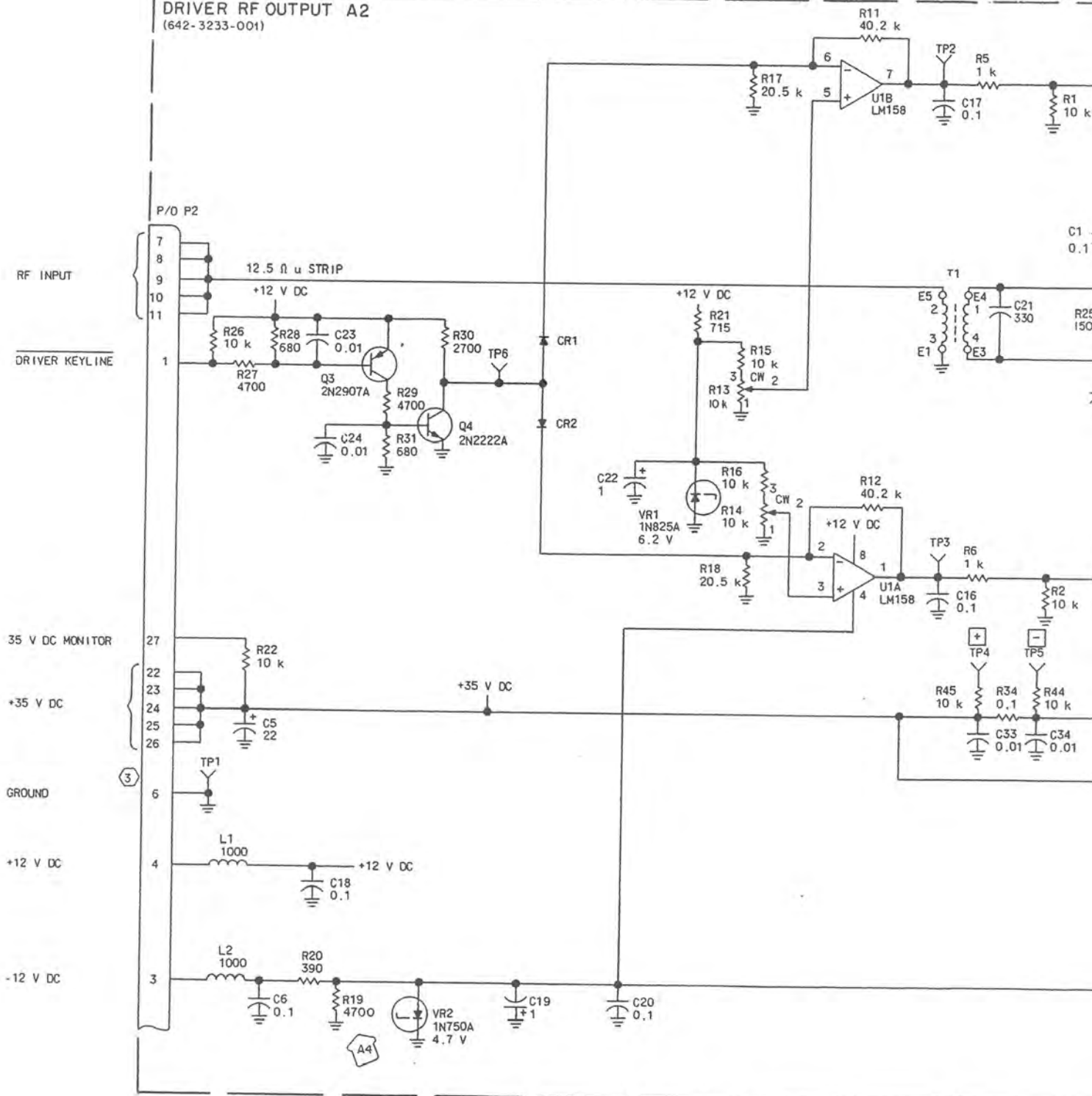
PRE-DRIVER CARD A1  
(642-3234-001)

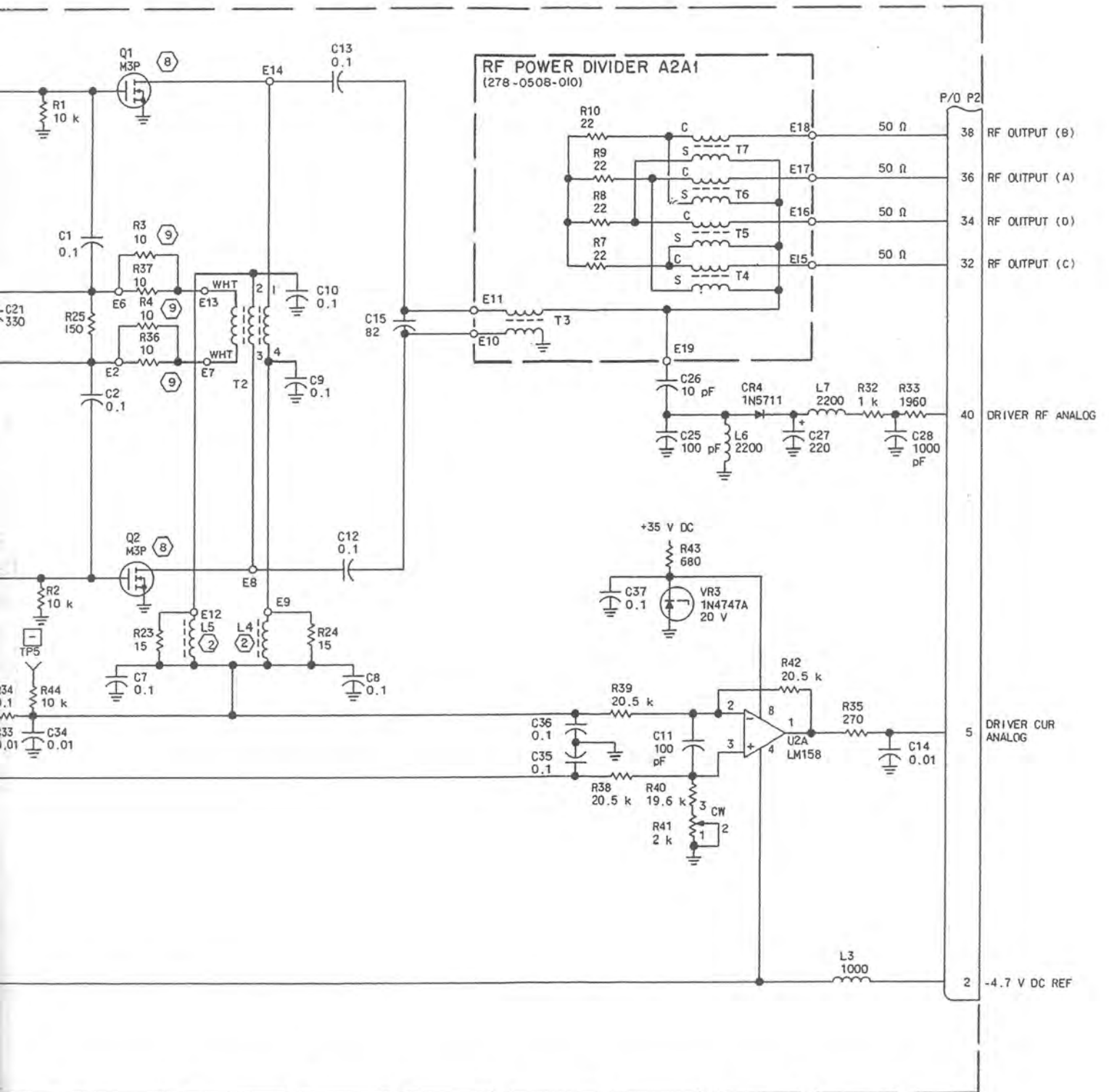




Driver Module, Schematic Diagram  
Figure 6 (Sheet 1 of 2)

**DRIVER RF OUTPUT A2**  
(642-3233-001)





647-7193  
TPA-3040-024

Driver Module, Schematic Diagram  
Figure 6 (Sheet 2)

# Power Amplifier Output Module (646-6406-001, -002)



Rockwell  
International

instructions

Collins Telecommunications Products Division

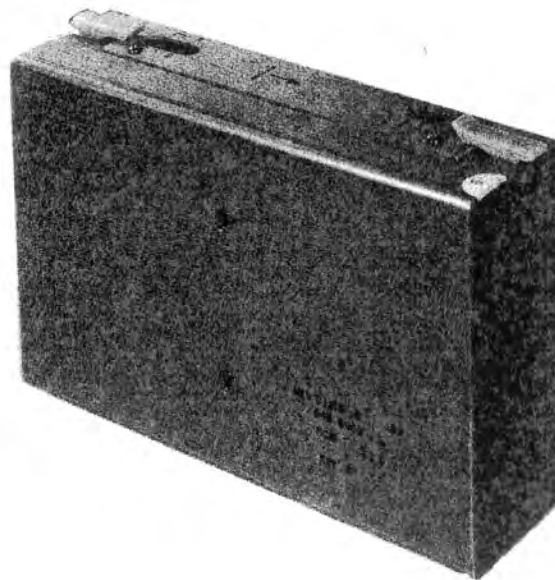
Printed in USA

523-0771671-001211  
15 September 1982

## 1. DESCRIPTION

Power Amplifier Output Module 646-6406-001, -002 (figure 1) is a plug-in modular assembly consisting of a printed circuit card and a heat sink mounted to a common assembly. Cooling air required by the circuit card and the output power transistors is passed

over the circuit card and through the heat sinks in the common assembly. The cooling air is supplied by blowers in the power amplifier assembly. A 40-pin pinfield (P1) provides all input power and control connections to the power amplifier output module. Rf output power is supplied through a single rf output connector (P2).



TPA-4662-017

Power Amplifier Output Module  
Figure 1

Power Amplifier Output Module  
(646-6406-001, -002)

523-0771671-001211

## **2. PRINCIPLES OF OPERATION (Refer to figure 2)**

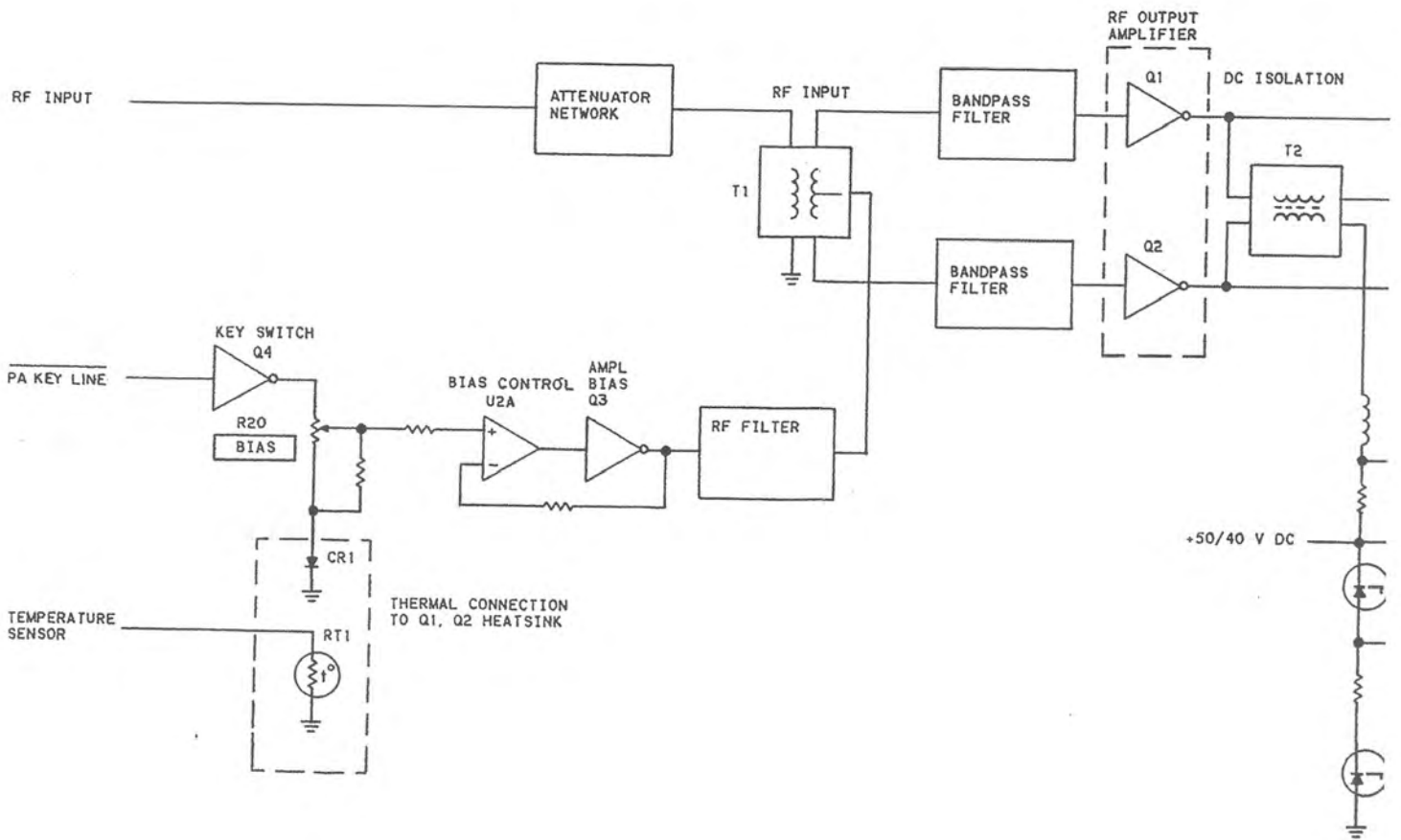
### **2.1 General**

The power amplifier output module consists of an input attenuator network and an rf output amplifier circuit.

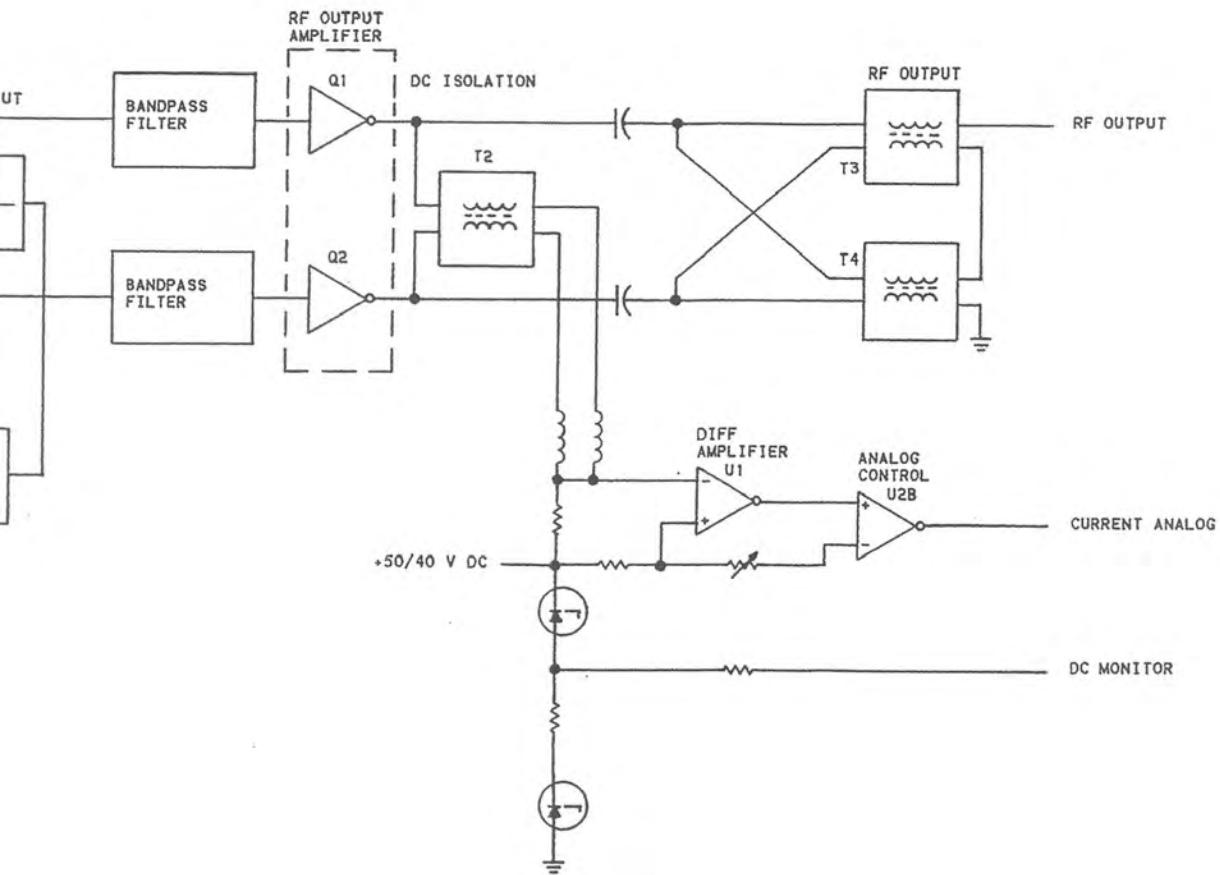
### **2.2 Block Diagram Theory**

The rf input is supplied through the attenuator network to the rf input transformer. The input attenu-

ator network is test selected to maintain low gain variation between pa modules. A key signal at the rf input transformer pa key line controls bias for transistors Q1 and Q2. The output of the rf input transformer is supplied through bandpass filtering, the rf output amplifier, and rf output power transformers. At the rf output amplifier, current monitoring the dc voltage monitoring are provided using a differential amplifier, an analog monitor (for the current monitor), and two voltage regulators (for the dc monitor).







TPA-5510-014

Block Diagram  
Figure 2

**3. TESTING/TROUBLESHOOTING PROCEDURES**

A defective power amplifier output module can be returned to a Rockwell-Collins authorized repair facility for repair. Contact the nearest Rockwell-Collins office or

Collins Telecommunications Products Division  
Attention: HF Products  
400 Collins Road, NE  
Cedar Rapids, Iowa 52498

for information and instructions.

**4. ALIGNMENT/ADJUSTMENT**

Alignment/adjustment is performed in conjunction with testing/troubleshooting.

**5. REPAIR**

Repair is accomplished using standard shop practices.

## 6. PARTS LIST/DIAGRAMS

### 6.1 Introduction

This paragraph assists in identification and requisition of parts. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included. The parts location illustration shows component placement on the circuit cards.

### 6.2 Parts List

REF DES Column — Reference designators and/or item numbers for each part/subassembly are listed in alphanumeric or numeric sequence. These are the reference designators and/or item numbers shown on the parts location illustration. Only the reference designators are shown on the schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modification.

Modifications are identified by two methods: An alphanumeric identifier is assigned to each electrical design change and listed in the REVISION IDENT column of the modification history. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change.

NA (not applicable) in the REVISION IDENT column indicates a documentation change and/or mechanical change. This revision activity will be noted in the DESCRIPTION column of the parts list only. This change does not affect the circuit card/subassembly components or the schematic. Each change relates to the REV (revision identifier) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history. Dash (—) denotes original; letter A first change; letter B second change, etc.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

### 6.3 How To Use This Parts List

To locate a part number, locate the part and its item number and/or reference designator on the illustration. Turn to the parts list page and find the item number and/or reference designator to determine its description and part number.

To locate the illustration for a part, if the reference designator and/or part number are known, refer to the parts list and find the figure and item number indicated in the parts list for location on the illustration.

### 6.4 Manufacturer's Code, Name, and Address

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
01121	ALLEN-BRADLEY CO 1201 SOUTH 2ND ST MILWAUKEE WI 53204
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49 DALLAS TX 75265
02111	SPECTROL ELECTRONICS CORP SUB OF CARRIER CORP 17070 E GALE AVE P O BOX 1220 CITY OF INDUSTRY CA 91749
04713	MOTOROLA INC SEMICONDUCTOR GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV SUB OF SCHLUMBERGER LTD NORTH AMERICAN SALES MAIL STOP 14-1053 401 ELLIS ST P O DRAWER 7284 MOUNTAIN VIEW CA 94042
07387	BIRTCHEER CORP THE MEDICAL DIV 4501 N ARDEN DR P O BOX 4399 EL MONTE CA 91734
10646	CARBORUNDUM CO THE P O BOX 337 NIAGARA FALLS NY 14302
11375	ACCURATE ELECTRONICS CORP 169 S ABBE RD P O BOX R ELYRIA OH 44035
12954	SIEMENS CORP COMPONENTS GROUP 8700 E THOMAS RD P O BOX 1390 SCOTTSDALE AZ 85252

MFR      MANUFACTURER'S NAME  
CODE      AND ADDRESS

13103      THERMALLOY CO INC  
2021 W VALLEY VIEW LANE  
P O BOX 340839  
DALLAS TX 75234

13499      ROCKWELL INTERNATIONAL CORP  
COLLINS TELECOMMUNICATIONS  
PRODUCTS DIV  
855 35TH ST NE  
P O BOX 728  
CEDAR RAPIDS IA 52498

14433      ITT SEMICONDUCTOR DIV  
WEST PALM BEACH FL

14936      GENERAL INSTRUMENT CORP  
DISCRETE SEMI CONDUCTOR DIV  
600 W JOHN ST  
HICKSVILLE NY 11802

20462      PREM ENTERPRISES INC  
3519 N CHAPEL HILL  
MC HENRY IL 60050

22526      DU PONT E I DE NEMOURS AND CO INC  
PHOTO PRODUCTS DEPT  
BERG ELECTRONICS DIV  
ROUTE 83  
NEW CUMBERLAND PA 17070

24931      SPECIALTY CONNECTOR CO INC  
2620 ENDRESS PLACE  
P O BOX D  
GREENWOOD IN 46142

29251      KRYSTINEL CORP  
126 PENNSYLVANIA AVE  
PATERSON NJ 07509

29990      AMERICAN TECHNICAL CERAMICS  
DIVISION OF PHASE INDUSTRIES  
1 NORDEN LANE  
HUNTINGTON STATION NY 11746

56289      SPRAGUE ELECTRIC CO  
87 MARSHALL ST  
NORTH ADAMS MA 01247

57582      KAHGAN ELECTRONICS CORP  
556 PENINSULA BLVD  
HEMPSTEAD NY 11550

70318      ALLMETAL SCREW PRODUCTS CO INC  
821 STEWART AVE  
GARDEN CITY NY 11530

72656      INDIANA GENERAL ELECTRONIC PRODUCTS  
A DIV OF ELECTRONIC MEMORIES AND  
MAGNETICS CORP  
CROWS MILL ROAD  
KEASBY NJ 08832

77250      ALLIED PRODUCTS CORP  
PHEOLL MFG CO DIV  
5700 W ROOSEVELT RD  
CHICAGO IL 60650

MFR      MANUFACTURER'S NAME  
CODE      AND ADDRESS

78189      ILLINOIS TOOL WORKS INC  
SHAKEPROOF DIVISION  
ST CHARLES ROAD  
ELGIN IL 60120

79807      WROUGHT WASHER MFG INC  
2100 S BAY ST  
MILWAUKEE WI 53207

80205      NATIONAL AEROSPACE STANDARD

81349      MILITARY SPECIFICATIONS

91637      DALE ELECTRONICS INC  
P O BOX 609  
COLUMBUS NE 68601

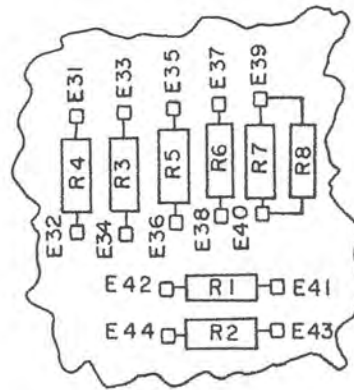
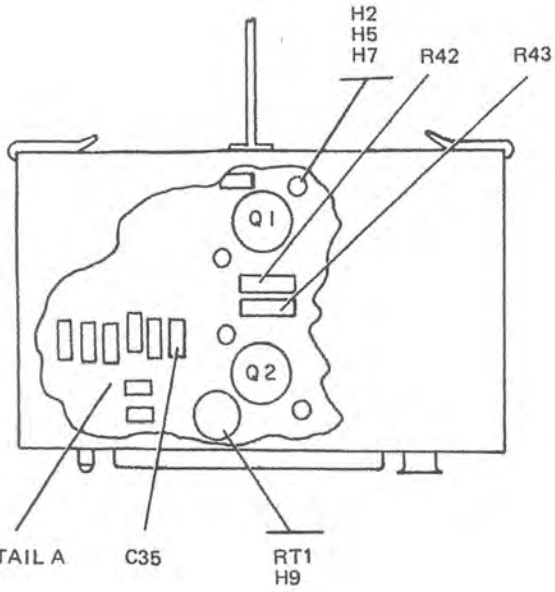
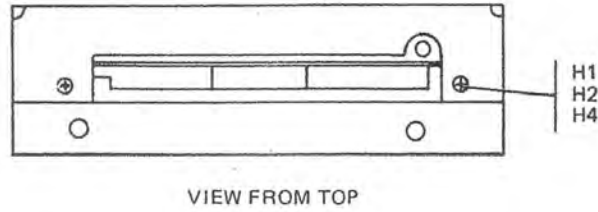
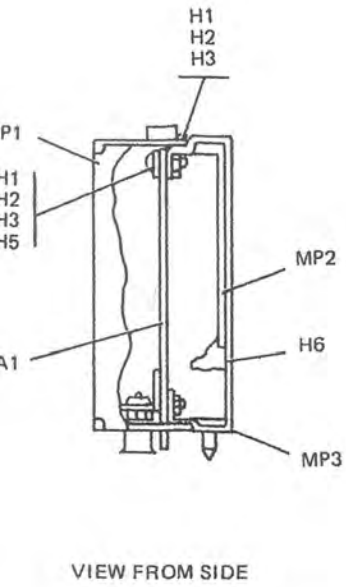
96906      MILITARY STANDARD

97794      YELLOW SPRINGS INSTRUMENT CO INC THE  
P O BOX 279  
YELLOW SPRINGS OH 45387

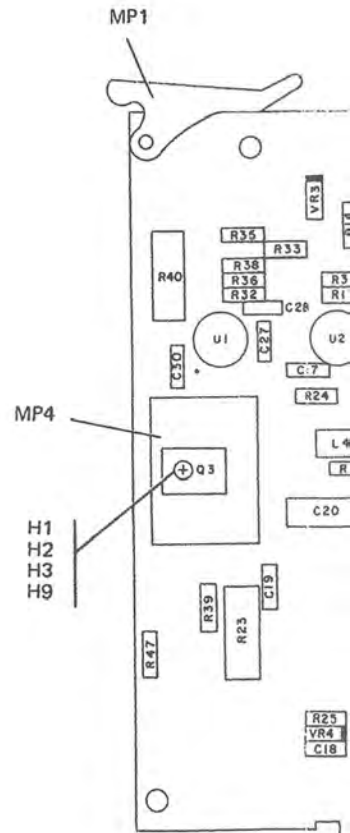
*6.5 Equipment Covered*

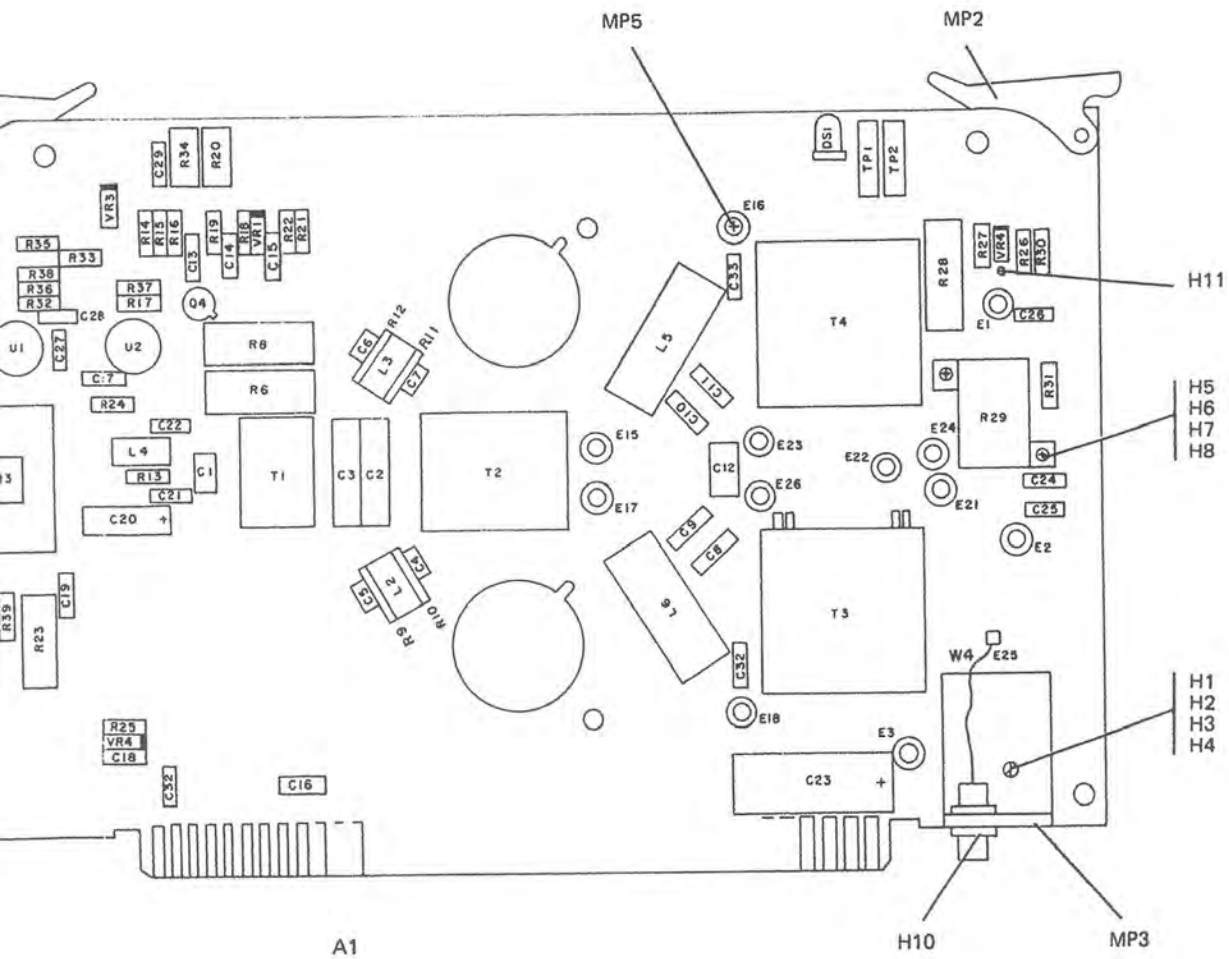
Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions. Configuration history before 1 April 1982 is not recorded in this section.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Power Amplifier Output Module	646-6406-001	REV H
Power Amplifier Output Module	646-6406-002	REV H
PA Module Card A1	642-3116-001	REV C
PA Module Card A1	642-3116-002	REV D



"E" NUMBERS ARE  
PREFIXED BY "A1"





TPA-4501-018

Power Amplifier Output Module,  
Parts Location Diagram  
Figure 3 (Sheet 1 of 2)

9 PART OF Large

## PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE	REF DES	DESCRIPTION
	POWER AMPLIFIER OUTPUT MODULE	646-6406-001 A					R4	RESISTOR, FX SELECT)
	POWER AMPLIFIER OUTPUT MODULE	646-6406-002 B					R4	RESISTOR, FX SELECT)
A1	PA MODULE CARD	642-3116-001 A					R4	RESISTOR, FX SELECT)
A1	PA MODULE CARD	642-3116-002 B					R4	RESISTOR, FX SELECT)
CRI	SEMICOND DEVICE	353-6442-020			14433 1M4002		R4	RESISTOR, FX SELECT)
C1-C34	NOT USED						R4	RESISTOR, FX SELECT)
C35	CAPACITOR, FXD MICA DIEI, 180PF, 5%, 500V (A1)	912-2834-000 B			81349 CM05FD181J03		R4	RESISTOR, FX SELECT)
H1	NUT, PLAIN, HEX SST, 4-40 (QTY 8)	313-0132-000 A			77250 P313-0132-000		R4	RESISTOR, FX SELECT)
H1	STUD, CONT THD STL, 4-40 X 3/8 (QTY 2)(A1)	312-0007-000 B			77250 P312-0007-000		R4	RESISTOR, FX SELECT)
H2	WASHER, SPRING CD PL BRZ, 0.115 ID X 0.209 OD (QTY 12)(A1)	310-0095-000 A			96906 HS35338-97		R4	RESISTOR, FX SELECT)
H2	WASHER, SPRING CD PL BRZ, 0.115 ID X 0.209 OD (QTY 4)	310-0095-000 B			96906 HS35338-97		R4	RESISTOR, FX SELECT)
H3	SCREW, MACH SST, 4-40 X 5/16 (QTY 6)	343-0134-000			96906 MS51957-14		R4	RESISTOR, FX SELECT)
H4	SCREW, MACH SST, 4-40 X 5/16 (QTY 2)	342-0045-000			96906 MS51959-14		R5	RESISTOR, FX SELECT)
H5	WASHER, FLAT PSVT CRES, 0.115 ID X 0.209 OD (QTY 8)	310-0740-200			80205 HAS620C4L		R5	RESISTOR, FX SELECT)
H6	SCREW, MACH SST, 8-32 X 5/16 (QTY 2)	342-0077-000			96906 MS51959-42		R5	RESISTOR, FX SELECT)
H7	SCREW, MACH STL, 4-40 X 1/4 (QTY 4)	343-0133-000 A			96906 MS51957-13		R5	RESISTOR, FX SELECT)
H7	SCREW, MACH STL, 4-40 X 1/4 (QTY 2)	343-0133-000 B			96906 MS51957-13		R5	RESISTOR, FX SELECT)
H8	SCREW ASSY (QTY 1)	371-0062-000			81349 M24308-26-1		R5	RESISTOR, FX SELECT)
HP1	COVER	642-2648-001					R5	RESISTOR, FX SELECT)
HP2	HEATSINK	642-2639-001					R5	RESISTOR, FX SELECT)
HP3	CHASSIS	642-2632-001					R5	RESISTOR, FX SELECT)
HP4	TERMINAL, FEEDTH (QTY 2)	306-2517-010 B			81349 SE109D01		R5	RESISTOR, FX SELECT)
Q1, Q2	TRANSISTOR, PAR PAIR	352-8531-020			352-8531-020		R5	RESISTOR, FX SELECT)
RT1	RESISTOR, THRM 100K	714-3270-010			97794 44011		R5	RESISTOR, FX SELECT)
R1	RESISTOR, FXD CHPSN, 560 OHMS, 5%, 2W (TEST SELECT)	745-5641-000			81349 RCR426561J5		R5	RESISTOR, FX SELECT)
R1	RESISTOR, FXD CHPSN, 620 OHMS, 5%, 2W (TEST SELECT)	745-5643-000			81349 RCR426621J5		R5	RESISTOR, FX SELECT)
R1	RESISTOR, FXD CHPSN, 680 OHMS, 5%, 2W (TEST SELECT)	745-5644-000			81349 RCR426681J5		R6	RESISTOR, FX SELECT)
R1	RESISTOR, FXD CHPSN, 750 OHMS, 5%, 2W (TEST SELECT)	745-5647-000			81349 RCR426751J5		R6	RESISTOR, FX SELECT)
R1	RESISTOR, FXD CHPSN, 820 OHMS, 5%, 2W (TEST SELECT)	745-5648-000			81349 RCR426821J5		R6	RESISTOR, FX SELECT)
R1	RESISTOR, FXD CHPSN, 1K, 5%, 2W (TEST SELECT)	745-5651-000			81349 RCR426102J5		R6	RESISTOR, FX SELECT)
R1	RESISTOR, FXD CHPSN, 1.1K, 5%, 2W (TEST SELECT)	745-5654-000			81349 RCR426112J5		R6	RESISTOR, FX SELECT)
R1	RESISTOR, FXD CHPSN, 1.3K, 5%, 2W (TEST SELECT)	745-5657-000			81349 RCR426132J5		R6	RESISTOR, FX SELECT)
R1	RESISTOR, FXD CHPSN, 1.6K, 5%, 2W (TEST SELECT)	745-5662-000			81349 RC426F182J		R6	RESISTOR, FX SELECT)
R1	RESISTOR, FXD CHPSN, 2.4K, 5%, 2W (TEST SELECT)	745-5668-000			81349 RCR426242J5		R6	RESISTOR, FX SELECT)
R1	RESISTOR, FXD CHPSN, 3.3K, 5%, 2W (TEST SELECT)	745-5672-000			81349 RCR426332J5		R6	RESISTOR, FX SELECT)
R1	RESISTOR, FXD CHPSN, 6.8K, 5%, 2W (TEST SELECT)	745-5686-000			81349 RCR426682J5		R6	RESISTOR, FX SELECT)
R2	RESISTOR, FXD CHPSN, 620 OHMS, 5%, 2W (TEST SELECT)	745-5643-000			81349 RCR426621J5		R6	RESISTOR, FX SELECT)
R2	RESISTOR, FXD CHPSN, 680 OHMS, 5%, 2W (TEST SELECT)	745-5644-000			81349 RCR426681J5		R6	RESISTOR, FX SELECT)
R2	RESISTOR, FXD CHPSN, 750 OHMS, 5%, 2W (TEST SELECT)	745-5647-000			81349 RCR426751J5		R7	RESISTOR, FX SELECT)
R2	RESISTOR, FXD CHPSN, 820 OHMS, 5%, 2W (TEST SELECT)	745-5648-000			81349 RCR426821J5		R7	RESISTOR, FX SELECT)
R2	RESISTOR, FXD CHPSN, 910 OHMS, 5%, 2W (TEST SELECT)	745-5650-000			81349 RCR426911J5		R7	RESISTOR, FX SELECT)
R2	RESISTOR, FXD CHPSN, 1K, 5%, 2W (TEST SELECT)	745-5651-000			81349 RCR426102J5		R7	RESISTOR, FX SELECT)
R2	RESISTOR, FXD CHPSN, 1.2K, 5%, 2W (TEST SELECT)	745-5655-000			81349 RCR426122J5		R7	RESISTOR, FX SELECT)
R2	RESISTOR, FXD CHPSN, 1.5K, 5%, 2W (TEST SELECT)	745-5658-000			81349 RCR426152J5		R7	RESISTOR, FX SELECT)
R2	RESISTOR, FXD CHPSN, 1.6K, 5%, 2W (TEST SELECT)	745-5661-000			81349 RCR426162J5		R7	RESISTOR, FX SELECT)
R2	RESISTOR, FXD CHPSN, 2.4K, 5%, 2W (TEST SELECT)	745-5668-000			81349 RCR426242J5		R7	RESISTOR, FX SELECT)
R2	RESISTOR, FXD CHPSN, 3.6K, 5%, 2W (TEST SELECT)	745-5675-000			81349 RCR426362J5		R7	RESISTOR, FX SELECT)
R2	RESISTOR, FXD CHPSN, 7.5K, 5%, 2W (TEST SELECT)	745-5689-000			81349 RCR426752J5		R7	RESISTOR, FX SELECT)
R3	RESISTOR, FXD CHPSN, 3 OHMS, 5%, 1W (TEST SELECT)	745-3535-000			81349 RCR3263R0J5		R7	RESISTOR, FX SELECT)
R3	RESISTOR, FXD CHPSN, 5.6 OHMS, 5%, 1W (TEST SELECT)	745-3545-000			81349 RCR3265R6J5		R7	RESISTOR, FX SELECT)
R3	RESISTOR, FXD CHPSN, 12 OHMS, 5%, 2W (TEST SELECT)	745-5571-000			81349 RCR426120J5		R8	RESISTOR, FX SELECT)
R3	RESISTOR, FXD CHPSN, 22 OHMS, 5%, 2W (TEST SELECT)	745-5581-000			81349 RCR426220J5		R9-R41	NOT USED
R3	RESISTOR, FXD CHPSN, 27 OHMS, 5%, 2W (TEST SELECT)	745-5585-000			81349 RCR426270J5		R42, R43	RESISTOR, FID PA MODULE CA PA MODULE CA
R3	RESISTOR, FXD CHPSN, 30 OHMS, 5%, 2W (TEST SELECT)	745-5587-000			81349 RCR426300J5		C1	CAPACITOR, FX
R3	RESISTOR, FXD CHPSN, 33 OHMS, 5%, 2W (TEST SELECT)	745-5588-000			81349 RCR426330J5		C2, C3	CAPACITOR, FX
R3	RESISTOR, FXD CHPSN, 39 OHMS, 5%, 2W (TEST SELECT)	745-5592-000			81349 RCR426390J5		C4-C7	CAPACITOR, FX
R3	RESISTOR, FXD CHPSN, 43 OHMS, 5%, 2W (TEST SELECT)	745-5594-000			81349 RCR426430J5		C8-C11	CAPACITOR, FX
R3	RESISTOR, FXD CHPSN, 47 OHMS, 5%, 2W (TEST SELECT)	745-5595-000			81349 RCR426470J5		C12	CAPACITOR, FX
R3	RESISTOR, FXD CHPSN, 51 OHMS, 5%, 2W (TEST SELECT)	745-5598-000			81349 RCR426510J5		C13	CAPACITOR, FX
R4	RESISTOR, FXD CHPSN, 3 OHMS, 5%, 1W (TEST SELECT)	745-3535-000			81349 RCR3263R0J5		C14-C19	CAPACITOR, FX
R4	RESISTOR, FXD CHPSN, 5.6 OHMS, 5%, 1W (TEST SELECT)	745-3545-000			81349 RCR3265R6J5		C20	CAPACITOR, FX
R4	RESISTOR, FXD CHPSN, 11 OHMS, 5%, 2W (TEST SELECT)	745-5570-000			81349 RCR426110J5		C21	CAPACITOR, FX
R4	RESISTOR, FXD CHPSN, 12 OHMS, 5%, 2W (TEST SELECT)	745-5571-000			81349 RCR426120J5		C22	CAPACITOR, FX
							C23	CAPACITOR, FX
							C24	CAPACITOR, FX
							C25, C26	CAPACITOR, FX
							C27, C28	CAPACITOR, FX
							C29, C30	CAPACITOR, FX
							C31	NOT USED
							C32	CAPACITOR, FX
							C33, C34	CAPACITOR, FX
							DS1	DIODE, LIGHT
							H1	NUT, PLAIN, HE

## PARTS LIST (Cont)

PARTS LI

SMR CODE	REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE	REF DES	DESCRIPTION
	R4	RESISTOR,FXD CHPSN, 22 OHMS, 5%, 2W (TEST SELECT)	745-5581-000		81349	RCR426220JS		H2	WASHER,LOCK SST, 0.115 ID X 0.209 OD (QTY 3)
	R4	RESISTOR,FXD CHPSN, 24 OHMS, 5%, 2W (TEST SELECT)	745-5584-000		81349	RCR426240JS		H3	WASHER,FLAT (QTY 3)
	R4	RESISTOR,FXD CHPSN, 30 OHMS, 5%, 2W (TEST SELECT)	745-5587-000		81349	RCR426300JS		H4	SCREW,HACH STL, 4-40 X 3/8 (QTY 2)
	R4	RESISTOR,FXD CHPSN, 33 OHMS, 5%, 2W (TEST SELECT)	745-5588-000		81349	RCR426330JS		H5	NUT,PLAIN,HEX SST, 2-56 (QTY 2)
	R4	RESISTOR,FXD CHPSN, 39 OHMS, 5%, 2W (TEST SELECT)	745-5592-000		81349	RCR426390JS		H6	WASHER,LOCK SST, 0.102 ID X 0.188 OD (QTY 2)
	R4	RESISTOR,FXD CHPSN, 43 OHMS, 5%, 2W (TEST SELECT)	745-5594-000		81349	RCR426430JS		H7	WASHER,FLAT SST, 0.092 X 0.219 OD (QTY 2)
	R4	RESISTOR,FXD CHPSN, 47 OHMS, 5%, 2W (TEST SELECT)	745-5595-000		81349	RCR426470JS		H8	SCREW,HACH CD PL STL, 2-56 X 5/16 (QTY 2)
	R4	RESISTOR,FXD CHPSN, 51 OHMS, 5%, 2W (TEST SELECT)	745-5598-000		81349	RCR426510JS		H9	SCREW,HACH STL, 4-40 X 7/16 (QTY 1)
	R5	RESISTOR,FXD CHPSN, 15 OHMS, 5%, 2W (TEST SELECT)	745-5574-000		81349	RCR426150JS		H10	WASHER,LOCK SST, 0.322 ID X 0.435 OD (QTY 1)
	R5	RESISTOR,FXD CHPSN, 22 OHMS, 5%, 2W (TEST SELECT)	745-5581-000		81349	RCR426220JS		H11	CONTACT,ELEC (QTY 7)
	R5	RESISTOR,FXD CHPSN, 27 OHMS, 5%, 2W (TEST SELECT)	745-5585-000		81349	RCR426270JS		OR	CONTACT,ELEC (QTY 7)
	R5	RESISTOR,FXD CHPSN, 30 OHMS, 5%, 2W (TEST SELECT)	745-5587-000		81349	RCR426300JS		L1	NOT USED
	R5	RESISTOR,FXD CHPSN, 39 OHMS, 5%, 2W (TEST SELECT)	745-5592-000		81349	RCR426390JS		L2-L4	BEAD,ATTEN FERR
	R5	RESISTOR,FXD CHPSN, 47 OHMS, 5%, 2W (TEST SELECT)	745-5595-000		81349	RCR426470JS		L5,L6	CORE,FERRITE
	R5	RESISTOR,FXD CHPSN, 51 OHMS, 5%, 2W (TEST SELECT)	745-5598-000		81349	RCR426510JS		NP1,HP2	EXTRACTOR
	R6	RESISTOR,FXD CHPSN, 560 OHMS, 5%, 2W (TEST SELECT)	745-5641-000		81349	RCR426561JS		HP3	BRACKET
	R6	RESISTOR,FXD CHPSN, 620 OHMS, 5%, 2W (TEST SELECT)	745-5643-000		81349	RCR426621JS		HP4	HEAT SINK
	R6	RESISTOR,FXD CHPSN, 680 OHMS, 5%, 2W (TEST SELECT)	745-5644-000		81349	RCR426681JS		MP5	TERMINAL,STUD (QTY 12)
	R6	RESISTOR,FXD CHPSN, 750 OHMS, 5%, 2W (TEST SELECT)	745-5647-000		81349	RCR426751JS		P1	NOT USED
	R6	RESISTOR,FXD CHPSN, 820 OHMS, 5%, 2W (TEST SELECT)	745-5648-000		81349	RCR426821JS		P2	CONNECTOR,RCPT ELEC
	R6	RESISTOR,FXD CHPSN, 1K, 5%, 2W (TEST SELECT)	745-5651-000		81349	RCR426102JS		Q1,Q2	NOT USED
	R6	RESISTOR,FXD CHPSN, 1.1K, 5%, 2W (TEST SELECT)	745-5654-000		81349	RCR426112JS		Q3	TRANSISTOR
	R6	RESISTOR,FXD CHPSN, 1.3K, 5%, 2W (TEST SELECT)	745-5657-000		81349	RCR426132JS		Q4	TRANSISTOR
	R6	RESISTOR,FXD CHPSN, 1.6K, 5%, 2W (TEST SELECT)	745-5661-000		81349	RC426F182J		R1-R8	NOT USED
	R6	RESISTOR,FXD CHPSN, 2.4K, 5%, 2W (TEST SELECT)	745-5668-000		81349	RCR426242JS		R9-R12	RESISTOR,FXD CHPSN, 2 OHMS, 5%, 1/2W
	R6	RESISTOR,FXD CHPSN, 3.3K, 5%, 2W (TEST SELECT)	745-5672-000		81349	RCR426332JS		R13	RESISTOR,FXD CHPSN, 10 OHMS, 10%, 1/4W
	R6	RESISTOR,FXD CHPSN, 6.8K, 5%, 2W (TEST SELECT)	745-5686-000		81349	RCR426682JS		R14	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W
	R7	RESISTOR,FXD CHPSN, 620 OHMS, 5%, 2W (TEST SELECT)	745-5643-000		81349	RCR426621JS		R15	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W
	R7	RESISTOR,FXD CHPSN, 680 OHMS, 5%, 2W (TEST SELECT)	745-5644-000		81349	RCR426681JS		R16	RESISTOR,FXD CHPSN, 680 OHMS, 10%, 1/4W
	R7	RESISTOR,FXD CHPSN, 750 OHMS, 5%, 2W (TEST SELECT)	745-5647-000		81349	RCR426751JS		R17	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W
	R7	RESISTOR,FXD CHPSN, 820 OHMS, 5%, 2W (TEST SELECT)	745-5648-000		81349	RCR426821JS		R18	RESISTOR,FXD FILM, 715 OHMS, 1%, 1/8W
	R7	RESISTOR,FXD CHPSN, 910 OHMS, 5%, 2W (TEST SELECT)	745-5650-000		81349	RCR426911JS		R19	RESISTOR,FXD FILM, 10K, 1%, 1/8W
	R7	RESISTOR,FXD CHPSN, 1K, 5%, 2W (TEST SELECT)	745-5651-000		81349	RCR426102JS		R20	RESISTOR,VAR NON-WM,500 OHMS, 10%
	R7	RESISTOR,FXD CHPSN, 1.2K, 5%, 2W (TEST SELECT)	745-5655-000		81349	RCR426122JS		R21	RESISTOR,FXD FILM, 10K, 1%, 1/8W
	R7	RESISTOR,FXD CHPSN, 1.5K, 5%, 2W (TEST SELECT)	745-5658-000		81349	RCR426152JS		R22	RESISTOR,FXD CHPSN, 0.10MEGΩ, 10%, 1/4W
	R7	RESISTOR,FXD CHPSN, 1.6K, 5%, 2W (TEST SELECT)	745-5661-000		81349	RCR426162JS		R23	RESISTOR,FXD WM, 3.3 OHMS, 5%, 3W
	R7	RESISTOR,FXD CHPSN, 2.4K, 5%, 2W (TEST SELECT)	745-5668-000		81349	RCR426242JS		R24	RESISTOR,FXD FILM, 10K, 1%, 1/8W
	R7	RESISTOR,FXD CHPSN, 3.3K, 5%, 2W (TEST SELECT)	745-5672-000		81349	RCR426332JS		R25	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W
	R7	RESISTOR,FXD CHPSN, 3.6K, 5%, 2W (TEST SELECT)	745-5675-000		81349	RCR426362JS		R26,R27	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W
	R7	RESISTOR,FXD CHPSN, 7.5K, 5%, 2W (TEST SELECT)	745-5689-000		81349	RCR426752JS		R28	RESISTOR,FXD CHPSN, 2.7K, 10%, 2W
	R8	RESISTOR,FXD WM, 82.0 OHMS, 5%, 3W	747-5383-000		81349	RM69V820		R29	RESISTOR,FXD WM, 0.07 OHMS, 3%, 10W
	R9-R41	NOT USED						R30,R31	RESISTOR,FXD FILM, 10K, 1%, 1/8W
	R42,R43	RESISTOR,FIXED CHPSN, 12 OHMS, 10%, 4W (A1)	712-0153-030 B		10646	234SP005		R32	RESISTOR,FXD FILM, 14.3K, 1%, 1/8W
		PA MODULE CARD A1	642-3116-001 A					R33	RESISTOR,FXD FILM, 14K, 1%, 1/8W
		PA MODULE CARD A1	642-3116-002 B					R34	RESISTOR,VAR NON-WM,500 OHMS, 10%
	C1	CAPACITOR,FXD MICA DIEI, 33PF, 2%, 500V	912-3849-000		81349	CM04ED330G03		R35,R36	RESISTOR,FXD FILM, 10K, 1%, 1/8W
	C2,C3	CAPACITOR,FXD MICA DIEI, 1000PF, 2%, 500V	912-3314-000		57582	KD20102G501		R37,R38	RESISTOR,FXD FILM, 49.9K, 1%, 1/8W
	C4-C7	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K		R39	RESISTOR,FXD CHPSN, 47 OHMS, 10%, 1/4W
	C8-C11	CAPACITOR,FXD CER DIEI, 0.1UF, 30%, 100V	914-1168-030		29990	200B104NHSX100		R40	RESISTOR,FXD CHPSN, 2.7K, 10%, 1W
	C12	CAPACITOR,FXD MICA DIEI, 82PF, 5%, 500V	912-3873-000		81349	CM04ED820J03		R41	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W
	C13	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K		TP1	JACK,TIP BRN
	C14-C19	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K		TP2	JACK,TIP RED
	C20	CAPACITOR,FIXED ELCTLY, 10UF, 10%, 20V	104-9086-460		81349	M39003-01-2286		T1	TRANSFORMER,RF
	C21	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K		T2	TRANSFORMER,RF
	C22	CAPACITOR,FXD CER DIEI, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K		T3,T4	TRANSFORMER,RF
	C23	CAPACITOR,FXD ELCTLY, 22UF, PS0.7M10%, 75V	183-1277-430		56289	600D226F075D05		U1	INTEGRATED CIRCUIT AMPLIFIER
	C24	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K		U2	INTEGRATED CIRCUIT OP AMP
	C25,C26	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K		VR2	SEMICOND DEVICE
	C27,C28	CAPACITOR,FXD CER DIEI, 100PF, 10%, 200V	913-4006-000		81349	CK05BX101K		VR3,VR4	SEMICOND DEVICE
	C29,C30	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K		W1-W3	WIRE,ELEC
	C31	NOT USED						W4	WIRE,ELEC
	C32	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K			
	C33,C34	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K			
	O51	DIODE,LIGHT EMI	353-0293-010			14936 HV5253			
	H1	NUT,PLAIN,HEX SST, 4-40 (QTY 3)	315-0132-000			77250 P313-0132-000			



PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE
H2	WASHER, LOCK SST, 0.115 ID X 0.209 OD (QTY 3)	310-0279-000		96906	H535338-135	
H3	WASHER, FLAT (QTY 3)	502-1515-002			502-1515-002	
H4	SCREW, MACH STL, 4-40 X 5/8 (QTY 2)	343-0135-000		96906	H551957-15	
H5	NUT, PLAIN, HEX SST, 2-56 (QTY 2)	313-0037-000		96906	H535649-224	
H6	WASHER, LOCK SST, 0.102 ID X 0.188 OD (QTY 2)	310-0276-000		70318	310-0276-000	
H7	WASHER, FLAT SST, 0.092 X 0.219 OD (QTY 2)	310-6320-000		79807	310-6320-000	
H8	SCREW, MACH CD PL STL, 2-56 X 5/16 (QTY 2)	343-0125-000		96906	H551957-4	
H9	SCREW, MACH STL, 4-40 X 7/16 (QTY 1)	343-0136-000		96906	H551957-16	
H10	WASHER, LOCK SST, 0.322 ID X 0.435 OD (QTY 1)	373-0084-000		78189	1718-02	
H11	CONTACT, ELEC (QTY 7)	372-2601-063			372-2601-063	
H11	CONTACT, ELEC (QTY 7)	372-2601-563		22526	75481-006	
L1	NOT USED					
L2-L4	BEAD, ATTEN FERR	288-0915-040		72656	AR9702	
L5, L6	CORE, FERRITE	288-1337-080		29251	288-1337-080	
MP1, MP2	EXTRACTOR	150-0815-010		07387	60-2-2	
MP3	BRACKET	642-2641-002				
MP4	HEAT SINK	352-9638-010		13103	6107814	
MP5	TERMINAL, STUD (QTY 12)	306-2723-010		11375	211-622-2	
P1	NOT USED					
P2	CONNECTOR, RCPT ELEC	357-9210-010		24931	33JR103-1	
Q1, Q2	NOT USED					
Q3	TRANSISTOR	352-1083-020		04713	MJE803	
Q4	TRANSISTOR	352-0551-010		04713	2N2907A	
R1-R8	NOT USED					
R9-R12	RESISTOR, FXD CHPSN, 2 OHMS, 5%, 1/2W	745-1870-080		01121	EB2065	
R13	RESISTOR, FXD CHPSN, 10 OHMS, 10%, 1/4W	745-0677-000		81349	RCR07G100KS	
R14	RESISTOR, FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS	
R15	RESISTOR, FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS	
R16	RESISTOR, FXD CHPSN, 680 OHMS, 10%, 1/4W	745-0743-000		81349	RCR07G681KS	
R17	RESISTOR, FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS	
R18	RESISTOR, FXD FILM, 715 OHMS, 1%, 1/8W	705-0989-000		81349	RN5507150F	
R19	RESISTOR, FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F	
R20	RESISTOR, VAR NON-MM, 500 OHMS, 10%	382-0052-240		02111	64X5017623	
R21	RESISTOR, FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F	
R22	RESISTOR, FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS	
R23	RESISTOR, FXD MM, 3.3 OHMS, 5%, 3W	747-5366-000		81349	RM49V3R3	
R24	RESISTOR, FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F	
R25	RESISTOR, FXD CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349	RCR07G471KS	
R26, R27	RESISTOR, FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS	
R28	RESISTOR, FXD CHPSN, 2.7K, 10%, 2W	745-5670-000		81349	RCR42G272KS	
R29	RESISTOR, FXD MM, 0.07 OHMS, 3%, 10W	747-8443-090		91637	RH10X000DR0700H	
R30, R31	RESISTOR, FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F	
R32	RESISTOR, FXD FILM, 14.3K, 1%, 1/8W	705-3605-550		81349	RN5501432F	
R33	RESISTOR, FXD FILM, 14K, 1%, 1/8W	705-1051-000		81349	RN5501402F	
R34	RESISTOR, VAR NON-MM, 500 OHMS, 10%	382-0052-240		02111	64X5017623	
R35, R36	RESISTOR, FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F	
R37, R38	RESISTOR, FXD FILM, 49.9K, 1%, 1/8W	705-3605-510		81349	RN5504992F	
R39	RESISTOR, FXD CHPSN, 47 OHMS, 10%, 1/4W	745-0781-000		81349	RCR07G470KS	
R40	RESISTOR, FXD CHPSN, 2.7K, 10%, 1W	745-3370-000		81349	RCR32G272KS	
R41	RESISTOR, FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS	
TP1	JACK, TIP BRN	360-0162-000		81349	H39024-11-04	
TP2	JACK, TIP RED	360-0160-000		81349	H39024-11-02	
T1	TRANSFORMER, RF	278-0428-110		20462	278-0428-110	
T2	TRANSFORMER, RF	278-0428-020 A		20462	278-0428-020	
T2	TRANSFORMER, RF	278-0428-150 B		20462	278-0428-150	
T3, T4	TRANSFORMER, RF	278-0428-100		20462	278-0428-100	
U1	INTEGRATED CIRCUIT AMPLIFIER	351-1029-010		07263	UA741HM	
U2	INTEGRATED CIRCUIT OP AMP	351-1211-010		04713	MLH1506	
VR1	SEMICOND DEVICE	353-3262-000		12954	1N825A	
VR2	SEMICOND DEVICE	353-6481-290		04713	1N4742A	
VR3, VR4	SEMICOND DEVICE	353-2938-000		01295	1N746A	
W1-W3	WIRE, ELEC	439-4440-000			439-4440-000	
W4	WIRE, ELEC	421-1620-000			421-1620-000	

Note

Configuration history b not recorded in this sec

MODIFICATION

REVISION IDENT	DESCRIPTION OF REVISION REASON FOR CHANGE
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Note

Service Bulletin No 102 convert 646-6406-002 and 642-3118-00

Added: C35 180 pf, 5%, 500V R42, R43 12 ohms, 10%, 4W

Power Amplifier Output Module, Parts Location Diagram Figure 3 (Sheet 2)

DART OF LABEL

SR	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE
79-000		96906	HS35338-135	
15-002			502-1515-002	
35-000		96906	HS51957-15	
37-000		96906	HS35649-224	
76-000		70318	310-0276-000	
20-000		79807	310-6320-000	
25-000		96906	HS51957-4	
36-000		96906	HS51957-16	
84-000		78189	1718-02	
01-063			372-2601-063	
01-563		22526	75481-006	
15-040		72656	AR9702	
37-080		29251	288-1337-080	
15-010		07387	60-2-2	
41-002				
38-010		13103	6107814	
23-010		11375	211-622-2	
10-010		24931	33JR103-1	
83-020		04713	HJE803	
51-010		04713	2N2907A	
70-080		01121	EB2065	
77-000		81349	RCR076100KS	
85-000		81349	RCR076103KS	
73-000		81349	RCR076472KS	
43-000		81349	RCR076681KS	
85-000		81349	RCR076103KS	
89-000		81349	RN5507150F	
44-000		81349	RN5501002F	
52-240		02111	64X501T623	
44-000		81349	RN5501002F	
321-000		81349	RCR076104KS	
66-000		81349	RM69V3R3	
44-000		81349	RN5501002F	
737-000		81349	RCR076471KS	
785-000		81349	RCR076103KS	
70-000		81349	RCR426272KS	
443-090		91637	RH10X000DR0700H	
44-000		81349	RN5501002F	
405-550		81349	RN5501432F	
51-000		81349	RN5501402F	
52-240		02111	64X501T623	
44-000		81349	RN5501002F	
505-810		81349	RN5504992F	
701-000		81349	RCR076470KS	
370-000		81349	RCR386272KS	
785-000		81349	RCR076103KS	
162-000		81349	M39024-11-04	
160-000		81349	M39024-11-02	
428-110		20462	278-0428-110	
428-020 A		20462	278-0428-020	
428-150 B		20462	278-0428-150	
428-100		20462	278-0428-100	
029-010		07263	UA741HM	
211-010		04713	MLM1506	
262-000		12954	1N825A	
481-290		04713	1N4742A	
938-000		01295	1N746A	
440-000			439-4440-000	
620-000			421-1620-000	

Note

Configuration history before 1 April 1982 is not recorded in this section.

MODIFICATION HISTORY

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
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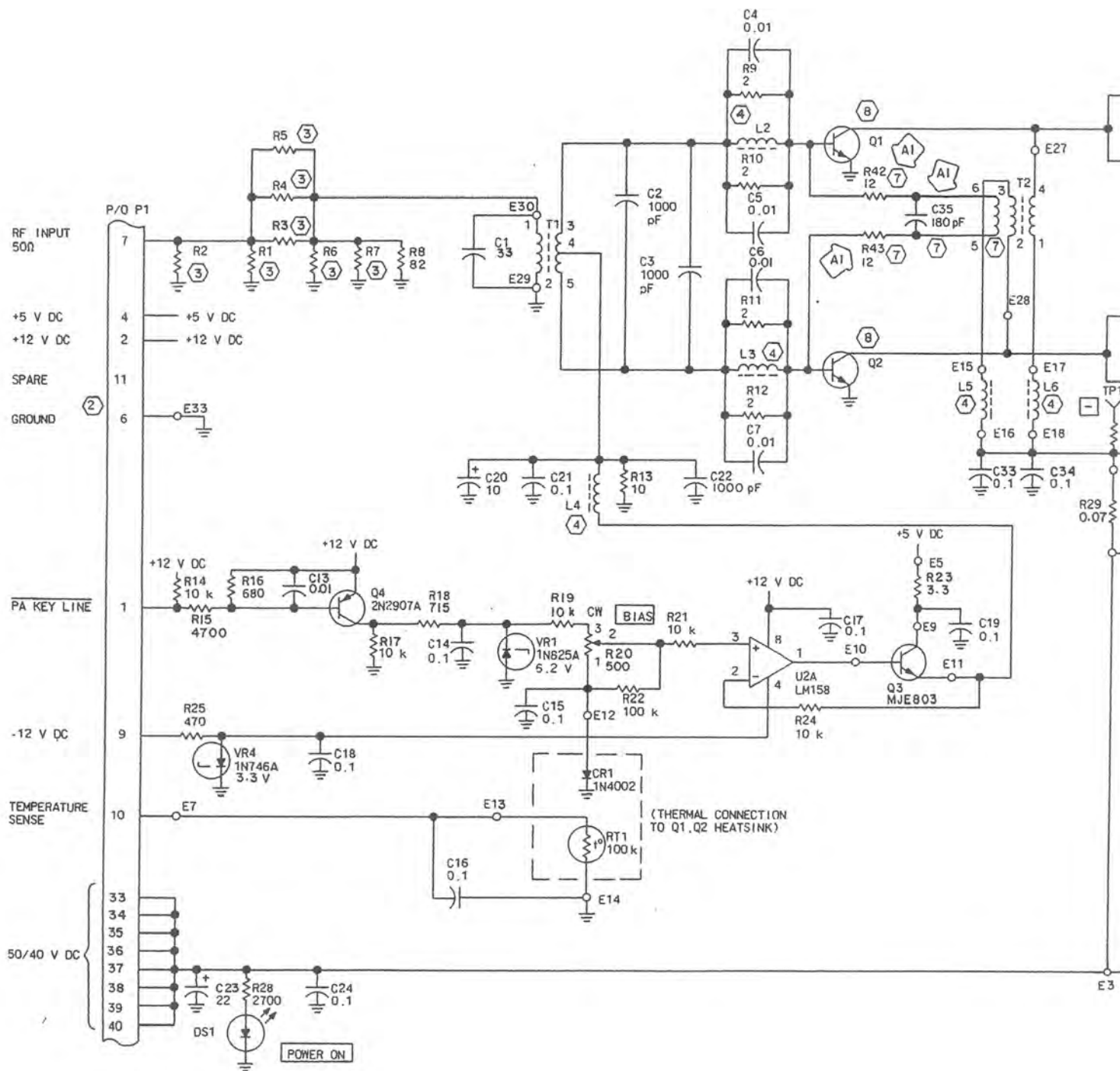
Note

Service Bulletin No 102 converts 646-6406-001 to 646-6406-002 and 642-3116-001 to 642-3116-002.

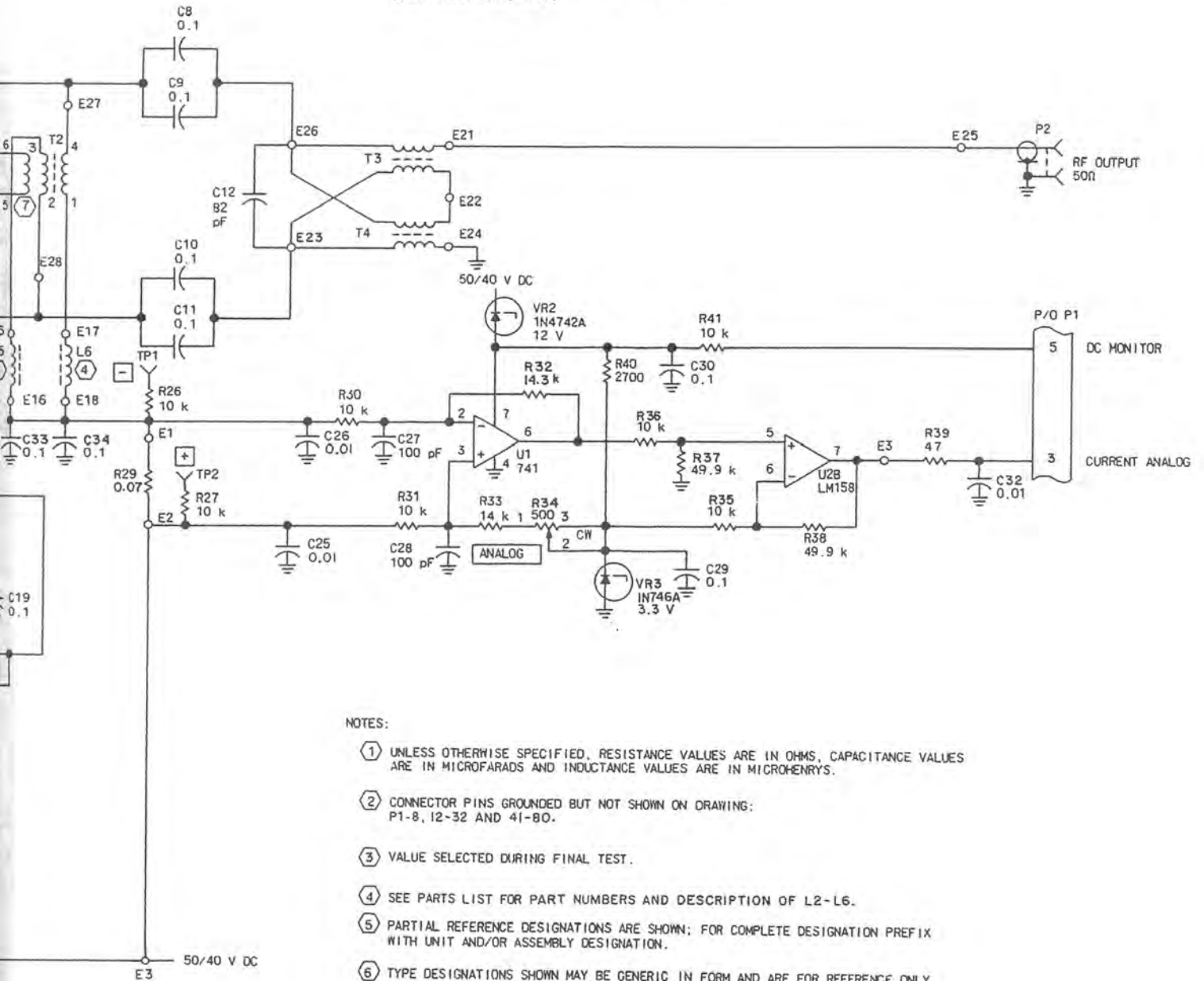
A1	Added: C35 180 pf, 5%, 500V R42, R43 12 ohms, 10%, 4W	646-6406-002 REV H SB 102
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Power Amplifier Output Module,  
Parts Location Diagram  
Figure 3 (Sheet 2)

PART  
OF  
LARGE



PA OUTPUT MODULE A3, A4, A5 OR A6  
(646 - 6406 -001, -002)



NOTES:

- ① UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS AND INDUCTANCE VALUES ARE IN MICROHENRYS.
- ② CONNECTOR PINS GROUNDED BUT NOT SHOWN ON DRAWING: P1-8, I2-32 AND 41-80.
- ③ VALUE SELECTED DURING FINAL TEST.
- ④ SEE PARTS LIST FOR PART NUMBERS AND DESCRIPTION OF L2-L6.
- ⑤ PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
- ⑥ TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.
- ⑦ R42, R43, C35, AND T2 WINDING 5-6 NOT USED ON -001 STATUS OF PA OUTPUT MODULE.
- ⑧ Q1 AND Q2, PART NUMBER 352-8531-Q20, ARE A MATCHED PAIR AND MUST BE REPLACED AS A SET.

647-7194  
TPA-5041-014

Power Amplifier Output Module,  
Schematic Diagram  
Figure 4



Rockwell  
International

instructions

Power Combiner  
(646-7120-001)

# Power Combiner (646-7120-001)

Collins Telecommunications Products Division

523-0771762-001211

15 September 1982

Printed in USA

## 1. DESCRIPTION

Power Combiner 646-7120-001 (figure 1) is a modular assembly consisting of two component mounting boards, a heat sink, and a modular enclosure. Cooling

air required by the power combiner is supplied over the heat sink fins by blowers in the power amplifier assembly. Rf inputs to the power combiner are supplied through four BNC connectors and the rf output is supplied by a type N connector.

(To be supplied)

Power Combiner  
Figure 1

523-0771762-001211

## **2. PRINCIPLES OF OPERATION**

The power combiner receives four rf inputs of approximately equal value, adds them through inductive coupling, and supplies an output which is at or near the sum of the four inputs. Note that when the inputs are all 250 watts, the output will be at or near 1000 watts, allowing for a slight loss between the inductive coupling of the input and output ports. If one input is lost, the output drops to one-half (or 500 watts). If two inputs are lost, the output drops to one-fourth (or 250 watts). Note that when inputs are lost, the output is reduced considerably. This is due to dissipation of the applied rf input signals in the unused rf input ports.

## **3. TESTING/TROUBLESHOOTING PROCEDURES**

A defective power combiner can be returned to a Rockwell-Collins authorized repair facility for

repair. Contact the nearest Rockwell-Collins office or

Collins Telecommunications Products Division  
Attention: HF Products  
400 Collins Road, NE  
Cedar Rapids, Iowa 52498

for information and instructions.

## **4. ALIGNMENT/ADJUSTMENT**

(Not applicable)

## **5. REPAIR**

Repair is accomplished using standard shop practices.

## 6. PARTS LIST/DIAGRAMS

### 6.1 Introduction

This paragraph assists in identification and requisition of parts. A parts location illustration, parts list tabulation, reference designation index, modification history, and schematic diagram are included in this instruction section. Parts listed meet critical equipment design specification requirements. Use only part numbers specified in this parts list for replacement of parts.

### 6.2 Group Assembly Parts List

FIG-ITEM Column — Digits preceding the dash refer to figure numbers. Digits following the dash are item numbers assigned in sequence to correspond with item numbers on the illustrations; the applicable sheet number will precede the index number, separated by a dash.

PART NO Column — Listed are MIL standard, vendor, or Collins part numbers. Collins part numbering system consists of 10 digits as follows: a 3-digit family number, a 4-digit serial number, and a 3-digit dash number.

INDENT Column — Items are coded 1, 2, 3, etc. to indicate the relationship to the next higher assembly.

DESCRIPTION Column — Listed are the noun name, modifier, descriptive information, federal manufacturer's code, reference designation, attaching part (AP), reference to other figures, and effectivities.

Attaching parts are identified by (AP) following the part or parts they attach.

Effectivities are identified by the following methods: MCN (Manufacturer Control Number) 101 and up; CI (Configuration Identifier) 5-digit number; REV (Revision Identifier) dash (—) denotes original, letter A first change, letter B second change, etc. One of the above identifiers is listed on each chassis and/or replaceable assembly. Service Bulletins are identified by SB 1, SB 2, etc.

UNITS PER ASSY Column — Quantities specified are per item number. Letters AR denote the selection of parts as required. Letters REF refer to an assembly completely assembled on a preceding figure and illustration.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

### 6.3 How To Use This Parts List

To locate a part number, locate the part and its index number on the illustration and find the index number on the Group Assembly Parts List page to determine its description and part number.

To locate the illustration for a part, if the reference designation is known, refer to the Reference Designation Index and find the symbol. Turn to the Group Assembly Parts List and find the figure and index number indicated in the index.

### 6.4 Manufacturer's Code, Name, and Address

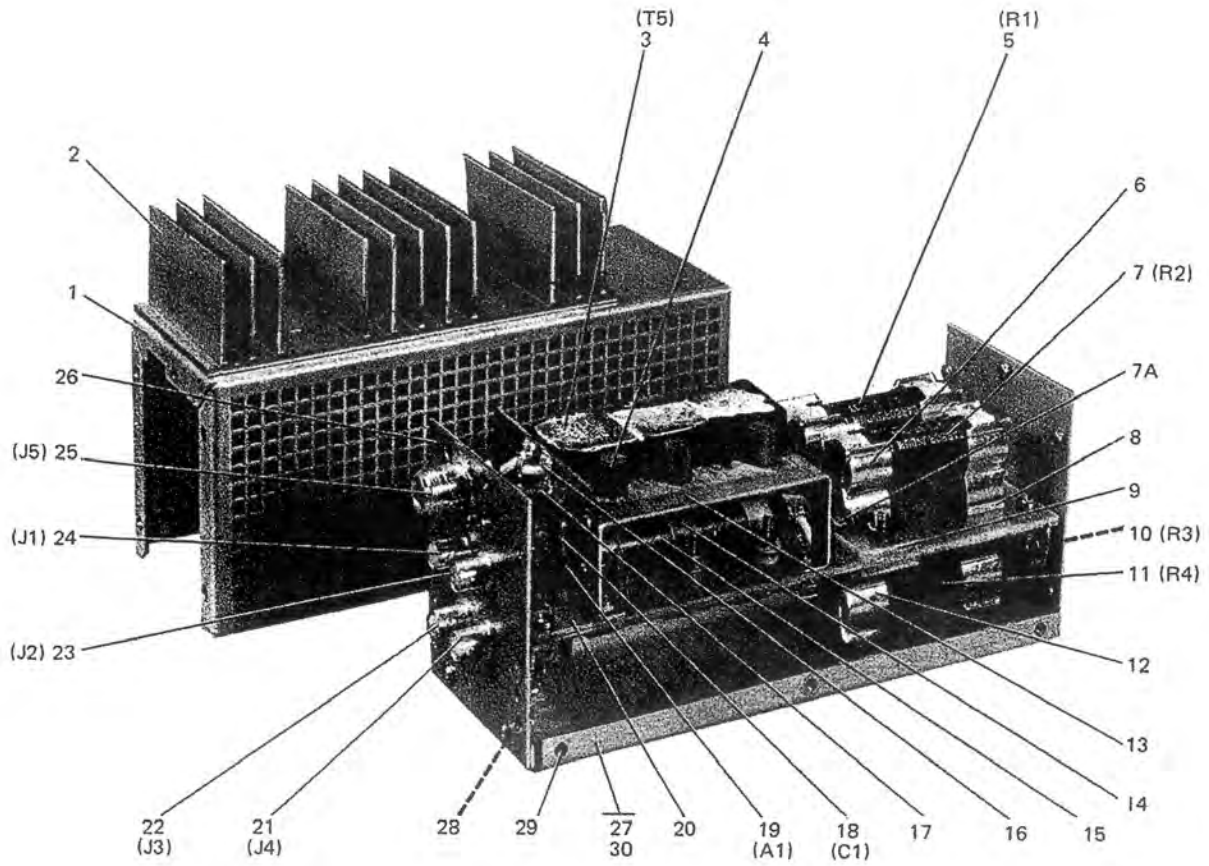
<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
10646	CARBORUNDUM CO THE P O BOX 337 NIAGARA FALLS NY 14302
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV 855 35TH ST NE P O BOX 728 CEDAR RAPIDS IA 52498
55943	AMRAD CORP 349 BONHAM ST P O BOX 876 PARIS TX 75460
72962	ESNA DIV OF AMERACE CORP 2330 VAUXHALL ROAD UNION NJ 07083
73899	JFD ELECTRONICS COMPONENTS CORP 112 MOTT ST OCEANSIDE NY 11572
77250	ALLIED PRODUCTS CORP PHEOLL MFG CO DIV 5700 W ROOSEVELT RD CHICAGO IL 60650
78488	STACKPOLE CARBON CO ST MARYS PA 15857
80302	MULTI ELECTRICAL MFG INC 4223-43 WEST LAKE ST CHICAGO IL 60624
81349	MILITARY SPECIFICATIONS
88044	AERONAUTICAL STANDARD
96906	MILITARY STANDARD

**6.5 Equipment Covered**

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions. Configuration history before 1 April 1982 is not recorded in this section.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Power Combiner	646-7120-001	REV D





TPA-3849-017

1-  
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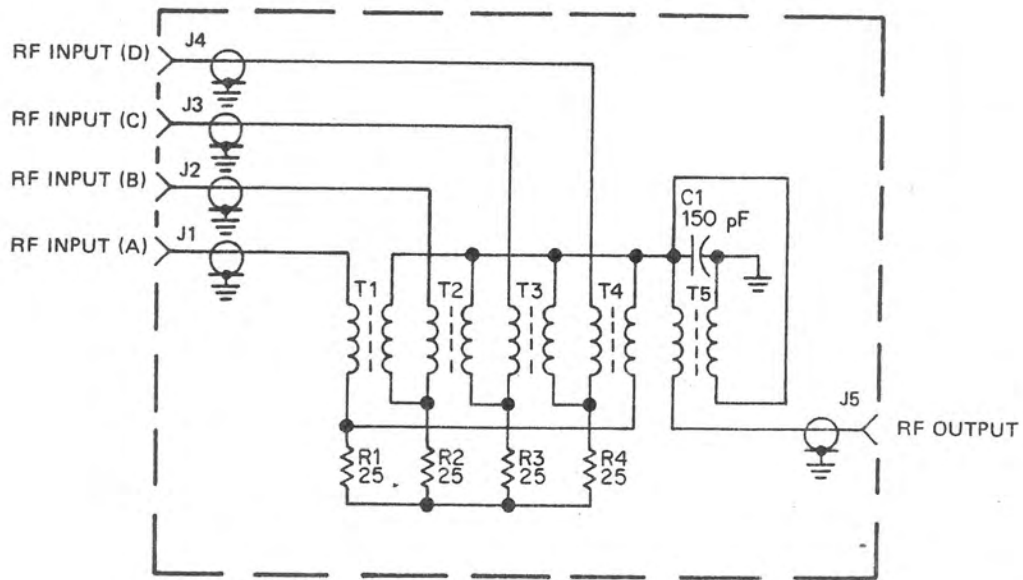
GROUP ASSEMBLY PARTS LIST

REFERENCE DESIGNATION INDEX

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
1-	646-7120-001	1	POWER COMBINER A7	1	
1	646-7116-001	2	COVER, CHASSIS-COMBINER		
	HSS1957-27	2	SCREW,MACH SST, 6-32 X 5/16 (96906) 343-0168-000 (AP)	16	
	HSS1957-13	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP)	4	
2	646-7165-001	2	HEATSINK, COMBINER	1	
	HSS1957-27	2	SCREW,MACH SST, 6-32 X 5/16 (96906) 343-0168-000 (AP)	6	
3	57-0503	2	CORE,BALLUM (78488) 288-0912-040 A7T5	3	
4	500-8921-001	2	POST, ELEC-MECH	6	
	AH961-6T	2	WASHER,FLAT TP BRS, 0.149 ID X 0.375 OD (88044) 310-0751-040 (AP)	6	
5	218SP003	2	RESISTOR,FXD CHPSN, 25 OHMS, 10%, 30M (10646) 712-0082-000 R1	1	
6	2022SILPL001	2	CLIP,FUSE (80302) 265-1001-000	4	
	P313-0056-000	2	NUT,PLAIN,HEX NP BRS, 10-32 (77250) 313-0056-000 (AP)	3	
	HS35338-100	2	WASHER,SPRING CD PL BRZ, 0.194 ID X 0.334 OD (96906) 310-0100-000 (AP)	3	
	P343-0349-000	2	SCREW,MACH NP BRS, 10-32 X 3/4 (77250) 343-0349-000 (AP)	1	
	P343-0203-000	2	SCREW,MACH SST, 8-32 X 3-3/4 (77250) 343-0203-000 (AP)	2	
7	218SP003	2	RESISTOR,FXD CHPSN, 25 OHMS, 10%, 30M (10646) 712-0082-000 R2	1	
7A	646-7157-001	2	STRAP, RESISTOR	4	
8	646-7147-001	2	PLATE, SPACER	2	
9	646-7146-001	2	BOARD, INSULATOR	2	
	HS35650-304	2	NUT,PLAIN,HEX SST, 10-32 (96906) 313-0019-000 (AP)	2	
	HS35338-138	2	WASHER,LOCK SST, 0.194 ID X 0.334 OD (96906) 310-0284-000 (AP)	2	
	HSS1958-64	2	SCREW,MACH SST, 10-32 X 5/8 (96906) 343-0229-000 (AP)	2	
10	218SP003	2	RESISTOR,FXD CHPSN, 25 OHMS, 10%, 30M (10646) 712-0082-000 R3	1	
11	218SP003	2	RESISTOR,FXD CHPSN, 25 OHMS, 10%, 30M (10646) 712-0082-000 R4	1	
12	2022SILPL001	2	CLIP,FUSE (80302) 265-1001-000	4	
	P313-0056-000	2	NUT,PLAIN,HEX NP BRS, 10-32 (77250) 313-0056-000 (AP)	3	
	HS35338-100	2	WASHER,SPRING CD PL BRZ, 0.194 ID X 0.334 OD (96906) 310-0100-000 (AP)	3	
	P342-0203-000	2	SCREW,MACH NP BRS, 10-32 X 3/8 (77250) 342-0203-000 (AP)	2	
	P343-0349-000	2	SCREW,MACH NP BRS, 10-32 X 3/4 (77250) 343-0349-000 (AP)	2	
13	646-7118-001	2	BRACKET, SUPPORT	1	
	HS35649-244	2	NUT,PLAIN,HEX SST, 4-40 (96906) 313-0043-000 (AP)	6	
	HS35338-135	2	WASHER,LOCK SST, 0.115 ID X 0.209 OD (96906) 310-0279-000 (AP)	6	
	HSS1957-27	2	SCREW,MACH SST, 6-32 X 5/16 (96906) 343-0168-000 (AP)	6	
	HSS1957-14	2	SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000 (AP)	6	
14	610-0008	2	CLAMP,LOOP (55943) 150-1545-000	12	
	P313-0143-000	2	NUT,PLAIN,HEX NP BRS, 8-32 (77250) 313-0143-000 (AP)	6	
	HS35338-98	2	WASHER,SPRING CD PL BRZ, 0.141 ID X 0.250 OD (96906) 310-0096-000 (AP)	6	
	AH961-6T	2	WASHER,FLAT TP BRS, 0.149 ID X 0.375 OD (88044) 310-0751-040 (AP)	36	
	P343-0336-000	2	SCREW,MACH NP BRS, 6-32 X 1 (77250) 343-0336-000 (AP)	6	
15	57-3238	2	CORE,FERRITE (78488) 288-1337-060 T1-T4	12	
16	646-7155-001	2	STRAP, TERMINAL	1	
17	646-7156-001	2	STRAP, TERMINAL	1	
18	UFP11516	2	CAPACITOR,FXD CER DIEL, 150PF, 2%, 2500V (73899) 914-3101-570 C1	1	
19	600-1996-860	2	BOARD,COMBINER A1	1	
20	646-7117-001	2	BOARD, COMPONENT	1	
	HS35650-304	2	NUT,PLAIN,HEX SST, 10-32 (96906) 313-0019-000 (AP)	4	
	HS35338-138	2	WASHER,LOCK SST, 0.194 ID X 0.334 OD (96906) 310-0284-000 (AP)	4	
	HSS1958-64	2	SCREW,MACH SST, 10-32 X 5/8 (96906) 343-0229-000 (AP)	4	
21	H39012-21-0001	2	CONNECTOR,RCPT ELEC (81349) 357-9670-000 J4	1	
22	H39012-21-0001	2	CONNECTOR,RCPT ELEC (81349) 357-9670-000 J3	1	
23	H39012-21-0001	2	CONNECTOR,RCPT ELEC (81349) 357-9670-000 J2	1	
24	H39012-21-0001	2	CONNECTOR,RCPT ELEC (81349) 357-9670-000 J1	1	
25	H39012-04-0002	2	CONNECTOR,RCPT ELEC (81349) 357-9003-000 J5	1	
26	646-7119-001	2	PLATE, CONNECTOR- PRSD	1	
	P313-0053-000	2	NUT,PLAIN,HEX NP BRS, 6-32 (77250) 313-0053-000 (AP)	2	
	HS35649-244	2	NUT,PLAIN,HEX SST, 4-40 (96906) 313-0043-000 (AP)	5	
	HS35338-98	2	WASHER,SPRING CD PL BRZ, 0.141 ID X 0.250 OD (96906) 310-0096-000 (AP)	2	
	HS35338-135	2	WASHER,LOCK SST, 0.115 ID X 0.209 OD (96906) 310-0279-000 (AP)	5	
	HSS1957-28	2	SCREW,MACH SST, 6-32 X 3/8 (96906) 343-0169-000 (AP)	2	
	HSS1957-15	2	SCREW,MACH STL, 4-40 X 3/8 (96906) 343-0135-000 (AP)	1	
	HSS1959-14	2	SCREW,MACH SST, 4-40 X 5/16 (96906) 342-0045-000 (AP)	4	
27	646-7115-001	2	CHASSIS, COMBINER- PRSD	1	
28	R12NCFM1-82	3	NUT,SFLKGD CD PL STL, 8-32 (72962) 333-0843-000	4	
29	R12NCFM1-62	3	NUT,SFLKGD CD PL STL, 6-32 (72962) 333-0841-000	11	
30	646-7115-002	3	CHASSIS, COMBINER	1	

REFERENCE DESIGNATION	FIG-ITEM	PART NUMBER
A1	1-	646-7120-001
C1	1-19	600-1996-860
J1	1-18	UFP11516
J2	1-24	H39012-21-0001
J3	1-23	H39012-21-0001
J4	1-22	H39012-21-0001
J5	1-21	H39012-21-0001
R1	1-25	H39012-04-0002
R2	1-5	218SP003
R3	1-7	218SP003
R4	1-10	218SP003
T1-T4	1-11	218SP003
T5	1-15	57-3238
	1-3	57-0503

Power Combiner, Parts Location Diagram  
Figure 2



TPA-4671-011

Power Combiner, Schematic Diagram  
Figure 3



**Rockwell  
International**

**instructions**

LOW-PASS FILTER ASSEMBLY  
(646-6400-001, -002)

# Low-Pass Filter Assembly (646-6400-001, -002)

Collins Telecommunications Products Division

523-0771763-001211

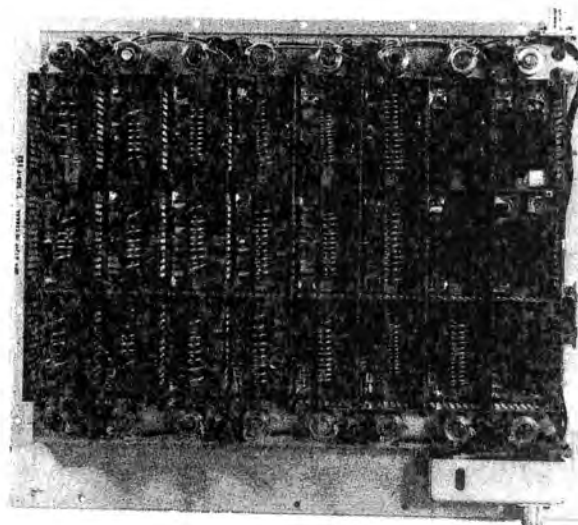
15 September 1982

Printed in USA

## 1. DESCRIPTION

Low-Pass Filter Assembly 646-6400-001, -002 (figure 1) is a modular assembly consisting of a directional coupler; a filter circuit board; a base plane for mounting switching relays, circuit board, and directional coupler; and a cage type rf enclosure for the low-pass filters. Cooling air required by the low-

pass filter assembly is supplied throughout the cage type rf enclosure by blowers in the power amplifier assembly. The rf input to the low-pass filter is supplied through a type N connector (J1) and the rf output is supplied through another type N connector (J6). Control signals are supplied through a 15-pin Cannon connector (J3).



TPA - 4665 - 017

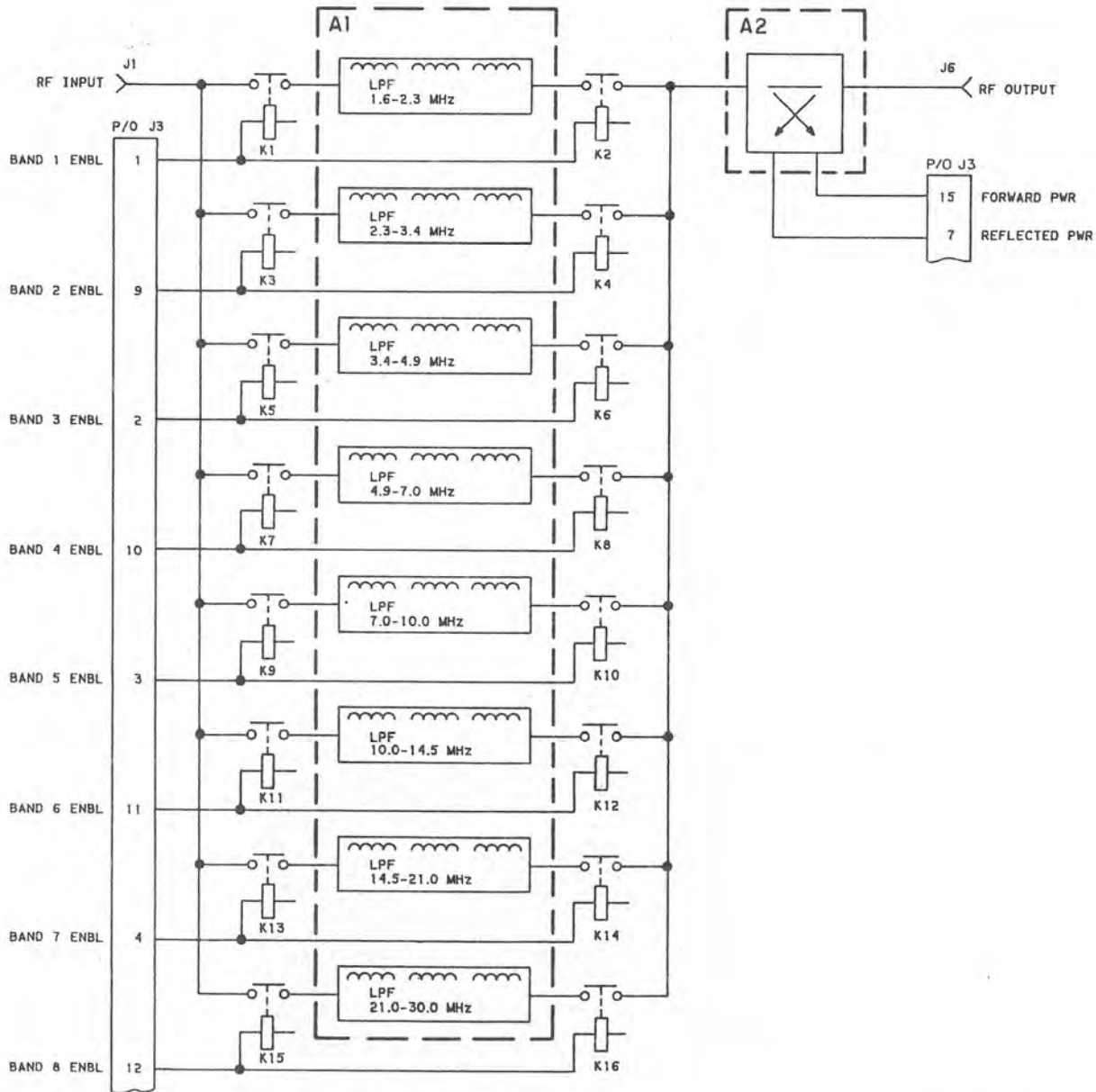
Low-Pass Filter Assembly (Top Cover Removed)  
Figure 1

523-0771763-001211

**2. PRINCIPLES OF OPERATION (Refer to figure 2)**

The low-pass filter assembly receives a 1.6- to 30.0-MHz rf signal input at J1, provides low-pass harmonic filtering, and supplies a filtered rf output at

J6. Filter control is provided for by the band enable signals at J3. Forward power monitor and reflected power monitor signals are also provided at J3 and indicate the rf power output of the low-pass filter assembly and the power reflected to the low-pass filter assembly.



TPA-4667-014

Low-Pass Filter Assembly, Simplified Block Diagram  
Figure 2

**3. TESTING/TROUBLESHOOTING PROCEDURES**

A defective low-pass filter assembly can be returned to a Rockwell-Collins authorized repair facility for repair. Contact the nearest Rockwell-Collins office or

Collins Telecommunications Products Division  
Attention: HF Products  
400 Collins Road, NE  
Cedar Rapids, Iowa 52498

for information and instructions.

**4. ALIGNMENT/ADJUSTMENT**

Alignment/adjustment is performed in conjunction with testing/troubleshooting.

**5. REPAIR**

Repair is accomplished using standard shop practices.

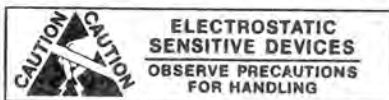
## 6. PARTS LIST/DIAGRAMS

### 6.1 Introduction

**Caution**

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All parts list illustrations containing ESDS items are shown with the following symbol:



This paragraph assists in identification and requisition of parts. A parts location illustration, parts list tabulation, reference designation index, modification history, and schematic diagram are included. Parts listed meet critical equipment design specification requirements. Use only part numbers specified in this parts list for replacement of parts.

### 6.2 Group Assembly Parts List

**FIG-ITEM Column** — Digits preceding the dash refer to figure numbers. Digits following the dash are item numbers assigned in sequence to correspond with item numbers on the illustrations; the applicable sheet number will precede the index number, separated by a dash.

**PART NO Column** — Listed are MIL standard, vendor, or Collins part numbers. Collins part numbering system consists of 10 digits as follows: a 3-digit family number, a 4-digit serial number, and a 3-digit dash number.

**INDENT Column** — Items are coded 1, 2, 3, etc, to indicate the relationship to the next higher assembly.

**DESCRIPTION Column** — Listed are the noun name, modifier, descriptive information, federal manufacturer's code, reference designation, attaching part (AP), reference to other figures, and effectivities.

Attaching parts are identified by (AP) following the part or parts they attach.

Effectivities are identified by the following methods: MCN (Manufacturer Control Number) 101 and up; CI (Configuration Identifier) 5-digit number; REV (Revision Identifier) dash (-) denotes original, letter A first change, letter B second change, etc. One of the above identifiers is listed on each chassis and/or replaceable assembly. Service Bulletins are identified by SB1, SB2, etc.

**UNITS PER ASSY Column** — Quantities specified are per item number. Letters AR denote the selection of parts as required. Letters REF refer to an assembly completely assembled on a preceding figure and illustration.

**USABLE ON CODE Column** — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

### 6.3 How to Use This Parts List

To locate a part number, locate the part and its index number on the illustration and find the index number on the Group Assembly Parts List page to determine its description and part number.

To locate the illustration for a part, if the reference designation is known, refer to the Reference Designation Index and find the symbol. Turn to the Group Assembly Parts List and find the figure and index number indicated in the index.

### 6.4 Manufacturer's Code, Name, and Address

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
04713	MOTOROLA INC SEMICONDUCTOR GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
05411	DU PAGE MFG CO 2250 CURTISS AVE DOWNERS GROVE IL 60515
06383	PANDUIT CORP 17301 RIDGELAND TINLEY PARK IL 60477
12615	U S TERMINALS INC 7504 CAMARGO ROAD CINCINNATI OH 45243

MFR      MANUFACTURER'S NAME  
CODE      AND ADDRESS

13499      ROCKWELL INTERNATIONAL CORP  
            COLLINS TELECOMMUNICATIONS  
            PRODUCTS DIV  
            855 35TH ST NE  
            P O BOX 728  
            CEDAR RAPIDS IA 52498

23056      WESTERN UNION TELEGRAPH CO  
            GOVERNMENT SYSTEMS DIV  
            7916 WESTPARK DR  
            MCLEAN VA 22101

27601      AERO STOP NUT CORP  
            191 FABYAN PLACE  
            NEWARK NJ 07112

28480      HEWLETT-PACKARD CO  
            CORPORATE HQ  
            3000 HANOVER ST  
            PALO ALTO CA 94304

71279      CAMBRIDGE THERMIONIC CORP  
            445 CONCORD AVE  
            CAMBRIDGE MA 02138

71468      ITT CANNON ELECTRIC  
            DIV OF INTERNATIONAL TELEPHONE AND  
            TELEGRAPH CORP  
            10550 TALBERT AVE  
            P O BOX 8040  
            FOUNTAIN VALLEY CA 92708

73899      JFD ELECTRONICS COMPONENTS CORP  
            112 MOTT ST  
            OCEANSIDE NY 11572

73949      GUARDIAN ELECTRIC MFG CO  
            1550 W CARROLL AVE  
            CHICAGO IL 60607

77147      PATTON-MACGUYER CO  
            DIV OF AVID CORP  
            17 VIRGINIA AVE  
            PROVIDENCE RI 02905

77250      ALLIED PRODUCTS CORP  
            PHEOLL MFG CO DIV  
            5700 W ROOSEVELT RD  
            CHICAGO IL 60650

78189      ILLINOIS TOOL WORKS INC  
            SHAKEPROOF DIVISION  
            ST CHARLES ROAD  
            ELGIN IL 60120

80205      NATIONAL AEROSPACE STANDARD

80294      BOURNS INSTRUMENTS INC  
            6135 MAGNOLIA AVE  
            RIVERSIDE CA 92506

81349      MILITARY SPECIFICATIONS

81840      LEDEX INC  
            801 SCHOLZ DR  
            P O BOX 427  
            VANDALIA OH 45377

MFR      MANUFACTURER'S NAME  
CODE      AND ADDRESS

95275      VITRAMON INC  
            BOX 544  
            BRIDGEPORT CT 06601

96906      MILITARY STANDARD

*6.5 Reference Designation Prefixes*

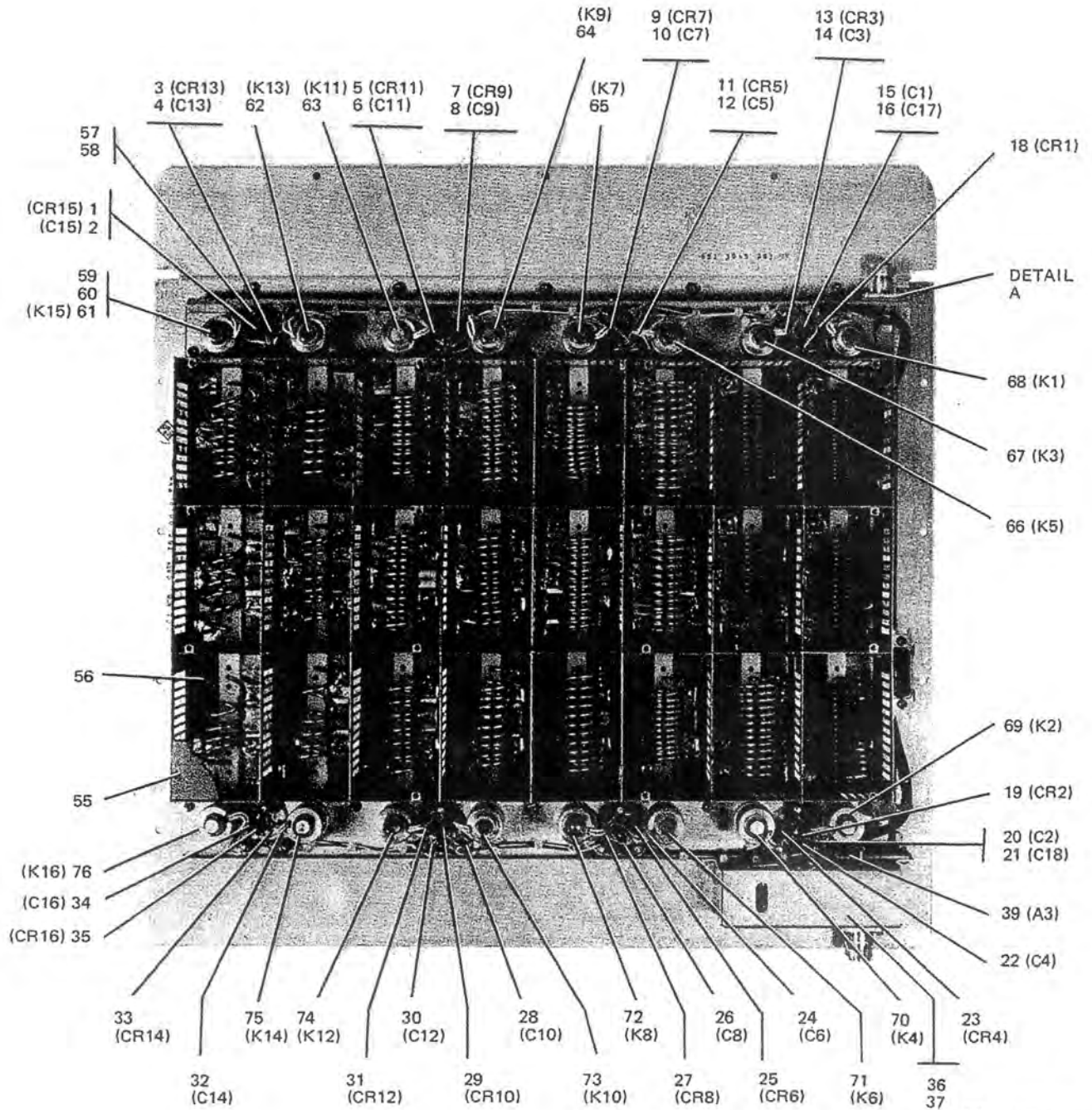
<u>PREFIX</u>	<u>UNIT</u> <u>PART NUMBER</u>	<u>FIG-</u> <u>ITEM</u>
A1	638-6964-001	4-
A1	638-6964-002	4-
A2	642-2634-001	5-

*6.6 Equipment Covered*

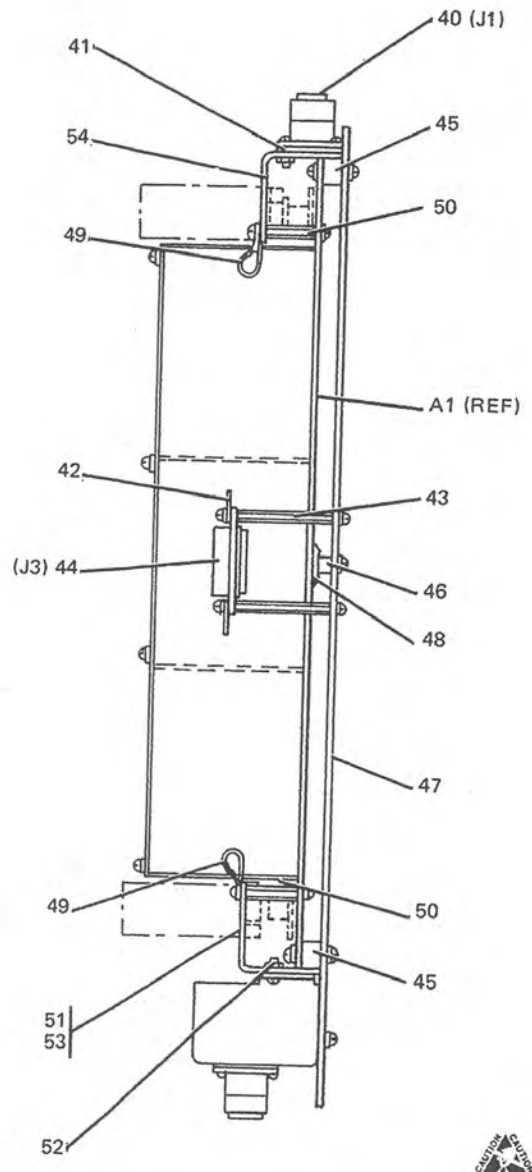
Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions. Configuration history before 1 April 1982 is not recorded in this section.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS</u> <u>PART</u> <u>NUMBER</u>	<u>LATEST</u> <u>EFFECTIVITY</u>
Low-Pass Filter Assembly	646-6400-001	REV G
Low-Pass Filter Assembly	646-6400-002	REV H
Low-Pass Filter Card A1	638-6964-001	REV J
Low-Pass Filter Card A1	638-6964-002	REV J
Directional Coupler A2	642-2634-001	REV D





CAUTION  
 ELECTROSTATIC SENSITIVE DEVICES  
 OBSERVE PRECAUTIONS FOR HANDLING



DETAIL A



TPA-3816-027

Low-Pass Filter Assembly, Parts Location Diagram  
Figure 3 (Sheet 1 of 2)

## GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
3-	646-6400-001	1	LOW-PASS FILTER ASSY (ESDS)	1	A
	646-6400-002	1	LOW-PASS FILTER ASSY (ESDS)	1	B
1	1N4007	2	SEMICONV DEVICE (04713) 353-6442-070 CR15	1	
2	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C15		
3	1N4007	2	SEMICONV DEVICE (04713) 353-6442-070 CR13	1	
4	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C13		
5	1N4007	2	SEMICONV DEVICE (04713) 353-6442-070 CR11	1	
6	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C11		
7	1N4007	2	SEMICONV DEVICE (04713) 353-6442-070 CR9	1	
8	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C9		
9	1N4007	2	SEMICONV DEVICE (04713) 353-6442-070 CR7	1	
10	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C7		
11	1N4007	2	SEMICONV DEVICE (04713) 353-6442-070 CR5	1	
12	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C5		
13	1N4007	2	SEMICONV DEVICE (04713) 353-6442-070 CR3	1	
14	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C3		
15	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C1		
16	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C17		
17			NOT USED		
18	1N4007	2	SEMICONV DEVICE (04713) 353-6442-070 CR1	1	
19	1N4007	2	SEMICONV DEVICE (04713) 353-6442-070 CR2	1	
20	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C2		
21	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C18		
22	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C4		
23	1N4007	2	SEMICONV DEVICE (04713) 353-6442-070 CR4	1	
24	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C6		
25	1N4007	2	SEMICONV DEVICE (04713) 353-6442-070 CR6	1	
26	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C8		
27	1N4007	2	SEMICONV DEVICE (04713) 353-6442-070 CR8	1	
28	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C10		
29	1N4007	2	SEMICONV DEVICE (04713) 353-6442-070 CR10	1	
30	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C12		
31	1N4007	2	SEMICONV DEVICE (04713) 353-6442-070 CR12	1	
32	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C14		
33	1N4007	2	SEMICONV DEVICE (04713) 353-6442-070 CR14	1	
34	CK06BX104K	2	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 100V (81349)	1	
			913-5019-440 C16		
35	1N4007	2	SEMICONV DEVICE (04713) 353-6442-070 CR16	1	
36	646-6395-001	2	HOUSING, COUPLER	1	
	MS51959-12	2	SCREW,MACH SST, 4-40 X 3/16 (96906) 342-0043-000 (AP)	2	
	MS51957-14	2	SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000 (AP)	2	
	P325-0063-000	2	SCREW,MACH SST, 6-32 X 5/16 (77250) 325-0063-000 (AP)	1	
37	333-1455-030	3	NUT,SELF-LOCKING CD PL STL, 6-32 (27601)	1	
38	646-6395-002	3	HOUSING	1	
39	642-2634-001	2	COUPLER, DIRECTIONAL (ESDS) A2 (SEE FIG 5)	1	
	MS51957-13	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP)	1	
	MS35338-97	2	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (96906)	1	
			310-0095-000 (AP)		
40	M39012-04-0002	2	CONNECTOR,RCPT ELEC (81349) 357-9003-000 J1	1	
	MS51957-13	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP)	1	
	MS51957-16	2	SCREW,MACH STL, 4-40 X 7/16 (96906) 343-0136-000 (AP)	4	
	MS35338-97	2	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (96906)	5	
			310-0095-000 (AP)		
	3017	2	TERMINAL,LUG (77147) 304-3000-000 (AP)	2	
	P313-0132-000	2	NUT,PLAIN,HEX SST, 4-40 (77250) 313-0132-000 (AP)	2	
41	642-2625-001	2	SHIM,CONN	2	
42	0110278	2	END LATCH ASSY (71468) 371-0040-070	1	
43	540-9053-003	2	POST,HEX	2	
44	04M15P	2	CONNECTOR,RCPT ELEC (71468) 371-0169-000 J3	1	
	P325-0181-230	2	SCREW,MACH SST, 4-40 X 5/16 (77250) 325-0181-230 (AP)	2	
			FOR 43)		
	NAS620C4L	2	WASHER,FLAT PSVT CRES, 0.115 ID X 0.209 OD (80205)	1	
			310-0740-200 (AP FOR 43)		
	4007-6HT	2	TERMINAL,LUG (77147) 304-0016-000 (AP FOR 43)	1	
	MS51957-13	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP)	2	
			FOR 44)		
	MS35338-97	2	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (96906)	4	
			310-0095-000 (AP FOR 43,44)		
45	642-2628-001	2	BAR,SUPPORT	2	A
45	642-2628-001	2	BAR,SUPPORT (EFF TO REV LTR H)	2	B
45	642-2628-002	2	BAR,SUPPORT (EFF REV LTR H)	2	B
46	642-2647-001	2	BAR,SUPPORT	1	A
46	642-2647-001	2	BAR,SUPPORT,CENTER (EFF TO REV LTR H)	1	B

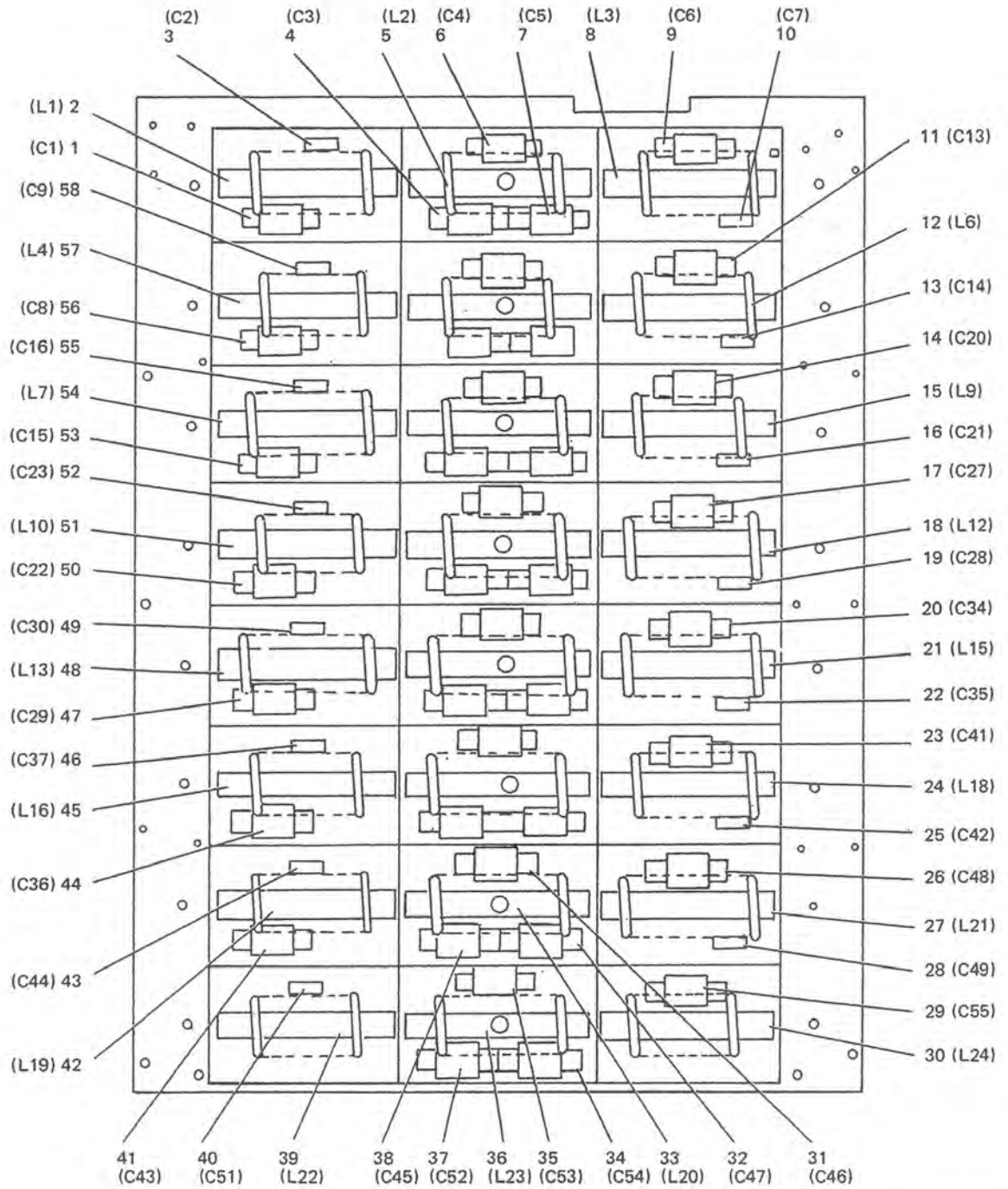
FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
3-46	642-2647-002	2	BAR,SUPPORT	2	A
	P325-0062-000	2	SCREW,MACH SST, 6-32 X 5/16 (77250) 325-0062-000 (AP)	1	
			FOR 46)		
	MS35338-98	2	WASHER,FLAT PSVT CRES, 0.115 ID X 0.209 OD (80205)	1	
			310-0740-200 (AP FOR 46)		
	MS51957-14	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP)	2	
			FOR 46)		
	MS35338-97	2	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (96906)	4	
			310-0095-000 (AP FOR 46,47)		
	NAS620C4L	2	WASHER,FLAT PSVT CRES, 0.115 ID X 0.209 OD (80205)	1	
			310-0740-200 (AP FOR 46)		
47	646-6390-001	2	HOUSING	1	
48	646-6603-001	2	STRIP,INSULATION	1	
	P343-0297-000	2	SCREW,MACH SST, 6-32 X 5/16 (77250) 343-0297-000 (AP)	1	
			FOR 48)		
	MS35338-96	2	WASHER,FLAT PSVT CRES, 0.115 ID X 0.209 OD (80205)	1	
			310-0740-200 (AP FOR 48)		
49	SSC4556	2	CLAMP,STRIP	1	
	MS51957-16	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0136-000 (AP)	1	
	MS35338-97	2	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (96906)	1	
			310-0095-000 (AP)		
	NAS620C4L	2	WASHER,FLAT PSVT CRES, 0.115 ID X 0.209 OD (80205)	1	
			310-0740-200 (AP FOR 49)		
50	540-9049-003	2	POST,HEX	2	
	MS51957-14	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP)	1	
	MS35338-97	2	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (96906)	1	
			310-0095-000 (AP)		
	NAS620C4L	2	WASHER,FLAT PSVT CRES, 0.115 ID X 0.209 OD (80205)	1	
			310-0740-200 (AP FOR 50)		
51	642-2645-001	2	BRACKET,INSULATION	1	
	MS51957-14	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP)	1	
	MS35338-97	2	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (96906)	1	
			310-0095-000 (AP)		
	MS35338-97	2	WASHER,FLAT PSVT CRES, 0.115 ID X 0.209 OD (80205)	1	
			310-0740-200 (AP FOR 51)		
52	333-1455-020	3	NUT,PLAIN,HEX SST, 4-40 (77250) 333-1455-020 (AP)	1	
53	642-2645-002	3	BRACKET,INSULATION	1	
54	642-2644-001	2	BRACKET,INSULATION	1	
	MS51959-13	2	SCREW,MACH SST, 4-40 X 1/4 (96906) 343-0133-000 (AP)	1	
55	642-2646-001	2	COVER,INSULATION	1	
	MS51957-13	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP)	1	
	MS35338-97	2	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (96906)	1	
			310-0095-000 (AP)		
	NAS620C4L	2	WASHER,FLAT PSVT CRES, 0.115 ID X 0.209 OD (80205)	1	
			310-0740-200 (AP FOR 55)		
56	638-6964-001	2	CARD	1	
56	638-6964-002	2	CARD	1	
57	4814-1-0516	2	TERMINAL,LUG	2	
58	2104-04-01-2520H	2	TERMINAL,LUG	2	
	MS51957-13	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP)	1	
			FOR 57)		
	MS35338-97	2	WASHER,FLAT PSVT CRES, 0.115 ID X 0.209 OD (80205)	1	
			310-0740-200 (AP FOR 58)		
59	642-2631-001	2	DISK	1	
	330-2245-000	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP)	1	
	310-0129-000	2	WASHER,FLAT PSVT CRES, 0.115 ID X 0.209 OD (80205)	1	
60	642-2627-001	2	BUTT	1	
	MS51963-1	2	SCREW,MACH SST, 4-40 X 1/4 (96906) 343-0133-000 (AP)	1	
			FOR 60)		
61	187401-001	2	SOLE	2	
62	187401-001	2	SOLE	2	
63	187401-001	2	SOLE	2	
64	187401-001	2	SOLE	2	
65	187401-001	2	SOLE	2	
66	187401-001	2	SOLE	2	
67	187401-001	2	SOLE	2	
68	187401-001	2	SOLE	2	
69	187401-001	2	SOLE	2	
70	187401-001	2	SOLE	2	
71	187401-001	2	SOLE	2	
72	187401-001	2	SOLE	2	
73	187401-001	2	SOLE	2	
74	187401-001	2	SOLE	2	
75	187401-001	2	SOLE	2	
76	187401-001	2	SOLE	2	
	330-2245-000	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP)	1	
	310-0129-000	2	WASHER,FLAT PSVT CRES, 0.115 ID X 0.209 OD (80205)	1	
			FOR 61)		
	1926-07	2	WASHER,FLAT PSVT CRES, 0.115 ID X 0.209 OD (80205)	1	
			310-0740-200 (AP FOR 61)		

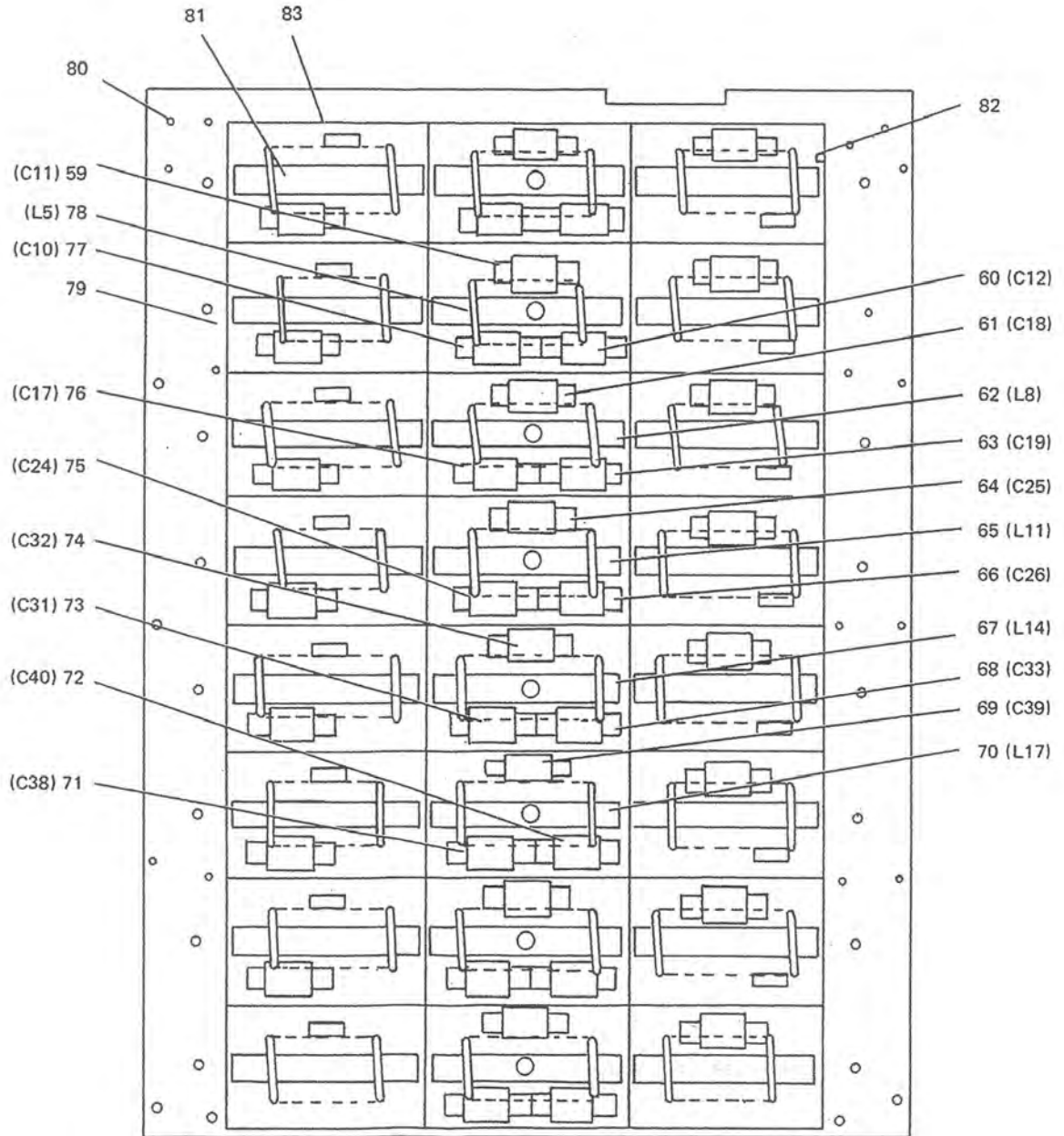
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GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	IDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
3-46	642-2647-002	2	BAR,SUPPORT,CENTER (EFF REV LTR H)	1	B
	P325-0062-000	2	SCREW,MACH SST, 6-32 X 1/4 (77250) 325-0062-000 (AP FOR 45,46)	12	
	MS35338-98	2	WASHER,SPRING CD PL BRZ, 0.141 ID X 0.250 OD (96906) 310-0095-000 (AP FOR 45,46)	12	
	MS51957-14	2	SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000 (AP FOR 45)	10	
	MS35338-97	2	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (96906) 310-0095-000 (AP FOR 45)	10	
	NAS620C4L	2	WASHER,FLAT PSVT CRES, 0.115 ID X 0.209 OD (80205) 310-0740-200 (AP FOR 45)	10	
47	646-6390-001	2	PLATE,BOTTOM	1	
48	646-6403-001	2	STRIP,GROUNDING	1	
	P343-0297-000	2	SCREW,MACH HP BRS, 2-56 X 1/8 (77250) 343-0297-000 (AP)	8	
	MS35338-96	2	WASHER,SPRING CD PL BRZ, 0.088 ID X 0.172 OD (96906) 310-0093-000 (AP)	8	
49	SSC4556	2	CLAMP,LOOP (06383) 435-0001-070	2	
	MS51957-16	2	SCREW,MACH STL, 4-40 X 7/16 (96906) 343-0136-000 (AP)	2	
	MS35338-97	2	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (96906) 310-0095-000 (AP)	2	
	NAS620C4L	2	WASHER,FLAT PSVT CRES, 0.115 ID X 0.209 OD (80205) 310-0740-200 (AP)	2	
50	540-9049-003	2	POST,HEX	10	
	MS51957-14	2	SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000 (AP)	14	
	MS35338-97	2	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (96906) 310-0095-000 (AP)	14	
	NAS620C4L	2	WASHER,FLAT PSVT CRES, 0.115 ID X 0.209 OD (80205) 310-0740-200 (AP)	10	
51	642-2645-001	2	BRACKET, SOLENOID-REAR	1	
	MS51957-14	2	SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000 (AP)	6	
	MS35338-97	2	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (96906) 310-0095-000 (AP)	6	
52	333-1455-020	3	MUT,SELF-LOCKING CD PL STL, 4-40 (27601)	2	
53	642-2645-002	3	BRACKET	1	
54	642-2644-001	2	BRACKET, SOLENOID-FRONT	1	
	MS51959-13	2	SCREW,MACH SST, 4-40 X 1/4 (96906) 342-0044-000 (AP)	5	
55	642-2646-001	2	COVER	1	
	MS51957-13	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP)	16	
	MS35338-97	2	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (96906) 310-0095-000 (AP)	16	
56	638-6964-001	2	CARD,LOW-PASS FILTER A1 (SEE FIG 4)	1	A
56	638-6964-002	2	CARD,LOW-PASS FILTER A1 (SEE FIG 4)	1	B
57	4814-1-0516	2	TERMINAL,STUD (71279) 306-2513-250	24	
58	2104-04-01-2520N	2	TERMINAL,LUG (78189) 304-0317-000	8	
	MS51957-13	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP FOR 57,58)	24	
	MS35338-97	2	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (96906) 310-0095-000 (AP FOR 57,58)	24	
59	642-2631-001	2	DISK,CONTACT	16	
	330-2245-000	2	SCREW,MACH NYL, 2-56 X 1/8 (23056) (AP)	16	
	310-0129-000	2	WASHER,FLAT BRS, 0.089 ID X 0.188 OD (05411) (AP)	16	
60	642-2627-001	2	BUTTON,INSULATOR	16	
	MS51963-1	2	SETSCREW CD PL STL, 2-56 X 1/8 (96906) 328-5025-000 (AP)	16	
61	187401-001	2	SOLENOID (81840) 411-0500-010 K15	1	
62	187401-001	2	SOLENOID (81840) 411-0500-010 K13	1	
63	187401-001	2	SOLENOID (81840) 411-0500-010 K11	1	
64	187401-001	2	SOLENOID (81840) 411-0500-010 K9	1	
65	187401-001	2	SOLENOID (81840) 411-0500-010 K7	1	
66	187401-001	2	SOLENOID (81840) 411-0500-010 K5	1	
67	187401-001	2	SOLENOID (81840) 411-0500-010 K3	1	
68	187401-001	2	SOLENOID (81840) 411-0500-010 K1	1	
69	187401-001	2	SOLENOID (81840) 411-0500-010 K2	1	
70	187401-001	2	SOLENOID (81840) 411-0500-010 K4	1	
71	187401-001	2	SOLENOID (81840) 411-0500-010 K6	1	
72	187401-001	2	SOLENOID (81840) 411-0500-010 K8	1	
73	187401-001	2	SOLENOID (81840) 411-0500-010 K10	1	
74	187401-001	2	SOLENOID (81840) 411-0500-010 K12	1	
75	187401-001	2	SOLENOID (81840) 411-0500-010 K14	1	
76	187401-001	2	SOLENOID (81840) 411-0500-010 K16	1	
	330-2245-000	2	SCREW,MACH NYL, 2-56 X 1/8 (23056) (AP FOR 61-76)	16	
	310-0129-000	2	WASHER,FLAT BRS, 0.089 ID X 0.188 OD (05411) (AP FOR 61-76)	16	
	1926-07	2	WASHER,LOCK CD PL BRZ, 0.572 ID X 0.692 OD (78189) 373-0190-010 (AP FOR 61-76)	16	

Low-Pass Filter Assembly, Parts Location Diagram  
Figure 3 (Sheet 2)





TPA-4788-029

Low-Pass Filter Card A1, Parts Location Diagram  
Figure 4 (Sheet 1 of 2)

GROUP ASSEMBLY PARTS LIST

GROUP ASSI

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
4-	638-6964-001	1	CARD,LOW-PASS FILTER A1 (SEE FIG 3-56 FOR NHA)	REF A	
	638-6964-002	1	CARD,LOW-PASS FILTER A1 (SEE FIG 3-56 FOR NHA)	REF B	
1	UFP1C21J	2	CAPACITOR,FXD CER DIE, 620PF, 5%, 500V (73899) 914-3101-860 A1C1	1	
2	646-6429-001	2	COIL,FILTER 19 TURNS A1L1	1	
3	VY82C181J	2	CAPACITOR,FXD GL DIE, 180PF, 5%, 500V (95275) 914-2611-000 A1C2	1	
4	FCJ231F	2	CAPACITOR,FXD CER DIE, 1450PF, 5%, 500V (73899) 914-3101-690 A1C3	1	
5	646-6429-002	2	COIL,FILTER 17 TURNS A1L2	1	
6	FCJ231D	2	CAPACITOR,FXD CER DIE, 865PF, 5%, 500V (73899) 914-3101-670 A1C4	1	
7	FCJ231E	2	CAPACITOR,FXD CER DIE, 1340PF, 5%, 500V (73899) 914-3101-680 A1C5	1	
8	646-6429-003	2	COIL,FILTER 15 TURNS A1L3	1	
9	UFP1771J	2	CAPACITOR,FXD CER DIE, 770PF, 5%, 500V (73899) 914-3101-660 A1C6	1	
10	VY82C271J	2	CAPACITOR,FXD GL DIE, 270PF, 5%, 500V (95275) 914-2623-000 A1C7	1	
11	UFP1511J	2	CAPACITOR,FXD CER DIE, 510PF, 5%, 500V (73899) 914-3101-300 A1C13	1	
12	646-6429-006	2	COIL,FILTER 13 TURNS A1L6	1	
13	VY82C181J	2	CAPACITOR,FXD GL DIE, 180PF, 5%, 500V (95275) 914-2611-000 A1C14	1	
14	UFP1361J	2	CAPACITOR,FXD CER DIE, 360PF, 5%, 500V (73899) 914-3101-280 A1C20	1	
15	646-6429-009	2	COIL,FILTER 12 TURNS A1L9	1	
16	VY81C131J	2	CAPACITOR,FXD GL DIE, 130PF, 5%, 500V (95275) 914-2602-000 A1C21	1	
17	UFP1241J	2	CAPACITOR,FXD CER DIE, 240PF, 5%, 2500V (73899) 914-3101-470 A1C27	1	
18	646-6429-012	2	COIL,FILTER 11 TURNS A1L12	1	
19	VY81C820J	2	CAPACITOR,FXD GL DIE, 82PF, 5%, 500V (95275) 914-2587-000 A1C28	1	
20	UFP1181J	2	CAPACITOR,FXD CER DIE, 180PF, 5%, 2500V (73899) 914-3101-460 A1C34	1 A	
20	UFP1620J	2	CAPACITOR,FIXED CER DIE, 62PF, 5%, 2500V (73899) 914-3101-160 A1C34	1 B	
21	646-6429-015	2	COIL,FILTER 9 TURNS A1L15	1 A	
21	646-6429-019	2	COIL,FILTER 12 TURNS A1L15	1 B	
22	VY81C560J	2	CAPACITOR,FXD GL DIE, 56PF, 5%, 500V (95275) 914-2575-000 A1C35	1 A	
22	VY82C161J	2	CAPACITOR,FXD GL DIE, 160PF, 5%, 500V (95275) 914-2608-000 A1C35	1 B	
23	UFP1121J	2	CAPACITOR,FXD CER DIE, 120PF, 5%, 2500V (73899) 914-3101-230 A1C41	1	
24	646-6429-018	2	COIL,FILTER 7 TURNS A1L18	1	
25	VY81C330J	2	CAPACITOR,FXD GL DIE, 33PF, 5%, 500V (95275) 914-2557-000 A1C42	1	
26	UFP1910J	2	CAPACITOR,FXD CER DIE, 91PF, 5%, 2500V (73899) 914-3101-210 A1C48	1	
27	646-6429-021	2	COIL,FILTER 5 TURNS A1L21	1	
28	VY81C150J	2	CAPACITOR,FXD GL DIE, 15PF, 5%, 500V (95275) 914-2533-000 A1C49	1	
29	UFP1560J	2	CAPACITOR,FXD CER DIE, 56PF, 5%, 2500V (73899) 914-3101-720 A1C55	1	
30	646-6429-024	2	COIL,FILTER 4 TURNS A1L24	1	
31	UFP1101J	2	CAPACITOR,FXD CER DIE, 100PF, 5%, 2500V (73899) 914-3101-220 A1C46	1	
32	UFP1121J	2	CAPACITOR,FXD CER DIE, 120PF, 5%, 2500V (73899) 914-3101-230 A1C47	1	
33	646-6429-020	2	COIL,FILTER 6 TURNS A1L20	1	
34	UFP1910J	2	CAPACITOR,FXD CER DIE, 91PF, 5%, 2500V (73899) 914-3101-210 A1C54	1	
35	UFP1560J	2	CAPACITOR,FXD CER DIE, 56PF, 5%, 2500V (73899) 914-3101-720 A1C53	1	
36	646-6429-023	2	COIL,FILTER 5 TURNS A1L23	1	
37	UFP1910J	2	CAPACITOR,FXD CER DIE, 91PF, 5%, 2500V (73899) 914-3101-210 A1C52	1	
38	UFP1141J	2	CAPACITOR,FXD CER DIE, 140PF, 5%, 2500V (73899) 914-3101-450 A1C45	1	
39	646-6429-022	2	COIL,FILTER 5 TURNS A1L22	1	
40	VY81C150J	2	CAPACITOR,FXD GL DIE, 15PF, 5%, 500V (95275) 914-2533-000 A1C51	1	
41	UFP1680J	2	CAPACITOR,FXD CER DIE, 68PF, 5%, 2500V (73899) 914-3101-190 A1C43	1	
42	646-6429-016	2	COIL,FILTER 7 TURNS A1L19	1	
43	VY81C200J	2	CAPACITOR,FXD GL DIE, 20PF, 5%, 500V (95275) 914-2542-000 A1C44	1	
44	UFP1111J	2	CAPACITOR,FXD CER DIE, 110PF, 5%, 500V (73899) 914-3101-620 A1C36	1	
45	646-6429-016	2	COIL,FILTER 9 TURNS A1L16	1	
46	VY81C270J	2	CAPACITOR,FXD GL DIE, 27PF, 5%, 500V (95275) 914-2551-000 A1C37	1	
47	UFP1151G	2	CAPACITOR,FXD CER DIE, 150PF, 5%, 2500V (73899) 914-3101-570 A1C29	1 A	
48	646-6429-013	2	COIL,FILTER 11 TURNS A1L13	1 A	
48	646-6429-025	2	COIL,FILTER 10 TURNS A1L13	1 B	
49	VY81C430J	2	CAPACITOR,FXD GL DIE, 43PF, 5%, 500V (95275) 914-2566-000 A1C30	1 A	

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
4-50	UFP1221J	2	CAPACITOR,FXD 914-3101-250		
51	646-6429-010	2	COIL,FILTER 11		
52	VY81C620J	2	CAPACITOR,FXD 914-2578-000		
53	UFP1301J	2	CAPACITOR,FXD 914-3101-480		
54	646-6429-007	2	COIL,FILTER 14		
55	VY81C820J	2	CAPACITOR,FXD 914-2587-000		
56	UFP1471J	2	CAPACITOR,FXD 914-3101-650		
57	646-6429-004	2	COIL,FILTER 15		
58	VY81C131J	2	CAPACITOR,FXD 914-2602-000		
59	UFP1C21J	2	CAPACITOR,FXD 914-3101-860		
60	UFP1911J	2	CAPACITOR,FXD 914-3101-850		
61	UFP1431J	2	CAPACITOR,FXD 914-3101-290		
62	646-6429-008	2	COIL,FILTER 11		
63	UFP1C21J	2	CAPACITOR,FXD 914-3101-860		
64	914-3101-271	2	CAPACITOR,FXD TO REV LTR J		
64	UFP1271J	2	CAPACITOR,FIXE 914-3101-270		
65	646-6429-011	2	COIL,FILTER 12		
66	UFP1431J	2	CAPACITOR,FXD 914-3101-290		
67	646-6429-014	2	COIL,FILTER 10		
67	646-6429-019	2	COIL,FILTER 12		
68	UFP1301J	2	CAPACITOR,FXD 914-3101-480		
68	UFP1361J	2	CAPACITOR,FIXE 914-3101-280		
69	UFP1141J	2	CAPACITOR,FXD 914-3101-450		
70	646-6429-017	2	COIL,FILTER 8		
71	UFP1241J	2	CAPACITOR,FXD 914-3101-470		
72	UFP1221J	2	CAPACITOR,FXD 914-3101-250		
73	914-3101-710	2	CAPACITOR,FXD A1C31		
74	UFP1201J	2	CAPACITOR,FXD 914-3101-260		
74	UFP1111J	2	CAPACITOR,FIXE 914-3101-620		
75	UFP1471J	2	CAPACITOR,FXD 914-3101-650		
76	UFP1681J	2	CAPACITOR,FXD 914-3101-310		
77	UFP1102J	2	CAPACITOR,FXD 914-3101-330		
78	646-6429-005	2	COIL,FILTER 13		
79	CR87A	2	CONTACT,ELEC		
80	628-1847-001	2	MJT,SPACER		
81	646-6389-001	2	SUPPORT,COIL		
82	642-2642-001	2	PARTITION-LONG		
83	642-2643-001	2	PARTITION-SHORT		
83	642-2643-001	2	PARTITION-SHORT		
83	642-2643-002	2	PARTITION-SHORT		

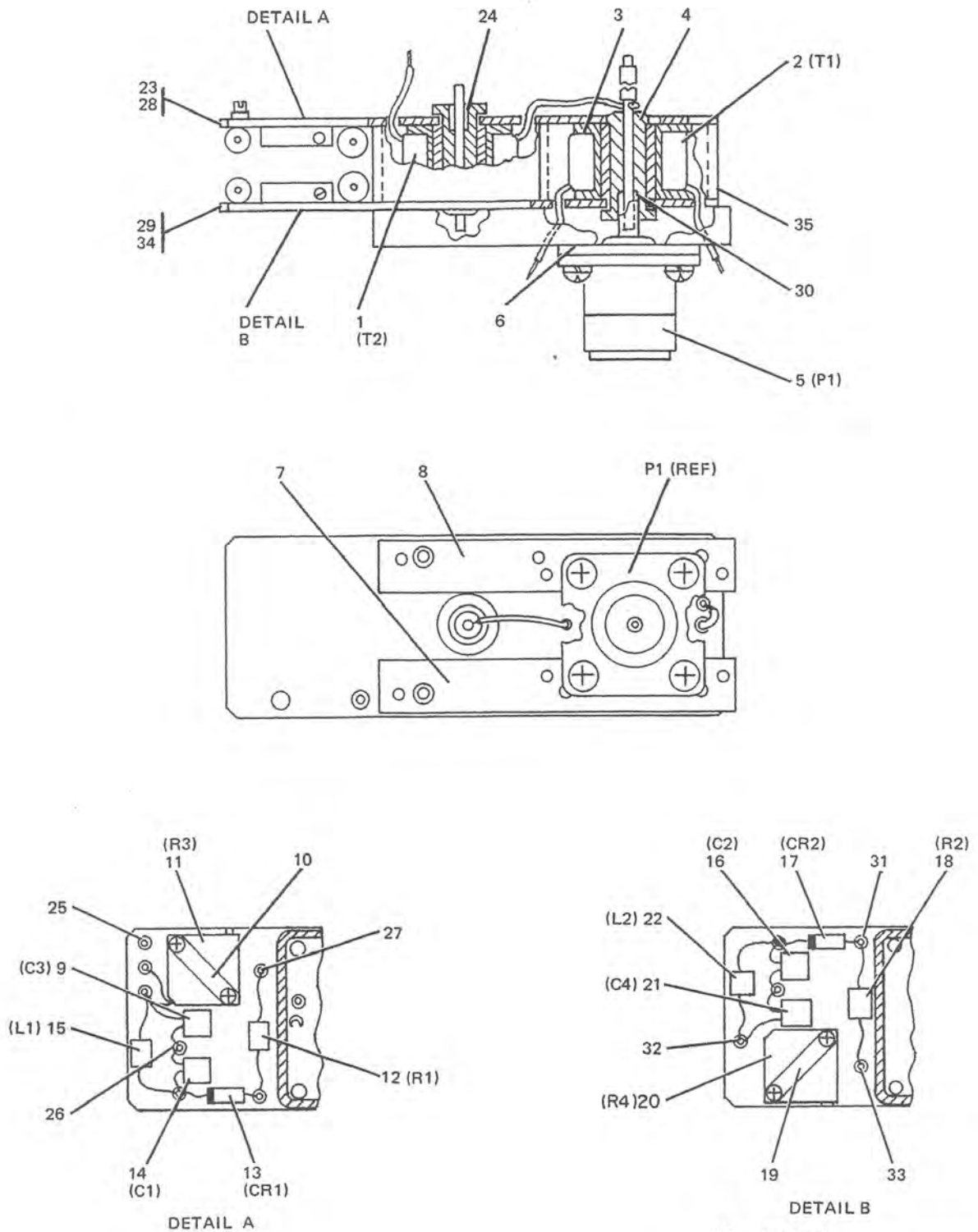
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GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
4-50	UFP1221J	2	CAPACITOR,FXD CER DIEI, 220PF, 5%, 2500V (73899) 914-3101-250 A1C22	1	
51	646-6429-010	2	COIL,FILTER 12 TURNS A1110	1	
52	VY81C620J	2	CAPACITOR,FXD GL DIEI, 62PF, 5%, 500V (95275) 914-2578-000 A1C23	1	
53	UFP1301J	2	CAPACITOR,FXD CER DIEI, 300PF, 5%, 2500V (73899) 914-3101-480 A1C15	1	
54	646-6429-007	2	COIL,FILTER 14 TURNS A117	1	
55	VY81C820J	2	CAPACITOR,FXD GL DIEI, 82PF, 5%, 500V (95275) 914-2587-000 A1C16	1	
56	UFP1471J	2	CAPACITOR,FXD CER DIEI, 470PF, 5%, 500V (73899) 914-3101-650 A1C8	1	
57	646-6429-004	2	COIL,FILTER 15 TURNS A114	1	
58	VY81C131J	2	CAPACITOR,FXD GL DIEI, 130PF, 5%, 500V (95275) 914-2602-000 A1C9	1	
59	UFP1C21J	2	CAPACITOR,FXD CER DIEI, 620PF, 5%, 500V (73899) 914-3101-860 A1C11	1	
60	UFP1911J	2	CAPACITOR,FXD CER DIEI, 910PF, 5%, 500V (73899) 914-3101-850 A1C12	1	
61	UFP1431J	2	CAPACITOR,FXD CER DIEI, 430PF, 5%, 500V (73899) 914-3101-290 A1C18	1	
62	646-6429-008	2	COIL,FILTER 11 TURNS A118	1	
63	UFP1C21J	2	CAPACITOR,FXD CER DIEI, 620PF, 5%, 500V (73899) 914-3101-860 A1C19	1	
64	914-3101-271	2	CAPACITOR,FXD CER DIEI, 270PF, 5%, 500V A1C25 (EFF TO REV LTR J)	1	
64	UFP1271J	2	CAPACITOR,FIXED CER DIEI, 270PF, 5%, 500V (73899) 914-3101-270 A1C25 (EFF REV LTR J)	1	
65	646-6429-011	2	COIL,FILTER 12 TURNS A1111	1	
66	UFP1431J	2	CAPACITOR,FXD CER DIEI, 430PF, 5%, 500V (73899) 914-3101-290 A1C26	1	
67	646-6429-014	2	COIL,FILTER 10 TURNS A1114	1 A	
67	646-6429-019	2	COIL FILTER 12 TURNS A1114	1 B	
68	UFP1301J	2	CAPACITOR,FXD CER DIEI, 300PF, 5%, 2500V (73899) 914-3101-480 A1C33	1 A	
68	UFP1361J	2	CAPACITOR,FIXED CER DIEI, 360PF, 5%, 500V (73899) 914-3101-280 A1C33	1 B	
69	UFP1141J	2	CAPACITOR,FXD CER DIEI, 140PF, 5%, 2500V (73899) 914-3101-450 A1C39	1	
70	646-6429-017	2	COIL,FILTER 8 TURNS A1117	1	
71	UFP1241J	2	CAPACITOR,FXD CER DIEI, 240PF, 5%, 2500V (73899) 914-3101-470 A1C38	1	
72	UFP1221J	2	CAPACITOR,FXD CER DIEI, 220PF, 5%, 2500V (73899) 914-3101-250 A1C40	1	
73	914-3101-710	2	CAPACITOR,FXD CER DIEI, 330PF, 5%, 500V (73899) A1C31	1	
74	UFP1201J	2	CAPACITOR,FXD CER DIEI, 200PF, 5%, 500V (73899) 914-3101-260 A1C32	1 A	
74	UFP1111J	2	CAPACITOR,FIXED CER DIEI, 110PF, 5%, 500V (73899) 914-3101-620 A1C32	1 B	
75	UFP1471J	2	CAPACITOR,FXD CER DIEI, 470PF, 5%, 500V (73899) 914-3101-650 A1C24	1	
76	UFP1681J	2	CAPACITOR,FXD CER DIEI, 680PF, 5%, 300V (73899) 914-3101-310 A1C17	1	
77	UFP1102J	2	CAPACITOR,FXD CER DIEI, 1000PF, 5%, 300V (73899) 914-3101-330 A1C10	1	
78	646-6429-005	2	COIL,FILTER 13 TURNS A115	1	
79	CR87A	2	CONTACT,ELEC (73999) 305-5230-000	32	
80	628-1847-001	2	MJT,SPACER	2	
81	646-6389-001	2	SUPPORT,COIL	24	
82	642-2642-001	2	PARTITION-LONG	4	
83	642-2643-001	2	PARTITION-SHORT	9 A	
83	642-2643-001	2	PARTITION-SHORT (EFF TO REV LTR J)	9 B	
83	642-2643-002	2	PARTITION-SHORT (EFF REV LTR J)	9 B	

Low-Pass Filter Card A1, Parts Location Diagram  
Figure 4 (Sheet 2)





TPA-3817-019

Directional Coupler A2, Parts Location Diagram  
Figure 5 (Sheet 1 of 2)

GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
5-	642-2634-001	1	COUPLER, DIRECTIONAL (ESDS) A2 (SEE FIG 3-39 FOR NHA)	REF	
1	651-3477-001	2	COIL, WATTMETER A2T2	1	
2	651-3477-001	2	COIL, WATTMETER A2T1	1	
	MS51957-21	2	SCREW, MACH STL, 4-40 X 1 (96906) 343-0141-000 (AP)	6	
	MS35338-97	2	WASHER, SPRING CD PL BRZ, 0.115 ID X 0.209 OD (96906) 310-0095-000 (AP)	6	
3	646-6391-001	2	WASHER, SHOULDER	4	
4	646-6396-001	2	INSULATOR, LEAD	2	
5	M39012-04-0002	2	CONNECTOR, RCPT ELEC (81349) 357-9003-000 A2P1	1	
6	642-2625-001	2	SHIM, CONNECTOR	1	
	MS51957-15	2	SCREW, MACH STL, 4-40 X 3/8 (96906) 343-0135-000 (AP FOR 5,6)	4	
	MS35338-97	2	WASHER, SPRING CD PL BRZ, 0.115 ID X 0.209 OD (96906) 310-0095-000 (AP FOR 5,6)	4	
7	646-6420-001	2	BAR, MTG-BOTTOM	1	
8	646-6419-001	2	BAR, MTG-TOP	1	
9	CK05BX102K	2	CAPACITOR, FXD CER DIEL, 1000PF, 10%, 200V (81349) 913-4018-000 A2C3	1	
10	H25	2	MTG HARDWARE (80294) 381-1446-000	1	
11	RJ22CL104	2	RESISTOR, VAR 100K, 10%, 1/4W (81349) 380-3755-100 A2R3	1	
	MS35649-224	2	NUT, PLAIN, HEX SST, 2-56 (96906) 313-0037-000 (AP FOR 10,11)	2	
	MS35338-134	2	WASHER, LOCK SST, 0.088 ID X 0.172 OD (96906) 310-0275-000 (AP FOR 10,11)	2	
	MS51957-5	2	SCREW, MACH SST, 2-56 X 3/8 (96906) 343-0126-000 (AP FOR 10,11)	2	
12	RCR326470JS	2	RESISTOR, FXD CHPSN, 47 OHMS, 5%, 1W (81349) 745-3295-000 A2R1	1	
13	IN5711	2	SEMICONV DEVICE (28480) 353-3691-010 A2CR1	1	
14	CK05BX102K	2	CAPACITOR, FXD CER DIEL, 1000PF, 10%, 200V (81349) 913-4018-000 A2C1	1	
15	MS75089-23	2	COIL, RF 1000UH (96906) 240-2715-490 A2L1	1	
16	CK05BX102K	2	CAPACITOR, FXD CER DIEL, 1000PF, 10%, 200V (81349) 913-4018-000 A2C2	1	
17	IN5711	2	SEMICONV DEVICE (28480) 353-3691-010 A2CR2	1	
18	RCR326470JS	2	RESISTOR, FXD CHPSN, 47 OHMS, 5%, 1W (81349) 745-3295-000 A2R2	1	
19	H25	2	MTG HARDWARE (80294) 381-1446-000	1	
20	RJ22CL104	2	RESISTOR, VAR 100K, 10%, 1/4W (81349) 380-3755-100 A2R4	1	
	MS35649-224	2	NUT, PLAIN, HEX SST, 2-56 (96906) 313-0037-000 (AP)	2	
	MS35338-134	2	WASHER, LOCK SST, 0.088 ID X 0.172 OD (96906) 310-0275-000 (AP)	2	
	MS51957-5	2	SCREW, MACH SST, 2-56 X 3/8 (96906) 343-0126-000 (AP)	2	
21	CK05BX102K	2	CAPACITOR, FXD CER DIEL, 1000PF, 10%, 200V (81349) 913-4018-000 A2C4	1	
22	MS75089-23	2	COIL, RF 1000UH (96906) 240-2715-490 A2L2	1	
23	646-6417-001	2	PLATE, TOROID NO 1	1	
24	646-6392-001	3	SLEEVE	1	
25	SE13XC01	3	TERMINAL, FEEDTH (81349) 306-2512-010	3	
26	SL354-351MHT	3	TERMINAL, FEEDTH (12615) 306-2474-010	3	
27	SL441-434MHT	3	TERMINAL, STDF (12615) 306-2222-100	3	
28	646-6417-002	3	PLATE	2	
29	646-6418-001	2	PLATE, TOROID NO 2	1	
30	646-6392-001	3	SLEEVE	1	
31	SL354-351MHT	3	TERMINAL, FEEDTH (12615) 306-2474-010	1	
32	SE13XC01	3	TERMINAL, FEEDTH (81349) 306-2512-010	1	
33	SL441-434MHT	3	TERMINAL, STDF (81349) 306-2512-010	3	
34	646-6418-002	3	TERMINAL, STDF (12615) 306-2222-100	2	
35	646-6421-001	2	SHIELD	1	

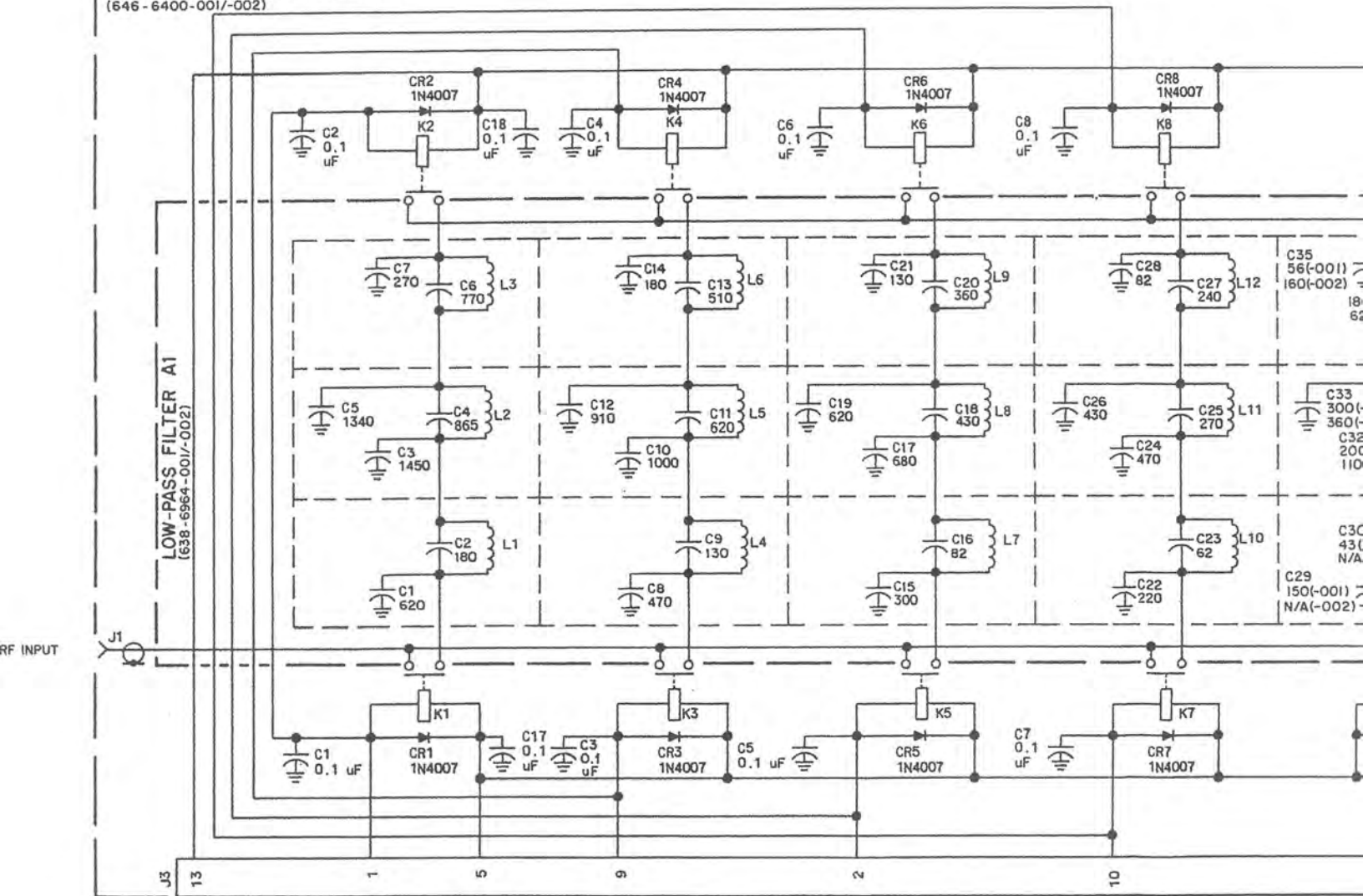
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A1I13	
A1I14	
A1I14	
A1I15	
A1I15	
A1I16	
A1I17	
A1I18	
A1I19	
A1I2	
A1I20	

REFERENCE DESIGNATION INDEX

REFERENCE DESIGNATION	FIG-ITEM	PART NUMBER	REFERENCE DESIGNATION	FIG-ITEM	PART NUMBER
A1	3-	646-6400-001	A1L21	4-27	646-6429-021
A1	3-	646-6400-002	A1L22	4-39	646-6429-022
A1	3-56	638-6964-001	A1L23	4-36	646-6429-023
A1	3-56	638-6964-002	A1L24	4-30	646-6429-024
A1	4-	638-6964-001	A1L3	4-8	646-6429-003
A1	4-	638-6964-002	A1L4	4-57	646-6429-004
A1C1	4-1	UFFP1C21J	A1L5	4-78	646-6429-005
A1C10	4-77	UFFP1102J	A1L6	4-12	646-6429-006
A1C11	4-59	UFFP1C21J	A1L7	4-54	646-6429-007
A1C12	4-60	UFFP1911J	A1L8	4-62	646-6429-008
A1C13	4-11	UFFP1511J	A1L9	4-15	646-6429-009
A1C14	4-13	VY82C181J	A2	3-39	642-2634-001
A1C15	4-53	UFFP1301J	A2	5-	642-2634-001
A1C16	4-55	VY81C820J	A2CR1	5-13	1N5711
A1C17	4-76	UFFP1481J	A2CR2	5-17	1N5711
A1C18	4-61	UFFP1431J	A2C1	5-14	CK05BX102K
A1C19	4-63	UFFP1C21J	A2C2	5-16	CK05BX102K
A1C2	4-3	VY82C181J	A2C3	5-9	CK05BX102K
A1C20	4-14	UFFP1361J	A2C4	5-21	CK05BX102K
A1C21	4-16	VY81C131J	A2L1	5-15	MS75089-23
A1C22	4-50	UFFP1221J	A2L2	5-22	MS75089-23
A1C23	4-52	VY81C620J	A2P1	5-5	M39012-04-0002
A1C24	4-75	UFFP1471J	A2R1	5-12	RCR326470JS
A1C25	4-64	UFFP1271J	A2R2	5-18	RCR326470JS
A1C25	4-64	914-3101-271	A2R3	5-11	RJ22CL104
A1C26	4-66	UFFP1431J	A2R4	5-20	RJ22CL104
A1C27	4-17	UFFP1241J	A2T1	5-2	651-3477-001
A1C28	4-19	VY81C820J	A2T2	5-1	651-3477-001
A1C29	4-47	UFFP11516	CR1	3-18	1N4007
A1C3	4-4	FCJ231F	CR10	3-29	1N4007
A1C30	4-49	VY81C430J	CR11	3-5	1N4007
A1C31	4-73	914-3101-710	CR12	3-31	1N4007
A1C32	4-74	UFFP1201J	CR13	3-3	1N4007
A1C32	4-74	UFFP1111J	CR14	3-33	1N4007
A1C33	4-68	UFFP1301J	CR15	3-1	1N4007
A1C33	4-60	UFFP1361J	CR16	3-35	1N4007
A1C34	4-20	UFFP1181J	CR2	3-19	1N4007
A1C34	4-20	UFFP1620J	CR3	3-13	1N4007
A1C35	4-22	VY81C560J	CR4	3-23	1N4007
A1C35	4-22	VY82C161J	CR5	3-11	1N4007
A1C36	4-44	UFFP1111J	CR6	3-25	1N4007
A1C37	4-46	VY81C270J	CR7	3-9	1N4007
A1C38	4-71	UFFP1241J	CR8	3-27	1N4007
A1C39	4-69	UFFP1141J	CR9	3-7	1N4007
A1C4	4-6	FCJ231D	C1	3-15	CK06BX104K
A1C40	4-72	UFFP1221J	C10	3-28	CK06BX104K
A1C41	4-23	UFFP1121J	C11	3-6	CK06BX104K
A1C42	4-25	VY81C330J	C12	3-30	CK06BX104K
A1C43	4-41	UFFP1680J	C13	3-4	CK06BX104K
A1C44	4-43	VY81C200J	C14	3-32	CK06BX104K
A1C45	4-38	UFFP1141J	C15	3-2	CK06BX104K
A1C46	4-31	UFFP1101J	C16	3-34	CK06BX104K
A1C47	4-32	UFFP1121J	C17	3-16	CK06BX104K
A1C48	4-26	UFFP1910J	C18	3-21	CK06BX104K
A1C49	4-28	VY81C150J	C2	3-20	CK06BX104K
A1C5	4-7	FCJ231E	C3	3-14	CK06BX104K
A1C51	4-40	VY81C150J	C4	3-22	CK06BX104K
A1C52	4-37	UFFP1910J	C5	3-12	CK06BX104K
A1C53	4-35	UFFP1560J	C6	3-24	CK06BX104K
A1C54	4-34	UFFP1910J	C7	3-10	CK06BX104K
A1C55	4-29	UFFP1560J	C8	3-26	CK06BX104K
A1C6	4-9	UFFP1771J	C9	3-8	CK06BX104K
A1C7	4-10	VY82C271J	J1	3-40	M39012-04-0002
A1C8	4-56	UFFP1471J	J3	3-44	DAM15P
A1C9	4-58	VY81C131J	K1	3-68	187401-001
A1L1	4-2	646-6429-001	K10	3-73	187401-001
A1L10	4-51	646-6429-010	K11	3-63	187401-001
A1L11	4-65	646-6429-011	K12	3-74	187401-001
A1L12	4-18	646-6429-012	K13	3-62	187401-001
A1L13	4-48	646-6429-013	K14	3-75	187401-001
A1L13	4-48	646-6429-025	K15	3-61	187401-001
A1L14	4-67	646-6429-014	K16	3-76	187401-001
A1L14	4-67	646-6429-019	K2	3-69	187401-001
A1L15	4-21	646-6429-015	K3	3-67	187401-001
A1L15	4-21	646-6429-019	K4	3-70	187401-001
A1L16	4-65	646-6429-016	K5	3-66	187401-001
A1L17	4-70	646-6429-017	K6	3-71	187401-001
A1L18	4-24	646-6429-018	K7	3-65	187401-001
A1L19	4-62	646-6429-018	K8	3-72	187401-001
A1L2	4-5	646-6429-002	K9	3-64	187401-001
A1L20	4-33	646-6429-020			

Directional Coupler A2, Parts Location Diagram  
Figure 5 (Sheet 2)

**LOW-PASS FILTER ASSEMBLY**  
(646 - 6400-001/-002)



+27 V DC

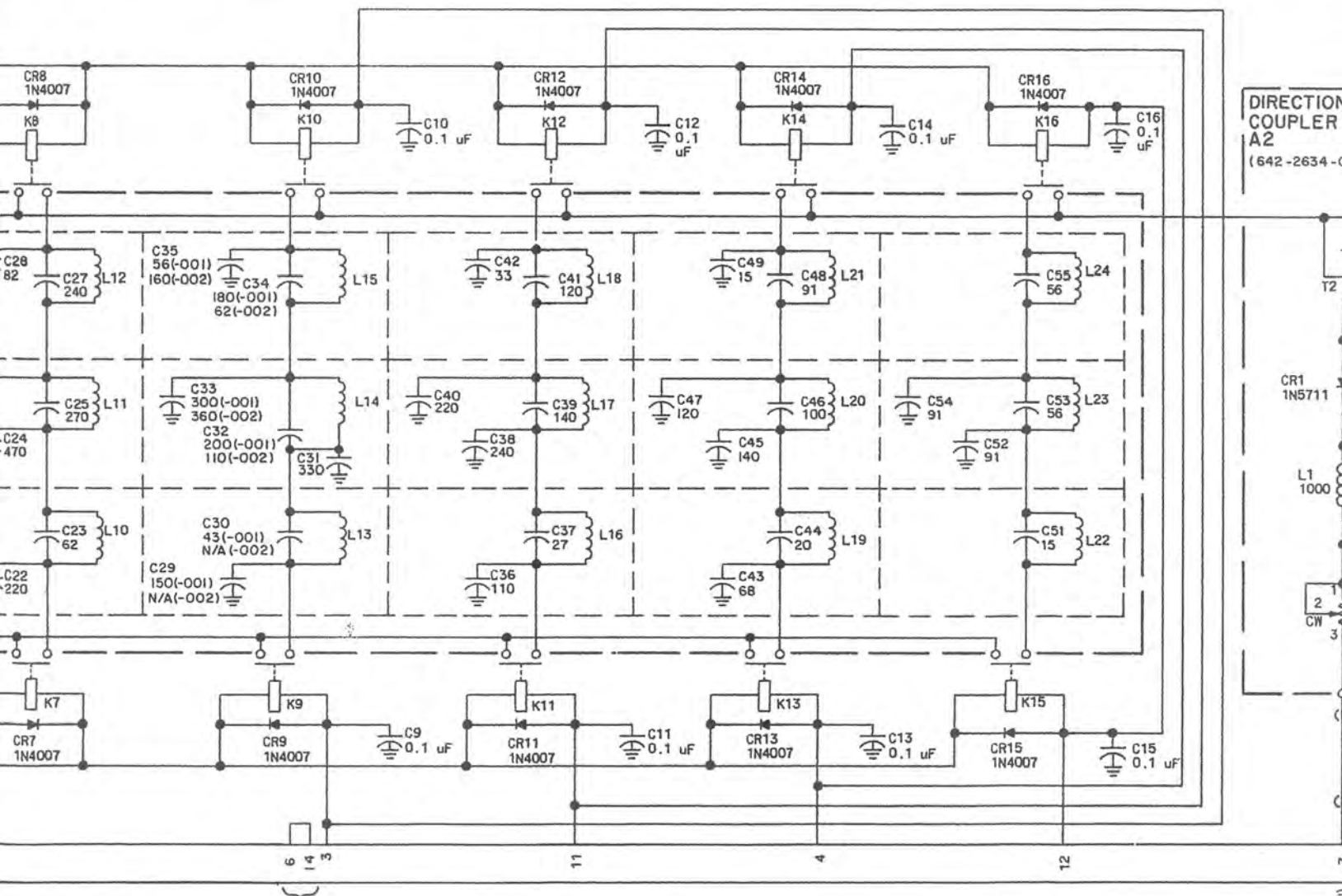
BAND 1 ENABLE

+27 V DC

BAND 2 ENABLE

BAND 3 ENABLE

BAND 4 ENABLE



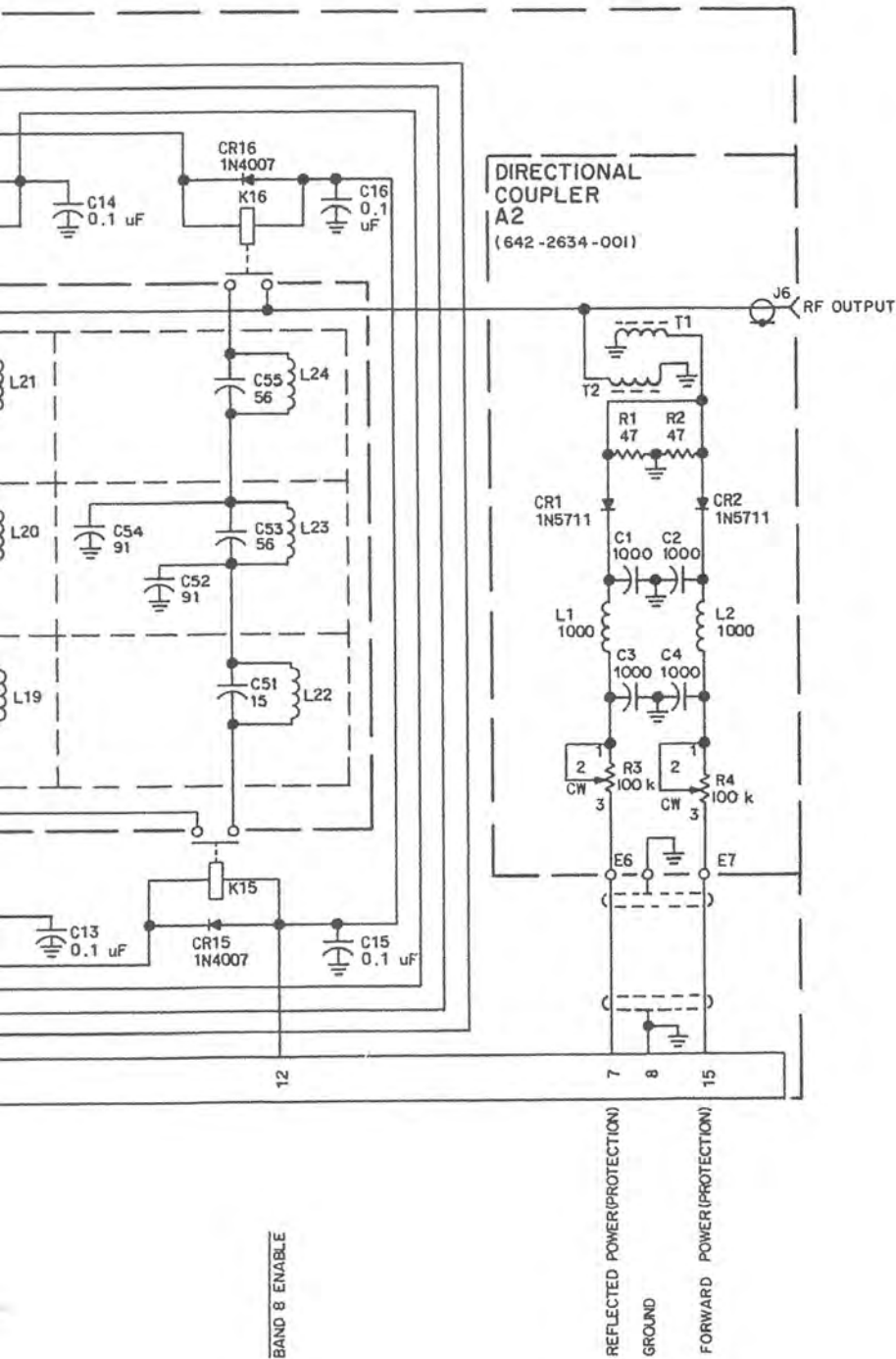
INTERLOCK  
BAND 5 ENABLE

BAND 6 ENABLE

BAND 7 ENABLE

BAND 8 ENABLE

REFLECTED POWER (PROTECTION)



NOTES:

- ① UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN PICO-FARADS, AND INDUCTANCE VALUES ARE IN MICRO-HENRYS.
- ② PARTIAL REFERENCE DESIGNATIONS ARE SHOWN, FOR COMPLETE DESIGNATION PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.

TPA - 5595 - 015

Low-Pass Filter Assembly, Schematic Diagram  
Figure 6



Rockwell  
International

instructions

# Digital Control Card (642-3592-001)

Collins Telecommunications Products Division

523-0771672-001211

15 September 1982

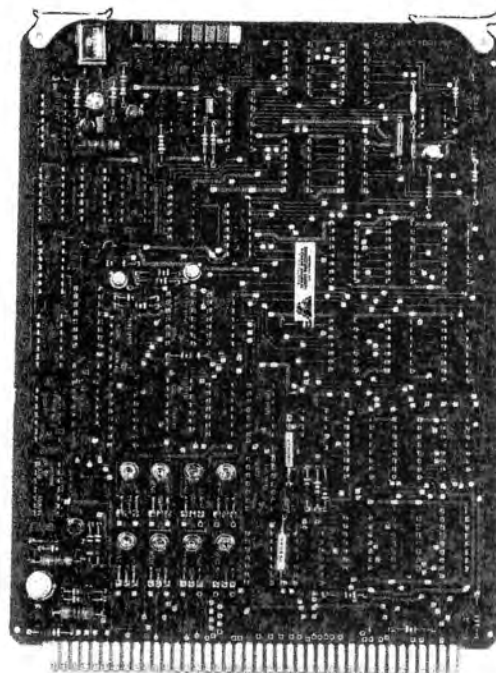
Printed in USA

(642-3592-001)

## 1. DESCRIPTION

Digital Control Card 642-3592-001 (figure 1) is a 2-layer plug-in circuit card with an 80-pin edge-on con-

necter (2 layers, 40 pins each). All control and electrical connections to the digital control card are made through this edge-on connector.



TPA-4673-017

Digital Control Card  
Figure 1

523-0771672-001211

## 2. PRINCIPLES OF OPERATION

### 2.1 General

The primary function of the digital control card is to take input signals (rf, analog, and digital) and convert them to useful digital control output signals. The digital control card has six basic areas of control: 1) frequency, 2) band, 3) keyline, 4) power/interlock, 5) power amplifier (and driver) control, and 6) tune control. These control areas are described in the following paragraphs.

### 2.2 Frequency/Band Control (Refer to figure 2)

Frequency/band control is accomplished by rf sampling. The rf is sampled (rf in) and is counted using pulse shaper U1 and gate Q1 to supply clock pulses to counter U2-U3. The output of counter U2-U3 is supplied to D latch comparator U4B-U5A.

Counters U13, U10, and U7 divide the 4096-kHz reference oscillator down to 1 kHz. U6B, U6A, and U5B produce a 1-ms pulse which enables U4B. As long as the 1-ms pulse remains at U4B-12, the output of

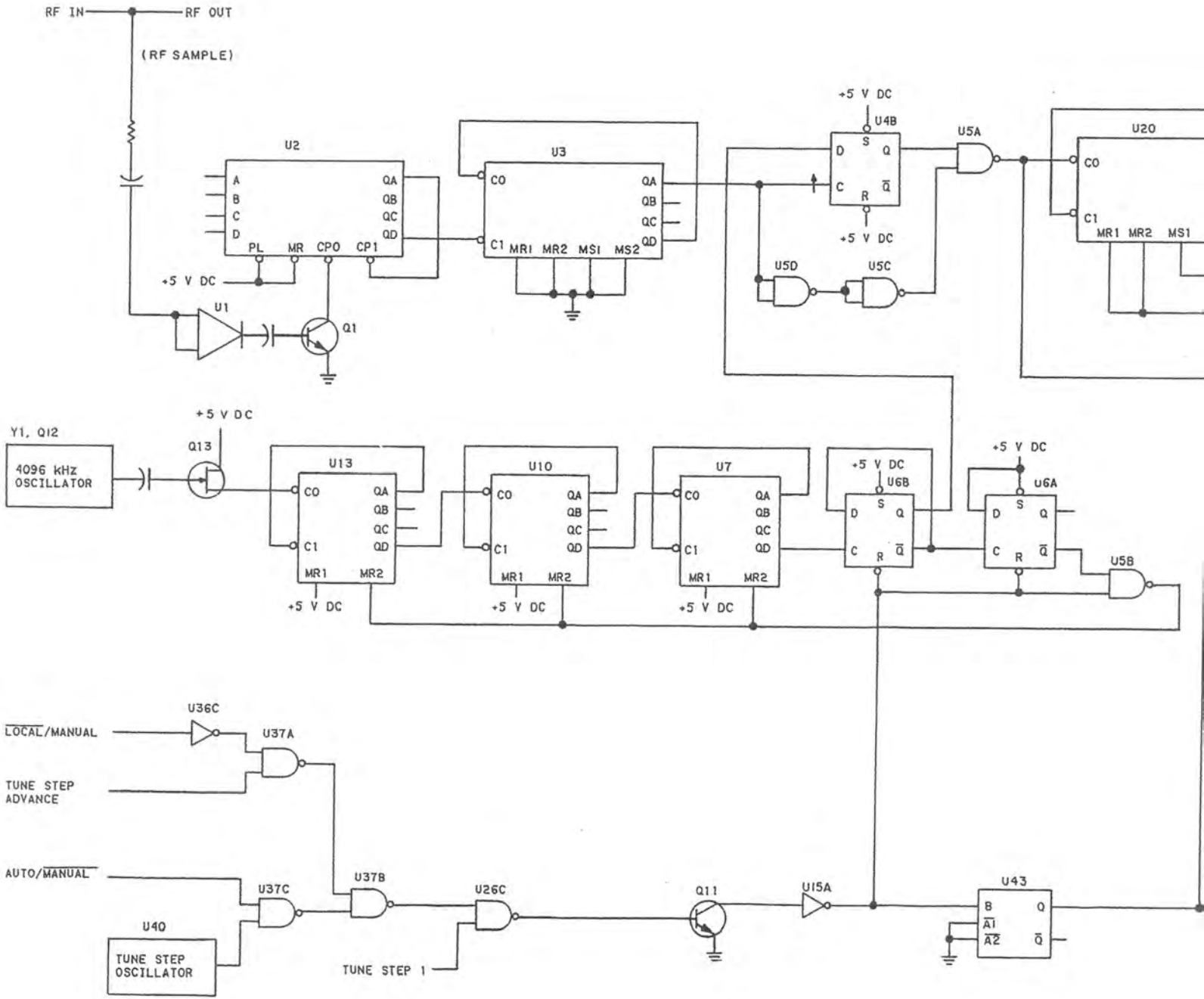
counter U3 is supplied to U9. U5D, U5C, and U5A form a clock synchronizer that produces a whole number of pulses which begin and end synchronously with the input pulses.

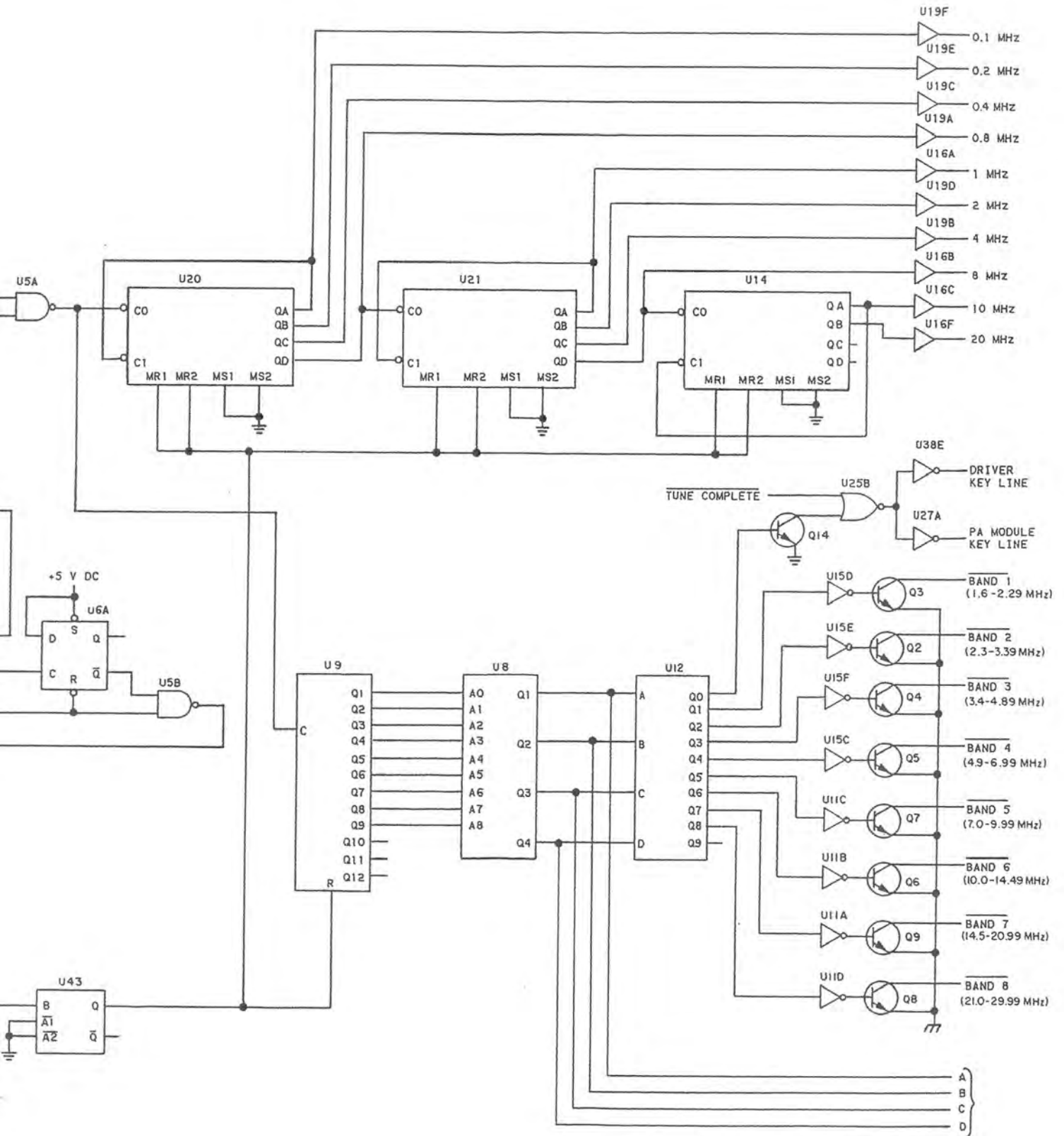
The clock output pulses are supplied to the digital frequency readout circuit of U20-U21-U14 and also to a band selection circuit of U9-U8-U12 and associated output drivers.

The digital frequency readout circuit consists of three digital decade counters: one for hundreds of kilohertz (U20), one for units of megahertz (U21), and one for tens of megahertz (U14). The input consists of 1 clock pulse for each 100 kHz of input frequency (rf sampled frequency).

The band selection circuit consists of a binary counter (U9), a binary input to bcd band encoder (U8), a bcd to band decoder (U12), and the associated output drive circuits. The outputs of the bcd band encoder (U8) are also supplied for use by a band display.







TPA-5329-014

Frequency/Band Control Circuit  
Figure 2

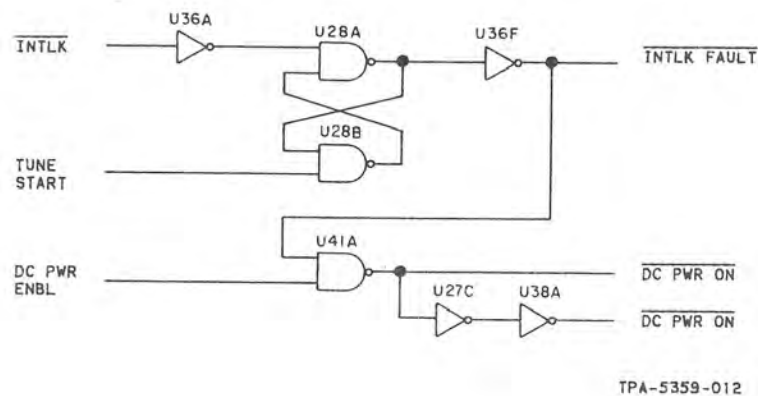
### 2.3 DC Power/Interlock Fault (Refer to figure 3)

With an  $\overline{\text{interlock}}$  signal (logic 1) applied to U36A (interlocks not satisfied), flip-flop (U28A, U28B) latches to logic 1 output and U36F supplies a logic 0 interlock fault output, indicating a fault.

With an  $\overline{\text{interlock}}$  signal (logic 0) applied to U36A (indicating interlocks are satisfied), flip-flop (U28A, U28B) is enabled and will supply a logic 0 output

when a tune start (logic 0) is applied. U36F will then supply a logic 1 interlock fault output, indicating no fault.

With an  $\overline{\text{interlock fault}}$  signal (logic 1) supplied, NAND gate U41A is inhibited and dc power cannot be enabled. With an  $\overline{\text{interlock fault}}$  signal (logic 0) supplied, NAND gate U41A is enabled and dc power on (logic 0) signals to enable power are applied as long as dc power enable input (logic 1) is supplied.



DC Power/Interlock Fault Circuit  
Figure 3

## 2.4 PA/Driver Summary (Refer to figure 4)

There are three primary pa/driver summary circuits: 1) pa ready, 2) pa fault, and 3) keyline.

The pa ready summary (logic 1) is supplied only when all of the following input conditions exist.

- a.  $\overline{\text{Tune complete}}$  is logic 1 (tuning is complete).
- b.  $\overline{\text{Vswr fault}}$  is logic 1 (no vswr fault).
- c.  $\overline{\text{Temperature fault}}$  is logic 1 (no temperature fault).
- d.  $\overline{\text{Antenna interlock fault}}$  is logic 1 (antenna interlock is satisfied).
- e.  $\overline{\text{Interlock fault}}$  is logic 1 (interlocks are satisfied).
- f.  $\overline{\text{Three module fault}}$  is logic 1 (not more than two pa output modules are faulted).
- g.  $\overline{\text{Dc power on}}$  is logic 0 (dc power set to on).
- h.  $\overline{\text{Power supply monitor}}$  is logic 0 (all power supplies are operating satisfactorily).
- i.  $\overline{\text{Module fault}}$  is logic 1 (no pa output modules are faulted).

### Note

If  $\overline{\text{module fault}}$  is logic 0 and not more than two pa output modules are faulted, and all other indications are normal, a pulsing pa ready and pa fault summary is supplied.

The pa fault summary (logic 0, no fault) is supplied only when all of the following input conditions exist:

- a.  $\overline{\text{Vswr fault}}$  is logic 1 (no vswr fault).
- b.  $\overline{\text{Temperature fault}}$  is logic 1 (no temperature fault).
- c.  $\overline{\text{Antenna interlock fault}}$  is logic 1 (antenna interlock is satisfied).
- d.  $\overline{\text{Interlock fault}}$  is logic 1 (interlocks are satisfied).
- e.  $\overline{\text{Three module fault}}$  is logic 1 (not more than two pa output modules are faulted).
- f.  $\overline{\text{Dc power on}}$  is logic 0 (dc power set to on).
- g.  $\overline{\text{Power supply monitor}}$  is logic 0 (all power supplies are operating satisfactorily).
- h.  $\overline{\text{Module fault}}$  is logic 1 (no pa output modules are faulted).

### Note

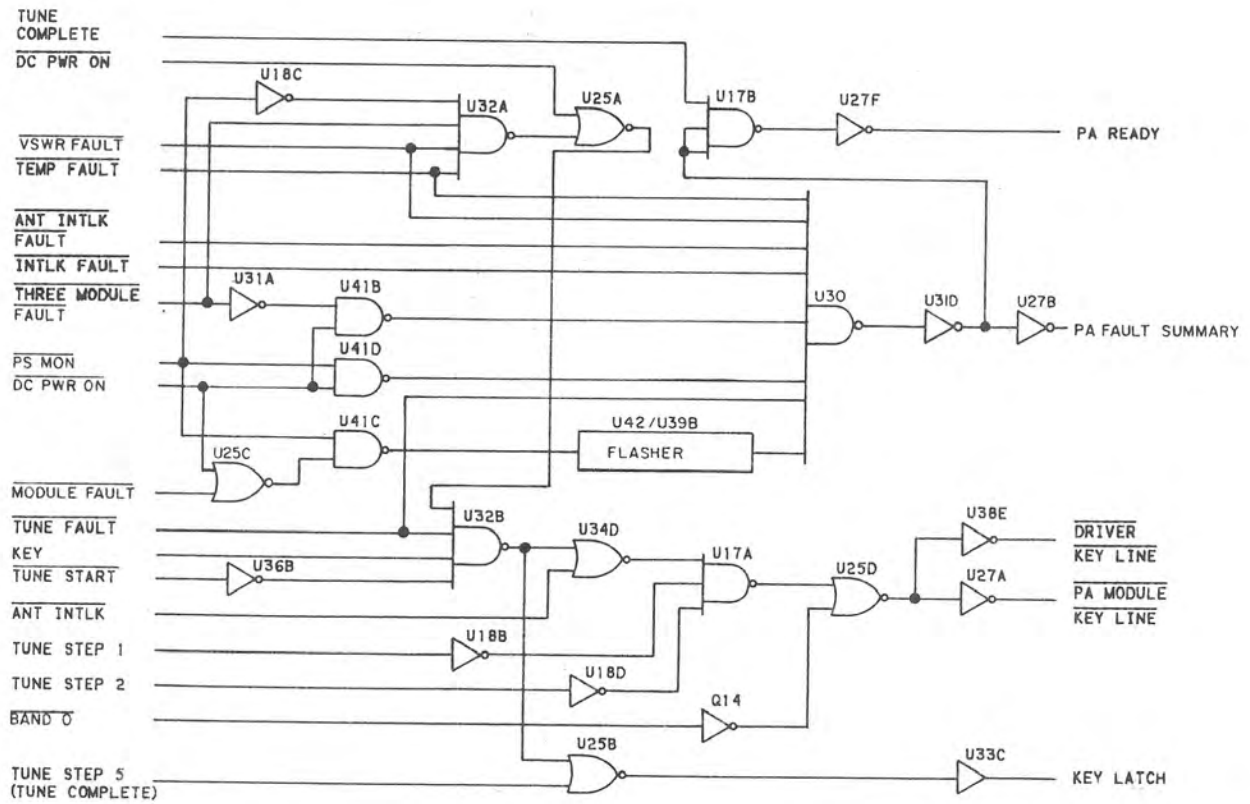
If  $\overline{\text{module fault}}$  is logic 0 and not more than two pa output modules are faulted, and all other indications are normal, a pulsing pa ready and pa fault summary is supplied.

The  $\overline{\text{driver keyline}}$  and  $\overline{\text{power amplifier module keyline}}$  (logic 0's) are supplied only when the following conditions exist:

- a.  $\overline{\text{Dc power on}}$  is logic 0 (dc power on).
- b.  $\overline{\text{Power supply monitor}}$  is logic 0 (all power supplies are operating satisfactorily).
- c.  $\overline{\text{Three module fault}}$  is logic 1 (not more than two pa output modules are faulted).
- d.  $\overline{\text{Vswr fault}}$  is logic 1 (no vswr fault).
- e.  $\overline{\text{Temperature fault}}$  is logic 1 (no temperature fault).
- f.  $\overline{\text{Tune fault}}$  is logic 1 (no tune fault).
- g.  $\overline{\text{Key}}$  is logic 1 (unit is keyed).
- h.  $\overline{\text{Tune start}}$  is logic 0 (tune start is not applied).
- i.  $\overline{\text{Antenna interlock}}$  is logic 0 (antenna interlock is satisfied).
- j.  $\overline{\text{Tune step 1}}$  is logic 0 (unit not in tune step 1).
- k.  $\overline{\text{Tune step 2}}$  is logic 0 (unit not in tune step 2).
- l.  $\overline{\text{Band 0}}$  is logic 1 (band 0 is not selected, any other band is selected).

The key latch (logic 1) is supplied only when the following conditions exist:

- a.  $\overline{\text{Dc power on}}$  is logic 0 (dc power set to on).
- b.  $\overline{\text{Power supply monitor}}$  is logic 0 (all power supplies are operating satisfactorily).
- c.  $\overline{\text{Three module fault}}$  is logic 1 (not more than two pa output modules are faulted).
- d.  $\overline{\text{Vswr fault}}$  is logic 1 (no vswr fault).
- e.  $\overline{\text{Temperature fault}}$  is logic 1 (no temperature fault).
- f.  $\overline{\text{Tune fault}}$  is logic 1 (no tune fault).
- g.  $\overline{\text{Key}}$  is logic 1 (unit is keyed).
- h.  $\overline{\text{Tune start}}$  is logic 0 (tune start is not applied).
- i.  $\overline{\text{Tune step 5}}$  (tune complete) is logic 0 (tuning is not complete).



TPA-5360-014

PA/Driver Summary Circuits  
Figure 4

2.5 Tune Control (Refer to figure 5)

There are three primary tune control circuits: 1) tune fault, 2) tune relay enable, and 3) tune sequence circuits.

The  $\overline{\text{tune fault}}$  (logic 0, fault) is supplied only when the following conditions exist.

- a.  $\overline{\text{Auto/manual}}$  input is logic 1 (automatic position).
- b.  $\overline{\text{Tune step 1}}$  (logic 1) is supplied, providing a trigger for U23. If tune complete (logic 1) is not received in approximately 10 seconds (20 seconds strapping available) after a tune start (logic 1) is applied, time delay circuit times out and provides a logic 0 output. With the logic 0 output from U23 and logic 0 from U26D, a  $\overline{\text{tune fault}}$  (logic 0) output signal is supplied. Refer to truth table, table 1.

$\overline{\text{Tune relay enable}}$  (logic 0, enable) is supplied only when the following conditions exist.

- a. Tune complete input is logic 0 (tune not complete).
- b. Radio not in tune step 4 (logic 0 output at U35-Q4).
- c. Radio in tune step 3 (logic 1 output at U35-Q3) with coupler tune power interlock at logic 1.

Tune sequence circuit is enabled when all of the following conditions exist. When any of these conditions are the complement of that shown, the tune sequence counter is inhibited and count stopped.

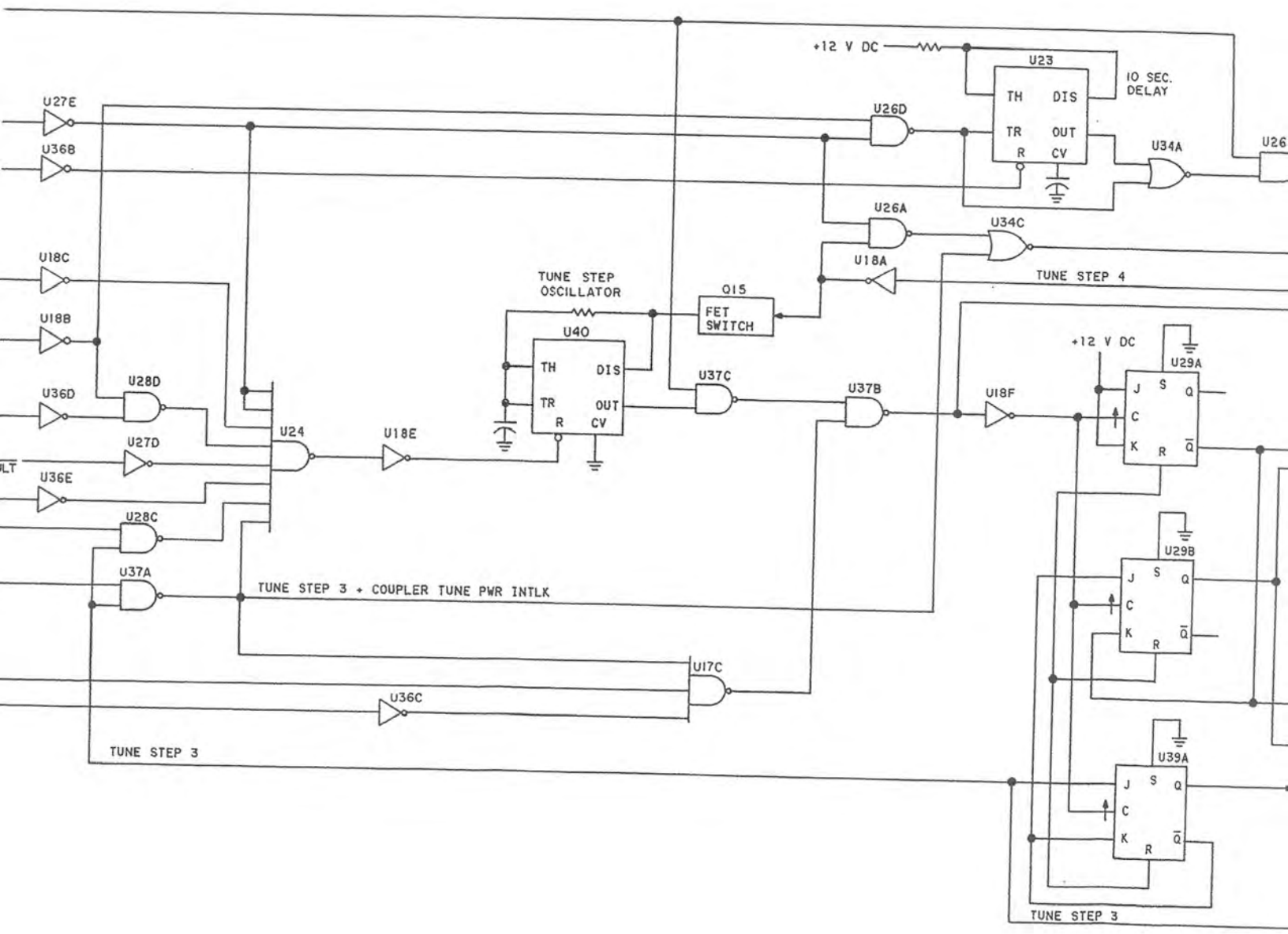
- a.  $\overline{\text{Tune complete}}$  is logic 0 (tune not complete).
- b.  $\overline{\text{Tune step 1}}$  and antenna interlock are logic 1 (antenna interlock and tune step 1 are complete).
- c. Dc power, key, tune start, and  $\overline{\text{tune fault}}$  are logic 0.
- d.  $\overline{\text{Rf input monitor}}$  is logic 0 (sufficient rf applied).
- e.  $\overline{\text{Rf prove}}$  and tune step 3 are logic 0.
- f. Tune step 3 and/or coupler tune power interlock are logic 0.
- g.  $\overline{\text{Power supply monitor}}$  is logic 0 (power supply operating).

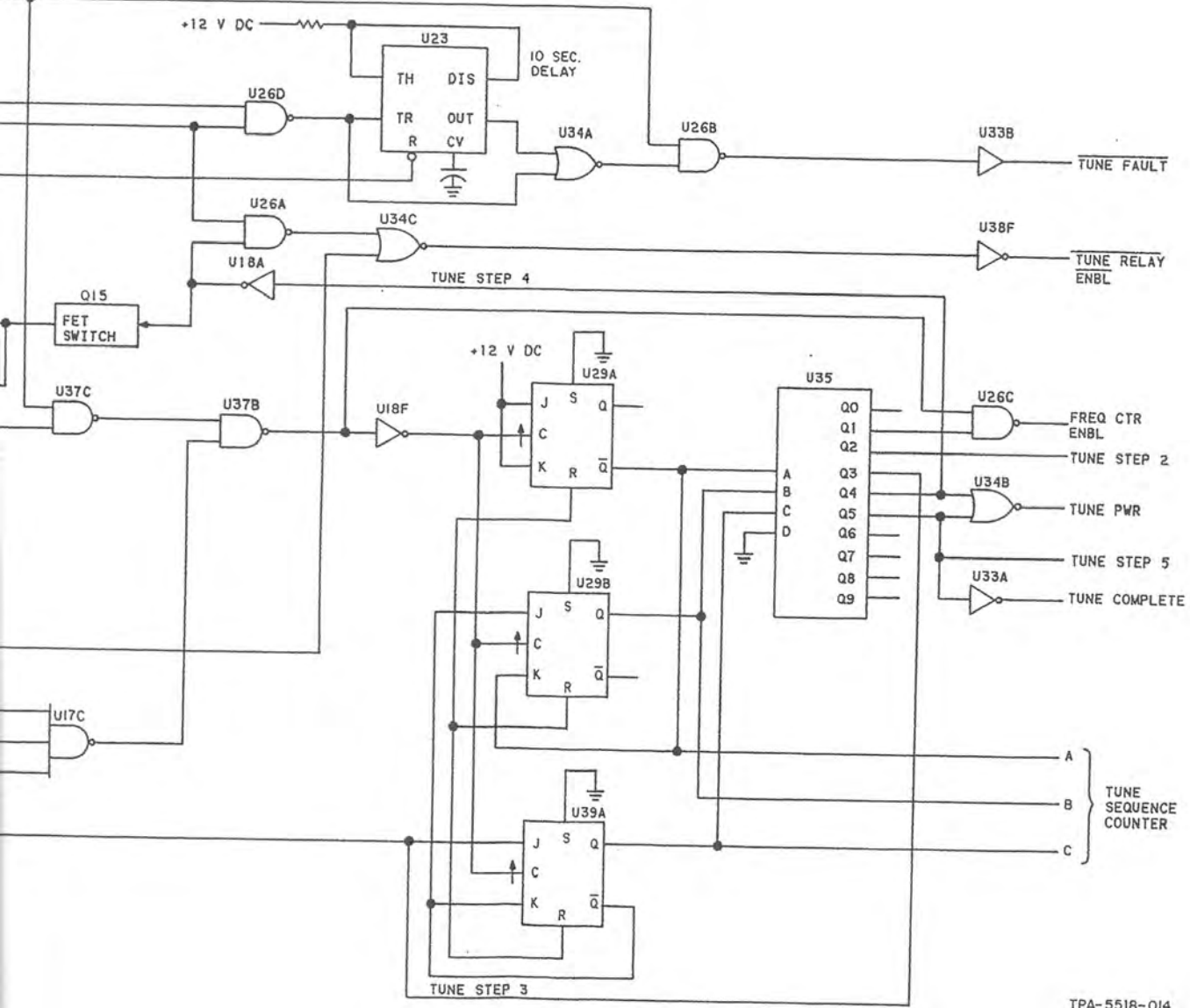
Table 1.  $\overline{\text{Tune Fault}}$ , Logic Truth Table.

U27E-IN	U18B-IN	U27E-OUT	U18B-OUT	U26D-OUT	U23-OUT	U34A-OUT	AUTO/MANUAL	U26B-OUT
0	0	1	1	0	0	1	1	0
0		1					1	
1		0		1	1	0	1	1

NOTE:  
IF TUNE COMPLETE (U27E-IN, LOGIC 1) NOT RECEIVED WITHIN TEN SECONDS, TUNE FAULT (U26B-OUT, LOGIC 0) SUPPLIED.

TPA-5984-012





TPA-5518-014

Tune Control Circuits  
Figure 5



### **3. TESTING/TROUBLESHOOTING PROCEDURES**

A defective digital control card can be returned to a Rockwell-Collins authorized repair facility for repair. Contact the nearest Rockwell-Collins office or

Collins Telecommunications Products Division  
Attention: HF Products  
400 Collins Road, NE  
Cedar Rapids, Iowa 52498

for information and instructions.

### **4. ALIGNMENT/ADJUSTMENT**

Alignment/adjustment is performed in conjunction with testing/troubleshooting.

### **5. REPAIR**

Repair is accomplished using standard shop practices.

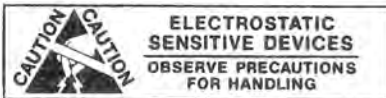
## 6. PARTS LIST/DIAGRAMS

### 6.1 Introduction

**Caution**

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All parts list illustrations containing ESDS items are shown with the following symbol:



This paragraph assists in identification and requisition of parts. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included. The parts location illustration shows component placement on the circuit cards.

### 6.2 Parts List

**REF DES Column** — Reference designators and/or item numbers for each part/subassembly are listed in alphanumeric or numeric sequence. These are the reference designators and/or item numbers shown on the parts location illustration. Only the reference designators are shown on the schematic diagram.

**DESCRIPTION Column** — Lists the noun name, modifier, descriptive information, and modification.

Modifications are identified by two methods: An alphanumeric identifier is assigned to each electrical design change and listed in the REVISION IDENT column of the modification history. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change.

NA (not applicable) in the REVISION IDENT column indicates a documentation change and/or mechanical change. This revision activity will be noted in the DESCRIPTION column of the parts list only. This

change does not affect the circuit card/subassembly components or the schematic. Each change relates to the REV (revision identifier) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history. Dash (—) denotes original; letter A first change; letter B second change, etc.

**COLLINS PART NUMBER Column** — Lists the Collins part number for each item in the parts list.

**USABLE ON CODE Column** — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

**MFR CODE Column** — Lists the manufacturer's code from which selected parts can be procured.

**MFR PART NUMBER Column** — Lists the manufacturer's part number for the selected parts.

### 6.3 How To Use This Parts List

To locate a part number, locate the part and its item number and/or reference designator on the illustration. Turn to the parts list page and find the item number and/or reference designator to determine its description and part number.

To locate the illustration for a part, if the reference designator and/or part number are known, refer to the parts list and find the figure and item number indicated in the parts list for location on the illustration.

### 6.4 Manufacturer's Code, Name, and Address

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
01121	ALLEN-BRADLEY CO 1201 SOUTH 2ND ST MILWAUKEE WI 53204
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49 DALLAS TX 75265
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
04099	CAPCO INC FORESIGHT INDUSTRIAL PARK P O BOX 2164 GRAND JUNCTION CO 81501

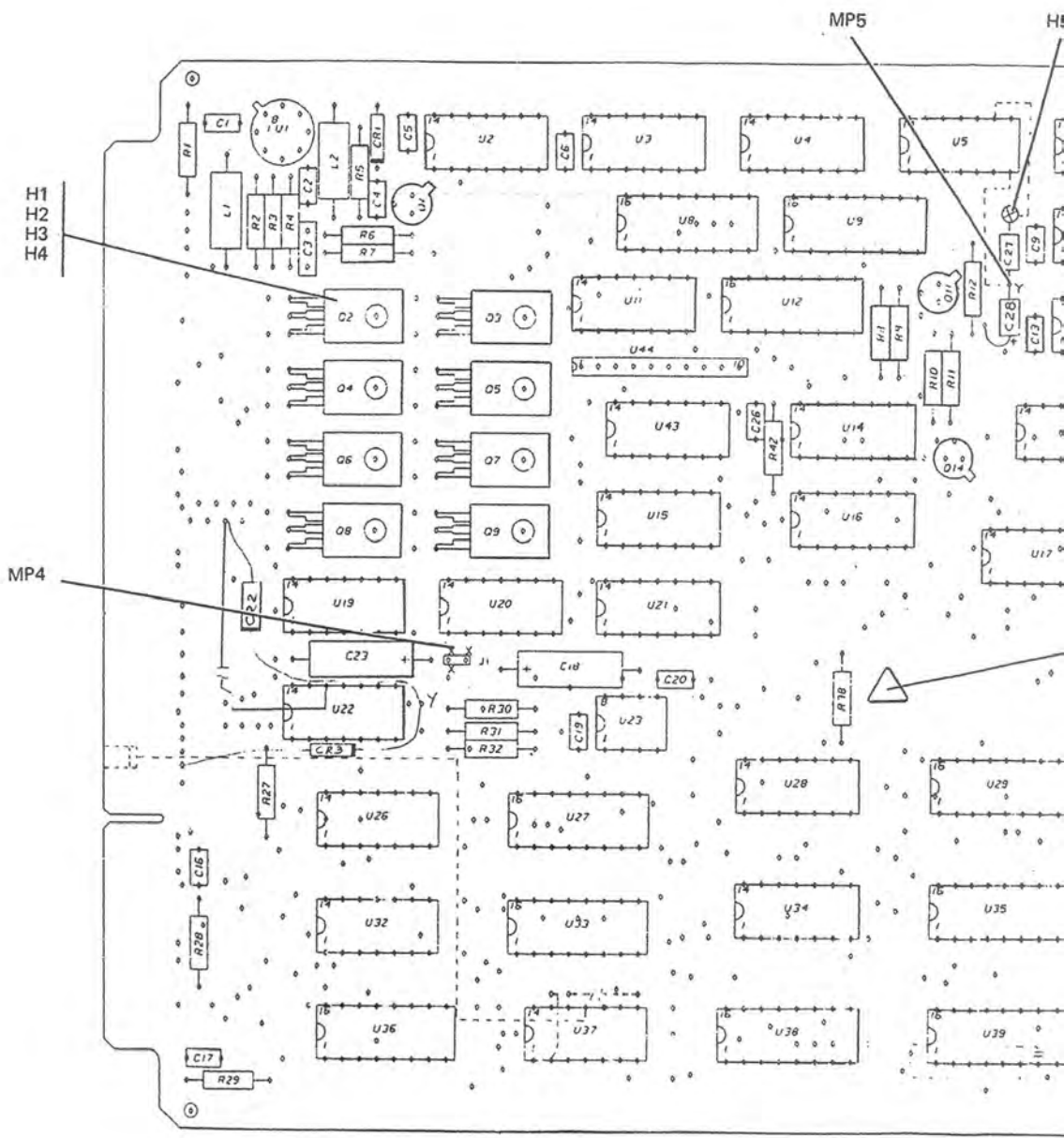
<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
04713	MOTOROLA INC SEMICONDUCTOR GROUP 5005 E. MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV SUB OF SCHLUMBERGER LTD NORTH AMERICAN SALES MAIL STOP 14-1053 401 ELLIS ST P O DRAWER 7284 MOUNTAIN VIEW CA 94042
07387	BIRTCHER CORP THE MEDICAL DIV 4501 N ARDEN DR P O BOX 4399 EL MONTE CA 91734
12040	NATIONAL SEMICONDUCTOR CORP COMMERCE DR P O BOX 443 DANBURY CT 06810
12615	U S TERMINALS INC 7504 CAMARGO ROAD CINCINNATI OH 45243
12998	QUALITY NAME PLATE INC MILL ROAD EAST GLASTONBURY CT 06025
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV 855 35TH ST NE P O BOX 728 CEDAR RAPIDS IA 52498
14433	ITT SEMICONDUCTOR DIV WEST PALM BEACH FL
18324	SIGNETICS CORP 811 E ARQUES SUNNYVALE CA 94086
19701	MEPCO/ELECTRA INC A NORTH AMERICAN PHILIPS CO P O BOX 760 MINERAL WELLS TX 76067
22526	DU PONT E I DE NEMOURS AND CO INC PHOTO PRODUCTS DEPT BERG ELECTRONICS DIV ROUTE 83 NEW CUMBERLAND PA 17070
27014	NATIONAL SEMICONDUCTOR CORP 2900 SEMICONDUCTOR DR SANTA CLARA CA 95051
31433	UNION CARBIDE CORP ELECTRONICS DIV HWY 276 SE P O BOX 5928 GREENVILLE SC 29606

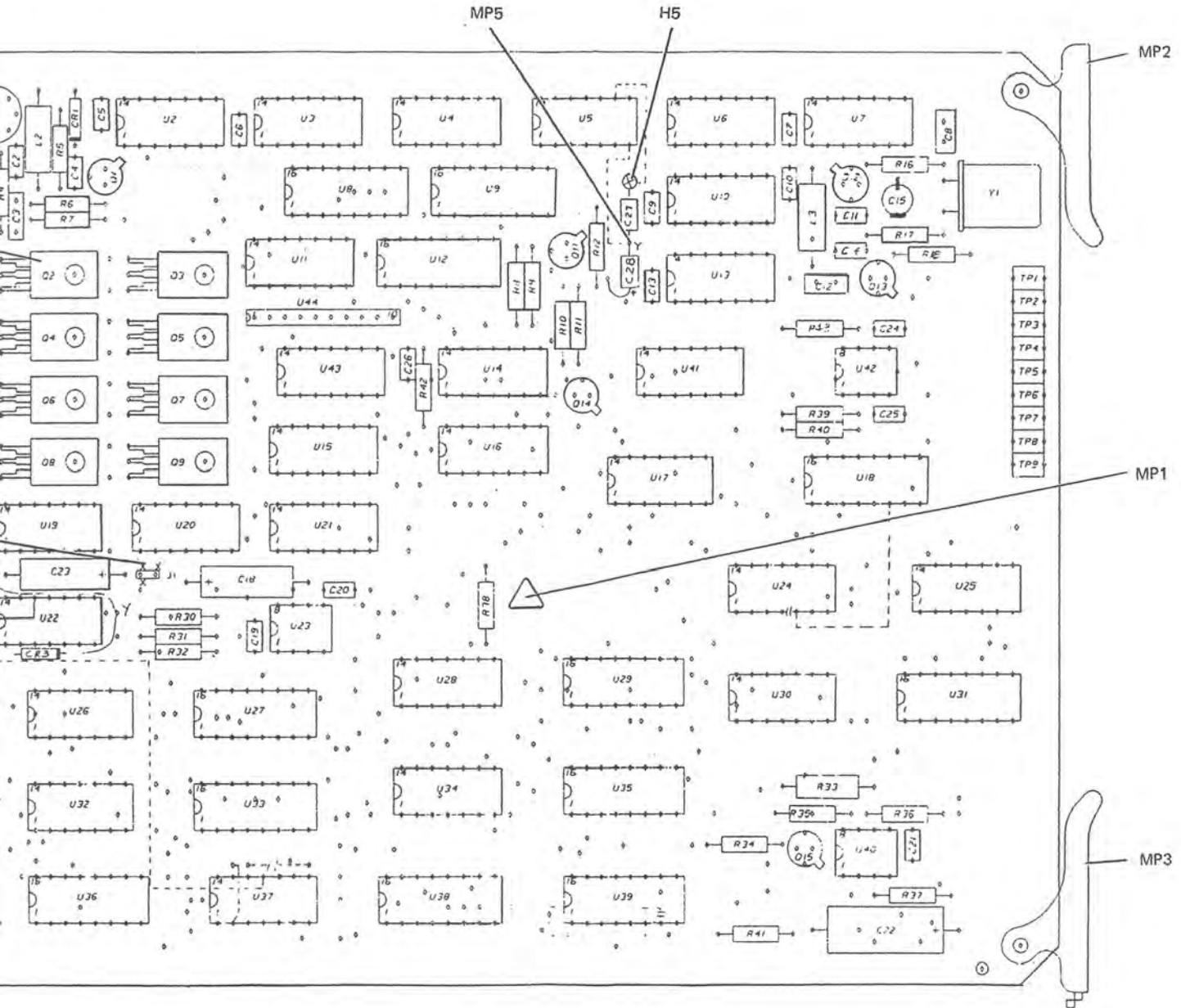
<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
49956	RAYTHEON CO EXECUTIVE OFFICES 141 SPRING ST LEXINGTON MA 02173
56289	SPRAGUE ELECTRIC CO 87 MARSHALL ST NORTH ADAMS MA 01247
72982	ERIE TECHNOLOGICAL PRODUCTS INC 645 W 11TH ST ERIE PA 16512
74970	JOHNSON E F CO 299 10TH AVE S W WASECA MN 56093
75378	CTS KNIGHTS INC 400 REIMANN AVE SANDWICH IL 60548
77250	ALLIED PRODUCTS CORP PHEOLL MFG CO DIV 5700 W ROOSEVELT RD CHICAGO IL 60650
81349	MILITARY SPECIFICATIONS
93790	CORNELL-DUBILIER ELECTRONICS DIV FEDERAL PACIFIC ELECTRIC CO 1605 RODNEY FRENCH BLVD NEW BEDFORD MA 02741
96906	MILITARY STANDARD

*6.5 Equipment Covered*

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions. Configuration history before 1 April 1982 is not recorded in this section.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Digital Control Card	642-3592-001	REV J





TPA-4829-019

Digital Control Card, Parts Location Diagram  
Figure 6 (Sheet 1 of 2)

## PARTS LIST

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	REF DES	DESCRIPTION
CR1	DIGITAL CONTROL CARD (ESDS)	642-3592-001		642-3592-001			
CR1-CR3	SEMICOND DEVICE (A1)	353-3644-010		31433 1M4454		U3	INTEGRATED CIRCUIT DECADE COUNTER
C1,C2	SEMICOND DEVICE	353-3644-010		31433 1M4454-1		U4	INTEGRATED CIRCUIT FLIP FLOP
C3	CAPACITOR,FXD CER DIEL, 0.01UF, 10%, 100VDC	913-5019-200		81349 CK05BX103K		U5	INTEGRATED CIRCUIT LOGIC GATE
C4	CAPACITOR,FXD CER DIEL, 1UF, 10%, 50VDC	913-5019-560		81349 CK06BX105K		U6	INTEGRATED CIRCUIT FLIP FLOP
C5-C7	CAPACITOR,FIXED CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349 CK05BX102K		U7	INTEGRATED CIRCUIT COUNTER
C8	CAPACITOR,FXD CER DIEL, 0.1UF, 10%, 100VDC	913-5019-440		81349 CK06BX104K		U8	INTEGRATED CIRCUIT, PROM
C9,C10	CAPACITOR,FXD MICA DIEL, 22PF, PORM 0.5PF, 300V	912-4141-030		93790 CDSEC22000		U9	INTEGRATED CIRCUIT DGTL MOS (ESDS)
C11	CAPACITOR,FXD CER DIEL, 0.1UF, 10%, 100VDC	913-5019-440		81349 CK06BX104K		U10	INTEGRATED CIRCUIT COUNTER
C12	CAPACITOR,FIXED CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349 CK05BX102K		U11	INTEGRATED CIRCUIT LOGIC GATE
C13	CAPACITOR,FXD CER DIEL, 91PF, 5%, 50V	912-4141-360		81349 CK05FY910J0		U12	INTEGRATED CIRCUIT DECODER
C14	CAPACITOR,FXD CER DIEL, 0.1UF, 10%, 100VDC	913-5019-440		81349 CK06BX104K		U13	INTEGRATED CIRCUIT COUNTER
C15	CAPACITOR,FIXED CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349 CK05BX102K		U14	INTEGRATED CIRCUIT DECADE COUNTER
C16,C17	CAPACITOR,VAR CER DIEL, 5 TO 25PF, 100V	917-1256-030		72902 518-024A5-25PF		U15	INTEGRATED CIRCUIT LOGIC GATE
C18	CAPACITOR,FXD CER DIEL, 0.01UF, 10%, 100VDC	913-5019-200		81349 CK05BX103K		U16	INTEGRATED CIRCUIT LOGIC BUFFER
C19	CAPACITOR,FIXED CER DIEL, 10UF, 10%, 20V	184-9096-460		81349 H39003-01-2266		U17	INTEGRATED CIRCUIT DGTL MOS (ESDS)
C20,C21	CAPACITOR,FXD CER DIEL, 0.01UF, 10%, 100VDC	913-5019-200		81349 CK05BX102K		U18	INTEGRATED CIRCUIT DGTL MOS (ESDS)
C22	CAPACITOR,FXD PLSTC DIEL, 1UF, 10%, 50V	933-1081-200		04099 CRC1-200		U19	INTEGRATED CIRCUIT LOGIC BUFFER
C23	CAPACITOR,FIXED ELCLTL, 15UF, 10%, 20V	184-9026-490		81349 H39003-01-2289		U20,U21	INTEGRATED CIRCUIT DECADE COUNTER
C24	CAPACITOR,FXD CER DIEL, 0.1UF, 10%, 100VDC	913-5019-440		81349 CK06BX104K		U22	RESISTOR NETWORK DUAL-IN-LINE, 100K, 2%
C25	CAPACITOR,FXD CER DIEL, 0.01UF, 10%, 100VDC	913-5019-200		81349 CK05BX103K		U23	INTEGRATED CIRCUIT TIMER
C26	CAPACITOR,FXD CER DIEL, 4700PF, 10%, 100VDC	913-5019-160		81349 CK05BX103K		U24	INTEGRATED CIRCUIT MOS GATE (ESDS)
C27	CAPACITOR,FIXED CER DIEL, 479PF, 10%, 200V	913-4014-000		81349 CK05BX472K		U25	INTEGRATED CIRCUIT DGTL MOS (ESDS)
C28	CAPACITOR,FIXED ELCLTL, 0.68UF, 10%, 50V	184-9087-400		81349 CK05BX471K		U26	INTEGRATED CIRCUIT DGTL MOS (ESDS)
H1	NUT,PLAIN,HEX SST, 4-40 (QTY 8)	313-0132-000		77250 P313-0132-000		U27	INTEGRATED CIRCUIT DGTL MOS (ESDS)
H2	WASHER,LOCK SST, 0.115 ID X 0.209 OD (QTY 8)	310-0279-000		96906 HS35338-135		U29	INTEGRATED CIRCUIT DGTL MOS (ESDS)
H3	WASHER,FLAT CRES, 0.125ID X 0.250 OD (QTY 16)	310-0779-030		96906 HS15795-803		U30	INTEGRATED CIRCUIT DGTL MOS (ESDS)
H4	SCREW,MACH NP BRN, 4-40 X 5/16 (QTY 8)	343-0286-000		77250 P343-0286-000		U31	INTEGRATED CIRCUIT DGTL MOS (ESDS)
H5	TERMINAL,FEEDTH (QTY 1)	306-1272-000		12615 5L180-231		U32	INTEGRATED CIRCUIT DGTL MOS (ESDS)
J1	CONNECTOR,JMPR SYS	372-0046-010		22526 65474-001		U33	INTEGRATED CIRCUIT DGTL MOS (ESDS)
L1,L2	COIL,RF 100UH	240-2715-370		96906 HS75089-11		U34	INTEGRATED CIRCUIT DGTL MOS (ESDS)
L3	COIL,RF 820UH	240-2715-480		96906 HS75089-22		U35	INTEGRATED CIRCUIT DGTL MOS (ESDS)
MP1	LABEL,PRESS SEMS	280-2745-010		12998 280-2745-010		U37	INTEGRATED CIRCUIT DGTL MOS (ESDS)
MP2	HANDLE,SCREEMED	466-5341-001				U38	INTEGRATED CIRCUIT TRANSISTOR ARRAY
MP3	EXTRACTOR	150-0815-010		07387 60-2-2		U39	INTEGRATED CIRCUIT DGTL MOS (ESDS)
MP4	CONTACT,ELEC (QTY 3)	372-2601-037		372-2601-037		U40	INTEGRATED CIRCUIT TIMER
MP4	CONTACT,ELEC (QTY 3)	372-2601-537		22526 75481-001		U41	INTEGRATED CIRCUIT DGTL MOS (ESDS)
MP5	CONTACT,ELEC (QTY 1)(A1)	372-2601-048		372-2601-048		U42	INTEGRATED CIRCUIT TIMER
MP5	CONTACT,ELECTRICAL (QTY 2)	372-2601-048		372-2601-048		U43	INTEGRATED CIRCUIT
Q1	TRANSISTOR	352-0596-030		14433 2N2369A		Y1	RESISTOR NETWORK FILM, 470 OHMS, 2%, 1.25W
Q2-Q9	TRANSISTOR	352-1083-020		04713 HJE803			CRYSTAL UNIT,QTZ 4.096000MHZ
Q10	NOT USED						
Q11	TRANSISTOR	352-0661-020		49956 2N2222A			
Q12,Q13	TRANSISTOR	352-0756-010		12040 2N4416			
Q14	TRANSISTOR	352-0661-020		49956 2N2222A			
Q15	TRANSISTOR	352-0756-010		12040 2N4416			
R1	RESISTOR,FXD CHPSN, 680 OHMS, 10%, 1/4W	745-0743-000		81349 RCR076681KS			
R2	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349 RCR076101KS			
R3	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349 RCR076222KS			
R4,R5	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349 RCR076102KS			
R6	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349 RCR076471KS			
R7	RESISTOR,FXD CHPSN, 6.8K, 10%, 1/4W	745-0779-000		81349 RCR076622KS			
R8	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349 RCR076103KS			
R9	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349 RCR076102KS			
R10	RESISTOR,FXD CHPSN, 15K, 10%, 1/4W	745-0791-000		81349 RCR076153KS			
R11	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349 RCR076103KS			
R12	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349 RCR076471KS			
R13-R15	NOT USED						
R16	RESISTOR,FXD CHPSN, 0.47MEGO, 10%, 1/4W	745-0845-000		81349 RCR076474KS			
R17	RESISTOR,FXD CHPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349 RCR076224KS			
R18	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349 RCR076331KS			
R19-R26	NOT USED						
R27	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349 RCR076104KS			
R26,R29	RESISTOR,FXD CHPSN, 15K, 10%, 1/4W	745-0791-000		81349 RCR076153KS			
R30	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349 RCR076105KS			
R31,R32	RESISTOR,FXD CHPSN, 15K, 10%, 1/4W	745-0791-000		81349 RCR076153KS			
R33	RESISTOR,FXD FILM, 348K, 1%, 1/4W	705-6718-000		81349 RN6003483F			
R34	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349 RCR076103KS			
R35	RESISTOR,FXD FILM, 6.81K, 1%, 1/8W	705-1036-000		81349 RN5506811F			
R36	RESISTOR,FXD FILM, 12.7K, 1%, 1/8W	705-1049-000		81349 RN5501272F			
R37	RESISTOR,FXD CHPSN, 15K, 10%, 1/4W	745-0791-000		81349 RCR076153KS			
R38	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349 RCR076153KS			
R39	RESISTOR,FXD CHPSN, 0.15MEGO, 10%, 1/4W	745-0827-000		81349 RCR076104KS			
R40	RESISTOR,FIXED CHPSN, 15K, 10%, 1/4W	745-0791-000		81349 RCR076154KS			
R41	RESISTOR,FIXED CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349 RCR076153KS			
R42	RESISTOR,FXD CHPSN, 47K, 10%, 1/4W	745-0809-000		81349 RCR076104KS			
R43	RESISTOR,FXD CHPSN, 0.39MEGO, 10%, 1/4W	745-0842-000		81349 RCR076473KS			
TP1	JACK,TIP BRN	360-0484-070		74970 105-1108-011			
TP2	JACK,TIP RED	360-0484-020		74970 105-1102-011			
TP3	JACK,TIP ORN	360-0484-050		74970 105-1106-011			
TP4	JACK,TIP YEL	360-0484-060		74970 105-1107-011			
TP5	JACK,TIP GRN	360-0484-040		74970 105-1104-011			
TP6	JACK,TIP BLU	360-0484-080		74970 105-1110-011			
TP7	JACK,TIP VIO	360-0484-090		74970 105-1112-011			
TP8	JACK,TIP GRA	360-0484-100		74970 105-1113-011			
TP9	JACK,TIP NHT	360-0484-010		74970 105-1101-011			
U1	INTEGRATED CIRCUIT	351-1011-020		27014 LM3028AH			
U2	INTEGRATED CIRCUIT COUNTER	351-7542-030		07263 541960M			

PARTS LIST (Cont)

Note

SABLE N ODE	MFR CODE	MFR PART NUMBER	REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
		642-3592-001	U3	INTEGRATED CIRCUIT DECADE COUNTER				
		31433 1M4454	U4	INTEGRATED CIRCUIT FLIP FLOP	351-1636-020		01295	SH54LS90J
		31433 1M4454-1	U5	INTEGRATED CIRCUIT LOGIC GATE	351-1525-010		04713	SH54LS74AJ
		81349 CK05BX103K	U6	INTEGRATED CIRCUIT FLIP FLOP	351-1523-010		04713	SH54LS00J
		81349 CK06BX105K	U7	INTEGRATED CIRCUIT COUNTER	351-1525-010		04713	SH54LS74AJ
		81349 CK05BX102K	U8	INTEGRATED CIRCUIT, PROM	351-1738-010		01295	SH54LS93J
		81349 CK06BX104K	U9	INTEGRATED CIRCUIT DGTL MOS (ESDS)	047-7204-001			
		93790 CD5EC22000	U10	INTEGRATED CIRCUIT COUNTER	351-8159-240		07263	4040BPC
		81349 CK06BX104K	U11	INTEGRATED CIRCUIT LOGIC GATE	351-1738-010		01295	SH54LS93J
		81349 CK05BX102K	U12	INTEGRATED CIRCUIT DECODE	351-7646-050		18324	S5406F
		93790 CD5FY910J0	U13	INTEGRATED CIRCUIT DECADE COUNTER	351-1526-070		04713	SH54LS42J
		81349 CK06BX104K	U14	INTEGRATED CIRCUIT LOGIC GATE	351-1738-010		01295	SH54LS93J
		81349 CK05BX102K	U15	INTEGRATED CIRCUIT LOGIC GATE	351-1636-020		01295	SH54LS90J
		72982 518-024A5-25PF	U16	INTEGRATED CIRCUIT LOGIC BUFFER	351-7646-050		18324	S5406F
		81349 CK05BX103K	U17	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-7715-020		27014	DH5407J
		81349 H39003-01-2206	U18	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-360		07263	4023BPC
		81349 CK05BX102K	U19	INTEGRATED CIRCUIT LOGIC BUFFER	351-8159-210		07263	F4049BPC
		81349 CK05BX103K	U20,U21	INTEGRATED CIRCUIT DECADE COUNTER	351-7715-020		27014	DH5407J
		04099 CRC1-200	U22	RESISTOR NETWORK DUAL-IN-LINE, 100K, 2%, 125V	351-1636-020		01295	SH54LS90J
		81349 H39003-01-2289	U23	INTEGRATED CIRCUIT TIMER	350-4027-140		01121	3144104
		81349 CK06BX104K	U24	INTEGRATED CIRCUIT MOS GATE (ESDS)	351-1137-050		27014	LH555J
		81349 CK05BX103K	U25	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8207-020		02735	CD4068BE
		81349 CK05BX103K	U26	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-320		07263	4001BPC
		81349 CK05BX472K	U27	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-340		07263	4011BPC
		81349 CK05BX471K	U28	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-210		07263	F4049BPC
		81349 H39003/01-2353	U29	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-340		07263	4011BPC
		77250 P313-0132-000	U30	INTEGRATED CIRCUIT MOS GATE (ESDS)	351-8159-160		07263	4027BPC
		96906 MS35338-135	U31	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8207-020		02735	CD4068BE
		96906 MS15795-803	U32	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-210		07263	F4049BPC
		77250 P343-0286-000	U33	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-350		07263	4012BPC
		12615 5L180-231	U34	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-220		07263	4050BPC
		22526 65474-001	U35	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-320		07263	4001BPC
		96906 MS75089-11	U36	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-270		07263	4028BPC
		96906 MS75089-22	U37	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-210		07263	F4049BPC
		12998 280-2745-010	U38	INTEGRATED CIRCUIT TRANSISTOR ARRAY	351-8159-340		07263	4011BPC
		07387 60-2-2	U39	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-0196-050		56209	ULN2004A
		372-2601-037	U40	INTEGRATED CIRCUIT TIMER	351-8159-180		07263	4027BPC
		22526 75481-001	U41	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-1137-050		27014	LH555J
		372-2601-048	U42	INTEGRATED CIRCUIT TIMER	351-8159-340		07263	4011BPC
		372-2601-048	U43	INTEGRATED CIRCUIT	351-1137-050		27014	LH555J
		14433 2H2369A	U44	RESISTOR NETWORK FILM, 470 OHMS, 2%, 1.25W	351-7736-020		01295	SH54121J
		04713 MJE603	Y1	CRYSTAL UNIT,QTZ 4.096000MHZ	350-4045-730		19701	951047006L200
		49956 2N2222A			289-7128-230		75378	289-7128-230H2
		12040 2N4416						
		49956 2N2222A						
		12040 2N4416						
		81349 RCR07G681KS						
		81349 RCR07G101KS						
		81349 RCR07G222KS						
		81349 RCR07G102KS						
		81349 RCR07G471KS						
		81349 RCR07G682KS						
		81349 RCR07G103KS						
		81349 RCR07G102KS						
		81349 RCR07G153KS						
		81349 RCR07G103KS						
		81349 RCR07G471KS						
		81349 RCR07G104KS						
		81349 RCR07G224KS						
		81349 RCR07G331KS						
		81349 RCR07G104KS						
		81349 RCR07G153KS						
		81349 RCR07G105KS						
		81349 RCR07G153KS						
		81349 RN6003403F						
		81349 RCR07G103KS						
		81349 RN5504611F						
		81349 RN5501272F						
		81349 RCR07G153KS						
		81349 RCR07G104KS						
		81349 RCR07G154KS						
		81349 RCR07G153KS						
		81349 RCR07G104KS						
		81349 RCR07G473KS						
		81349 RCR07G394KS						
		74970 105-1108-011						
		74970 105-1102-011						
		74970 105-1106-011						
		74970 105-1107-011						
		74970 105-1104-011						
		74970 105-1110-011						
		74970 105-1112-011						
		74970 105-1113-011						
		74970 105-1101-011						
		27014 LH3028AH						
		07263 54196DH						

Configuration history b (REV H) is not recorded

MODIFICATION

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE
----------------	---

A1	Added CR2, CR3, 1N4454. Changed quantity of MP5 from
----	---

Note

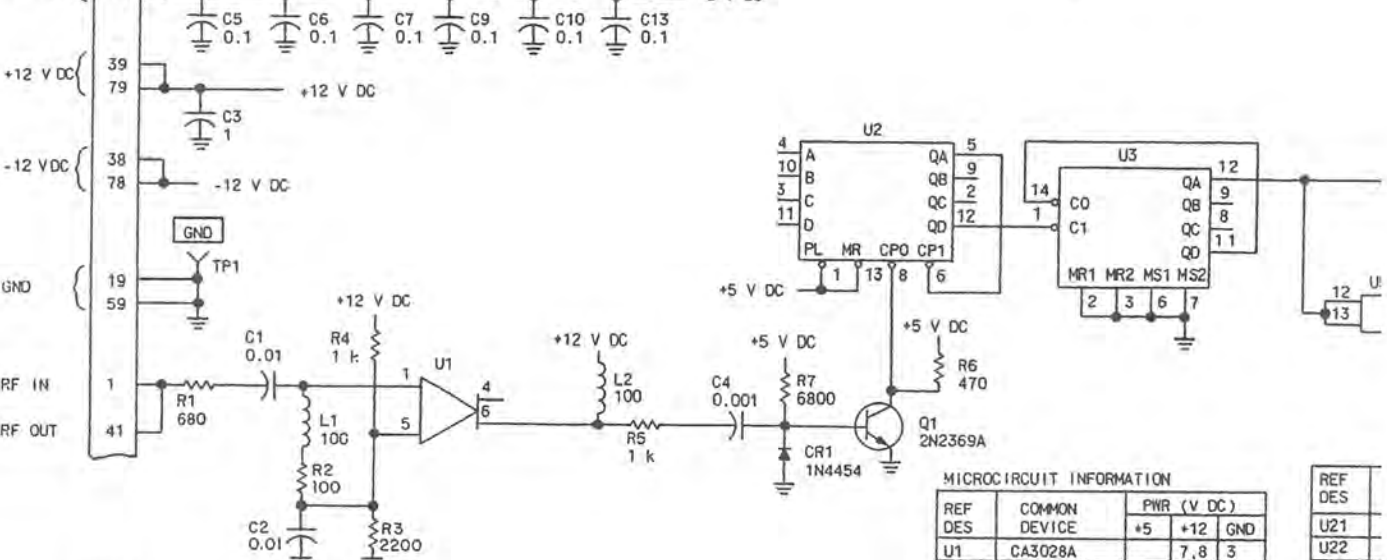
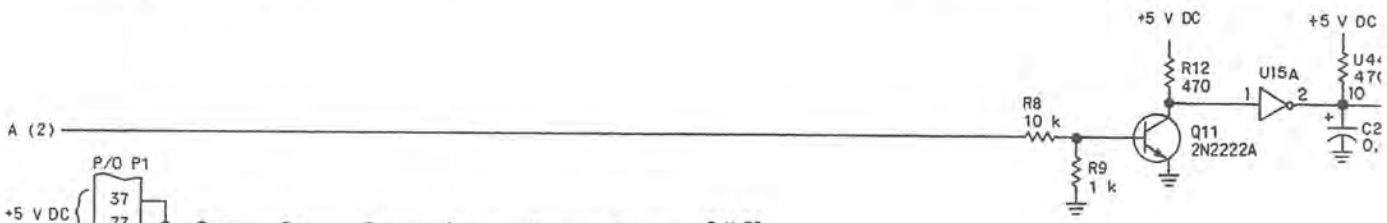
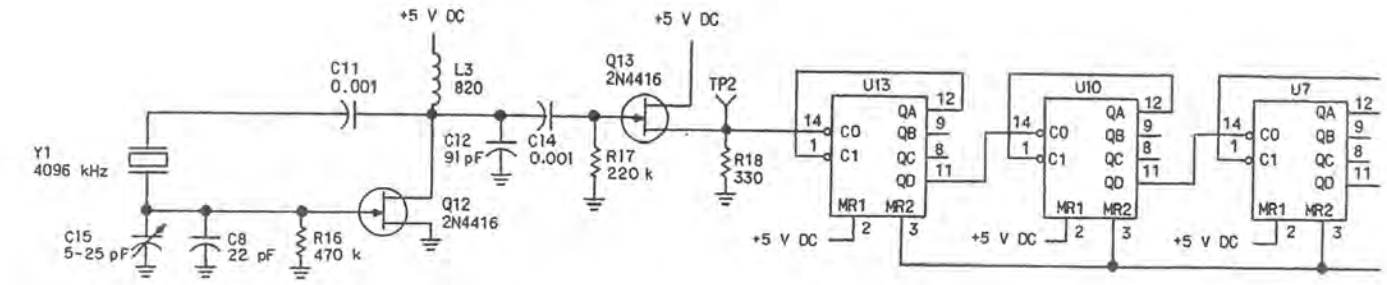
Configuration history before 1 April 1982  
(REV H) is not recorded in this section.

USABLE ON CODE	MFR CODE	MFR PART NUMBER
20	01295	SN54LS90J
10	04713	SN54LS74AJ
10	04713	SN54LS00J
10	04713	SN54LS74AJ
10	01295	SN54LS93J
01		
00	07263	4040BPC
10	01295	SN54LS93J
50	18324	S5406F
70	04713	SN54LS42J
00	01295	SN54LS93J
00	01295	SN54LS90J
00	18324	S5406F
00	27014	DH5407J
00	07263	4023BPC
00	07263	F4049BPC
00	27014	DH5407J
00	01295	SN54LS90J
00	01121	314A104
00	27014	LH555J
00	02735	CD4068BE
00	07263	4001BPC
00	07263	4011BPC
00	07263	F4049BPC
00	07263	4011BPC
00	07263	4027BPC
00	02735	CD4068BE
00	07263	F4049BPC
00	07263	4012BPC
00	07263	4050BPC
00	07263	4001EPC
00	07263	4028BPC
00	07263	F4049BPC
00	07263	4011BPC
00	56289	ULN2004A
00	07263	4027BPC
00	27014	LH555J
00	07263	4011BPC
00	27014	LH555J
00	01295	SN54121J
00	19701	951047006L200
00	75378	289-7128-230M2

MODIFICATION HISTORY

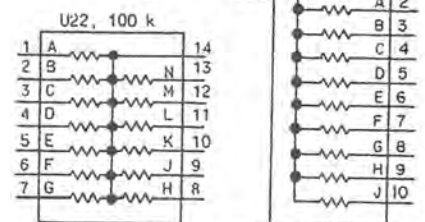
REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A1	Added CR2, CR3, 1N4454. Changed quantity of MP5 from 1 to 2.	REV J and above.



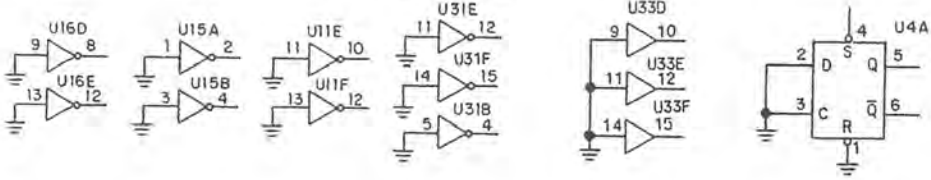


**NOTES:**

- UNLESS OTHERWISE SPECIFIED: RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS AND INDUCTANCE VALUES ARE IN MICROHENRYS.
- PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
- TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.
- THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.
- RESISTOR PACK



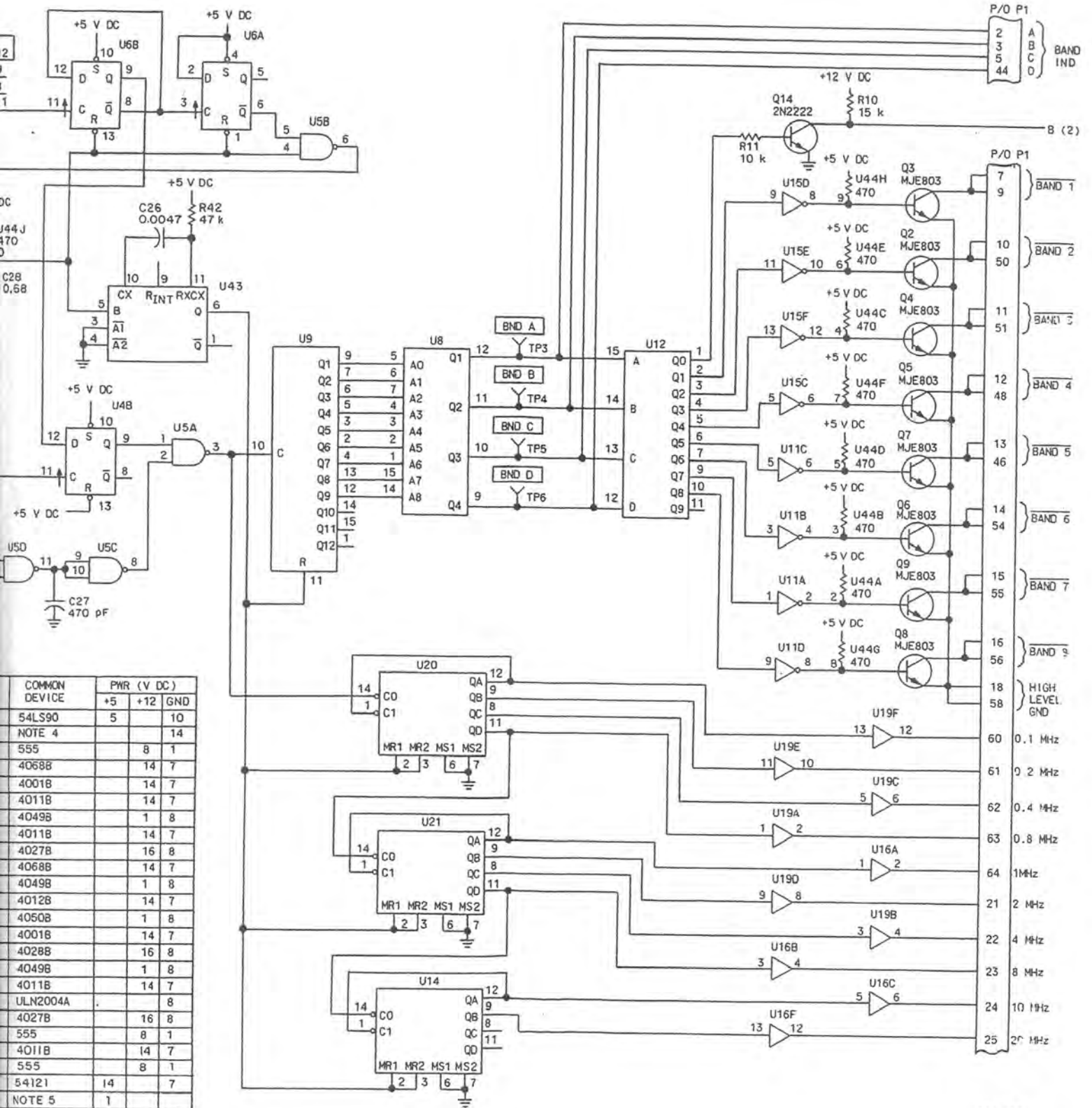
**SPARE GATES:**



**MICROCIRCUIT INFORMATION**

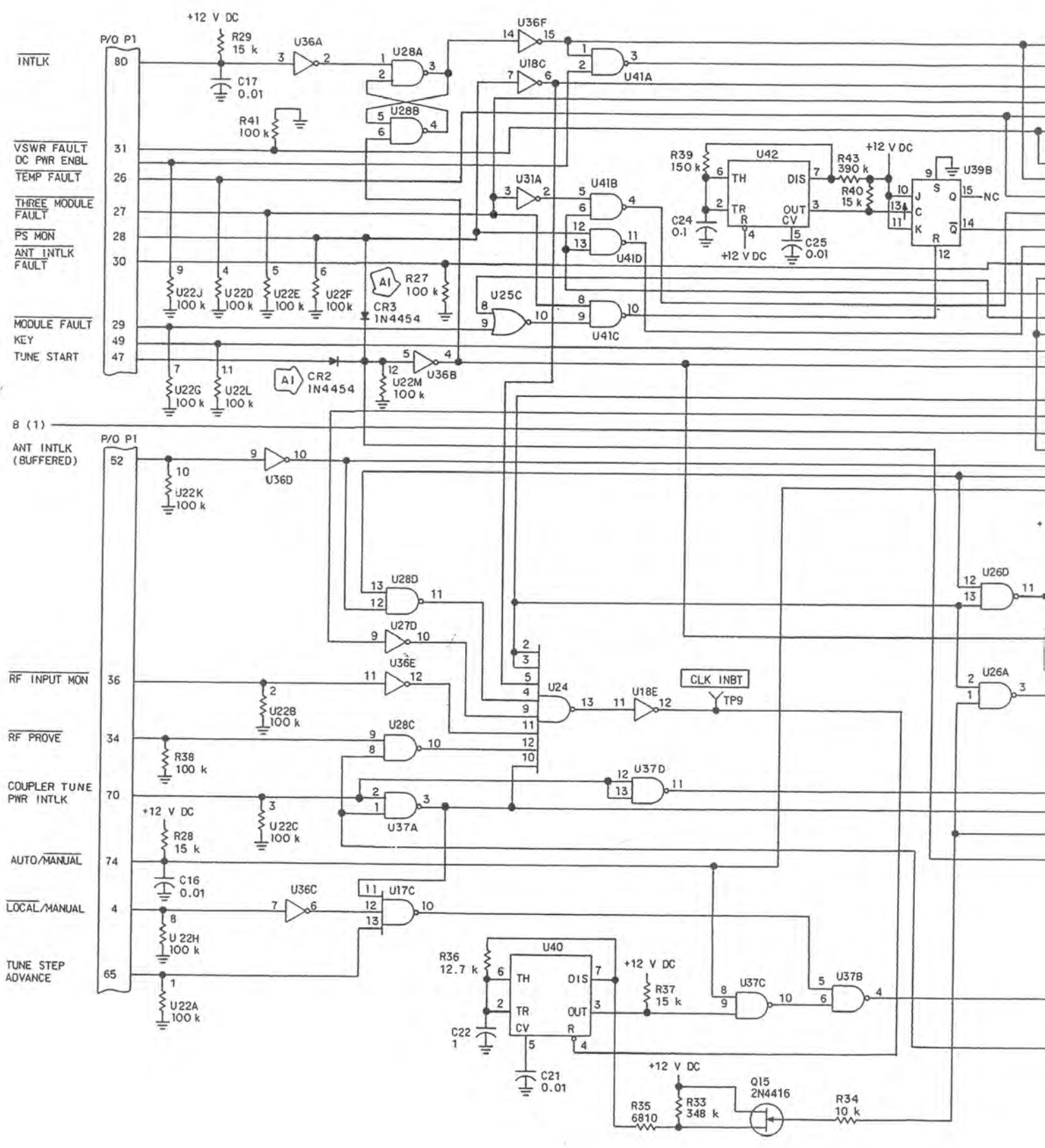
REF DES	COMMON DEVICE	PWR (V DC)		
		+5	+12	GND
U1	CA3028A		7, 8	3
U2	54196	14		7
U3	54LS90	5		10
U4	54LS74	14		7
U5	54LS00	14		7
U6	54LS74	14		7
U7	54LS93	5		10
U8	PROM	16	8, 13	
U9	4040B	16		8
U10	54LS93	5		10
U11	5406	14		7
U12	54LS42	16		8
U13	54LS93	5		10
U14	54LS90	5		10
U15	5406	14		7
U16	5407	14		7
U17	4023B		14	7
U18	4049B		1	8
U19	5407	14		7
U20	54LS90	5		10

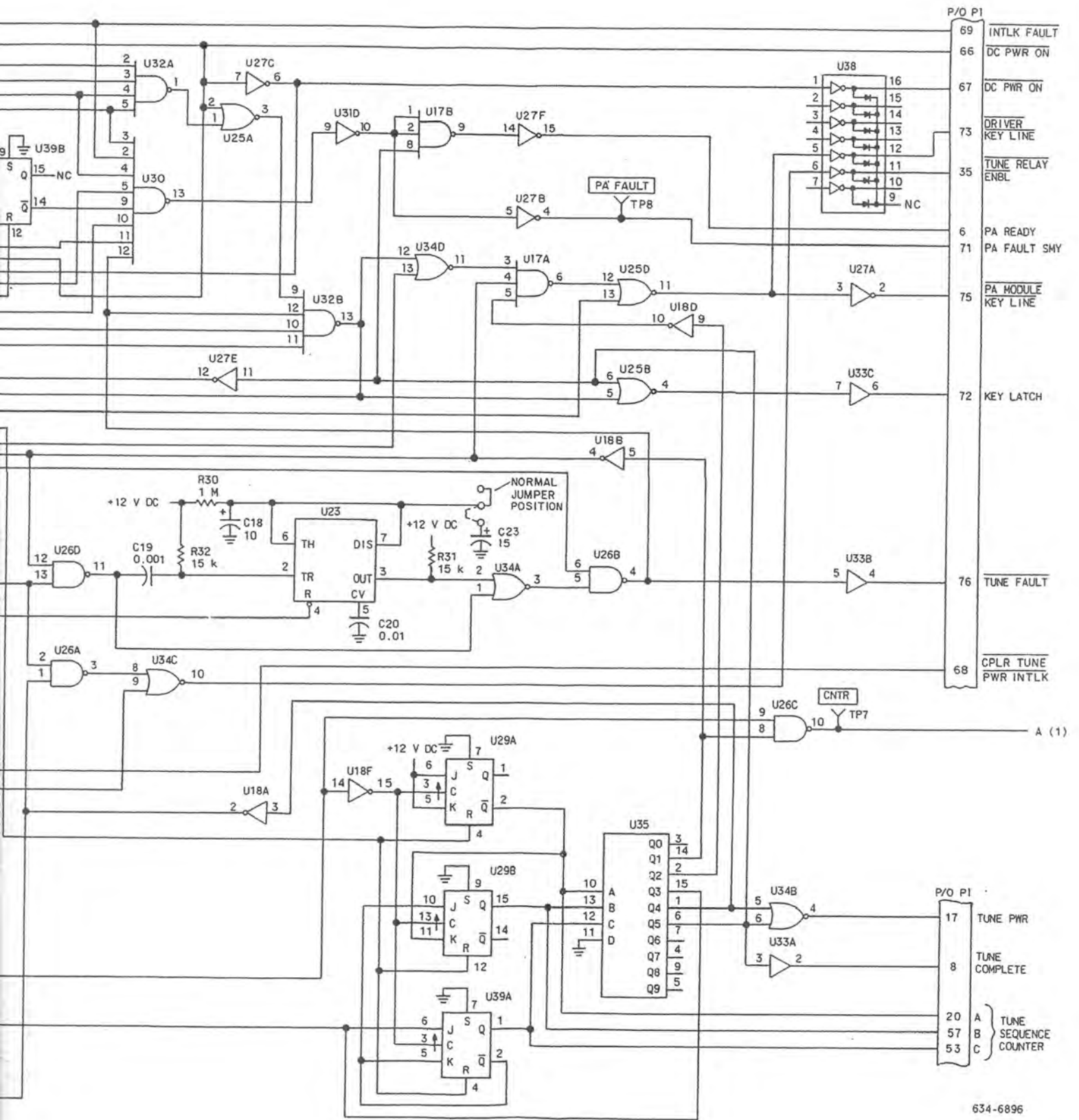
REF DES
U21
U22
U23
U24
U25
U26
U27
U28
U29
U30
U31
U32
U33
U34
U35
U36
U37
U38
U39
U40
U41
U42
U43
U44



634-6896

Digital Control Card, Schematic Diagram  
Figure 7 (Sheet 1 of 2)





Digital Control Card, Schematic Diagram  
Figure 7 (Sheet 2)

634-6896



Rockwell  
International

instructions

# Analog Control Card (642-3593-001)

Collins Telecommunications Products Division

523-0771673-001211

15 September 1982

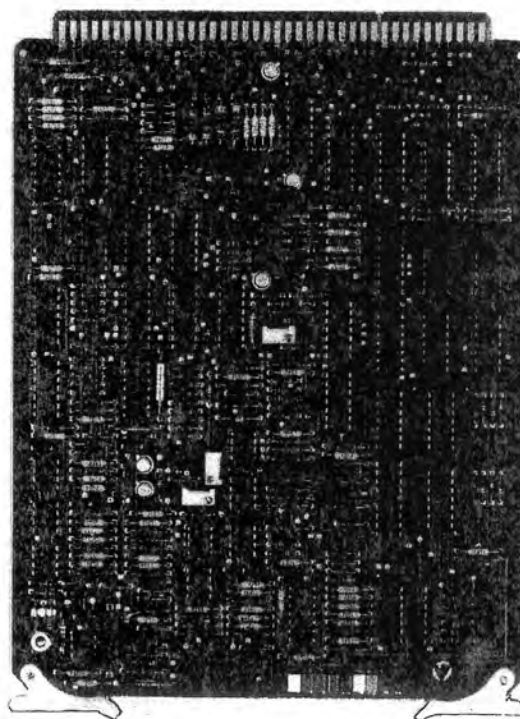
Printed in USA

(642-3593-001)

## 1. DESCRIPTION

Analog Control Card 642-3593-001 (figure 1) is a 3-layer plug-in circuit card with an 80-pin edge-on con-

necter (2 layers, 40 pins each). All control and electrical connections to the analog control card are made through this edge-on connector.



TPA-4663-017

Analog Control Card  
Figure 1

017100-010110-070

## **2. PRINCIPLES OF OPERATION**

### **2.1 General**

The analog control card receives analog, control, and power input signals and provides analog, control, monitor, and fault output signals that show and/or control power amplifier operating status.

### **2.2 Power Amplifier Current Analog**

Power amplifier current analog input signals are supplied at P1-6 (pa current analog A), P1-7 (pa current analog B), P1-8 (pa current analog C), and P1-9 (pa current analog D) and are used to produce a total power amplifier current analog output, crowbar signals to enable/disable the associated power supply outputs, and control ALC and IGC output signals.

Refer to figure 9. To produce the total power amplifier current analog output at P1-10 (total pa current analog), the power amplifier current analog inputs are amplified by U20A, U20B, U21A, and U21B and supplied to R37, R38, R39, and R40. These resistors provide a voltage divider network and cause the reference input at U29C to be a differential sum of the current analog inputs. Amplifiers U29C and U29B then produce an analog output that represents the total power amplifier current (1 volt per 10 amperes).

Crowbar signals are enabled/disabled by supplying separate current analogs for each power amplifier module through comparators U15D, U15A, U15B, and U15C or by the total power amplifier current analog supplied by U29A. U15 produces a crowbar if module current is too high. The separate current analog signals are supplied by U15D, U15A, U15B, or U15C as logic 1 or logic 0 inputs to U19D, U19A, U19B, and U19C respectively (shown as U1-A, figure 2). U10 and U11 produce a crowbar if current is outside a window set by 9-V reference and total pa current. The total power amplifier current analog is compared with the separate current analogs and a +9-V dc reference input by U10A, U10D, U11A, and U11D, and they provide a logic 1 or logic 0 input to U19D, U19A, U19B, and U19C respectively (shown as U1-B, figure 2). Refer to figure 9. With current analogs all satisfactory, U1-A and U1-B will be logic 1 as will U2-B, U2-C, and U2-D. However, U1-C/U2-A will be logic 0 and thus produce a logic 1 at U4-B (crowbar A output) as can be seen from the truth table. This circuit is a repeat for all crowbar circuits and with the inputs at U2-B, U2-C, and U2-D connected as they are, only one crowbar can be enabled

at a time. By this action, the others are inhibited due to current overloads, and outputs at P1-52 (crowbar A), P1-54 (crowbar B), P1-56 (crowbar C), and P1-58 (crowbar D) are enabled/inhibited.

ALC/IGC output signals are controlled by the separate current analogs through bilateral switches (U16A, U16B, U16C, U16D), diode detectors (CR6, CR7, CR8, CR9), and Darlington amplifier (U50A), and supplied as a reference input to ALC amplifier (U49A). Changes in the reference input control the gain of the ALC amplifier and therefore controls the ALC/IGC output signals at P1-14 (IGC), P1-62 (ADL output), and P1-73 (ACL delayed).

### **2.3 DC Monitors**

Dc monitor input signals are supplied at P1-21 (dc monitor A), P1-25 (dc monitor B), P1-17 (dc monitor C), P1-20 (dc monitor D), P1-5 (35-volt monitor), and P1-66 (dc power on) and are used to produce a power supply monitor signal and module fault signals, enable/inhibit the reference signals for control of ALC/IGC, and control the gain of the ALC/IGC circuits.

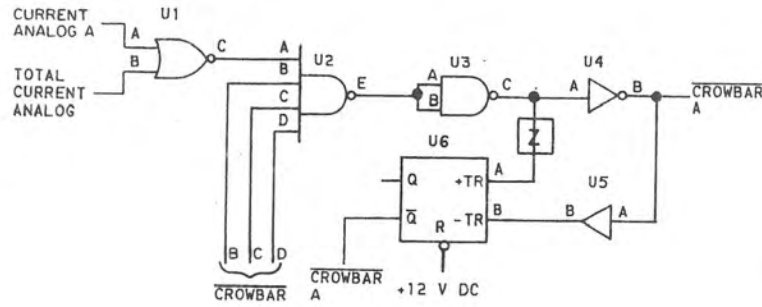
A logic 0 power supply monitor signal at P1-28 is produced when a logic 0 dc power on signal is applied, a logic 1 35-volt monitor signal is applied, and a logic 1 three module fault signal is applied. The three module fault signal is developed by using two single 8-channel multiplexers (refer to figure 3).

A logic 1 module fault at P1-29 is developed when no module is faulted. This is generated by monitoring the module fault inputs of the three module fault circuit using NOR gate U34A (all fault inputs at U34A must be logic 0's).

Module fault signals are supplied at P1-43 (A fault), P1-44 (B fault), P1-42 (C fault), and P1-46 (D fault) when the dc power on input is at logic 0 and the associated power supply monitor is at logic 0. This produces a logic 0 fault signal output. A logic 1 dc power on input (indicating dc power is not applied) inhibits all fault signals.

The reference signals (pa current analogs) for control of ALC/IGC are inhibited by U16A, U16B, U16C, or U16D when the associated dc monitor signal is logic 0 (faulted).

Gain of the AGC/IGC circuit is controlled using the same two single 8-channel multiplexers that were used to develop the three module fault signal. Gain is based on whether 2, 3, or 4 modules are operating (refer to figure 4).

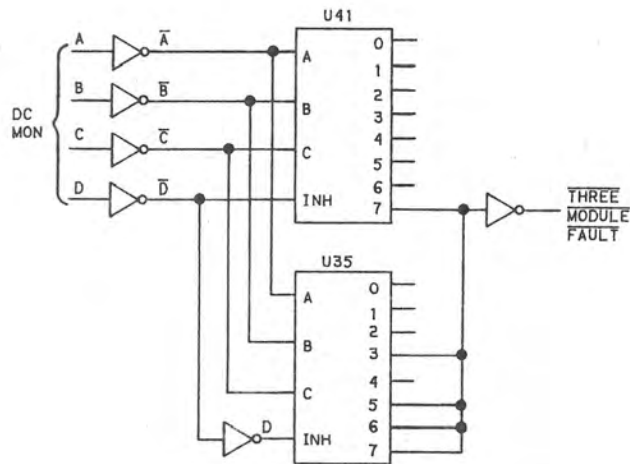


TRUTH TABLE

U1			U2					U3			U4		U5		U6		
A	B	C	A	B	C	D	E	A	B	C	A	B	A	B	A	B	$\bar{Q}$
1	1	0	0	0	0	0	1	1	1	0	0	1	1	1	0	1	1
SAME AS ABOVE			0	0	0	1	1	SAME AS ABOVE									
			0	0	1	0	1										
			0	0	1	1	1										
			0	1	0	0	1										
			0	1	0	1	1										
			0	1	1	0	1										
1	0	1	1	1	1	1	SAME AS ABOVE										
0	1	1	0	1													
0	0	1	0	1	1												
1	0	0	1	1													
1	1	0	0	1													
1	1	0	1	1													
1	1	1	0	1	1	0	0	1	1	0	0	0	1	0	0	0	

TPA-5330-013

Current Analog and Crowbar Circuit  
Figure 2



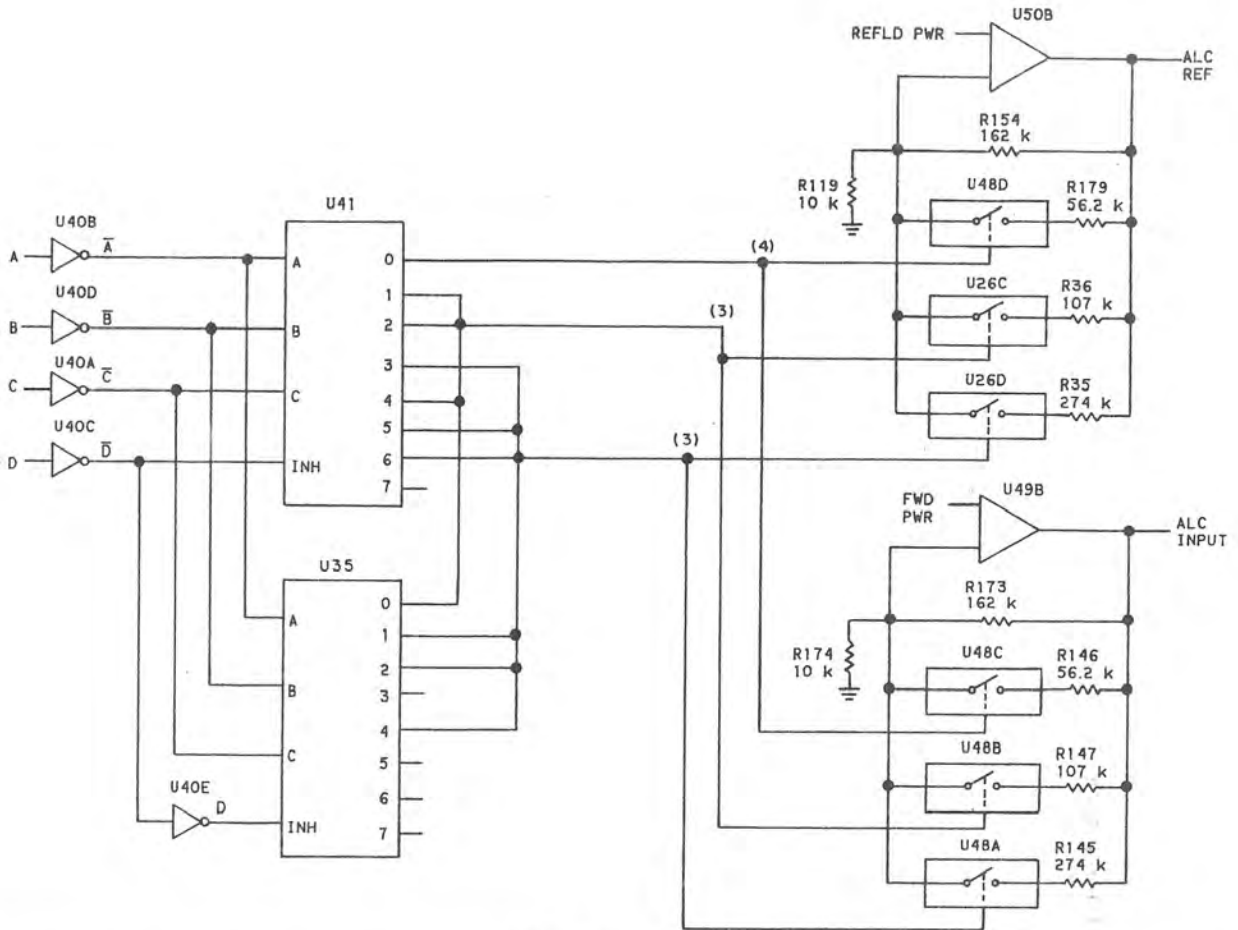
TRUTH TABLE

MODULES FAULTED	INPUTS					OUTPUTS					THREE MODULE FAULT
	$\bar{A}$	$\bar{B}$	$\bar{C}$	$\bar{D}$	D	U41-7	U35-3	U35-5	U35-6	U35-7	
NONE	0	0	0	0	1	-	-	-	-	-	1
A	1	0	0	0	1	-	-	-	-	-	1
B	0	1	0	0	1	-	-	-	-	-	1
A, B	1	1	0	0	1	-	-	-	-	-	1
C	0	0	1	0	1	-	-	-	-	-	1
A, C	1	0	1	0	1	-	-	-	-	-	1
B, C	0	1	1	0	1	-	-	-	-	-	1
A, B, C	1	1	1	0	1	1	-	-	-	-	0
D	0	0	0	1	0	-	-	-	-	-	1
A, D	1	0	0	1	0	-	-	-	-	-	1
B, D	0	1	0	1	0	-	-	-	-	-	1
A, B, D	1	1	0	1	0	-	1	-	-	-	0
C, D	0	0	1	1	0	-	-	-	-	-	1
A, C, D	1	0	1	1	0	-	-	1	-	-	0
B, C, D	0	1	1	1	0	-	-	-	1	-	0
A, B, C, D	1	1	1	1	0	-	-	-	-	1	0

TPA-5331-013

Three Module Fault Circuit  
Figure 3





TRUTH TABLE

MODULES WORKING	INPUTS				OUTPUTS												ADDED LOAD (k Ω)	
	Ā	B̄	C̄	D̄	D	U41-0	U41-1	U41-2	U41-3	U41-4	U41-5	U41-6	U35-0	U35-1	U35-2	U35-4		
A, B, C, D	0	0	0	0	1	1	-	-	-	-	-	-	-	-	-	-	-	56.2
B, C, D	1	0	0	0	1	-	1	-	-	-	-	-	-	-	-	-	-	107
A, C, D	0	1	0	0	1	-	-	1	-	-	-	-	-	-	-	-	-	107
C, D	1	1	0	0	1	-	-	-	1	-	-	-	-	-	-	-	-	274
A, B, D	0	0	1	0	1	-	-	-	-	1	-	-	-	-	-	-	-	107
B, D	1	0	1	0	1	-	-	-	-	-	1	-	-	-	-	-	-	274
A, D	0	1	1	0	1	-	-	-	-	-	-	1	-	-	-	-	-	274
D	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	-	-	NONE
A, B, C	0	0	0	1	0	-	-	-	-	-	-	-	1	-	-	-	-	107
B, C	1	0	0	1	0	-	-	-	-	-	-	-	-	1	-	-	-	107
A, C	0	1	0	1	0	-	-	-	-	-	-	-	-	-	1	-	-	274
C	1	1	0	1	0	-	-	-	-	-	-	-	-	-	-	-	-	NONE
A, B	0	0	1	1	0	-	-	-	-	-	-	-	-	-	-	1	-	274
B	1	0	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-	NONE
A	0	1	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-	NONE
NONE	1	1	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-	NONE

TPA-5332-014

ALC/IGC Loading Circuit  
Figure 4

## 2.4 Power Amplifier Module Keyline (Refer to figure 9)

The power amplifier module keyline is received as a logic 0 input at P1-69, is supplied through inverter U1C and inverter drivers U24C, U24F, U24D, and U24E, and supplied as four keyline outputs: P1-51 (power amplifier keyline A), P1-53 (power amplifier keyline B), P1-55 (power amplifier keyline C), and P1-57 (power amplifier module D).

## 2.5 ALC/IGC Circuit (Refer to figure 5)

ALC/IGC are gain control circuits and are enabled and varied by tune power, reflected power, forward power, ALC reference gain, ALC input gain, ALC input, and total current analog.

The IGC (internal gain control) output controls the pa output and is level-controlled by amplifiers U52A and U52B, driver-switch Q6, and the input circuits. The controlling inputs are as follows.

- a. If the ALC delayed input increases (in a negative direction), the IGC output increases (in a positive direction). As the IGC output increases, the pa output decreases.
- b. If tune power is applied, the output of U51B goes in a more negative direction. The IGC output increases to lower the pa output (tune power).
- c. If forward power increases, U51A output increases, raising the reference level of U51B, thus reducing the output of U51B and the pa output.
- d. If reflected power or ALC increases, the reference at U37B is increased and the output from U37B is decreased, as is the pa output.
- e. If total current analog increases, the output of U49A decreases, as does the pa output.
- f. If an ALC input increases (in a negative direction), the IGC output increases and the pa output decreases.
- g. When a tune complete signal (logic 1) is applied and ALC input does not exceed the threshold of U42A and/or U42D, U34B produces a logic 1 output which disables the ALC power switch (Q5), and the 40-volt enable output goes to logic 1, causing power to be switched. When the threshold of U42A and/or U42D is reached or exceeded, or a tune complete signal (logic 0) is applied, the ALC power switch is enabled and the 40-volt enable

output goes to logic 0, switching the 40-volt power for pa operation.

The ADL (anode dissipation limiter) output (logic 0) is supplied when reflected power/ALC reference or the total current analog exceeds their respective thresholds to produce a logic 0 output.

The rf prove output (logic 0) is supplied when the ALC input exceeds the threshold of U42A.

## 2.6 VSWR Circuit (Refer to figure 6)

The vswr circuits consist of a vswr fault circuit and a vswr analog circuit.

The vswr analog circuit includes U31A, U32, U33A, U33B, and U36B and is designed to implement the function:

$$VSWR = \frac{V_F + V_R}{V_F - V_R}$$

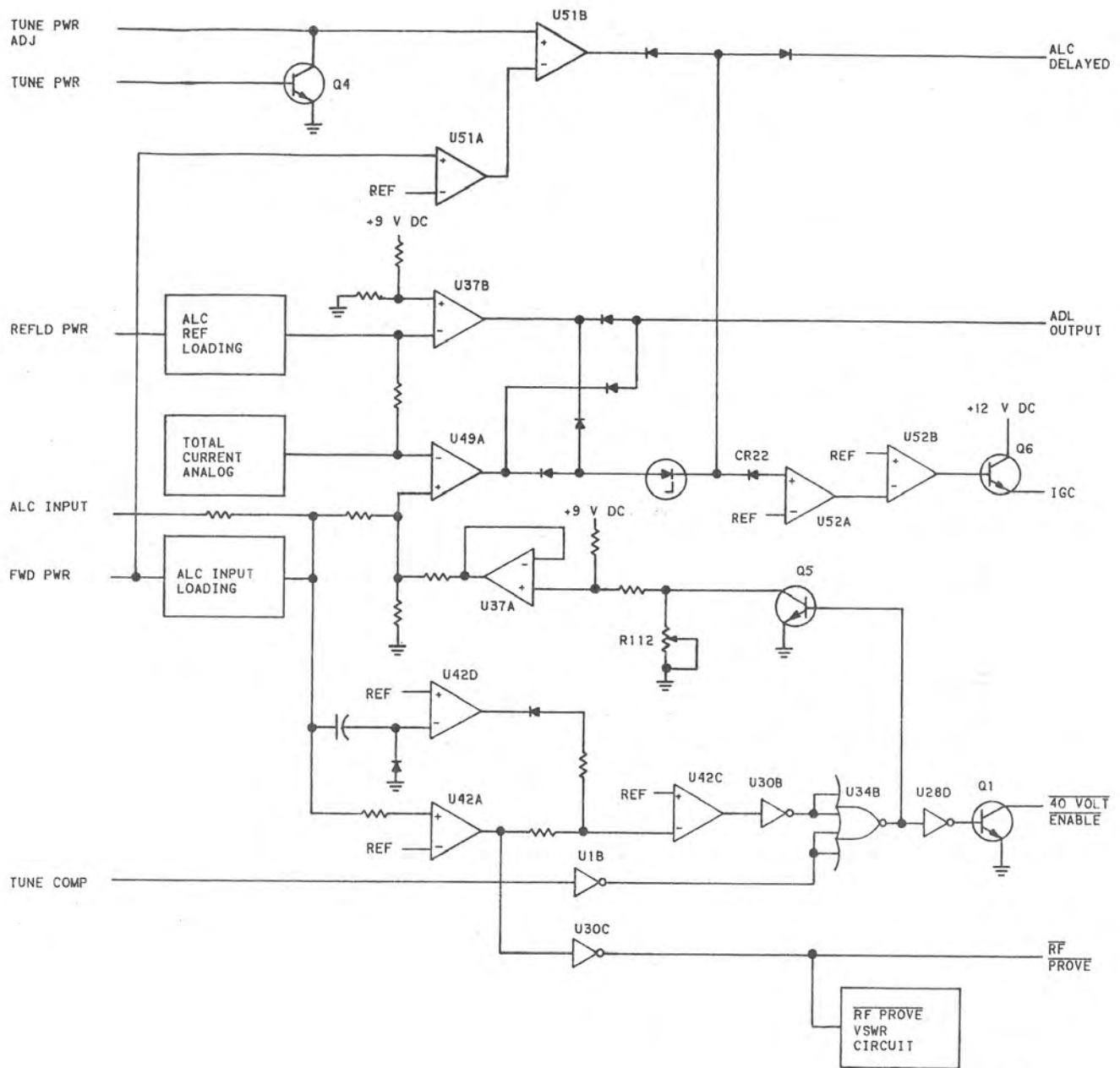
where  $V_F$  and  $V_R$  are analog voltages directly proportional to the forward and reflected voltages on the rf output transmission lines.

The dc analog voltages received are each about 1.5 V dc for maximum indications (1500 watts forward and 500 watts reflected power). To apply the above formula, the dc gain of the analog inputs is reduced (by U33A, U33B, and U36B) to a level proportional to the actual forward and reflected powers and is applied to U32-5 ( $V_F - V_R$ ) and U32-8 ( $V_F + V_R$ ). U32 performs the analog division and provides an analog output at U32-4 representing vswr (5 V dc equals 5:1 vswr).

Potentiometer R110 is used to calibrate vswr meter. Diode VR6 prevents meter damage when excessive vswr is present and diode VR5 prevents latchup of U32 when vswr is excessive. Dc power is removed from circuit by Q3 whenever rf power output is less than what is required to activate the rf prove circuit, thus, preventing errors in vswr computation and meter readout.

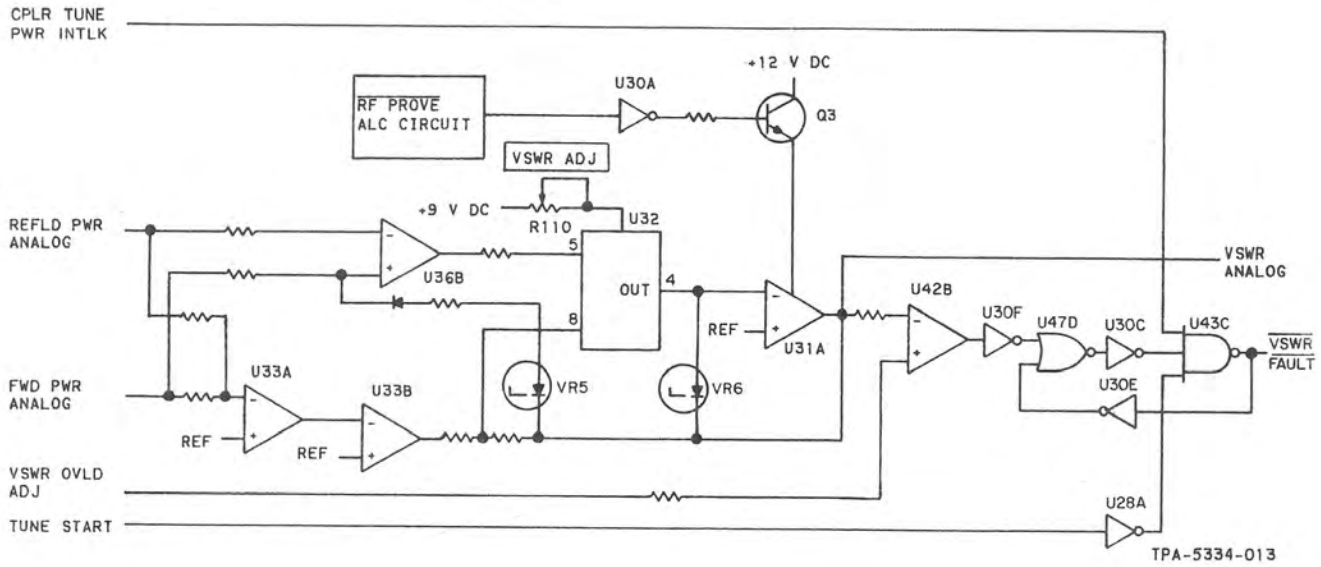
Comparator circuit U42B provides an input to the VSWR FAULT circuit when vswr analog exceeds an externally adjusted overload threshold dc voltage.

These inputs are compared and summed to provide a vswr analog output that is relative to the vswr.

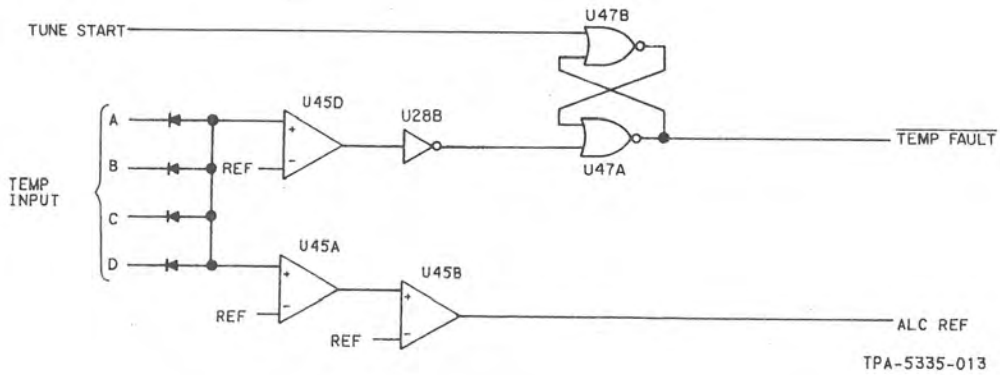


TPA-5333-014

ALC/IGC Circuit  
Figure 5



VSWR Circuit  
Figure 6



Temperature Control Circuit  
Figure 7

The vswr fault circuit receives the following inputs:

- a. Vswr analog
- b. Vswr overload adjust
- c. Tune start
- d. Coupler tune power interlock

The vswr overload adjust and vswr analog are supplied to differential amplifier U42B. If the threshold of U42B is exceeded, a logic 0 is supplied from U42B (logic 1 to U43C). If U43C receives three logic 1 inputs — coupler tune power interlock (interlock satisfied), tune start (not in tune start, logic 0 to U28A) and the logic 0 from U42B (described above) — a logic 0 vswr fault output (fault) is supplied.

### **2.7 Temperature Control Circuit (Refer to figure 7)**

The temperature control circuit receives analog inputs that directly relate to the temperature circuits being controlled. As the analog signal is reduced, the ALC reference is changed to help reduce the heat being dissipated. If the analog level falls below the temperature fault threshold, a logic 1 is applied to U47A and a temperature fault output (logic 0) is generated.

The temperature fault is coupled through the flip-flop arrangement of U47A-U47B to disable the tem-

perature fault during tune start, thus allowing the temperature analog input to rise above the temperature fault threshold when a tune start is initiated.

### **3. TESTING/TROUBLESHOOTING PROCEDURES**

A defective analog control card can be returned to a Rockwell-Collins authorized repair facility for repair. Contact the nearest Rockwell-Collins office or

Collins Telecommunications Products Division  
Attention: HF Products  
400 Collins Road, NE  
Cedar Rapids, Iowa 52498

for information and instructions.

### **4. ALIGNMENT/ADJUSTMENT**

Alignment/adjustment is performed in conjunction with testing/troubleshooting.

### **5. REPAIR**

Repair is accomplished using standard shop practices.

## 6. PARTS LIST/DIAGRAMS

### 6.1 Introduction

**Caution**

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All parts list illustrations containing ESDS items are shown with the following symbol:



This paragraph assists in identification and requisition of parts. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included. The parts location illustration shows component placement on the circuit cards.

### 6.2 Parts List

REF DES Column — Reference designators and/or item numbers for each part/subassembly are listed in alphanumeric or numeric sequence. These are the reference designators and/or item numbers shown on the parts location illustration. Only the reference designators are shown on the schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modification.

Modifications are identified by two methods: An alphanumeric identifier is assigned to each electrical design change and listed in the REVISION IDENT column of the modification history. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change.

NA (not applicable) in the REVISION IDENT column indicates a documentation change and/or mechanical change. This revision activity will be noted in the DESCRIPTION column of the parts list only. This

change does not affect the circuit card/subassembly components or the schematic. Each change relates to the REV (revision identifier) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history. Dash (—) denotes original; letter A first change; letter B second change, etc.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

### 6.3 How To Use This Parts List

To locate a part number, locate the part and its item number and/or reference designator on the illustration. Turn to the parts list page and find the item number and/or reference designator to determine its description and part number.

To locate the illustration for a part, if the reference designator and/or part number are known, refer to the parts list and find the figure and item number indicated in the parts list for location on the illustration.

### 6.4 Manufacturer's Code, Name, and Address

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
-------------	------------------------------------

01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49 DALLAS TX 75265
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02111	SPECTROL ELECTRONICS CORP SUB OF CARRIER CORP 17070 E GALE AVE P O BOX 1220 CITY OF INDUSTRY CA 91749
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02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
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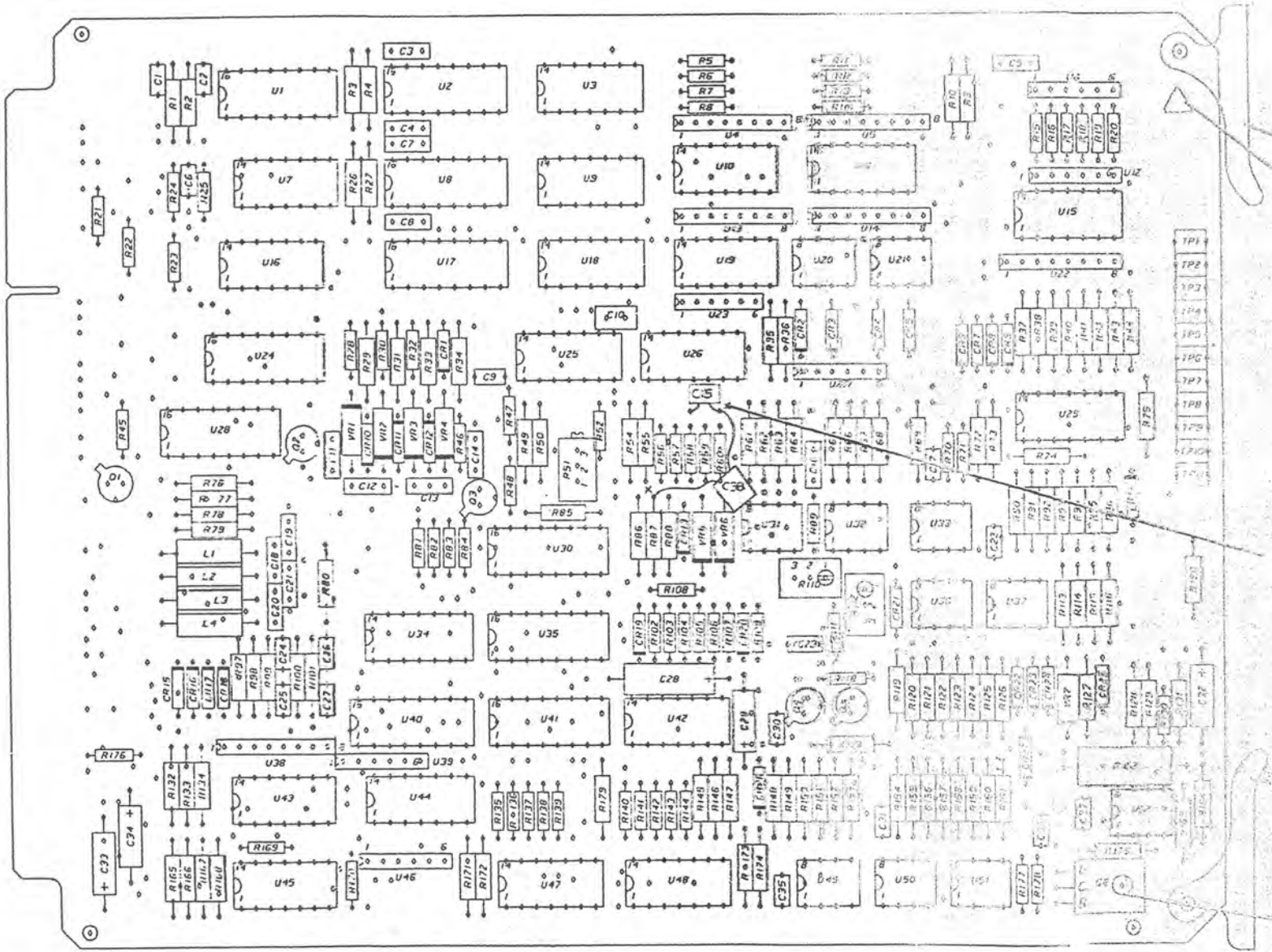
<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
04713	MOTOROLA INC SEMICONDUCTOR GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV SUB OF SCHLUMBERGER LTD NORTH AMERICAN SALES MAIL STOP 14-1053 401 ELLIS ST P O DRAWER 7284 MOUNTAIN VIEW CA 94042
07387	BIRTCHEP CORP THE MEDICAL DIV 4501 N ARDEN DR P O BOX 4399 EL MONTE CA 91734
12998	QUALITY NAME PLATE INC MILL ROAD EAST GLASTONBURY CT 06025
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV 855 35TH ST NE P O BOX 728 CEDAR RAPIDS IA 52498
19701	MEPCO/ELECTRA INC A NORTH AMERICAN PHILIPS CO P O BOX 760 MINERAL WELLS TX 76067
27014	NATIONAL SEMICONDUCTOR CORP 2900 SEMICONDUCTOR DR SANTA CLARA CA 95051
31433	UNION CARBIDE CORP ELECTRONICS DIV HWY 276 SE P O BOX 5928 GREENVILLE SC 29606
34335	ADVANCED MICRO DEVICES 901 THOMPSON PL SUNNYVALE CA 94086
49956	RAYTHEON CO EXECUTIVE OFFICES 141 SPRING ST LEXINGTON MA 02173
56289	SPRAGUE ELECTRIC CO 87 MARSHALL ST NORTH ADAMS MA 01247
74970	JOHNSON E F CO 299 10TH AVE S W WASECA MN 56093
77250	ALLIED PRODUCTS CORP PHEOLL MFG CO DIV 5700 W ROOSEVELT RD CHICAGO IL 60650

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
81349	MILITARY SPECIFICATIONS
81483	INTERNATIONAL RECTIFIER 9220 SUNSET BLVD P O BOX 2321 TERMINAL ANNEX LOS ANGELES CA 90054
93790	CORNELL-DUBILIER ELECTRONICS DIV FEDERAL PACIFIC ELECTRIC CO 1605 RODNEY FRENCH BLVD NEW BEDFORD MA 02741
96906	MILITARY STANDARD

**6.5 Equipment Covered**

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions. Configuration history before 1 April 1982 is not recorded in this section.

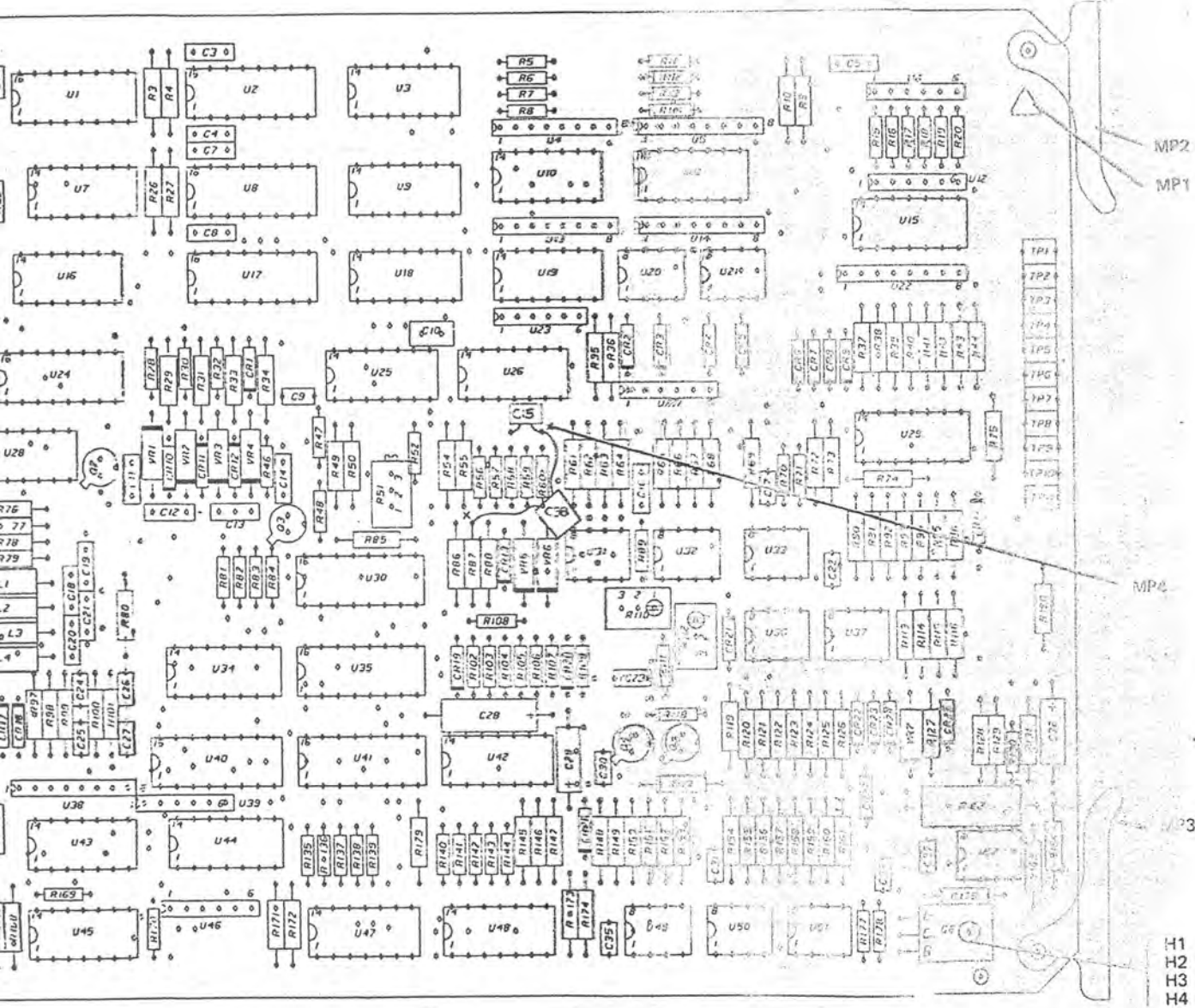
<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Analog Control Card	642-3593-001	REV H



TPA-

Analog Control Card, Parts Location Diagram  
Figure 8 (Sheet 1 of 2)





TPA-4898-019

Analog Control Card, Parts Location Diagram  
Figure 8 (Sheet 1 of 2)

## PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	REF DES	DESCRIPTION
	ANALOG CONTROL CARD (ESDS)	642-3593-001				R86	RESISTOR,FXD FILM, 66.5K, 1/8W
CR1-CR27	SEMICOND DEVICE	353-3644-010		31433	1H4454	R87	RESISTOR,FXD FILM, 10K, 1/8W
C1	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BK103K	R88	RESISTOR,FXD FILM, 4.42K, 1/8W
C2	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BK102K	R89	RESISTOR,FXD FILM, 2.49K, 1/8W
C3,C4	CAPACITOR,FXD CER DIEI, 0.68UF, 10%, 50VDC	913-5019-540		81349	CK06BK684K	R90	RESISTOR,FXD FILM, 10K, 1/8W
C5	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BK104K	R91	RESISTOR,FXD FILM, 10K, 1/8W
C6	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BK103K	R92	RESISTOR,FXD FILM, 10K, 1/8W
C7,C8	CAPACITOR,FXD CER DIEI, 0.68UF, 10%, 50VDC	913-5019-540		81349	CK06BK684K	R93	RESISTOR,FXD FILM, 10K, 1/8W
C9	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BK103K	R94	RESISTOR,FXD FILM, 10K, 1/8W
C10	CAPACITOR,FXD MICA DIEI, 100PF, 5%, 50V	912-4141-050		93790	UDSFY101J0	R95	RESISTOR,FXD FILM, 4.02K, 1/8W
C11-C14	CAPACITOR,FXD CER DIEI, 0.68UF, 10%, 50VDC	913-5019-540		81349	CK06BK684K	R96	RESISTOR,FXD FILM, 10K, 1/8W
C15	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BK103K	R97	RESISTOR,FXD FILM, 10K, 1/8W
C16	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BK104K	R98	RESISTOR,FXD FILM, 10K, 1/8W
C17	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BK103K	R99-R101	RESISTOR,FXD FILM, 3.32K, 1/8W
C18-C21	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BK104K	R102	RESISTOR,FXD FILM, 10K, 1/8W
C22	CAPACITOR,FXD CER DIEI, 1000PF, 10%, 200V	913-4010-000		81349	CK05BK102K	R103	RESISTOR,FXD FILM, 10K, 1/8W
C23-C27	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BK103K	R104	RESISTOR,FXD FILM, 10K, 1/8W
C28	CAPACITOR,FXD CER DIEI, 10UF, 10%, 20V	184-9086-460		81349	H39003-01-2286	R105,	RESISTOR,FXD FILM, 4.7K, 1/8W
C29	CAPACITOR,FXD CER DIEI, 10UF, 10%, 50V	184-9087-430		81349	H39003-01-2356	R106	RESISTOR,FXD FILM, 10K, 1/8W
C30	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BK103K	R107	RESISTOR,FXD FILM, 10K, 1/8W
C31	CAPACITOR,FXD CER DIEI, 1000PF, 10%, 200V	913-4010-000		81349	CK05BK102K	R108	RESISTOR,FXD FILM, 10K, 1/8W
C32-C34	CAPACITOR,FXD CER DIEI, 1UF, 10%, 50V	184-9087-430		81349	H39003-01-2356	R109	RESISTOR,FXD FILM, 10K, 1/8W
C35-C37	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BK103K	R110	RESISTOR,FXD FILM, 10K, 1/8W
C38	CAPACITOR,FXD CER DIEI, 1UF, 10%, 50VDC (A2)	913-5019-560		81349	CK06BK105K	R111	RESISTOR,FXD FILM, 10K, 1/8W
H1	NUT,PLAIN,HEX SST, 4-40 (QTY 1)	313-0043-000		96906	MS35649-244	R112	RESISTOR,FXD FILM, 10K, 1/8W
H2	WASHER,LOCK SST, 0.115 ID X 0.209 OD (QTY 1)	310-0279-000		96906	MS35338-135	R113	RESISTOR,FXD FILM, 3.01K, 1/8W
H3	WASHER,FLAT CRP, 0.125ID X 0.250 OD (QTY 2)	310-0779-030		96906	MS15795-603	R114	RESISTOR,FXD FILM, 7.5K, 1/8W
H4	SCREW,MACH NP BR5, 4-40 X 3/8 (QTY 1)	343-0287-000		77250	P343-0287-000	R115	RESISTOR,FXD FILM, 1.07K, 1/8W
L1-L4	COIL,RF 1000UH	240-2715-490		96906	MS75089-23	R116	RESISTOR,FXD FILM, 1K, 1/8W
MP1	LABEL,PRESS SENS (ESDS)	280-2745-040		12998	280-2745-040	R117	RESISTOR,FXD FILM, 2K, 1/8W
MP2	HANDLE,SCREENED	646-5342-001				R118	RESISTOR,FXD FILM, 10K, 1/8W
MP3	EXTRACTOR	150-0815-010		07387	60-2-2	R119,	RESISTOR,FXD FILM, 10K, 1/8W
MP4	CONTACT,ELEC (QTY 2) (A1H A2)	372-2601-037		372-2601	037	R120	RESISTOR,FXD FILM, 17.4K, 1/8W
Q1-Q5	TRANSISTOR	352-0661-020		49956	2N2222A	R121-	RESISTOR,FXD FILM, 17.4K, 1/8W
Q6	TRANSISTOR	352-1083-020		04713	HJE803	R123	RESISTOR,FXD FILM, 10K, 1/8W
R1	RESISTOR,FXD FILM, 2.49K, 1%, 1/8W	705-3605-180		81349	RH5502431F	R124	RESISTOR,FXD FILM, 10K, 1/8W
R2	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RH5501002F	R125	RESISTOR,FXD FILM, 4.66K, 1/8W
R3,R4	RESISTOR,FXD FILM, 162K, 1%, 1/8W	705-3604-130		81349	RH5501823F	R126	RESISTOR,FXD FILM, 8.66K, 1/8W
R5-R8	RESISTOR,FXD CHPSN, 1MEG0, 10%, 1/8W	745-2449-000		81349	RCR05G105K9	R127	RESISTOR,FXD FILM, 10K, 1/8W
R9	RESISTOR,FXD FILM, 3.4K, 1%, 1/8W	705-3605-250		81349	RH5503401F	R128,	RESISTOR,FXD FILM, 22.6K, 1/8W
R10	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RH5501002F	R129	RESISTOR,FXD FILM, 470K, 1/8W
R11-R14	RESISTOR,FXD CHPSN, 1MEG0, 10%, 1/8W	745-2449-000		81349	RCR05G105K8	R131	RESISTOR,FXD FILM, 562 OHM, 1/8W
R15	RESISTOR,FXD CHPSN, 15K, 5%, 1/8W	745-1863-770		81349	RCR05G153J5	R132	RESISTOR,FXD FILM, 5.62K, 1/8W
R16	RESISTOR,FXD CHPSN, 1K, 5%, 1/8W	745-1863-490		81349	RCR05G102J5	R133	RESISTOR,FXD FILM, 10K, 1/8W
R17-R20	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	RCR05G104K5	R134	RESISTOR,FXD FILM, 9.53K, 1/8W
R21-R23	RESISTOR,FXD CHPSN, 470K, 10%, 1/8W	745-2437-000		81349	RCR05G474K5	R135-	RESISTOR,FXD CHPSN, 1MEG0, 1/8W
R24	RESISTOR,FXD CHPSN, 47K, 5%, 1/8W	745-1863-690		81349	RCR05G473J5	R138	RESISTOR,FXD CHPSN, 470K, 1/8W
R25	RESISTOR,FXD CHPSN, 10K, 5%, 1/8W	745-1863-730		81349	RCR05G103J5	R139	RESISTOR,FXD CHPSN, 470K, 1/8W
R26,R27	RESISTOR,FXD FILM, 162K, 1%, 1/8W	705-3604-130		81349	RH5501823F	R140	RESISTOR,FXD CHPSN, 15K, 1/8W
R28	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/8W	745-2329-000		81349	RCR05G471K5	R141	RESISTOR,FXD CHPSN, 330K, 1/8W
R29	RESISTOR,FXD FILM, 49.9K, 1%, 1/8W	705-3605-810		81349	RH5504992F	R142	RESISTOR,FXD CHPSN, 390 OHM, 1/8W
R30	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/8W	745-2329-000		81349	RCR05G471K5	R143	RESISTOR,FXD CHPSN, 8.2K, 1/8W
R31	RESISTOR,FXD FILM, 49.9K, 1%, 1/8W	705-3605-810		81349	RH5504992F	R144	RESISTOR,FXD CHPSN, 1K, 5% RESISTOR,FXD FILM, 276K, 1/8W
R32	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/8W	745-2329-000		81349	RCR05G471K5	R146	RESISTOR,FXD FILM, 6.34K, 1/8W
R33,R34	RESISTOR,FXD FILM, 49.9K, 1%, 1/8W	705-3605-810		81349	RH5504992F	R147	RESISTOR,FXD FILM, 107K, 1/8W
R35	RESISTOR,FXD FILM, 274K, 1%, 1/8W	705-1113-000		81349	RH5502743F	R148	RESISTOR,FXD FILM, 6.34K, 1/8W
R36	RESISTOR,FXD FILM, 107K, 1%, 1/8W	705-3604-020		81349	RH5501073F	R149	RESISTOR,FXD FILM, 9.53K, 1/8W
R37-R40	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RH5501002F	R150	RESISTOR,FXD FILM, 200K, 1/8W
R41	RESISTOR,FXD FILM, 1.24K, 1%, 1/8W	705-3605-040		81349	RH5501241F	R151	RESISTOR,FXD FILM, 9.53K, 1/8W
R42	RESISTOR,FXD FILM, 2.49K, 1%, 1/8W	705-1015-000		81349	RH5502491F	R152	RESISTOR,FXD FILM, 8.67K, 1/8W
R43	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RH5501002F	R153	RESISTOR,FXD FILM, 20K, 1/8W
R44	RESISTOR,FXD FILM, 8.06K, 1%, 1/8W	705-3605-430		81349	RH5508061F	R154	RESISTOR,FXD FILM, 162K, 1/8W
R45	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103K9	R155-	RESISTOR,FXD FILM, 10K, 1/8W
R46	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/8W	745-2329-000		81349	RCR05G471K9	R157	RESISTOR,FXD FILM, 43.2K, 1/8W
R47	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103K9	R159	RESISTOR,FXD FILM, 10K, 1/8W
R48	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/8W	745-2304-000		81349	RCR05G101K9	R160	RESISTOR,FXD FILM, 10K, 1/8W
R49	RESISTOR,FXD CHPSN, 47 OHMS, 10%, 1/8W	745-0701-000		81349	RCR07G470K5	R161	RESISTOR,FXD FILM, 100K, 1/8W
R50	RESISTOR,FXD FILM, 750 OHMS, 1%, 1/8W	705-0990-000		81349	RH5507500F	R162	RESISTOR,FXD FILM, 10K, 1/8W
R51	RESISTOR,VAR NON-MM, 1K, 10%	382-0052-430		02111	6441027623	R163-	RESISTOR,FXD MM, 47.0 OHMS
R52	RESISTOR,FXD CHPSN, 1K, 10%, 1/8W	745-2341-000		81349	RCR05G102K9	R167	RESISTOR,FXD FILM, 10K, 1/8W
R53	NOT USED					R168	RESISTOR,FXD FILM, 8.67K, 1/8W
R54	RESISTOR,FXD FILM, 2K, 1%, 1/8W	705-3605-140		81349	RH5502001F	R169	RESISTOR,FXD CHPSN, 15K, 1/8W
R55	RESISTOR,FXD FILM, 6.04K, 1%, 1/8W	705-3605-370		81349	RH5506041F	R170	RESISTOR,FXD CHPSN, 1MEG0, 1/8W
R56	RESISTOR,FXD CHPSN, 15K, 10%, 1/8W	745-2383-000		81349	RCR05G153K5	R171,	RESISTOR,FXD FILM, 10K, 1/8W
R57-R59	RESISTOR,FXD CHPSN, 1K, 10%, 1/8W	745-2341-000		81349	RCR05G102K5	R172	RESISTOR,FXD FILM, 162K, 1/8W
R60	RESISTOR,FXD CHPSN, 15K, 10%, 1/8W	745-2383-000		81349	RCR05G153K5	R173	RESISTOR,FXD FILM, 10K, 1/8W
R61	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RH5501002F	R174	RESISTOR,FXD FILM, 10K, 1/8W
R62	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RH5501002F	R175	RESISTOR,FXD CHPSN, 1K, 1/8W
R63	RESISTOR,FXD FILM, 162K, 1%, 1/8W	705-3604-130		81349	RH5501823F	R176	RESISTOR,FXD CHPSN, 47 OHM, 1/8W
R64	RESISTOR,FXD FILM, 7.5K, 1%, 1/8W	705-1038-000		81349	RH5507501F	R177,	RESISTOR,FXD CHPSN, 470 OHM, 1/8W
R65	RESISTOR,FXD FILM, 33.2K, 1%, 1/8W	705-1069-000		81349	RH5503322F	R178	RESISTOR,FXD CHPSN, 470 OHM, 1/8W
R66	RESISTOR,FXD FILM, 12.4K, 1%, 1/8W	705-3605-520		81349	RH5501242F		
R67-R69	RESISTOR,FXD FILM, 17.4K, 1%, 1/8W	705-3605-590		81349	RH5501742F		
R70	RESISTOR,FXD CHPSN, 1MEG0, 10%, 1/8W	745-2449-000		81349	RCR05G105K5		
R71	RESISTOR,FXD CHPSN, 10K, 5%, 1/8W	745-1863-730		81349	RCR05G103J5		
R72	RESISTOR,FXD FILM, 51.1 OHMS, 1%, 1/8W	705-0934-000		81349	RH55051R1F		
R73	RESISTOR,FXD FILM, 6.81K, 1%, 1/8W	705-1036-000		81349	RH5506811F		
R74-R79	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RH5501002F		
R80	RESISTOR,FXD FILM, 3.32K, 1%, 1/8W	705-1021-000		81349	RH5503321F		
R81-R84	RESISTOR,FXD CHPSN, 470K, 10%, 1/8W	745-2437-000		81349	RCR05G474K5		
R85	RESISTOR,FXD FILM, 4.64K, 1%, 1/8W	705-1028-000		81349	RH5504641F		

PARTS LIST (Cont)

USABLE ON CODE	MFR CODE	MFR PART NUMBER	REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	REF DES	DESCRIPTION
	31433	1M4454	R86	RESISTOR,FXD FILM, 66.5K, 1%, 1/8W	705-3605-870		81349	RN55D6652F	R179	RESISTOR,FXD FILM, 56.2K, 1%, 1/8W
	81349	CK05BX103K	R87	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F	R180	RESISTOR,FIXED CHPSN, 10K, 10%
	81349	CK05BX102K	R88	RESISTOR,FXD FILM, 4.42K, 1%, 1/8W	705-1027-000		81349	RN55D4421F	TP1	JACK,TIP BRN
	81349	CK06BX604K	R89	RESISTOR,FXD FILM, CHPSN, 1MEG, 10%, 1/8W	745-2449-000		81349	RCR05G105KS	TP2	JACK,TIP RED
	81349	CK06BX104K	R90	RESISTOR,FXD FILM, 200K, 1%, 1/8W	705-3604-150		81349	RN55D2003F	TP3	JACK,TIP ORN
	81349	CK05BX103K	R91	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F	TP4	JACK,TIP YEL
	81349	CK06BX604K	R92	RESISTOR,FXD FILM, 2.49K, 1%, 1/8W	705-1015-000		81349	RN55D2491F	TP5	JACK,TIP GPN
	81349	CK05BX103K	R93	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F	TP6	JACK,TIP BLU
	93790	CD5FY101J0	R94	RESISTOR,FXD FILM, 442 OHMS, 1%, 1/8W	705-0979-000		81349	RN55D4420F	TP7	JACK,TIP VIO
	81349	CK06BX604K	R95	RESISTOR,FXD FILM, 4.02K, 1%, 1/8W	705-1025-000		81349	RN55D4021F	TP8	JACK,TIP GRA
	81349	CK05BX103K	R96	RESISTOR,FXD FILM, 4.42K, 1%, 1/8W	705-1027-000		81349	RN55D4421F	TP9	JACK,TIP WHT
	81349	CK06BX104K	R97	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F	TP10	JACK,TIP BHT (A1)
	81349	CK05BX103K	R98	RESISTOR,FXD FILM, 8.07K, 1%, 1/8W	705-3605-450		81349	RN55D0871F	TP11	JACK,TIP BRN (A1)
	81349	CK06BX104K	R99-R101	RESISTOR,FXD FILM, 3.32K, 1%, 1/8W	705-1021-000		81349	RN55D3321F	U1	INTEGRATED CIRCUIT DGTL MOS (ESD)
	81349	CK06BX104K	R102	RESISTOR,FXD CHPSN, 100 OHMS, 5%, 1/8W	745-1863-250		81349	RCR05G101JS	U2	INTEGRATED CIRCUIT MULTIVIBRATOR
	81349	CK05BX102K	R103	RESISTOR,FXD CHPSN, 10K, 5%, 1/8W	745-1863-730		81349	RCR05G103JS	U3	INTEGRATED CIRCUIT DGTL MOS (ESD)
	81349	CK05BX103K	R104	RESISTOR,FXD CHPSN, 1K, 5%, 1/8W	745-1863-490		81349	RCR05G102JS	U4,U5	RESISTOR NETWORK FILM, 10K, 2%,
	81349	H39003-01-2286	R105,	RESISTOR,FXD CHPSN, 4.7K, 5%, 1/8W	745-1863-650		81349	RCR05G472JS	U6	RESISTOR NETWORK FILM, 10K, 2%,
	81349	H39003-01-2356	R106						U7	INTEGRATED CIRCUIT DGTL MOS (ESD)
	81349	CK05BX103K	R107	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	RCR05G104KS	U8	INTEGRATED CIRCUIT MULTIVIBRATOR
	81349	CK05BX102K	R108	RESISTOR,FXD CHPSN, 15K, 10%, 1/8W	745-2383-000		81349	RCR05G153KS	U9	INTEGRATED CIRCUIT DGTL MOS (ESD)
	81349	H39003-01-2356	R109	RESISTOR,FXD CHPSN, 10K, 5%, 1/8W	745-1863-730		81349	RCR05G103JS	U10,U11	INTEGRATED CIRCUIT COMPARATOR
	81349	CK05BX103K	R110	RESISTOR,VAR NON-WW,50K, 10%	382-0052-490		02111	6445031623	U12	RESISTOR NETWORK FILM, 10K, 2%,
	81349	CK06BX105K	R111	RESISTOR,FXD CHPSN, 10K, 5%, 1/8W	745-1863-730		81349	RCR05G103JS	U13,U14	RESISTOR NETWORK FILM, 10K, 2%,
	96906	M535649-244	R112	RESISTOR,VAR NON-WW,2K, 10%	382-0052-440		02111	6442026283	U15	INTEGRATED CIRCUIT COMPARATOR
	96906	M535338-135	R113	RESISTOR,FXD FILM, 3.01K, 1%, 1/8W	705-1019-000		81349	RN55D3011F	U16	INTEGRATED CIRCUIT SWITCH (ESDS)
	96906	M515799-803	R114	RESISTOR,FXD FILM, 7.5K, 1%, 1/8W	705-1030-000		81349	RN55D7501F	U17	INTEGRATED CIRCUIT DGTL MOS (ESDS)
	77250	P343-0287-000	R115	RESISTOR,FXD FILM, 1.07K, 1%, 1/8W	705-3605-020		81349	RN55D1071F	U18	INTEGRATED CIRCUIT DGTL MOS (ESDS)
	96906	M575089-23	R116	RESISTOR,FXD FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D2001F	U19	INTEGRATED CIRCUIT DGTL MOS (ESDS)
	12998	240-2745-040	R117	RESISTOR,FXD FILM, 2K, 1%, 1/8W	705-3605-140		81349	RN55D2001F	U20,U21	INTEGRATED CIRCUIT OP AMP
	07387	60-2-2	R118	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS	U22	RESISTOR NETWORK FILM, 10K, 2%,
		372-2601-037	R119,	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F	U23	RESISTOR NETWORK FILM, 10K, 2%,
	49956	2H2222A	R120						U24	INTEGRATED CIRCUIT TRANSISTOR ARR
	04713	MJE803	R121-	RESISTOR,FXD FILM, 17.4K, 1%, 1/8W	705-3605-590		81349	RN55D1742F	U25	INTEGRATED CIRCUIT V RGLTR
	81349	RN55D2431F	R122						U26	INTEGRATED CIRCUIT SWITCH (ESDS)
	81349	RN55D1002F	R123	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F	U27	RESISTOR NETWORK FILM, 10K, 2%,
	81349	RN55D1823F	R124	RESISTOR,FXD FILM, 6.66K, 1%, 1/8W	705-1041-000		81349	RN55D08641F	U28	INTEGRATED CIRCUIT DGTL MOS (ESDS)
	81349	RCR05G105KS	R125	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F	U29	INTEGRATED CIRCUIT AMPLIFIER,OPRY
	81349	RN55D3401F	R126	RESISTOR,FXD FILM, 22.6K, 1%, 1/8W	705-1061-000		81349	RN55D2262F	U30	INTEGRATED CIRCUIT DGTL MOS (ESDS)
	81349	RN55D1002F	R127						U31	INTEGRATED CIRCUIT OP AMP
	81349	RCR05G105KS	R130	RESISTOR,FXD CHPSN, 470K, 10%, 1/8W	745-2437-000		81349	RCR05G474KS	U32	INTEGRATED CIRCUIT ANALOG MULTIP
	81349	RCR05G153KS	R131	RESISTOR,FXD FILM, 562 OHMS, 1%, 1/8W	705-0904-000		81349	RN55D5620F	U33	INTEGRATED CIRCUIT AMPLIFIER
	81349	RCR05G102JS	R132	RESISTOR,FXD FILM, 5.62K, 1%, 1/8W	705-1032-000		81349	RN55D5621F	U34	INTEGRATED CIRCUIT DGTL MOS (ESDS)
	81349	RCR05G104KS	R133	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F	U35	INTEGRATED CIRCUIT MOS,ANALOG MUL
	81349	RCR05G474KS	R134	RESISTOR,FXD FILM, 9.53K, 1%, 1/8W	705-1043-000		81349	RN55D09531F	(ESDS)	
	81349	RCR05G473JS	R135-	RESISTOR,FXD CHPSN, 1MEG, 10%, 1/8W	745-2449-000		81349	RCR05G105KS	U36	INTEGRATED CIRCUIT OP AMP
	81349	RCR05G103JS	R138						U37	INTEGRATED CIRCUIT OP AMP
	81349	RN55D1823F	R139	RESISTOR,FXD CHPSN, 470K, 10%, 1/8W	745-2437-000		81349	RCR05G474KS	U38	RESISTOR NETWORK FILM, 10K, 2%,
	81349	RCR05G471KS	R140	RESISTOR,FXD CHPSN, 15K, 10%, 1/8W	745-2383-000		81349	RCR05G153KS	U39	RESISTOR NETWORK FILM, 10K, 2%,
	81349	RN55D4992F	R141	RESISTOR,FXD CHPSN, 330K, 5%, 1/8W	745-1864-130		81349	RCR05G334JS	U40	INTEGRATED CIRCUIT DGTL MOS (ESDS)
	81349	RCR05G471KS	R142	RESISTOR,FXD CHPSN, 390 OHMS, 5%, 1/8W	745-1863-390		81349	RCR05G391JS	U41	INTEGRATED CIRCUIT MOS,ANALOG MUL
	81349	RN55D4992F	R143	RESISTOR,FXD CHPSN, 8.2K, 5%, 1/8W	745-1863-710		81349	RCR05G682JS	(ESDS)	
	81349	RCR05G471KS	R144	RESISTOR,FXD CHPSN, 1K, 5%, 1/8W	745-1863-490		81349	RCR05G102JS	U42	INTEGRATED CIRCUIT AMPLIFIER,QUAD
	81349	RN55D4992F	R145	RESISTOR,FXD FILM, 274K, 1%, 1/8W	705-1113-000		81349	RN55D2743F	U43	INTEGRATED CIRCUIT DGTL MOS (ESDS)
	81349	RN55D2743F	R146	RESISTOR,FXD FILM, 56.2K, 1%, 1/8W	705-1080-000		81349	RN55D5622F	U44	INTEGRATED CIRCUIT COMPARATOR
	81349	RN55D1073F	R147	RESISTOR,FXD FILM, 6.34K, 1%, 1/8W	705-3604-020		81349	RN55D1073F	U45	INTEGRATED CIRCUIT AMPLIFIER,QUAD
	81349	RN55D1002F	R148	RESISTOR,FXD FILM, 107K, 1%, 1/8W	705-3605-380		81349	RN55D06341F	U46	RESISTOR NETWORK FILM, 10K, 2%,
	81349	RN55D1261F	R149	RESISTOR,FXD FILM, 9.53K, 1%, 1/8W	705-1043-000		81349	RN55D9531F	U47	INTEGRATED CIRCUIT DGTL MOS (ESDS)
	81349	RN55D2491F	R150	RESISTOR,FXD FILM, 200K, 1%, 1/8W	705-3604-150		81349	RN55D2003F	U48	INTEGRATED CIRCUIT SWITCH (ESDS)
	81349	RN55D1002F	R151	RESISTOR,FXD FILM, 9.53K, 1%, 1/8W	705-1043-000		81349	RN55D9531F	U49-U52	INTEGRATED CIRCUIT OP AMP
	81349	RN55D0061F	R152	RESISTOR,FXD FILM, 8.07K, 1%, 1/8W	705-3605-450		81349	RN55D0871F	VR1	SEMICONDUCTOR DEVICE
	81349	RCR05G103KS	R153	RESISTOR,FXD FILM, 20K, 1%, 1/8W	705-3605-620		81349	RN55D2002F	VR2-VR4	SEMICONDUCTOR DEVICE
	81349	RCR05G471KS	R154	RESISTOR,FXD FILM, 162K, 1%, 1/8W	705-1102-000		81349	RN55D1623F	VR5	SEMICONDUCTOR DEVICE
	81349	RCR05G103KS	R155-	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F	VR6	SEMICONDUCTOR DEVICE
	81349	RCR05G101KS	R157						VR7	SEMICONDUCTOR DEVICE
	81349	RCR076470KS	R158	RESISTOR,FXD FILM, 43.2K, 1%, 1/8W	705-3605-780		81349	RN55D4322F		
	81349	RN55D7500F	R159	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F		
	02111	644102T623	R160	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F		
	81349	RCR05G102KS	R161	RESISTOR,FXD FILM, 100K, 1%, 1/8W	705-1092-000		81349	RN55D1003F		
			R162	RESISTOR,FXD MM, 47.0 OHMS, 5%, 3W	747-5379-000		81349	RM69V470		
	81349	RN55D2001F	R163-	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F		
	81349	RN55D6041F	R167							
	81349	RCR05G153KS	R168	RESISTOR,FXD FILM, 8.07K, 1%, 1/8W	705-3605-450		81349	RN55D0871F		
	81349	RCR05G102KS	R169	RESISTOR,FXD CHPSN, 15K, 10%, 1/8W	745-2383-000		81349	RCR05G153KS		
	81349	RCR05G153KS	R170	RESISTOR,FXD CHPSN, 1MEG, 10%, 1/8W	745-2449-000		81349	RCR05G105KS		
	81349	RN55D1002F	R171,	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F		
	81349	RN55D1002F	R172							
	81349	RN55D1023F	R173	RESISTOR,FXD FILM, 162K, 1%, 1/8W	705-1102-000		81349	RN55D1623F		
	81349	RN55D7501F	R174	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F		
	81349	RN55D3322F	R175	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS		
	81349	RN55D1242F	R176	RESISTOR,FXD CHPSN, 47 OHMS, 10%, 1/8W	745-2292-000		81349	RCR05G470KS		
	81349	RN55D1742F	R177,	RESISTOR,FXD CHPSN, 470K, 10%, 1/8W	745-2437-000		81349	RCR05G474KS		
	81349	RCR05G105KS	R178							
	81349	RCR05G103JS								
	81349	RN55D91R1F								
	81349	RN55D6811F								
	81349	RN55D1002F								
	81349	RN55D3321F								
	81349	RCR05G474KS								
	81349	RN55D4641F		</						

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	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	705-3605-870		81349	RN5506622F
	705-1044-000		81349	RN5501002F
	705-1027-000		81349	RN5504421F
	745-2449-000		81349	RCR056105KS
	705-3604-150		81349	RN5502003F
	705-1044-000		81349	RN5501002F
	705-1015-000		81349	RN5502491F
	705-1044-000		81349	RN5501002F
	705-0979-000		81349	RN5504420F
	705-1025-000		81349	RN5504021F
	705-1027-000		81349	RN5504421F
	705-1044-000		81349	RN5501002F
	705-3605-450		81349	RN5500871F
	705-1021-000		81349	RN5503321F
	745-1863-250		81349	RCR056101JS
	745-1863-730		81349	RCR056103JS
	745-1863-490		81349	RCR056102JS
	745-1863-650		81349	RCR056472JS
	745-2413-000		81349	RCR056104KS
	745-2383-000		81349	RCR056153KS
	745-1863-730		81349	RCR056103JS
	562-0052-490		02111	6445037623
	745-1863-730		81349	RCR056103JS
	382-0052-440		02111	6442027623
	705-1019-000		81349	RN5503011F
	705-1030-000		81349	RN5507501F
	705-3605-020		81349	RN5501071F
	705-0996-000		81349	RN5501001F
	705-3605-140		81349	RN5502001F
	745-2377-000		81349	RCR056103KS
	705-1044-000		81349	RN5501002F
	705-3605-590		81349	RN5501742F
	705-1044-000		81349	RN5501002F
	705-1028-000		81349	RN5504641F
	705-1041-000		81349	RN5500661F
	705-1044-000		81349	RN5501002F
	705-1061-000		81349	RN5502262F
	745-2437-000		81349	RCR056474KS
	705-0904-000		81349	RN5505620F
	705-1032-000		81349	RN5505621F
	705-1044-000		81349	RN5501002F
	705-1043-000		81349	RN5509531F
	745-2449-000		81349	RCR056105KS
	745-2437-000		81349	RCR056474KS
	745-2383-000		81349	RCR056153KS
	745-1864-130		81349	RCR056334JS
	745-1863-390		81349	RCR056391JS
	745-1863-710		81349	RCR056822JS
	745-1863-490		81349	RCR056102JS
	705-1113-000		81349	RN5502743F
	705-1000-000		81349	RN5505622F
	705-3604-020		81349	RN5501073F
	705-3605-360		81349	RN5506341F
	705-1043-000		81349	RN5509531F
	705-3604-150		81349	RN5502003F
	705-1043-000		81349	RN5509531F
	705-3605-450		81349	RN5500871F
	705-3605-620		81349	RN5502002F
	705-1102-000		81349	RN5501623F
	705-1044-000		81349	RN5501002F
	705-3605-780		81349	RN5504322F
	705-1044-000		81349	RN5501002F
	705-1044-000		81349	RN5501002F
	705-1092-000		81349	RN5501003F
	747-5379-000		81349	RW69V470
	705-1044-000		81349	RN5501002F
	705-3605-450		81349	RN5500871F
	745-2383-000		81349	RCR056153KS
	745-2449-000		81349	RCR056105KS
	705-1044-000		81349	RN5501002F
	705-1102-000		81349	RN5501623F
	705-1044-000		81349	RN5501002F
	745-0749-000		81349	RCR076102KS
	745-2292-000		81349	RCR056470KS
	745-2437-000		81349	RCR056474KS

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
R179	RESISTOR,FXD FILM, 56.2K, 1%, 1/8W	705-1080-000		81349	RN5505622F
R180	RESISTOR,FIXED CHPSM, 10K, 10%, 1/4W (A1)	745-0785-000		81349	RCR076103KS
TP1	JACK,TIP BRN	360-0484-070		74970	105-1108-011
TP2	JACK,TIP RED	360-0484-020		74970	105-1102-011
TP3	JACK,TIP ORN	360-0484-050		74970	105-1106-011
TP4	JACK,TIP YEL	360-0484-060		74970	105-1107-011
TP5	JACK,TIP GRN	360-0484-040		74970	105-1104-011
TP6	JACK,TIP BLU	360-0484-080		74970	105-1110-011
TP7	JACK,TIP VIO	360-0484-090		74970	105-1112-011
TP8	JACK,TIP GRA	360-0484-100		74970	105-1113-011
TP9	JACK,TIP BHT	360-0484-010		74970	105-1101-011
TP10	JACK,TIP BLK (A1)	360-0484-030		74970	105-1103-011
TP11	JACK,TIP BRN (A1)	360-0484-070		74970	105-1106-011
U1	INTEGRATED CIRCUIT DCTL MOS (ESDS)	351-8159-210		07263	F40498PC
U2	INTEGRATED CIRCUIT MULTIVIBRATOR (ESDS)	351-8270-010		02735	CD4098BE
U3	INTEGRATED CIRCUIT DCTL MOS (ESDS)	351-8159-350		07263	40128PC
U4, U5	RESISTOR NETWORK FILM, 10K, 2%, 1W	350-4046-750		19701	95061002GL001
U6	RESISTOR NETWORK FILM, 10K, 2%, 0.75W	350-4045-200		19701	95061002GL002
U7	INTEGRATED CIRCUIT DCTL MOS (ESDS)	351-8159-320		07263	40018PC
U8	INTEGRATED CIRCUIT MULTIVIBRATOR (ESDS)	351-8270-010		02735	CD4098BE
U9	INTEGRATED CIRCUIT DCTL MOS (ESDS)	351-8159-350		07263	40128PC
U10, U11	INTEGRATED CIRCUIT COMPARATOR	351-1122-020		01295	LM239J
U12	RESISTOR NETWORK FILM, 10K, 2%, 0.75W	350-4045-200		19701	95061002GL001
U13, U14	RESISTOR NETWORK FILM, 10K, 2%, 1W	350-4046-750		19701	95061002GL002
U15	INTEGRATED CIRCUIT COMPARATOR	351-1122-020		01295	LM239J
U16	INTEGRATED CIRCUIT SWITCH (ESDS)	351-8252-010		02735	CD4066BE
U17	INTEGRATED CIRCUIT DCTL MOS (ESDS)	351-8159-220		07263	40508PC
U18	INTEGRATED CIRCUIT DCTL MOS (ESDS)	351-8159-340		07263	40118PC
U19	INTEGRATED CIRCUIT DCTL MOS (ESDS)	351-8159-320		07263	40018PC
U20, U21	INTEGRATED CIRCUIT OP AMP	351-1329-020		01295	TL082HJG
U22	RESISTOR NETWORK FILM, 10K, 2%, 1W	350-4046-750		19701	95061002GL001
U23	RESISTOR NETWORK FILM, 10K, 2%, 0.75W	350-4045-200		19701	95061002GL002
U24	INTEGRATED CIRCUIT TRANSISTOR ARRAY	351-0196-050		56289	ULM2004A
U25	INTEGRATED CIRCUIT V RGLTR	351-1035-040		49956	RM7230C
U26	INTEGRATED CIRCUIT SWITCH (ESDS)	351-8252-010		02735	CD4066BE
U27	RESISTOR NETWORK FILM, 10K, 2%, 0.75W	350-4045-200		19701	95061002GL002
U28	INTEGRATED CIRCUIT DCTL MOS (ESDS)	351-8159-210		07263	F40498PC
U29	INTEGRATED CIRCUIT AMPLIFIER,OPRTNL	351-1262-020		27014	LM148J
U30	INTEGRATED CIRCUIT DCTL MOS (ESDS)	351-8159-210		07263	F40498PC
U31	INTEGRATED CIRCUIT OP AMP	351-1211-040		04713	LM1358U
U32	INTEGRATED CIRCUIT ANALOG MULTIPLIER	351-1476-020		49956	RV420NDE
U33	INTEGRATED CIRCUIT AMPLIFIER	351-1206-010		07263	UA1558RM
U34	INTEGRATED CIRCUIT DCTL MOS (ESDS)	351-8159-330		07263	40028PC
U35	INTEGRATED CIRCUIT MOS,ANALOG MULTIPLEXER (ESDS)	351-8227-010		02735	CD4051BE
U36	INTEGRATED CIRCUIT OP AMP	351-1211-040		04713	LM1358U
U37	INTEGRATED CIRCUIT OP AMP	351-1329-020		01295	TL082HJG
U38	RESISTOR NETWORK FILM, 10K, 2%, 1W	350-4046-750		19701	95061002GL001
U39	RESISTOR NETWORK FILM, 10K, 2%, 0.75W	350-4045-200		19701	95061002GL002
U40	INTEGRATED CIRCUIT DCTL MOS (ESDS)	351-8159-210		07263	F40498PC
U41	INTEGRATED CIRCUIT MOS,ANALOG MULTIPLEXER (ESDS)	351-8227-010		02735	CD4051BE
U42	INTEGRATED CIRCUIT AMPLIFIER,QUAD OPRTNL	351-1141-020		34335	LM224D
U43	INTEGRATED CIRCUIT DCTL MOS (ESDS)	351-8159-360		07263	40238PC
U44	INTEGRATED CIRCUIT COMPARATOR	351-1122-020		01295	LM239J
U45	INTEGRATED CIRCUIT AMPLIFIER,QUAD OPRTNL	351-1141-020		34335	LM224D
U46	RESISTOR NETWORK FILM, 10K, 2%, 0.75W	350-4045-200		19701	95061002GL002
U47	INTEGRATED CIRCUIT DCTL MOS (ESDS)	351-8159-320		07263	40018PC
U48	INTEGRATED CIRCUIT SWITCH (ESDS)	351-8252-010		02735	CD4066BE
U49-U52	INTEGRATED CIRCUIT OP AMP	351-1329-020		01295	TL082HJG
VR1	SEMICONV DEVICE	353-3591-510		04713	1N4627
VR2-VR4	SEMICONV DEVICE	353-3591-440		04713	1N4620
VR5	SEMICONV DEVICE	353-3591-450		04713	1N4621
VR6	SEMICONV DEVICE	353-2714-000		81403	1N753A
VR7	SEMICONV DEVICE	353-3591-490		04713	1N4625

14 cont on next page

Note

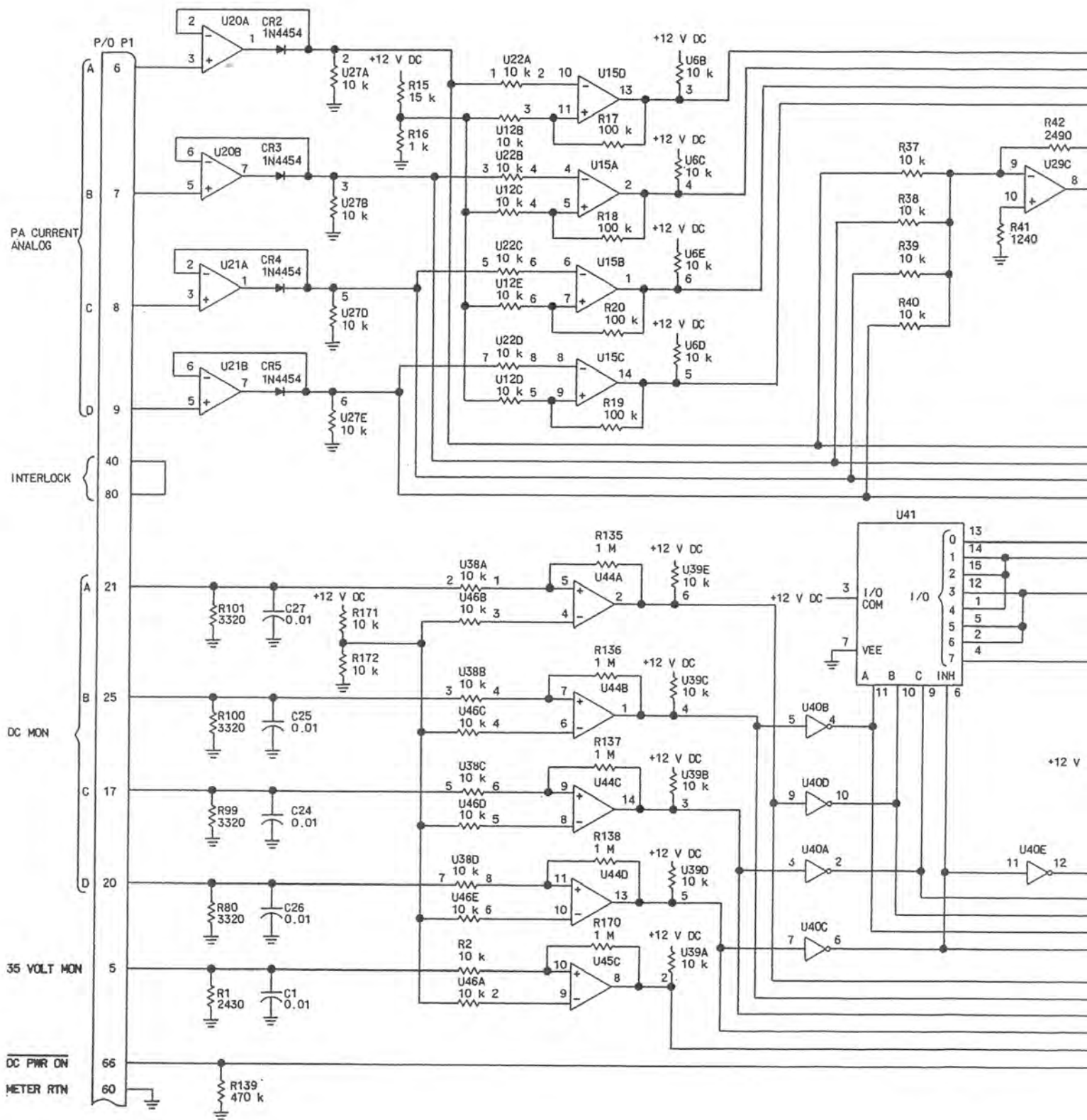
Configuration history before 1 April 1982 (REV F) is not recorded in this section.

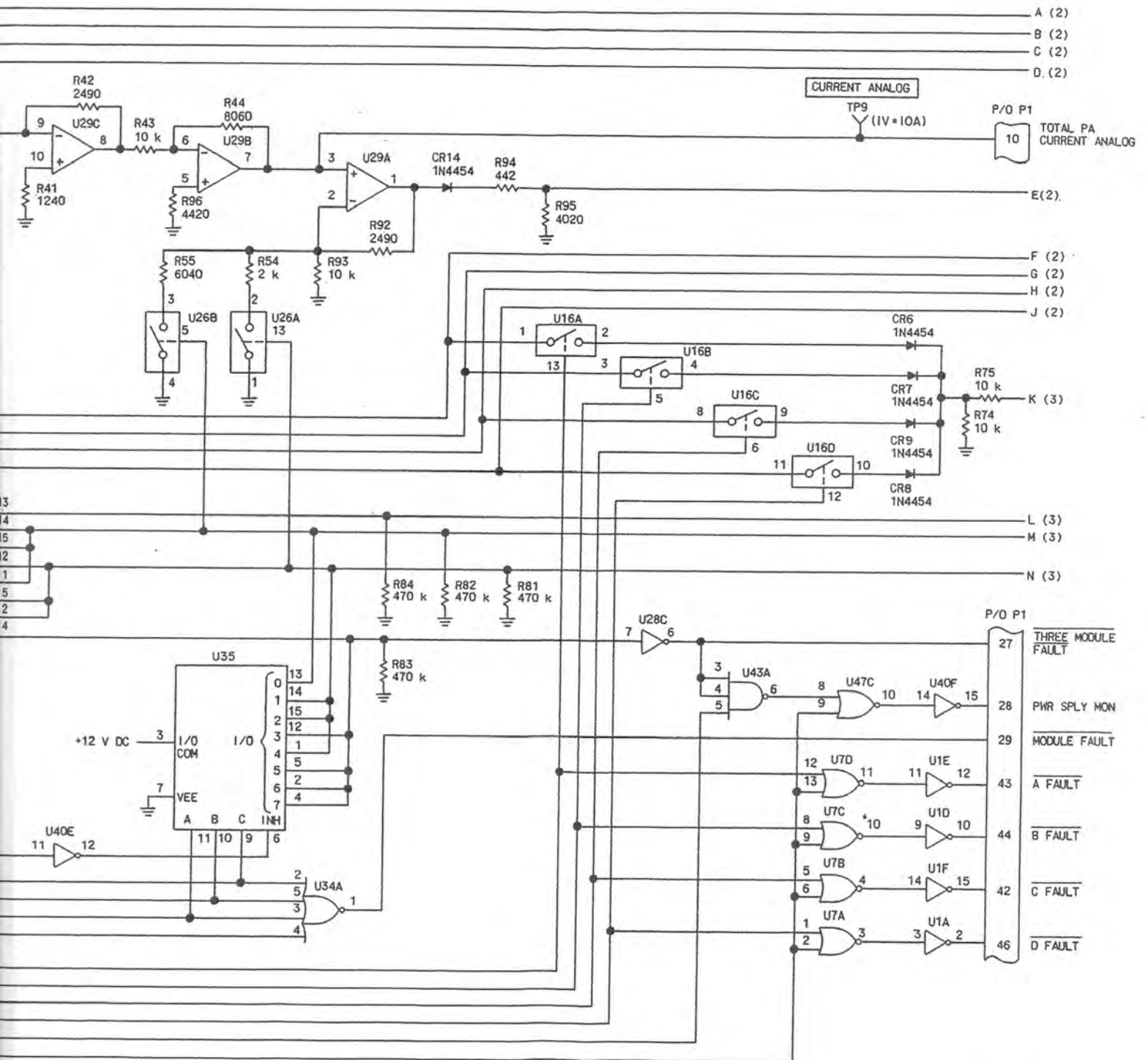
MFR  
 PART NUMBER  
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 CR07G103KS  
 105-1100-011  
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 105-1104-011  
 105-1110-011  
 105-1112-011  
 105-1113-011  
 105-1101-011  
 105-1103-011  
 105-1100-011  
 :4049BPC  
 :D4098BE  
 :012BPC  
 95061002GL001  
 95061002GL002  
 :001BPC  
 :D4098BE  
 :012BPC  
 :H239J  
 95061002GL002  
 95061002GL001  
 :H239J  
 :D4066BE  
 :050BPC  
 :011BPC  
 :001BPC  
 FL002HJG  
 95061002GL001  
 95061002GL002  
 JLN2004A  
 RM723DC  
 :D4066BE  
 95061002GL002  
 :4049BPC  
 :M148J  
 :4049BPC  
 1LH358U  
 VV4200DE  
 JA1558RH  
 :002BPC  
 :D4051BE  
 J  
 :JG  
 95061002GL001  
 95061002GL002  
 :4049BPC  
 :D4051BE  
 :H224D  
 :023BPC  
 :H239J  
 :H224D  
 95061002GL002  
 :001BPC  
 :D4066BE  
 :L002HJG  
 :N4627  
 :N4620  
 :N4621  
 :N753A  
 :N4625

MODIFICATION HISTORY

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A1	Deleted MP4 Added: R180, 10K, 10%, 1/4W TP10, TP11	REV G and above
A2	Added: C38, 1 μF MP4, contacts (qty 2)	REV H and above SB 100

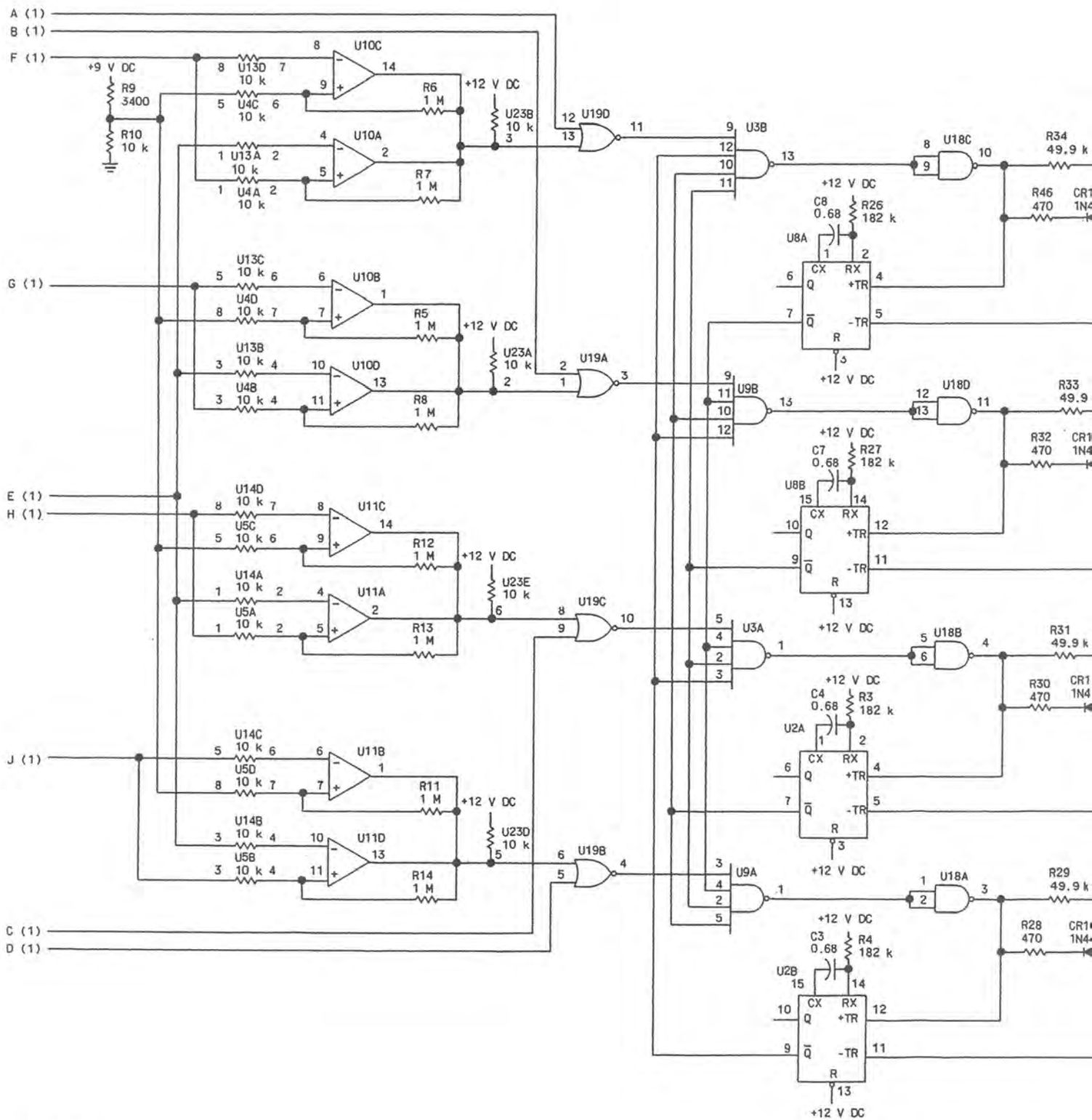
*p14 - part 2*





642-3598  
TPA-3061-044

Analog Control Card, Schematic Diagram  
Figure 9 (Sheet 1 of 4)

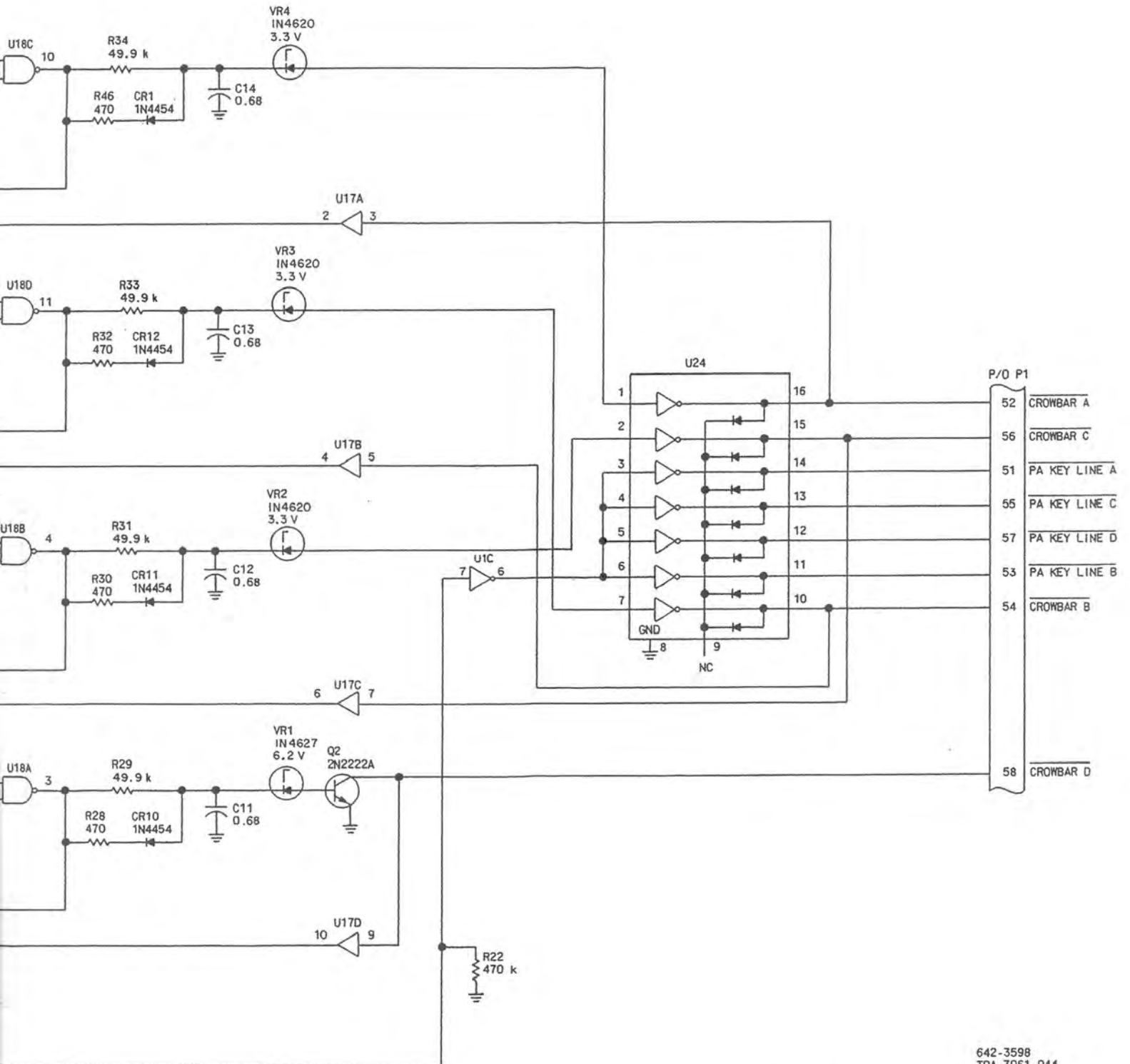


P/O P1

PA MODULE  
KEY LINE

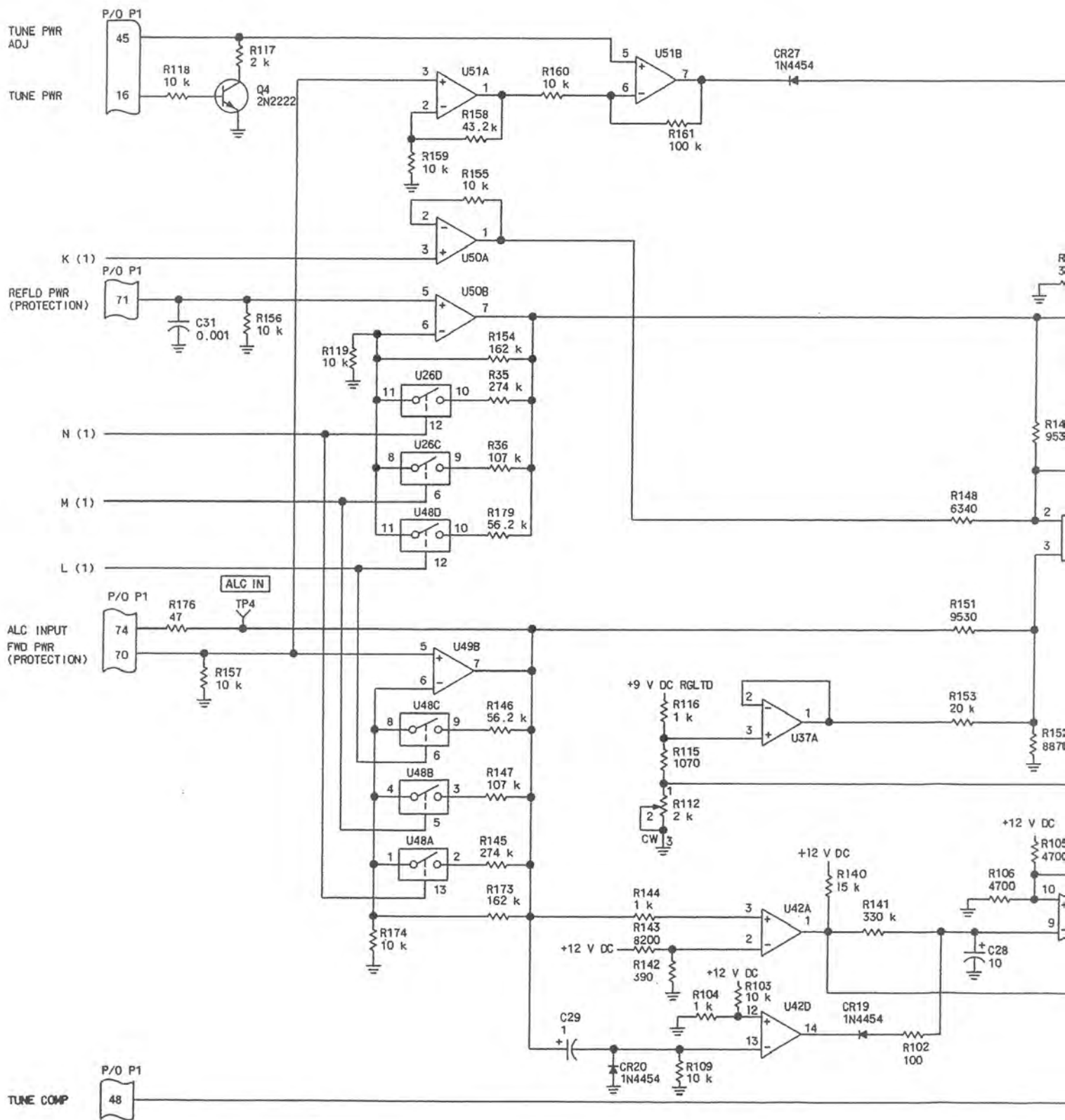
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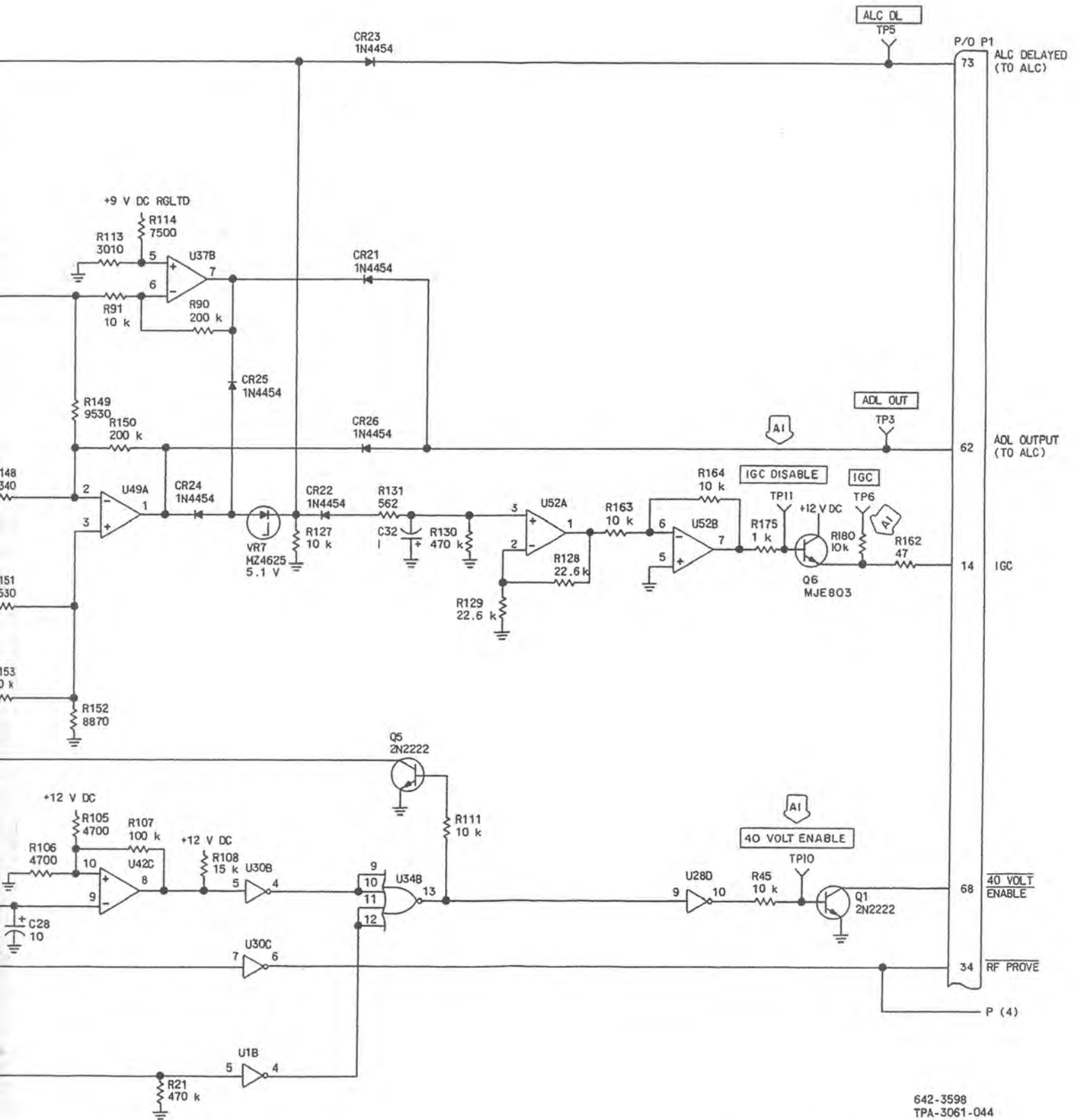




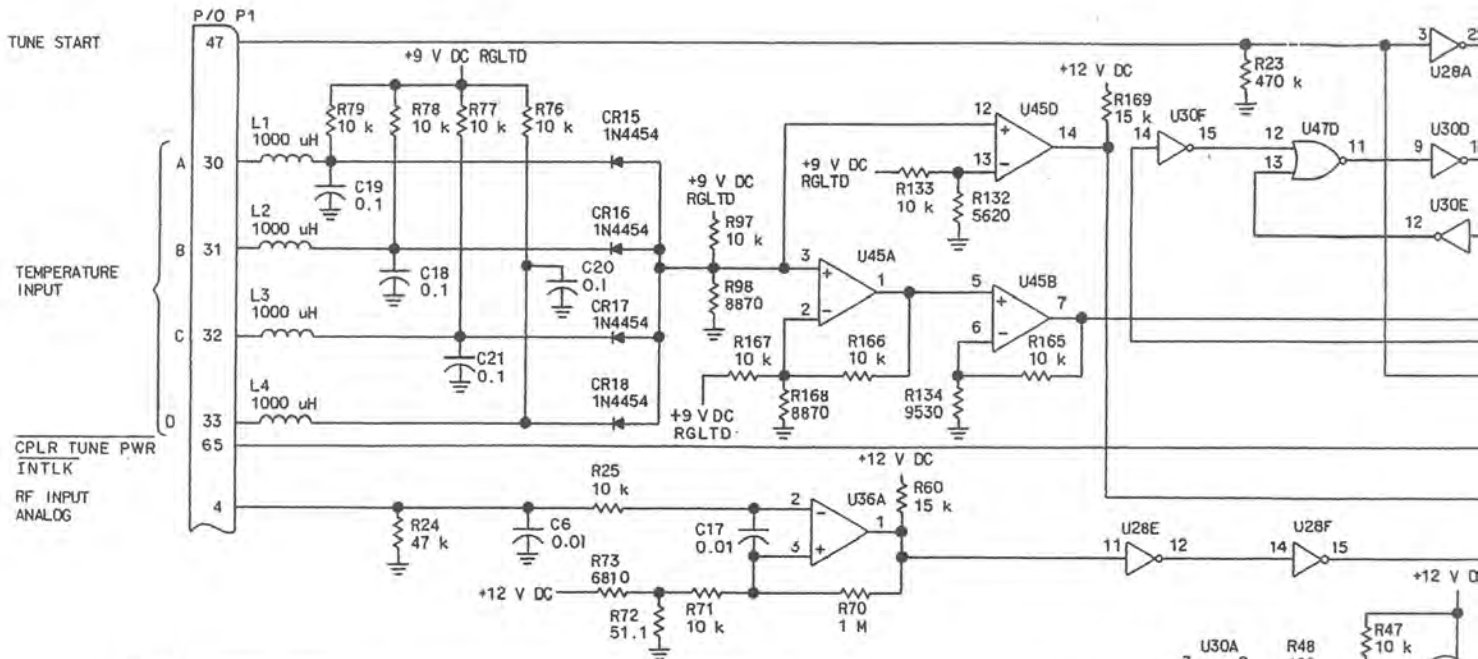
642-3598  
TPA-3061-044

Analog Control Card, Schematic Diagram  
Figure 9 (Sheet 2)

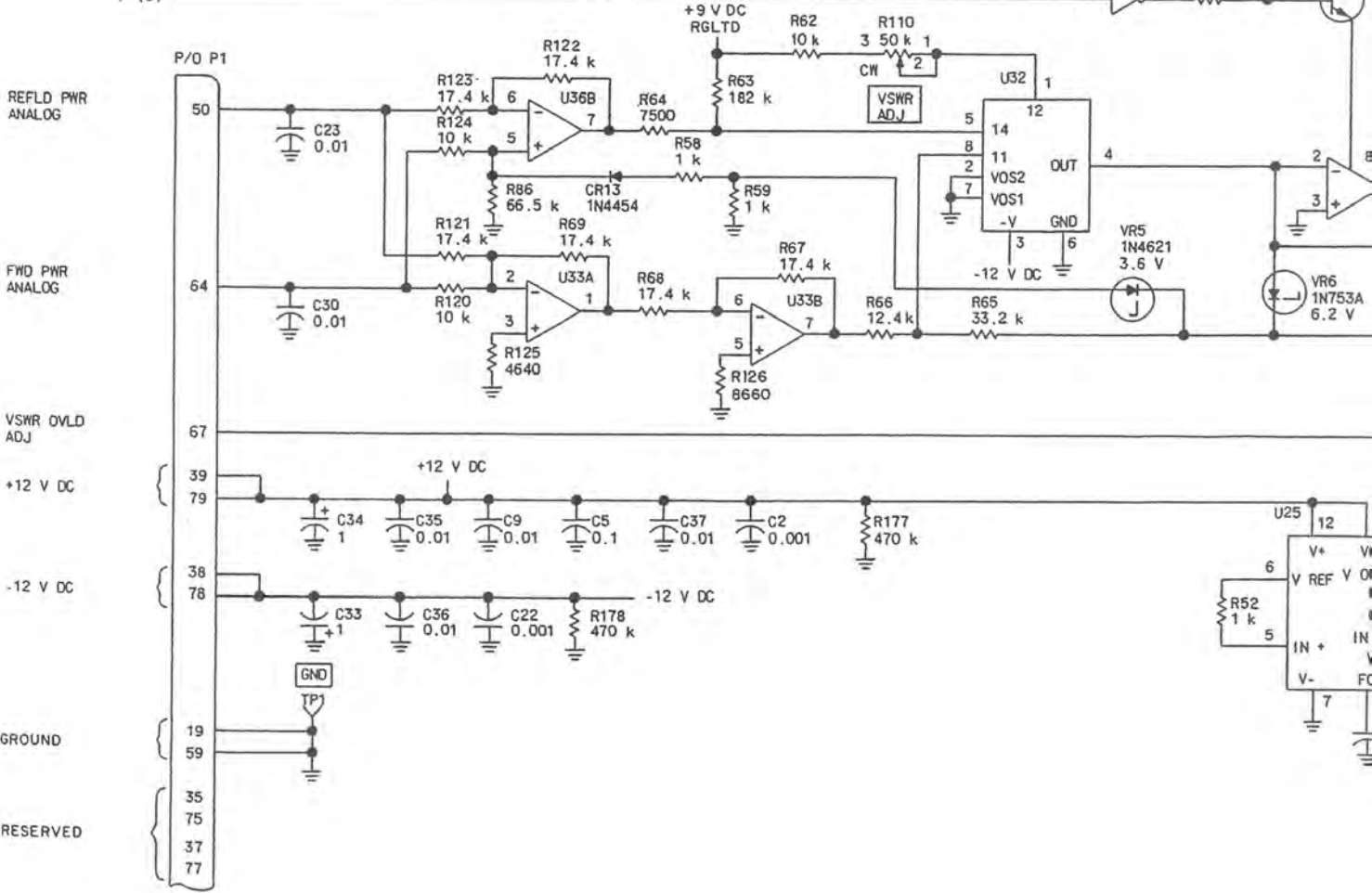


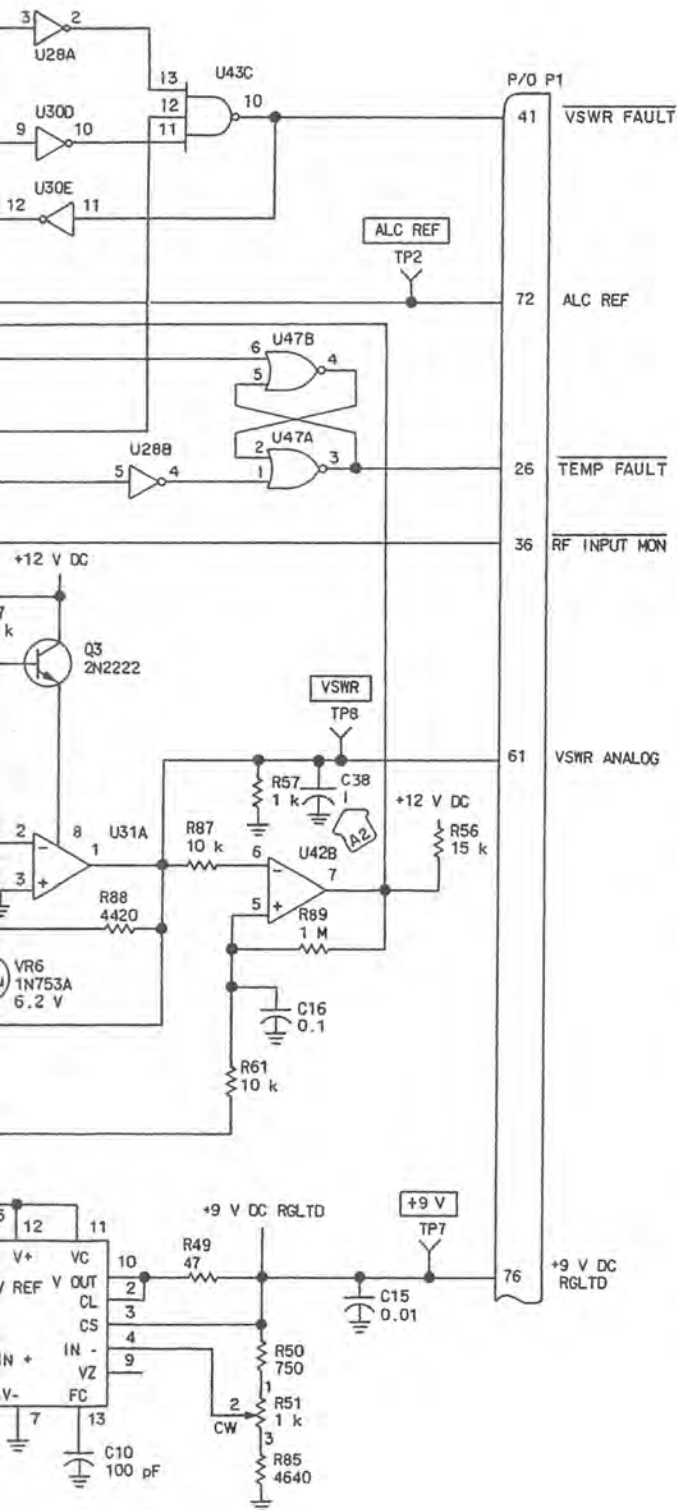


Analog Control Card, Schematic Diagram  
Figure 9 (Sheet 3)



P (3)

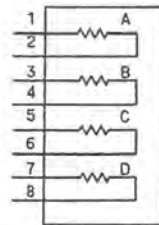
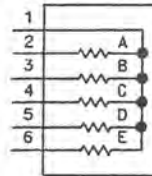




NOTES:

- ① UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS.
- ② PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
- ③ TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.
- ④ THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.
- ⑤ U6, U12, U23, U27, U39, AND U46 ARE 10 k RESISTOR ARRAYS.

U4, U5, U13, U14, U22 AND U38 ARE 10 k RESISTOR ARRAYS.



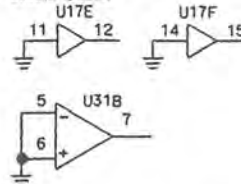
MICROCIRCUIT INFORMATION

U NO	TYPE	PWR (V DC)		
		+12	GND	-12
U1	4049B	1	8	
U2	4098	16	8	
U3	4012B	14	7	
⑤ U4	RES ARRAY			
⑤ U5	RES ARRAY			
⑤ U6	RES ARRAY			
U7	4001B	14	7	
U8	4098	16	8	
U9	4012B	14	7	
U10	LM239	3	12	
⑤ U11	LM239	3	12	
⑤ U12	RES ARRAY			
⑤ U13	RES ARRAY			
⑤ U14	RES ARRAY			
U15	LM239	3	12	
U16	4066B	14	7	
U17	4050	1	8	
U18	4011B	14	7	
U19	4001B	14	7	
U20	TL082	8		4
U21	TL082	8		4
⑤ U22	RES ARRAY			
U23	RES ARRAY			
U24	ULN-2004A	REF DWG		
U25	LM723	REF DWG		
U26	4066B	14	7	
⑤ U27	RES ARRAY			
U28	4049B	1	8	
U29	LM148	4		11
U30	4049B	1	8	

MICROCIRCUIT INFORMATION

U NO	TYPE	PWR (V DC)		
		+12	GND	-12
U31	LM358		4	
U32	RV4200NB	REF DWG		
U33	MC1558	8		4
U34	4002B	14	7	
U35	4051B	16	8	
U36	LM358	8	4	
U37	TL082	8		4
⑤ U38	RES ARRAY			
⑤ U39	RES ARRAY			
U40	4049B	1	8	
U41	4051B	16	8	
U42	LM224	4	11	
U43	4023B	14	7	
U44	LM239	3	12	
U45	LM224	4	11	
⑤ U46	RES ARRAY			
U47	4001B	14	7	
U48	4066B	14	7	
U49	TL082	8		4
U50	TL082	8		4
U51	TL082	8		4
U52	TL082	8		4

SPARE GATES



642-3598  
TPA-3061-044

Analog Control Card, Schematic Diagram  
Figure 9 (Sheet 4)



Rockwell  
International

instructions

# HF-80 Interface Card (635-0745-001)

Collins Telecommunications Products Division

523-0767976-302211

2nd Edition, 1 June 1978

3rd Revision, 15 November 1981

Printed in USA

635-0745-001

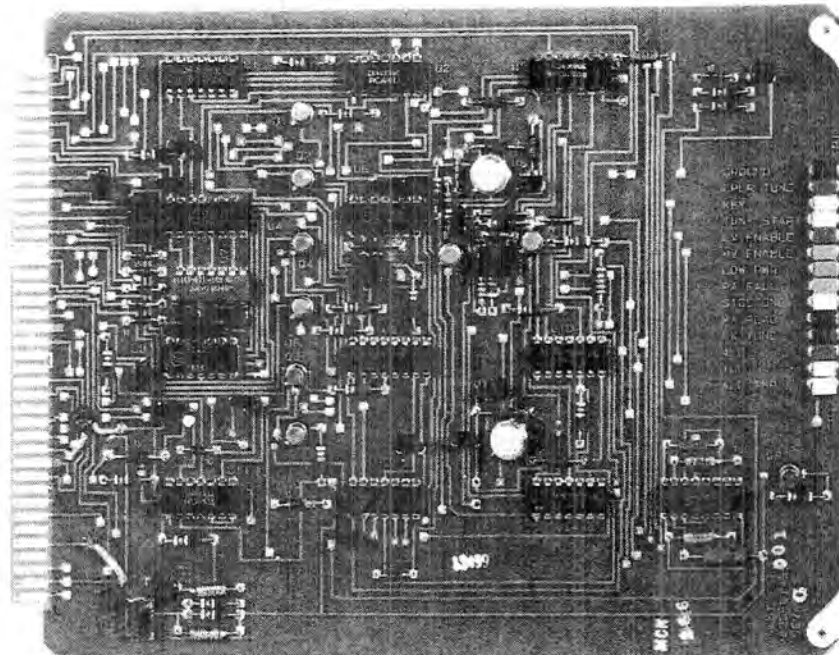
## 1. DESCRIPTION

HF-80 Interface Card 635-0745-001 (figure 1) is a 2-layer planar card with an 80-pin edge-on connector (2 layers, 40 pins each). CMOS logic components are used extensively on this card.

## 2. PRINCIPLES OF OPERATION

### 2.1 General

Refer to the block diagram, figure 2. The interface card provides all of the circuits necessary to interface



TP5-1531-017

HF-80 Interface Card  
Figure 1

117700101010-000011



is forced to a logic 0. This logic 0 is inverted by U2C and turns on transistor Q3 which enables (grounds) the T/R RELAY ENABLE output (P1-63). This enables the transmit/receive relay in the power amplifier which, in turn, grounds the KEY INTERLOCK input at P1-60. This signal enables the KEY output (logic 1 at P1-49) and the KEY MONITOR output (logic 0 at P1-55). The KEY output is the key signal for the power amplifier. During the tuning cycle (after receipt of the system key signal) the KEY LATCH input (P1-72) goes to a logic 1 and is applied to gate U10B along with the logic 1 REMOTE signal (P1-4). This turns on transistor Q2 and applies a ground (latch) to the system key line. This condition exists until the power amplifier completes tuning. When the power amplifier is unkeyed, the logic 0 output of inverter U2C forces a logic 0 KEY output. This unkeys the power amplifier circuits at the same time the tr relay is deenergized.

### 2.2.2 Antenna Interlock

The ANTENNA INTERLOCK input (P1-30) indicates dc continuity to ground through the system antenna or antenna coupler/antenna. A logic 0 input (interlock satisfied) produces a logic 1 ANTENNA INTERLOCK (BUFFERED) output at P1-52 and applies a logic 0 to antenna interlock fault summary gate U14A. The logic 0 input forces a logic 1 ANTENNA INTERLOCK FAULT output (P1-5) that indicates no fault exists. A fault is declared (logic 0 at P1-5) only when the interlock input at P1-30 is open (logic 1), the power amplifier is in tune step 7 (tune complete, or operate), and a key signal is present. The key signal triggers one-shot circuit U15A which applies a short duration logic 0 pulse to U14A that is long enough to allow external equipments or accessories to close (ground) the interlock input after receiving the key command. This prevents a fault output from U14A during normal operation.

### 2.2.3 Tune Start

The SYSTEM TUNE START input signal (P1-29) is a logic 0 pulse received from the system exciter. The pulse is generated whenever a change of operating frequency of 1 kHz or greater is made. The input is inverted to produce the logic 1 TUNE START output (P1-47) used in the power amplifier. The tune start signal resets the power amplifier to tune step 1 of the tune cycle.

### 2.2.4 Low-Voltage Enable

The SYSTEM LOW VOLTAGE ENABLE input signal (P1-14) is a logic 0 applied from the system ex-

citer. The logic 1 LOW VOLTAGE ENABLE output signal (P1-44) is applied through the power amplifier control circuits to the power supply control circuits to turn on the filament, blower, and low-level power supplies.

### 2.2.5 High-Voltage Enable

The SYSTEM HIGH VOLTAGE ENABLE input signal (P1-15) is a logic 0 that is received from the system exciter. The logic 1 HIGH VOLTAGE ENABLE output (P1-45) is applied through the power amplifier control circuits to the power supply control circuits to turn on the plate and screen voltages.

### 2.2.6 Low Power Enable

Power amplifier low power operation (approximately one-half the rated power output level) is enabled by a logic 0 SYSTEM LOW POWER ENABLE input signal (P1-27) from the system exciter. When the input at P1-27 is a logic 1, the power amplifier operates at the normal rated power output level. The output of U4A is a logic 1 for high power and logic 0 for low power. This switches the high or low ALC and TGC threshold level input to the ALC and TGC circuits.

### 2.2.7 System PA Ready

When the power amplifier reaches step 7 (tune complete) of the tune cycle, the PA READY input (P1-6) goes to logic 1. This, combined with the logic 1 LOCAL/REMOTE input (P1-4) turns on transistor Q1 and grounds (enables) the SYSTEM PA READY output at P1-10. This output remains a logic 1 during local operation.

### 2.2.8 System PA Fault

If any of the functions monitored by the power amplifier control circuits indicate a fault, the PA FAULT SUMMARY input signal (P1-71) goes to a logic 1. This, combined with the logic 1 LOCAL/REMOTE input (P1-4), turns off transistor Q4 and applies a logic 1 fault indication to the SYSTEM PA FAULT output (P1-17). This signal is applied to the monitor circuits in the system exciter. This signal remains a logic 0 during local operation.

### 2.2.9 Sidetone Enable

As soon as the power amplifier begins producing rf output power (during a tune cycle), the RF OUTPUT MONITOR input (P1-34) goes to a logic 0. This turns on transistor Q5 and grounds (enables) the





START output at P1-47. The SYSTEM TUNE START function is described in paragraph 2.2.3. The LOCAL TUNE START function (a logic 0 at P1-9) forces a positive output from gate U14B that triggers one-shot circuit U15B. The positive output of U15B turns on transistor Q9 and grounds (enables) the system tune start circuit. This produces the logic 1 TUNE START output (P1-47) and grounds the SYSTEM TUNE START line (P1-29) to assure that external equipments or accessories receive the tune start command. This prevents transmitting into an antenna coupler tuned to a different operating frequency. A local tune start signal is also generated when the maintenance panel local/remote switch is changed or if power is interrupted.

#### 2.3.4 Local Low-Voltage Enable

During local operation, the SYSTEM LOW VOLTAGE ENABLE input (P1-14) is disregarded. The LOCAL LOW VOLTAGE ENABLE input (P1-46) controls the low-voltage enable circuit (paragraph 2.2.4).

#### 2.3.5 Local High-Voltage Enable

During local operation, the SYSTEM HIGH POWER ENABLE input (P1-15) is disregarded. The LOCAL HIGH VOLTAGE ENABLE input (P1-51) controls the high-voltage enable circuit (paragraph 2.2.5).

#### 2.3.6 Local Low Power Enable

During local operation, the SYSTEM LOW POWER ENABLE input (P1-27) is disregarded. The LOCAL LOW POWER ENABLE input (P1-12) controls the low power enable circuit (paragraph 2.2.6) in either an automatic or manual mode.

### 3. TESTING/TROUBLESHOOTING PROCEDURES

#### 3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the interface card are listed in the maintenance section of this instruction book.

#### 3.2 Testing

The test procedures of table 1 are performed using the TS-8022 Card Extender and the TS-8020 Maintenance Panel. The test procedures of table 2 are performed using the TS-8022 Card Extender and the TS-8021 Maintenance Panel. The test setup for table 1 is shown in figure 3, and the test setup for table 2 is shown in figure 4. The test procedures of table 3 are performed using the TS-8023 PA Card Test Set. Refer to the TS-8023 PA Card Test Set Instruction Book, Collins part number 523-0768236, for overall views of the TS-8023 and functional descriptions of all controls and indicators. Figure 5 in this section shows the specific controls applicable to the test procedures in table 3. All of the test procedures check total performance of the circuit card and permit fault isolation to a component or circuit when used in conjunction with the circuit card schematic diagram.

### 4. ALIGNMENT/ADJUSTMENT

The interface card requires no alignment or adjustment.

### 5. REPAIR

Repair of the interface card is accomplished using the planar card repair procedures in the maintenance section of this instruction book.







Table 1. HF-80 Interface Card, Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. Local high-voltage enable check	After the 3-minute delay, check for high voltage enable.	TS-8020 FIL TIMER indicator turns on. PLATE indicator on the HF-8020 front panel turns on.	Check U2E, U4B, and associated components.
4. Key and tr relay enable check	a. Turn the TS-8020 KEY switch to ON.  b. Press the TUNE STEP ADV switch until TUNE STEP 3 indicator turns on. The signal generator remains set the same as test 2.a.  c. Check the rf voltmeter for an indication of rf power out (tr relay enabled).	TS-8020 KEY MONITOR indicator turns on.   Rf output indication	Check U1B, U2B, U2F, and associated components. Perform test 2.c.  Check Q3, U9A/U9B, U2C, U4D, and associated components.
5. Exciter tune check	Use the digital voltmeter to check the logic level of TP11.	Logic 0 (enable). NMT +2 V dc.	Check Q6, U3B, U9F, and associated components.
6. Forward power analog check	Use the digital voltmeter to check the dc voltage at connector P1-28 and P1-64.	Approximately 0.5 V dc at both connector pins.	Check U13A and associated components.
7. Sidetone enable check	Use the digital voltmeter to check the logic level at TP9 (SIDETONE).	Logic 0 (NMT +2 V dc).	Check Q5, U11A, and associated components.
8. Antenna coupler tune power check	Use the digital voltmeter to check the logic levels at TP2 (CPLR TUNE) and connector P1-70.	TP2 should indicate an open (logic 1). P1-70 should indicate a logic 0 (NMT +2 V dc).	Check U11B and associated components.
9. Antenna interlock (buffered) check	If an antenna coupler is not used in the system, use the digital voltmeter to check the logic level at connector P1-52.  <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 10px auto;">Note</div> If an HF-8040 Antenna Coupler is used in the system, connector P1-52 should indicate a logic 1 only when the antenna coupler is ready to accept an rf input from the HF-8020 during normal operation.	P1-52 should indicate a logic 1 (NLT +9 V dc).	Check U11F and associated components.



Table 1. HF-80 Interface Card, Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL														
14. (Cont)	<p>d. Set the system exciter controls as follows:</p> <table border="1"> <thead> <tr> <th><u>CONTROL</u></th> <th><u>SETTING</u></th> </tr> </thead> <tbody> <tr> <td>KEY</td> <td>CW</td> </tr> <tr> <td>CONT</td> <td>LCL</td> </tr> <tr> <td>MODE</td> <td>CW</td> </tr> <tr> <td>FREQ KHZ</td> <td>1.6 MHz</td> </tr> <tr> <td>PWR</td> <td>OFF</td> </tr> <tr> <td>PA PWR</td> <td>OFF</td> </tr> </tbody> </table> <p>e. Apply system power to the HF-8020.</p>	<u>CONTROL</u>	<u>SETTING</u>	KEY	CW	CONT	LCL	MODE	CW	FREQ KHZ	1.6 MHz	PWR	OFF	PA PWR	OFF		
<u>CONTROL</u>	<u>SETTING</u>																
KEY	CW																
CONT	LCL																
MODE	CW																
FREQ KHZ	1.6 MHz																
PWR	OFF																
PA PWR	OFF																
14.1 Low-voltage enable check	Set the exciter PWR switch to on. Set the PA PWR switch to STDBY.	HF-8020 blower runs. CONTROL and FILAMENT indicators on the HF-8020 turn on. TS-8020 TUNE STEP 1 indicator turns on.	Check U4C.														
14.2 High-voltage enable check	After a 3-minute time delay, the high voltage to the HF-8020 should be enabled.	TS-8020 FIL TIMER indicator turns on. The PLATE indicator on the HF-8020 front panel turns on.	Check U4B.														
14.3 Tune start and key check	<p>a. Set the exciter PA PWR switch to LOW PWR.</p> <p>b. Move one of the exciter FREQ KHZ switches to one position, then return it to the original position (1.6 MHz). Press the system key.</p>	<p>TS-8020 TUNE STEP 1 indicator turns on, then, the HF-8020 should proceed through the remaining tune steps within 5 to 10 seconds.</p> <p>If the HF-8020 completes the tune cycle (TS-8020 TUNE STEP 7 indicator turns on and HF-8020 front panel READY indicator turns on), proceed to test 14.10.</p> <p>If the HF-8020 fails to complete the tune cycle, within 25 seconds (TS-8020 TUNE FAULT indicator turns on), repeat test 14.3.b. If the fault repeats, note the tune step where the tune sequence stopped. Then perform the applicable following tests.</p>															





Table 1. HF-80 Interface Card, Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
14.9 (Cont)	<ul style="list-style-type: none"> <li>e. Use the digital voltmeter to check the voltage level at connector pins P1-3 and P1-50.</li> <li>f. Unkey the HF-8020, and replace the connection to the rf load.</li> </ul>	Both P1-3 and P1-50 should indicate $\pm 1.1$ V dc.	Check U13B and associated components.
14.10 System pa fault check	<ul style="list-style-type: none"> <li>a. Generate a new tune cycle for the HF-8020.</li> <li>b. During the tune cycle between tune steps 2 and 6 remove the rf input to the HF-8020.</li> <li>c. Wait 25 seconds until the fault timer circuit times out.</li> </ul>	<p>TS-8020 TUNE FAULT indicator turns on.</p> <p>PA FAULT indicator on the exciter turns on.</p>	Check Q4, U10C, and associated components.
15. Shutdown	<ul style="list-style-type: none"> <li>a. Set the exciter PA PWR switch of OFF.</li> <li>b. Remove system power from the HF-8020.</li> <li>c. Install the interface card.</li> <li>d. Return antenna interlock switch S9 on the rear panel of the HF-8020 to the normal operating position.</li> <li>e. Perform the overall unit test procedures in the maintenance section.</li> </ul>		



Table 2. HF-80 Interface Card, Test Procedures (Using TS-8021 Maintenance Panel).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																																		
1. Test setup	<p>a. Be sure system power to the power amplifier is off.</p> <p>b. Connect the test equipment as shown in figure 4.</p> <p>c. Extend the interface card using the TS-8022 Extender Card, Collins part number 622-3430-001.</p> <p>d. Be sure that all power amplifier covers, except the control compartment and circuit breaker access panel covers, are in place and properly secured.</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 10px auto;">Warning</div> <p>Lethal voltages are present within the 3- and 10-kW power amplifiers (+3300 V dc in the 3-kW power amplifier and +6250 V dc in the 10-kW power amplifier). Use extreme caution when testing or troubleshooting to prevent severe electrical burns or severe electrical shock.</p> <p>e. Test points used for testing the interface card are listed below.</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 20px;">1</td><td><u>Ground</u></td></tr> <tr><td>2</td><td><u>Coupler tune power</u></td></tr> <tr><td>3</td><td><u>System key</u></td></tr> <tr><td>4</td><td><u>System tune start</u></td></tr> <tr><td>5</td><td><u>System low voltage enable</u></td></tr> <tr><td>6</td><td><u>System high voltage enable</u></td></tr> <tr><td>7</td><td><u>System low-power enable</u></td></tr> <tr><td>8</td><td><u>System pa fault</u></td></tr> <tr><td>9</td><td><u>Sidetone enable</u></td></tr> <tr><td>10</td><td><u>System pa ready</u></td></tr> <tr><td>11</td><td><u>Exciter tune</u></td></tr> <tr><td>12</td><td>ALC output</td></tr> <tr><td>13</td><td>TGC output</td></tr> <tr><td>14</td><td>ALC amplifier</td></tr> </table> <p>f. Set the TS-8021 Maintenance Panel controls as follows:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;"><u>CONTROL</u></th> <th style="text-align: left;"><u>SETTING</u></th> </tr> </thead> <tbody> <tr><td>LOCAL/REMOTE</td><td>LOCAL</td></tr> <tr><td>MAN/AUTO</td><td>MAN</td></tr> <tr><td>DRVR</td><td>ON</td></tr> <tr><td>PRI</td><td>ON</td></tr> <tr><td>SEC</td><td>ON</td></tr> <tr><td>LOAD</td><td>ON</td></tr> <tr><td>PWR</td><td>L</td></tr> <tr><td>FIL</td><td>ON</td></tr> <tr><td>HV</td><td>ON</td></tr> <tr><td>KEY</td><td>OFF</td></tr> </tbody> </table>	1	<u>Ground</u>	2	<u>Coupler tune power</u>	3	<u>System key</u>	4	<u>System tune start</u>	5	<u>System low voltage enable</u>	6	<u>System high voltage enable</u>	7	<u>System low-power enable</u>	8	<u>System pa fault</u>	9	<u>Sidetone enable</u>	10	<u>System pa ready</u>	11	<u>Exciter tune</u>	12	ALC output	13	TGC output	14	ALC amplifier	<u>CONTROL</u>	<u>SETTING</u>	LOCAL/REMOTE	LOCAL	MAN/AUTO	MAN	DRVR	ON	PRI	ON	SEC	ON	LOAD	ON	PWR	L	FIL	ON	HV	ON	KEY	OFF		
1	<u>Ground</u>																																																				
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HV	ON																																																				
KEY	OFF																																																				



Table 2. HF-80 Interface Card, Test Procedures (Using TS-8021 Maintenance Panel) (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7. Sidetone enable check	Use the digital voltmeter to check the logic level at TP9 (SIDE TONE).	Logic 0 (NMT +2 V dc).	Check Q5, U11A, and associated components.
8. Antenna coupler tune power check	Use the digital voltmeter to check the logic levels at TP2 (CPLR TUNE) and connector P1-70.	TP2 should indicate an open (logic 1). P1-70 should indicate a logic 0 (NMT +2 V dc).	Check U11B and associated components.
9. Antenna interlock (buffered check)	If an antenna coupler is not used in the system, use the digital voltmeter to check the logic level at connector P1-52.	P1-52 should indicate a logic 1 (NLT +9 V dc).	Check U11F and associated components.
10. Antenna interlock fault check	Use the digital voltmeter to check the logic level at connector P1-5.	P1-5 should indicate a logic 1 (NLT +9 V dc).	Check U14A, U11D, U15A and associated components.
11. Tune step sequence C check	Use the digital voltmeter to check the logic level at TP13 (TGC).	TP13 should indicate a logic 0 (NMT +2 V dc).	Check U9E, Q8, and associated components.
12. TGC check	a. Repeatedly press the TS-8021 TUNE STEP ADV switch until the power amplifier reaches tune step 7 (tune complete).	TUNE STEP indicator indicates step 7. READY indicator on the power amplifier turns on.	
	b. Use the digital voltmeter to check the negative voltage level at TP13 (TGC).	TP13 should indicate approximately -8 V dc.	Check U6A and associated components.  Check Q8.  If checks do not indicate a fault, perform the adjustment procedures in the maintenance section.
	c. Set the TS-8021 PWR switch to H. Check the negative voltage level at TP13.	TP12 should indicate approximately -7 V dc.	Same as test 12.b.
13. ALC check	a. With the power amplifier remaining in tune step 7 (tune complete) and the TS-8021 PWR switch in the H position, check the negative voltage level at TP12 (ALC) with the digital voltmeter.	TP13 should indicate approximately -2 V dc.	Check U6B and associated components.
(Cont)	b. Check the negative voltage level at TP14 (ALC AMP).	TP14 should indicate approximately -3 V dc.	Check VR1 and associated components.



Table 2. HF-80 Interface Card, Test Procedures (Using TS-8021 Maintenance Panel) (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
14.3 (Cont)	b. Press the system key.	TS-8021 TUNE STEP 1 indicator turns on, then, the power amplifier should proceed through the remaining tune steps within 5 to 10 s. If the power amplifier completes the tune cycle (TS-8021 TUNE STEP indicator indicates step 7 and power amplifier READY indicator turns on), proceed to test 14.4. If the power amplifier fails to complete the tune cycle, within 25 s (TS-8021 TUNE FAULT indicator turns on), repeat test 14.3.b. If the fault repeats, note the tune step where the tune sequence stopped. Then, perform the applicable following tests.	
14.4 System pa fault check	<p>a. Generate a new tune cycle for the power amplifier.</p> <p>b. During the tune cycle between tune steps 2 and 6, remove the rf input to the power amplifier.</p> <p>c. Wait 25 s until the fault timer circuit times out.</p>	TS-8021 TUNE FAULT indicator turns on. PA FAULT indicator on the exciter turns on.	Check Q4, U10C, and associated components.
15. Shutdown	<p>a. Set the exciter PA PWR switch to OFF.</p> <p>b. Remove system power from the power amplifier.</p> <p>c. Install the interface card.</p> <p>d. Perform the overall unit test procedures in the maintenance section.</p>		





Table 3. HF-80 Interface Card, Test Procedures (Using TS-8023 PA Card Test Set).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Test setup	<p style="text-align: center;"><b>Note</b></p> <p>These test procedures are for use with the TS-8023 PA Card Test Set.</p> <p>a. Be sure that the TS-8023 POWER switch is in the OFF position.</p> <p>b. Plug the interface card into INTERFACE connector on the top of the TS-8023.</p> <p>c. Set TS-8023 3/10 KW PS/1 KW PS CONT/OTHER selector switch to the OTHER position. Set all other TS-8023 switches and controls to the OFF, down, or maximum counterclockwise position.</p> <p style="text-align: center;"><b>Note</b></p> <p>Other than frequency control and test indicators, the controls used in these procedures are in the INTERFACE CARD section of the TS-8023, as shown in figure 5.</p> <p>d. Test points on the interface card are as follows:</p> <ol style="list-style-type: none"> <li>1 <u>Ground</u></li> <li>2 <u>Coupler tune power</u></li> <li>3 <u>System key</u></li> <li>4 <u>System tune start</u></li> <li>5 <u>System low-voltage enable</u></li> <li>6 <u>System high-voltage enable</u></li> <li>7 <u>System low-power enable</u></li> <li>8 <u>System pa fault</u></li> <li>9 <u>Sidetone enable</u></li> <li>10 <u>System pa ready</u></li> <li>11 <u>Exciter tune</u></li> <li>12 <u>ALC output</u></li> <li>13 <u>TGC output</u></li> <li>14 <u>ALC amplifier</u></li> </ol> <p style="text-align: center;"><b>Note</b></p> <p>The TS-8023 requires a primary power source of 115 or 230 V ac, 50 to 60 Hz, for operation. Verify that reversible circuit card, in TS-8023 power connector J53, is set for applicable source voltage.</p> <p>e. Plug the TS-8023 into the proper primary power source.</p> <p>f. Turn the TS-8023 POWER switch to ON.</p>		



Table 3. HF-80 Interface Card, Test Procedures (Using TS-8023 PA Card Test Set) (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																				
4. Key logic	a. Set the LCL-RMT switch (5) to LCL. b. Perform the procedures in the following tabulation.																						
	<table border="1"> <thead> <tr> <th>SWITCH</th> <th>POSITION</th> <th>TEST INDICATOR</th> <th>CHECK</th> </tr> </thead> <tbody> <tr> <td>KEY (6) KEY LATCH (7)</td> <td>ON OFF</td> <td>18: On</td> <td>Same as test 2.</td> </tr> <tr> <td>KEY (6) KEY LATCH (7)</td> <td>ON ON</td> <td>18: Off</td> <td>Same as test 2.</td> </tr> <tr> <td>KEY (6) KEY LATCH (7) Toggle LCL RMT (5)</td> <td>OFF OFF OFF</td> <td>18: Off</td> <td>Same as test 2.</td> </tr> <tr> <td>KEY (6) KEY LATCH (7)</td> <td>OFF ON</td> <td>18: Off</td> <td>Same as test 2.</td> </tr> </tbody> </table>	SWITCH	POSITION	TEST INDICATOR	CHECK	KEY (6) KEY LATCH (7)	ON OFF	18: On	Same as test 2.	KEY (6) KEY LATCH (7)	ON ON	18: Off	Same as test 2.	KEY (6) KEY LATCH (7) Toggle LCL RMT (5)	OFF OFF OFF	18: Off	Same as test 2.	KEY (6) KEY LATCH (7)	OFF ON	18: Off	Same as test 2.		
SWITCH	POSITION	TEST INDICATOR	CHECK																				
KEY (6) KEY LATCH (7)	ON OFF	18: On	Same as test 2.																				
KEY (6) KEY LATCH (7)	ON ON	18: Off	Same as test 2.																				
KEY (6) KEY LATCH (7) Toggle LCL RMT (5)	OFF OFF OFF	18: Off	Same as test 2.																				
KEY (6) KEY LATCH (7)	OFF ON	18: Off	Same as test 2.																				
5. Antenna interlock	a. Set the LCL-RMT switch (5) to LCL. b. Set the KEY LATCH switch (7) to off. c. Perform the tests in the following tabulation.																						
	<table border="1"> <thead> <tr> <th>SWITCH</th> <th>POSITION</th> <th>TEST INDICATOR</th> <th>CHECK</th> </tr> </thead> <tbody> <tr> <td>KEY (6) TUNE COMPL (16) ANT INTLK (12)</td> <td>X X ON</td> <td>24: On</td> <td>Check U11F and associated components.</td> </tr> <tr> <td>KEY TUNE COMPL ANT INTLK</td> <td>X X OFF</td> <td>24: Off</td> <td>Same as above.</td> </tr> <tr> <td>KEY TUNE COMPL ANT INTLK</td> <td>ON ON OFF</td> <td>1: On</td> <td>Check U14A and U11D.</td> </tr> <tr> <td>KEY TUNE COMPL ANT INTLK</td> <td>ON ON ON</td> <td>1: Off</td> <td>Same as above. Check U15A, U4D, U2C, R21.</td> </tr> </tbody> </table>	SWITCH	POSITION	TEST INDICATOR	CHECK	KEY (6) TUNE COMPL (16) ANT INTLK (12)	X X ON	24: On	Check U11F and associated components.	KEY TUNE COMPL ANT INTLK	X X OFF	24: Off	Same as above.	KEY TUNE COMPL ANT INTLK	ON ON OFF	1: On	Check U14A and U11D.	KEY TUNE COMPL ANT INTLK	ON ON ON	1: Off	Same as above. Check U15A, U4D, U2C, R21.		
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KEY TUNE COMPL ANT INTLK	ON ON ON	1: Off	Same as above. Check U15A, U4D, U2C, R21.																				
(Cont)																							



Table 3. HF-80 Interface Card, Test Procedures (Using TS-8023 PA Card Test Set) (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																				
8. Transmit gain control	a. Set ALC switch (17) to PLATE. b. Set TUNE SEQ COUNT C switch (11) to ON. c. Connect dvm to TGC jack (23). d. Adjust VLTG SOURCE pot (4) for the voltage shown in VOLTAGE AT TGC (23) column of following tabulation. e. Connect dvm to VLTG SOURCE jack (4). f. Measure the voltage in VLTG SOURCE (4) column for each TGC voltage and switch position.		Check U5A, U5B, U6A, and associated components. Check U9E, Q8, and associated components.																				
<table border="1"> <thead> <tr> <th>SWITCH</th> <th>POSITION</th> <th>VLTG SOURCE (4)</th> <th>VOLTAGE AT TGC (23)</th> </tr> </thead> <tbody> <tr> <td>LOW PWR (9) LCL RMT (5)</td> <td>ON LCL</td> <td>+6.4 to +7.0 V dc</td> <td>-4.98 to -5.02 V dc</td> </tr> <tr> <td>LOW PWR LCL RMT</td> <td>OFF LCL</td> <td>+4.6 to +5.0 V dc</td> <td>-4.98 to -5.02 V dc</td> </tr> <tr> <td>LOW PWR LCL RMT</td> <td>OFF RMT</td> <td>+6.4 to +7.0 V dc</td> <td>-4.98 to -5.02 V dc</td> </tr> <tr> <td>LOW PWR LCL RMT</td> <td>ON RMT</td> <td>+4.6 to +5.0 V dc</td> <td>-4.98 to -5.02 V dc</td> </tr> </tbody> </table>				SWITCH	POSITION	VLTG SOURCE (4)	VOLTAGE AT TGC (23)	LOW PWR (9) LCL RMT (5)	ON LCL	+6.4 to +7.0 V dc	-4.98 to -5.02 V dc	LOW PWR LCL RMT	OFF LCL	+4.6 to +5.0 V dc	-4.98 to -5.02 V dc	LOW PWR LCL RMT	OFF RMT	+6.4 to +7.0 V dc	-4.98 to -5.02 V dc	LOW PWR LCL RMT	ON RMT	+4.6 to +5.0 V dc	-4.98 to -5.02 V dc
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LOW PWR LCL RMT	ON RMT	+4.6 to +5.0 V dc	-4.98 to -5.02 V dc																				
9. Automatic load control	a. Set ALC switch (17) to PLATE. b. Set LCL-RMT switch (5) to LCL. c. Set TUNE COMPL switch (16) to ON. d. Set LOW PWR switch (9) to ON in LCL or OFF in remote. e. Connect dvm to ALC jack (22). f. Start from full ccw. Increase VLTG SOURCE pot (4) cw and observe dvm.	Dvm does not indicate more than +1.0 V dc.	Check U6A, Q8, and associated components.  Check VR1, U6B, and associated components.  Check U5C and U5D. Check U9F, Q7, and associated components.																				
(Cont)																							



Table 3. HF-80 Interface Card, Test Procedures (Using TS-8023 PA Card Test Set) (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
10. (Cont)	e. Adjust VLTG SOURCE pot (4) for a voltage between -6.9 and -7.1 V dc at ALC jack (22). f. Measure voltage at ALC AMP jack (2).	Dvm indicates -2.55 to -3.15 V dc.	Same as step d.
11. ADL	a. Set TUNE COMPL switch (16) to ON. b. Adjust VLTG SOURCE pot (4) for a voltage between -0.20 and +0.20 V dc at VLTG SOURCE jack (4). c. Set ALC switch (17) to ADL. d. Use the dvm to measure voltage at ALC jack (22). e. Use the dvm and adjust VLTG SOURCE pot (4) for a voltage between -4.8 and -5.2 V dc at ALC jack (22). f. Measure the voltage at VLTG SOURCE jack (4).	0 V dc.     Dvm indicates -5.3 to -6.3 V dc.	Check CR8, CR12, CR17, R17, and associated components.     Same as step d.
12. Frequency lines	a. Use the TS-8023 FREQUENCY MHZ switches and check each frequency listed in the following tabulation for proper TEST INDICATOR indication.		
	FREQUENCY	TEST INDICATOR	
	20	12 ON	
	10	13 ON	
	1	17 ON	
	2	16 ON	
	4	15 ON	
	8	14 ON	
13. Shutdown	a. Set the TS-8023 switches and controls as follows:		
	<u>SWITCH/CONTROL</u>	<u>POSITION</u>	
	VLTG SOURCE (4)	CCW	
	LCL/RMT	RMT	
	KEY (6)	OFF	
	KEY LATCH (7)	OFF	
	TUNE START (8)	OFF	
	LOW PWR (9)	OFF	
(Cont)	CPLR TUNE (10)	OFF	





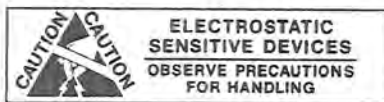
## 6. PARTS LIST/DIAGRAMS

### 6.1 Introduction

**Caution**

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All parts list illustrations containing ESDS items are shown with the following symbol:



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram. The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The description, Collins part number, usable on code, manufacturer's code and manufacturer's part number are listed for each reference designator.

### 6.2 Parts List

REF DES Column — Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modification.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification

history. NA (not applicable) in the REVISION IDENT column indicates a documentation change only. The change does not affect the circuit card/subassembly components.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

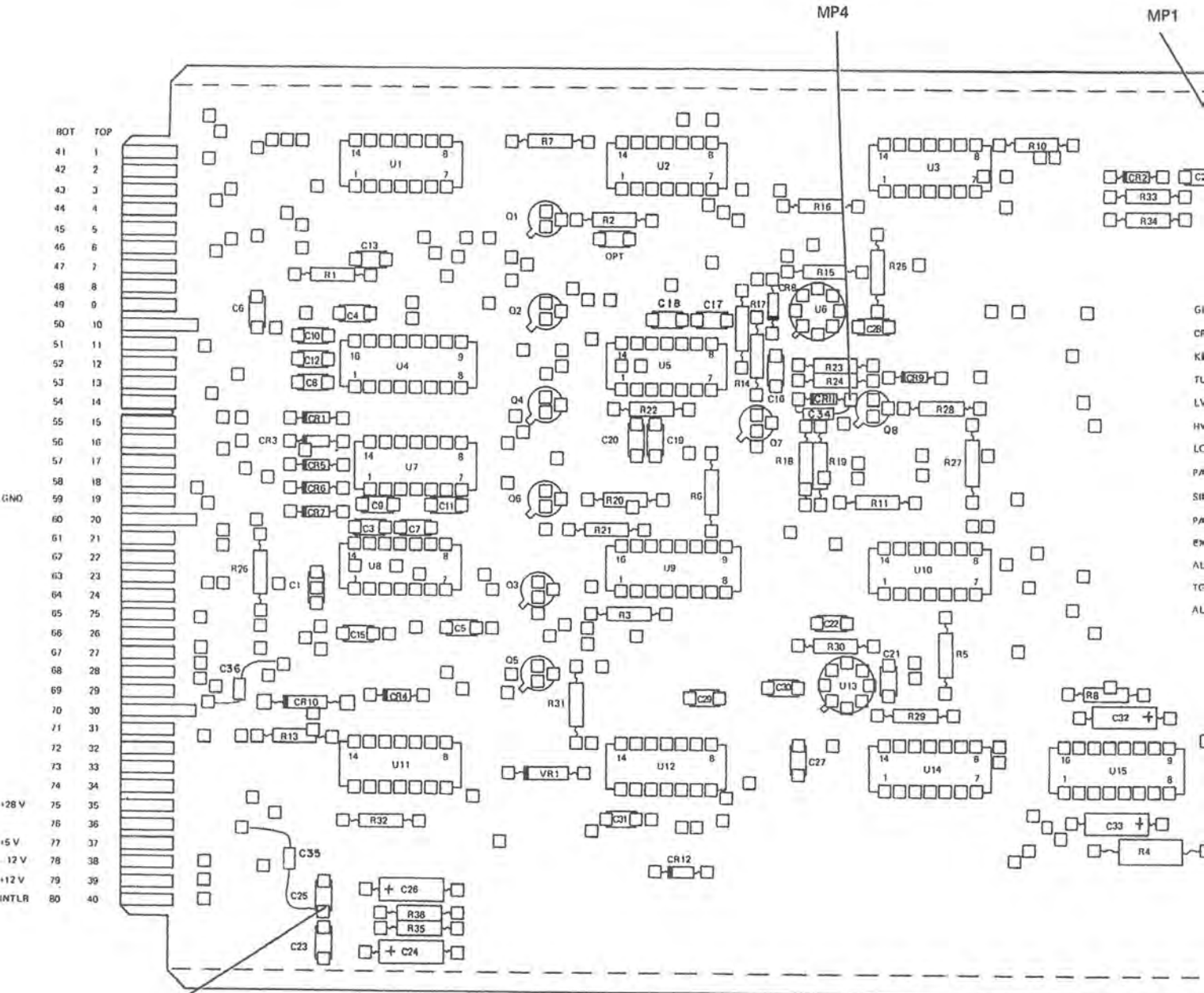
MFR Code Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

Listed below are manufacturer's names and addresses for the manufacturer's codes found in this parts list.

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
01121	ALLEN-BRADLEY CO 1201 SOUTH 2ND ST MILWAUKEE WI 53204
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49 DALLAS TX 75265
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
04713	MOTOROLA INC SEMICONDUCTOR GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV SUB OF SCHLUMBERGER LTD NORTH AMERICAN SALES MAIL STOP 14-1053 401 ELLIS ST P O DRAWER 7284 MOUNTAIN VIEW CA 94042
07387	BIRTCHE CORP THE MEDICAL DIV 4501 N ARDEN DR P O BOX 4399 EL MONTE CA 91734
12040	NATIONAL SEMICONDUCTOR CORP COMMERCE DR P O BOX 443 DANBURY CT 06810

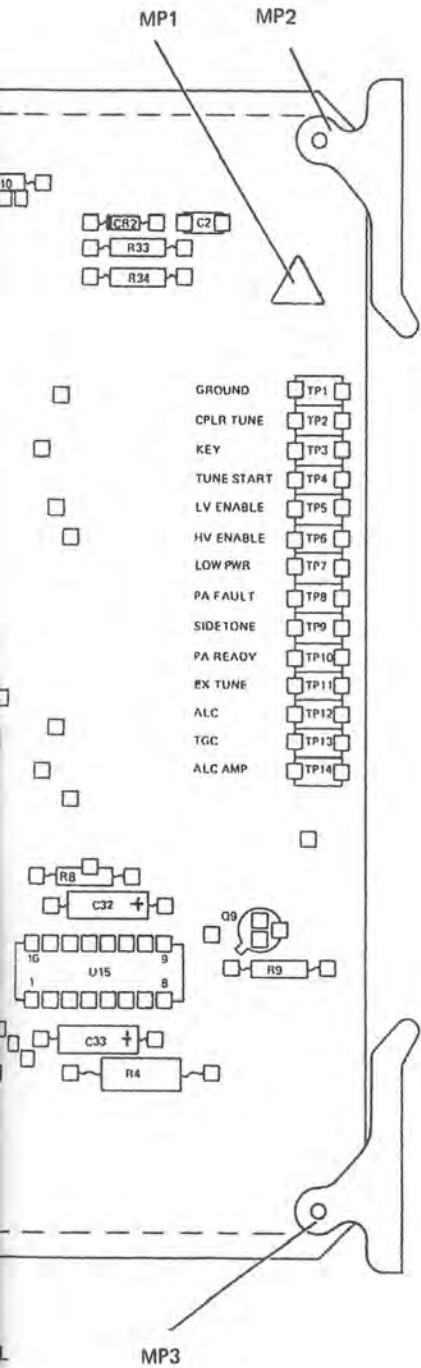




MP5

EFF TO REV LTR L

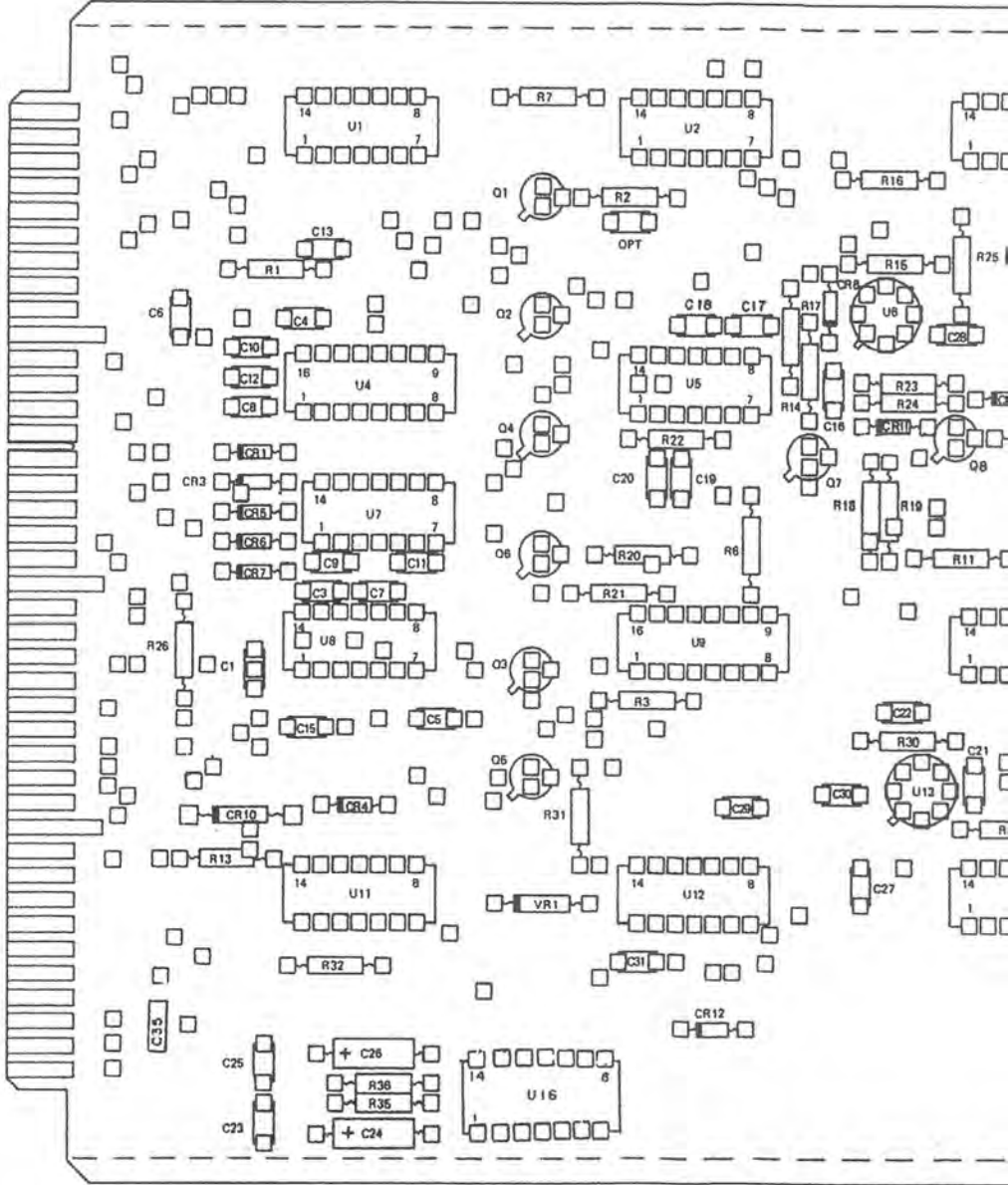
MP3



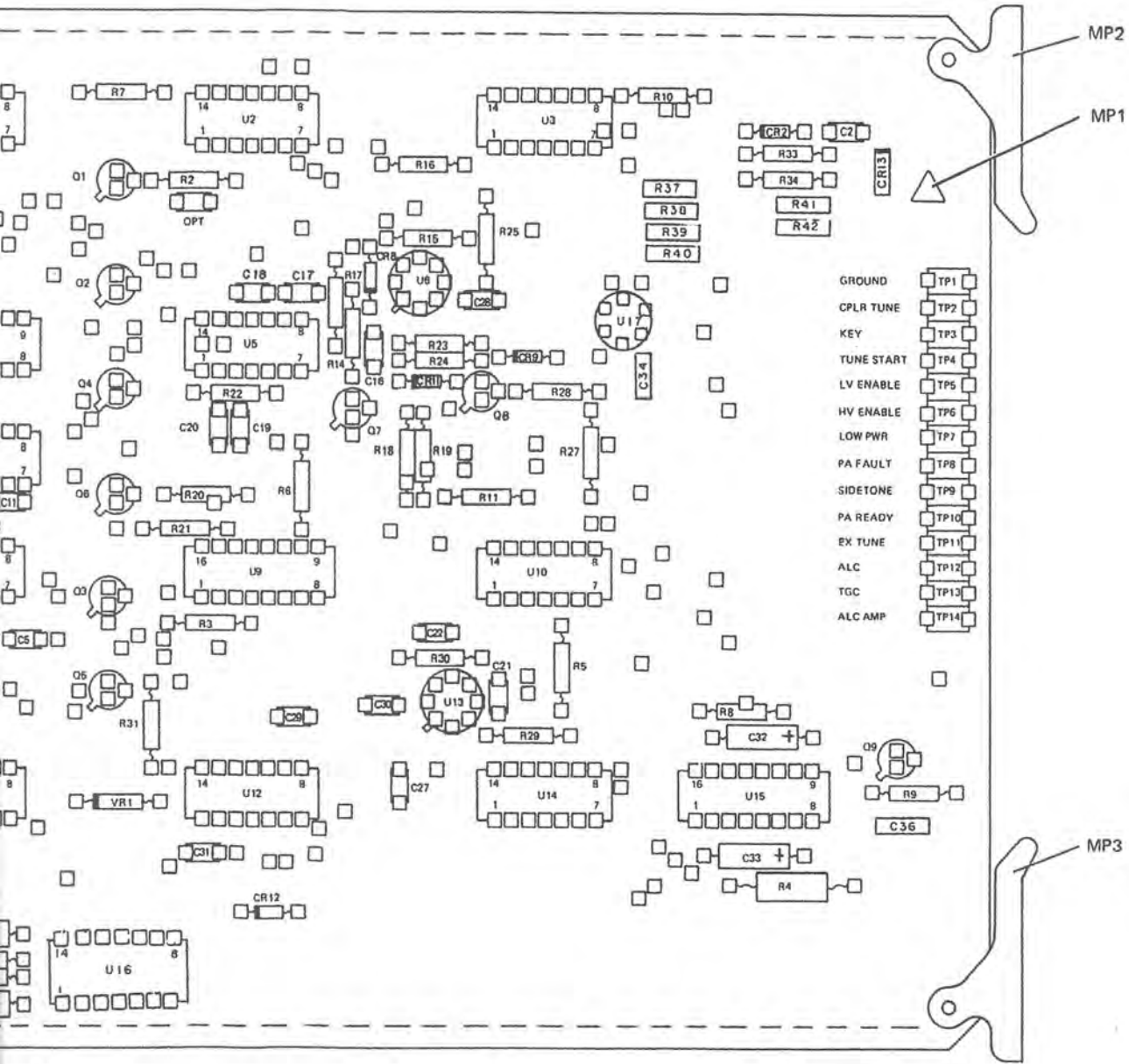
BOT	TOP
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42	2
43	3
44	4
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69	29
70	30
71	31
72	32
73	33
74	34
75	35
76	36
77	37
78	38
79	39
80	40

(W)

+28 V  
 +15 V  
 +12 V  
 +12 V  
 INTLR



ELECTROSTATIC SENSITIVE DEVICES OBSERVE PRECAUTIONS FOR HANDLING  
 TP5-1028-019



EFF REV LTR L



TPA-4448-018

HF-80 Interface Card,  
Schematic Diagram  
Figure 6 (Sheet 1 of 3)

## PARTS LIST

## PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	REF DES	DESCRIPTION	COLLINS PART NUMBER
CR1-CR9	INTERFACE CARD (ESDS)	635-0745-001			635-0745-001	U6	INTEGRATED CIRCUIT OP AMP (B3)	351-1329-
CR10	SEMICONV DEVICE IN4454	353-3644-010		31433	IN4454-1	U6	INTEGRATED CIRCUIT JFET OPRTNL AMPL	351-1987-
CR11	SEMICONV DEVICE IN4454	353-6442-070		14936	IN4007GP	U7	RESISTOR NETWORK DUAL-IN-LINE, 10K, 2%, 125V	350-4027-
CR12	SEMICONV DEVICE IN4454	353-3644-010		31433	IN4454-1	U8	RESISTOR NETWORK DUAL-IN-LINE, 10K, 2%, 125V	350-4027-
CR13	SEMICONV DEVICE IC31	353-3691-010				U9	INTEGRATED CIRCUIT DGTL MOS (ESDS) 4050	351-8159-
C1-C13	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		28480	1M5711	U10	INTEGRATED CIRCUIT DGTL MOS (ESDS) (C3)	351-8159-
C14	NOT USED			81349	CK058X103K	U11	INTEGRATED CIRCUIT MOS GATE (ESDS) 4099	351-8287-
C15-C20	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK058X103K	U12	INTEGRATED CIRCUIT DGTL MOS (ESDS) (C3)	351-8159-
C21,C22	CAPACITOR,FXD CER DIEI, 1000PF, 10%, 200V	913-4018-000		81349	CK058X102K	U12	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-
C23	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK058X103K	U13	INTEGRATED CIRCUIT OPRTNL AMPLIFIER MC1558	351-1071-
C24	CAPACITOR,FXD ELCTLT, 1UF, 10%, 50V	184-9087-430		81349	H39003-01-2356	U14	INTEGRATED CIRCUIT DGTL MOS (ESDS) (C3)	351-8159-
C25	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK058X103K	U14	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-
C26	CAPACITOR,FXD ELCTLT, 1UF, 10%, 50V	184-9087-430		81349	H39003-01-2356	U15	INTEGRATED CIRCUIT MULTIVIBRATOR (ESDS) 4098	351-8278-
C27-C31	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 50VDC (B1)	913-5019-320		81349	CK058X104K	U16	INTEGRATED CIRCUIT DGTL MOS (ESDS) (C3)	351-8159-
C28-C31	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 50VDC	913-5019-320		81349	CK058X104K	U17	INTEGRATED CIRCUIT OPRTNL AMPLIFIER (C3)	351-1071-
C32,C33	CAPACITOR,FXD ELCTLT, 1UF, 10%, 50V	184-9087-430		81349	H39003-01-2356	YR1	SEMICONV DEVICE H2625	353-3591-
C34	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 50VDC (A1)	913-5019-320		81349	CK058X104K			
C35	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC (A1)	913-5019-200		81349	CK058X103K			
C36	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 50VDC (A1)	913-5019-320		81349	CK058X104K			
MP1	LABEL,PRESS SENS (ESDS) (C2)	280-2745-040		12990	280-2745-040			
MP2	EXTRACTOR	635-0765-001						
MP3	HANDLE	150-0815-010		07387	60-2-2			
MP4	CONTACT,ELEC (C3)	372-2601-143			372-2601-143			
MP5	TERMINAL,SPECIAL (C3)	797-7253-004			797-7253-004			
Q1-Q6	TRANSISTOR 2N2222A	352-0661-020		49956	2N2222A			
Q7,Q8	TRANSISTOR 2N2907A	352-0551-010		04713	2N2907A			
Q9	TRANSISTOR 2N2222A	352-0661-020		49956	2N2222A			
R1	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS			
R2	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS			
R3	RESISTOR,FXD CHPSN, 1.8K, 10%, 1/4W	745-0758-000		81349	RCR07G182KS			
R4	RESISTOR,FXD FILM, 51K, 1%, 1/4W	705-6726-000		81349	RN5005113F			
R5	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS			
R6	RESISTOR,FXD CHPSN, 1.8K, 10%, 1/4W	745-0758-000		81349	RCR07G182KS			
R7	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS			
R8	RESISTOR,FXD FILM, 205K, 1%, 1/8W	705-1107-000		81349	RN5502053F			
R9	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS			
R10	RESISTOR,FXD FILM, 205K, 1%, 1/8W	705-1107-000		81349	RN5502053F			
R11	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS			
R12	NOT USED							
R13	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS			
R14	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W (C1)	745-0785-000		81349	RCR07G103KS			
R15	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F			
R15,R16	RESISTOR,FXD FILM, 100K, 1%, 1/8W	705-1092-000		81349	RN5501003F			
R17	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W (B1)	745-0785-000		81349	RCR07G103KS			
R17	RESISTOR,FXD FILM, 6.81K, 1%, 1/8W (B1)	705-1036-000		81349	RN5506811F			
R17	RESISTOR,FXD CHPSN, 3.3K, 10%, 1/4W (B2)	745-0767-000		81349	RCR07G332KS			
R18	RESISTOR,FXD CHPSN, 33K, 10%, 1/4W	745-0803-000		81349	RCR07G333KS			
R19	RESISTOR,FXD CHPSN, 47K, 10%, 1/4W	745-0809-000		81349	RCR07G473KS			
R20	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS			
R21	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS			
R22	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F			
R23	RESISTOR,FXD FILM, 44.2K, 1%, 1/8W	705-1075-000		81349	RN5504422F			
R24	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS			
R25	RESISTOR,FXD CHPSN, 0.49K, 1%, 1/8W	705-1042-000		81349	RN5509091F			
R26	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS			
R27	RESISTOR,FXD CHPSN, 33K, 10%, 1/4W	745-0803-000		81349	RCR07G333KS			
R28	RESISTOR,FXD CHPSN, 47K, 10%, 1/4W	745-0809-000		81349	RCR07G473KS			
R29,R30	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F			
R31	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS			
R32	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS			
R33,R34	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS			
R35,R36	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS			
R37	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W (C3)	745-0785-000		81349	RCR07G103KS			
R38	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W (C3)	745-0857-000		81349	RCR07G105KS			
R39,R40	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W (C3)	745-0785-000		81349	RCR07G103KS			
R41	RESISTOR,FXD FILM, 7.5K, 1%, 1/8W (C3)	705-1038-000		81349	RN5507501F			
R42	RESISTOR,FXD FILM, 4.99K, 1%, 1/8W (C3)	705-3605-330		81349	RN5504991F			
TP1	JACK,TIP BRN	360-0484-070		74970	105-1108-011			
TP2	JACK,TIP RED	360-0484-020		74970	105-1102-011			
TP3	JACK,TIP ORN	360-0484-050		74970	105-1106-011			
TP4	JACK,TIP YEL	360-0484-060		74970	105-1107-011			
TP5	JACK,TIP GRN	360-0484-040		74970	105-1104-011			
TP6	JACK,TIP BLU	360-0484-080		74970	105-1110-011			
TP7	JACK,TIP VIO	360-0484-090		74970	105-1112-011			
TP8	JACK,TIP GRA	360-0484-100		74970	105-1113-011			
TP9	JACK,TIP WHT	360-0484-010		74970	105-1101-011			
TP10	JACK,TIP BLK	360-0484-030		74970	105-1103-011			
TP11	JACK,TIP BRN	360-0484-070		74970	105-1108-011			
TP12	JACK,TIP RED	360-0484-020		74970	105-1102-011			
TP13	JACK,TIP ORN	360-0484-050		74970	105-1106-011			
TP14	JACK,TIP YEL	360-0484-060		74970	105-1107-011			
U1	INTEGRATED CIRCUIT DGTL MOS (ESDS) (C3)	351-8159-040		04713	MC1401UBCP			
U1	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-340		07263	4011BPC			
U2,U3	INTEGRATED CIRCUIT MOS GATE (ESDS) 4099	351-8287-080		02735	CD4069UBE			
U4	INTEGRATED CIRCUIT DGTL MOS (ESDS) 4019	351-8159-080		07263	4019BPC			
U5	INTEGRATED CIRCUIT SWITCH (ESDS) 4066	351-8252-010		02735	CD4066BE			
U6	INTEGRATED CIRCUIT OPRTNL AMPLIFIER (B2)	351-1071-020		07263	UA1558MHG			
U6	INTEGRATED CIRCUIT JFET OPRTNL AMPL (ALTERNATE (B2))	351-1987-010		12040	LF153H			

PARTS LIST (Cont)

MFR MFR CODE PART NUMBER	REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR MFR CODE PART NUMBER	REVISION IDENT	MODIFICATION DESCRIPTION OF REVISION AND REASON FOR CHANGE
635-0745-001	U6	INTEGRATED CIRCUIT OP AMP (83)	351-1329-010		01295 TL082HL		
31433 1N4454-1	U7	INTEGRATED CIRCUIT JFET OPRTNL AMPL	351-1987-010		12040 LF153H		
14936 1N4007GP	U8	RESISTOR NETWORK DUAL-IN-LINE, 10K, 2%, 125V	350-4027-090		01121 314B103	A1	Added capacitors C34, C35, and
31433 1N4454-1	U9	RESISTOR NETWORK DUAL-IN-LINE, 10K, 2%, 125V	350-4027-120		01121 314A103		
20400 1N5711	U10	INTEGRATED CIRCUIT DGTL MOS (ESDS) 4050	351-8159-220		07263 4050BPC	B1	Change R17 from 10 to 6.81 kΩ
01349 CK05BX103K	U10	INTEGRATED CIRCUIT DGTL MOS (ESDS) (C3)	351-8159-040		04713 MC14011UBCP		
	U11	INTEGRATED CIRCUIT MOS GATE (ESDS) 4099	351-8287-080		02735 CD4069UBE	B2	Delecta C27 0.1 μF, 10%, 50 V
01349 CK05BX103K	U12	INTEGRATED CIRCUIT DGTL MOS (ESDS) (C3)	351-8159-040		04713 MC14011UBCP		
01349 CK05BX102K	U12	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-340		07263 4011BPC		
01349 CK05BX103K	U13	INTEGRATED CIRCUIT OPRTNL AMPLIFIER MC1558	351-1071-020		07263 4011BPC	B2	Change U8 from MC1558 to TL082
01349 H39003-01-2356	U14	INTEGRATED CIRCUIT DGTL MOS (ESDS) (C3)	351-8159-050		04713 MC14012UBCP		
01349 CK05BX103K	U14	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-350		07263 4012BPC		
01349 H39003-01-2356	U15	INTEGRATED CIRCUIT MULTIVIBRATOR (ESDS) 4098	351-8278-010		02735 CD4098BE		
01349 CK05BX104K	U16	INTEGRATED CIRCUIT DGTL MOS (ESDS) (C3)	351-8159-350		07263 4012BPC	B3	Change U6 from TL082 to F772BHM
01349 CK05BX104K	U17	INTEGRATED CIRCUIT OPRTNL AMPLIFIER (C3)	351-1071-020		07263 UA1558HMG		
01349 H39003-01-2356	VR1	SEMICOND DEVICE 1N4625	353-3591-490		04713 1N4625		
01349 CK05BX104K						C1	Change R14 from 10K, 10%, 1/4 W to 10K, 1%, 1/8 W
12998 280-2745-040						C2	Added MP1 (ESDS) Label
07387 60-2-2						C3	Delete contact 372-2601-143, qty 3
372-2601-143							
797-7253-004							
49956 2N2222A							
04713 2N2907A							
49956 2N2222A							
01349 RCR07G104KS						C3	Delete special terminal 797-7253-004, qty 1
01349 RCR07G223KS							
01349 RCR07G102KS							
01349 RH6005113F							
01349 RCR07G104KS						C3	Add diode CR13, 1N5711
01349 RCR07G102KS							
01349 RCR07G103KS							
01349 RH5502053F						C3	Add resistor R37, R39 & R40, 10 K, 10%
01349 RCR07G472KS							
01349 RH5502053F						C3	Add resistor R38, 1 Ω
01349 RCR07G223KS							
01349 RCR07G104KS						C3	Add resistor R41, 7150 Ω
01349 RCR07G103KS							
01349 RH5501002F							
01349 RH5501003F						C3	Add resistor R42, 4590 Ω
01349 RCR07G103KS							
01349 RH5506811F							
01349 RCR07G332KS						C3	Change IC U1, U10 & U12 from 4011 to 4011B
01349 RCR07G333KS							
01349 RCR07G473KS							
01349 RCR07G223KS							
01349 RCR07G104KS						C3	Change IC U14 from 4012 to 4012B
01349 RH5501002F							
01349 RH5504422F							
01349 RCR07G102KS						C3	Add IC U16, CD4012B
01349 RH5509991F							
01349 RCR07G104KS							
01349 RCR07G333KS						C3	Add IC U17, 1558
01349 RCR07G473KS							
01349 RH5501002F							
01349 RCR07G223KS						C3	Change Location of C34, C35 & C36
01349 RCR07G104KS							
01349 RCR07G103KS							
01349 RCR07G104KS						NA	Data change only
01349 RCR07G103KS							
01349 RCR07G105KS							
01349 RCR07G103KS							
01349 RH5507501F							
01349 RH5504991F							
74970 105-1108-011							
74970 105-1102-011							
74970 105-1106-011							
74970 105-1107-011							
74970 105-1104-011							
74970 105-1110-011							
74970 105-1112-011							
74970 105-1113-011							
74970 105-1101-011							
74970 105-1103-011							
74970 105-1108-011							
74970 105-1102-011							
74970 105-1106-011							
74970 105-1107-011							
74970 105-1107-011							
04713 MC14011UBCP							
07263 4011BPC							
02735 CD4069UBE							
07263 4019BPC							
02735 CD4066BE							
07263 UA1558HMG							
2040 LF153H							



cont)

MODIFICATION HISTORY

COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
351-1329-010		01295	TL082HL			
351-1907-010		12040	LF153H			
350-4027-090		01121	314B103	A1	Added capacitors C34, C35, and C36. 0.01 $\mu$ F	REV C
350-4027-120		01121	314A103	B1	Change R17 from 10 to 6.81 k $\Omega$	REV F
351-8159-220		07263	4050BPC			
351-8159-340		04713	MC14011UBCP	B2	Delecte C27 0.1 $\mu$ F, 10%, 50 V	REV G SB 42
351-8159-340		07263	4011BPC			
351-8287-080		02735	CD4069UBE			
351-8159-040		04713	MC14011UBCP	B2	Change U8 from MC1558 to TL082	REV G SB 42
351-8159-340		07263	4011BPC			
351-1071-020		07263	UA1558HTG			
351-8159-050		04713	MC14012UBCP	B3	Change U6 from TL082 to F772BHM	REV H SB 42
351-8159-350		07263	4012BPC			
351-8278-010		02735	CD4098BE			
351-8159-350		07263	4012BPC	C1	Change R14 from 10K, 10%, 1/4 W to 10K, 1%, 1/8 W	REV J
351-1071-020		07263	UA1558HTG	C2	Added MP1 (ESDS) Label	REV K
353-3591-490		04713	1N4625	C3	Delete contact 372-2601-143, qty 3	REV L
				C3	Delete special terminal 797-7253-004, qty 1	REV L
				C3	Add diode CR13, 1N5711	REV L
				C3	Add resistor R37, R39 & R40, 10 K, 10%	REV L
				C3	Add resistor R38, 1 $\Omega$	REV L
				C3	Add resistor R41, 7150 $\Omega$	REV L
				C3	Add resistor R42, 4990 $\Omega$	REV L
				C3	Change IC U1, U10 & U12 from 4011 to 4011B	REV L
				C3	Change IC U14 from 4012 to 4012B	REV L
				C3	Add IC U16, CD4012B	REV L
				C3	Add IC U17, 1558	REV L
				C3	Change Location of C34, C35 & C36	REV L
				NA	Data change only	REV M

HF-80 Interface Card,  
Schematic Diagram  
Figure 6 (Sheet 2)

P/O PT

- 10 MHz (1) INPUT
- 10 MHz (2) INPUT
- 1 MHz (1) INPUT
- 1 MHz (2) INPUT
- 1 MHz (4) INPUT
- 1 MHz (8) INPUT

KEY INTLK

LOCAL KEY

SYSTEM KEY

KEY LATCH

ANTENNA INTLK

SYSTEM TUNE START

LOCAL TUNE START

SYSTEM LOW VOLTAGE ENBL

LOCAL LOW VOLTAGE ENBL

SYSTEM HIGH VOLTAGE ENBL

P/O PT

- 10 MHz (1) OUTPUT
- 10 MHz (2) OUTPUT
- 1 MHz (1) OUTPUT
- 1 MHz (2) OUTPUT
- 1 MHz (4) OUTPUT
- 1 MHz (8) OUTPUT

KEY

KEY MONITOR

T/R RELAY ENBL

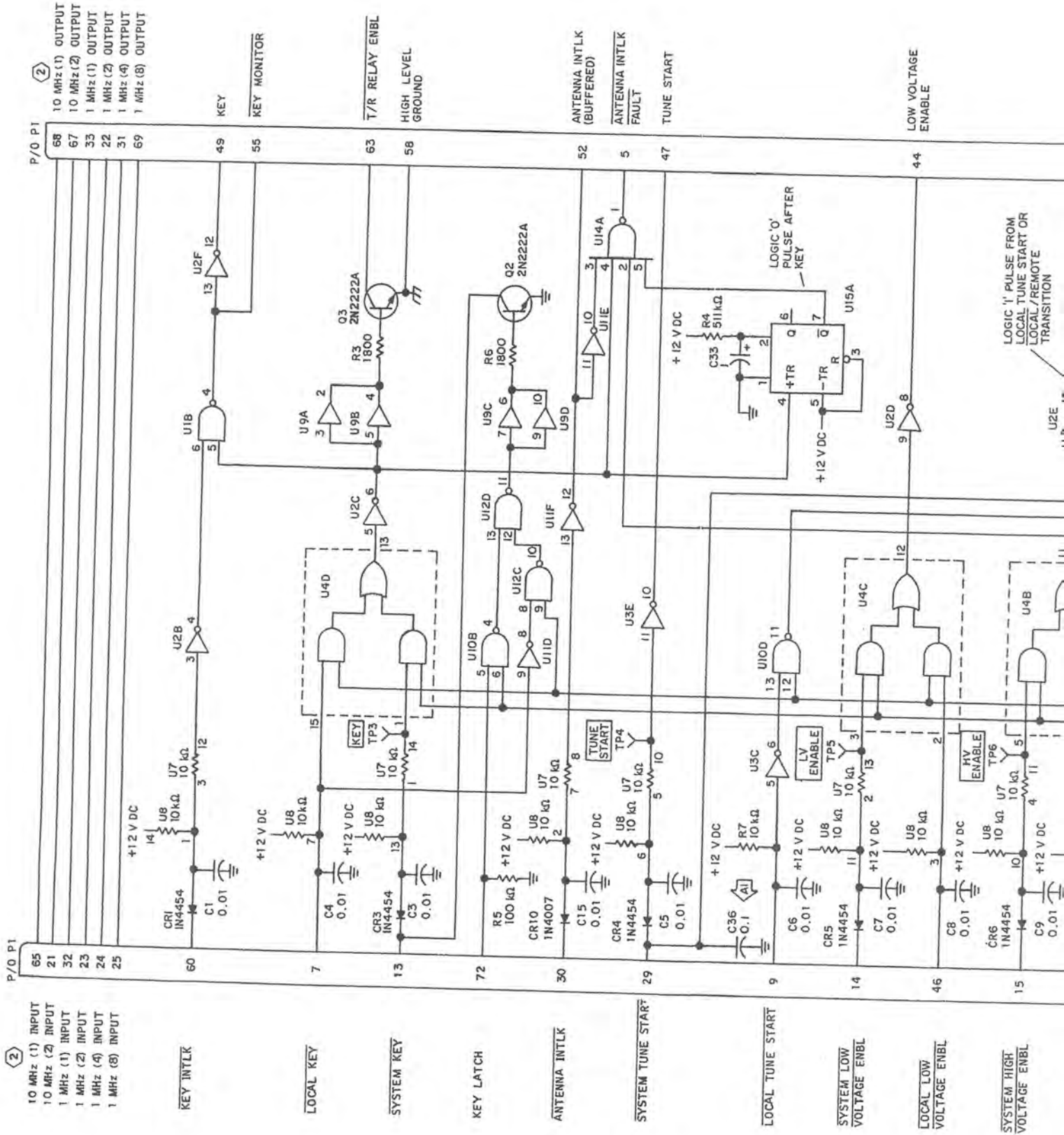
HIGH LEVEL GROUND

ANTENNA INTLK (BUFFERED)

ANTENNA INTLK FAULT

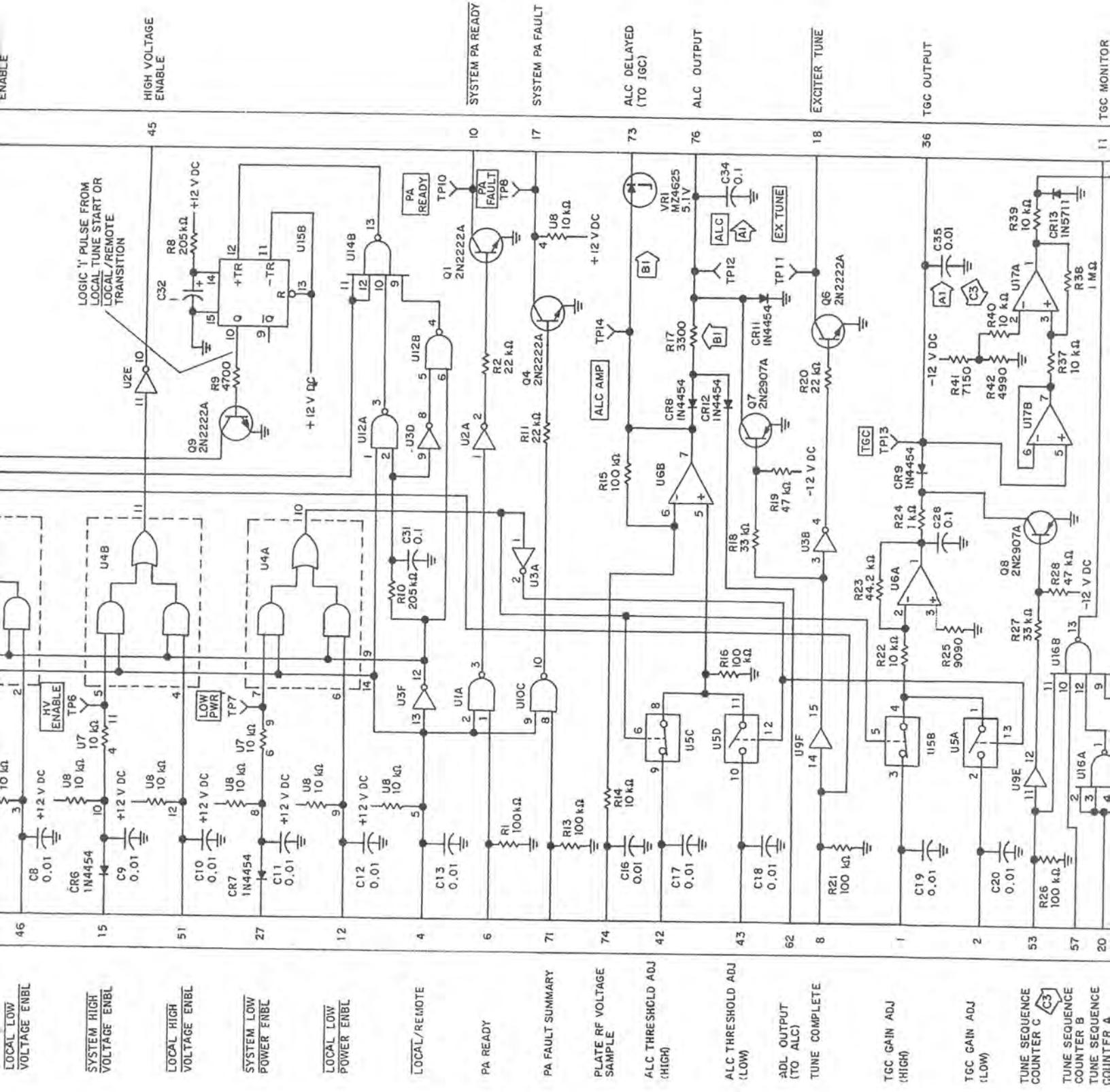
TUNE START

LOW VOLTAGE ENABLE



LOGIC '1' PULSE FROM LOCAL TUNE START OR LOCAL/REMOTE TRANSITION

LOGIC '0' PULSE AFTER KEY



ENABLE

HIGH VOLTAGE ENABLE

SYSTEM PA READY

SYSTEM PA FAULT

ALC DELAYED (TO IGC)

ALC OUTPUT

EXCITER TUNE

TGC OUTPUT

TGC MONITOR

LOCAL LOW VOLTAGE ENBL

SYSTEM HIGH VOLTAGE ENBL

LOCAL HIGH VOLTAGE ENBL

SYSTEM LOW POWER ENBL

LOCAL LOW POWER ENBL

LOCAL/REMOTE

PA READY

PA FAULT SUMMARY

PLATE RF VOLTAGE SAMPLE

ALC THRESHOLD ADJ (HIGH)

ALC THRESHOLD ADJ (LOW)

ADL OUTPUT (TO ALC)

TUNE COMPLETE

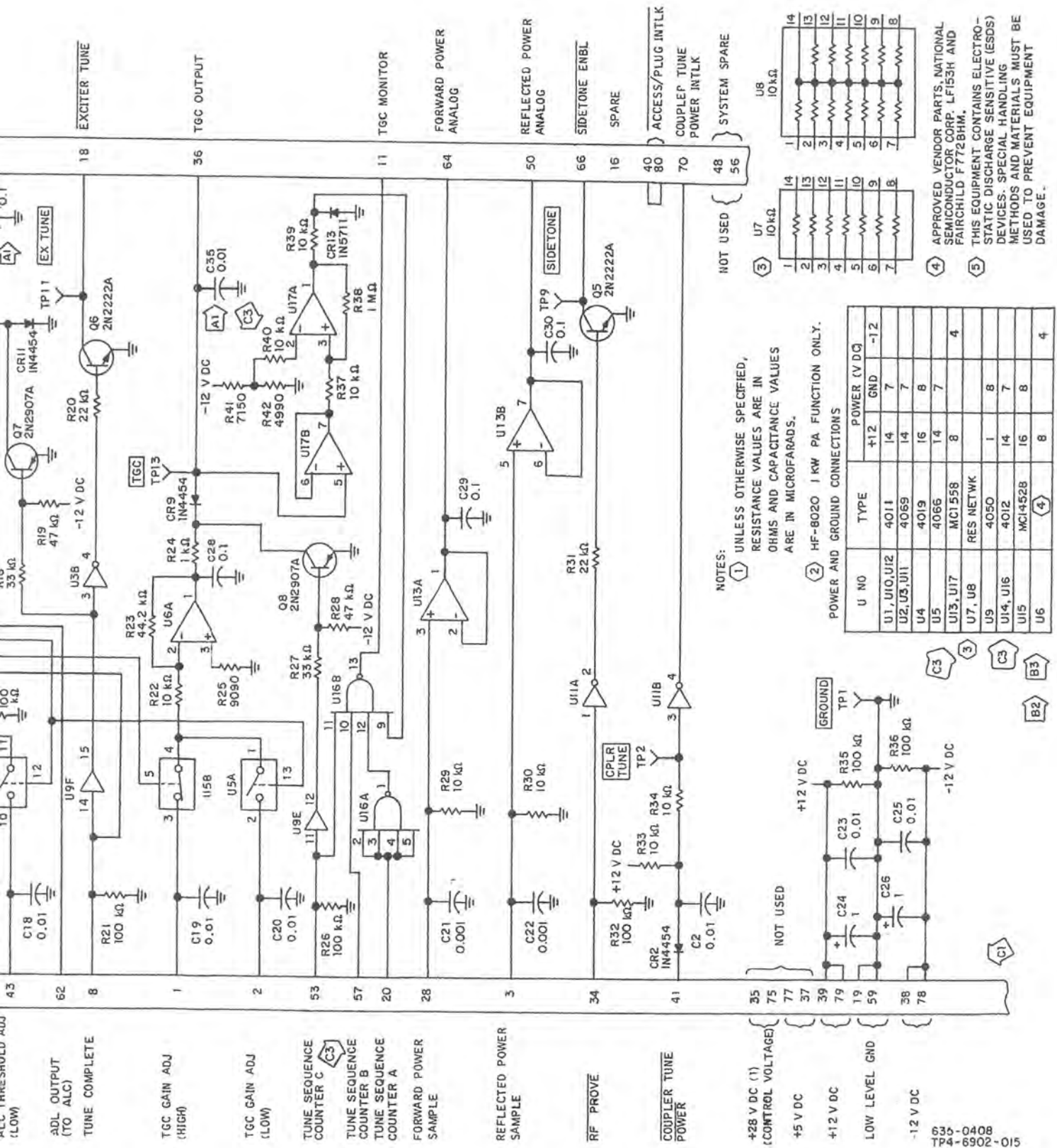
TGC GAIN ADJ (HIGH)

TGC GAIN ADJ (LOW)

TUNE SEQUENCE COUNTER C

TUNE SEQUENCE COUNTER B

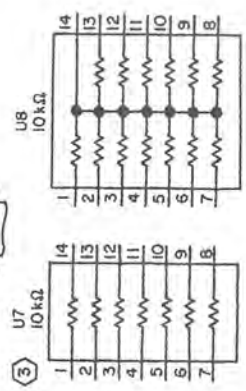
TUNE SEQUENCE COUNTER A



NOTES: (1) UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MICROFARADS. (2) HF-8020 1 KW PA FUNCTION ONLY.

POWER AND GROUND CONNECTIONS

U NO	TYPE	POWER (V D G)
U1, U10, U12	4011	14 7
U2, U3, U11	4069	14 7
U4	4019	16 8
U5	4066	14 7
U7, U8	MC1558	8
U9	4050	1 8
U14, U16	4012	14 7
U15	MC14528	16 8
U6	(4)	8 4



(4) APPROVED VENDOR PARTS, NATIONAL SEMICONDUCTOR CORP. LF153H AND FAIRCHILD F7728HM. (5) THIS EQUIPMENT CONTAINS ELECTRO-STATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.

HF-80 Interface Card, Schematic Diagram Figure 6 (Sheet 3)

# 1000-Watt Converter Module (646-6883-001)



Rockwell  
International

instructions

Collins Telecommunications Products Division

Printed in USA

523-0771674-001211

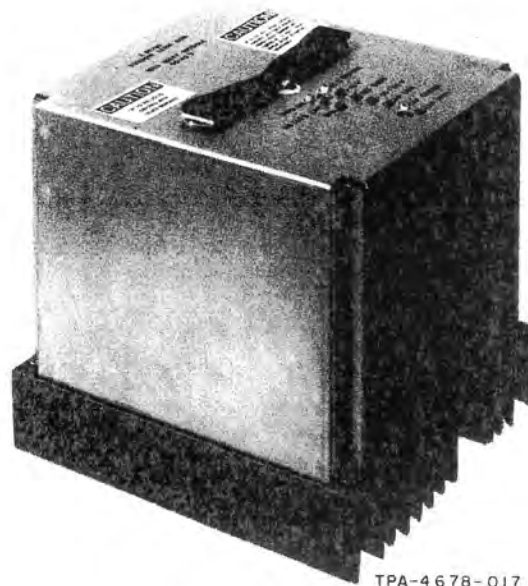
15 September 1982

1000-WATT CONVERTER MODULE  
(646-6883-001)

## 1. DESCRIPTION

1000-Watt Converter Module 646-6883-001 (figure 1) is a plug-in modular assembly consisting of two printed circuit cards, a test point terminal board, a heat sink, and a mechanically configured assembly. This assembly is enclosed in a metal protective covering forming the module.

All electrical connections to the 1000-watt converter module are made through a 3-pin Cannon connector (P1) and a 17-pin Cannon connector (P2). Subassemblies A1 and A2 are interconnected internally using 34-pin and 12-pin connectors (P3 and P4 respectively) and one 10-pin pendant cable connector (A2P1).



TPA-4678-017

1000-Watt Converter Module  
Figure 1

523-0771674-001211

## 2. PRINCIPLES OF OPERATION

### 2.1 General

The 1000-watt converter module is a dc-dc power converter and consists of two primary circuits: a power circuit and a control circuit.

### 2.2 Block Diagram Theory (Refer to figure 2)

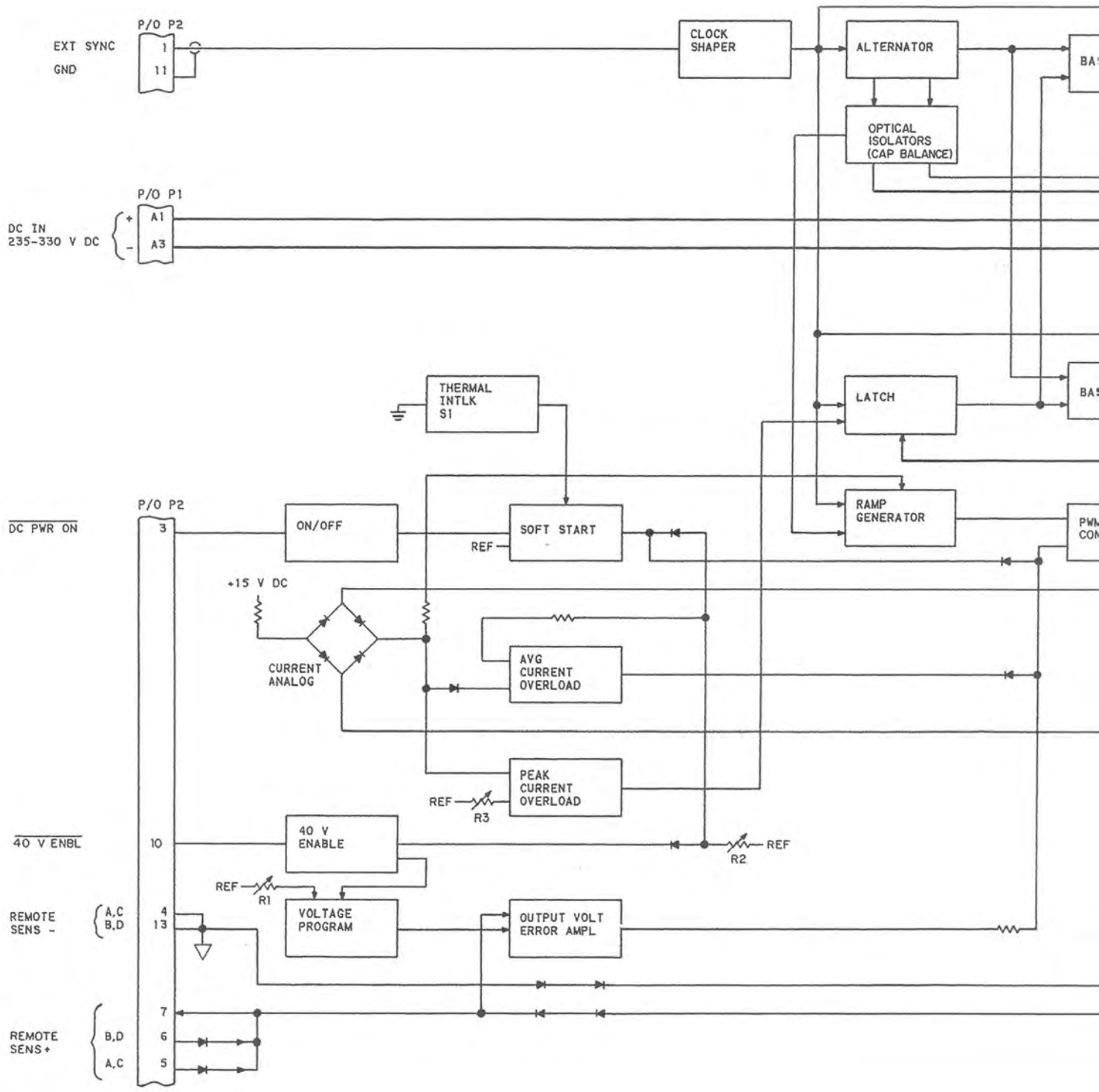
The dc input power source (rectified ac) is filtered by an input filter consisting of two balanced capacitors and equal bleeder resistors. The two balanced capacitors are coupled with two transistor switches, Q1 and Q2, to form a full-wave 4-element bridge. This is driven by a square-wave signal (alternating between Q1 and Q2) to produce a symmetrical square wave which drives power transformer T1 and current sampling transformer T2. The output from the secondary of T1 is rectified and filtered to produce pure dc (+50/40 V dc) at P2-1A, -A2.

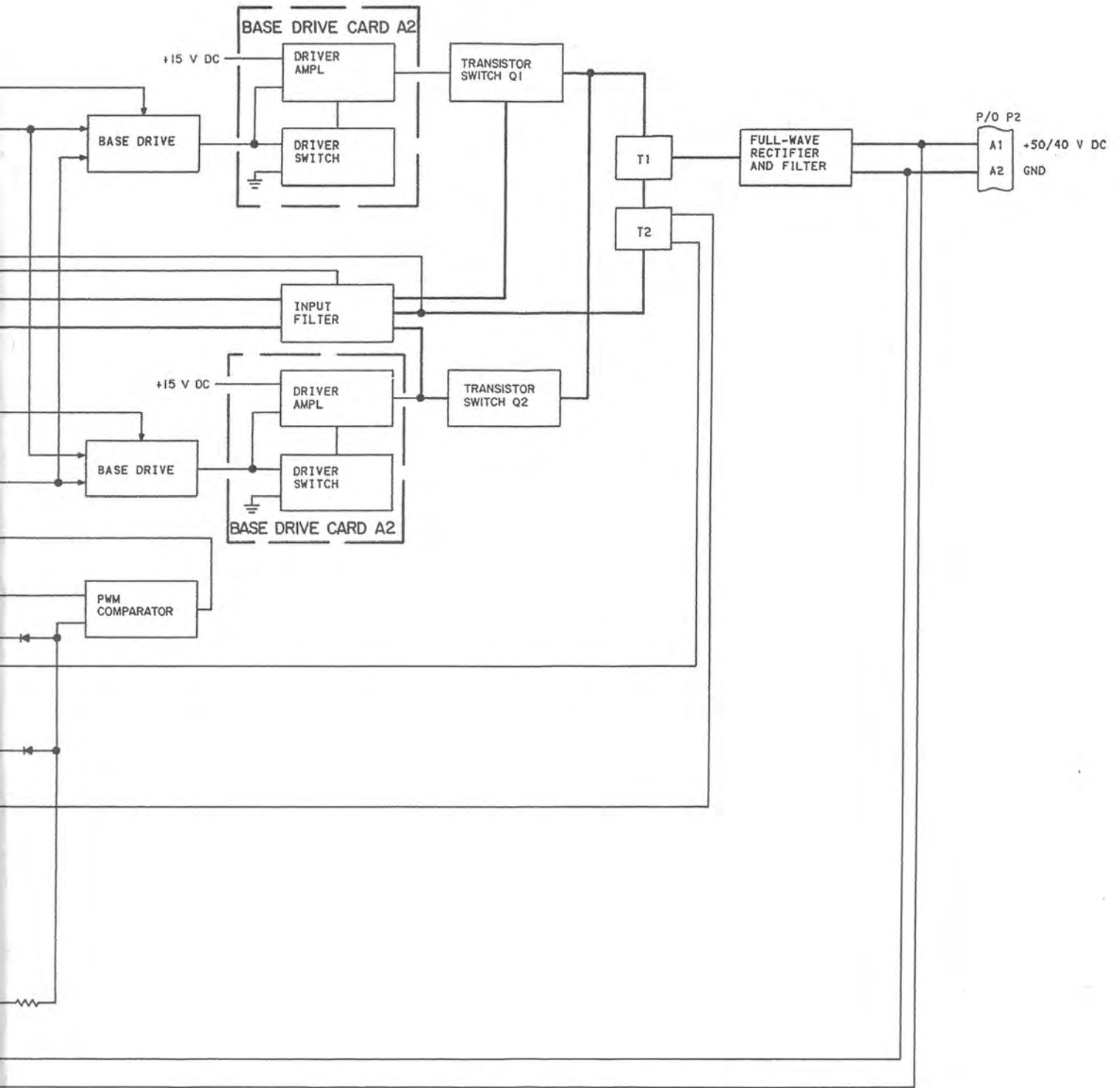
The control loop (with pulse width modulation) is made up of an error amplifier that compares the output voltage (via the remote sense lines) against a stable programmed reference and produces a dc signal to be used by the PWM comparator. The PWM comparator produces a pulse width modulated signal by comparison of the error signal (dc signal) and the ramp signal from the ramp generator. The ramp sig-

nal is generated from the voltage waveform on secondary of T2. This voltage represents the current waveform of T1 and generates a ramp signal on each half cycle that is proportional to the amperes times second products of each half cycle of T1 current. The ramp signal is in sync with the clock signal from an external source so that it starts at zero volt at each half cycle of the square-wave drive signal. The ramp signal changes toward a set voltage with a set rate of rise. When the ramp signal equals the error signal, the power transistors (transistor switches Q1, Q2) are turned off for the remainder of the cycle. The on-off control of the power transistors is accomplished through base drive card A2, with gating being done by driver switches. Flip-flop A1U2A (alternator) is driven by clock signal and alternates outputs at the clock rate so that power transformer gets an alternating drive signal.

Optical isolators are controlled by an unbalanced condition of the input balanced capacitors and change the loading of the associated half cycle accordingly to force a balanced condition. The unbalanced condition is then supplied to the ramp generator in proper phase (balanced).

A dc power, 40-volt enable, and thermal interlock are provided for positive control and protection of the 1000-watt converter module.





TPA-5559-014

Block Diagram  
Figure 2



**3. TESTING/TROUBLESHOOTING PROCEDURES**

A defective 1000-watt converter module can be returned to a Rockwell-Collins authorized repair facility for repair. Contact the nearest Rockwell-Collins office or

Collins Telecommunications Products Division  
Attention: HF Products  
400 Collins Road, NE  
Cedar Rapids, Iowa 52498

for information and instructions.

**4. ALIGNMENT/ADJUSTMENT**

Alignment/adjustment is performed in conjunction with testing/troubleshooting.

**5. REPAIR**

Repair is accomplished using standard shop practices.

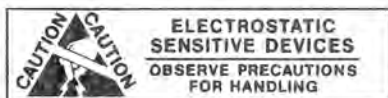
## 6. PARTS LIST/DIAGRAMS

### 6.1 Introduction

**Caution**

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All parts list illustrations containing ESDS items are shown with the following symbol:



This paragraph assists in identification and requisition of parts. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included. The parts location illustration shows component placement on the circuit cards.

### 6.2 Parts List

**REF DES Column** — Reference designators and/or item numbers for each part/subassembly are listed in alphanumeric or numeric sequence. These are the reference designators and/or item numbers shown on the parts location illustration. Only the reference designators are shown on the schematic diagram.

**DESCRIPTION Column** — Lists the noun name, modifier, descriptive information, and modification.

Modifications are identified by two methods: An alphanumeric identifier is assigned to each electrical design change and listed in the REVISION IDENT column of the modification history. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change.

NA (not applicable) in the REVISION IDENT column indicates a documentation change and/or mechanical change. This revision activity will be noted in the DESCRIPTION column of the parts list only. This change does not affect the circuit card/subassembly components or the schematic. Each change relates to

the REV (revision identifier) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history. Dash (—) denotes original; letter A first change; letter B second change, etc.

**COLLINS PART NUMBER Column** — Lists the Collins part number for each item in the parts list.

**USABLE ON CODE Column** → Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

**MFR CODE Column** — Lists the manufacturer's code from which selected parts can be procured.

**MFR PART NUMBER Column** — Lists the manufacturer's part number for the selected parts.

### 6.3 How To Use This Parts List

To locate a part number, locate the part and its item number and/or reference designator on the illustration. Turn to the parts list page and find the item number and/or reference designator to determine its description and part number.

To locate the illustration for a part, if the reference designator and/or part number are known, refer to the parts list and find the figure and item number indicated in the parts list for location on the illustration.

### 6.4 Manufacturer's Code, Name, and Address

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
00779	AMP INC P O BOX 3608 HARRISBURG PA 17105
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49 DALLAS TX 75265
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
03506	ANGELUS FURNITURE MFG CO 3650 E OLYMPIC LOS ANGELES CA 90023
04713	MOTOROLA INC SEMICONDUCTOR GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>	<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
05411	DU PAGE MFG CO 2250 CURTISS AVE DOWNERS GROVE IL 60515	18796	ERIE TECHNOLOGICAL PRODUCTS INC STATE COLLEGE DIV 1900 W COLLEGE AVE STATE COLLEGE PA 16801
08289	BLINN DELBERT CO INC THE 1678 E MISSION BLVD P O BOX 2007 POMONA CA 91766	24036	CLEMENS CANVAS AND MFG 839 SECOND AVE SW P O BOX 1464 CEDAR RAPIDS IA 52406
09969	DALE ELECTRONICS INC EAST HIGHWAY 50 P O BOX 180 YANKTON SD 57078	27014	NATIONAL SEMICONDUCTOR CORP 2900 SEMICONDUCTOR DR SANTA CLARA CA 95051
12040	NATIONAL SEMICONDUCTOR CORP COMMERCE DR P O BOX 443 DANBURY CT 06810	31433	UNION CARBIDE CORP ELECTRONICS DIV HWY 276 SE P O BOX 5928 GREENVILLE SC 29606
12615	U S TERMINALS INC 7504 CAMARGO ROAD CINCINNATI OH 45243	49956	RAYTHEON CO EXECUTIVE OFFICES 141 SPRING ST LEXINGTON MA 02173
12954	SIEMENS CORP COMPONENTS GROUP 8700 E THOMAS RD P O BOX 1390 SCOTTSDALE AZ 85252	50558	ELECTRONIC CONCEPTS INC 526 INDUSTRIAL WAY WEST EATONTOWN NJ 07724
12969	UNITRODE CORP 580 PLEASANT ST WATERTOWN MA 02172	56289	SPRAGUE ELECTRIC CO 87 MARSHALL ST NORTH ADAMS MA 01247
12998	QUALITY NAME PLATE INC MILL ROAD EAST GLASTONBURY CT 06025	57582	KAHGAN ELECTRONICS CORP 556 PENINSULA BLVD HEMPSTEAD NY 11550
13103	THERMALLOY CO INC 2021 W VALLEY VIEW LANE P O BOX 340839 DALLAS TX 75234	71279	CAMBRIDGE THERMIONIC CORP 445 CONCORD AVE CAMBRIDGE MA 02138
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV 855 35TH ST NE P O BOX 728 CEDAR RAPIDS IA 52498	71468	ITT CANNON ELECTRIC DIV OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORP 10550 TALBERT AVE P O BOX 8040 FOUNTAIN VALLEY CA 92708
14099	SEMTECH CORP 652 MITCHELL ROAD NEWBURY PARK CA 91320	72962	ESNA DIV OF AMERACE CORP 2330 VAUXHALL ROAD UNION NJ 07083
14604	ELMWOOD SENSORS INC 1655 ELMWOOD AVENUE CRANSTON RI 02907	72982	ERIE TECHNOLOGICAL PRODUCTS INC 645 W 11TH ST ERIE PA 16512
15857	MODULAR ELECTRONICS CO INC 4386 E LA PALMA AVE ANAHEIM CA 92806	73386	FREED TRANSFORMER CO INC 1718 MIERFIELD ST RIDGEMOOD QUEENS NY 11385
16037	SPRUCE PINE MICA CO INC P O BOX 219 SPRUCE PINE NC 28777	77147	PATTON-MACGUYER CO DIV OF AVID CORP 17 VIRGINIA AVE PROVIDENCE RI 02905
17856	SILICONIX INC 2201 LAURELWOOD RD SANTA CLARA CA 95054	77250	ALLIED PRODUCTS CORP PHEOLL MFG CO DIV 5700 W ROOSEVELT RD CHICAGO IL 60650

MFR      MANUFACTURER'S NAME  
CODE     AND ADDRESS

79807      WROUGHT WASHER MFG INC  
            2100 S BAY ST  
            MILWAUKEE WI 53207

80223      TRW INC  
            TRW UNITED TRANSFORMER DIV  
            150 VARICK ST  
            NEW YORK NY 10013

80294      BOURNS INSTRUMENTS INC  
            6135 MAGNOLIA AVE  
            RIVERSIDE CA 92506

81349      MILITARY SPECIFICATIONS

88044      AERONAUTICAL STANDARD

91637      DALE ELECTRONICS INC  
            P O BOX 609  
            COLUMBUS NE 68601

91886      MICRODOT MANUFACTURING INC  
            MALCO MFG DIV  
            12 PROGRESS DR  
            MONTGOMERYVILLE PA 18936

96906      MILITARY STANDARD

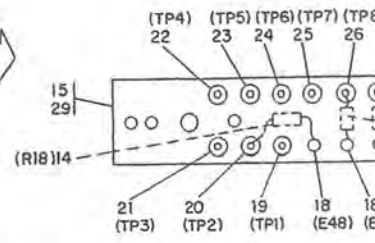
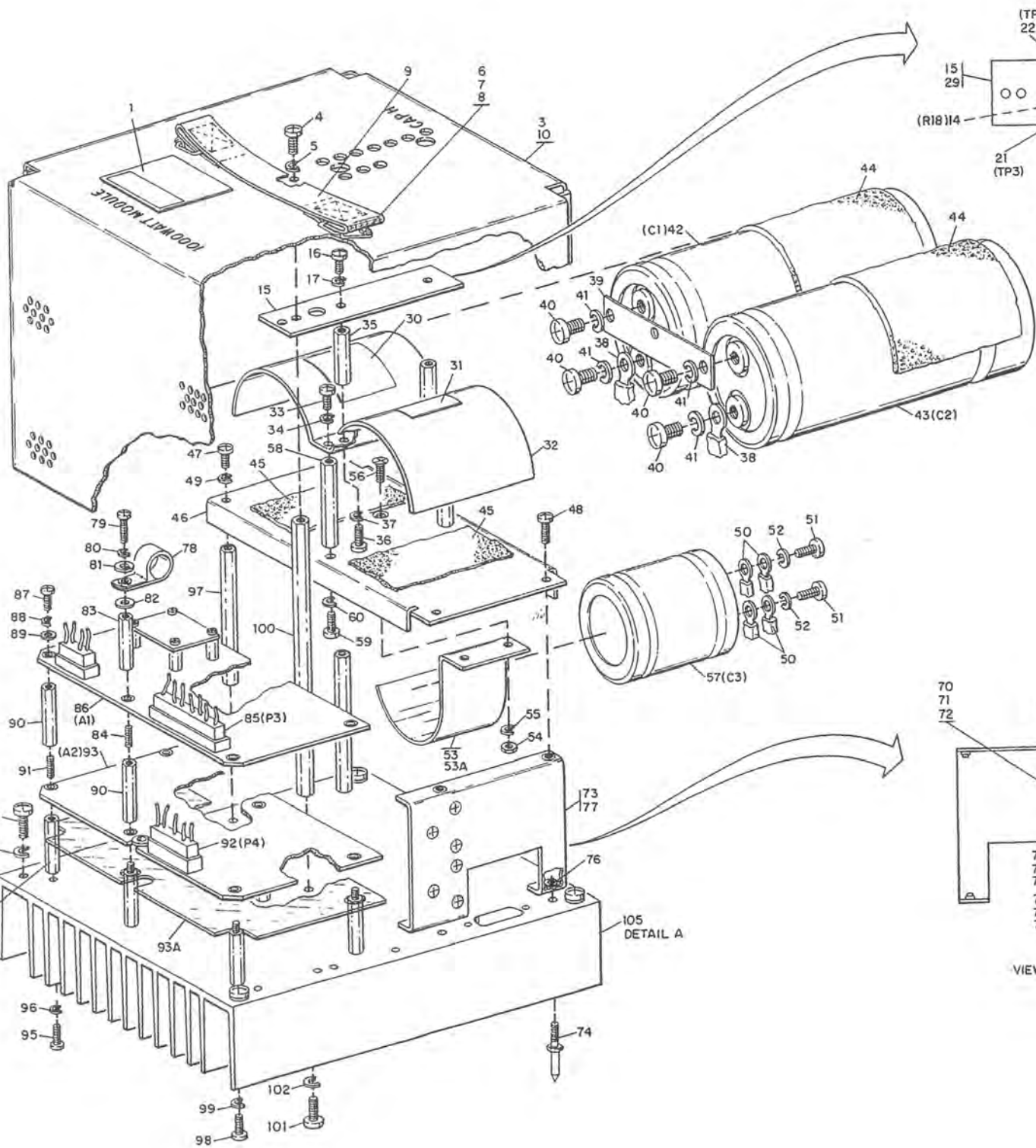
98330      POLYPHASE INSTRUMENT CO  
            175 COMMERCE DR  
            FORT WASHINGTON PA 19034

99392      MEPCO/ELECTRA INC ROXBORO DIV  
            INDUSTRIAL DR  
            P O BOX 1223  
            ROXBORO NC 27573

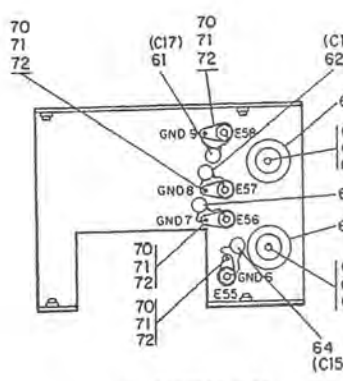
*6.5 Equipment Covered*

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions. Configuration history before 1 April 1982 is not recorded in this section.

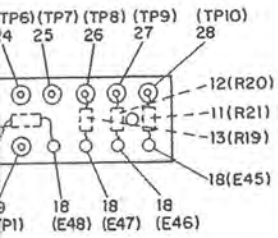
<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
1000-Watt Converter Module	646-6883-001	REV H
Control Card A1	642-3513-002	REV G
Peak Current Overload Board A1A1	646-5908-002	REV A
Base Driver Card A2	642-3232-001	REV C



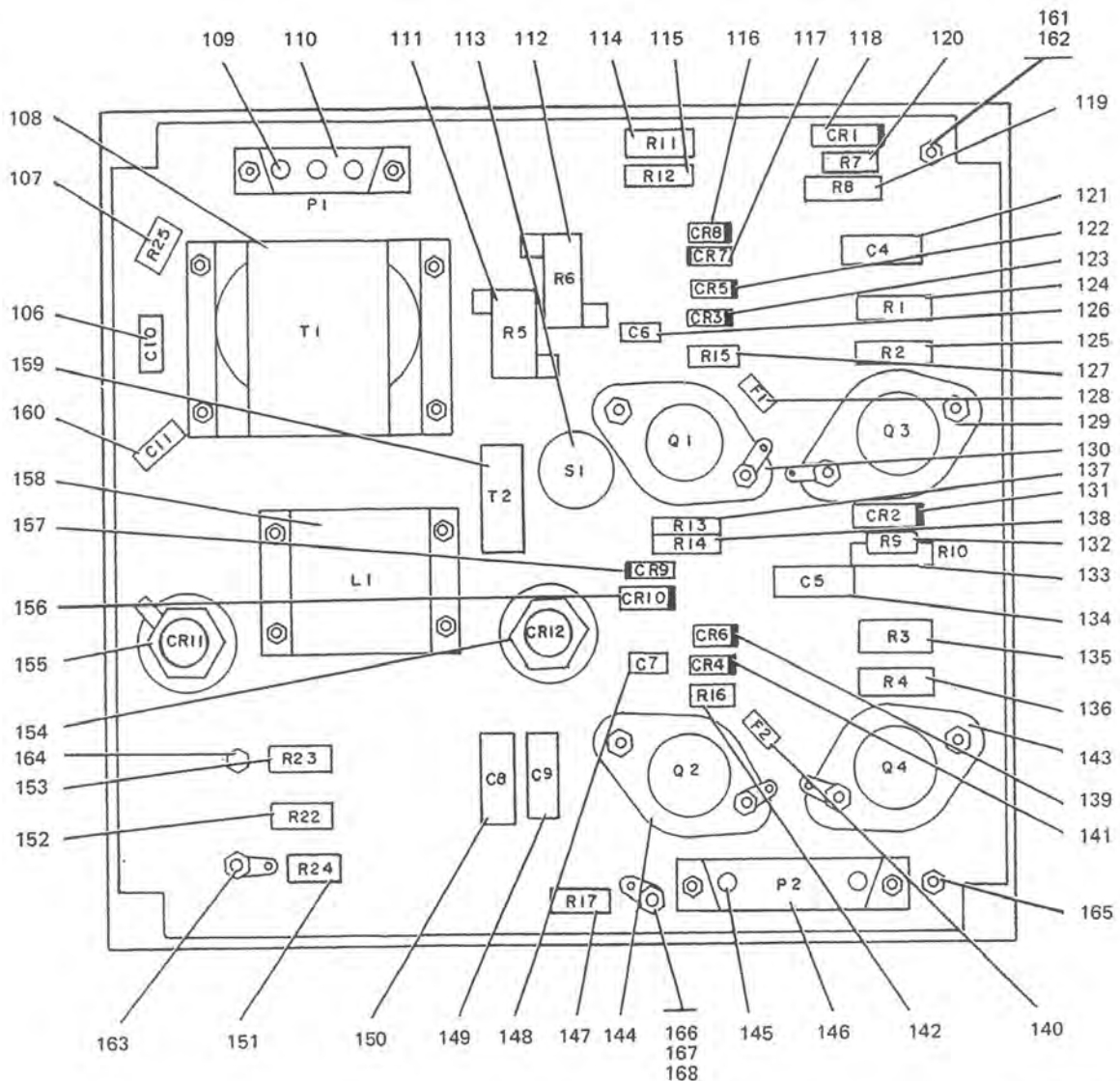
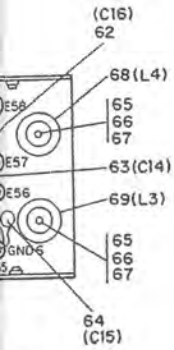
NOTE:  
COMPONENTS ARE  
UNDERSIDE OF TER



VIEW ROTATED 180°



COMPONENTS ARE MOUNTED ON REVERSE SIDE OF TERMINAL BOARD.



DETAIL A

TPA-4506-019



TPA-4445-014

1000-Watt Converter Module, Parts Location Diagram  
 Figure 3 (Sheet 1 of 6)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE	REF DES	DESCRIPTION
	1000 WATT CONVERTER MODULE (ES05)	646-6883-001			646-6883-001		74	GUIDE, PIN (QTY 2) (EFF REV LTR 6)
							75	NOT USED
1	LABEL, PRESSURE SENS	280-1368-730		12998	280-1368-730		76	NUT, SLFLK, CLINCH CD PL STL
2	NOT USED						77	BRACKET (QTY 1)
3	COVER, MODULE (QTY 1)	646-6798-001					78	CLAMP, LOOP (QTY 1)
4	SCREW, MACH SST, 8-32 X 3/8 (AP) (QTY 1)	343-0187-000		96906	MS51957-43		79	SCREW, MACH STL, 4-40 X 1/2 (AP)
5	WASHER, LOCK CRES, 0.171 ID X 0.293 OD (AP) (QTY 1)	310-0072-000		96906	MS35338-137		80	WASHER, LOCK SST, 0.115 ID X 0.250 OD (AP) (QTY 2)
6	HANDLE, BAIL-COVER (QTY 2)	546-6127-002			546-6127-002		81	NOT USED
7	HANDLE, RETAINER (QTY 2)	546-6126-002			546-6126-002		82	WASHER, FLAT TP BR5, 0.149 ID X 0.250 OD (AP) (QTY 2)
	BRACKET (QTY 1)	646-6798-005					83	POST, ELEC-MECH (QTY 1)
	RIVET, SOLID AL, 0.094 DIA X 0.187 (AP FOR 7, 8) (QTY 4)	305-1154-000		96906	MS20470AD3-3		84	STUD, CONH THD STL, 4-40 X 3/8 (AP) (QTY 2)
9	STRAP, WEBBING (QTY 1)	011-0116-030		24036	011-0116-030		85	HOUSING, CONN, ELEC P3
10	COVER (QTY 1)	646-6798-003					86	HOUSING, CONN, ELEC (QTY 23)
11	RESISTOR, FXD CHPSN, 0.22MEGO, 10%, 1/2W R21	745-1450-000		81349	RCR20G224K5		87	CARD, CONTROL A1
12	RESISTOR, FXD CHPSN, 0.22MEGO, 10%, 1/2W R20	745-1450-000		81349	RCR20G224K5		88	SCREW, MACH SST, 4-40 X 5/16 (AP) (QTY 2)
13	RESISTOR, FXD CHPSN, 0.22MEGO, 10%, 1/2W R19	745-1450-000		81349	RCR20G224K5		89	WASHER, LOCK SST, 0.115 ID X 0.250 OD (AP) (QTY 2)
14	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W R18	745-0785-000		81349	RCR07G103K5		90	WASHER, FLAT CRES, 0.125 ID X 0.250 OD (AP) (QTY 2)
15	BOARD, TERMINAL (QTY 1)	646-6557-001					91	POST, HEX (QTY 6)
16	SCREW, MACH SST, 6-32 X 5/16 (AP) (QTY 2)	343-0168-000		96906	MS51957-27		92	STUD, CONH THD STL, 4-40 X 3/8 (AP) (QTY 2)
17	WASHER, LOCK SST, 0.141 ID X 0.250 OD (AP) (QTY 2)	310-0282-000		96906	MS35338-136			CONTACT, ELEC (QTY 7)
18	TERMINAL, STDF E45-E48	306-1521-000		12615	SL439-4330HT			PLUG, KEYING (QTY 2)
19	TEST JACK TERM TP1	306-2241-020		12615	SL490-450BRN		93	CARD, BASE DRIVER (ES05) A2
20	TEST JACK TERM TP2	306-2241-030		12615	SL490-450RED		93A	INSULATOR
21	TEST JACK TERM TP3	306-2241-040		12615	SL490-450BRN		94	POST (QTY 6)
22	TEST JACK TERM TP4	306-2241-050		12615	SL490-450YEL		95	SCREW, MACH SST, 4-40 X 5/16 (AP) (QTY 2)
23	TEST JACK TERM TP5	306-2241-060		12615	SL490-450GRN		96	WASHER, LOCK SST, 0.115 ID X 0.250 OD (AP) (QTY 2)
24	TEST JACK TERM TP6	306-2241-070		12615	SL490-450BLU		97	POST, ELEC-MECH (QTY 2)
25	TEST JACK TERM TP7	306-2241-080		12615	SL490-450VIO		98	SCREW, MACH SST, 6-32 X 5/16 (AP) (QTY 2)
26	TEST JACK TERM TP8	306-2241-090		12615	SL490-450GY		99	WASHER, LOCK SST, 0.141 ID X 0.250 OD (AP) (QTY 2)
27	TEST JACK TERM TP9	306-2241-100		12615	SL490-450WHT		100	POST, HEX (QTY 1)
28	TEST JACK TERM TP10	306-2241-010		12615	SL490-450BLK		101	SCREW, MACHINE SST, 8-32 X 3/8 (AP) (QTY 1)
29	BOARD (QTY 1)	646-6557-002					102	WASHER, LOCK CRES, 0.171 ID X 0.293 OD (AP) (QTY 1)
30	LABEL, PRESSURE SENS (QTY 1)	280-1368-740		12998	280-1368-740		103	SCREW, MACH CD PL STL, 8-32 X 3/4 (AP) (QTY 4)
31	LABEL, PRESSURE SENS (QTY 1)	280-1368-180		12998	280-1368-180		104	WASHER, LOCK CRES, 0.171 ID X 0.293 OD (AP) (QTY 4)
32	CLAMP, CAPACITOR (QTY 1)	646-6556-001					105	HEATSINK (QTY 1)
33	SCREW, MACH SST, 6-32 X 5/16 (AP) (QTY 2)	343-0168-000		96906	MS51957-27		106	CAPACITOR, FXD MICA DIEL, 4700PF, 20%, 500V C17
34	WASHER, LOCK SST, 0.141 ID X 0.250 OD (AP) (QTY 2)	310-0282-000		96906	MS35338-136		107	RESISTOR, FXD CHPSN, 22 OHMS, 10%, 1/2W R22
35	POST, ELEC-MECH (QTY 2)	540-9221-003			540-9221-003		108	TRANSFORMER, POWER T1
36	SCREW, MACH SST, 6-32 X 5/16 (AP) (QTY 2)	343-0168-000		96906	MS51957-27		109	SCREW, MACH SST, 6-32 X 5/8 (AP) (QTY 2)
37	WASHER, LOCK SST, 0.141 ID X 0.250 OD (AP) (QTY 2)	310-0282-000		96906	MS35338-136		110	CONTACT, PIN (QTY 2)
38	TERMINAL, LUG (QTY 2)	304-1284-000		96906	MS25036-157			CONNECTOR, RCPT ELEC P1
39	STRIP, ELECTRICAL (QTY 1)	646-6817-001						NUT, PLAIN, HEX HP BR5, 4-40 (AP) (QTY 4)
40	SCREW, MACH SST, 1/4-28 X 3/8 (AP FOR 38, 39) (QTY 4)	343-0279-000		96906	MS51958-77			WASHER, LOCK SST, 0.115 ID X 0.250 OD (AP) (QTY 2)
41	WASHER, SPRING CD PL BRZ, 0.255 ID X 0.489 OD (AP FOR 38, 39) (QTY 4)	310-0102-000		96906	MS35338-101		111	SCREW, MACH SST, 4-40 X 3/8 (AP) (QTY 2)
42	CAPACITOR, FXD AL ELEK, 3300UF, P75M10%, 250VDC C1	183-1511-060		99392	3120FH332T250DP		112	RESISTOR, FIXED HM, 12.4K, 1%, 1/2W R23
43	CAPACITOR, FXD AL ELEK, 3300UF, P75M10%, 250VDC C2	183-1511-060		99392	3120FH332T250DP			NUT, SLFLK, HEX AL, 2-56 (AP FOR 4)
44	SPACER, COMPRESSION (QTY 2)	646-6816-001						SCREW, MACH SST, 2-56 X 3/8 (AP FOR 111, 112) (QTY 4)
45	PAD, COMPRESSION (QTY 2)	646-6816-002						SWITCH, THERMOSTATIC S1
46	MOUNT, CAPACITOR (QTY 1)	646-6555-001						NUT, PLAIN, HEX SST, 6-32 (AP) (QTY 2)
47	SCREW, MACH SST, 6-32 X 5/16 (AP) (QTY 2)	343-0168-000		96906	MS51957-27			WASHER, LOCK SST, 0.141 ID X 0.250 OD (AP) (QTY 1)
48	SCREW, MACH SST, 4-40 X 5/16 (AP) (QTY 2)	343-0134-000		96906	MS51957-14		114	RESISTOR, FXD CHPSN, 100 OHMS, 10%, 1/2W R24
49	NOT USED						115	RESISTOR, FXD CHPSN, 100 OHMS, 10%, 1/2W R25
50	TERMINAL, LUG (QTY 4)	304-1282-000		96906	MS25036-112		116	SEMICOND DEVICE CR8
51	SCREW, MACH SST, 10-32 X 3/8 (AP) (QTY 2)	343-0226-000		96906	MS51958-61		117	SEMICOND DEVICE CR7
52	WASHER, SPRING CD PL BRZ, 0.194 ID X 0.334 OD (AP) (QTY 2)	310-0100-000		96906	MS35338-100		118	RESISTOR, FIXED 220 OHMS, 5%, 6.5W R26
53	CLAMP, CAPACITOR (QTY 1)	646-6556-001					119	RESISTOR, FIXED 220 OHMS, 5%, 6.5W R27
53A	PAD, COMPRESSION	646-6816-002					120	SEMICOND DEVICE CR1
54	NUT, PLAIN, HEX SST, 6-32 (AP) (QTY 2)	313-0045-001		77250	P313-0045-000		121	CAPACITOR, FXD PPR-HYLAR DIE, 0.60V C4
55	WASHER, LOCK SST, 0.141 ID X 0.250 OD (AP) (QTY 2)	310-0282-000		96906	MS35338-136		122	SEMICOND DEVICE CR5
56	SCREW, MACHINE CRES, 6-32 X 5/16 (AP) (QTY 2)	342-0061-000		96906	MS51959-27		123	SEMICOND DEVICE CR3
57	CAPACITOR, FXD AL ELEK, 4600UF, P75M10%, 75VDC C3	183-1511-100		99392	3120EA462T075BP		124	RESISTOR, FIXED HM, 0.100 OHMS, 1%, 1/2W R28
58	POST, HEX (QTY 2)	540-9230-003			540-9230-003		125	RESISTOR, FIXED HM, 0.100 OHMS, 1%, 1/2W R29
59	SCREW, MACH SST, 6-32 X 5/16 (AP) (QTY 2)	343-0168-000		96906	MS51957-27		126	CAPACITOR, FXD CER DIEL, 1000PF, 20%, 500V C15
60	WASHER, LOCK SST, 0.141 ID X 0.250 OD (AP) (QTY 2)	310-0282-000		96906	MS35338-136		127	RESISTOR, FIXED CHPSN, 47 OHMS, 10%, 1/2W R30
61	CAPACITOR, FXD CER DIEL, 4700PF, 20%, 500V C17	913-1187-000		81349	CK62A4472H		128	FUSE F1
62	CAPACITOR, FXD CER DIEL, 4700PF, 20%, 500V C16	913-1187-000		81349	CK62A4472H		129	TRANSISTOR, POWER Q3
63	CAPACITOR, FXD CER DIEL, 4700PF, 20%, 500V C14	913-1187-000		81349	CK62A4472H		130	TRANSISTOR, POWER Q1
64	CAPACITOR, FXD CER DIEL, 4700PF, 20%, 500V C15	913-1187-000		81349	CK62A4472H			NUT, PLAIN, HEX HP BR5, 4-40 (AP FOR 129, 130) (QTY 4)
65	RETAINER, TORIOD (QTY 2)	679-1814-000		15857	D100-2-440			WASHER, LOCK SST, 0.115 ID X 0.250 OD (AP) (QTY 4)
66	SCREW, MACH SST, 4-40 X 1/2 (AP) (QTY 2)	342-0048-000		96906	MS51959-17			WASHER, FLAT CRES, 0.125 ID X 0.250 OD (AP) (QTY 4)
67	WASHER VARN CTD PLSTC, 0.194 ID X 5/8 OD (AP) (QTY 2)	540-3025-003			540-3025-003			BUSHING, INSULATED (AP FOR 129, 130) TO REV 6)
68	CHOKE, RF 18UH L4	678-0304-010		09969	ITD-1031-12			BUSHING, INSULATOR (AP FOR 129, 130) TO REV 6)
69	CHOKE, RF 18UH L3	678-0304-010		09969	ITD-1031-12			TERMINAL, LUG (AP FOR 129, 130) (QTY 2)
70	TERMINAL, STUD E55-E58	306-2513-250		71279	4814-1-0516			INSULATOR, PLATE (AP FOR 129, 130) (QTY 2)
71	TERMINAL, LUG (QTY 4)	304-0016-000		77147	4007-6HT			INSULATOR, TRANSISTOR (AP FOR 129, 130) (QTY 2)
72	SCREW, MACH SST, 4-40 X 1/4 (AP FOR 70, 71) (QTY 4)	342-0044-000		96906	MS51959-13			
73	BRACKET, MOUNT (QTY 1)	647-7348-001						
74	SCREW, MACH SST, 4-40 X 5/16 (AP) (QTY 2) (EFF TO REV LTR 6)	343-0134-000		96906	MS51957-14			

PARTS LIST (Cont)

REF DES	MFR PART NUMBER	SMR CODE	REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE	REF DES	DESCRIPTION
	646-6883-001		74	GUIDE,PIN (QTY 2)(EFF REV LTR G)	646-6873-001						SCREW,MACH STL, 4-40 X 1/2 (AP FOR 129,130)(QTY 4)(EFF TO REV G)
998	280-1368-730		75	NOT USED							SCREW,MACH STL, 4-40 X 5/8 (AP FOR 129,130)(QTY 4)(EFF REV G)
			76	NUT,SFLKLG,CLINCH CD PL STL, 4-40 (QTY 4)	333-0840-000		81349	M45938/5-4			RESISTOR,FXD CHPSN, 100 OHMS, 10%, 2W R11
			77	BRACKET (QTY 1)	647-7348-002						SEMICONV DEVICE CR8
			78	CLAMP,LOOP (QTY 1)	150-0708-040		96906	MS25281R5		131	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 2W R12
906	MS51957-43		79	SCREW,MACH STL, 4-40 X 1/2 (AP)(QTY 1)	343-0137-000		96906	MS51957-17		132	SEMICONV DEVICE CR2
906	MS35338-137		80	WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 1)	310-0279-000		96906	MS35338-135		133	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 2W R13
										134	CAPACITOR,FXD PPR-HYLAR DIEI, 0.01UF, 600V C5
	546-6127-002		81	NOT USED							RESISTOR,FXD CHPSN, 100 OHMS, 10%, 2W R14
	546-6126-002		82	WASHER,FLAT TP BR5, 0.149 ID X 0.375 OD (AP)(QTY 2)	310-0751-040		88044	AN961-6T		135	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 2W R15
906	MS20470A03-3		83	POST,ELEC-MECH (QTY 1)	540-9053-003			540-9053-003		136	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 2W R16
			84	STUD,CONT THD STL, 4-40 X 3/8 (QTY 1)	312-0007-000		77250	P312-0007-000		137	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 2W R17
36	011-0116-030		85	HOUSING,CONN,ELEC P3	372-0044-140		00779	2-87631-7		138	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 2W R18
										139	SEMICONV DEVICE CR6
										140	FUSE F2
949	RCR20G224KS		86	CARD,CONTROL A1	642-3513-002		00779	2-87631-7		141	SEMICONV DEVICE CR4
949	RCR20G224KS		87	SCREW,MACH SST, 4-40 X 5/16 (AP)(QTY 5)	343-0134-000			642-3513-002		142	RESISTOR,FXD CHPSN, 47 OHMS, 5%, 6.5W R19
949	RCR20G224KS		88	WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 5)	310-0279-000		96906	MS51957-14		143	TRANSISTOR,POWER Q4
949	RCR07G103KS						96906	MS35338-135		144	TRANSISTOR,POWER Q2
			89	WASHER,FLAT CRES, 0.125ID X 0.250 OD (AP)(QTY 5)	310-0779-030		96906	MS15795-803			NUT,PLAIN,HEX HP BR5, 4-40 (AP FOR 143,144)(QTY 4)
906	MS51957-27		90	POST,HEX (QTY 6)	540-9055-003			540-9055-003			WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 4)
906	MS35338-136		91	STUD,CONT THD STL, 4-40 X 3/8 (QTY 6)	312-0007-000		77250	P312-0007-000			WASHER,FLAT CRES, 0.125ID X 0.250 OD (AP)(QTY 4)
15	SL439-433MHT		92	HOUSING,CONN,ELEC P4	372-0044-040		00779	87631-7			143,144)(QTY 4)
15	SL490-458BRN										143,144)(QTY 4)
15	SL490-458RED										143,144)(QTY 4)
15	SL490-458ORN										BUSHING,INSULATOR (AP FOR 143,144 TO REV G)
15	SL490-458YL		93	CARD,BASE DRIVER (ESDS) A2	642-3232-001			642-3232-001			BUSHING,INSULATOR (AP FOR 143,144 TO REV G)
15	SL490-458GRN	93A	94	INSULATOR	646-6836-001			646-6836-001			BUSHING,INSULATOR (AP FOR 143,144 TO REV G)
15	SL490-458BLU		95	POST (QTY 6)	540-9051-003			540-9051-003			TERMINAL,LUG (AP FOR 143,144)(QTY 1)
15	SL490-458VIO		96	SCREW,MACH SST, 4-40 X 5/16 (AP)(QTY 6)	343-0134-000		96906	MS51957-14			INSULATOR,PLATE (AP FOR 143,144)(QTY 2)
15	SL490-458GVI		97	WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 6)	310-0279-000		96906	MS35338-135			SHIELD,TRANSISTOR (AP FOR 143,144)
15	SL490-458GHT										INSULATOR, TRANSISTOR (AP FOR 143,144)
15	SL490-458BLK		98	SCREW,MACH SST, 6-32 X 5/16 (AP)(QTY 2)	343-0168-000		96906	MS51957-27			SCREW,MACH STL, 4-40 X 1/2 (AP FOR 143,144)(QTY 4)(EFF TO REV G)
			99	WASHER,LOCK SST, 0.141 ID X 0.250 OD (AP)(QTY 2)	310-0282-000		96906	MS35338-136			SCREW,MACH STL, 4-40 X 5/8 (AP FOR 143,144)(QTY 4)(EFF REV G)
98	280-1368-740		100	POST,HEX (QTY 1)	646-6818-001						CONTACT,SOCKET (QTY 2)
98	280-1368-100		101	SCREW,MACHINE SST, 8-32 X 3/8 (AP)(QTY 1)	343-0187-000		96906	MS51957-43		145	CONNECTOR,RCPT ELEC P2
			102	WASHER,LOCK CRES, 0.171 ID X 0.293 OD (AP)(QTY 1)	310-0072-000		96906	MS35338-137		146	NUT,SFLKLG,HEX AL, 2-56 (AP)(QTY 2)
906	MS51957-27		103	SCREW,MACH CD PL STL, 8-32 X 3/4 (AP)(QTY 4)	330-1375-000		77250	P330-1375-000			RESISTOR,FXD CHPSN, 1.2K, 5%, 6.5W
906	MS35338-136		104	WASHER,LOCK CRES, 0.171 ID X 0.293 OD (AP)(QTY 4)	310-0072-000		96906	MS35338-137		147	CAPACITOR,FXD CER DIEI, 1000PF, 20% R20
										148	CAPACITOR,FXD CER DIEI, 1000PF, 20% R21
	540-9221-003		105	HEATSINK (QTY 1)	640-6551-001					149	CAPACITOR,FXD PLSTC DIEI, 1UF, 10% R22
906	MS51957-27		106	CAPACITOR,FXD MICA DIEI, 4700PF, 5%, 300V C10	912-3366-000		57582	KD2047ZJ301		150	CAPACITOR,FXD PLSTC DIEI, 1UF, 10% R23
906	MS35338-136		107	RESISTOR,FXD CHPSN, 22 OHMS, 10%, 2W R25	745-5582-000		81349	RCR42G220KS		151	CAPACITOR,FXD PLSTC DIEI, 1UF, 10% R24
			108	TRANSFORMER,POWER T1	662-0936-010		98330	CT104657		152	RESISTOR,FXD CHPSN, 1.2K, 5%, 6.5W R25
906	MS51958-77		109	SCREW,MACH SST, 6-32 X 5/8 (AP)(QTY 4)	343-0173-000		96906	MS51957-31		153	RESISTOR,FXD CHPSN, 1.2K, 5%, 6.5W R26
			110	CONTACT,PIH (QTY 2)	371-2593-030		71468	DMS3745-27		154	RESISTOR,FXD CHPSN, 1.2K, 5%, 6.5W R27
							71468	DMH3P3		155	SEMICONV DEVICE CR12
906	MS35338-101						77250	P313-0051-000			SEMICONV DEVICE CR11
							96906	MS35338-135			NUT,PLAIN,HEX TP BR5, 1/4-28 (AP FOR 154,155)(QTY 2)
906	3120FH332T2500P										WASHER,LOCK CD PL BRZ, 0.255 ID X 0.410 OD (AP)(QTY 2)
906	3120FH332T2500P										WASHER,FLAT HP PL BR5, 0.265 ID X 0.410 OD (AP)(QTY 2)
											INSULATOR,TRANSISTOR MICA, 0.265 ID X 0.410 OD (AP)(QTY 4)
906	MS51957-27										SPACER,INSULATING (AP FOR 154,155)(QTY 2)
906	MS51957-14										LUG,SOLDER (AP FOR 154,155)(QTY 2)
			113	SWITCH,THERMOSTATIC S1	267-0243-110		14604	3100-43-108		156	SEMICONV DEVICE CR10
							77250	P313-0045-000		157	SEMICONV DEVICE CR9
906	MS25036-112						96906	MS35338-136		158	INDUCTOR L1
906	MS51958-61										SCREW,MACH SST, 6-32 X 7/16 (AP)(QTY 2)
906	MS35338-100		114	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 2W R11	745-5610-000		81349	RCR42G101KS		159	SCREW,MACH SST, 4-40 X 5/16 (AP)(QTY 2)
			115	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 2W R12	745-5610-000		81349	RCR42G101KS			WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 2)
			116	SEMICONV DEVICE CR8	353-6558-010		14099	INS415			161,162)(QTY 4)
			117	SEMICONV DEVICE CR7	353-6558-010		14099	INS415			WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 2)
906	P313-0045-000		118	RESISTOR,FXD CHPSN, 220 OHMS, 5%, 6.5W R7	747-5447-000		81349	RM67V221		160	CAPACITOR,FXD CER DIEI, 0.82UF, 50V C11
906	MS35338-136		119	RESISTOR,FXD CHPSN, 220 OHMS, 5%, 6.5W R8	747-5447-000		81349	RM67V221			TERMINAL,STUD (QTY 42)
906	MS51959-27		120	SEMICONV DEVICE CR1	353-6558-050		14099	INS419		162	TERMINAL,LUG (QTY 2)
906	3120EA462T075BP		121	CAPACITOR,FXD PPR-HYLAR DIEI, 0.01UF, 10%, 600V C4	933-1074-040		81349	M19978-10591K			SCREW,MACH SST, 4-40 X 5/16 (AP FOR 161,162)(QTY 4)
											WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 2)
	540-9230-003		122	SEMICONV DEVICE CR5	353-6558-050		14099	INS419			161,162)(QTY 4)
906	MS51957-27		123	SEMICONV DEVICE CR3	353-6558-050		14099	INS419			WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 2)
906	MS35338-136		124	RESISTOR,FXD CHPSN, 0.100 OHMS, 1%, 6.5W R1	747-2161-070		91637	RS-5-10SER1000F		163	TERMINAL,LUG (QTY 2)
			125	RESISTOR,FXD CHPSN, 0.100 OHMS, 1%, 6.5W R2	747-2161-070		91637	RS-5-10SER1000F			NUT,PLAIN,HEX SST, 6-32 (AP)(QTY 2)
906	CK62AM472M		126	CAPACITOR,FXD CER DIEI, 1000PF, 20%, 1000V C6	913-1186-000		81349	CK60AM102M			WASHER,LOCK SST, 0.141 ID X 0.250 OD (AP)(QTY 2)
906	CK62AM472M		127	RESISTOR,FXD CHPSN, 47 OHMS, 10%, 1/4W R15	745-0701-000		81349	RCR07G470KS			SCREW,MACH SST, 6-32 X 3/8 (AP)(QTY 7)
906	CK62AM472M		128	FUSE F1	264-0964-010		81349	FH04-125V5A		164	TERMINAL,STUD (QTY 7)
906	CK62AM472M		129	TRANSISTOR,POWER Q3	352-6500-010		04713	MJ10009			SCREW,MACH CD PL STL, 2-56 X 1/4 (AP FOR 166-168)(QTY 1)
906	CK62AM472M		130	TRANSISTOR,POWER Q1	352-6500-010		04713	MJ10009			WASHER,LOCK SST, 0.088 ID X 0.172 OD (AP)(QTY 7)
906	D100-2-440						77250	P313-0051-000			GUIDE,PIN (EFF REV LTR G)
906	MS51959-17										NUT,PLAIN,HEX HP BR5, 4-40 (QTY 1)
906	540-3025-003										WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP FOR 129,130)(QTY 4)(EFF TO REV G)
906	ITD-1031-12										GUIDE,PIN (EFF REV LTR G)
906	ITD-1031-12										NUT,PLAIN,HEX HP BR5, 4-40 (QTY 1)
906	4014-1-0516										WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 4)(EFF TO REV G)
906	4007-6HT										GUIDE,PIN (EFF REV LTR G)
906	MS51959-13										TERMINAL,STUD
											TERMINAL,LUG
906	MS51957-14										WASHER,LOCK CD PL BRZ, 0.123 ID X 0.172 OD (AP FOR 166-168)(QTY 1)

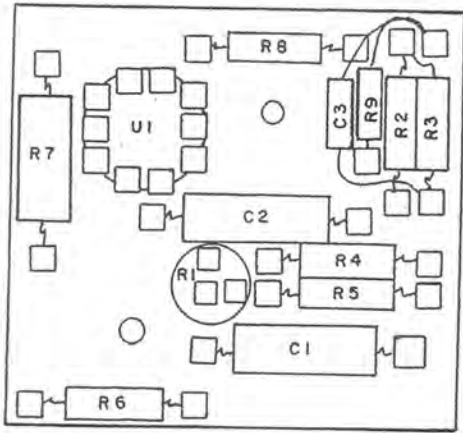
1000-Watt Converter Module, Parts List  
Figure 3 (Sheet 2)



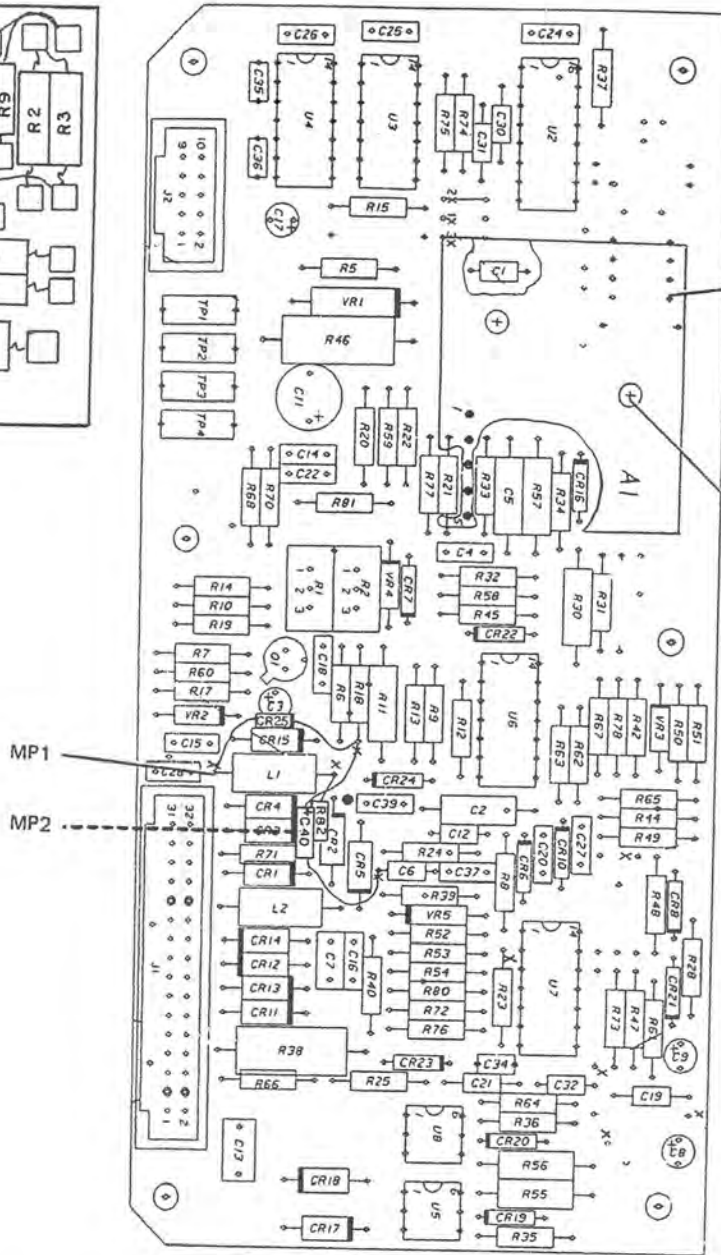
PARTS LIST (Cont)

USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE	REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE
001					SCREW,MACH STL, 4-40 X 1/2 (AP FOR 129,130)(QTY 4)(EFF TO REV 6)	343-0137-000		96906	MS51957-17	
000	81349	M45930/5-4			SCREW,MACH STL, 4-40 X 5/8 (AP FOR 129,130)(QTY 4)(EFF REV 6)	343-0138-000		96906	MS51957-18	
002				131	RESISTOR, FIXED 220 OHMS, 5%, 6.5W R9	747-5447-000		81349	RM67V221	
040	96906	MS25281R5		132	SEMICOND DEVICE CR2	353-6558-050		14099	1N5419	
000	96906	MS51957-17		133	RESISTOR, FIXED 220 OHMS, 5%, 6.5W R10	747-5447-000		81349	RM67V221	
000	96906	MS35338-135		134	CAPACITOR, FXD PPR-HYLAR DIEI, 0.01UF, 10%, 600V C5	933-1074-040		81349	ML9978-1059IK	
040	88044	AN961-6T		135	RESISTOR, FIXED MM, 0.100 OHMS, 1%, 6.5W R3	747-2161-070		91637	RS-5-105ER1000F	
				136	RESISTOR, FIXED MM, 0.100 OHMS, 1%, 6.5W R4	747-2161-070		91637	RS-5-105ER1000F	
203		540-9053-003		137	RESISTOR, FXD CMPSN, 100 OHMS, 10%, 2W R13	745-5610-000		81349	RCR42G10IKS	
000	77250	P312-0007-000		138	RESISTOR, FXD CMPSN, 100 OHMS, 10%, 2W R14	745-5610-000		81349	RCR42G10IKS	
040	00779	2-87631-7		139	SEMICOND DEVICE CR6	353-6558-050		14099	1N5419	
040	00779	2-87631-7		140	FUSE F2	264-0964-010		81349	FM04-125V5A	
002		642-3513-002		141	SEMICOND DEVICE CR4	353-6558-050		14099	1N5419	
000	96906	MS51957-14		142	RESISTOR, FIXED CMPSN, 47 OHMS, 10%, 1/4W R16	745-0701-000		81349	RCR076470KS	
000	96906	MS35338-135		143	TRANSISTOR, POWER Q4	352-6500-010		04713	HJ10009	
				144	TRANSISTOR, POWER Q2	352-6500-010		04713	HJ10009	
030	96906	MS15795-803			NUT, PLAIN, HEX HP BR5, 4-40 (AP FOR 143,144)(QTY 4)	313-0051-000		77250	P313-0051-000	
003		540-9055-003			WASHER, LOCK SST, 0.115 ID X 0.209 OD (AP FOR 143,144)(QTY 4)	310-0279-000		96906	MS35338-135	
000	77250	P312-0007-000			WASHER, FLAT CRES, 0.125ID X 0.250 OD (AP FOR 143,144)(QTY 4)	310-0779-030		96906	MS15795-803	
040	00779	87631-7			BUSHING, INSULATOR (AP FOR 143,144)(QTY 4)(EFF TO REV 6)	547-8177-022			547-8177-022	
040	00779	86016-2			BUSHING, INSULATOR (AP FOR 143,144)(QTY 4)(EFF REV 6)	547-8177-023			547-8177-023	
020	00779	87077-1			TERMINAL, LUG (AP FOR 143,144)(QTY 2)	304-0016-000		77147	4007-6HT	
001		642-3232-001			INSULATOR, PLATE (AP FOR 143,144)(QTY 4)	352-9882-010		16037	111	
001		646-6836-001			SHIELD, TRANSISTOR (AP FOR 143,144)(QTY 2)	651-3943-001				
003		540-9051-003			INSULATOR, TRANSISTOR (AP FOR 143,144)(QTY 2)	623-4186-001			623-4186-001	
000	96906	MS51957-14			SCREW, MACH STL, 4-40 X 1/2 (AP FOR 143,144)(QTY 4)(EFF TO REV 6)	343-0137-000		96906	MS51957-17	
000	96906	MS35338-135			SCREW, MACH STL, 4-40 X 5/8 (AP FOR 143,144)(QTY 4)(EFF REV 6)	343-0138-000		96906	MS51957-18	
001	96906	MS51957-43		145	CONTACT, SOCKET (QTY 2)	371-2593-040		71468	DH53744-25	
000	96906	MS35338-137		146	CONNECTOR, RCPT ELEC P2	371-0919-000		71468	DBHF17M2S	
000					NUT, SLFLKG, HEX AL, 2-56 (AP)(QTY 2)	333-0604-000		72962	68-1660-26	
000	77250	P330-1375-000			SCREW, MACH SST, 2-56 X 3/8 (AP)(QTY 2)	342-0135-000		96906	MS51959-5	
000	96906	MS35338-137		147	RESISTOR, FIXED MM, 1.2K, 5%, 6.5W R17	747-5462-000		81349	RM67V122	
				148	CAPACITOR, FXD CER DIEI, 1000PF, 20%, 1000V C7	913-1186-090		81349	CK60AM102M	
				149	CAPACITOR, FIXED PLSTC DIEI, 1UF, 10%, 200V C9	933-1081-610		50558	HC32F105K	
001	57582	KD20472J301		150	CAPACITOR, FIXED PLSTC DIEI, 1UF, 10%, 200V C8	933-1081-610		50558	HC32F105K	
000	81349	RCR42G220KS		151	RESISTOR, FIXED MM, 820 OHMS, 5%, 6.5W R24	747-5458-000		81349	RM67V821	
010	96906	CT104657		152	RESISTOR, FIXED MM, 820 OHMS, 5%, 6.5W R22	747-5458-000		81349	RM67V821	
000	96906	MS51957-31		153	RESISTOR, FIXED MM, 820 OHMS, 5%, 6.5W R23	747-5458-000		81349	RM67V821	
030	71468	DH53745-27		154	SEMICOND DEVICE CR12	353-3786-040		12969	UE5805R	
000	71468	DAM343P		155	SEMICOND DEVICE CR11	353-3786-040		12969	UE5805R	
000	77250	P313-0051-000			NUT, PLAIN, HEX TP BR5, 1/4-28 (AP FOR 154,155)(QTY 2)	313-0019-050		96906	MS35650-3255T	
000	96906	MS35338-135			WASHER, LOCK CD PL BRZ, 0.255 ID X 0.489 OD (AP FOR 154,155)(QTY 2)	310-0103-000		79807	310-0103-000	
000	96906	MS51959-15			WASHER, FLAT HI PL BR5, 0.265 ID X 0.625 OD (AP FOR 154,155)(QTY 2)	310-0061-000		79807	NIPLBRS.265IDX.625OD.040	
060	91637	RH10X012ER4F			INSULATOR, WASHER MICA, 0.265 ID X 1.0 OD (AP FOR 154,155)(QTY 4)	302-0640-270		08289	MN1-265	
060	91637	RH10X012ER4F			SPACER, INSULATING (AP FOR 154,155)(QTY 4)	352-9561-020		08209	TM-516-25	
000	96906	MS51957-5			LUG, SOLDER (AP FOR 154,155)(QTY 2)	304-1528-010		91886	008-0131-0000	
010	14604	3100-43-108		156	SEMICOND DEVICE CR10	353-6558-010		14099	1N5415	
000	77250	P313-0045-000		157	SEMICOND DEVICE CR9	353-6558-010		14099	1N5415	
000	96906	MS35338-136		158	INDUCTOR L1	668-0516-010		73386	42931	
000	81349	RCR42G10IKS		159	SCREW, MACH SST, 6-32 X 7/16 (AP)(QTY 4)	343-0170-000		96906	MS51957-29	
000	81349	RCR42G10IKS			TRANSFORMER, RF T2	674-0181-020		80223	APD093	
010	14099	1N5415			SCREW, MACH SST, 4-40 X 5/16 (AP)(QTY 2)	343-0134-000		96906	MS51957-14	
010	14099	1N5415			WASHER, LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 2)	310-0279-000		96906	MS35338-135	
000	81349	RM67V221		160	CAPACITOR, FIXED CER DIEI, 0.82UF, 10%, 50VDC C11	913-5019-550		81349	CK06BX824K	
000	81349	RM67V221			TERMINAL, STUD (QTY 42)	306-2513-250		71279	4814-1-0516	
050	14099	1N5419		161	TERMINAL, LUG (QTY 2)	304-0016-000		77147	4007-6HT	
040	81349	ML9978-1059IK		162	SCREW, MACH SST, 4-40 X 5/16 (AP FOR 161,162)(QTY 4)	343-0134-000		96906	MS51957-14	
050	14099	1N5419			WASHER, LOCK SST, 0.115 ID X 0.209 OD (AP FOR 161,162)(QTY 4)	310-0279-000		96906	MS35338-135	
050	14099	1N5419			TERMINAL, LUG (QTY 2)	304-0016-000		77147	4007-6HT	
070	91637	RS-5-105ER1000F		163	NUT, PLAIN, HEX SST, 6-32 (AP)(QTY 2)	313-0045-000		77250	P313-0045-000	
070	91637	RS-5-105ER1000F			WASHER, LOCK SST, 0.141 ID X 0.250 OD (AP)(QTY 2)	310-0282-000		96906	MS35338-136	
000	81349	CK60AM102M			SCREW, MACH SST, 6-32 X 3/8 (AP)(QTY 2)	343-0169-000		96906	MS51957-28	
000	81349	RCR076470KS			TERMINAL, STUD (QTY 7)	306-1018-010		12615	469-77-10A	
010	81349	FM04-125V5A		164	SCREW, MACH CD PL STL, 2-56 X 1/4 (AP)(QTY 7)	343-0124-000		96906	MS51957-3	
010	04713	HJ10009			WASHER, LOCK SST, 0.088 ID X 0.172 OD (AP)(QTY 7)	310-0275-000		96906	MS35338-134	
010	04713	HJ10009			GUIDE, PIN (EFF REV LTR 6)	646-6873-001				
000	77250	P313-0051-000		165	NUT, PLAIN, HEX HP BR5, 4-40 (QTY 1)	313-0051-000		77250	P313-0051-000	
000	96906	MS35338-135			WASHER, LOCK SST, 0.115 ID X 0.209 OD (QTY 1)	310-0279-000		96906	MS35338-135	
030	96906	MS15795-803			GUIDE, PIN (EFF REV LTR 6)	646-6873-001		71279	4814-1-0516	
012		547-8177-012		166	TERMINAL, STUD	306-2513-250		77147	4007-6HT	
023		547-8177-023		168	TERMINAL, LUG	304-0016-000		77147	4007-6HT	
000	77147	4007-6HT			WASHER, LOCK CD PL BRZ, 0.125 ID X 0.270 OD (AP FOR 166-168)(QTY 1)	373-3010-000		96906	MS35333-104	
010	16037	111								
001		623-4186-001								

1000-Watt Converter Module, Parts Location Diagram  
Figure 3 (Sheet 2)

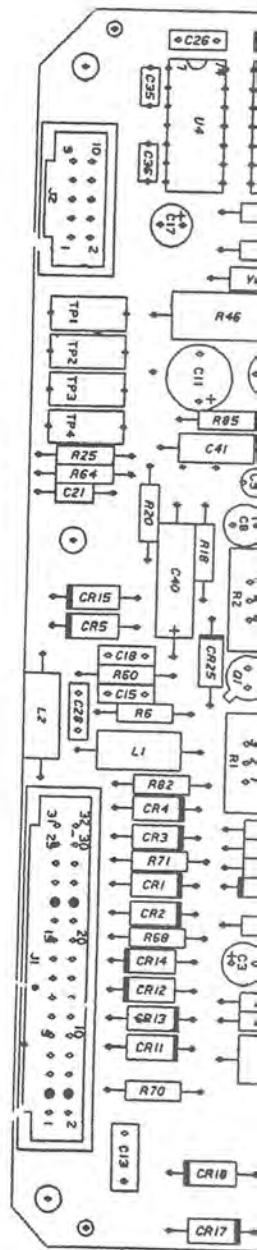


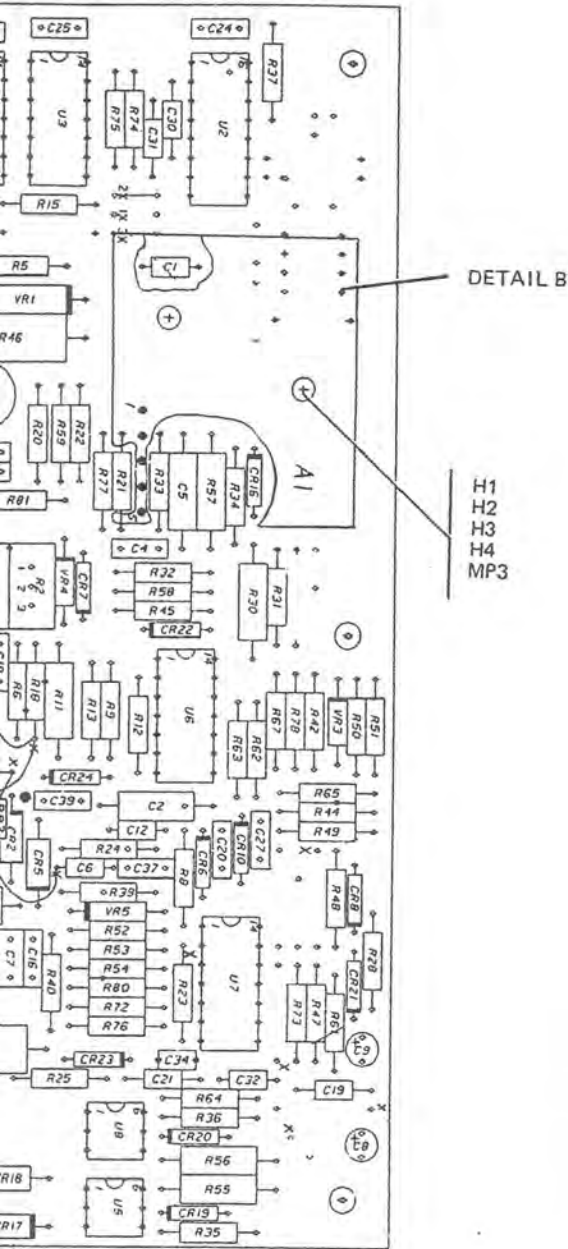
A1A1 DETAIL B



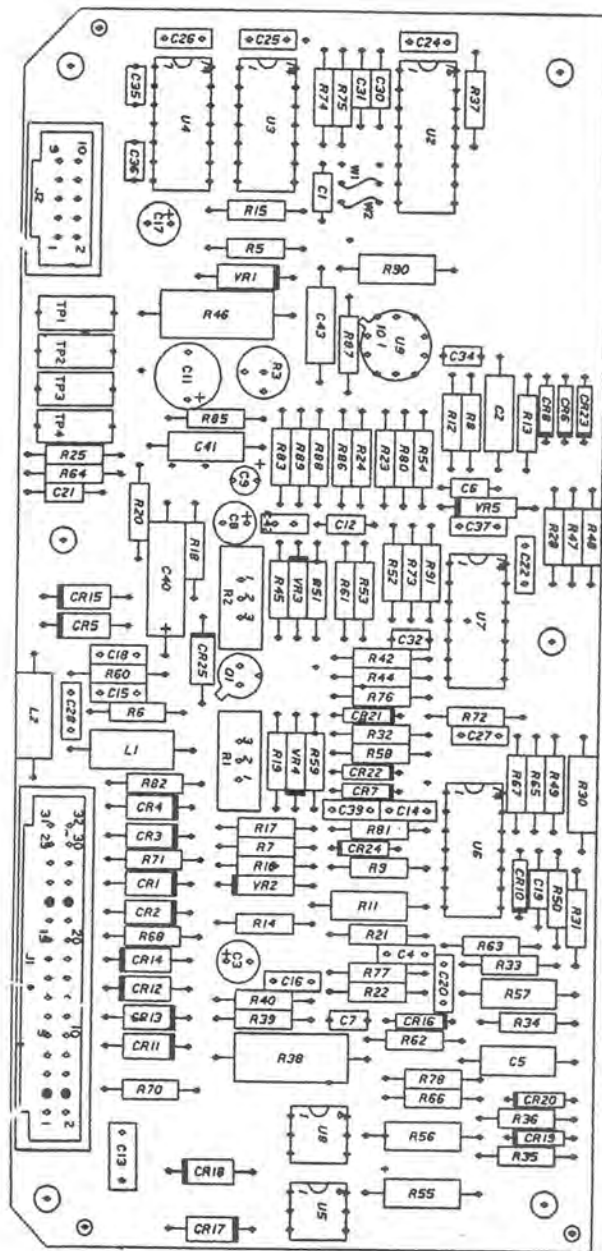
A1

(EFF TO REV LTR G)





A1  
(EFF TO REV LTR G)



A1  
(EFF REV LTR G)



TPA-4523-019

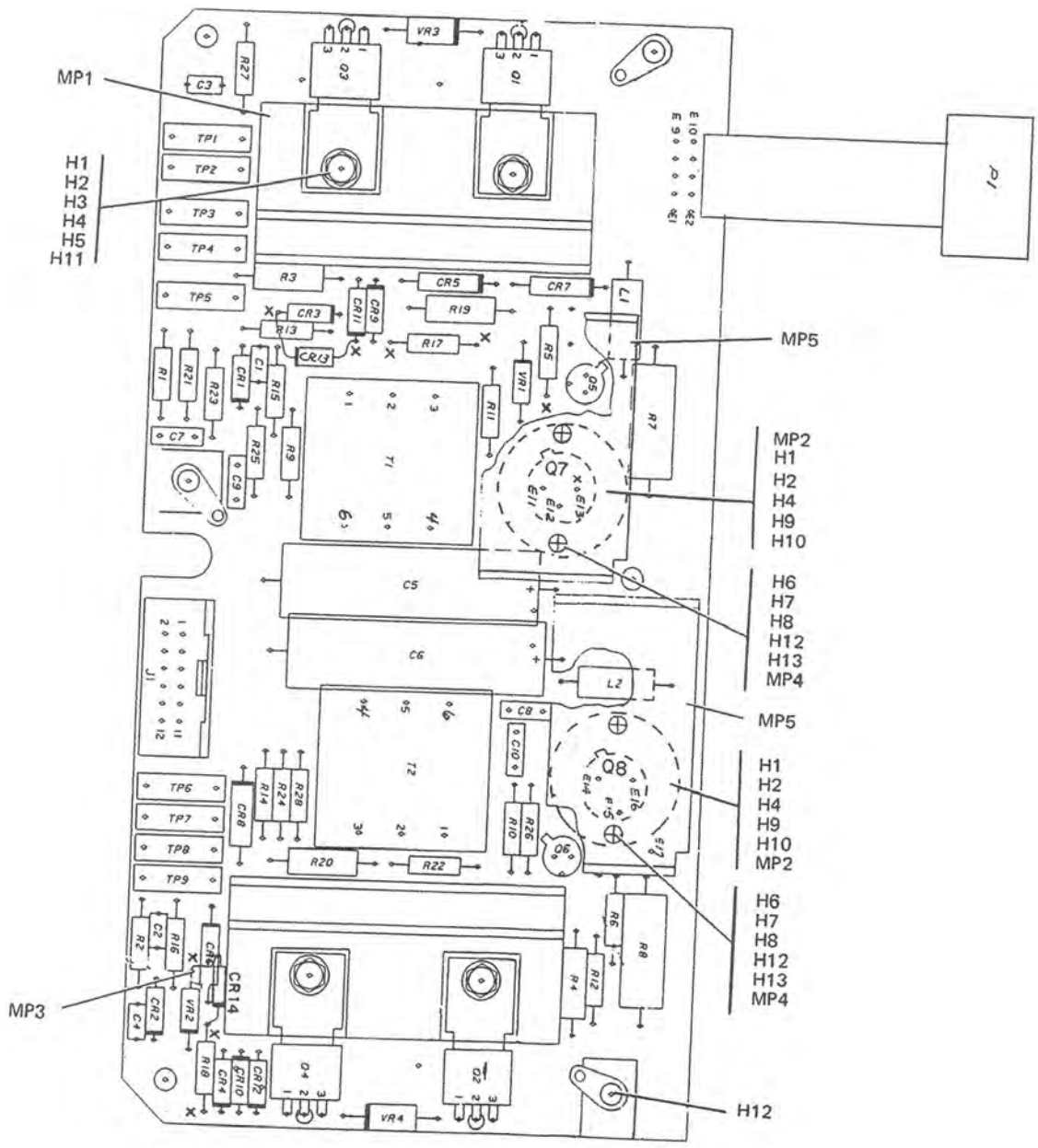
1000-Watt Converter Module, Parts Location Diagram  
Figure 3 (Sheet 3)

## PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE	REF DES	DESCRIPTION
	CONTROL CARD A1	642-3513-002			642-3513-002		R28	RESISTOR, FIXED CHPSN, 1K, 10%
A1	PEAK CURRENT OVERLOAD BOARD (A1)	646-5908-002					R29	NOT USED
CR1-CR5	SEMICONV DEVICE	353-6556-010		12969	1N5614		R30	RESISTOR, FXD FILM, 1MEGO, 1%
CR6-CR8	SEMICONV DEVICE	353-3644-010		31433	1N4454-1		R31	RESISTOR, FIXED FILM, 19.6K, 1%
CR9	NOT USED						R32	RESISTOR, FIXED FILM, 10K, 1%
CR10	SEMICONV DEVICE	353-3644-010		31433	1N4454-1		R33	RESISTOR, FIXED FILM, 154K, 1%
CR11-CR14	SEMICONV DEVICE	353-6496-020		14099	SC5615		R34	RESISTOR, FXD FILM, 562 OHMS, 1%
CR15	SEMICONV DEVICE	353-6556-010		12969	1N5614		R35, R36	RESISTOR, FXD CHPSN, 33K, 10%
CR16	SEMICONV DEVICE	353-3644-010		31433	1N4454-1		R37	RESISTOR, FIXED CHPSN, 1K, 10%
CR17, CR18	SEMICONV DEVICE	353-6556-020		12969	1N5616		R38	RESISTOR, FXD MM, 100.0 OHMS, 1%
CR19-CR24	SEMICONV DEVICE	353-3644-010		31433	1N4454-1		R39	RESISTOR, FXD FILM, 6.81K, 1%
CR25	SEMICONV DEVICE	353-6496-020		14099	SC5615		R40	RESISTOR, FXD FILM, 1.62K, 1%
C1	CAPACITOR, FIXED CER DIEI, 1000PF, 10%, 100V	913-4778-000		81349	CK128X102K		R41	NOT USED
C2	CAPACITOR, FIXED CER DIEI, 0.047UF, 10%, 100V	913-5020-640		81349	CK148X473K		R42	RESISTOR, FIXED CHPSN, 10K, 1%
C3	CAPACITOR, FIXED THTLM ELCTLT, 22UF, 20%, 10V	184-9102-080		31433	T368B226H010AS		R43	NOT USED
C4	CAPACITOR, FIXED CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K		R44	RESISTOR, FIXED FILM, 3.32K, 1%
C5	CAPACITOR, FIXED CER DIEI, 0.022UF, 10%, 100V	913-4778-000		81349	CK148X223K		R45	RESISTOR, FIXED CHPSN, 10K, 1%
C6	CAPACITOR, FIXED CER DIEI, 1000PF, 10%, 100V	913-4778-000		81349	CK128X102K		R46	RESISTOR, FIXED CHPSN, 10K, 1%
C7	CAPACITOR, FIXED CER DIEI, 100PF, 10%, 200V	913-4006-000		81349	CK058X101K		R47	RESISTOR, FIXED CHPSN, 10K, 1%
C8	CAPACITOR, FIXED THTLM ELCTLT, 22UF, 20%, 10V	184-9102-080		31433	T368B226H010AS		R48	RESISTOR, FIXED CHPSN, 10K, 1%
C9	CAPACITOR, FIXED THTLM ELCTLT, 1.5UF, 20%, 25V	184-9102-210		31433	T368A155H025AS		R49, R50	RESISTOR, FIXED CHPSN, 10K, 1%
C10	NOT USED						R51	RESISTOR, FIXED CHPSN, 1K, 10%
C11	CAPACITOR, FIXED THTLM ELCTLT, 22UF, 20%, 35V	184-9102-430		31433	T362C226H035AS		R52	RESISTOR, FIXED FILM, 1K, 1%
C12	CAPACITOR, FIXED CER DIEI, 1000PF, 10%, 100V	913-4778-000		81349	CK128X102K		R53	RESISTOR, FIXED FILM, 1K, 1%
C13	CAPACITOR, FXD CER DIEI, 1000PF, 20%, 1000V	913-1186-000		81349	CK60A102M		R54	RESISTOR, FIXED CHPSN, 1K, 10%
C14	CAPACITOR, FIXED CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K		R55, R56	RESISTOR, FXD FILM, 1MEGO, 1%
C15	CAPACITOR, FIXED CER DIEI, 0.68UF, 10%, 50VDC	913-5019-540		81349	CK068X684K		R57	RESISTOR, FIXED FILM, 407K, 1%
C16	CAPACITOR, FIXED CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K		R58	RESISTOR, FXD FILM, 21.5K, 1%
C17	CAPACITOR, FIXED THTLM ELCTLT, 22UF, 20%, 10V	184-9102-080		31433	T368B226H010AS		R59, R60	RESISTOR, FIXED CHPSN, 10K, 1%
C18	CAPACITOR, FIXED CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K		R61	RESISTOR, FIXED CHPSN, 0.1MEGO
C19	CAPACITOR, FIXED CER DIEI, 0.010UF, 10%, 100V	913-5020-430		81349	CK138X103K		R62, R63	RESISTOR, FIXED CHPSN, 10K, 1%
C20	CAPACITOR, FIXED CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K		R64	RESISTOR, FIXED CHPSN, 1K, 10%
C21	CAPACITOR, FIXED CER DIEI, 0.010UF, 10%, 100V	913-5020-430		81349	CK138X103K		R65-R68	RESISTOR, FIXED CHPSN, 10K, 1%
C22	CAPACITOR, FIXED CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K		R69	NOT USED
C23	NOT USED						R70-R72	RESISTOR, FIXED CHPSN, 10K, 1%
C24-C28	CAPACITOR, FIXED CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K		R73	RESISTOR, FIXED FILM, 14K, 1%
C29	NOT USED						R74, R75	RESISTOR, FIXED FILM, 215 OHMS
C30, C31	CAPACITOR, FIXED CER DIEI, 0.010UF, 10%, 100V	913-5020-430		81349	CK138X103K		R76	RESISTOR, FIXED FILM, 10K, 1%
C32	CAPACITOR, FIXED CER DIEI, 100PF, 10%, 200V	913-4006-000		81349	CK058X101K		R77, R78	RESISTOR, FIXED CHPSN, 1K, 10%
C33	NOT USED						R79	NOT USED
C34	CAPACITOR, FIXED CER DIEI, 100PF, 10%, 200V	913-4006-000		81349	CK058X101K		R80	RESISTOR, FIXED FILM, 1K, 1%
C35, C36	CAPACITOR, FIXED CER DIEI, 470PF, 10%, 200V	913-4014-000		81349	CK058X971K		R81	RESISTOR, FIXED FILM, 26.1K, 1%
C37	CAPACITOR, FIXED CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K		R82	RESISTOR, FIXED FILM, 100 OHMS
C38	NOT USED						R83	RESISTOR, FIXED FILM, 1K, 1%
C39	CAPACITOR, FIXED CER DIEI, 0.47UF, 10%, 50VDC	913-5019-520		81349	CK068X474K		R84	NOT USED
C40	CAPACITOR, FIXED CER DIEI, 56PF, 5%, 100VDC	913-3401-070		18796	8121-100-C06-560		R85	RESISTOR, FXD FILM, 21.5K, 1%
C41	CAPACITOR, FIXED CER DIEI, 0.047UF, 10%, 100V (A1)	913-5020-640		81349	CK148X473K		R86	RESISTOR, FIXED FILM, 19.6K, 1%
C42	CAPACITOR, FIXED CER DIEI, 56PF, 5%, 100VDC (A1)	913-3401-070		18796	8121-100-C06-560		R87	RESISTOR, FIXED FILM, 1K, 1%
C43	CAPACITOR, FIXED CER DIEI, 0.047UF, 10%, 100V (A1)	913-5020-640		81349	CK148X473K		R88, R89	RESISTOR, FIXED FILM, 5.11K, 1%
H1	SCREW, MACH SST, 2-56 X 5/8 (QTY 2) (EFF TO REV LTR G)	343-0005-000		96906	MS51957-8		R90	RESISTOR, FXD FILM, 1MEGO, 1%
H2	MASHER, FLAT BRS, 0.089 ID X 0.188 OD (QTY 4) (EFF TO REV LTR G)	310-0129-000		05411	BR50-089IDX0.188		R91	RESISTOR, FIXED FILM, 1K, 1%
H3	MASHER, HM PLSTC, 3/32 ID X 3/16 OD (QTY 2) (EFF TO REV LTR G)	303-2100-000		79807	303-2100-000		TP1	JACK, TIP BRN
H4	NUT, SLFLKG, HEX AL, 2-56 (QTY 2) (EFF TO REV LTR G)	333-0604-000		72962	68-1660-26		TP2	JACK, TIP RED
J1	HOUSING, CONN, EL	372-0043-440		00779	1-87478-8		TP3	JACK, TIP ORN
J2	HOUSING, CONN, EL	372-0043-330		00779	87478-2		TP4	JACK, TIP YEL
L1, L2	COIL, RF 100UH	240-2715-370		96906	HS75089-11		U1	NOT USED
MP1	CONTACT, ELECTRICAL (QTY 9) (EFF TO REV LTR G)	372-2601-033			372-2601-033		U2	INTEGRATED CIRCUIT FLIP FLOP
MP2	CONTACT, SPECIAL (QTY 1) (EFF TO REV LTR G)	797-7253-002			797-7253-002		U3	INTEGRATED CIRCUIT LOGIC GATE
MP3	SPACER, SLEEVE (QTY 2) (EFF TO REV LTR G)	541-5953-002			541-5953-002		U4	INTEGRATED CIRCUIT LOGIC BUFF
Q1	TRANSISTOR	352-0661-020		49956	2N2222A		U5	INTEGRATED CIRCUIT ISOLATOR
R1	RESISTOR, VARIABLE MM, 1K, PORM5%, 3/4W	361-1721-280		81349	RT22C2W102		U6	INTEGRATED CIRCUIT AMPLIFIER
R2	RESISTOR, VARIABLE MM, 10K, PORM5%, 3/4W	361-1721-310		81349	RT22C2W103		U7	INTEGRATED CIRCUIT COMPARTOR
R3, R4	NOT USED						U8	INTEGRATED CIRCUIT ISOLATOR
R5	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS		U9	INTEGRATED CIRCUIT DUAL COMPAR
R6	RESISTOR, FIXED FILM, 26.1K, 1%, 1/8W	705-1064-000		81349	RN55D2612F		VR1	SEMICONV DEVICE
R7	RESISTOR, FXD FILM, 2.87K, 1%, 1/8W	705-1018-000		81349	RN55D2871F		VR2, VR3	SEMICONV DEVICE
R8	RESISTOR, FIXED FILM, 15.4K, 1%, 1/8W	705-1053-000		81349	RN55D1542F		VR4	SEMICONV DEVICE
R9	RESISTOR, FXD FILM, 1.62K, 1%, 1/8W	705-1086-000		81349	RN55D1621F		VR5	SEMICONV DEVICE
R10	RESISTOR, FXD FILM, 562 OHMS, 1%, 1/8W	705-0984-000		81349	RN55D5620F			PEAK CURRENT OVERLOAD BOARD A1
R11	RESISTOR, FXD FILM, 301K, 1%, 1/4W	705-6715-000		81349	RN60D3013F		C1, C2	CAPACITOR, FIXED CER DIEI, 0.047UF, 10%, 100V
R12	RESISTOR, FIXED FILM, 68.1K, 1%, 1/8W	705-1064-000		81349	RN55D6812F		C3	CAPACITOR, FIXED CER DIEI, 6PF, 100V (A2)
R13	RESISTOR, FIXED CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR076222KS		C5	CAPACITOR, FIXED CER DIEI, 56PF, 100V
R14	RESISTOR, FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D1001F		MP1	CONTACT, ELECTRICAL (QTY 3)
R15	RESISTOR, FIXED CHPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349	RCR076221KS		R1	RESISTOR, VARIABLE 10K, 10%, 0.5W
R16	NOT USED						R2	RESISTOR, FIXED FILM, 19.6K, 1%
R17	RESISTOR, FXD FILM, 3.65K, 1%, 1/8W	705-1023-000		81349	RN55D3651F		R3	RESISTOR, FIXED FILM, 5.11K, 1%
R18	RESISTOR, FXD FILM, 53.6K, 1%, 1/8W	705-1079-000		81349	RN55D5362F		R4	RESISTOR, FIXED FILM, 1K, 1%
R19	RESISTOR, FXD FILM, 5.9K, 10%, 1/8W	705-1033-000		81349	RN55D5901F		R5	RESISTOR, FXD FILM, 21.5K, 1%
R20-R22	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS		R6	RESISTOR, FIXED FILM, 1K, 1%
R23	RESISTOR, FIXED CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR076105KS		R7	RESISTOR, FXD FILM, 1MEGO, 1%
R24-R25	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS		R8	RESISTOR, FIXED FILM, 1K, 1%
R26, R27	NOT USED						R9	RESISTOR, FIXED FILM, 5.11K, 1%
							U1	INTEGRATED CIRCUIT DUAL COMPAR

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE
R28	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000			81349 RCR076102KS	
R29	NOT USED					
R30	RESISTOR, FXD FILM, 1MEGO, 1%, 1/4W	705-6740-000			81349 RN6001004F	
R31	RESISTOR, FIXED FILM, 19.6K, 1%, 1/8W	705-1058-000			81349 RN5501962F	
R32	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000			81349 RN5501002F	
R33	RESISTOR, FIXED FILM, 154K, 1%, 1/8W	705-1101-000			81349 RN5501543F	
R34	RESISTOR, FXD FILM, 562 OHMS, 1%, 1/8W	705-0964-000			81349 RN5505620F	
R35, R36	RESISTOR, FXD CHPSN, 33K, 10%, 1/4W	745-0803-000			81349 RCR076333KS	
R37	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000			81349 RCR076102KS	
R38	RESISTOR, FXD WM, 100.0 OHMS, 5%, 3W	747-5340-000			81349 RM69V101	
R39	RESISTOR, FXD FILM, 6.81K, 1%, 1/8W	705-1036-000			81349 RN5506811F	
R40	RESISTOR, FXD FILM, 1.62K, 1%, 1/8W	705-1006-000			81349 RN5501621F	
R41	NOT USED					
R42	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000			81349 RCR076103KS	
R43	NOT USED					
R44	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000			81349 RCR076103KS	
R45	RESISTOR, FXD FILM, 3.32K, 1%, 1/8W	705-1021-000			81349 RN5503321F	
R46	RESISTOR, FXD WM, 82.0 OHMS, 5%, 3W	747-5303-000			81349 RM69V820	
R47	RESISTOR, FIXED CHPSN, 1MEGO, 10%, 1/4W	745-0857-000			81349 RCR076105KS	
R48	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000			81349 RCR076103KS	
R49, R50	RESISTOR, FIXED CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000			81349 RCR076104KS	
R51	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000			81349 RCR076102KS	
R52	RESISTOR, FIXED FILM, 68.1K, 1%, 1/8W	705-1084-000			81349 RN5506812F	
R53	RESISTOR, FIXED FILM, 1K, 1%, 1/8W	705-0996-000			81349 RN5501001F	
R54	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000			81349 RCR076102KS	
R55, R56	RESISTOR, FXD FILM, 1MEGO, 1%, 1/4W	705-6740-000			81349 RN6001004F	
R57	RESISTOR, FIXED FILM, 487K, 1%, 1/4W	705-6725-000			81349 RN6004873F	
R58	RESISTOR, FXD FILM, 21.5K, 1%, 1/8W	705-1060-000			81349 RN5502152F	
R59, R60	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000			81349 RCR076103KS	
R61	RESISTOR, FIXED CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000			81349 RCR076104KS	
R62, R63	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000			81349 RCR076103KS	
R64	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000			81349 RCR076102KS	
R65-R68	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000			81349 RCR076103KS	
R69	NOT USED					
R70-R72	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000			81349 RCR076103KS	
R73	RESISTOR, FIXED FILM, 14K, 1%, 1/8W	705-1051-000			81349 RN5501402F	
R74, R75	RESISTOR, FIXED FILM, 215 OHMS, 1%, 1/8W	705-0964-000			81349 RN5502150F	
R76	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000			81349 RN5501002F	
R77, R78	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000			81349 RCR076102KS	
R79	NOT USED					
R80	RESISTOR, FIXED FILM, 1K, 1%, 1/8W	705-0996-000			81349 RN5501001F	
R81	RESISTOR, FIXED FILM, 26.1K, 1%, 1/8W	705-1064-000			81349 RN5502612F	
R82	RESISTOR, FIXED FILM, 100 OHMS, 1%, 1/8W	705-0948-000			81349 RN5501000F	
R83	RESISTOR, FIXED FILM, 1K, 1%, 1/8W (A1)	705-0996-000			81349 RN5501001F	
R84	NOT USED					
R85	RESISTOR, FXD FILM, 21.5K, 1%, 1/8W (A1)	705-1060-000			81349 RN5502152F	
R86	RESISTOR, FIXED FILM, 19.6K, 1%, 1/8W (A1)	705-1058-000			81349 RN5501962F	
R87	RESISTOR, FIXED FILM, 1K, 1%, 1/8W (A1)	705-0996-000			81349 RN5501001F	
R88, R89	RESISTOR, FIXED FILM, 5.11K, 1%, 1/8W (A1)	705-1030-000			81349 RN5505111F	
R90	RESISTOR, FXD FILM, 1MEGO, 1%, 1/4W (A1)	705-6740-000			81349 RN6001004F	
R91	RESISTOR, FIXED FILM, 1K, 1%, 1/8W (A1)	705-0996-000			81349 RN5501001F	
TP1	JACK, TIP BRN	360-0162-000			81349 H39024-11-04	
TP2	JACK, TIP RED	360-0160-000			81349 H39024-11-02	
TP3	JACK, TIP ORN	360-0164-000			81349 H39024-11-06	
TP4	JACK, TIP YEL	360-0166-000			81349 H39024-11-08	
U1	NOT USED					
U2	INTEGRATED CIRCUIT FLIP FLOP (ESDS)	351-1525-020			04713 SN54LS112AJ	
U3	INTEGRATED CIRCUIT LOGIC GATE (ESDS)	351-1523-050			04713 SN54LS10J	
U4	INTEGRATED CIRCUIT LOGIC BUFFER	351-7715-020			27014 DM5407J	
U5	INTEGRATED CIRCUIT ISOLATOR (ESDS)	351-0047-010			03506 H11A1	
U6	INTEGRATED CIRCUIT AMPLIFIER, QUAD OPRTNL	351-1141-020			12040 LM224J	
U7	INTEGRATED CIRCUIT COMPARATOR	351-1122-020			01295 LM239J	
U8	INTEGRATED CIRCUIT ISOLATOR (ESDS)	351-0047-010			03506 H11A1	
U9	INTEGRATED CIRCUIT DUAL COMPARATOR (A1)	351-1166-030			27014 LM119H	
VR1	SEMICOND DEVICE	353-6481-110			04713 1N4733A	
VR2, VR3	SEMICOND DEVICE	353-3261-000			12954 1N821A	
VR4	SEMICOND DEVICE	353-3591-490			04713 1N4625	
VR5	SEMICOND DEVICE	353-3591-400			04713 1N4616	
	PEAK CURRENT OVERLOAD BOARD A1A1	646-5908-002				
C1, C2	CAPACITOR, FIXED CER DIEL, 0.047UF, 10%, 100V	913-5020-640			81349 CK148K473K	
C3	CAPACITOR, FIXED CER DIEL, 6PF, 10%, 100VDC (A2)	913-1098-070			72982 8101-100-C06-609 K	
C3	CAPACITOR, FIXED CER DIEL, 56PF, 5%, 100VDC	913-3401-070			10796 8121-100-C06-560 J	
HP1	CONTACT, ELECTRICAL (QTY 3)	372-2601-033			372-2601-033	
R1	RESISTOR, VARIABLE 10K, 10%, 0.5W	382-0027-100			80294 3329H-CY3-103	
R2	RESISTOR, FIXED FILM, 19.6K, 1%, 1/8W	705-1058-000			81349 RN5501962F	
R3	RESISTOR, FIXED FILM, 5.11K, 1%, 1/8W	705-1030-000			81349 RN5505111F	
R4	RESISTOR, FIXED FILM, 1K, 1%, 1/8W	705-0996-000			81349 RN5501001F	
R5	RESISTOR, FXD FILM, 21.5K, 1%, 1/8W	705-1060-000			81349 RN5502152F	
R6	RESISTOR, FIXED FILM, 1K, 1%, 1/8W	705-0996-000			81349 RN5501001F	
R7	RESISTOR, FXD FILM, 1MEGO, 1%, 1/4W	705-6740-000			81349 RN6001004F	
R8	RESISTOR, FIXED FILM, 1K, 1%, 1/8W	705-0996-000			81349 RN5501001F	
R9	RESISTOR, FIXED FILM, 5.11K, 1%, 1/8W	705-1030-000			81349 RN5505111F	
U1	INTEGRATED CIRCUIT DUAL COMPARATOR	351-1166-030			27014 LM119H	



MP1  
H1  
H2  
H3  
H4  
H5  
H11

E100  
E99  
E98  
E97  
E96  
E95  
E94

MP5

MP2  
H1  
H2  
H4  
H9  
H10

H6  
H7  
H8  
H12  
H13  
MP4

MP5

H1  
H2  
H4  
H9  
H10  
MP2

H6  
H7  
H8  
H12  
H13  
MP4

MP3

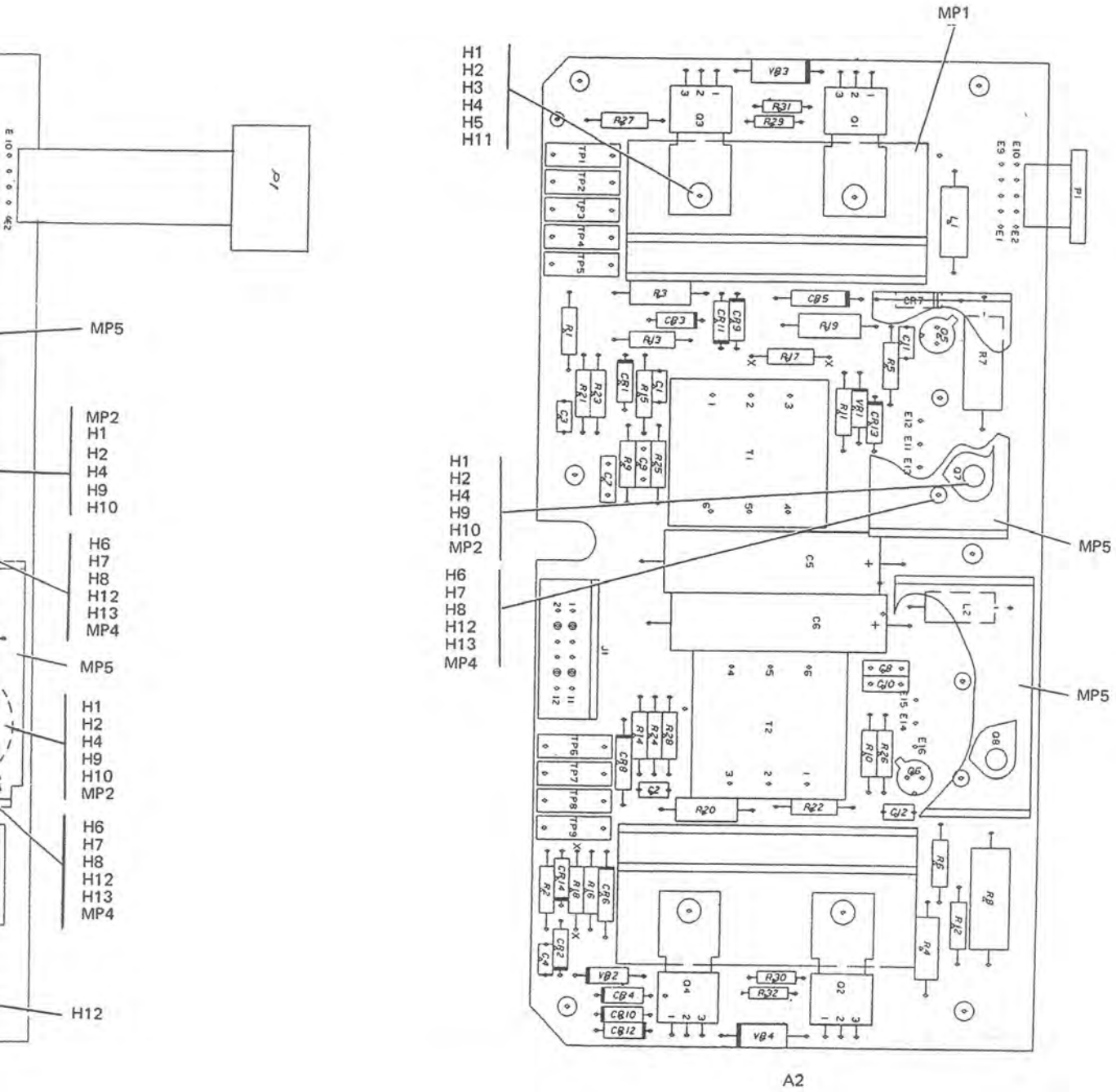
H12

H1  
H2  
H3  
H4  
H5  
H11

H1  
H2  
H4  
H9  
H10  
MP2

H6  
H7  
H8  
H12  
H13  
MP4

A2  
(EFF TO REV LTR C)



A2

(EFF REV LTR C)



ELECTROSTATIC SENSITIVE DEVICES  
OBSERVE PRECAUTIONS FOR HANDLING

TPA-5833-019

1000-Watt Converter Module, Parts Location Diagram  
Figure 3 (Sheet 5)

## PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE
	BASE DRIVER CARD A2 (ESDS)	642-3232-001			642-3232-001	
CR1-CR4	SEMICOND DEVICE	353-3644-010		31433	1N4454-1	
CR5-CR8	SEMICOND DEVICE	353-6556-010		12969	1N5614	
CR9-CR14	SEMICOND DEVICE	353-3644-010		31433	1N4454-1	
C1,C2	CAPACITOR, FIXED CER DIEI, 1500PF, 10%, 100V	913-5019-100		81349	CK05BX152K	
C3,C4	CAPACITOR, FIXED CER DIEI, 33PF, 10%, 200V	913-5019-070		81349	CK05BX330K	
C5,C6	CAPACITOR, Fxd ELCTLT, 100UF, P75/M10%, 30V	183-1277-250		56289	600010760300E5	
C7-C10	CAPACITOR, FIXED CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K	
C11,C12	CAPACITOR, FIXED CER DIEI, 1000PF, 10%, 100V	913-4778-000		81349	CK12BX102K	
H1	NUT, PLAIN, HEX SST, 4-40 (QTY 8)	313-0132-000		77250	P313-0132-000	
H2	WASHER, SPRING CD PL BRZ, 0.115 ID X 0.209 OD (QTY 8)	310-0095-000		96906	MS35338-97	
H3	BUSHING, INSULATED (QTY 4)					
H4	WASHER, FLAT CRES, 0.125ID X 0.250 OD (QTY 6)	547-8177-017			547-8177-017	
H5	SCREW, MACH STL, 4-40 X 1/2 (QTY 4)	310-0779-030		96906	MS15795-803	
H6	SCREW, MACH CD PL STL, 2-56 X 1/4 (QTY 4)	343-0137-000		96906	MS51957-17	
H7	WASHER, LOCK SST, 0.088 ID X 0.172 OD (QTY 4)	343-0124-000		96906	MS51957-3	
H8	WASHER, FLAT BRS, 0.089 ID X 0.188 OD (QTY 4)	310-0275-000		96906	MS35338-134	
		310-0129-000		05411	BRS0.089IDX0.188 00X0.016	
H9	BUSHING, INSULATOR (QTY 4)	547-8177-018			547-8177-018	
H10	SCREW, MACH NP BRS, 4-40 X 5/16 (QTY 4)	343-0286-000		77250	P343-0286-000	
H11	MTG KIT, XSTR (QTY 4)	352-9653-030		13103	43-77-9	
H12	TERMINAL, LUG (QTY 5) (EFF TO REV LTR C)	304-0015-000		77147	4007-4HT	
H12	TERMINAL, LUG (QTY 2) (EFF REV LTR C)	304-0015-000		77147	4007-4HT	
H13	SCREW, MACH SST, 2-56 X 1/4 (QTY 2)	342-0133-000		96906	MS51959-3	
J1	HOUSING, COMM, EL	372-0043-340		00779	1-87478-0	
L1,L2	COIL, RF 2.2UH	240-2715-170		96906	MS75088-5	
MP1	HEATSINK (QTY 2)	646-6552-001				
MP2	INSULATOR, PLATE (QTY 2)	352-9570-020		00289	TA-2402-A	
MP3	CONTACT, ELECTRICAL (QTY 9) (EFF TO REV LTR C)	372-2601-037			372-2601-037	
MP3	CONTACT, ELECTRICAL (QTY 4) (EFF REV LTR C)	372-2601-037			372-2601-037	
MP4	POST, HEX (QTY 4)	540-9008-003			540-9008-003	
MP5	BRACKET, HEATSINK (QTY 2)	651-4109-001				
P1	WIRING HARNESS	647-7241-001				
Q1-Q4	TRANSISTOR (ESDS)	352-7975-020		17856	VN66AF	
Q5,Q6	TRANSISTOR	352-0551-010		04713	2H2907A	
Q7,Q8	TRANSISTOR	352-0704-020		02735	2H3879	
R1,R2	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS	
R3,R4	RESISTOR, Fxd FILM, 1K, 1%, 1/4W	705-6596-000		81349	RN60D1001F	
R5,R6	RESISTOR, FIXED FILM, 475 OHMS, 1%, 1/8W	705-3600-810		81349	RN55D4750F	
R7,R8	RESISTOR, Fxd FM, 4.7 OHMS, 5%, 3W	747-5368-000		81349	RN69V4R7	
R9,R10	RESISTOR, FIXED CHPSN, 47 OHMS, 10%, 1/4W	745-0701-000		81349	RCR07G470KS	
R11,R12	RESISTOR, FIXED CHPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349	RCR07G221KS	
R13,R14	RESISTOR, Fxd FILM, 619 OHMS, 1%, 1/8W	705-0986-000		81349	RN55D6190F	
R15,R16	RESISTOR, FIXED FILM, 100K, 1%, 1/8W	705-1092-000		81349	RN55D1003F	
R17,R18	RESISTOR, Fxd FILM, 1.15K, 1%, 1/8W (TEST SELECT)	705-0999-000		81349	RN55D1151F	
R17,R18	RESISTOR, Fxd FILM, 1.21K, 1%, 1/8W (TEST SELECT)	705-1000-000		81349	RN55D1211F	
R17,R18	RESISTOR, Fxd FILM, 1.27K, 1%, 1/8W (TEST SELECT)	705-1001-000		81349	RN55D1271F	
R17,R18	RESISTOR, Fxd FILM, 1.33K, 1%, 1/8W (TEST SELECT)	705-1002-000		81349	RN55D1331F	
R17,R18	RESISTOR, Fxd FILM, 1.40K, 1%, 1/8W (TEST SELECT)	705-1003-000		81349	RN55D1401F	
R17,R18	RESISTOR, FIXED FILM, 1.47K, 1%, 1/8W (TEST SELECT)	705-1004-000		81349	RN55D1471F	
R17,R18	RESISTOR, Fxd FILM, 1.54K, 1%, 1/8W (TEST SELECT)	705-1005-000		81349	RN55D1541F	
R17,R18	RESISTOR, Fxd FILM, 1.62K, 1%, 1/8W (TEST SELECT)	705-1006-000		81349	RN55D1621F	
R17,R18	RESISTOR, Fxd FILM, 1.69K, 1%, 1/8W (TEST SELECT)	705-1007-000		81349	RN55D1691F	
R17,R18	RESISTOR, FIXED FILM, 1.78K, 1%, 1/8W (TEST SELECT)	705-1008-000		81349	RN55D1781F	
R17,R18	RESISTOR, Fxd FILM, 1.87K, 1%, 1/8W (TEST SELECT)	705-1009-000		81349	RN55D1871F	
R17,R18	RESISTOR, Fxd FILM, 1.96K, 1%, 1/8W (TEST SELECT)	705-1010-000		81349	RN55D1961F	
R17,R18	RESISTOR, Fxd FILM, 2.05K, 1%, 1/8W (TEST SELECT)	705-1011-000		81349	RN55D2051F	
R17,R18	RESISTOR, Fxd FILM, 2.15K, 1%, 1/8W (TEST SELECT)	705-1012-000		81349	RN55D2151F	
R17,R18	RESISTOR, Fxd FILM, 2.26K, 1%, 1/8W (TEST SELECT)	705-1013-000		81349	RN55D2261F	
R19,R20	RESISTOR, Fxd CHPSN, 680 OHMS, 10%, 1/2W	745-1345-000		81349	RCR20G681KS	
R21-R24	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS	
R25,R26	RESISTOR, FIXED CHPSN, 150 OHMS, 10%, 1/4W	745-0719-000		81349	RCR07G151KS	
R27,R28	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS	
R29-R32	RESISTOR, FIXED CHPSN, 470 OHMS, 10%, 1/8W	745-2329-000		81349	RCR05G471KS	
TP1	JACK, TIP BRN	360-0162-000		81349	H39024-11-04	
TP2	JACK, TIP RED	360-0160-000		81349	H39024-11-02	
TP3	JACK, TIP ORN	360-0164-000		81349	H39024-11-06	
TP4	JACK, TIP YEL	360-0166-000		81349	H39024-11-08	
TP5	JACK, TIP GRN	360-0163-000		81349	H39024-11-05	
TP6	JACK, TIP BLU	360-0165-000		81349	H39024-11-07	
TP7	JACK, TIP VIO	360-0238-000		81349	H39024-11-10	
TP8	JACK, TIP GRA	360-0167-000		81349	H39024-11-09	
TP9	JACK, TIP MHT	360-0159-000		81349	H39024-11-01	
T1,T2	TRANSFORMER	664-8500-010		98330	T4738	
VR1,VR2	SEMICOND DEVICE	353-3591-060		04713	1N4104	
VR3,VR4	SEMICOND DEVICE	353-6550-360		04713	1N53688	



**Note**

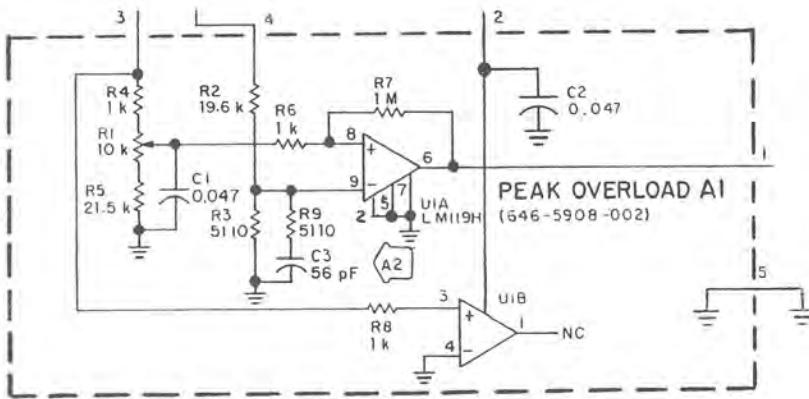
Configuration history before 1 April 1982 is not recorded in this section.

**MODIFICATION HISTORY**

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
None	See parts list for revision history effectivity (no effect to schematic)	646-6883-001 REV H and above
CONTROL CARD A1 642-3513-002		
<b>Note</b>		
Modification history after REV F for configuration baseboard 600-1998-767 (EFF TO R/L G) are listed below:		
A1	Deleted A1A1 Peak Current Overload Board, 646-5908-002 See parts list for revision effectivity for mechanical changes.	642-3513-002 REV G and above

**MODIFICATION HISTORY (Cont)**

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
BASE DRIVER CARD A2		642-3232-001 REV C and above
<b>Note</b>		
The Base Driver Card A2, 642-3232-001 has two configuration baseboards. The original baseboard 600-1996-594 is only effective to REV C. The current configuration baseboard 600-2001-007 is effective at REV C.		
Each baseboard contains a different component layout and/or different printed circuits, but are compatible. Changes to mechanical parts are shown in parts list with the revision history.		
PEAK CURRENT OVERLOAD BOARD A1A1		
A2	Changed C3 from 6pF to 56pF.	646-5908-002 REV B and above



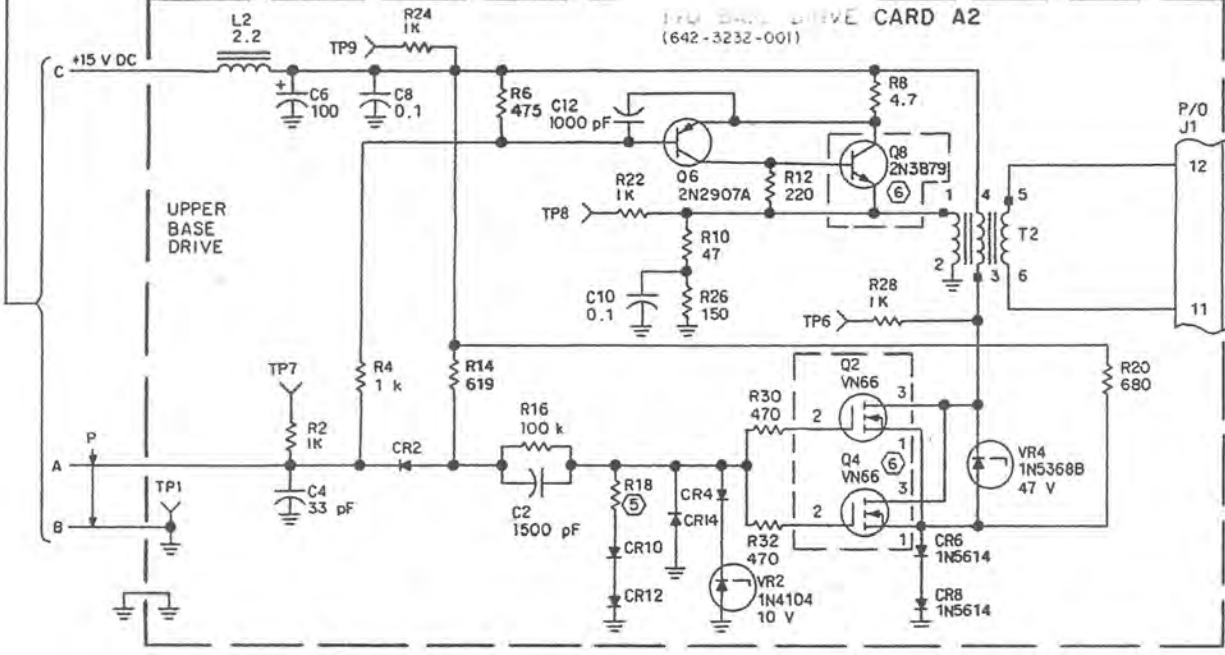
**Note**

Modification history for REV G on the current configuration baseboard 600-2001-087 (EFF REV LTR G) are listed below:

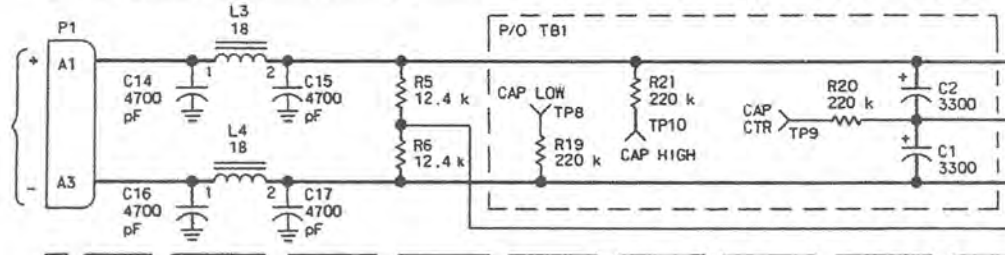
A1	Added: A1C41, 0.047μF A1C42, 56pF A1C43, 0.047 μF A1R83, 1 kΩ, 1%, 1/8W A1R85, 21.5 kΩ, 1%, 1/8W A1R86, 19.6 kΩ, 1%, 1/8W A1R87, 1 kΩ, 1%, 1/8W A1R88, A1R89, 5.11 kΩ, 1%, 1/8W A1R90, 1 MΩ, 1%, 1/4W A1R91, 1 kΩ, 1%, 1/8W A1U9, LM119H	642-3513-002 REV G
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1000-Watt Converter Module, Parts Location Diagram  
Figure 3 (Sheet 6)

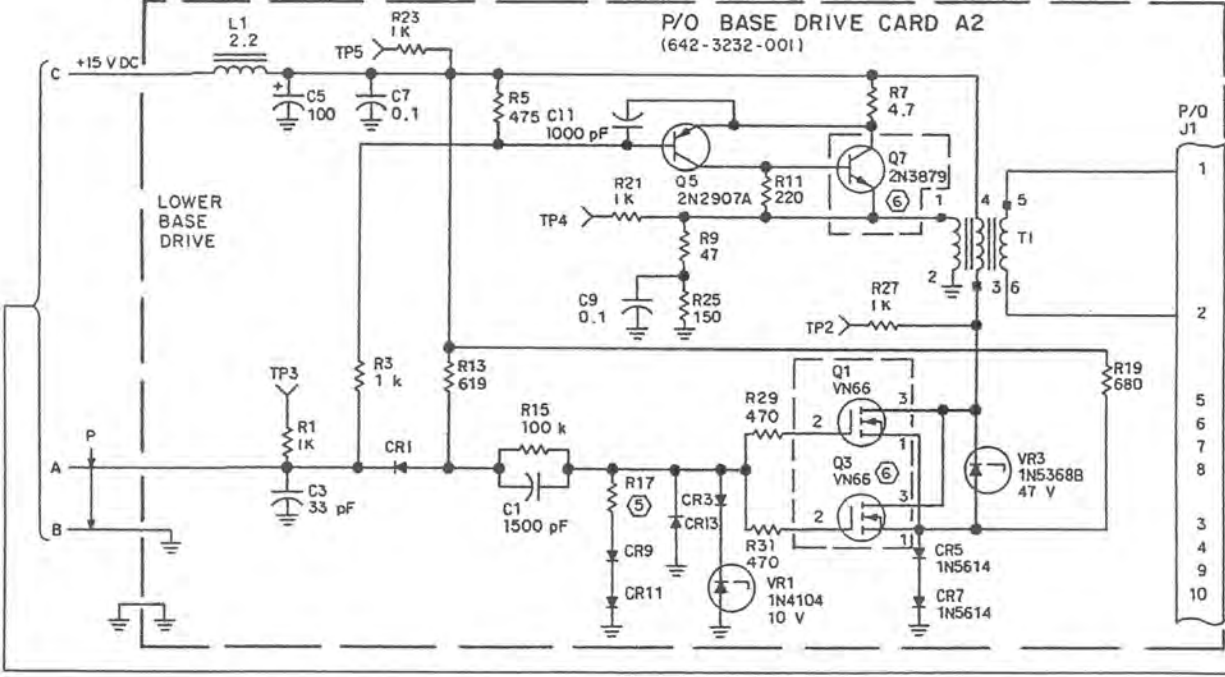
UPPER BASE DRIVE CARD A2  
(642-3232-001)



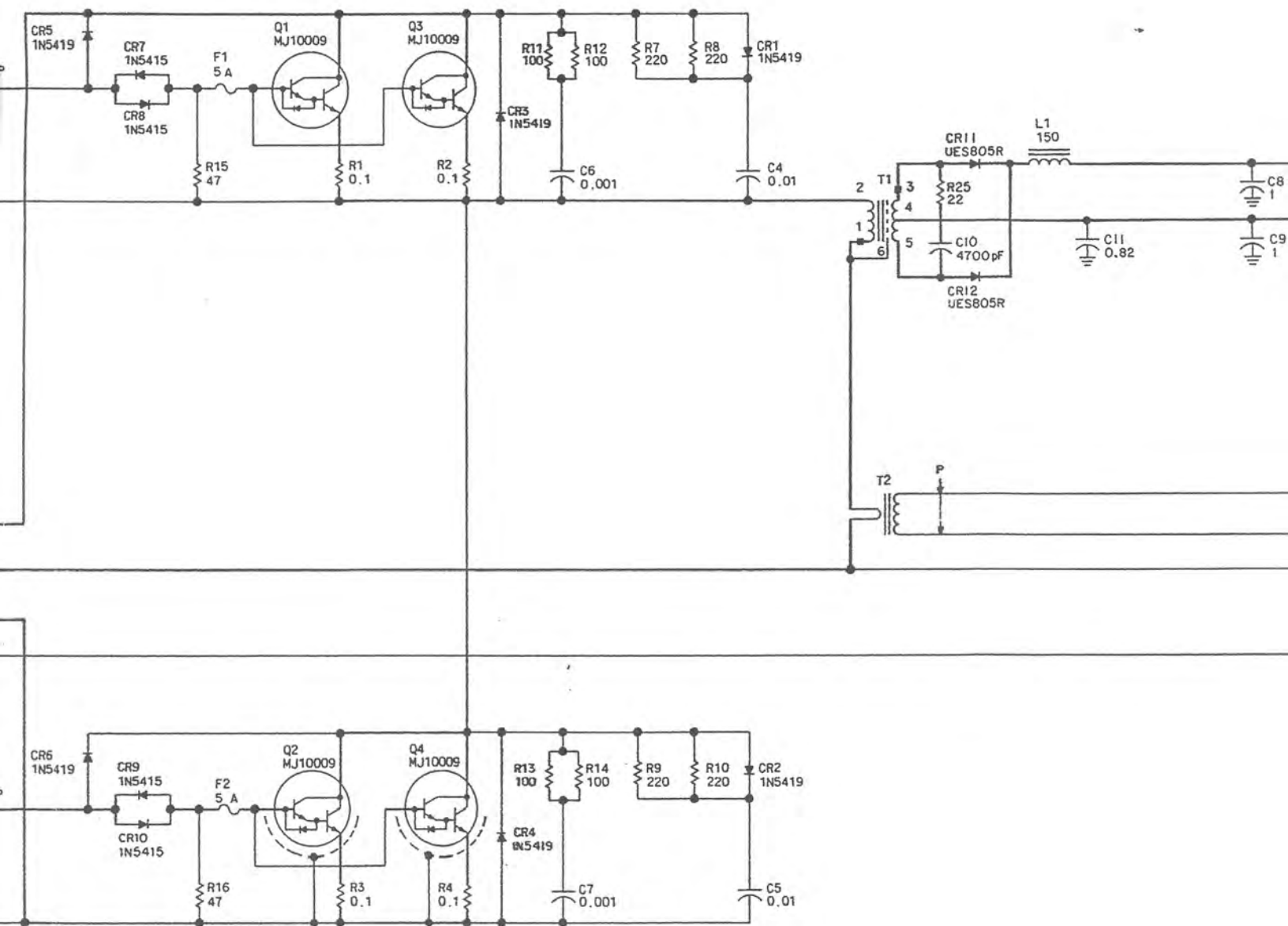
DC INPUT  
235-330 V DC



P/O BASE DRIVE CARD A2  
(642-3232-001)



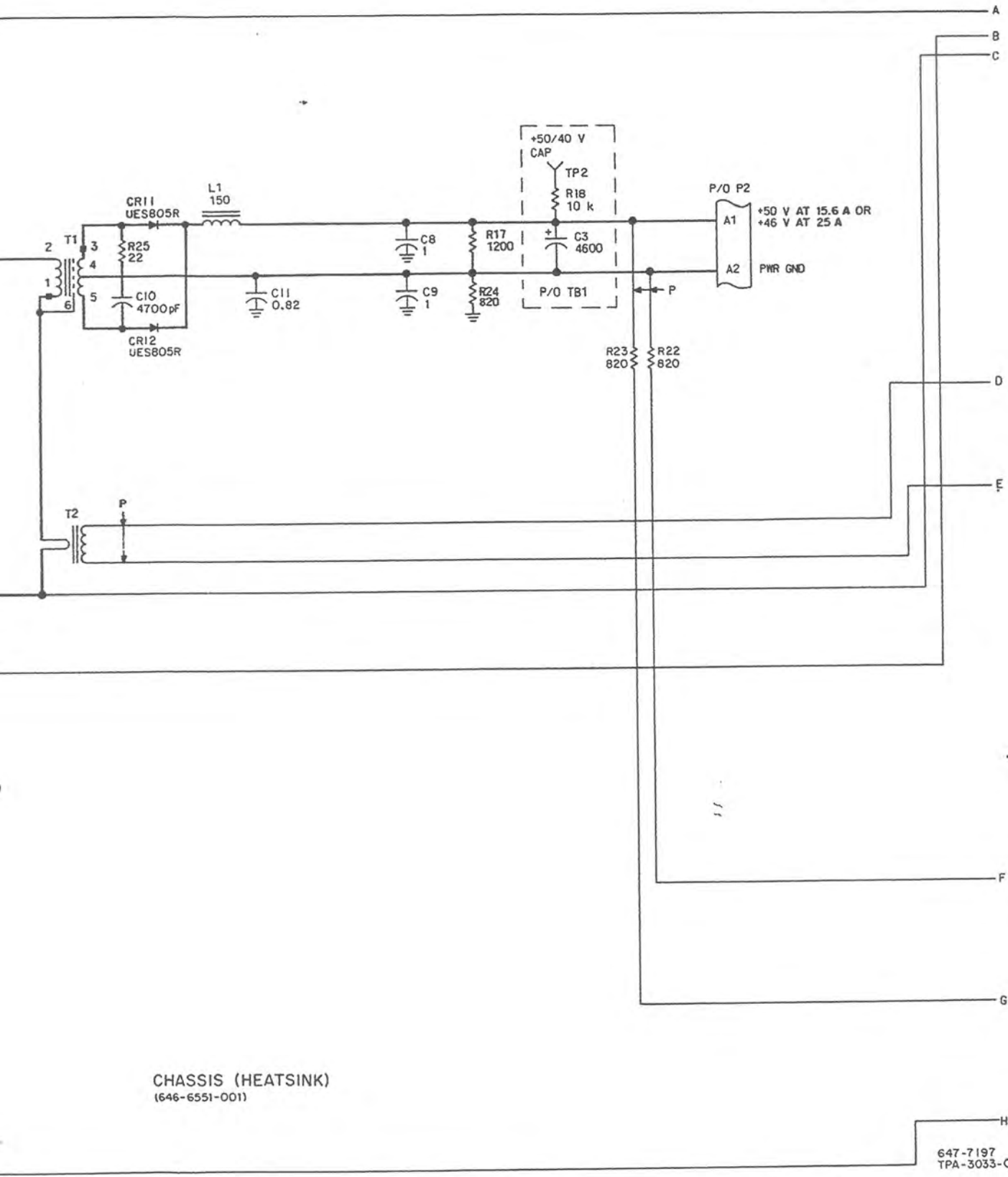
SPARE  
UNUSED



SPARE

UNUSED

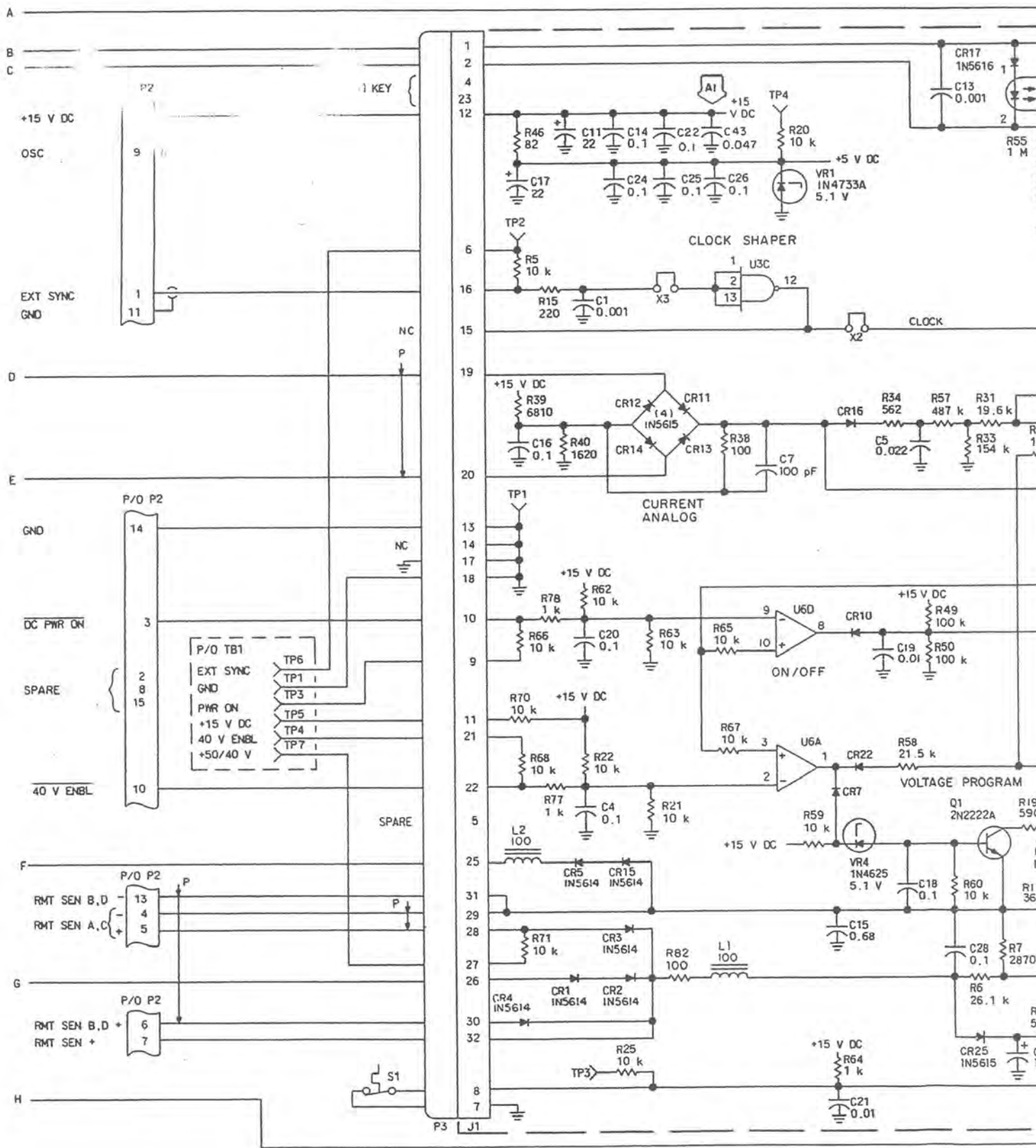
CHASSIS (HEATSINK)  
 (646-6551-001)

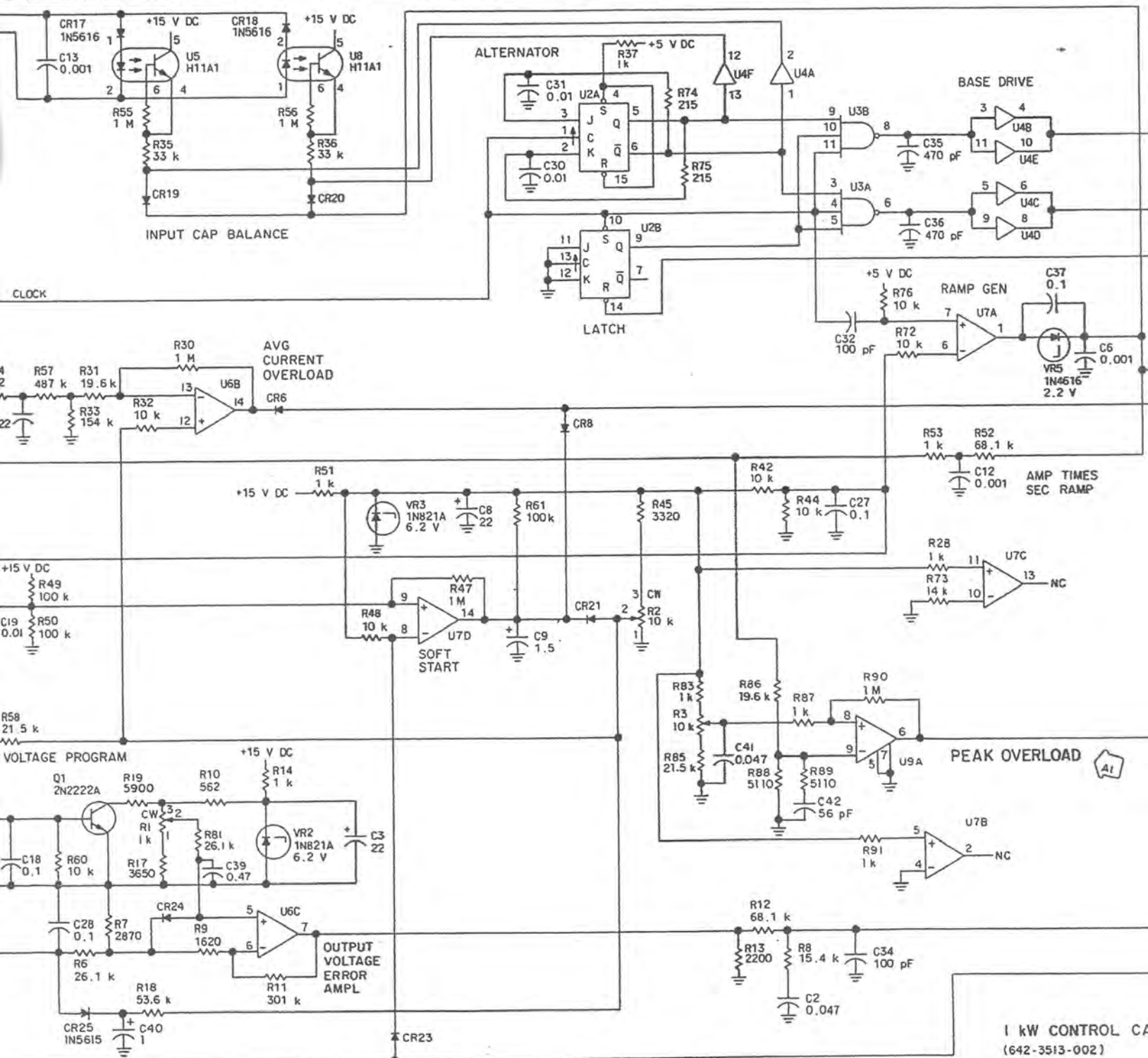


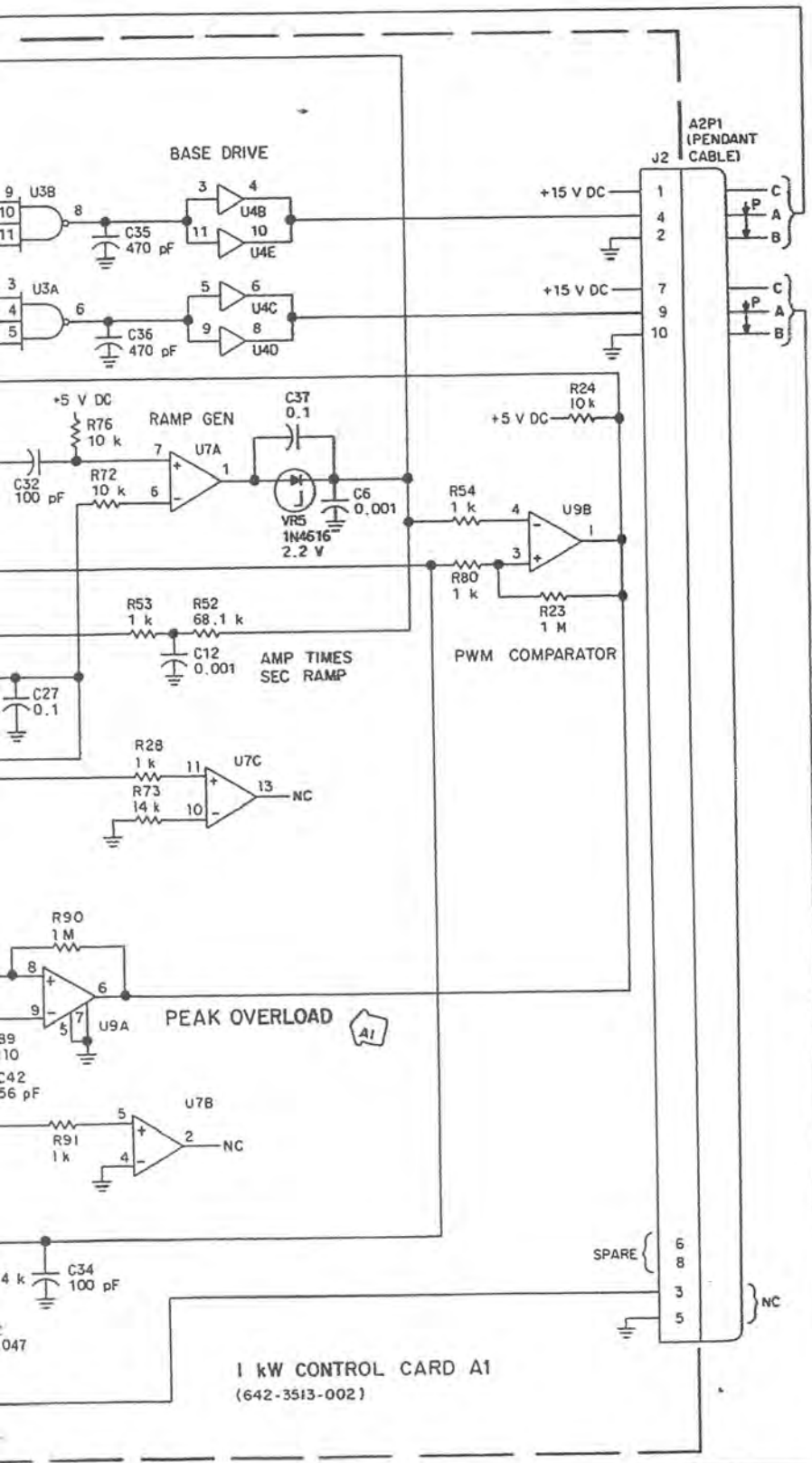
CHASSIS (HEATSINK)  
(646-6551-001)

647-7197  
TPA-3033-025

1000-Watt Converter Module, Schematic Diagram  
Figure 4 (Sheet 1 of 2)







NOTES:

- ① UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS, INDUCTANCE VALUES ARE IN MICROHENRYS, AND DIODES ARE IN4454.
- ② PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
- ③ TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.
- ④ THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.
- ⑤ VALUES ARE SELECTED IN TEST.
- ⑥ BASE DRIVER CARD 01, 2, 3, 4, 7 AND 8 ARE MOUNTED ON HEATSINK.

MICROCIRCUIT INFORMATION FOR CONTROL CARD A1

REF DES	COMMON DEVICE	PWR (V DC)		
		+5	+15	GND
U1				
U2	54LS112	16		8
U3	54LS10	14		7
U4	5407	14		7
U5	H11A1			
U6	LM224		4	11
U7	LM239		3	12
U8	H11A1			
U9	LM119		10	2

647-7197  
TPA-3033-025

1000-Watt Converter Module, Schematic Diagram  
Figure 4 (Sheet 2)

# 500-Watt Converter Module (646-6882-001)



Rockwell  
International

instructions

Collins Telecommunications Products Division

523-0771675-001211

15 September 1982

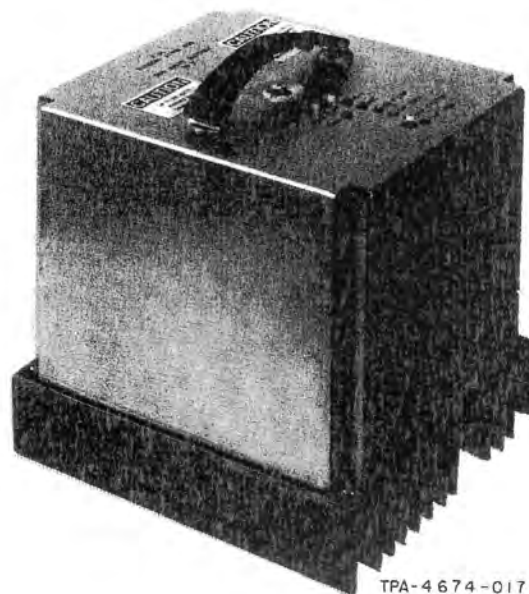
Printed in USA

500-Watt Converter Module  
(646-6882-001)

## 1. DESCRIPTION

500-Watt Converter Module 646-6882-001 (figure 1) is a plug-in modular assembly consisting of two printed circuit cards, a test point terminal board, a heat sink, and a mechanically configured assembly. This assembly is enclosed in a metal protective covering forming the module.

All electrical connections to the 500-watt converter module are made through a 3-pin Cannon connector (P1) and a 17-pin Cannon connector (P2). Subassemblies A1 and A2 are interconnected internally using 34-pin and 12-pin connectors (P3 and P4 respectively) and one 10-pin pendant cable connector (A2P1).



TPA-4 674-017

500-Watt Converter Module  
Figure 1

523-0771675-001211



## **2. PRINCIPLES OF OPERATION**

### **2.1 General**

The 500-watt converter module is a dc-dc power converter and consists of two primary circuits: a power circuit and a control circuit.

### **2.2 Block Diagram Theory (Refer to figure 2)**

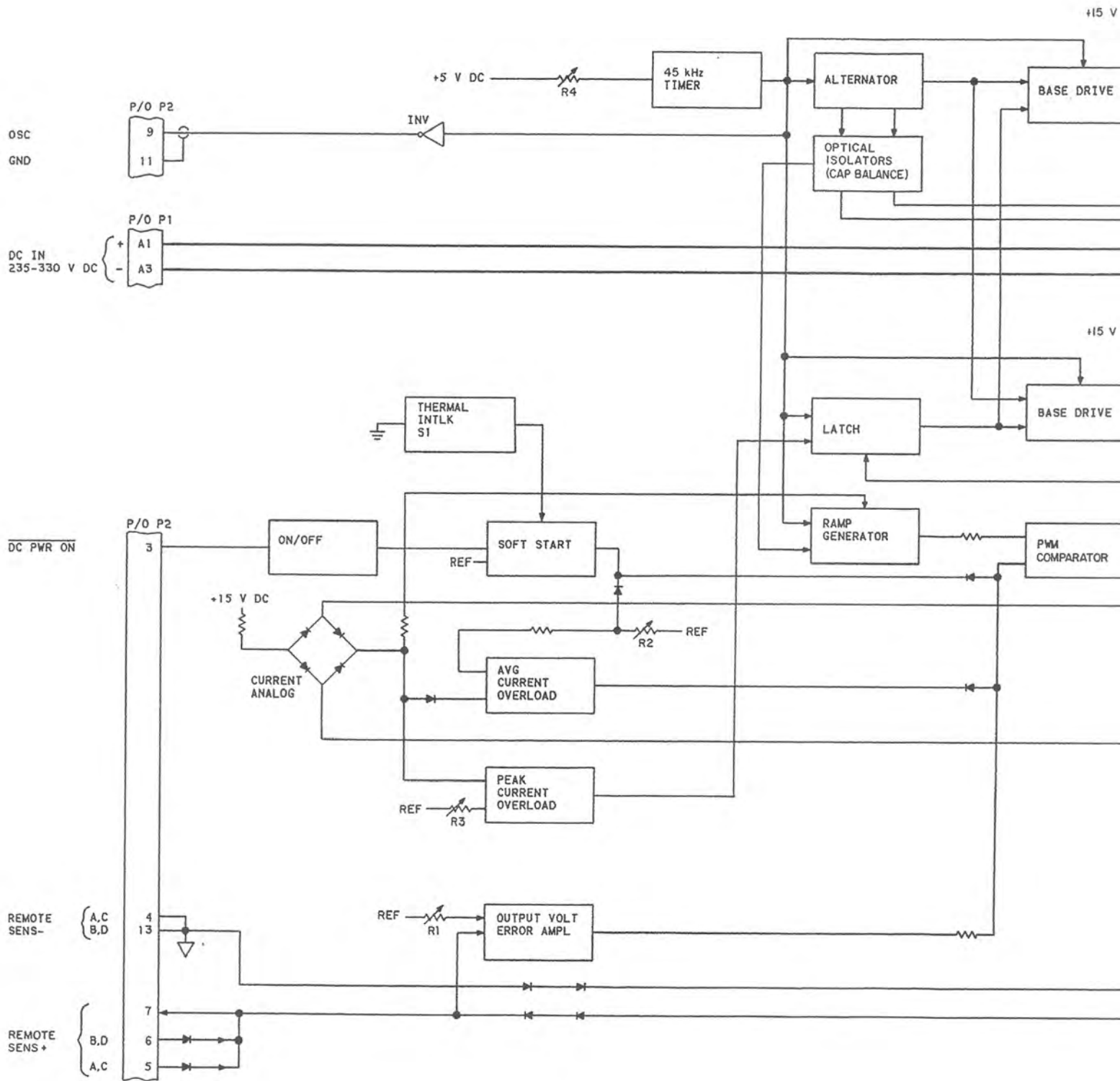
The dc input power source (rectified ac) is filtered by an input filter consisting of two balanced capacitors and equal bleeder resistors. The two balanced capacitors are coupled with two transistor switches, Q1 and Q2, to form a full-wave 4-element bridge. This is driven by a square-wave signal (alternating between Q1 and Q2) to produce a symmetrical square wave which drives power transformer T1 and current sampling transformer T2. The output from the secondary of T1 is rectified and filtered to produce pure dc (+35 V dc) at P2-A1, -A2.

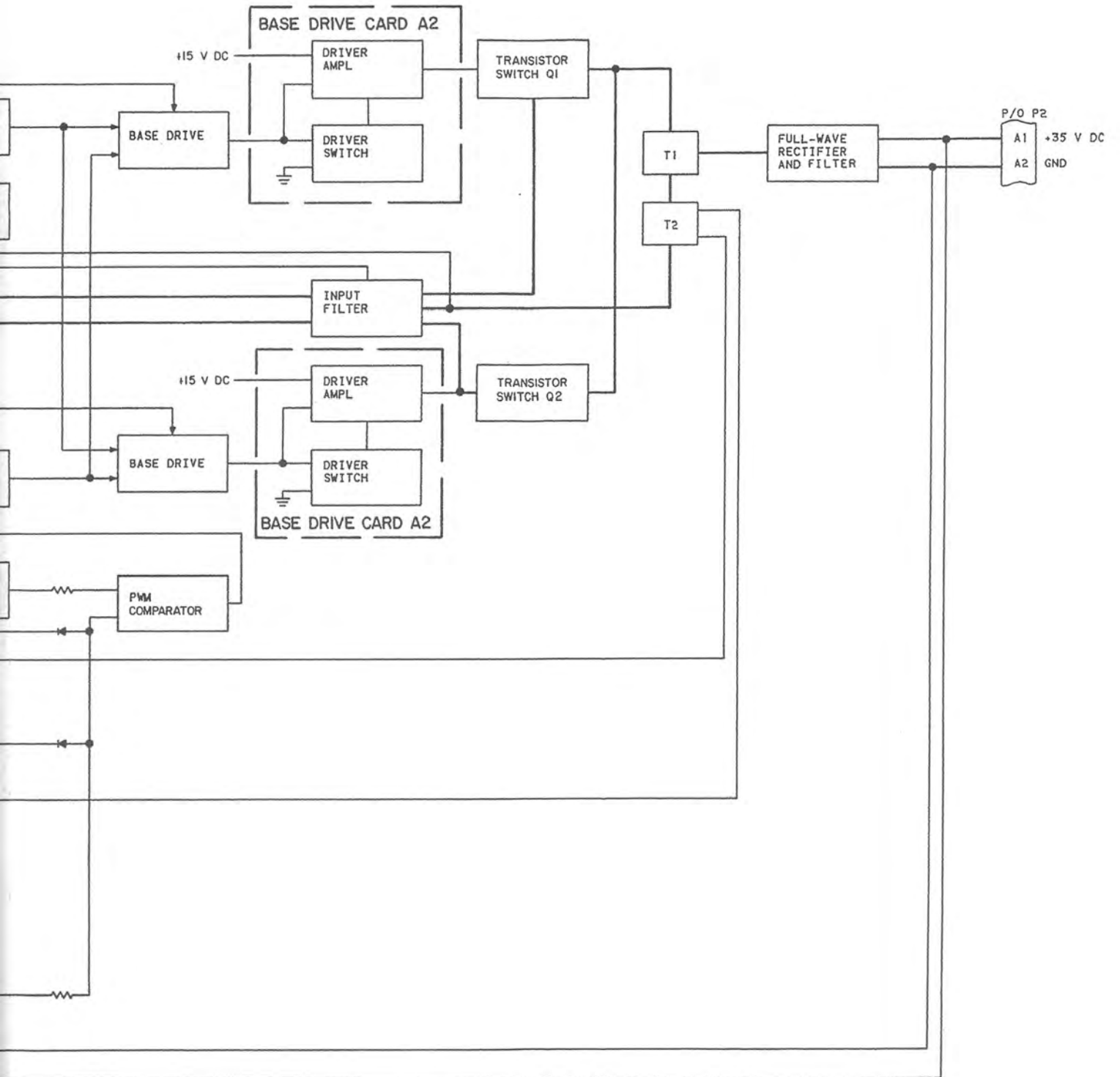
The control loop (with pulse width modulation) is made up of an error amplifier that compares the output voltage (via the remote sense lines) against a stable reference and produces a dc signal to be used by the PWM comparator. The PWM comparator produces a pulse-width modulated signal by comparison of the error signal (dc signal) and the ramp signal

from the ramp generator. The ramp signal is generated from the voltage waveform on secondary of T2. This voltage represents the current waveform of T1 and generates a ramp signal on each half cycle that is proportional to the amperes times second products of each half cycle of T1 current. The ramp signal is in sync with the clock signal (from 45-kHz timer) so that it starts at zero volt at each half cycle of the square-wave drive signal. The ramp signal changes toward a set voltage with a set rate of rise. When the ramp signal equals the error signal, the power transistors (transistor switches Q1, Q2) are turned off for the remainder of the cycle. The on-off control of the power transistors is accomplished through the base drive card A2, with gating being done by driver switches. Flip-flop A1U2A (alternator) is driven by 45-kHz signal and alternates outputs at the clock rate so that power transformer gets an alternating drive signal.

Optical isolators are controlled by an unbalanced condition of the input balanced capacitors and change the loading of the associated half cycle accordingly to force a balanced condition. The unbalanced condition is then supplied to the ramp generator in proper phase (balanced).

A dc power and thermal interlock are provided for positive control and protection of the 500-watt converter module.





TPA-5558-014

Block Diagram  
Figure 2

**3. TESTING/TROUBLESHOOTING PROCEDURES**

A defective 500-watt converter module can be returned to a Rockwell-Collins authorized repair facility for repair. Contact the nearest Rockwell-Collins office or

Collins Telecommunications Products Division  
Attention: HF Products  
400 Collins Road, NE  
Cedar Rapids, Iowa 52498

for information and instructions.

**4. ALIGNMENT/ADJUSTMENT**

Alignment/adjustment is performed in conjunction with testing/troubleshooting.

**5. REPAIR**

Repair is accomplished using standard shop practices.

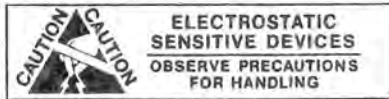
## 6. PARTS LIST/DIAGRAMS

### 6.1 Introduction

**Caution**

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All parts list illustrations containing ESDS items are shown with the following symbol:



This paragraph assists in identification and requisition of parts. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included. The parts location illustration shows component placement on the circuit cards.

### 6.2 Parts List

REF DES Column — Reference designators and/or item numbers for each part/subassembly are listed in alphanumeric or numeric sequence. These are the reference designators and/or item numbers shown on the parts location illustration. Only the reference designators are shown on the schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modification.

Modifications are identified by two methods: An alphanumeric identifier is assigned to each electrical design change and listed in the REVISION IDENT column of the modification history. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change.

NA (not applicable) in the REVISION IDENT column indicates a documentation change and/or mechanical change. This revision activity will be noted in the DESCRIPTION column of the parts list only. This change does not affect the circuit card/subassembly

components or the schematic. Each change relates to the REV (revision identifier) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history. Dash (—) denotes original; letter A first change; letter B second change, etc.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

### 6.3 How To Use This Parts List

To locate a part number, locate the part and its item number and/or reference designator on the illustration. Turn to the parts list page and find the item number and/or reference designator to determine its description and part number.

To locate the illustration for a part, if the reference designator and/or part number are known, refer to the parts list and find the figure and item number indicated in the parts list for location on the illustration.

### 6.4 Manufacturer's Code, Name, and Address

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
00779	AMP INC P O BOX 3608 HARRISBURG PA 17105
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49 DALLAS TX 75265
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
03506	ANGELUS FURNITURE MFG CO 3650 E OLYMPIC LOS ANGELES CA 90023

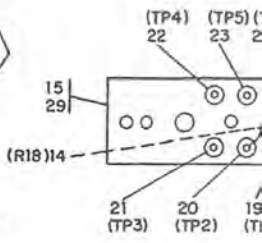
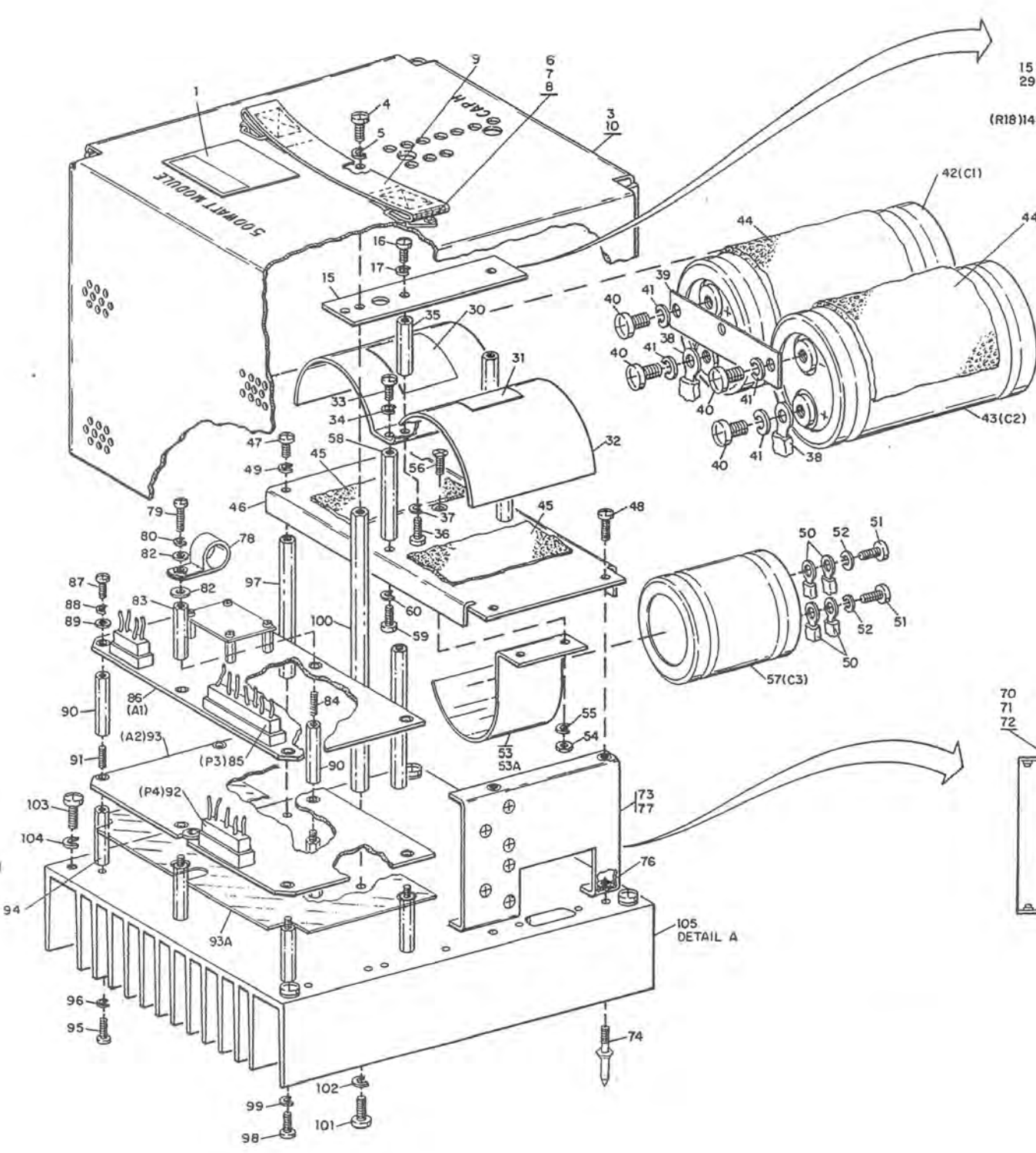
<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>	<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
04099	CAPCO INC FORESIGHT INDUSTRIAL PARK P O BOX 2164 GRAND JUNCTION CO 81501	18796	ERIE TECHNOLOGICAL PRODUCTS INC STATE COLLEGE DIV 1900 W COLLEGE AVE STATE COLLEGE PA 16801
04713	MOTOROLA INC SEMICONDUCTOR GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008	24036	CLEMENS CANVAS AND MFG 839 SECOND AVE SW P O BOX 1464 CEDAR RAPIDS IA 52406
05411	DU PAGE MFG CO 2250 CURTISS AVE DOWNERS GROVE IL 60515	27014	NATIONAL SEMICONDUCTOR CORP 2900 SEMICONDUCTOR DR SANTA CLARA CA 95051
08289	BLINN DELBERT CO INC THE 1678 E MISSION BLVD P O BOX 2007 POMONA CA 91766	31433	UNION CARBIDE CORP ELECTRONICS DIV HWY 276 SE P O BOX 5928 GREENVILLE SC 29606
12615	U S TERMINALS INC 7504 CAMARGO ROAD CINCINNATI OH 45243	34335	ADVANCED MICRO DEVICES 901 THOMPSON PL SUNNYVALE CA 94086
12954	SIEMENS CORP COMPONENTS GROUP 8700 E THOMAS RD P O BOX 1390 SCOTTSDALE AZ 85252	51642	CENTRE ENGINEERING INC 2820 E COLLEGE AVE STATE COLLEGE PA 16801
12969	UNITRODE CORP 580 PLEASANT ST WATERTOWN MA 02172	56289	SPRAGUE ELECTRIC CO 87 MARSHALL ST NORTH ADAMS MA 01247
12998	QUALITY NAME PLATE INC MILL ROAD EAST GLASTONBURY CT 06025	57582	KAHGAN ELECTRONICS CORP 556 PENINSULA BLVD HEMPSTEAD NY 11550
13103	THERMALLOY CO INC 2021 W VALLEY VIEW LANE P O BOX 340839 DALLAS TX 75234	71279	CAMBRIDGE THERMIONIC CORP 445 CONCORD AVE CAMBRIDGE MA 02138
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV 855 35TH ST NE P O BOX 728 CEDAR RAPIDS IA 52498	71468	ITT CANNON ELECTRIC DIV OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORP 10550 TALBERT AVE P O BOX 8040 FOUNTAIN VALLEY CA 92708
14099	SEMTECH CORP 652 MITCHELL ROAD NEWBURY PARK CA 91320	72962	ESNA DIV OF AMERACE CORP 2330 VAUXHALL ROAD UNION NJ 07083
14604	ELMWOOD SENSORS INC 1655 ELMWOOD AVENUE CRANSTON RI 02907	72982	ERIE TECHNOLOGICAL PRODUCTS INC 645 W 11TH ST ERIE PA 16512
15857	MODULAR ELECTRONICS CO INC 4386 E LA PALMA AVE ANAHEIM CA 92806	73386	FREED TRANSFORMER CO INC 1718 WIERFIELD ST RIDGEMOOD QUEENS NY 11385
16037	SPRUCE PINE MICA CO INC P O BOX 219 SPRUCE PINE NC 28777	77147	PATTON-MACGUYER CO DIV OF AVID CORP 17 VIRGINIA AVE PROVIDENCE RI 02905
17856	SILICONIX INC 2201 LAURELWOOD RD SANTA CLARA CA 95054	77250	ALLIED PRODUCTS CORP PHEOLL MFG CO DIV 5700 W ROOSEVELT RD CHICAGO IL 60650

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
79807	WROUGHT WASHER MFG INC 2100 S BAY ST MILWAUKEE WI 53207
80223	TRW INC TRW UNITED TRANSFORMER DIV 150 VARICK ST NEW YORK NY 10013
80294	BOURNS INSTRUMENTS INC 6135 MAGNOLIA AVE RIVERSIDE CA 92506
81349	MILITARY SPECIFICATIONS
88044	AERONAUTICAL STANDARD
91637	DALE ELECTRONICS INC P O BOX 609 COLUMBUS NE 68601
91886	MICRODOT MANUFACTURING INC MALCO MFG DIV 12 PROGRESS DR MONTGOMERYVILLE PA 18936
96906	MILITARY STANDARD
98291	SEAELECTRO CORP 225 HOYT MAMARONECK NY 10544
98330	POLYPHASE INSTRUMENT CO 175 COMMERCE DR FORT WASHINGTON PA 19034
99392	MEPCO/ELECTRA INC ROXBORO DIV INDUSTRIAL DR P O BOX 1223 ROXBORO NC 27573

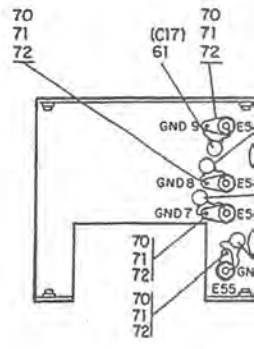
### 6.5 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions. Configuration history before 1 April 1982 is not recorded in this section.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
500-Watt Converter Module	646-6882-001	REV H
Control Board A1	642-3513-001	REV G
Peak Current Overload Board A1A1	646-5908-001	REV A
Base Driver Card A2	642-3232-001	REV C

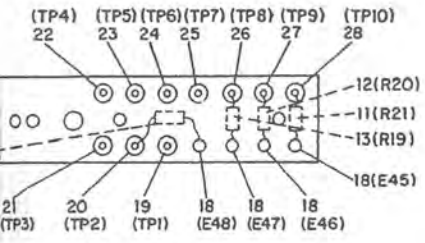


NOTE:  
COMP  
UNDE

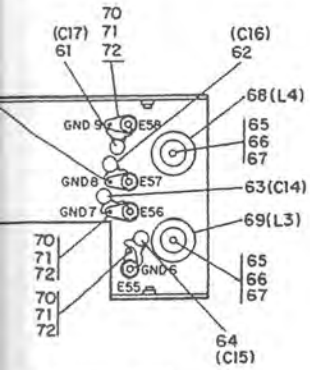


VIEW ROTATED 180

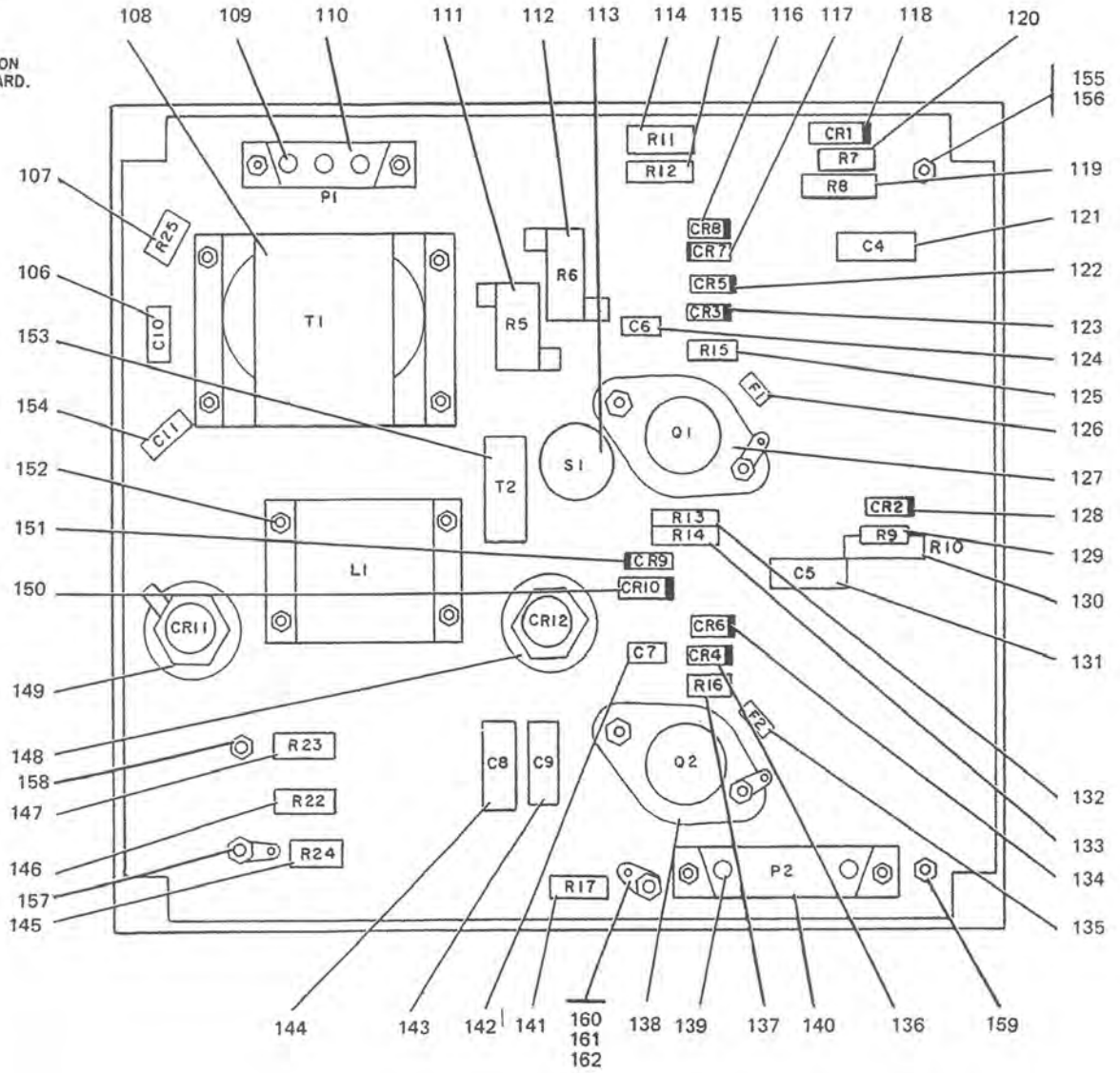




NOTE:  
 COMPONENTS ARE MOUNTED ON  
 UNDERSIDE OF TERMINAL BOARD.



VIEW ROTATED 180°



DETAIL A

TPA-4522-019



TPA-4446-014

500-Watt Converter Module, Parts Location Diagram  
 Figure 3 (Sheet 1 of 6)

## PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE	REF DES	DE
	500 WATT CONVERTER MODULE (ESDS)	646-6882-001					74	GU
1	LABEL,PRESSURE SENS	200-1368-730		12998	280-1368-730		75	NO
2	LABEL,PRESSURE SENS	280-1368-350		12998	280-1368-350		76	
3	COVER,MODULE (QTY 1)	646-6798-002					77	
4	SCREW,MACHINE SST, 6-32 X 3/8 (AP)(QTY 1)	343-0187-000		96906	MS51957-43		78	SC
5	WASHER,LOCK SST, 0.168 ID X 0.296 OD (AP)(QTY 1)	310-0072-000		96906	MS35338-137		79	SC
6	HANDLE,BAIL-COVER (QTY 2)	546-6127-002		546-6127-002			80	WA
7	HANDLE,RETAINER (QTY 2)	546-6126-002		546-6126-002			81	HO
8	BRACKET (QTY 1)	646-6798-005					82	HA
	RIVET,SOLID AL, 0.094 DIA X 0.187 (AP FOR 7,8)(QTY 4)	305-1154-000		96906	MS20470AD3-3		83	PO
9	STRAP,WEBBING (QTY 1)	011-0116-030		24036	011-0116-030		84	ST
10	COVER (QTY 1)	646-6798-004					85	HO
11	RESISTOR,FXD CHPSN, 0.22MEGO, 10%, 1/2W R21	745-1450-000		81349	RCR20G224KS		86	CO
12	RESISTOR,FXD CHPSN, 0.22MEGO, 10%, 1/2W R20	745-1450-000		81349	RCR20G224KS		87	SC
13	RESISTOR,FXD CHPSN, 0.22MEGO, 10%, 1/2W R19	745-1450-000		81349	RCR20G224KS		88	WA
14	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W R18	745-0785-000		81349	RCR07G10KS		89	MA
15	TERMINAL BOARD	646-6557-001					90	MA
16	SCREW,MACH SST, 6-32 X 5/16 (AP)(QTY 2)	343-0168-000		96906	MS51957-27		91	ST
17	WASHER,LOCK SST, 0.141 ID X 0.250 OD (AP)(QTY 2)	310-0282-000		96906	MS35338-136		92	HO
18	TERMINAL,STDF E45-E48	306-1521-000		12615	SL439-433MHT		93	COM
19	TEST JACK TERM TP1	306-2241-020		12615	SL490-456BRN		94	INS
20	TEST JACK TERM TP2	306-2241-030		12615	SL490-456RED		95	POS
21	TEST JACK TERM TP3	306-2241-040		12615	SL490-456ORN		96	SCR
22	TEST JACK TERM TP4	306-2241-050		12615	SL490-456YEL		97	WAS
23	TEST JACK TERM TP5	306-2241-060		12615	SL490-456GRN		98	MA
24	TEST JACK TERM TP6	306-2241-070		12615	SL490-456BLU		99	POS
25	TEST JACK TERM TP7	306-2241-080		12615	SL490-456VIO		100	SCR
26	TEST JACK TERM TP8	306-2241-090		12615	SL490-456GY		101	WAS
27	TEST JACK TERM TP9	306-2241-100		12615	SL490-456MHT		102	MA
28	TEST JACK TERM TP10	306-2241-010		12615	SL490-456BLK		103	POS
29	BOARD (QTY 1)	646-6557-002					104	SCR
30	LABEL,PRESSURE SENS	280-1368-740		12998	280-1368-740		105	HEA
31	LABEL,PRESSURE SENS	280-1368-180		12998	280-1368-180		106	CAP
32	CLAMP,CAPACITOR (QTY 1)	646-6556-001					107	RES
33	SCREW,MACH SST, 6-32 X 5/16 (AP)(QTY 2)	343-0168-000		96906	MS51957-27		108	TRA
34	WASHER,LOCK SST, 0.141 ID X 0.250 OD (AP)(QTY 2)	310-0282-000		96906	MS35338-136		109	SCR
35	POST,HEX (QTY 2)	540-9221-003		540-9221-003			110	CON
36	SCREW,MACH SST, 6-32 X 5/16 (AP)(QTY 2)	343-0168-000		96906	MS51957-27		111	COM
37	WASHER,LOCK SST, 0.141 ID X 0.250 OD (AP)(QTY 2)	310-0282-000		96906	MS35338-136		112	NUT
38	TERMINAL,LUG (QTY 2)	304-1284-000		96906	MS25036-157		113	WASH
39	STRIP,ELECTRIC (QTY 1)	646-6817-001					114	RES
40	SCREW,MACH SST, 1/4-28 X 3/8 (AP FOR 38,39)(QTY 4)	343-0279-000		96906	MS51958-77		115	RES
41	WASHER,SPRING CD PL BRZ, 0.255 ID X 0.489 OD (AP FOR 38,39)(QTY 4)	310-0102-000		96906	MS35338-101		116	NUT
42	CAPACITOR,FXD AL ELEK, 1400UF, P75%10%, 250VDC C1	183-1511-090		99392	3120FC142T250DP		117	SEM
43	CAPACITOR,FXD AL ELEK, 1400UF, P75%10%, 250VDC C2	183-1511-090		99392	3120FC142T250DP		118	RES
44	PAD,COMPRESSION (QTY 2)	646-6816-001					119	RES
45	PAD,COMPRESSION (QTY 2)	646-6816-002					120	NUT
46	MOUNT,CAPACITOR (QTY 1)	646-6555-001					121	SEM
47	SCREW,MACH SST, 6-32 X 5/16 (AP)(QTY 2)	343-0168-000		96906	MS51957-27		122	SEM
48	SCREW,MACH SST, 4-40 X 5/16 (AP)(QTY 2)	343-0134-000		96906	MS51957-14		123	SEM
49	NOT USED						124	CAP
50	TERMINAL,LUG (QTY 4)	304-1282-000		96906	MS25036-112		125	FUSE
51	SCREW,MACH SST, 10-32 X 3/8 (AP)(QTY 2)	343-0226-000		96906	MS51958-61		126	SEM
52	WASHER,SPRING CD PL BRZ, 0.194 ID X 0.334 OD (AP)(QTY 2)	310-0100-000		96906	MS35338-100		127	CAP
53	CLAMP,CAPACITOR (QTY 1)	646-6554-001					128	RES
53A	PAD,COMPRESSION	646-6816-002					129	SEM
54	NUT,PLAIN,HEX SST, 6-32 (AP)(QTY 2)	313-0045-000		77250	P313-0045-000		130	SEM
55	WASHER,LOCK SST, 0.141 ID X 0.250 OD (AP)(QTY 2)	310-0282-000		96906	MS35338-136		131	RES
56	SCREW,MACHINE CRES, 6-32X5/16 (AP)(QTY 2)	342-0061-000		96906	MS51959-27		132	SEM
57	CAPACITOR,FXD AL ELEK, 4600UF, P75%10%, 75VDC C3	183-1511-100		99392	3120EA462T075BP		133	CAP
58	POST,HEX (QTY 2)	540-9230-003		540-9230-003			134	SEM
59	SCREW,MACH SST, 6-32 X 5/16 (AP)(QTY 2)	343-0168-000		96906	MS51957-27		135	SEM
60	WASHER,LOCK SST, 0.141 ID X 0.250 OD (AP)(QTY 2)	310-0282-000		96906	MS35338-136		136	CAP
61	CAPACITOR,FXD CER DIEI, 4700PF, 20%, 500V C17	913-1187-000		81349	CK62AM472M		137	FUSE
62	CAPACITOR,FXD CER DIEI, 4700PF, 20%, 500V C16	913-1187-000		81349	CK62AM472M		138	TRAN
63	CAPACITOR,FXD CER DIEI, 4700PF, 20%, 500V C15	913-1187-000		81349	CK62AM472M		139	NUT
64	CAPACITOR,FXD CER DIEI, 4700PF, 20%, 500V C14	913-1187-000		81349	CK62AM472M		140	WASH
65	RETAINER,TOROID (QTY 2)	679-1814-000		15857	D100-2-440		141	MA
66	SCREW,MACH SST, 4-40 X 1/2 (AP)(QTY 2)	342-0048-000		96906	MS51959-17		142	WASH
67	WASHER VARN CTD PLSTC, 0.144 ID X 5/8 OD (AP)(QTY 2)	540-3025-003		540-3025-003			143	MA
68	INDUCTOR,PHR L4	678-0304-010		80223	APD325		144	BUSH
69	INDUCTOR,PHR L3	678-0304-010		80223	APD325		145	BUSH
70	TERMINAL,STUD E55-E58	306-2513-250		71279	4814-1-0516		146	TERM
71	TERMINAL,LUG (QTY 4)	304-0016-000		77147	4007-6HT		147	INSU
72	SCREW,MACH SST, 4-40 X 1/4 (AP FOR 70,71)(QTY 4)	342-0044-000		96906	MS51959-13		148	INSU
73	BRACKET,MOUNT (QTY 1)	647-7348-001					149	REV
74	SCREW,MACH SST, 4-40 X 5/16 (AP)(QTY 2)(EFF TO REV LTR H)	343-0134-000		96906	MS51957-14		150	SCRE

PARTS LIST (Cont)

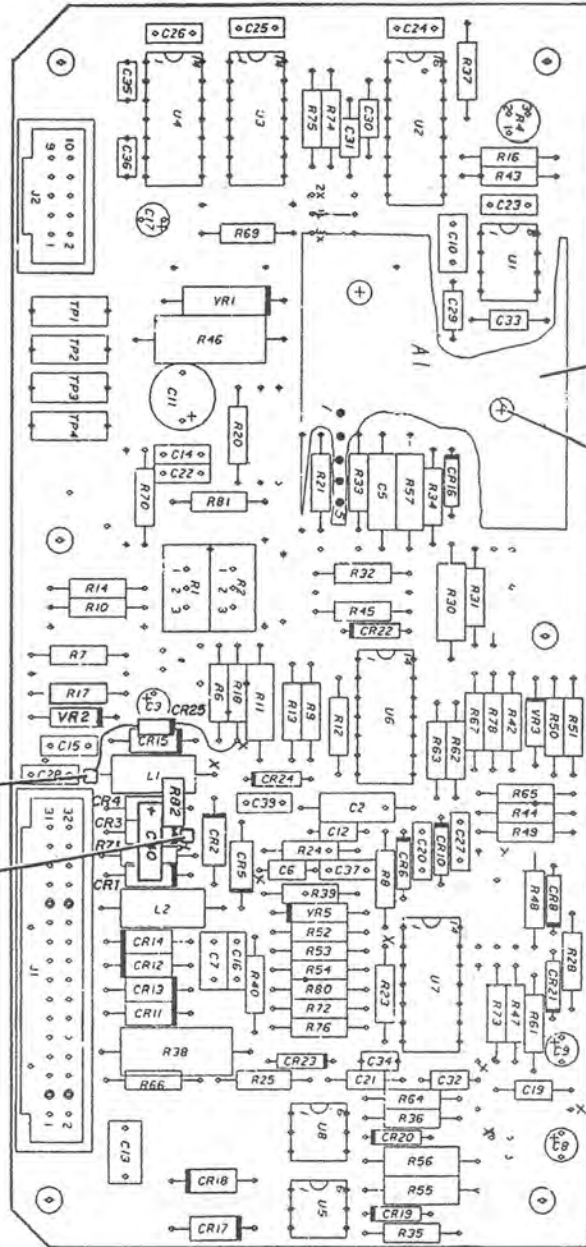
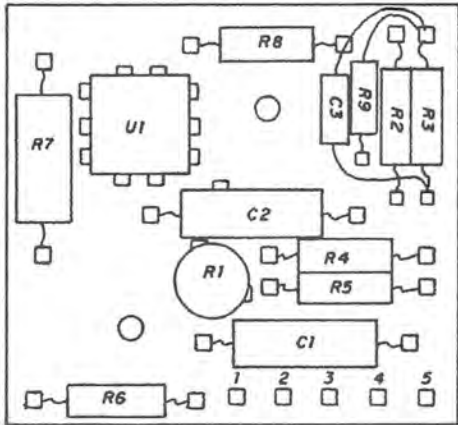
NUMBER	SMR CODE	REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE	REF DES	DESCRIPTION
		74	GUIDE,PIN (QTY 2)(EFF REV LTR H)	646-6873-001					126	RESISTOR,FIXED 220 OHMS, 5%, 6.5W R9
		75	NOT USED						129	SEMICONV DEVICE CR2
8-730		76	NUT,SLFLKG,CLINCH CD PL STL, 4-40 (QTY 4)	333-0840-000		81349	M45938/5-4		130	RESISTOR,FIXED 220 OHMS, 5%, 6.5W R10
8-350		77	BRACKET (QTY 1)	647-7348-002					131	CAPACITOR,FXD PPR-HYLAR DIEI, 0.01UF, 160V C5
		78	CLAMP,LOOP (QTY 1)	150-0708-040		96906	MS25281R5		132	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 2W R11
-43		79	SCREW,MACH SST, 4-40 X 1/2 (AP)(QTY 1)	343-0137-000		96906	MS51957-17		133	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 2W R12
-137		80	WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 1)	310-0279-000		96906	MS35338-135		134	SEMICONV DEVICE CR6
7-002		81	NOT USED						135	FUSE F2
6-002		82	WASHER,FLAT TP BR5, 0.149 ID X 0.375 OD (AP)(QTY 2)	310-0751-040		88044	AH961-6T		136	SEMICONV DEVICE CR4
AD3-3		83	POST,HEX (QTY 1)	540-9053-003			540-9053-003		137	RESISTOR,FIXED CMPSN, 47 OHMS, 10%, 1/4W R13
		84	STUD,CONT THD STL, 4-40 X 3/8 (QTY 1)	312-0007-000		77250	P312-0007-000		138	TRANSISTOR,POWER R2
6-030		85	HOUSING,CONN,ELEC P3 CONTACT,ELEC (QTY 2)	372-0044-140 372-2501-050		00779	2-87631-7 00779 86015-2			NUT,PLAIN,HEX NP BR5, 4-40 (AP)(QTY 2)
24KS		86	CONTROL BOARD A1	642-3513-001						WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 2)
24KS		87	SCREW,MACH SST, 4-40 X 5/16 (AP)(QTY 5)	343-0134-000		96906	MS51957-14			BUSHING,INSULATED (AP)(QTY 2)(EFF TO REV LTR H)
24KS		88	WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 5)	310-0279-000		96906	MS35338-135			BUSHING,INSULATED (AP)(QTY 2)(EFF REV LTR H)
03KS		89	WASHER,FLAT CRES, 0.125ID X 0.250 OD (AP)(QTY 5)	310-0779-030		96906	MS15795-803			INSULATOR,PLATE (AP)(QTY 2)
-27		90	POST,ELEC-MECH (QTY 6)	540-9051-003			540-9051-003			SHIELD,TRANSISTOR (AP)(QTY 1)
-136		91	STUD,CONT THD STL, 4-40 X 3/8 (QTY 6)	312-0007-000		77250	P312-0007-000			INSULATOR (AP)(QTY 1)
33MHT		92	HOUSING,CONN,ELEC P4 CONTACT,ELEC (QTY 2)	372-0044-040 372-2501-040		00779	87631-7 00779 86016-2			SCREW,MACH STL, 4-40 X 1/2 (AP)(QTY 2)(EFF REV LTR H)
56BRN			PLUG,KEYING (QTY 2)	372-2641-020		00779	87077-1			SCREW,MACH STL, 4-40 X 5/8 (AP)(QTY 2)(EFF REV LTR H)
56DRN		93	BASE DRIVER CARD (ESDS) A2	642-3232-001					139	CONTACT,ELEC (QTY 2)
56EVL		94	INSULATOR	646-6836-001					140	CONNECTOR,RCPT ELEC P2
56GRN		95A	POST,HEX (QTY 6)	540-9053-003			540-9053-003			NUT,SLFLKG,HEX AL, 2-56 (AP)(QTY 2)
56BLU		95	SCREW,MACH SST, 4-40 X 5/16 (AP)(QTY 6)	343-0134-000		96906	MS51957-14			SCREW,MACH SST, 2-56 X 3/8 (AP)(QTY 2)
58VIO		96	WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 6)	310-0279-000		96906	MS35338-135		141	RESISTOR,FIXED MM, 1.2K, 5%, 6.5W R17
58GY			POST,HEX (QTY 2)	540-9238-003			540-9238-003		142	CAPACITOR,FXD CER DIEI, 1000PF, 20%, 10V R14
58MHT		98	SCREW,MACH SST, 6-32 X 5/16 (AP)(QTY 2)	343-0168-000		96906	MS51957-27		143	CAPACITOR,FIXED PLSTC DIEI, 1UF, 10%, 25V R15
58BLK		99	WASHER,LOCK SST, 0.141 ID X 0.250 OD (AP)(QTY 2)	310-0282-000		96906	MS35338-136		144	CAPACITOR,FIXED PLSTC DIEI, 1UF, 10%, 25V R16
3-740		100	POST,HEX (QTY 1)	646-6818-001					145	RESISTOR,FIXED MM, 820 OHMS, 5%, 6.5W R18
3-180		101	SCREW,MACHINE SST, 8-32 X 3/8 (AP)(QTY 1)	343-0187-000		96906	MS51957-43		146	RESISTOR,FIXED MM, 820 OHMS, 5%, 6.5W R19
-27		102	WASHER,LOCK SST, 0.168 ID X 0.296 OD (AP)(QTY 1)	310-0072-000		96906	MS35338-137		147	SEMICONV DEVICE CR12
-136		103	SCREW,MACH CD PL STL, 8-32 X 3/4 (AP)(QTY 4)	330-1375-000		77250	P330-1375-000		148	SEMICONV DEVICE CR11
1-003		104	WASHER,LOCK SST, 0.168 ID X 0.296 OD (AP)(QTY 4)	310-0072-000		96906	MS35338-137		149	NUT,PLAIN,HEX TP BR5, 1/4-28 (AP FOR 148,149)(QTY 2)
-27		105	HEATSINK (QTY 1)	646-6551-001						WASHER,LOCK CD PL BRZ, 0.255 ID X 0.469 OD (AP FOR 148,149)(QTY 2)
-136		106	CAPACITOR,FXD MICA DIEI, 4700PF, 5%, 300V C10	912-3366-000		57582	KD20472J301			WASHER,FLAT BR5, 0.265 ID X 0.625 OD (AP FOR 148,149)(QTY 2)
157		107	RESISTOR,FXD CMPSN, 22 OHMS, 10%, 2W R25	745-5582-000		81349	RCR426220KS			INSULATOR,WASHER MICA, 0.265 ID X 1.0 OD (AP FOR 148,149)(QTY 4)
77		108	TRANSFORMER,RF T1	662-0935-010		96906	MS51957-31			SPACER,INSULATING (AP FOR 148,149)(QTY 4)
101		109	SCREW,MACH SST, 6-32 X 5/8 (AP)(QTY 4)	343-0173-000		96906	MS51957-31			LUG,SOLDER (AP FOR 148,149)(QTY 2)
2T2500P		110	CONTACT,ELEC (QTY 2)	371-2593-030		71468	DMS3745-27		150	SEMICONV DEVICE CR10
		111	CONNECTOR,RCPT ELEC P1	371-0907-000		71468	DAH3M3P		151	SEMICONV DEVICE CR9
		112	NUT,PLAIN,HEX NP BR5, 4-40 (AP)(QTY 2)	313-0051-000		77250	P313-0051-000		152	INDUCTOR L1
			WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 2)	310-0279-000		96906	MS35338-135			SCREW,MACH SST, 6-32 X 7/16 (AP)(QTY 4)
2T2500P		113	SCREW,MACH SST, 4-40 X 3/8 (AP)(QTY 2)	342-0046-000		96906	MS51959-15		153	TRANSFORMER,RF T2
			RESISTOR,FIXED MM, 12.4K, 1%, 12.5W R5	747-0985-560		91637	RH10X012ERAF			SCREW,MACH SST, 4-40 X 5/16 (AP)(QTY 2)
			RESISTOR,FIXED MM, 12.4K, 1%, 12.5W R6	747-0985-560		91637	RH10X012ERAF			WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP FOR 111,112)(QTY 4)
			NUT,SLFLKG,HEX AL, 2-56 (AP,FOR 111,112)(QTY 4)	333-0604-000		72962	68-1660-26		154	CAPACITOR,FIXED CER DIEI, 0.82UF, 10%, 50V C11
27			SCREW,MACH SST, 2-56 X 3/8 (AP FOR 111,112)(QTY 4)	343-0126-000		96906	MS51957-5		155	TERMINAL,STUD (QTY 34)
14			SWITCH,THERMOSTATIC S1	267-0243-110		14604	3100-43-108		156	TERMINAL,LUG (QTY 2)
112		113	NUT,PLAIN,HEX SST, 6-32 (AP)(QTY 1)	313-0045-000		77250	P313-0045-000			SCREW,MACH SST, 4-40 X 5/16 (AP FOR 155,156)(QTY 34)
61			WASHER,LOCK SST, 0.141 ID X 0.250 OD (AP)(QTY 1)	310-0282-000		96906	MS35338-136			WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP FOR 155,156)(QTY 34)
100		114	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 2W R11	745-5610-000		81349	RCR426101KS		157	TERMINAL,LUG (QTY 7)
		115	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 2W R12	745-5610-000		81349	RCR426101KS			NUT,PLAIN,HEX SST, 6-32 (AP)(QTY 7)
5-000		116	SEMICONV DEVICE CR8	353-6558-010		14099	1N5415			WASHER,LOCK SST, 0.141 ID X 0.250 OD (AP FOR 114,115)(QTY 34)
136		117	SEMICONV DEVICE CR7	353-6558-010		14099	1N5415			SCREW,MACH SST, 6-32 X 3/8 (AP)(QTY 7)
		118	RESISTOR,FIXED 220 OHMS, 5%, 6.5W R7	747-5447-000		81349	RH67V221		158	TERMINAL,STUD (QTY 7)
		119	RESISTOR,FIXED 220 OHMS, 5%, 6.5W R8	747-5447-000		81349	RH67V221			SCREW,MACH CD PL STL, 2-56 X 1/4 (AP)(QTY 7)
27		120	SEMICONV DEVICE CR1	353-6558-050		14099	1N5419			WASHER,LOCK SST, 0.088 ID X 0.172 OD (AP FOR 120,121)(QTY 7)
2T0758P		121	CAPACITOR,FXD PPR-HYLAR DIEI, 0.01UF, 10%, 600V C4	933-1074-040		81349	M19976-10591K			GUIDE,PIN (EFF REV LTR H)
-003		122	SEMICONV DEVICE CR5	353-6558-050		14099	1N5419			NUT,PLAIN,HEX NP BR5, 4-40 (AP)(QTY 1)(EFF REV LTR H)
27		123	SEMICONV DEVICE CR3	353-6558-050		14099	1N5419			WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 1)(EFF REV LTR H)
136		124	CAPACITOR,FXD CER DIEI, 1000PF, 20%, 1000V C6	913-1186-000		81349	CK60AM102H		159	GUIDE,PIN (EFF REV LTR H)
2M		125	RESISTOR,FIXED CMPSN, 47 OHMS, 10%, 1/4W R15	745-0701-000		81349	RCR076470KS			TERMINAL,STUD (QTY 7)
2M		126	FUSE F1	264-0964-010		81349	FH04-125V5A			WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP FOR 125,126)(QTY 7)
2M		127	TRANSISTOR,POWER R1	352-6500-010		04713	HJ10009		160	GUIDE,PIN (EFF REV LTR H)
2M			NUT,PLAIN,HEX NP BR5, 4-40 (AP)(QTY 2)	313-0051-000		77250	P313-0051-000		161	TERMINAL,STUD
2M			WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 2)	310-0279-000		96906	MS35338-135		162	TERMINAL,LUG
40			WASHER,FLAT CRES, 0.125ID X 0.250 OD (AP)(QTY 2)	310-0779-030		96906	MS15795-803			WASHER,LOCK CD PL BRZ, 0.123 ID X 0.270 OD (AP FOR 160-162)(QTY 1)(EFF REV LTRH)
17			BUSHING,INSULATED (AP)(QTY 2)(EFF TO REV LTR H)	547-8177-012			547-8177-012			
-003			BUSHING,INSULATED (AP)(QTY 2)(EFF REV LTR H)	547-8177-023			547-8177-023			
516			TERMINAL,LUG (AP)(QTY 1)	304-0016-000		77147	4007-6MT			
13			INSULATOR,PLATE (AP)(QTY 1)	352-9882-010		16037	111			
			INSULATOR (AP)(QTY 1)	623-4186-001			623-4186-001			
			SCREW,MACH STL, 4-40 X 1/2 (AP)(QTY 2)(EFF TO REV LTR H)	343-0137-000		96906	MS51957-17			
14			SCREW,MACH STL, 4-40 X 5/8 (AP)(QTY 2)(EFF REV LTR H)	343-0138-000		96906	MS51957-18			

500-Watt Converter Module, Parts Location Figure 3 (Sheet 2)

PARTS LIST (Cont)

USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE	REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE
001				128	RESISTOR, FIXED 220 OHMS, 5%, 6.5W R9	747-5447-000		81349	RM67V221	
000	81349	MA5938/5-4		129	SEMICONV DEVICE CR2	353-6558-050		14099	INS419	
002				130	RESISTOR, FIXED 220 OHMS, 5%, 6.5W R10	747-5447-000		81349	RM67V221	
040	96906	MS25281R5		131	CAPACITOR, FXD PPR-HYLAR DIEI, 0.01UF, 10%, 600V C5	933-1074-040		81349	H19978-10591K	
000	96906	MS51957-17		132	RESISTOR, FXD CHPSN, 100 OHMS, 10%, 2W R13	745-5610-000		81349	RCR42G101KS	
000	96906	MS35338-135		133	RESISTOR, FXD CHPSN, 100 OHMS, 10%, 2W R14	745-5610-000		81349	RCR42G101KS	
040	80044	AN961-6T		134	SEMICONV DEVICE CR6	353-6558-050		14099	INS419	
003		540-9053-003		135	FUSE F2	264-0964-010		81349	FM04-125VSA	
000	77250	P312-0007-000		136	SEMICONV DEVICE CR4	353-6558-050		14099	INS419	
140	00779	2-87631-7		137	RESISTOR, FIXED CHPSN, 47 OHMS, 10%, 1/4W R16	745-0701-000		81349	RCR07G470KS	
050	00779	86015-2		138	TRANSISTOR, POWER Q2	352-6500-010		04713	MJ10009	
001	96906	MS51957-14			NUT, PLAIN, HEX NP BR5, 4-40 (AP)(QTY 2)	313-0051-000		77250	P313-0051-000	
000	96906	MS35338-135			WASHER, LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 2)	310-0279-000		96906	MS35338-135	
030	96906	MS15795-803			BUSHING, INSULATED (AP)(QTY 2)(EFF TO REV LTR H)	547-8177-022				
003		540-9051-003			BUSHING, INSULATED (AP)(QTY 2)(EFF REV LTR H)	547-8177-023			547-8177-023	
000	77250	P312-0007-000			TERMINAL, LUG (AP)(QTY 1)	304-0016-000		77147	4007-6HT	
040	00779	87631-7			INSULATOR, PLATE (AP)(QTY 2)	352-9082-010		16037	111	
040	00779	86016-2			SHIELD, TRANSISTOR (AP)(QTY 1)	651-3943-001				
020	00779	87077-1			INSULATOR (AP)(QTY 1)	623-4186-001			623-4186-001	
001		540-9053-003			SCREW, MACH STL, 4-40 X 1/2 (AP)(QTY 2)(EFF TO REV LTR H)	343-0137-000		96906	MS51957-17	
001	96906	MS51957-14		139	SCREW, MACH STL, 4-40 X 5/8 (AP)(QTY 2)(EFF REV LTR H)	343-0138-000		96906	MS51957-18	
000	96906	MS35338-135		140	CONTACT, ELEC (QTY 2)	371-2593-040		71468	DMS3749-25	
000	96906	MS51957-14			CONNECTOR, RCPT ELEC P2	371-0919-000		71468	DBHF17M2S	
000	96906	MS35338-135			NUT, SLFLKG, HEX AL, 2-56 (AP)(QTY 2)	333-0604-000		72962	68-1660-26	
003		540-9238-005		141	SCREW, MACH SST, 2-56 X 3/8 (AP)(QTY 2)	342-0135-000		96906	MS51959-5	
000	96906	MS51957-27		142	RESISTOR, FIXED WM, 1.2K, 5%, 6.5W R17	747-5462-000		81349	RM67V122	
000	96906	MS35338-136		143	CAPACITOR, FXD CER DIEI, 1000PF, 20%, 1000V C7	913-1186-000		81349	CK60AM102M	
001		540-9238-005		144	CAPACITOR, FIXED PLSTC DIEI, 1UF, 10%, 200V C9	933-1081-610		04099	CRC-1-610	
000	96906	MS35338-136		145	CAPACITOR, FIXED PLSTC DIEI, 1UF, 10%, 200V C8	933-1081-610		04099	CRC-1-610	
001	96906	MS51957-43		146	RESISTOR, FIXED WM, 820 OHMS, 5%, 6.5W R24	747-5458-000		81349	RM67V821	
000	96906	MS35338-137		147	RESISTOR, FIXED WM, 820 OHMS, 5%, 6.5W R22	747-5458-000		81349	RM67V821	
000	77250	P330-1375-000		148	RESISTOR, FIXED WM, 820 OHMS, 5%, 6.5W R23	747-5458-000		81349	RM67V821	
000	96906	MS35338-137		149	SEMICONV DEVICE CR12	353-3786-040		12969	UES805R	
001		57502 KD20472J301			SEMICONV DEVICE CR11	353-3786-040		12969	UES805R	
000	81349	RCR42G220KS			NUT, PLAIN, HEX TP BR5, 1/4-28 (AP FOR 148,149)(QTY 2)	313-0019-050		96906	MS35650-3255T	
010	98330	CT104678			WASHER, LOCK CD PL BRZ, 0.255 ID X 0.489 OD (AP FOR 148,149)(QTY 2)	310-0103-000		79807	310-0103-000	
030	96906	MS51957-31			WASHER, FLAT BR5, 0.265 ID X 0.625 OD (AP FOR 148,149)(QTY 2)	310-0061-000		79807	310-0061-000	
000	71468	DMS3745-27			INSULATOR, WASHYR MICA, 0.265 ID X 1.0 OD (AP FOR 148,149)(QTY 4)	302-0640-270		08289	M41-265	
000	71468	DAM3M3P		150	SPACER, INSULATING (AP FOR 148,149)(QTY 4)	352-9561-020		08289	TM-516-25-050	
000	77250	P313-0051-000		151	LUG, SOLDER (AP FOR 148,149)(QTY 2)	304-1528-010		91886	008-0131-0000	
000	96906	MS35338-135		152	SEMICONV DEVICE CR10	353-6558-010		14099	INS415	
000	96906	MS51959-15			SEMICONV DEVICE CR9	353-6558-010		14099	INS415	
060	91637	RH10X012ER4F		153	INDUCTOR L1	668-0516-010		73386	42931	
060	91637	RH10X012ER4F			SCREW, MACH SST, 6-32 X 7/16 (AP)(QTY 4)	343-0170-000		96906	MS51957-29	
000	72962	68-1660-26			TRANSFORMER, RF T2	674-0181-020		80223	APD093	
000	96906	MS51957-5		154	SCREW, MACH SST, 4-40 X 5/16 (AP)(QTY 2)	343-0134-000		96906	MS51957-14	
110	14604	3100-43-108			WASHER, LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 2)	310-0279-000		96906	MS35338-135	
000	77250	P313-0045-000		155	CAPACITOR, FIXED CER DIEI, 0.82UF, 10%, 50VDC C11	913-5019-550		81349	CK06BX824K	
000	96906	MS35338-136		156	TERMINAL, STUD (QTY 34)	306-2513-250		71279	4814-1-0516	
000	81349	RCR42G101KS			TERMINAL, LUG (QTY 2)	304-0016-000		77147	4007-6HT	
010	14099	INS415			SCREW, MACH SST, 4-40 X 5/16 (AP FOR 155,156)(QTY 34)	343-0134-000		96906	MS51957-14	
010	14099	INS415			WASHER, LOCK SST, 0.115 ID X 0.209 OD (AP FOR 155,156)(QTY 34)	310-0279-000		96906	MS35338-135	
000	81349	RM67V221		157	TERMINAL, LUG (QTY 7)	304-0016-000		77147	4007-6HT	
000	81349	RM67V221			NUT, PLAIN, HEX SST, 6-32 (AP)(QTY 7)	313-0045-000		77250	P313-0045-000	
050	14099	INS419			WASHER, LOCK SST, 0.191 ID X 0.250 OD (AP)(QTY 7)	310-0282-000		96906	MS35338-136	
040	81349	H19978-10591K		158	SCREW, MACH SST, 6-32 X 3/8 (AP)(QTY 7)	343-0169-000		96906	MS51957-28	
050	14099	INS419			TERMINAL, STUD (QTY 7)	306-1018-010		98291	013-5703-000789	
000	81349	CK60AM102M			SCREW, MACH CD PL STL, 2-56 X 1/4 (AP)(QTY 7)	343-0124-000		96906	MS51957-3	
010	81349	RCR07G470KS			WASHER, LOCK SST, 0.088 ID X 0.172 OD (AP)(QTY 7)	310-0275-000		96906	MS35338-134	
010	81349	FM04-125VSA		159	GUIDE, PIN (EFF REV LTR H)	646-6873-001				
010	04713	MJ10009			NUT, PLAIN, HEX NP BR5, 4-40 (AP)(QTY 1)(EFF REV LTR H)	313-0051-000		77250	P313-0051-000	
000	77250	P313-0051-000			WASHER, LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 1)(EFF REV LTR H)	310-0279-000		96906	MS35338-135	
000	96906	MS35338-135		160	GUIDE, PIN (EFF REV LTR H)	646-6873-001				
030	96906	MS15795-803		161	TERMINAL, STUD	306-2513-250		71279	4814-1-0516	
012		547-8177-012		162	TERMINAL, LUG	304-0016-000		77147	4007-6HT	
023		547-8177-023			WASHER, LOCK CD PL BRZ, 0.123 ID X 0.270 OD (AP FOR 160-162)(QTY 1)(EFF REV LTR H)	373-3010-000		96906	MS35333-104	
000	77147	4007-6HT								
010	16037	111								
001	96906	MS51957-17								
000	96906	MS51957-18								

500-Watt Converter Module, Parts Location Diagram  
Figure 3 (Sheet 2)



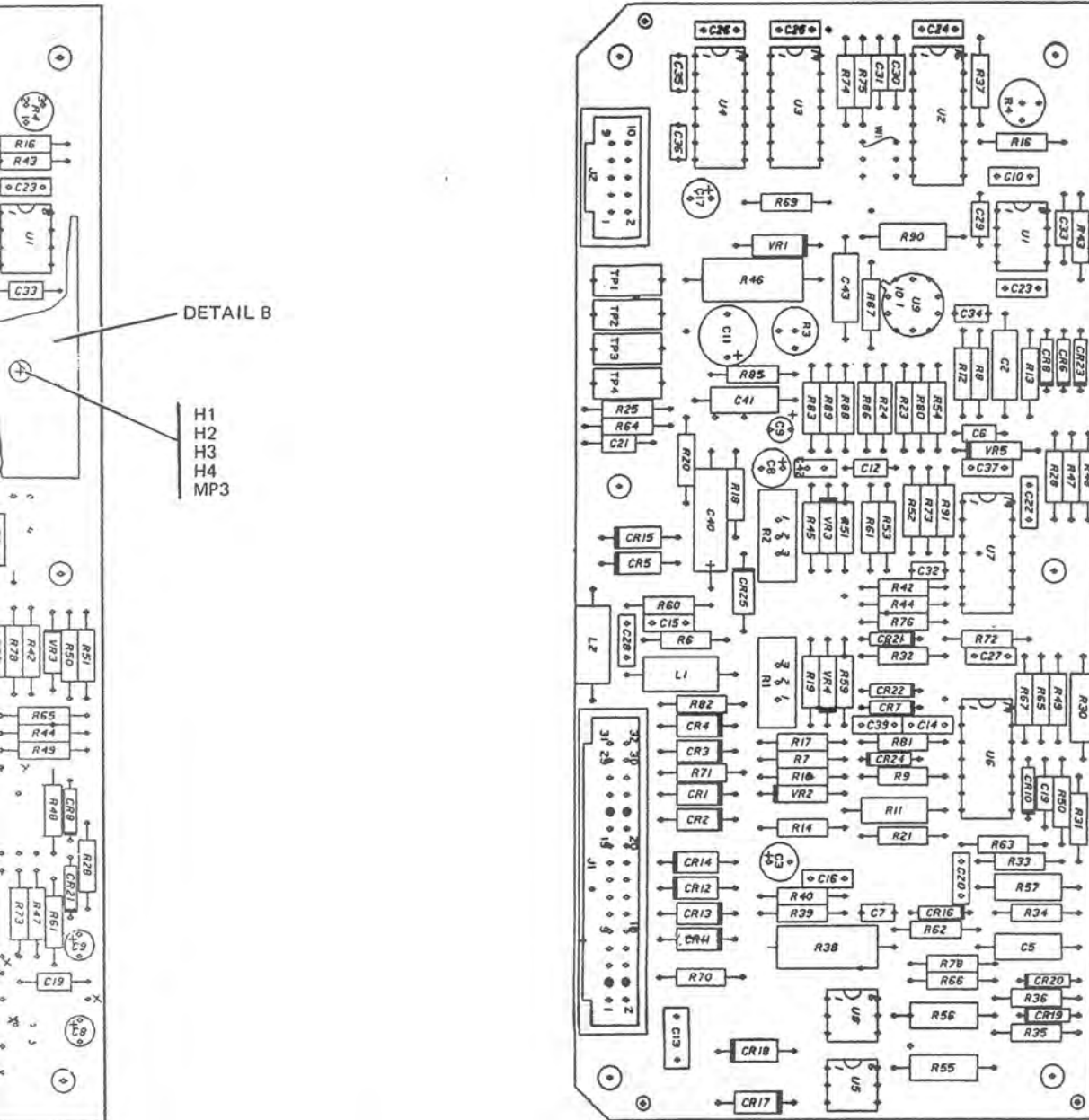
MP1

MP2

DETAIL B

A1

(EFF TO REV LTR G)



A1

(EFF REV LTR G)



TPA-4559-018

500-Watt Converter Module, Parts Location Diagram  
Figure 3 (Sheet 3)

## PARTS LIST

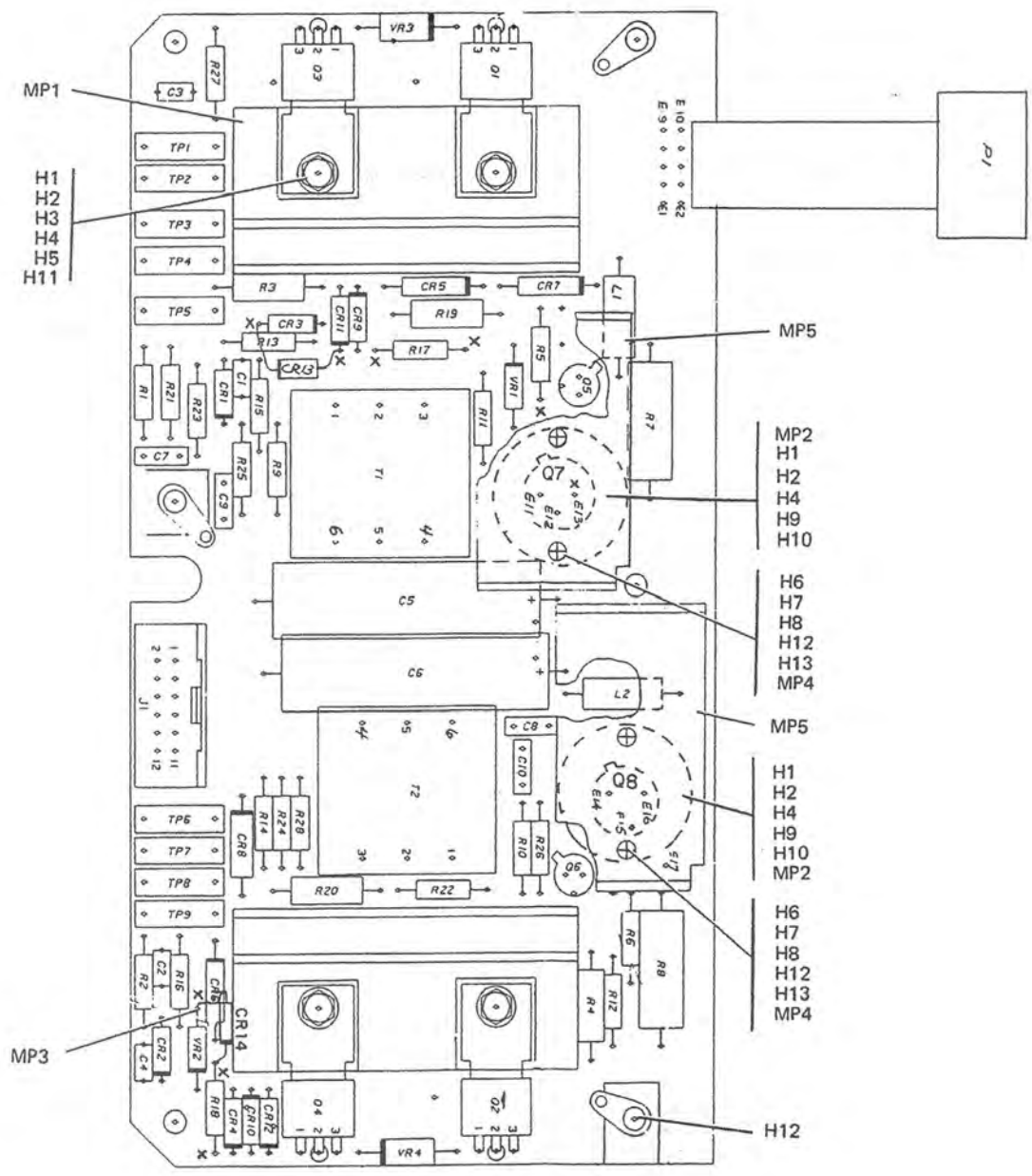
PART

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE	REF DES	DESCRIPTION
	CONTROL BOARD A1	642-3513-001					R20	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W
A1	PEAK CURRENT OVERLOAD BOARD (A1)	646-5908-001					R29	NOT USED
CR1-CR5	SEMICOND DEVICE	353-6556-010		12969	1N5614		R30	RESISTOR, FXD FILM, 1MEGO, 1%, 1/4W
CR6	SEMICOND DEVICE	353-3644-010		31433	1N4454		R31	RESISTOR, FIXED FILM, 19.6K, 1%, 1/8W
CR7	NOT USED						R32	RESISTOR, FIXED FILM, 10K, 1%, 1/8W
CR8	SEMICOND DEVICE	353-3644-010		31433	1N4454		R33	RESISTOR, FIXED FILM, 154K, 1%, 1/8W
CR9	NOT USED						R34	RESISTOR, FXD FILM, 562 OHMS, 1%, 1/8W
CR10	SEMICOND DEVICE	353-3644-010		31433	1N4454		R35, R36	RESISTOR, FXD CHPSN, 33K, 10%, 1/4W
CR11	SEMICOND DEVICE	353-6496-020		14099	SC5615		R37	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W
CR14							R38	RESISTOR, FXD WM, 100.0 OHMS, 5%, 3W
CR15	SEMICOND DEVICE	353-6556-010		12969	1N5614		R39	RESISTOR, FXD FILM, 6.81K, 1%, 1/8W
CR16	SEMICOND DEVICE	353-3644-010		31433	1N4454		R40	RESISTOR, FXD FILM, 1.62K, 1%, 1/8W
CR17,	SEMICOND DEVICE	353-6556-020		12969	1N5616		R41	NOT USED
CR18							R42	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W
CR19-	SEMICOND DEVICE	353-3644-010		31433	1N4454		R43	RESISTOR, FXD FILM, 2.74K, 1%, 1/8W
CR24							R44	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W
CR25	SEMICOND DEVICE	353-6496-020		14099	SC5615		R45	RESISTOR, FXD FILM, 3.32K, 1%, 1/8W
C1	NOT USED						R46	RESISTOR, FXD WM, 82.0 OHMS, 5%, 3W
C2	CAPACITOR, FIXED CER DIELECT, 47,000PF, 10%, 100V	913-5020-640		81349	CK148X473K		R47	RESISTOR, FIXED CHPSN, 1MEGO, 10%, 1/4W
C3	CAPACITOR, FIXED THTLM ELCTLT, 22UF, 20%, 10V	184-9102-080		56289	199D226X0010CB1		R48	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W
C4	NOT USED						R49, R50	RESISTOR, FIXED CHPSN, 0.10MEGO, 10%, 1/4W
C5	CAPACITOR, FIXED CER DIELECT, 22,000PF, 10%, 100V	913-5020-640		81349	CK148X223K		R51	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W
C6	CAPACITOR, FIXED CER DIELECT, 1000PF, 10%, 100V	913-4778-000		81349	CK128X102K		R52	RESISTOR, FIXED FILM, 68.1K, 1%, 1/8W
C7	CAPACITOR, FIXED CER DIELECT, 100PF, 10%, 200V	913-4006-000		81349	CK058X101K		R53	RESISTOR, FIXED FILM, 1K, 1%, 1/8W
C8	CAPACITOR, FIXED THTLM ELCTLT, 22UF, 20%, 10V	184-9102-080		56289	199D226X0010CB1		R54	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W
C9	CAPACITOR, FIXED THTLM ELCTLT, 1.5UF, 20%, 25V	184-9102-210		56289	199D155X0025AB1		R55, R56	RESISTOR, FXD FILM, 1MEGO, 1%, 1/4W
C10	CAPACITOR, FIXED CER DIELECT, 2200PF, PORM5%, 100V	913-3281-300		51642	300-100HPO-222J		R57	RESISTOR, FIXED FILM, 487K, 1%, 1/4W
C11	CAPACITOR, FIXED THTLM ELCTLT, 22UF, 20%, 35V	184-9102-430		56289	196D246		R58-R60	NOT USED
C12	CAPACITOR, FIXED CER DIELECT, 1000PF, 10%, 100V	913-4778-000		81349	CK128X102K		R61	RESISTOR, FIXED CHPSN, 0.10MEGO, 10%, 1/4W
C13	CAPACITOR, FXD CER DIELECT, 1000PF, 20%, 1000V	913-1186-000		81349	CK604M102M		R62, R63	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W
C14	CAPACITOR, FIXED CER DIELECT, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K		R64	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W
C15	CAPACITOR, FIXED CER DIELECT, 0.68UF, 10%, 50VDC	913-5019-540		81349	CK068X684K		R65-R67	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W
C16	CAPACITOR, FIXED CER DIELECT, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K		R68	NOT USED
C17	CAPACITOR, FIXED THTLM ELCTLT, 22UF, 20%, 10V	184-9102-080		56289	199D226X0010CB1		R69-R72	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W
C18	NOT USED						R73	RESISTOR, FIXED FILM, 14K, 1%, 1/8W
C19	CAPACITOR, FIXED CER DIELECT, 10,000PF, 10%, 100V	913-5020-430		81349	CK138X103K		R74, R75	RESISTOR, FIXED FILM, 215 OHMS, 1%, 1/8W
C20	CAPACITOR, FIXED CER DIELECT, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K		R76	RESISTOR, FIXED FILM, 10K, 1%, 1/8W
C21	CAPACITOR, FIXED CER DIELECT, 10,000PF, 10%, 100V	913-5020-430		81349	CK138X103K		R77	NOT USED
C22-C28	CAPACITOR, FIXED CER DIELECT, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K		R78	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W
C29	CAPACITOR, FIXED CER DIELECT, 1000PF, 10%, 100V	913-4778-000		81349	CK128X102K		R79	NOT USED
C30, C31	CAPACITOR, FIXED CER DIELECT, 10,000PF, 10%, 100V	913-5020-430		81349	CK138X103K		R80	RESISTOR, FIXED FILM, 1K, 1%, 1/8W
C32	CAPACITOR, FIXED CER DIELECT, 100PF, 10%, 200V	913-4006-000		81349	CK058X101K		R81	RESISTOR, FIXED FILM, 26.1K, 1%, 1/8W
C33	CAPACITOR, FIXED CER DIELECT, 10,000PF, 10%, 100V	913-5020-430		81349	CK138X103K		R82	RESISTOR, FIXED FILM, 100 OHMS, 1%, 1/8W
C34	CAPACITOR, FIXED CER DIELECT, 100PF, 10%, 200V	913-4006-000		81349	CK058X101K		R83	RESISTOR, FIXED FILM, 1K, 1%, 1/8W (A1)
35, C36	CAPACITOR, FIXED CER DIELECT, 470PF, 10%, 200V	913-4014-000		81349	CK058X471K		R84, R85	NOT USED
37	CAPACITOR, FIXED CER DIELECT, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K		R86	RESISTOR, FIXED FILM, 19.6K, 1%, 1/8W (A1)
38	NOT USED						R87	RESISTOR, FIXED FILM, 1K, 1%, 1/8W (A1)
C39	CAPACITOR, FIXED CER DIELECT, 0.47UF, 10%, 50VDC	913-5019-520		81349	CK068X474K		R88, R89	RESISTOR, FIXED FILM, 5.11K, 1%, 1/8W (A1)
C40	CAPACITOR, FIXED ELCTLT, 1UF, 10%, 100V	184-9080-840		81349	H39003/01-2465		R90	RESISTOR, FXD FILM, 1MEGO, 1%, 1/4W (A1)
C41	CAPACITOR, FIXED CER DIELECT, 0.047UF, 10%, 100V (A1)	913-5020-640		81349	CK148X473K		R91	RESISTOR, FIXED FILM, 1K, 1%, 1/8W (A1)
C42	CAPACITOR, FIXED CER DIELECT, 75PF, 5%, 100VDC (A1)	913-3401-070		18796	8111-100-C06-560 J		TP1	JACK, TIP BRN
C43	CAPACITOR, FIXED CER DIELECT, 0.047UF, 10%, 100V (A1)	913-5020-640		81349	CK148X473K		TP2	JACK, TIP RED
H1	SCREW, MACH SST, 2-56 X 5/8 (QTY 2)(EFF TO REV LTR G)	343-0005-000		96906	MS51957-6		TP3	JACK, TIP ORN
H2	WASHER, FLAT BRN, 0.069 ID X 0.168 OD (QTY 4)(EFF TO REV LTR G)	310-0129-000		05411	310-0129-000		TP4	JACK, TIP YEL
H3	WASHER, NI PLSTC, 3/32 ID X 3/16 OD (QTY 2)(EFF TO REV LTR G)	303-2100-000		79807	303-2100-000		U1	INTEGRATED CIRCUIT TIMER
H4	NUT, SLF LKG, HEX AL, 2-56 (QTY 2)(EFF TO REV LTR G)	333-0604-000		72962	68-1660-26		U2	INTEGRATED CIRCUIT FLIP FLOP
J1	HOUSING, CONN, EL	372-0043-440		80779	1-87478-6		U3	INTEGRATED CIRCUIT LOGIC GATE
J2	HOUSING, CONN, EL	372-0043-330		80779	87478-2		U4	INTEGRATED CIRCUIT LOGIC BUFFER
L1, L2	COIL, RF 100MH	240-2715-370		96906	MS75089-11		U5	INTEGRATED CIRCUIT ISOLATOR (ESOS)
MP1	CONTACT, ELECTRICAL (QTY 9)(EFF TO REV LTR G)	372-2601-033			372-2601-033		U6	INTEGRATED CIRCUIT AMPLIFIER, QUAD OPRTNL
MP2	CONTACT, SPECIAL (QTY 1)(EFF TO REV LTR G)	797-7253-002			797-7253-002		U7	INTEGRATED CIRCUIT COMPARATOR
MP3	SPACER, SLEEVE (QTY 2)(EFF TO REV LTR G)	541-5953-002			541-5953-002		U8	INTEGRATED CIRCUIT ISOLATOR (ESOS)
R1	RESISTOR, VARIABLE WM, 1K, PORM5%, 3/4W	381-1721-280		81349	RT22C2M102		U9	INTEGRATED CIRCUIT DUAL COMPARATOR (A1)
R2	RESISTOR, VARIABLE WM, 10K, PORM5%, 3/4W	381-1721-310		81349	RT22C2M103		VR1	SEMICOND DEVICE
R3	RESISTOR, VARIABLE 10K, 10%, 0.5W (A1)	382-0027-100		80294	3329H-CY3-103		VR2, VR3	SEMICOND DEVICE
R4	RESISTOR, VARIABLE 10K, 10%, 0.5W	382-0027-100		80294	3329H-CY3-103		VR4	NOT USED
R5	NOT USED						VR5	SEMICOND DEVICE
R6	RESISTOR, FIXED FILM, 26.1K, 1%, 1/8W	705-1064-000		81349	RN5502612F			PEAK CURRENT OVERLOAD BOARD A1A1
R7	RESISTOR, FXD FILM, 2.87K, 1%, 1/8W	705-1018-000		81349	RN5502871F		C1, C2	CAPACITOR, FIXED CER DIELECT, 47,000PF, 10%,
R8	RESISTOR, FIXED FILM, 15.4K, 1%, 1/8W	705-1053-000		81349	RN5501542F		C3	CAPACITOR, FIXED CER DIELECT, 6PF, 10%, 100VDC (A2)
R9	RESISTOR, FXD FILM, 1.62K, 1%, 1/8W	705-1006-000		81349	RN5501621F		C3	CAPACITOR, FIXED CER DIELECT, 75PF, 5%, 100VDC
R10	RESISTOR, FXD FILM, 2.87K, 1%, 1/8W	705-1018-000		81349	RN5502871F		MP1	CONTACT, ELECTRICAL (QTY 3)
R11	RESISTOR, FXD FILM, 301K, 1%, 1/4W	705-6715-000		81349	RN6003013F		R1	RESISTOR, VARIABLE 10K, 10%, 0.5W
R12	RESISTOR, FIXED FILM, 68.1K, 1%, 1/8W	705-1084-000		81349	RN5506812F		R2	RESISTOR, FIXED FILM, 19.6K, 1%, 1/8W
R13	RESISTOR, FIXED CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR076222KS		R3	RESISTOR, FIXED FILM, 5.11K, 1%, 1/8W
R14	RESISTOR, FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN5501001F		R4	RESISTOR, FIXED FILM, 10K, 1%, 1/8W
R15	NOT USED						R5	RESISTOR, FXD FILM, 6.81K, 1%, 1/8W
R16	RESISTOR, FIXED FILM, 5.62K, 1%, 1/8W	705-1032-000		81349	RN5505621F		R6	RESISTOR, FIXED FILM, 1K, 1%, 1/8W
R17	RESISTOR, FXD FILM, 3.65K, 1%, 1/8W	705-1023-000		81349	RN5503651F		R7	RESISTOR, FXD FILM, 1MEGO, 1%, 1/4W
R18	RESISTOR, FXD FILM, 53.6K, 1%, 1/8W	705-1079-000		81349	RN5505362F		R8	RESISTOR, FIXED FILM, 1K, 1%, 1/8W
R19	NOT USED						R9	RESISTOR, FIXED FILM, 5.11K, 1%, 1/8W
R20, R21	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS		U9	INTEGRATED CIRCUIT DUAL COMPARATOR
R22	NOT USED							
R23	RESISTOR, FIXED CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR076105KS			
R24, R25	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS			
R26, R27	NOT USED							

PARTS LIST (Cont)

MFR CODE	MFR PART NUMBER	SMR CODE	REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE
			R28	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS	
			R29	NOT USED					
2969	1N5614		R30	RESISTOR, FXD FILM, 1MEG0, 1%, 1/4W	705-6740-000		81349	RN6001004F	
1433	1N4454		R31	RESISTOR, FIXED FILM, 19.6K, 1%, 1/8W	705-1058-000		81349	RN5501962F	
			R32	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F	
1433	1N4454		R33	RESISTOR, FIXED FILM, 154K, 1%, 1/8W	705-1101-000		81349	RN5501543F	
			R34	RESISTOR, FXD FILM, 562 OHMS, 1%, 1/8W	705-0984-000		81349	RN5505620F	
1433	1N4454		R35, R36	RESISTOR, FXD CHPSN, 33K, 10%, 1/4W	745-0003-000		81349	RCR07G333KS	
4099	3C5615		R37	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS	
2969	1N5614		R38	RESISTOR, FXD MM, 100.0 OHMS, 5%, 3M	747-5340-000		81349	RW69V101	
1433	1N4454		R39	RESISTOR, FXD FILM, 6.81K, 1%, 1/8W	705-1036-000		81349	RN5506811F	
2969	1N5614		R40	RESISTOR, FXD FILM, 1.62K, 1%, 1/8W	705-1006-000		81349	RN5501621F	
			R41	NOT USED					
			R42	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS	
1433	1N4454		R43	RESISTOR, FXD FILM, 2.74K, 1%, 1/8W	705-1017-000		81349	RN5502741F	
			R44	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS	
4099	3C5615		R45	RESISTOR, FXD FILM, 3.32K, 1%, 1/8W	705-1021-000		81349	RN5503321F	
			R46	RESISTOR, FXD MM, 82.0 OHMS, 5%, 3M	747-5383-000		81349	RW69V820	
1349	CK148X473K		R47	RESISTOR, FIXED CHPSN, 1MEG0, 10%, 1/4W	745-0857-000		81349	RCR07G105KS	
3289	1990226X0010CB1		R48	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS	
			R49, R50	RESISTOR, FIXED CHPSN, 0.10MEG0, 10%, 1/4W	745-0621-000		81349	RCR07G104KS	
1349	CK148X223K		R51	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS	
1349	CK128X102K		R52	RESISTOR, FIXED FILM, 68.1K, 1%, 1/8W	705-1084-000		81349	RN5506812F	
1349	CK058X101K		R53	RESISTOR, FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN5501001F	
289	1990226X0010CB1		R54	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS	
289	1990155X0025AB1		R55, R56	RESISTOR, FXD FILM, 1MEG0, 1%, 1/4W	705-6740-000		81349	RN6001004F	
1642	300-100NPO-222J		R57	RESISTOR, FIXED FILM, 487K, 1%, 1/4W	705-6725-000		81349	RN6004873F	
289	196D246		R58-R60	NOT USED					
1349	CK128X102K		R61	RESISTOR, FIXED CHPSN, 0.10MEG0, 10%, 1/4W	745-0821-000		81349	RCR07G104KS	
1349	CK60AM102M		R62, R63	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS	
1349	CK068X104K		R64	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS	
1349	CK068X604K		R65-R67	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS	
1349	CK068X104K		R68	NOT USED					
289	1990226X0010CB1		R69-R72	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS	
1349	CK138X103K		R73	RESISTOR, FIXED FILM, 14K, 1%, 1/8W	705-1051-000		81349	RN5501402F	
1349	CK068X104K		R74, R75	RESISTOR, FIXED FILM, 215 OHMS, 1%, 1/8W	705-0964-000		81349	RN5502150F	
1349	CK138X103K		R76	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F	
1349	CK068X104K		R77	NOT USED					
1349	CK128X102K		R78	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS	
1349	CK138X103K		R79	NOT USED					
1349	CK058X101K		R80	RESISTOR, FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN5501001F	
1349	CK058X101K		R81	RESISTOR, FIXED FILM, 26.1K, 1%, 1/8W	705-1064-000		81349	RN5502612F	
1349	CK138X103K		R82	RESISTOR, FIXED FILM, 100 OHMS, 1%, 1/8W	705-0968-000		81349	RN5501000F	
1349	CK058X101K		R83	RESISTOR, FIXED FILM, 1K, 1%, 1/8W (A1)	705-0996-000		81349	RN5501001F	
1349	CK058X471K		R84, R85	NOT USED					
1349	CK068X104K		R86	RESISTOR, FIXED FILM, 19.6K, 1%, 1/8W (A1)	705-1058-000		81349	RN5501962F	
1349	CK068X474K		R87	RESISTOR, FIXED FILM, 1K, 1%, 1/8W (A1)	705-0996-000		81349	RN5501001F	
1349	M39003-01-2465		R88, R89	RESISTOR, FIXED FILM, 5.11K, 1%, 1/8W (A1)	705-1030-000		81349	RN5505111F	
1349	CK148X473K		R90	RESISTOR, FXD FILM, 1MEG0, 1%, 1/4W (A1)	705-6740-000		81349	RN6001004F	
			R91	RESISTOR, FIXED FILM, 1K, 1%, 1/8W (A1)	705-0996-000		81349	RN5501001F	
796	J111-100-C06-560		TP1	JACK, TIP BRN	360-9162-000		81349	M39024-11-04	
			TP2	JACK, TIP RED	360-0160-000		81349	M39024-11-02	
			TP3	JACK, TIP ORN	360-0164-000		81349	M39024-11-06	
1349	CK148X473K		TP4	JACK, TIP YEL	360-0166-000		81349	M39024-11-08	
			U1	INTEGRATED CIRCUIT TIMER	351-1137-050		27014	LM555J	
906	MS51957-8		U2	INTEGRATED CIRCUIT FLIP FLOP	351-1525-020		04713	SN54LS112AJ	
			U3	INTEGRATED CIRCUIT LOGIC GATE	351-1523-050		04713	SN54LS10J	
411	310-0129-000		U4	INTEGRATED CIRCUIT LOGIC BUFFER	351-7715-020		27014	DM5407J	
			U5	INTEGRATED CIRCUIT ISOLATOR (ESOS)	351-0047-010		03506	H11A1	
807	303-2100-000		U6	INTEGRATED CIRCUIT AMPLIFIER, QUAD OPRTHL	351-1141-020		34335	LM224D	
			U7	INTEGRATED CIRCUIT COMPARATOR	351-1122-020		01295	LM239J	
962	68-1660-26		U8	INTEGRATED CIRCUIT ISOLATOR (ESOS)	351-0047-010		03506	H11A1	
			U9	INTEGRATED CIRCUIT DUAL COMPARATOR (A1)	351-1166-030		27014	LM119H	
779	1-07478-6		VR1	SEMICONV DEVICE	353-6481-110		04713	1N4733A	
779	07478-2		VR2, VR3	SEMICONV DEVICE	353-3261-000		12954	1N821A	
906	MS75089-11		VR4	NOT USED					
			VR5	SEMICONV DEVICE	353-3591-400		04713	1N4616	
				PEAK CURRENT OVERLOAD BOARD A1A1	646-5906-001				
1349	RN5502612F		C1, C2	CAPACITOR, FIXED CER DIEL, 47,000PF, 10%, 100V	913-5820-640		81349	CK148X473K	
1349	RN5502871F		C3	CAPACITOR, FIXED CER DIEL, 6PF, 10%, 100VDC (A2)	913-1498-070		72982	8101-100-C06-609 K	
1349	RN5501542F		C3	CAPACITOR, FIXED CER DIEL, 75PF, 5%, 100VDC	913-3401-070		18796	8111-100-C06-560 J	
1349	RN5501621F		MP1	CONTACT, ELECTRICAL (QTY 3)	372-2601-033		372-2601-033		
1349	RN5502871F		R1	RESISTOR, VARIABLE 10K, 10%, 0.5W	382-0027-100		80294	3329H-CY3-103	
1349	RN5501621F		R2	RESISTOR, FIXED FILM, 19.6K, 1%, 1/8W	705-1058-000		81349	RN5501962F	
1349	RN5502871F		R3	RESISTOR, FIXED FILM, 5.11K, 1%, 1/8W	705-1030-000		81349	RN5505111F	
1349	RN6003013F		R4	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F	
1349	RN5506812F		R5	RESISTOR, FXD FILM, 6.81K, 1%, 1/8W	705-1936-000		81349	RN5506811F	
1349	RCR07G222KS		R6	RESISTOR, FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN5501001F	
1349	RN5501001F		R7	RESISTOR, FXD FILM, 1MEG0, 1%, 1/4W	705-6740-000		81349	RN6001004F	
1349	RN5505621F		R8	RESISTOR, FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN5501001F	
1349	RN5503651F		R9	RESISTOR, FIXED FILM, 5.11K, 1%, 1/8W	705-1030-000		81349	RN5505111F	
1349	RN5505362F		U1	INTEGRATED CIRCUIT DUAL COMPARATOR	351-1166-030		27014	LM119H	
1349	RCR07G103KS								
1349	RCR07G105KS								
1349	RCR07G103KS								





A2  
(EFF TO REV LTR C)

H1  
H2  
H3  
H4  
H5  
H11

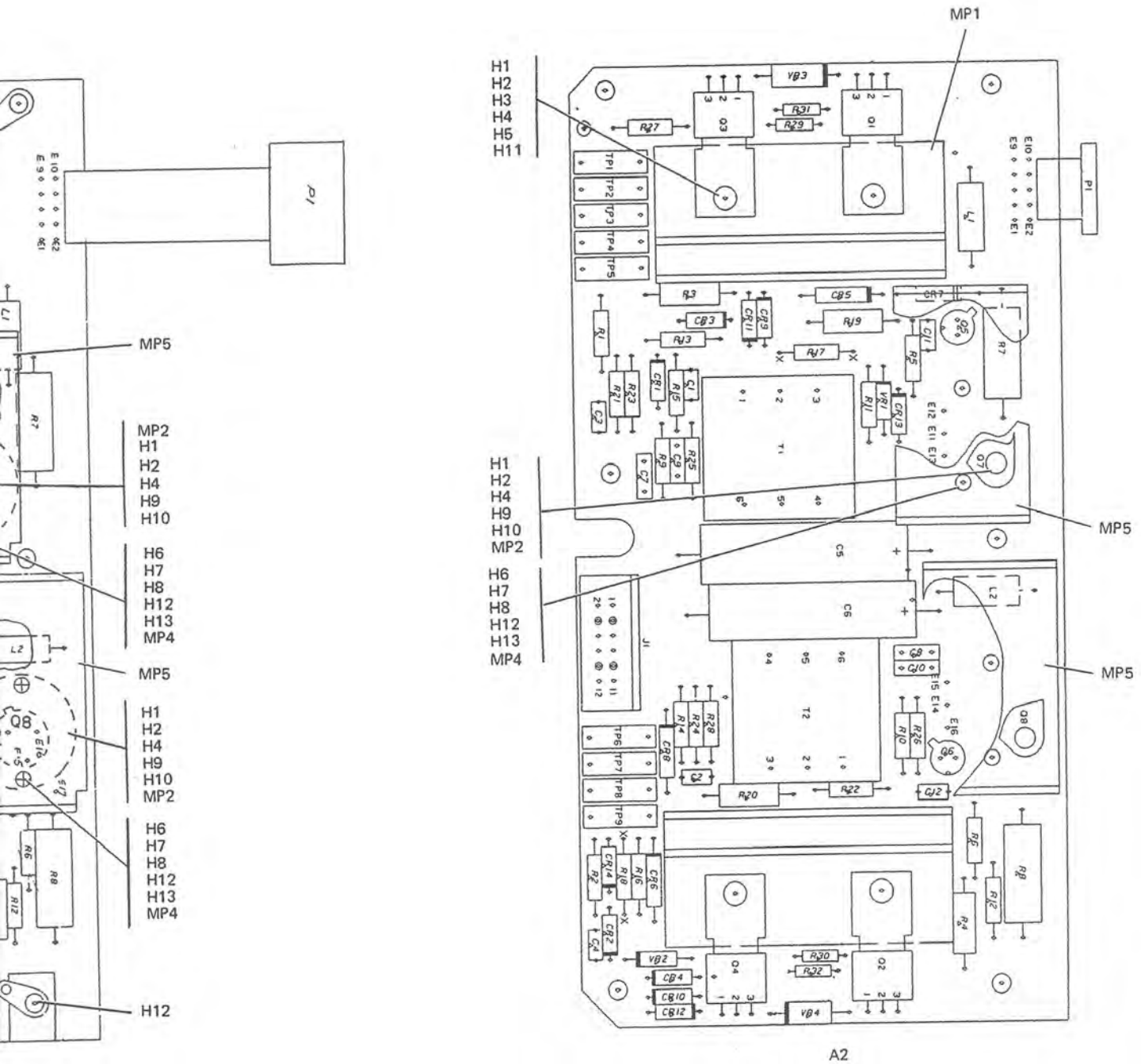
H1  
H2  
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H10  
MP2

H6  
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H11



(EFF REV LTR C)



TPA-5833-019

500-Watt Converter Module, Parts Location Diagram  
Figure 3 (Sheet 5)

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE
	BASE DRIVER CARD (ESDSIA2)	642-3232-001				
CR1-CR4	SEMICOND DEVICE	353-3644-010		31433	1N4454	
CR5-CR8	SEMICOND DEVICE	353-6556-010		12969	1N5614	
CR9-CR14	SEMICOND DEVICE	353-3644-010		31433	1N4454	
C1,C2	CAPACITOR, FIXED CER DIEL, 1500PF, 10%, 100V	913-5019-100		81349	CK058X152K	
C3,C4	CAPACITOR, FIXED CER DIEL, 33PF, 10%, 200V	183-1277-250		81349	CK058X330K	
C5,C6	CAPACITOR, FXD ELCTLT, 100UF, P75/M10%, 30V	913-5019-440		56289	600010760300E5	
C7-C10	CAPACITOR, FIXED CER DIEL, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK068X104K	
C11,C12	CAPACITOR, FIXED CER DIEL, 1000PF, 10%, 100V	913-4778-000		81349	CK128X102K	
H1	NUT, PLAIN, HEX SST, 4-40 (QTY 8)	313-0132-000		77250	P313-0132-000	
H2	WASHER, SPRING CD PL BRZ, 0.115 ID X 0.209 OD (QTY 8)	310-0095-000		96906	MS35338-97	
H3	BUSHING, INSULATED (QTY 4)	547-8177-017			547-8177-017	
H4	WASHER, FLAT CRES, 0.125 ID X 0.250 OD (QTY 6)	310-0779-030		96906	MS15795-803	
H5	SCREW, MACH STL, 4-40 X 1/2 (QTY 4)	343-0137-000		96906	MS51957-17	
H6	SCREW, MACH CD PL STL, 2-56 X 1/4 (QTY 4)	343-0124-000		96906	MS51957-5	
H7	WASHER, LOCK SST, 0.088 ID X 0.172 OD (QTY 4)	310-0275-000		96906	MS35338-134	
H8	WASHER, FLAT BRZ, 0.089 ID X 0.168 OD (QTY 4)	310-0129-000		05411	310-0129-000	
H9	BUSHING, INSULATOR (QTY 4)	547-8177-018			547-8177-018	
H10	SCREW, MACH NP BRZ, 4-40 X 5/16 (QTY 4)	343-0286-000		77250	P343-0286-000	
H11	MTG KIT, XSTR (QTY 4)	352-9653-030			13103 43-77-9	
H12	TERMINAL, LUG (QTY 5) (EFF TO REV LTR G)	304-0015-000		77147	4007-4HT	
H12	TERMINAL, LUG (QTY 2) (EFF REV LTR G)	304-0015-000		77147	4007-4HT	
H13	SCREW, MACH STL, 4-40 X 1/4 (QTY 2)	343-0133-000		96906	MS51957-13	
J1	HOUSING, COMM, EL	372-0043-340		00779	1-87478-0	
L1, L2	COIL, RF 2.2UH	240-2715-170		96906	MS75086-5	
MP1	HEATSINK	646-6552-001				
MP2	INSULATOR, PLATE	352-9570-020				
MP3	CONTACT, ELECTRICAL (QTY 9) (EFF TO REV LTR G)	372-2601-037		08289	TA-2402-A	
MP3	CONTACT, ELECTRICAL (QTY 4) (EFF REV LTR G)	372-2601-037			372-2601-037	
MP4	POST, ELEC-MECH (QTY 4)	540-9008-003			540-9008-003	
MP5	BRACKET, HEATSINK (QTY 2)	651-6109-001				
P1	WIRING HARNESS	647-7241-001				
Q1-Q4	TRANSISTOR (ES05)	352-7975-020		17856	VM66AF	
Q5, Q6	TRANSISTOR	352-0551-010		04713	2N2907A	
Q7, Q8	TRANSISTOR	352-0704-020		02735	2N3679	
R1, R2	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR076102KS	
R3, R4	RESISTOR, FXD FILM, 1K, 1%, 1/4W	705-6596-000		81349	RM0601001F	
R5, R6	RESISTOR, FIXED FILM, 475 OHMS, 1%, 1/8W	705-3600-610		81349	RN5504750F	
R7, R8	RESISTOR, FXD FM, 4.7 OHMS, 5%, 3W	747-5368-000		81349	RM69V4R7	
R9, R10	RESISTOR, FIXED CHPSN, 47 OHMS, 10%, 1/4W	745-0701-000		81349	RCR076470KS	
R11, R12	RESISTOR, FIXED CHPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349	RCR076221KS	
R13, R14	RESISTOR, FXD FILM, 619 OHMS, 1%, 1/8W	705-0986-000		81349	RN5506190F	
R15, R16	RESISTOR, FIXED FILM, 100K, 1%, 1/8W	705-1092-000		81349	RN5501003F	
R17, R18	RESISTOR, FXD FILM, 1.15K, 1%, 1/8W (TEST SELECT)	705-0999-000		81349	RN5501151F	
R17, R18	RESISTOR, FXD FILM, 1.21K, 1%, 1/8W (TEST SELECT)	705-1000-000		81349	RN5501211F	
R17, R18	RESISTOR, FXD FILM, 1.27K, 1%, 1/8W (TEST SELECT)	705-1001-000		81349	RN5501271F	
R17, R18	RESISTOR, FXD FILM, 1.33K, 1%, 1/8W (TEST SELECT)	705-1002-000		81349	RN5501331F	
R17, R18	RESISTOR, FXD FILM, 1.40K, 1%, 1/8W (TEST SELECT)	705-1003-000		81349	RN5501401F	
R17, R18	RESISTOR, FIXED FILM, 1.47K, 1%, 1/8W (TEST SELECT)	705-1004-000		81349	RN5501471F	
R17, R18	RESISTOR, FXD FILM, 1.54K, 1%, 1/8W (TEST SELECT)	705-1005-000		81349	RN5501541F	
R17, R18	RESISTOR, FXD FILM, 1.62K, 1%, 1/8W (TEST SELECT)	705-1006-000		81349	RN5501621F	
R17, R18	RESISTOR, FXD FILM, 1.69K, 1%, 1/8W (TEST SELECT)	705-1007-000		81349	RN5501691F	
R17, R18	RESISTOR, FIXED FILM, 1.76K, 1%, 1/8W (TEST SELECT)	705-1008-000		81349	RN5501761F	
R17, R18	RESISTOR, FXD FILM, 1.87K, 1%, 1/8W (TEST SELECT)	705-1009-000		81349	RN5501871F	
R17, R18	RESISTOR, FXD FILM, 1.96K, 1%, 1/8W (TEST SELECT)	705-1010-000		81349	RN5501961F	
R17, R18	RESISTOR, FXD FILM, 2.05K, 1%, 1/8W (TEST SELECT)	705-1011-000		81349	RN5502051F	
R17, R18	RESISTOR, FXD FILM, 2.15K, 1%, 1/8W (TEST SELECT)	705-1012-000		81349	RN5502151F	
R17, R18	RESISTOR, FXD FILM, 2.26K, 1%, 1/8W (TEST SELECT)	705-1013-000		81349	RN5502261F	
R19, R20	RESISTOR, FXD CHPSN, 680 OHMS, 10%, 1/2W	745-1345-000		81349	RCR206681KS	
R21, R24	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR076102KS	
R25, R26	RESISTOR, FIXED CHPSN, 150 OHMS, 10%, 1/4W	745-0719-000		81349	RCR076151KS	
R27, R28	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR076102KS	
R29, R32	RESISTOR, FIXED CHPSN, 470 OHMS, 10%, 1/8W	745-2329-000		81349	RCR056471KS	
TP1	JACK, TIP BRN	360-0162-000		81349	H39024-11-04	
TP2	JACK, TIP RED	360-0160-000		81349	H39024-11-02	
TP3	JACK, TIP ORN	360-0164-000		81349	H39024-11-06	
TP4	JACK, TIP YEL	360-0166-000		81349	H39024-11-08	
TP5	JACK, TIP GRN	360-0163-000		81349	H39024-11-05	
TP6	JACK, TIP BLU	360-0165-000		81349	H39024-11-07	
TP7	JACK, TIP VIO	360-0238-000		81349	H39024-11-10	
TP8	JACK, TIP GRA	360-0167-000		81349	H39024-11-09	
TP9	JACK, TIP WHT	360-0159-000		81349	H39024-11-01	
T1, T2	TRANSFORMER, RF	664-8500-010		98330	T4738	
VR1, VR2	SEMICOND DEVICE	353-3591-060		04713	1N4104	
VR3, VR4	SEMICOND DEVICE	353-6550-360		04713	1N5360B	

Configuration his not recorded in t

MODIF

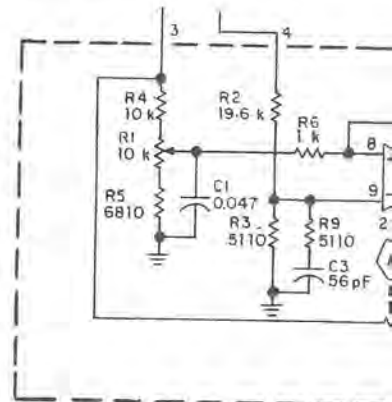
REVISION IDENT DESCRIPTION OF REASON FOR CHANGE

None See parts list for revision to schematic)

CONTROL CARD A

Modification history configuration base (EFF TO R/L G)

A1 Delete A1A1 Peak C 5908-001 See parts list for revision changes.



Modification history current configuration 087 (EFF REV LTR

A1 Added: A1C41, 0.047 A1C42, 56 pF A1C43, 0.047 A1R3, 10 kΩ, A1R83, 1 kΩ, A1R86, 19.6 kΩ A1R87, 1 kΩ, A1R88, A1R89 A1R90, 1 MΩ, A1R91, 1 kΩ, A1U9, LM119P

**Note**

Configuration history before 1 April 1982 is not recorded in this section.

**MODIFICATION HISTORY**

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
None	See parts list for revision history effectivity (no effect to schematic)	646-6882-001 REV H and above
CONTROL CARD A1 642-3513-001		
<b>Note</b>		
Modification history after REV F for configuration baseboard 600-1998-767 (EFF TO R/L G) are listed below:		
A1	Delete A1A1 Peak Current Overload Board, 646-5908-001 See parts list for revision effectivity for mechanical changes.	642-3513-001 REV G and above

**MODIFICATION HISTORY**

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
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BASE DRIVER CARD A2

642-3232-001  
REV C and above

**Note**

Base Driver Card A2 642-3232-001 has two configuration baseboards. The original baseboard 600-1996-594 is only effective to REV C. The current configuration baseboard 600-2001-007 is effective at REV C.

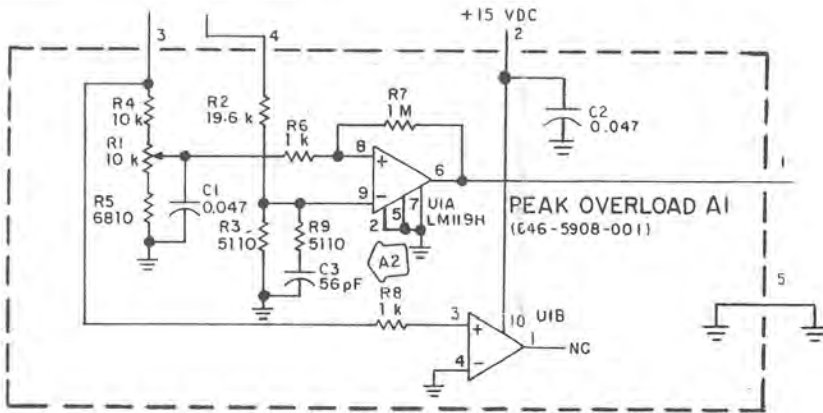
Each baseboard contains a different component layout and/or different printed circuits, but are compatible. Changes to mechanical parts are shown in parts list with the revision history.

PEAK CURRENT OVERLOAD BOARD A1A1

A2

Changed C3 from 6 pF to 56 pF.

646-5908-001  
REV B and above

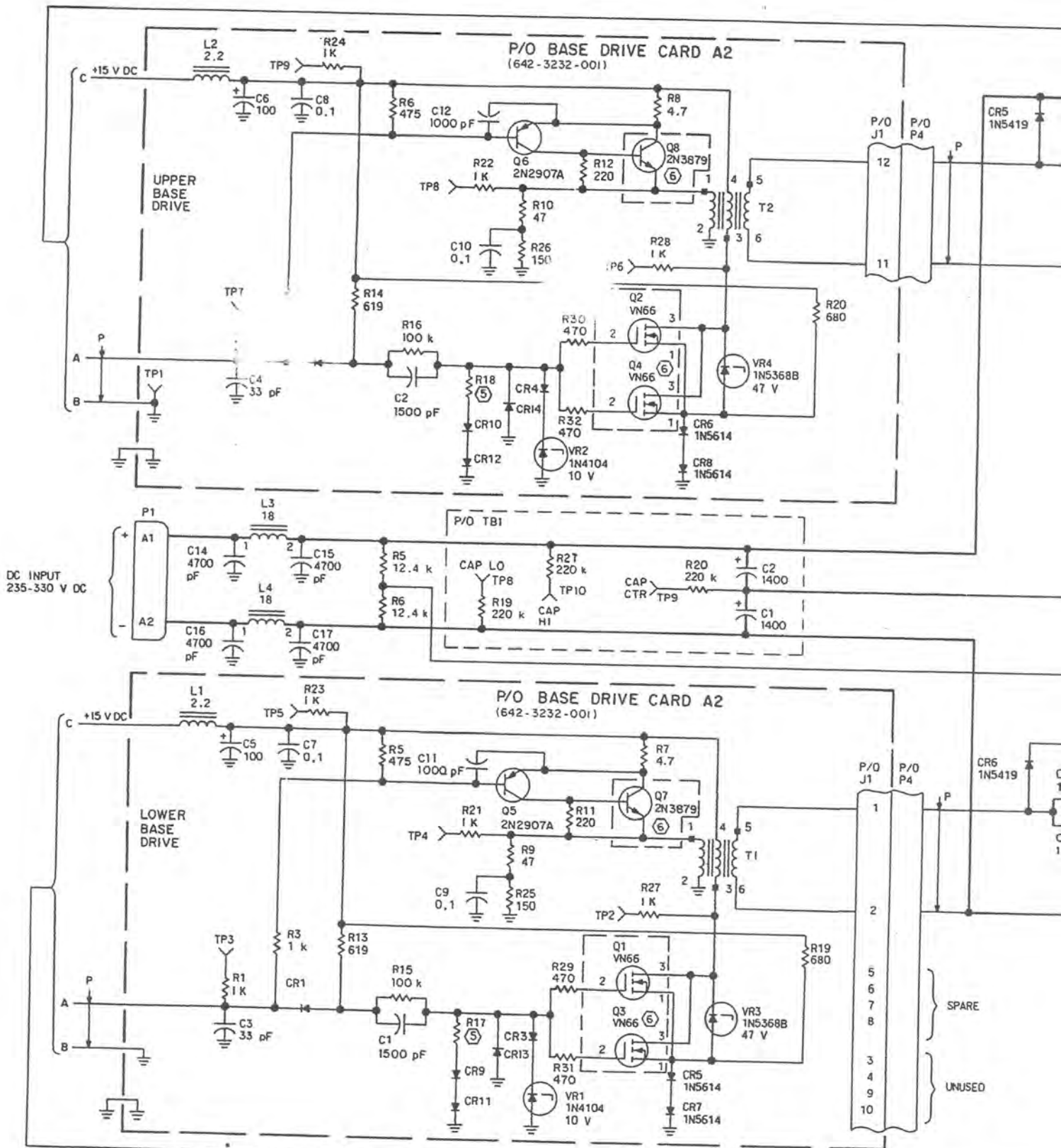


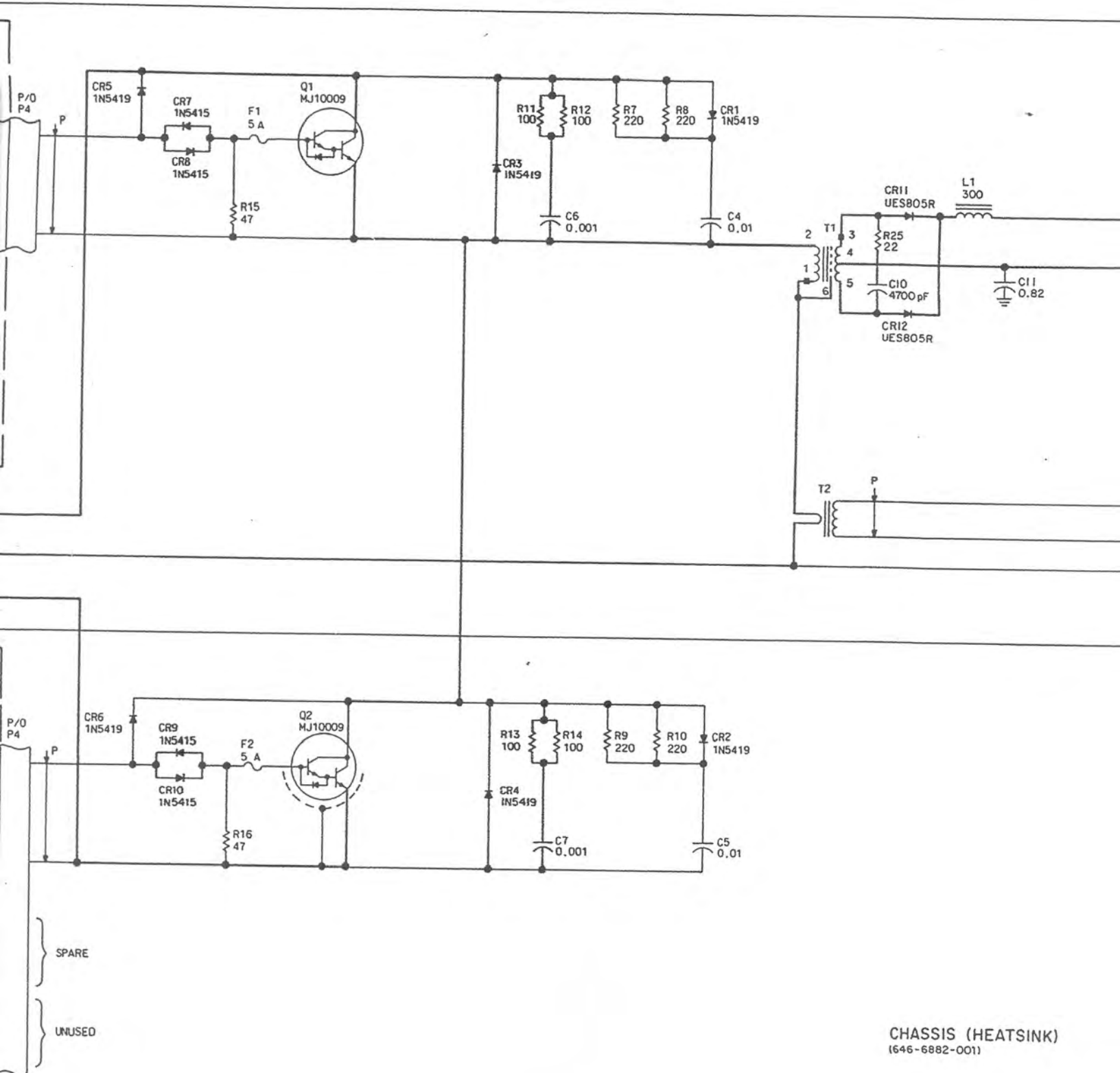
**Note**

Modification history for REV G on the current configuration baseboard, 600-2001-087 (EFF REV LTR G) are listed below:

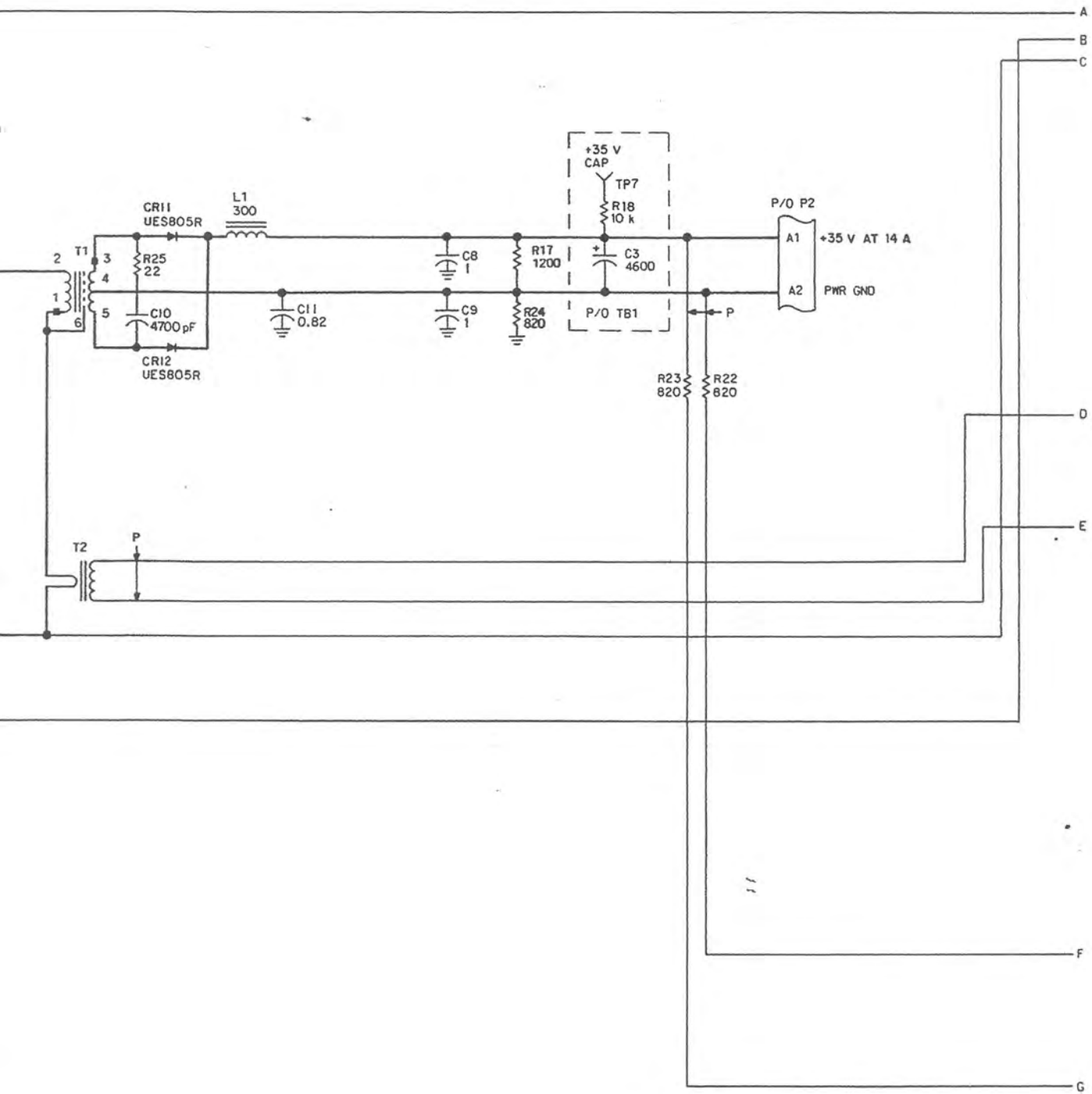
A1	Added: A1C41, 0.047 $\mu$ F A1C42, 56 pF A1C43, 0.047 $\mu$ F A1R3, 10 k $\Omega$ , 10%, 0.5W A1R83, 1 k $\Omega$ , 1%, 1/8W A1R86, 19.6 k $\Omega$ , 1%, 1/8W A1R87, 1 k $\Omega$ , 1%, 1/8W A1R88, A1R89, 5.11 k $\Omega$ , 1%, 1/8W A1R90, 1 M $\Omega$ , 1%, 1/4W A1R91, 1 k $\Omega$ , 1%, 1/8W A1U9, LM119H	642-3513-001 REV G
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500-Watt Converter Module, Parts Location Diagram  
Figure 3 (Sheet 6)





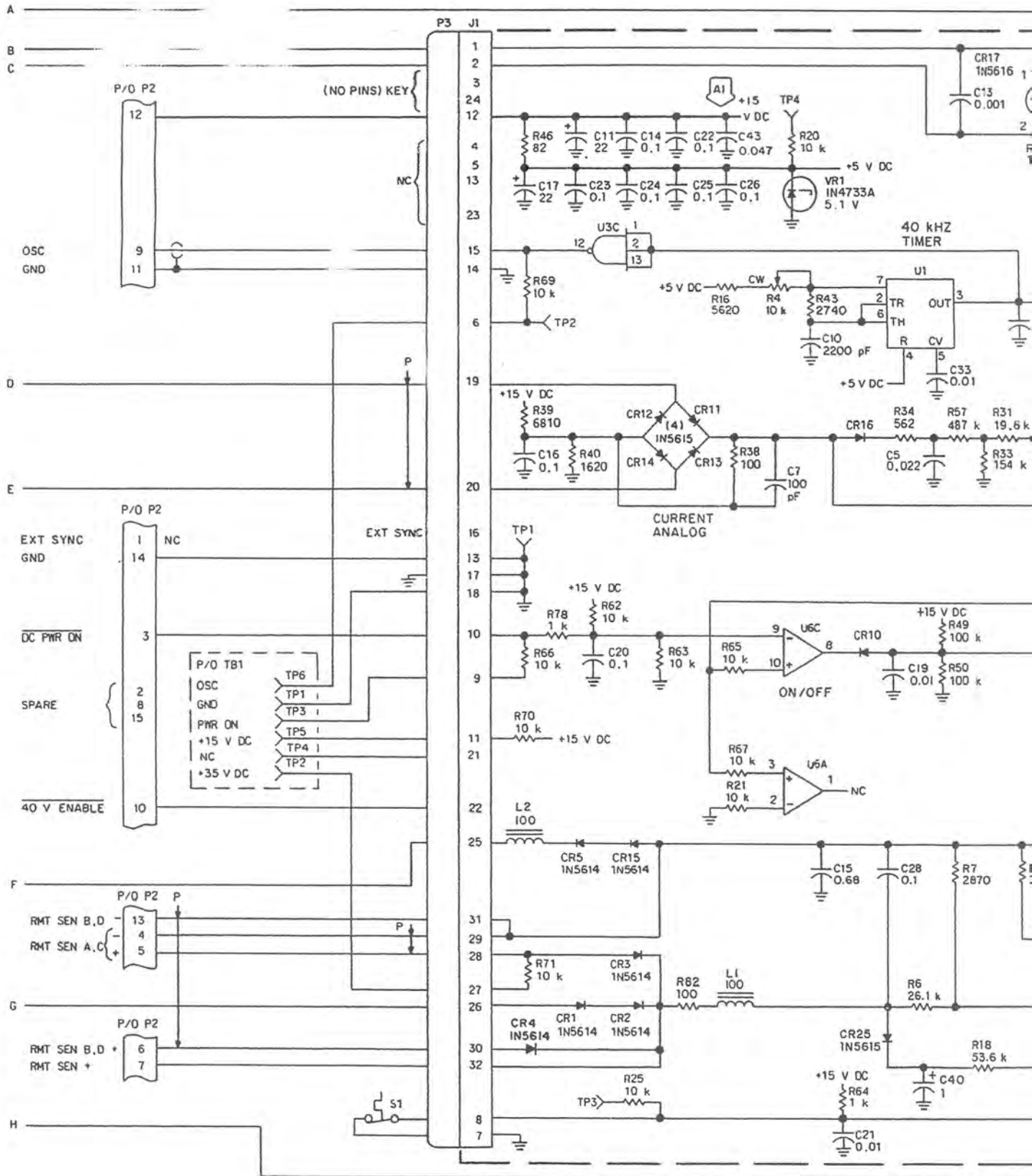
CHASSIS (HEATSINK)  
 (646-6882-001)



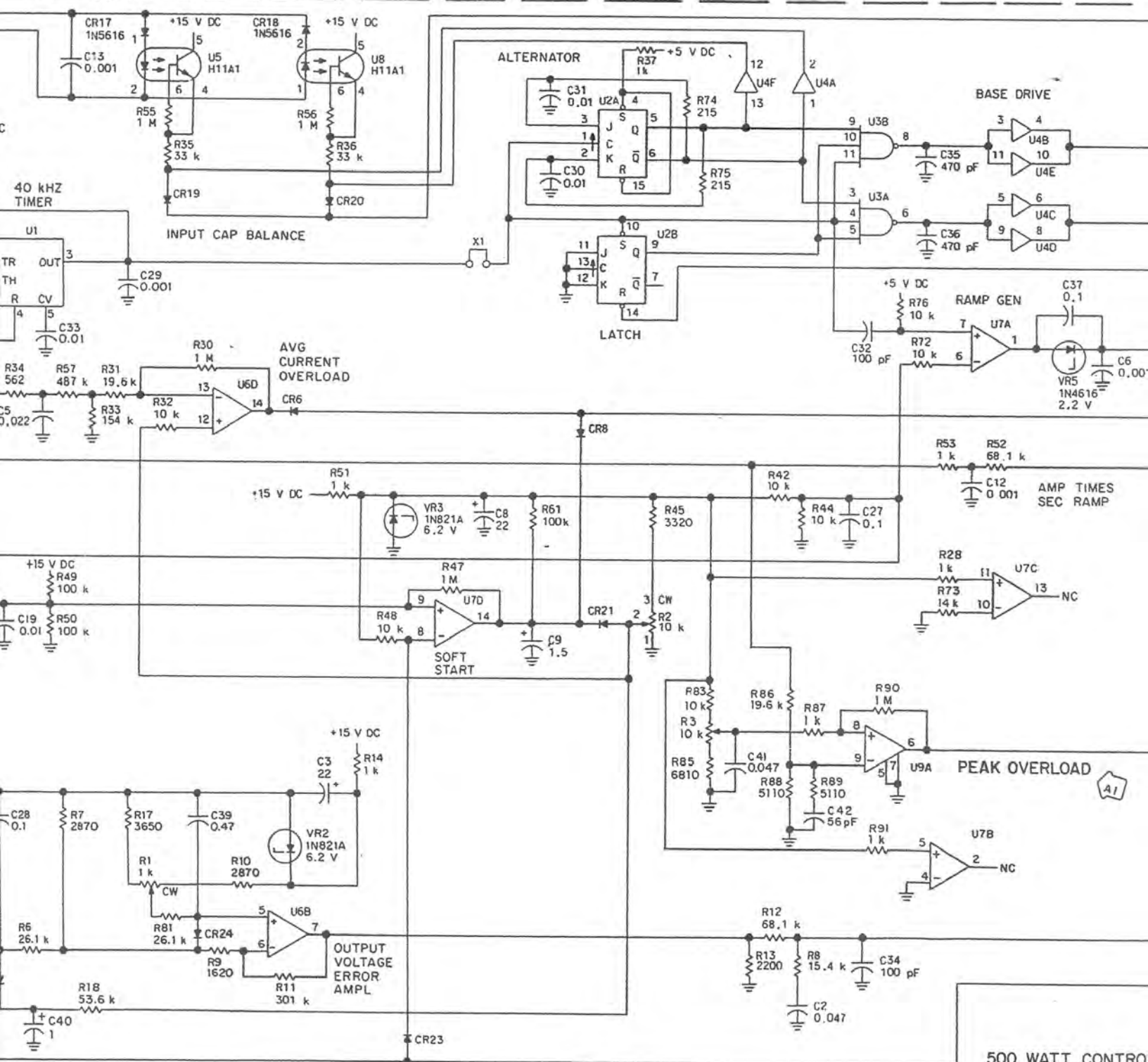
CHASSIS (HEATSINK)  
(646-6882-001)

H  
647-7198  
TPA-3034-025

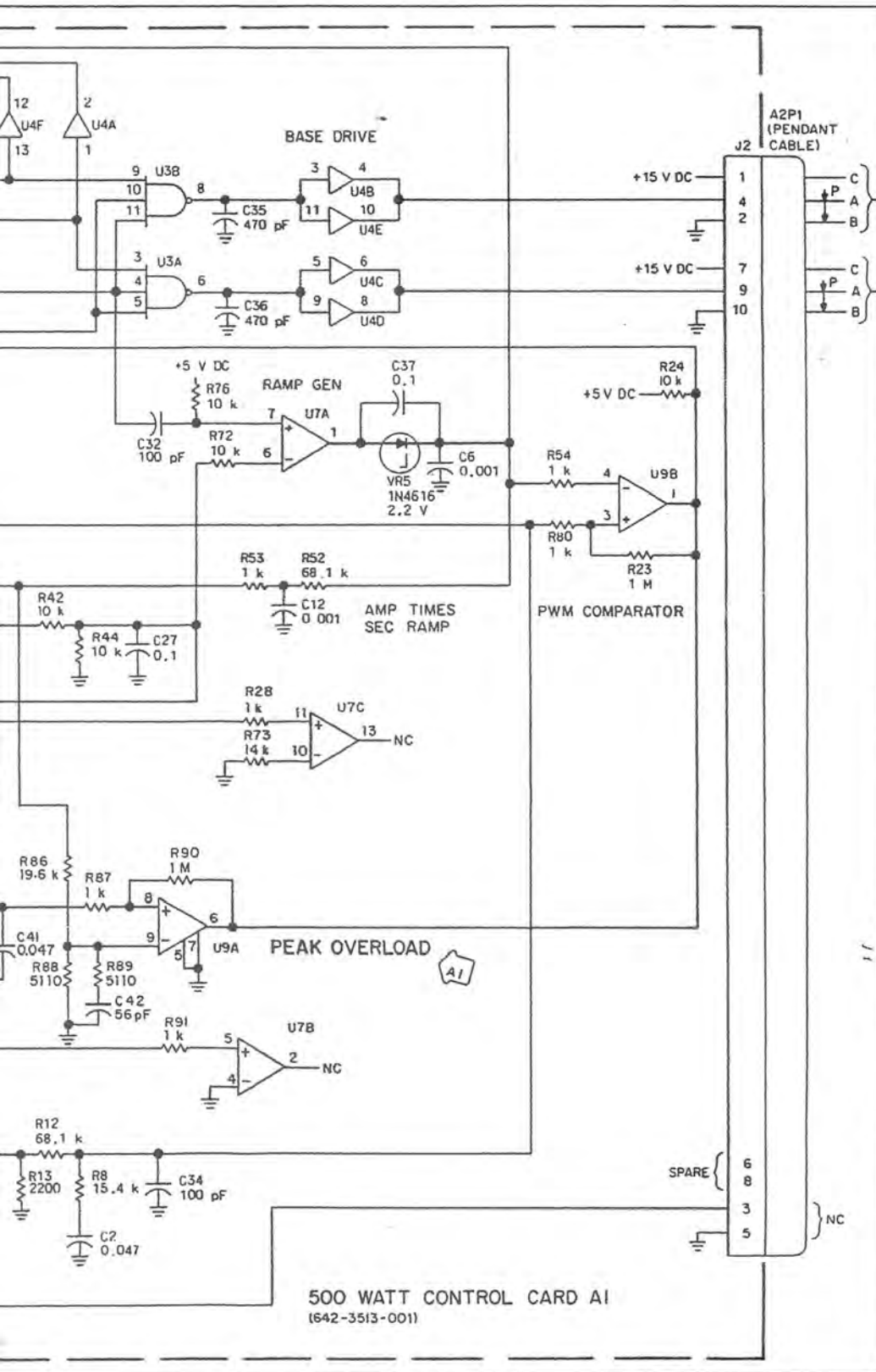
500-Watt Converter Module, Schematic Diagram  
Figure 4 (Sheet 1 of 2)







500 WATT CONTROL  
(642-3513-001)



NOTES:

- ① UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS, INDUCTANCE VALUES ARE IN MICROHENRYS AND DIODES ARE 1N4454.
- ② PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
- ③ TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.
- ④ THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.
- ⑤ VALUES ARE SELECTED IN TEST
- ⑥ BASE DRIVER CARD 01, 2, 3, 4, 7 AND 8 ARE MOUNTED ON HEATSINK.

MICROCIRCUIT INFORMATION FOR CONTROL CARD A1

REF DES	COMMON DEVICE	PWR (V DC)		
		+5	+15	GND
U1	555	8		1
U2	54LS112	16		8
U3	54LS10	14		7
U4	5407	14		7
U5	H11A1			
U6	LM224	4		11
U7	LM239	3		12
U8	H11A1			
U9	LM119		10	2

647-7198  
TPA-3034-025

500-Watt Converter Module, Schematic Diagram  
Figure 4 (Sheet 2)



Rockwell  
International

instructions

Collins Telecommunications Products Division

523-0771676-001211

15 September 1982

# Low-Voltage Module (646-6812-001)

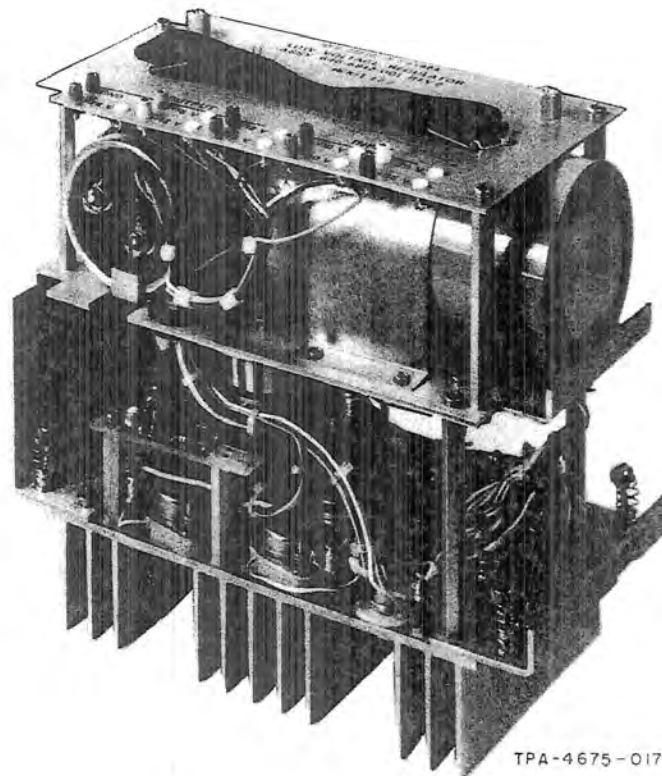
Printed in USA

LOW-VOLTAGE MODULE  
(646-6812-001)

## 1. DESCRIPTION

Low-Voltage Module 646-6812-001 (figure 1) is a plug-in modular assembly consisting of one printed

circuit card, a test point terminal board, a heat sink, and a mechanically configured assembly. All electrical connections to the low-voltage module are made through a 37-pin Cannon connector.



Low-Voltage Module  
Figure 1

117100-0/01/0-07C

## 2. PRINCIPLES OF OPERATION

### 2.1 General

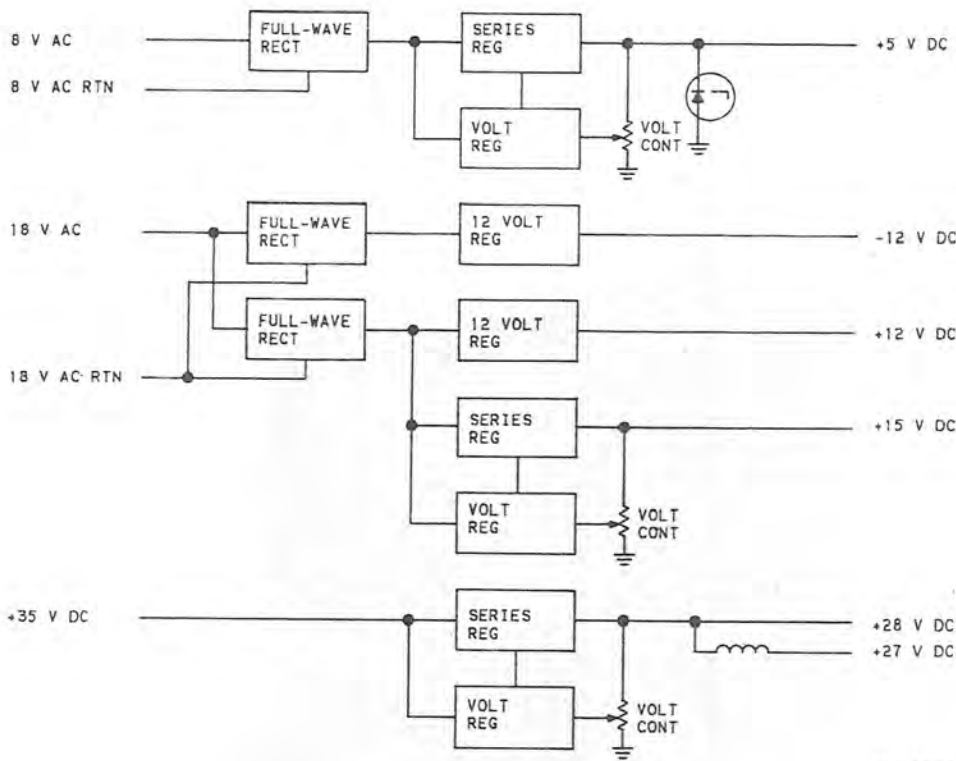
The low-voltage module consists of three power supplies that supply regulated outputs at six different voltage levels (+5, -12, +12, +15, +27, and +28 V dc).

### 2.2 Block Diagram (Refer to figure 2)

The +5-V dc power supply is supplied with single-phase 8 V ac to a full-wave rectifier. The input is rectified and supplied to a series regulator and supplies a +5-V dc regulated output.

The -12, +12, +15-V dc power supply is supplied with single-phase 18 V ac to a bridge rectifier. The bridge rectifier is separated into two full-wave rectifiers, one for the negative supply, one for the positive supply. The negative output is supplied through a 12-volt regulator to supply -12 V dc. The positive output is supplied through a series regulator to produce the +15 V dc and through a 12-volt regulator to supply +12 V dc.

The +27, +28-V dc power supply is supplied with +35-V dc regulated input. The +35 V dc is supplied through a series regulator to produce +28-V dc output. The +28-V dc output is supplied through a choke filter to produce a +27-V dc output.



TPA-5524-013

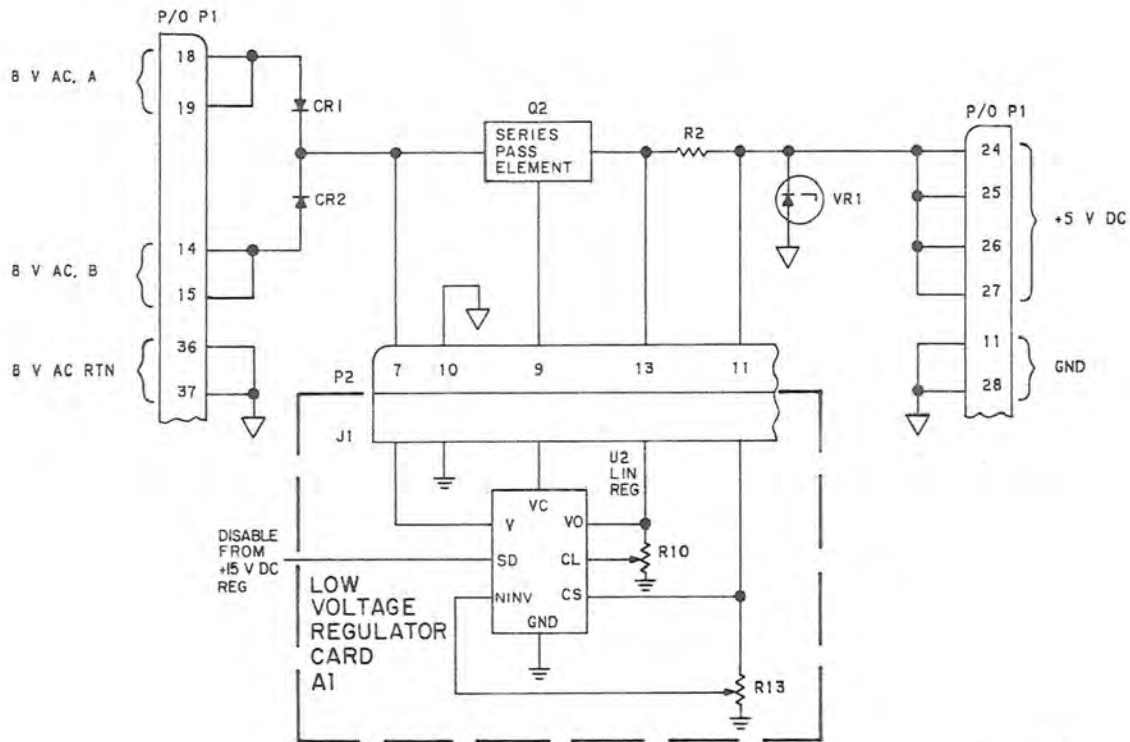
Low-Voltage Module, Block Diagram  
Figure 2

**2.3 5-Volt Regulator Circuits (Refer to figure 3)**

The 5-volt regulator is supplied with an 8-V ac input that is full-wave rectified by CR1-CR2. The output of CR1-CR2 is supplied to series pass element Q2 and linear regulator A1U2. Regulator A1U2 provides voltage and current regulation of series regulator Q2.

A1R13 provides voltage regulation adjustment/control and R2 and A1R10 provide current regulation adjustment/control. Voltage regulator VR1 places a high-voltage limit on the +5-V dc output.

A disable input from the +15-V dc supply is used to disable the +5-V dc supply for power up/down sequencing.



TPA-5525-013

5-Volt Regulator Circuit  
Figure 3

**2.4 12/15-Volt Regulator Circuits (Refer to figure 4)**

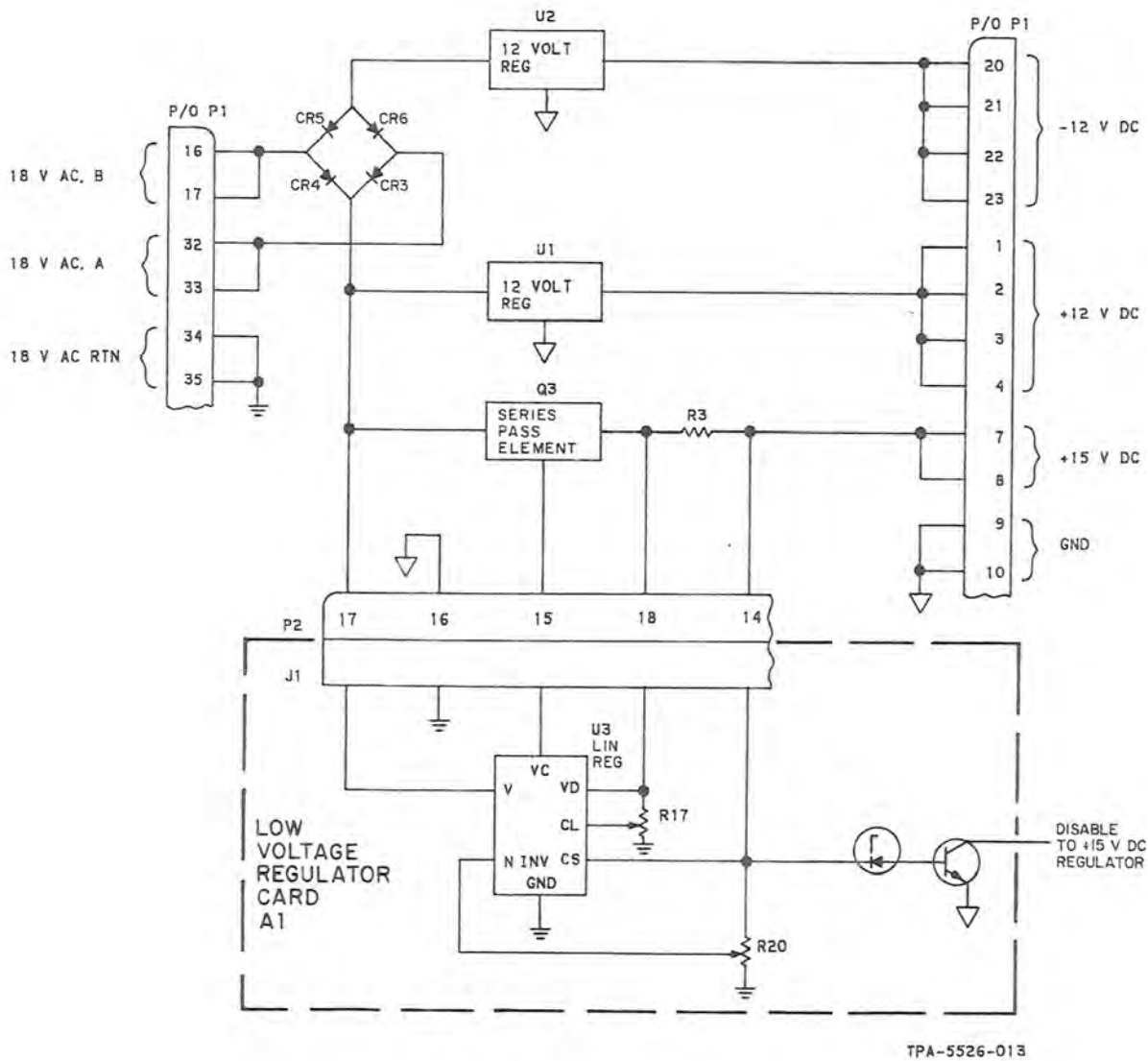
The 12/15-volt regulator circuits are supplied with an 18-V ac input. That input is applied to a bridge rectifier which is connected as two full-wave rectifiers. One of these rectifiers supplies the input for a -12-V dc supply, the other supplies the input for a +12-V dc supply and a +15-V dc supply.

The output of CR5-CR6 is supplied to 12-volt regulator U2 which produces the low current -12-V dc output.

The output of CR3-CR4 is supplied to 12-volt regulator U3 which produces the low current +12-V dc output.

The output of CR3-CR4 is also supplied to series pass element Q3 and linear regulator A1U3. Regulator A1U3 provides voltage and current regulation of series pass element Q3. A1R20 provides voltage regulation adjustment/control and R3 and A1R17 provide current regulation adjustment/control.

The disable output from the +15-V dc supply is used to disable the +5-V dc supply for power up/down sequencing.

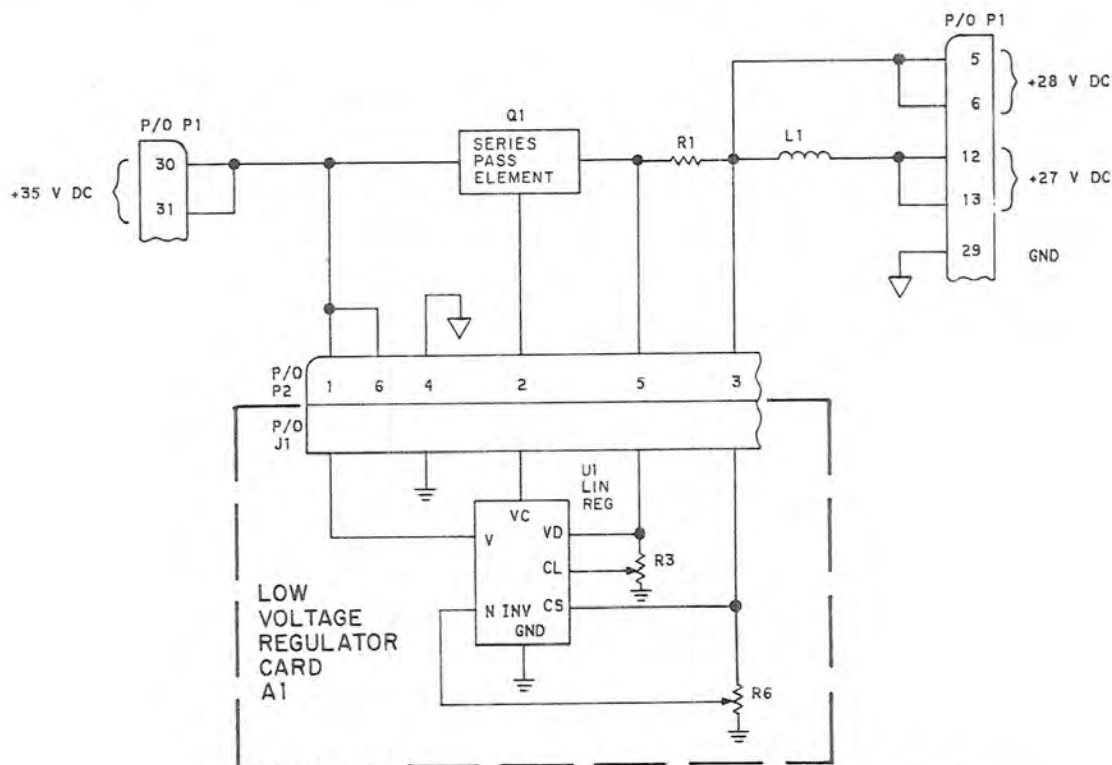


12/15-Volt Regulator Circuits  
Figure 4

**2.5 28-Volt Regulator Circuits (Refer to figure 5)**

The 28-volt regulator circuits are supplied with a 35-V dc input. That input is supplied to series pass element Q1 and linear regulator A1U1. Regulator A1U1 provides voltage and current regulation of series

pass element Q1. A1R6 provides voltage regulation adjustment/control and R1 and A1R3 provide current regulation adjustment/control. +28-V dc is supplied at P1-5, -6 and a second output is supplied through L1 to P1-12, -13. The output at P1-12, -13 is used for relay operation, thus L1 is used to filter relay noise from the +28-V dc output.



28-Volt Regulator Circuit  
Figure 5

**3. TESTING/TROUBLESHOOTING PROCEDURES**

A defective low-voltage module can be returned to a Rockwell-Collins authorized repair facility for repair. Contact the nearest Rockwell-Collins office or

Collins Telecommunications Products Division  
Attention: HF Products  
400 Collins Road, NE  
Cedar Rapids, Iowa 52498

for information and instructions.

**4. ALIGNMENT/ADJUSTMENT**

Alignment/adjustment is performed in conjunction with testing/troubleshooting.

**5. REPAIR**

Repair is accomplished using standard shop practices.



## 6. PARTS LIST/DIAGRAMS

### 6.1 Introduction

This paragraph assists in identification and requisition of parts. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included. The parts location illustration shows component placement on the circuit cards.

### 6.2 Parts List

REF DES Column — Reference designators and/or item numbers for each part/subassembly are listed in alphanumeric or numeric sequence. These are the reference designators and/or item numbers shown on the parts location illustration. Only the reference designators are shown on the schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modification.

Modifications are identified by two methods: An alphanumeric identifier is assigned to each electrical design change and listed in the REVISION IDENT column of the modification history. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change.

NA (not applicable) in the REVISION IDENT column indicates a documentation change and/or mechanical change. This revision activity will be noted in the DESCRIPTION column of the parts list only. This change does not affect the circuit card/subassembly components or the schematic. Each change relates to the REV (revision identifier) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history. Dash (—) denotes original; letter A first change; letter B second change, etc.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

### 6.3 How To Use This Parts List

To locate a part number, locate the part and its item number and/or reference designator on the illustration. Turn to the parts list page and find the item number and/or reference designator to determine its description and part number.

To locate the illustration for a part, if the reference designator and/or part number are known, refer to the parts list and find the figure and item number indicated in the parts list for location on the illustration.

### 6.4 Manufacturer's Code, Name, and Address

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
-------------	------------------------------------

00779	AMP INC P O BOX 3608 HARRISBURG PA 17105
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
04713	MOTOROLA INC SEMICONDUCTOR GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV SUB OF SCHLUMBERGER LTD NORTH AMERICAN SALES MAIL STOP 14-1053 401 ELLIS ST P O DRAWER 7284 MOUNTAIN VIEW CA 94042
08289	BLINN DELBERT CO INC THE 1678 E MISSION BLVD P O BOX 2007 POMONA CA 91766
12615	U S TERMINALS INC 7504 CAMARGO ROAD CINCINNATI OH 45243
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV 855 35TH ST NE P O BOX 728 CEDAR RAPIDS IA 52498
14099	SEMTECH CORP 652 MITCHELL ROAD NEWBURY PARK CA 91320
16758	DELCO ELECTRONICS DIV OF GENERAL MOTORS CORP 700 E FIRMIN ST KOKOMO IN 46901

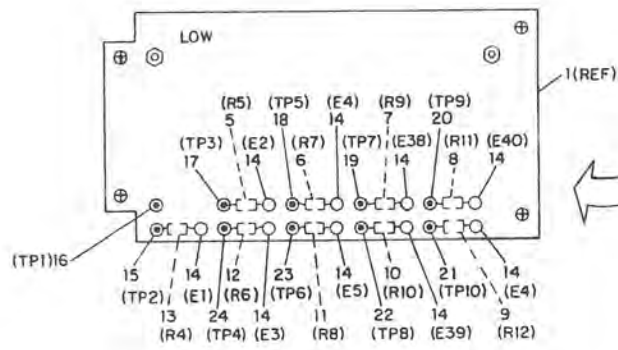
<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
24444	GENERAL SEMICONDUCTOR INDUSTRIES INC 2001 W 10TH PLACE P O BOX 3078 TEMPE AZ 85281
27014	NATIONAL SEMICONDUCTOR CORP 2900 SEMICONDUCTOR DR SANTA CLARA CA 95051
34333	SILICON GENERAL INC 11651 MONARCH ST GARDEN GROVE CA 92641
49956	RAYTHEON CO EXECUTIVE OFFICES 141 SPRING ST LEXINGTON MA 02173
56289	SPRAGUE ELECTRIC CO 87 MARSHALL ST NORTH ADAMS MA 01247
71279	CAMBRIDGE THERMIONIC CORP 445 CONCORD AVE CAMBRIDGE MA 02138
71468	ITT CANNON ELECTRIC DIV OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORP 10550 TALBERT AVE P O BOX 8040 FOUNTAIN VALLEY CA 92708
77147	PATTON-MACGUYER CO DIV OF AVID CORP 17 VIRGINIA AVE PROVIDENCE RI 02905
77250	ALLIED PRODUCTS CORP PHEOLL MFG CO DIV 5700 W ROOSEVELT RD CHICAGO IL 60650
79963	ZIERICK MFG CO RADIO CIRCLE MT KISCO NY 10549
80223	TRW INC TRW UNITED TRANSFORMER DIV 150 VARICK ST NEW YORK NY 10013
80294	BOURNS INSTRUMENTS INC 6135 MAGNOLIA AVE RIVERSIDE CA 92506
81349	MILITARY SPECIFICATIONS
81483	INTERNATIONAL RECTIFIER 9220 SUNSET BLVD P O BOX 2321 TERMINAL ANNEX LOS ANGELES CA 90054
84830	LEE SPRING CO INC 30 MAIN ST BROOKLYN NY 11201
88044	AERONAUTICAL STANDARD

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
91506	AUGAT INC 33 PERRY AVE P O BOX 779 ATTLEBORO MA 02703
91637	DALE ELECTRONICS INC P O BOX 609 COLUMBUS NE 68601
91886	MICRODOT MANUFACTURING INC MALCO MFG DIV 12 PROGRESS DR MONTGOMERYVILLE PA 18936
94222	SOUTHCO INC 210 N BRINTON LAKE RD CONCORDVILLE PA 19331
96906	MILITARY STANDARD
99392	MEPCO/ELECTRA INC ROXBORO DIV INDUSTRIAL DR P O BOX 1223 ROXBORO NC 27573

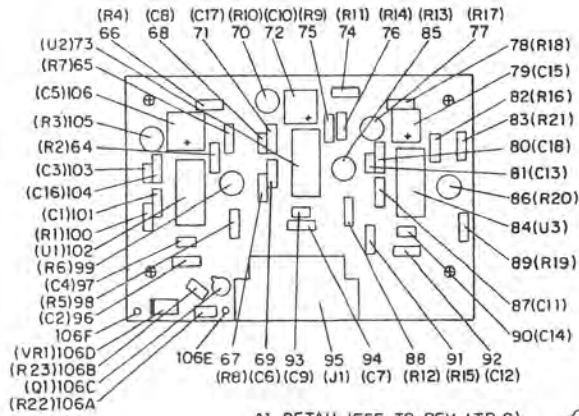
*6.5 Equipment Covered*

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions. Configuration history before 1 April 1982 is not recorded in this section.

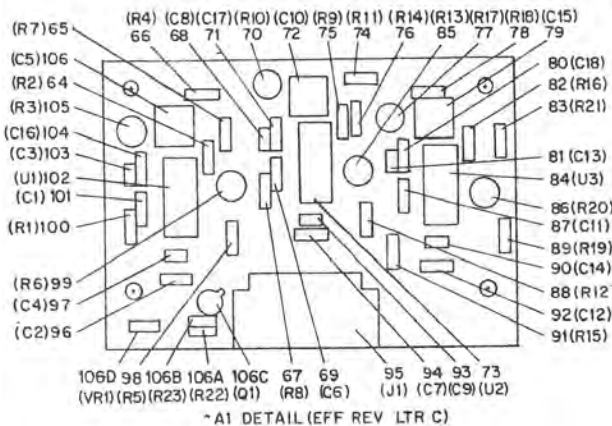
<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Low-Voltage Module	646-6812-001	REV F
Regulator Card A1	642-3561-001	REV C



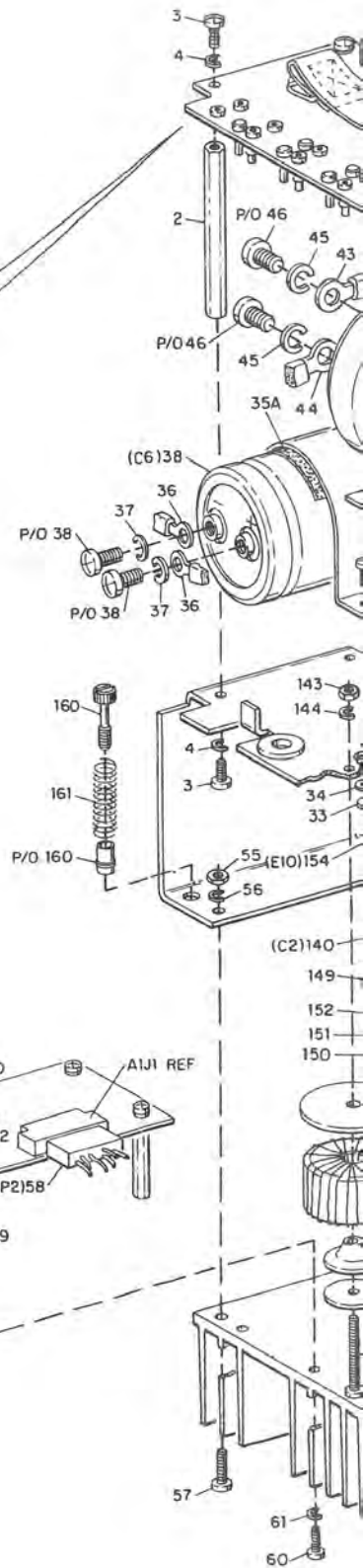
NOTE:  
COMPONENTS ARE MOUNTED ON  
UNDERSIDE OF BOARD.

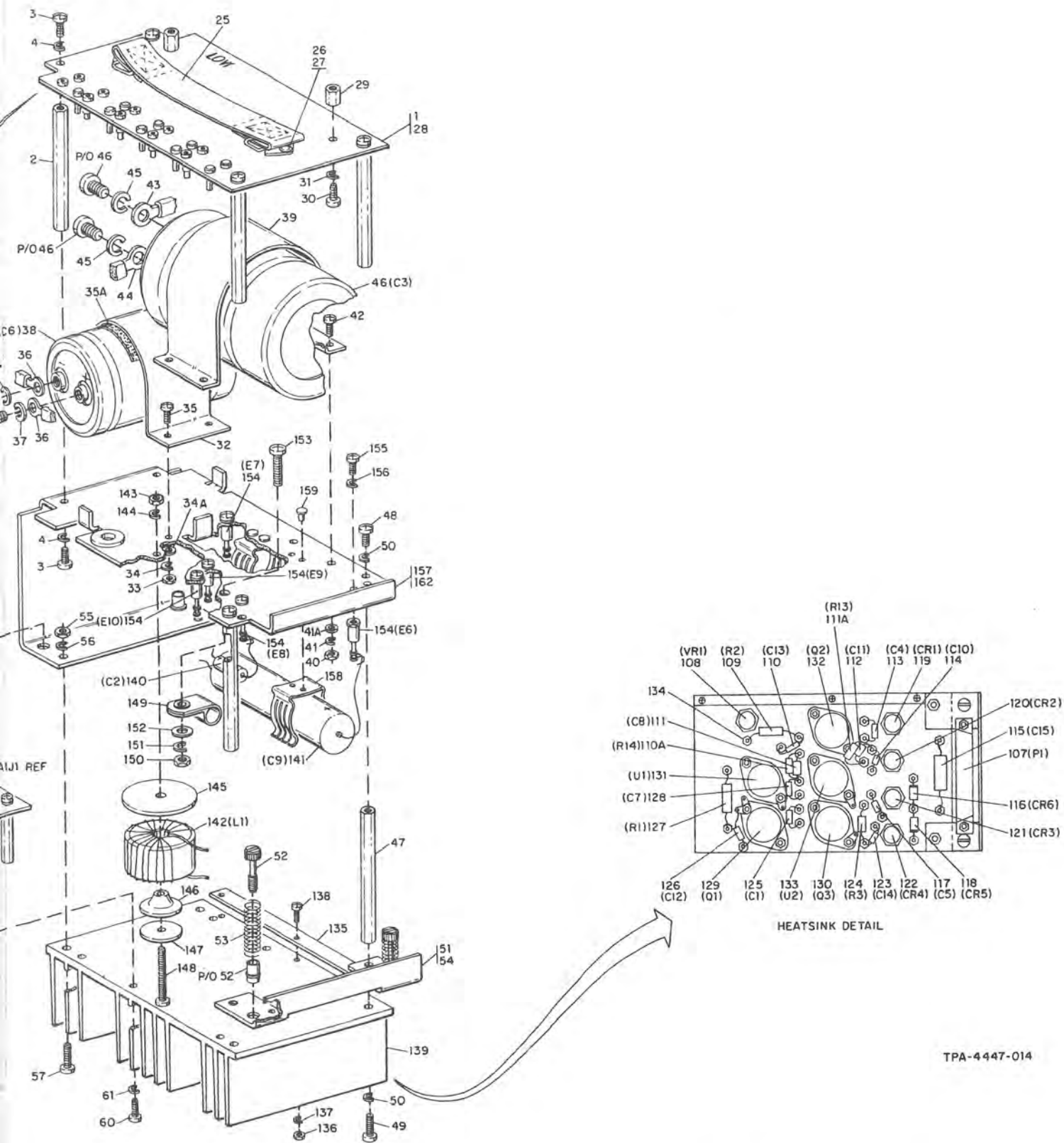


A1 DETAIL (EFF TO REV LTR C)



- A1 DETAIL (EFF REV LTR C)





TPA-4447-014

Low-Voltage Module, Parts Location Diagram  
Figure 6 (Sheet 1 of 2)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE	REF DES	DESCRIPTION
	LOW VOLTAGE MODULE	646-6812-001					66	RESISTOR,FXD FILM, 2.2K
1	PLATE, TOP, PRSD (QTY 1)	646-6801-001					67	RESISTOR,FXD CHPSN, 2.2K
2	POST, HEX (QTY 4)	540-9237-003			540-9237-003		68	CAPACITOR,FXD CER DIE
3	SCREW, MACH SST, 6-32 X 1/4 (AP FOR 1,2)(QTY 8)	343-0167-000		96906	MS51957-26		69	100VDC A1C8
4	WASHER, LOCK SST, 0.141 ID X 0.250 OD (AP FOR 1,2)(QTY 8)	310-0282-000		96906	MS35338-136		70	CAPACITOR,FXD CER DIE
5	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W R5	745-0785-000		81349	RCR07G103KS		71	50VDC A1C6
6	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W R7	745-0785-000		81349	RCR07G103KS		72	RESISTOR,VARIABLE 500K
7	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W R9	745-0785-000		81349	RCR07G103KS		73	AIR10
8	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W R11	745-0785-000		81349	RCR07G103KS		74	CAPACITOR,FXD CER DIE
9	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W R12	745-0785-000		81349	RCR07G103KS		75	100VDC A1C17
10	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W R10	745-0785-000		81349	RCR07G103KS		76	CAPACITOR,FXD THTLM E
11	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W R8	745-0785-000		81349	RCR07G103KS		77	10V A1C10
12	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W R6	745-0785-000		81349	RCR07G103KS		78	INTEGRATED CIRCUIT RE
13	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W R4	745-0785-000		81349	RCR07G103KS		79	RESISTOR,FXD FILM, 2.2K
14	TERMINAL, STDF E1-E5, E38-E41	306-1521-000		12615	SL439-433MHT		80	RESISTOR,FXD CHPSN, 50K
15	TEST JACK TERM TP2	306-2241-030		12615	SL490-458RED		81	AIR9
16	TEST JACK TERM TP1	306-2241-020		12615	SL490-458BRN		82	RESISTOR,FXD FILM, 2.2K
17	TEST JACK TERM TP3	306-2241-040		12615	SL490-458ORN		83	RESISTOR,VARIABLE 500K
18	TEST JACK TERM TP5	306-2241-060		12615	SL490-458GRN		84	AIR17
19	TEST JACK TERM TP7	306-2241-080		12615	SL490-458VIO		85	RESISTOR,FXD FILM, 10K
20	TEST JACK TERM TP9	306-2241-100		12615	SL490-458MHT		86	CAPACITOR,FXD THTLM E
21	TEST JACK TERM TP10	306-2241-010		12615	SL490-458BLK		87	20V A1C15
22	TEST JACK TERM TP8	306-2241-090		12615	SL490-458GY		88	CAPACITOR,FXD CER DIE
23	TEST JACK TERM TP6	306-2241-070		12615	SL490-458BLU		89	100VDC A1C18
24	TEST JACK TERM TP4	306-2241-050		12615	SL490-458YEL		90	CAPACITOR,FXD CER DIE
25	HANDLE, BAIL-COVER (QTY 1)	546-6127-002		546-6127-002			91	100VDC A1C13
26	RETAINER, HANDLE (QTY 2)	546-6126-002		546-6126-002			92	RESISTOR,FXD CHPSN, 2.2K
27	RIVET, SOLID AL, 0.094 DIA X 0.187 (AP)(QTY 4)	305-1154-000		96906	HS20670AD3-3		93	INTEGRATED CIRCUIT RE
28	PLATE, TOP (QTY 1)	646-6801-002					94	RESISTOR,VARIABLE 500K
29	POST, HEX (QTY 2)	540-9442-003			540-9442-003		95	AIR13
30	SCREW, MACH SST, 6-32 X 1/4 (AP)(QTY 2)	343-0167-000		96906	MS51957-26		96	RESISTOR,VARIABLE 500K
31	WASHER, LOCK SST, 0.141 ID X 0.250 OD (AP)(QTY 2)	310-0282-000		96906	MS35338-136		97	AIR20
32	CLAMP, CAPACITOR (QTY 1)	646-6554-001					98	CAPACITOR,FXD CER DIE
33	NUT, PLAIN, HEX SST, 4-40 (AP)(QTY 2)	313-0132-000		77250	P313-0132-000		99	50VDC A1C11
34	WASHER, LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 2)	310-0279-000		96906	MS35338-135		100	RESISTOR,FXD FILM, 2.2K
34A	WASHER, FLAT CRES, 0.125ID X 0.250 OD (AP)(QTY 2)(EFF REV LTR F)	310-0779-030		96906	MS15795-803		101	CAPACITOR,FXD CER DIE
35	SCREW, MACH STL, 4-40 X 1/4 (AP)(QTY 2)(EFF TO REV LTR F)	343-0133-000		96906	MS51957-13		102	100VDC A1C12
35	SCREW, MACH SST, 4-40 X 5/16 (AP)(QTY 2)(EFF REV LTR F)	343-0134-000		96906	MS51957-14		103	CAPACITOR,FXD CER DIE
35A	PAD, COMPRESSION (QTY 1)	646-6816-002					104	100VDC A1C9
36	TERMINAL, LUG (QTY 2)	304-1271-000		96906	MS25036-108		105	CAPACITOR,FXD CER DIE
37	WASHER, SPRING CD PL BRZ, 0.194 ID X 0.334 OD (AP)(QTY 2)	310-0100-000		96906	MS35338-100		106	100VDC A1C7
38	CAPACITOR, FIXED AL ELEC, 10,000UF, P50%M10%, 30VDC C6	183-1467-240		56289	602D103G030BB2A		106A	HOUSING, CONN, EL ALJ1
39	CLAMP, CAPACITOR (QTY 1)	646-6548-001					106B	CAPACITOR,FXD CER DIE
40	NUT, PLAIN, HEX SST, 4-40 (AP)(QTY 4)	313-0132-000		77250	P313-0132-000		107	100VDC A1C2
41	WASHER, LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 4)	310-0279-000		96906	MS35338-135		108	CAPACITOR,FXD CER DIE
41A	WASHER, FLAT CRES, 0.125ID X 0.250 OD (AP)(QTY 4)(EFF REV LTR F)	310-0779-030		96906	MS15795-803		109	100VDC A1C4
42	SCREW, MACH STL, 4-40 X 1/4 (AP)(QTY 4)(EFF TO REV LTR F)	343-0133-000		96906	MS51957-13		110	RESISTOR,FXD FILM, 2.2K
42	SCREW, MACH SST, 4-40 X 5/16 (AP)(QTY 4)(EFF REV LTR F)	343-0134-000		96906	MS51957-14		110	RESISTOR,VARIABLE 500K
43	TERMINAL, LUG (QTY 1)	304-1284-000		96906	MS25036-157		110B	RESISTOR,FXD CHPSN, 2.2K
44	TERMINAL, LUG (QTY 1)	304-1273-000		96906	MS25036-154		111	AIR1
45	WASHER, SPRING CD PL BRZ, 0.255 ID X 0.489 OD (AP FOR 43,44)(QTY 2)	310-0102-000		96906	MS35338-101		112	CAPACITOR,FXD CER DIE
46	CAPACITOR,FXD AL ELCTLT, 50,000UF, P75%M10%, 25VDC C3	183-1511-020		99392	3I20FE50300250P		113	100VDC A1C3
47	POST, HEX (QTY 2)	540-9239-003			540-9239-003		114	CAPACITOR,FXD CER DIE
48	SCREW, MACH SST, 6-32 X 1/4 (AP)(QTY 2)	343-0167-000		96906	MS51957-26		115	100VDC A1C16
49	SCREW, MACH SST, 6-32 X 7/16 (AP)(QTY 2)	343-0170-000		96906	MS51957-29		116	RESISTOR,VARIABLE 500K
50	WASHER, LOCK SST, 0.141 ID X 0.250 OD (AP)(QTY 4)	310-0282-000		96906	MS35338-136		116F	CAPACITOR,FXD THTLM E
51	BRACKET, CONN, PRSD (QTY 1)	646-6809-001					117	35V A1C5
52	FASTENER, RTNR CRES, 6-32 X 21/32 X 3/32 DP (QTY 2)	012-4948-170		94222	51-18-506-24		118	RESISTOR, FIXED CHPSN, AIR22
53	SPRING, HLCL, CPR (QTY 2)	340-1077-190		84830	LC02208		119	RESISTOR, FIXED CHPSN, AIR22
54	BRACKET, CONN (QTY 1)	646-6809-002					120	RESISTOR, FIXED CHPSN, AIR21
55	NUT, PLAIN, HEX SST, 6-32 (QTY 2)	313-0045-000		77250	P313-0045-000		121	SEMICONV DEVICE AIRV
56	WASHER, LOCK SST, 0.141 ID X 0.250 OD (AP)(QTY 2)	310-0282-000		96906	MS35338-136		122	TERMINAL, STDF (QTY 4)
57	SCREW, MACH SST, 6-32 X 7/16 (AP)(QTY 2)	343-0170-000		96906	MS51957-29		123	TERMINAL, FEEDTH (QTY 4)
58	HOUSING, CONN, ELEC P2	372-0044-080		00779	1-87631-5		124	CONNECTOR, RCPT ELEC P1
59	CONTACT, ELEC (QTY 16)	372-2501-040		00779	86016-2		125	NUT, PLAIN, HEX NP BR3, 5
60	POST, HEX (QTY 4)	540-9184-003			540-9184-003		126	WASHER, SPRING CD PL BRZ (AP)(QTY 1)
61	SCREW, MACH SST, 4-40 X 5/16 (AP)(QTY 4)	343-0134-000		96906	MS51957-14		127	RESISTOR,FXD 0.05 OHMS
62	WASHER, LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 4)	310-0279-000		96906	MS35338-135		128	CAPACITOR,FXD CER DIE
63	WASHER, FLAT CRES, 0.125ID X 0.250 OD (AP)(QTY 4)	310-0779-030		96906	MS15795-803		129	CAPACITOR,FXD THTLM E
64	REGULATOR CARD A1	642-3561-001					130	RESISTOR,FXD CER DIE
65	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W AIR2	745-0761-000		81349	RCR07G222KS		131	CAPACITOR,FXD CER DIE
	RESISTOR,FXD FILM, 2.05K, 1%, 1/8W AIR7	705-1011-000		81349	RN5502051F		132	CAPACITOR,FXD ELCTLT, 4
							133	SEMICONV DEVICE CR6

PARTS LIST (Cont)

FR PART NUMBER	SMR CODE	REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE	REF DES	DESCRIPTION
		66	RESISTOR,FXD FILM, 21.5K, 1%, 1/8W AIR4	705-1060-000		81349	RN55D2152F		117	CAPACITOR,FXD CER DIEI, 0.1UF, 10%,
		67	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/4W AIR8	745-0725-000		81349	RCR07G221KS		118	SEMICON DEVICE CR5
40-9237-003		68	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC A1C8	913-5019-200		81349	CK05BX103K		119	SEMICON DEVICE CR1
551957-26		69	CAPACITOR,FXD CER DIEI, 0.47UF, 10%, 50VDC A1C6	913-5019-520		81349	CK06BX474K		120	SEMICON DEVICE CR2
535338-136		70	RESISTOR,VARIABLE 500 OHMS, 10%, 0.5W AIR10	382-0027-060		80294	3329H-CY3-501		121	SEMICON DEVICE CR3
CR07G103KS		71	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC A1C17	913-5019-440		81349	CK06BX104K		122	SEMICON DEVICE CR4
CR07G103KS		72	CAPACITOR,FXD THTLM ELCTLT, 100UF, 20%, 10V A1C10	184-9102-100		56289	196D235			NUT,PLAIN,HEX NP BR5, 10-32 (AP FOR 119-122)(QTY 4)
CR07G103KS		73	INTEGRATED CIRCUIT REGULATOR AIU2	351-1373-010		34333	SG1532J			WASHER,SPRING CD PL BRZ, 0.194 ID X 0.354 OD (AP FOR 119-122)(QTY 4)
CR07G103KS		74	RESISTOR,FXD FILM, 2.6K, 1%, 1/8W AIR11	705-3605-210		81349	RN55D2001F			WASHER,FLAT TP BR5, 0.203 ID X 0.438 OD FOR 119-122(QTY 4)
CR07G103KS		75	RESISTOR,FXD CHPSN, 500 OHMS, 10%, 1/4W AIR9	745-0740-000		81349	RCR07G561KS			INSULATOR,WASHER MICA, 0.197 ID X 0.4 (AP FOR 119-122)(QTY 8)
L439-4334HT		76	RESISTOR,FXD FILM, 2.05K, 1%, 1/8W AIR14	705-1011-000		81349	RN55D2051F			TERMINAL,LUG (AP FOR 119-122)(QTY 4) (EFF TO REV LTR E)
L490-458RED		77	RESISTOR,VARIABLE 500 OHMS, 10%, 0.5W AIR17	382-0027-060		80294	3329H-CY3-501			TERMINAL,LUG (AP FOR 119-122)(QTY 4) (EFF REV LTR E)
L490-458BRN		78	RESISTOR,FXD FILM, 18.7K, 1%, 1/8W AIR18	705-1057-000		81349	RN55D1872F		123	SPACER,INSULATING (AP FOR 119-122)(QTY 4)
L490-458GRN		79	CAPACITOR,FXD THTLM ELCTLT, 47UF, 20%, 20V A1C15	184-9102-630		56289	19901022		124	CAPACITOR,FXD CER DIEI, 0.1UF, 10%,
L490-458VIO		80	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC A1C18	913-5019-440		81349	CK06BX104K		125	RESISTOR,FXD MH, 0.086 OHMS, 1%, 3W
L490-458WHT		81	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC A1C13	913-5019-200		81349	CK05BX103K		126	CAPACITOR,FXD CER DIEI, 0.1UF, 10%,
L490-458BLU		82	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W AIR16	745-0761-000		81349	RCR07G222KS		127	CAPACITOR,FXD CER DIEI, 0.1UF, 10%,
L490-458YEL		83	RESISTOR,FXD FILM, 2.05K, 1%, 1/8W AIR21	705-1011-000		81349	RN55D1132F		128	RESISTOR,FXD 0.05 OHMS, 10%, 6.5W R1
46-6127-002		84	INTEGRATED CIRCUIT REGULATOR AIU3	351-1373-010		34333	SG1532J		129	CAPACITOR,FXD CER DIEI, 0.1UF, 10%,
46-6126-002		85	RESISTOR,VARIABLE 500 OHMS, 10%, 0.5W AIR13	382-0027-060		80294	3329H-CY3-501		130	TRANSISTOR Q1
520470AD3-3		86	RESISTOR,VARIABLE 500 OHMS, 10%, 0.5W AIR20	382-0027-060		80294	3329H-CY3-501		131	TRANSISTOR Q3
40-9442-003		87	CAPACITOR,FXD CER DIEI, 0.47UF, 10%, 50VDC A1C11	913-5019-520		81349	CK06BX474K		132	INTEGRATED CIRCUIT REGULATOR U1
551957-26		88	RESISTOR,FXD FILM, 2.05K, 1%, 1/8W AIR12	705-1011-000		81349	RN55D2051F		133	INTEGRATED CIRCUIT REGULATOR U2
535338-136		89	RESISTOR,FXD FILM, 11.3K, 1%, 1/8W AIR19	705-3605-500		81349	CK05BX103K			NUT,PLAIN,HEX SST, 4-40 (AP FOR 129-133)(QTY 10)
535338-135		90	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC A1C14	913-5019-200		81349	RCR07G221KS			WASHER,FLAT CRES, 0.125ID X 0.250 OD 129-133)(QTY 10)
515795-803		91	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/4W AIR15	745-0725-000		81349	RCR07G221KS			TERMINAL,LUG (AP FOR 129-133)(QTY 6)
551957-13		92	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC A1C12	913-5019-440		81349	CK06BX104K			TERMINAL,LUG (AP FOR 129-133)(QTY 5)
551957-14		93	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC A1C9	913-5019-200		81349	CK05BX103K			BUSHING,INSULATED (AP FOR 129-133)(QTY 1)
25036-108		94	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC A1C7	913-5019-440		81349	CK06BX104K			INSULATOR, (AP FOR 129-133)(QTY 5)
535338-100		95	HOUSING,CON,EL ALJ1	372-0043-060		00779	87476-1			BLOCK,HEATSINK (AP FOR 129-133)(QTY 5)
201036030BB2A		96	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC A1C2	913-5019-440		81349	CK06BX104K			SCREW,MACH STL, 4-40 X 3/4 (AP FOR 129-133)(QTY 10)
113-0132-000		97	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC A1C4	913-5019-200		81349	CK05BX103K		134	TERMINAL,STUD (QTY 29)
35338-135		98	RESISTOR,FXD FILM, 23.2K, 1%, 1/8W AIR5	705-3605-650		81349	RN55D132F			SCREW,MACH SST, 4-40 X 5/16 (AP)(QTY 29)
515795-803		99	RESISTOR,VARIABLE 500 OHMS, 10%, 0.5W AIR6	382-0027-060		80294	3329H-CY3-501		135	WASHER,LOCK SST, 0.115 ID X 0.209 OD 29)
51957-13		100	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/4W AIR1	745-0725-000		81349	RCR07G221KS		136	PLATE,AIR FLOW (QTY 1)
51957-14		101	CAPACITOR,FXD CER DIEI, 0.47UF, 10%, 50VDC A1C1	913-5019-520		81349	CK06BX474K		137	NUT,PLAIN,HEX SST, 2-56 (AP)(QTY 3)
25036-157		102	INTEGRATED CIRCUIT REGULATOR AIU1	351-1373-010		34333	SG1532J		138	WASHER,LOCK SST, 0.080 ID X 0.172 OD 3)
25036-154		103	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC A1C3	913-5019-200		81349	CK05BX103K		139	SCREW,MACH CD PL STL, 2-56 X 5/16 (AP (QTY 1)
535338-101		104	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC A1C16	913-5019-440		81349	CK06BX104K		140	HEATSINK
20FE5030025DP		105	RESISTOR,VARIABLE 500 OHMS, 10%, 0.5W AIR3	382-0027-060		80294	3329H-CY3-501		141	CAPACITOR,FXD ELCTLT, 220UF, 10%, 35V
0-9239-003		106A	CAPACITOR,FXD THTLM ELCTLT, 47UF, 20%, 35V A1C5	184-9102-890		56289	196D248A		142	CAPACITOR,FXD ELCTLT, 220UF, 10%, 35V
551957-26		106B	RESISTOR,FIXED CHPSN, 2.2K, 10%, 1/8W AIR22	745-2353-000		81349	RCR05G222KS		143	COIL,RF L1
551957-29		106C	TRANSISTOR AIQ1	352-0661-020		81349	RCR05G103KS		144	NUT,PLAIN,HEX SST, 6-32 (AP)(QTY 1)
535338-136		106D	SEMICON DEVICE A1VR1	353-3591-060		49956	2N222A		145	WASHER,LOCK SST, 0.141 ID X 0.250 OD 1)
535338-135		106E	TERMINAL,STDF (QTY 4)(EFF TO REV LTR C)	306-2222-100		04713	IN4104		146	SCREW,MACH SST, 10-32 X 5/8 (AP)(QTY 1)
		106F	TERMINAL,FEEDTH (QTY 1)(EFF TO REV LTR C)	306-2474-110		12615	SL441-434WHT		147	TERMINAL,STUD E6-E10
-18-506-24		107	CONNECTOR,RCPT ELEC P1	371-0171-000		12615	SL444-435WHT		148	SCREW,MACH STL, 4-40 X 1/4 (AP)(QTY 5)
02208		108	NUT,PLAIN,HEX SST, 4-40 (AP)(QTY 2)	313-0132-000		77250	P313-0132-000		149	WASHER,LOCK SST, 0.115 ID X 0.209 OD (5)
113-0045-000		109	WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 2)	310-0279-000		96906	HS35338-135		150	NUT,PLAIN,HEX NP BR5, 10-32 (AP)(QTY 1)
35338-136		110	SCREW,MACH SST, 4-40 X 5/16 (AP)(QTY 2)	343-0134-000		96906	HS35338-100		151	WASHER,FLAT TP BR5, 0.203 ID X 0.438 OD (AP)(QTY 1)
51957-29		110A	SEMICON DEVICE VR1	353-0325-020		24444	G204118A		152	SCREW,MACH SST, 10-32 X 5/8 (AP)(QTY 1)
07631-5		111	NUT,PLAIN,HEX NP BR5, 10-32 (AP)(QTY 1)	313-0056-000		77250	P313-0056-000		153	TERMINAL,STUD E6-E10
016-2		112	WASHER,SPRING CD PL BRZ, 0.194 ID X 0.354 OD (AP)(QTY 1)	310-0190-000		96906	HS35338-100		154	SCREW,MACH STL, 4-40 X 1/4 (AP)(QTY 5)
0-9104-003		113	RESISTOR,FXD 0.05 OHMS, 10%, 6.5W R2	747-2161-020		91637	CM5-5GR0500K		155	WASHER,LOCK SST, 0.115 ID X 0.209 OD (5)
51957-14		114	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC C13	913-5019-440		81349	CK06BX104K		156	CHASSIS,POWER SUPPLY (QTY 1)
535338-135		115	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/4W R14	745-0755-000		81349	RCR07G152KS		157	CLIP, SPR TNSH (QTY 2)
515795-803		116	CAPACITOR,FXD THTLM ELCTLT, 10UF, 20%, 20V C8	184-9102-610		56289	199D106X0020CE3		158	RIVET,TUBULAR AL, 0.123 DIA X 0.156 (AP)(QTY 2)
		117	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/4W R13	745-0755-000		81349	RCR07G152KS		159	FASTENER,RTRN CRES, 6-32 X 21/32 X 3/8 DP (QTY 2)
		118	CAPACITOR,FXD THTLM ELCTLT, 10UF, 20%, 20V C11	184-9102-610		56289	199D106X0020CE3		160	SPRING,HLCL,CPR (QTY 2)
		119	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC C4	913-5019-440		81349	CK06BX104K		161	CHASSIS
		120	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC C10	913-5019-440		81349	CK06BX104K		162	
		121	CAPACITOR,FXD ELCTLT, 47UF, P75XH10%, 30V C15	183-1277-230		56289	600D476G030K05			
		122	SEMICON DEVICE CR6	353-3718-040		14099	1HS550			

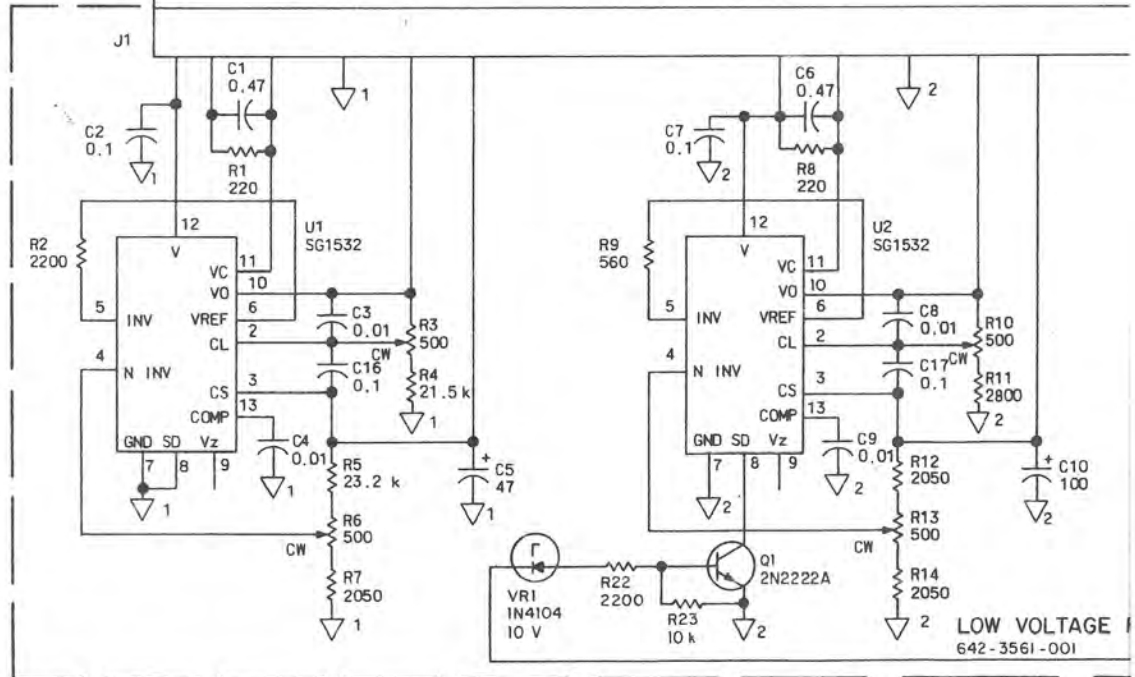
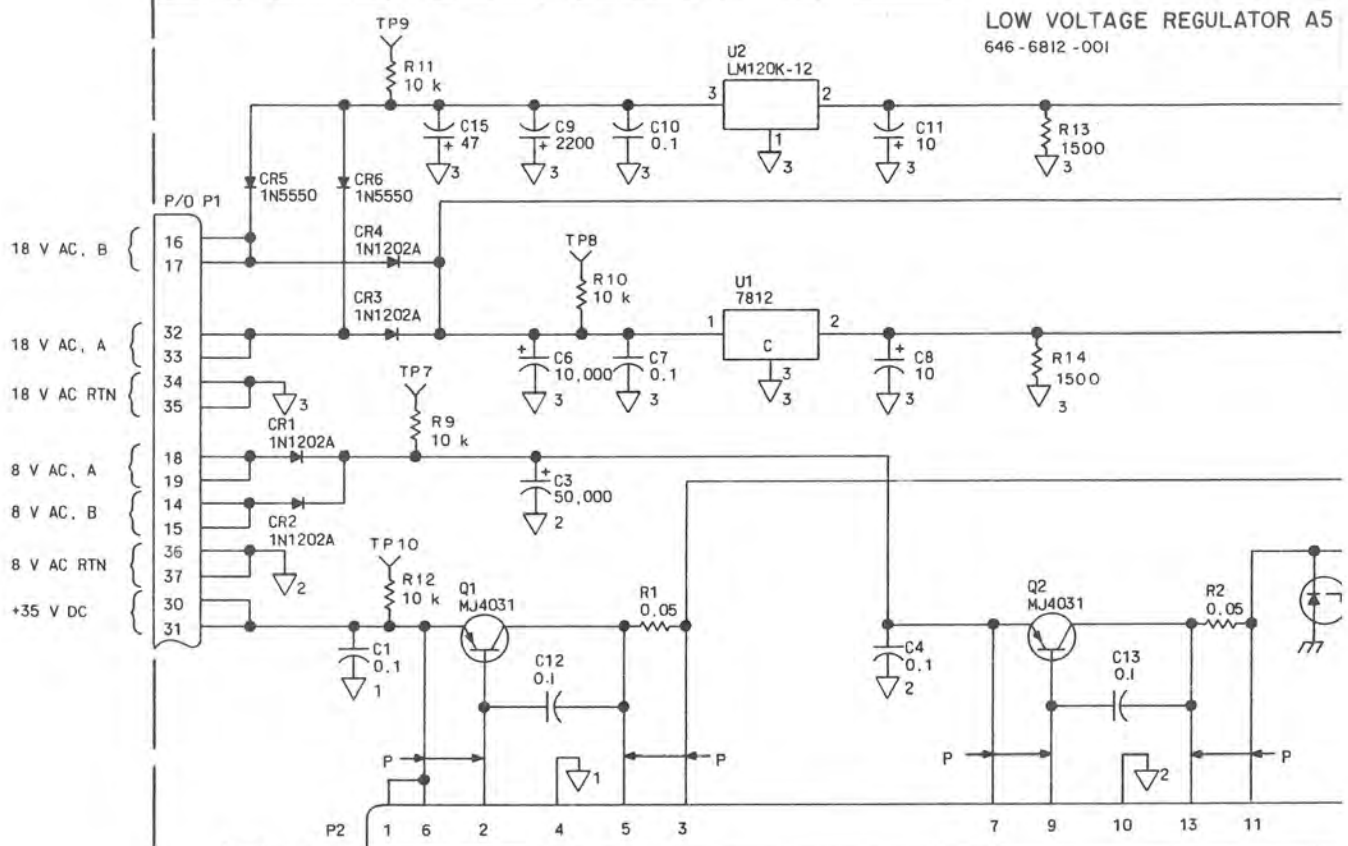
Low-Voltage Module, Parts Location D  
Figure 6 (Sheet 2)

PARTS LIST (Cont)

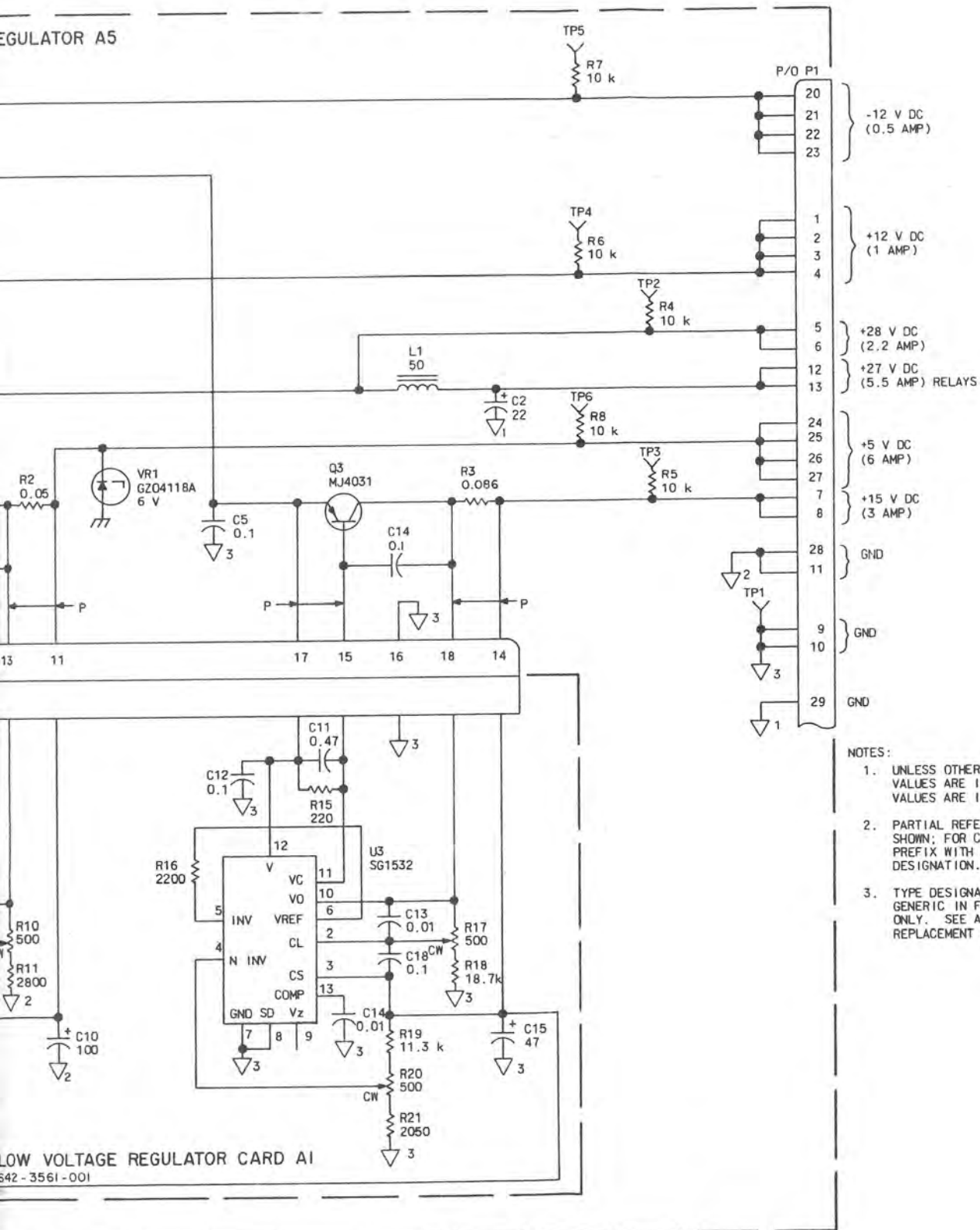
USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE	REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE
	81349	RH5502152F		117	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC C5	913-5019-440		81349	CK06BX104K	
	81349	RCR07G221KS		118	SEMICON DEVICE CR5	353-3718-040		14099	IN5550	
	81349	CK05BX103K		119	SEMICON DEVICE CR1	353-1889-000		81483	IN1202A	
	81349	CK06BX474K		120	SEMICON DEVICE CR2	353-1889-000		81483	IN1202A	
	81349	CK06BX474K		121	SEMICON DEVICE CR3	353-1889-000		81483	IN1202A	
	81349	CK06BX474K		122	SEMICON DEVICE CR4	353-1889-000		81483	IN1202A	
	80294	3329H-CY3-501			NUT,PLAIN,HEX NP BR5, 10-32 (AP FOR 119-122)(QTY 4)	313-0056-000		77250	P313-0056-000	
	81349	CK06BX104K			WASHER,SPRING CD PL BRZ, 0.194 ID X 0.334 OD (AP FOR 119-122)(QTY 4)	310-0100-000		96906	MS35338-100	
	56289	1960235			WASHER,FLAT TP BR5, 0.203 ID X 0.438 OD (AP FOR 119-122)(QTY 4)	310-0751-020		88044	AN961-10T	
	34333	SG1532J			INSULATOR,WASHER MICA, 0.197 ID X 0.625 OD (AP FOR 119-122)(QTY 8)	302-0640-190		08289	MM625-197	
	81349	RH5502001F			TERMINAL,LUG (AP FOR 119-122)(QTY 4)	304-0040-140		79963	619CET196	
	81349	RCR07G561KS			TERMINAL,LUG (AP FOR 119-122)(QTY 4) (EFF TO REV LTR E)	304-1466-010		91886	2115	
	81349	RH5502051F			SPACER,INSULATING (AP FOR 119-122)(QTY 4)	352-9561-260		08289	TM200-280-125	
	80294	3329H-CY3-501		123	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC C14	913-5019-440		81349	CK06BX104K	
	81349	RH5501072F		124	RESISTOR,FXD HW, 0.066 OHMS, 1%, 3W R3	746-8001-250		91637	RS2COR0860F	
	56289	1990102E		125	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC C1	913-5019-440		81349	CK06BX104K	
	81349	CK06BX104K		126	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC C12	913-5019-440		81349	CK06BX104K	
	81349	CK06BX104K		127	RESISTOR,FXD 0.05 OHMS, 10%, 6.5W R1	747-2161-020		91637	CM5-5GR0500K	
	81349	CK05BX103K		128	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC C7	913-5019-440		81349	CK06BX104K	
	81349	RCR07G222KS		129	TRANSISTOR Q1	352-1006-030		02735	66804	
	81349	RH5502051F		130	TRANSISTOR Q3	352-1006-030		02735	66804	
	81349	RH5501132F		131	INTEGRATED CIRCUIT REGULATOR U1	351-1217-020		07263	UA7812KM	
	34333	SG1532J		132	TRANSISTOR Q2	352-1006-030		02735	66804	
	80294	3329H-CY3-501		133	INTEGRATED CIRCUIT VOLT REGULATOR U2	351-1218-020		27014	IN120K12	
	80294	3329H-CY3-501			NUT,PLAIN,HEX SST, 4-40 (AP FOR 129-133)(QTY 10)	313-0132-000		77250	P313-0132-000	
	80294	3329H-CY3-501			WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP FOR 129-133)(QTY 10)	310-0279-000		96906	MS35338-135	
	81349	CK06BX474K			WASHER,FLAT CRES, 0.125 ID X 0.250 OD (AP FOR 129-133)(QTY 10)	310-0779-030		96906	MS15795-803	
	81349	RH5502051F			TERMINAL,LUG (AP FOR 129-133)(QTY 6)	304-0016-000		77147	4007-6HT	
	81349	RH5501132F			TERMINAL,LUG (AP FOR 129-133)(QTY 5)	304-0016-000		77147	4007-6HT	
	81349	CK05BX103K			BUSHING,INSULATED (AP FOR 129-133)(QTY 10)	547-8177-012			547-8177-012	
	81349	RCR07G221KS			INSULATOR, (AP FOR 129-133)(QTY 5)	352-9882-030		16758	7304943	
	81349	CK06BX104K			BLOCK,HEATSINK (AP FOR 129-133)(QTY 5)	641-6601-001				
	81349	CK05BX103K			SCREW,MACH STL, 4-40 X 3/4 (AP FOR 129-133)(QTY 10)	343-0139-000		96906	MS51957-19	
	81349	CK06BX104K		134	TERMINAL,STUD (QTY 29)	306-2513-250		71279	4814-1-0516	
	81349	CK05BX103K			SCREW,MACH SST, 4-40 X 5/16 (AP)(QTY 29)	343-0134-000		96906	MS51957-14	
	81349	CK06BX104K			WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 29)	310-0279-000		96906	MS35338-135	
	00779	87476-1		135	PLATE,AIR FLOW (QTY 1)	646-6810-001				
	81349	CK06BX104K		136	NUT,PLAIN,HEX SST, 2-56 (AP)(QTY 3)	313-0037-000		96906	MS35649-224	
	81349	CK05BX103K		137	WASHER,LOCK SST, 0.088 ID X 0.172 OD (AP)(QTY 3)	310-0275-000		96906	MS35338-134	
	81349	CK05BX103K		138	SCREW,MACH CD PL STL, 2-56 X 5/16 (AP)(QTY 3)	343-0125-000		96906	MS51957-4	
	81349	RH5502322F		139	HEATSINK	646-6544-001				
	80294	3329H-CY3-501		140	CAPACITOR,FIXED ELCTLT, 220UF, 10%, 35V C2	184-9086-660		81349	M39003-01-2306	
	81349	RCR07G221KS		141	CAPACITOR,FXD ELCTLT, 220UF, H10ZP75%, 30V C9	184-5102-740		81349	M39016-03-0733	
	81349	CK06BX474K		142	COIL,RF L1	678-0305-010		60223	AP0324	
	81349	CK06BX474K		143	NUT,PLAIN,HEX SST, 6-32 (AP)(QTY 1)	313-0045-000		77250	P313-0045-000	
	81349	CK06BX474K		144	WASHER,LOCK SST, 0.141 ID X 0.250 OD (AP)(QTY 1)	310-0282-000		96906	MS35338-136	
	81349	CK05BX103K		145	WASHER,INSULATOR (AP)(QTY 1)	646-6811-001				
	81349	CK05BX103K		146	RETAINER (AP)(QTY 1)	679-1832-001				
	81349	CK06BX104K		147	WASHER,SPECIAL (AP)(QTY 1)	623-5821-001			623-5821-001	
	81349	CK06BX104K		148	SCREW,MACH SST, 6-32 X 1-1/8 (AP)(QTY 1)	343-0177-000		77250	P343-0177-000	
	81349	CK06BX104K		149	CLAMP,LOOP (QTY 1)	150-0708-840		96906	MS25281R5	
	80294	3329H-CY3-501		150	NUT,PLAIN,HEX NP BR5, 10-32 (AP)(QTY 1)	313-0056-000		77250	P313-0056-000	
	56289	1960246A		151	WASHER,SPRING CD PL BRZ, 0.194 ID X 0.334 OD (AP)(QTY 1)	310-0100-000		96906	MS35338-100	
	81349	RCR05G222KS		152	WASHER,FLAT TP BR5, 0.203 ID X 0.438 OD (AP)(QTY 1)	310-0751-020		88044	AN961-10T	
	81349	RCR05G103KS		153	SCREW,MACH SST, 10-32 X 5/8 (AP)(QTY 1)	343-0229-000		96906	MS51958-64	
	49956	2M2222A		154	TERMINAL,STUD E6-E10	306-2513-250		71279	4814-1-0516	
	04713	IN4104		155	SCREW,MACH STL, 4-40 X 1/4 (AP)(QTY 5)	343-0133-000		96906	MS51957-13	
	12615	SL441-434MHT		156	WASHER,LOCK SST, 0.115 ID X 0.209 OD (AP)(QTY 5)	310-0279-000		96906	MS35338-135	
	12615	SL444-435MHT			CHASSIS,POWER SUPPLY (QTY 1)	646-6535-001		91506	6019-41CN	
	71468	DCM-37P		157	CLIP, SFR THSN (QTY 2)	139-3491-010		96906	MS16535-153	
	77250	P313-0132-000		158	RIVET,TUBULAR AL, 0.123 DIA X 0.156 (AP)(QTY 2)	305-1800-000				
	96906	MS35338-135		159	FASTENER,RTHR CRES, 6-32 X 21/32 X 3/32 DP (QTY 2)	012-4948-170		94222	51-16-506-24	
	77250	P313-0056-000		161	SPRING,HLCL,CPR (QTY 2)	340-1077-190		84830	LC02208	
	96906	MS35338-100		162	CHASSIS	646-6535-002				
	91637	CM5-5GR0500K								
	81349	CK06BX104K								
	81349	RCR07G152KS								
	56289	1990106X0020CE3								
	81349	RCR07G152KS								
	56289	1990106X0020CE3								
	81349	CK06BX104K								
	81349	CK06BX104K								
	56289	6800476G030K05								
	14099	IN5550								

Low-Voltage Module, Parts Location Diagram  
Figure 6 (Sheet 2)

**LOW VOLTAGE REGULATOR AS**  
646-6812-001







TPA-3035-014  
647-7199

Low-Voltage Module, Schematic Diagram  
Figure 7



Rockwell  
International

instructions

Collins Telecommunications Products Division

523-0771677-001211

15 September 1982

# Digital Voltmeter Card (642-3197-001, -002)

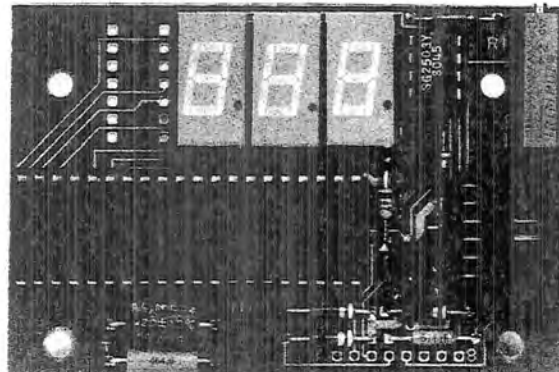
Printed in USA

Digital Voltmeter Card  
(642-3197-001, -002)

## 1. DESCRIPTION

Digital Voltmeter Card 642-3197-001, -002 (figure 1) is a 2-layer plug-in circuit card with an 8-pin connector.

All electrical connections to the digital voltmeter card are made through this connector.



TPA-4676-017

Digital Voltmeter Card  
Figure 1

523-0771677-001211

## 2. PRINCIPLES OF OPERATION

### 2.1 General

The digital voltmeter card consists of a 3½-digit a/d converter, a reference voltage, and a 3-digit display.

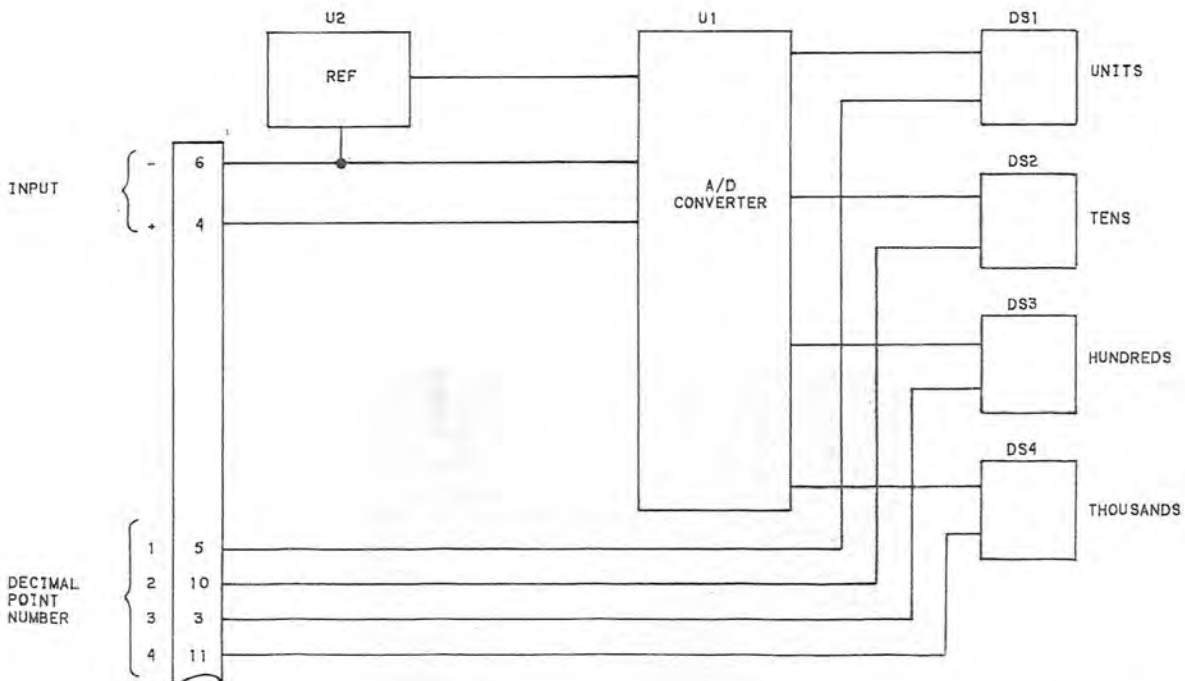
### 2.2 Block Diagram Theory (Refer to figure 2)

The digital voltmeter card uses a reference to establish the full-scale reading based on the anticipated

input analog voltages. The reference input should be approximately ½ the expected full-scale analog input.

The reference and the analog input are applied to the a/d converter which converts the analog input to a digital signal. The digital signal is supplied through display drivers in the a/d converter and is supplied to the digital voltmeter displays.

Decimal points are applied to the appropriate displays as supplied by the unit.



TPA-6061-012

Block Diagram  
Figure 2

**3. TESTING/TROUBLESHOOTING PROCEDURES**

A defective digital voltmeter card can be returned to a Rockwell-Collins authorized repair facility for repair. Contact the nearest Rockwell-Collins office or

Collins Telecommunications Products Division  
Attention: HF Products  
400 Collins Road, NE  
Cedar Rapids, Iowa 52498

for information and instructions.

**4. ALIGNMENT/ADJUSTMENT**

Alignment/adjustment is performed in conjunction with testing/troubleshooting.

**5. REPAIR**

Repair is accomplished using standard shop practices.

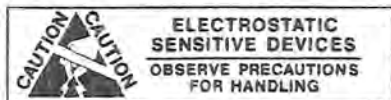
## 6. PARTS LIST/DIAGRAMS

### 6.1 Introduction

**Caution**

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All parts list illustrations containing ESDS items are shown with the following symbol:



This paragraph assists in identification and requisition of parts. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included. The parts location illustration shows component placement on the circuit cards.

### 6.2 Parts List

REF DES Column — Reference designators and/or item numbers for each part/subassembly are listed in alphanumeric or numeric sequence. These are the reference designators and/or item numbers shown on the parts location illustration. Only the reference designators are shown on the schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modification.

Modifications are identified by two methods: An alphanumeric identifier is assigned to each electrical design change and listed in the REVISION IDENT column of the modification history. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change.

NA (not applicable) in the REVISION IDENT column indicates a documentation change and/or mechanical change. This revision activity will be noted in the DESCRIPTION column of the parts list only. This change does not affect the circuit card/subassembly components or the schematic. Each change relates to

the REV (revision identifier) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history. Dash (—) denotes original; letter A first change; letter B second change, etc.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

### 6.3 How To Use This Parts List

To locate a part number, locate the part and its item number and/or reference designator on the illustration. Turn to the parts list page and find the item number and/or reference designator to determine its description and part number.

To locate the illustration for a part, if the reference designator and/or part number are known, refer to the parts list and find the figure and item number indicated in the parts list for location on the illustration.

### 6.4 Manufacturer's Code, Name, and Address

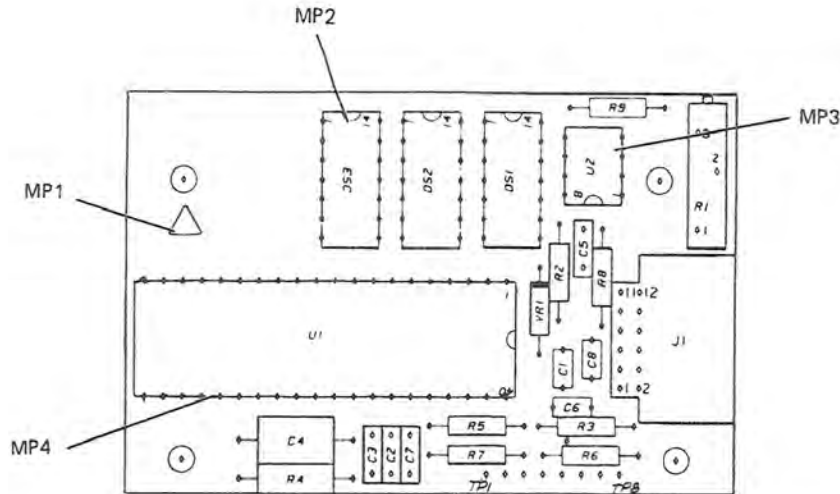
MFR CODE	MANUFACTURER'S NAME AND ADDRESS
00779	AMP INC P O BOX 3608 HARRISBURG PA 17105
04099	CAPCO INC FORESIGHT INDUSTRIAL PARK P O BOX 2164 GRAND JUNCTION CO 81501
04713	MOTOROLA INC SEMICONDUCTOR GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
12998	QUALITY NAME PLATE INC MILL ROAD EAST GLASTONBURY CT 06025

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV 855 35TH ST NE P O BOX 728 CEDAR RAPIDS IA 52498
32293	INTERSIL INC 10900 N TANTAU AVE CUPERTINO CA 95014
34333	SILICON GENERAL INC 11651 MONARCH ST GARDEN GROVE CA 92641
50522	MONSANTO INDUSTRIAL CHEMICALS CO 755 PAGE MILL RD PALO ALTO CA 94304
73803	TEXAS INSTRUMENTS INC METALLURGICAL MATERIALS DIVISION 34 FOREST ST ATTLEBORO MA 02703
80031	MEPCO/ELECTRA INC 22 COLUMBIA RD MORRISTOWN NJ 07960
81349	MILITARY SPECIFICATIONS

*6.5 Equipment Covered*

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions. Configuration history before 1 April 1982 is not recorded in this section.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Digital Voltmeter Card	642-3197-001	REV E



DIGITAL VOLTMETER

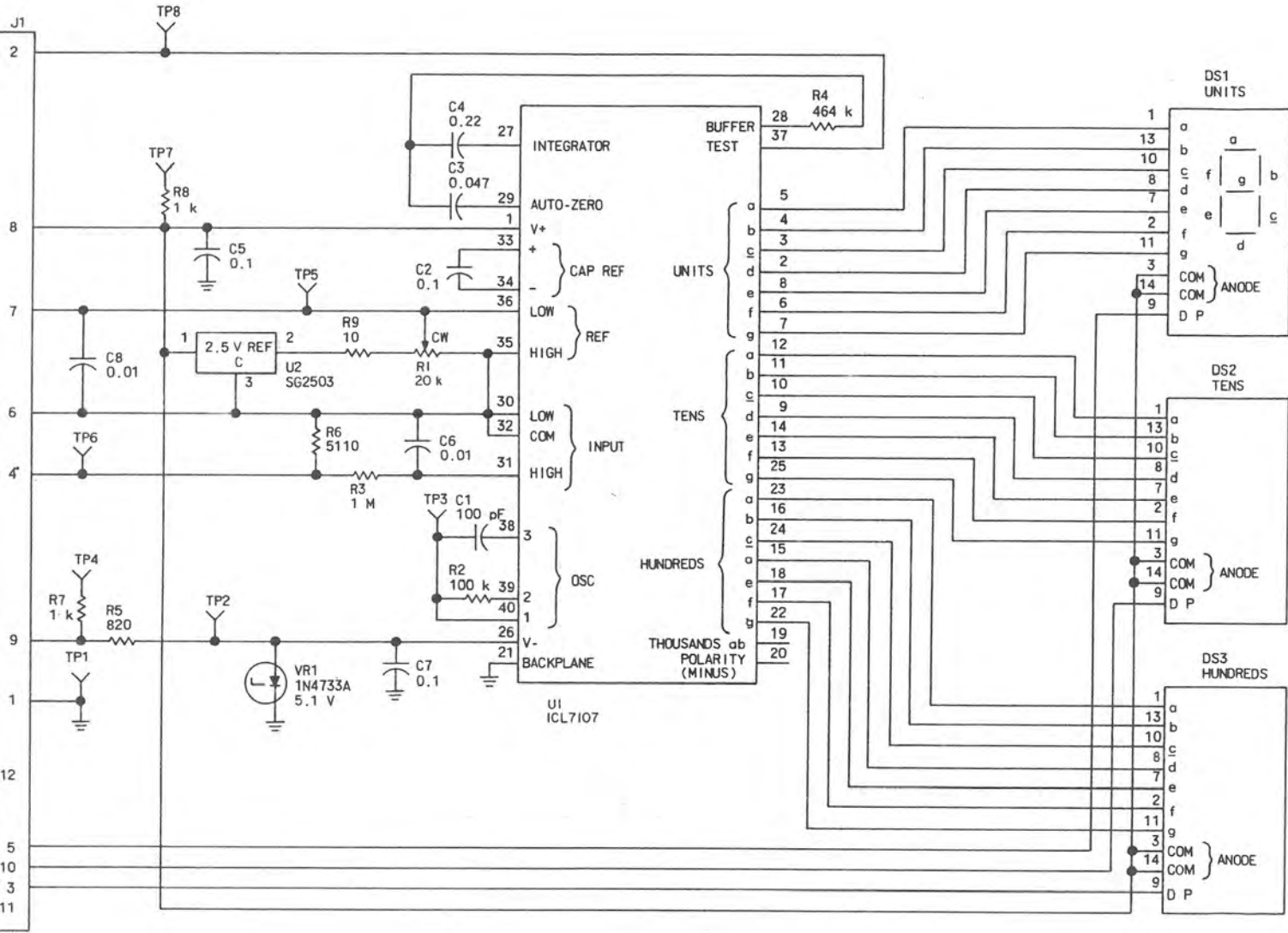
TPA-4782-019



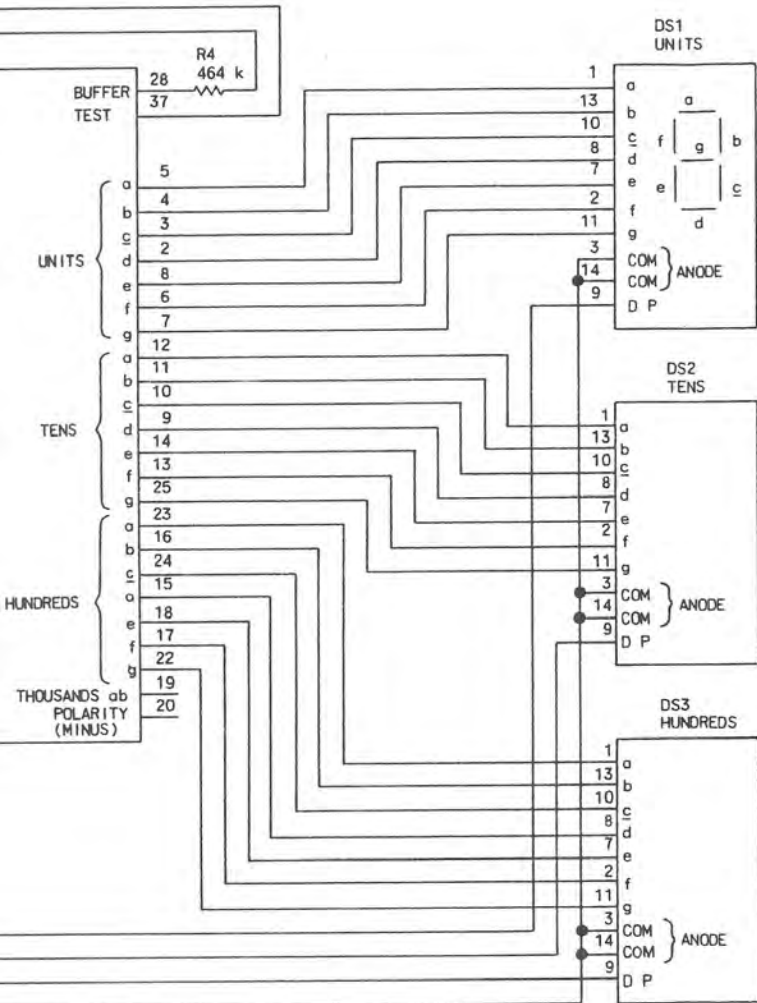
PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE
	DIGITAL VOLTMETER (ESDS)	642-3197-001			642-3197-001	
C1	CAPACITOR, FIXED CER DIEL, 100PF, 10%, 200V	913-4006-000		81349	CK05BX101K	
C2	CAPACITOR, FIXED CER DIEL, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K	
C3	CAPACITOR, FIXED CER DIEL, 0.047UF, 10%, 100VDC	913-5019-400		81349	CK06BX473K	
C4	CAPACITOR, FIXED PLSTC DIEL, 0.22UF, 10%, 50V	933-1081-120		04099	CRC-1-120	
C5	CAPACITOR, FIXED CER DIEL, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K	
C6	CAPACITOR, FIXED CER DIEL, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K	
C7	CAPACITOR, FIXED CER DIEL, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K	
C8	CAPACITOR, FIXED CER DIEL, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K	
DS1-DS3	SEMICOND DEVICE	262-1453-010		50522	MAN4610A	
J1	HOUSING, CONN, EL	372-0043-020		00779	1-87476-1	
MP1	LABEL, PRESS SEMS (ESDS)	280-2745-040		12998	280-2745-040	
MP2	SOCKET, IC (QTY 3)	220-0049-010		73803	C93-14-02	
MP3	SOCKET, IC (EFF TO REV LTR E)	220-0049-100		73803	C93-08-02	
MP4	SOCKET, IC (EFF TO REV LTR E)	220-0049-080		73803	C93-40-02	
R1	RESISTOR, VARIABLE CERMET, 20K, 10%, 3/4W	382-0012-300		80031	8035EKP203	
R2	RESISTOR, FIXED FILM, 100K, 1%, 1/8W	705-1092-000		81349	RN5501003F	
R3	RESISTOR, FIXED CHPSN, 1MEG, 10%, 1/4W	745-0857-000		81349	RCR07G105KS	
R4	RESISTOR, FXD FILM, 464K, 1%, 1/4W	705-6724-000		81349	RN60D4643F	
R5	RESISTOR, FIXED CHPSN, 820 OHMS, 10%, 1/4W	745-0746-000		81349	RCR07G023KS	
R6	RESISTOR, FIXED FILM, 5.11K, 1%, 1/8W	705-1030-000		81349	RN5505111F	
R7, R8	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS	
R9	RESISTOR, FXD FILM, 10 OHMS, 1%, 1/8W	705-0900-000		81349	RN55D10R0F	
U1	INTEGRATED CIRCUIT A/D CONVERTER (ESDS)	351-8730-010		32293	ICL7107CPL	
U2	INTEGRATED CIRCUIT VOLTAGE GENERATOR	351-0522-010		34333	SG2503M	
VR1	SEMICOND DEVICE	353-6401-110		04713	IN4733A	

Digital Voltmeter Card, Parts Location Diagram  
Figure 3







NOTES:

1. UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS, AND CAPACITANCE VALUES ARE IN MICROFARADS.
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATIONS, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATIONS.
3. TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.
4. THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.

647-7200  
TPA-3036-024

Digital Voltmeter Card 642-3197-001, Schematic Diagram  
Figure 4



Rockwell  
International

instructions

# Crowbar/Logic Card (642-3579-001)

Collins Telecommunications Products Division

Printed in USA

523-0771678-001211

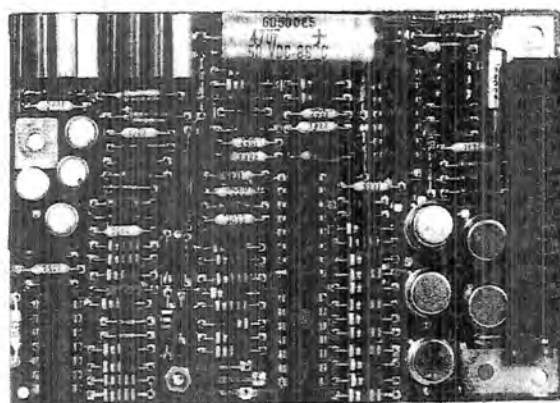
15 September 1982

(642-3579-001)

## 1. DESCRIPTION

Crowbar/Logic Card 642-3579-001 (figure 1) is a 2-layer plug-in circuit card with a 36-pin connector.

All electrical connections to the crowbar/logic card are made through this connector.



TPA-4677-017

Crowbar/Logic Card  
Figure 1

523-0771678-001211

## 2. PRINCIPLES OF OPERATION

### 2.1 General

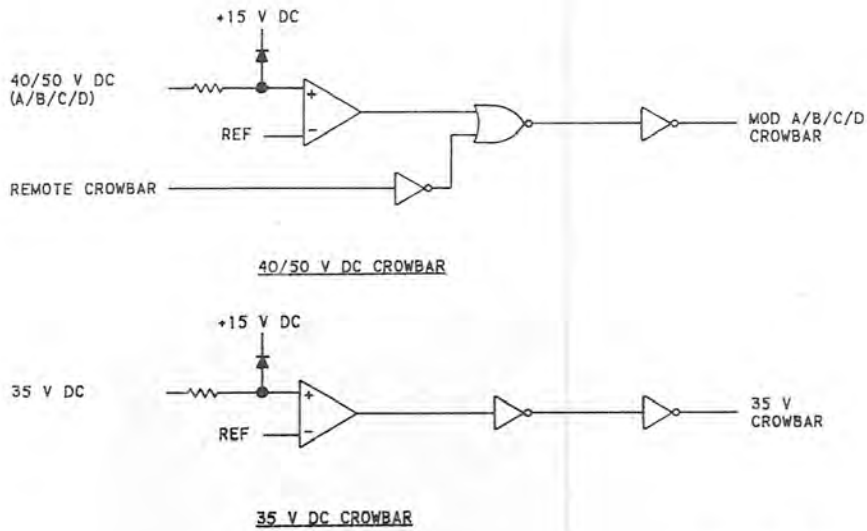
The crowbar/logic card consists of five crowbar control circuits, four identical and one slightly different, and power enable control circuits.

### 2.2 Crowbar Control Circuits (Refer to figure 2)

The 50/40-V dc crowbar circuits supply a crowbar enable signal when the 50/40-V dc input goes too high or when a remote crowbar (logic 0) input is supplied. The 50/40-V dc input is supplied to the positive side of a differential amplifier. When the 50/40-V dc input exceeds the reference input, a logic 1 out-

put is supplied from the differential amplifier through the NAND gate and inverter to supply a logic 1 crowbar enable signal to the associated crowbar circuit. The 50/40-V dc input is disabled during shutdown by a diode and the +15-V dc source. A remote 50/40-V dc crowbar (logic 0) can be supplied to initiate a crowbar signal.

The 35-V dc crowbar circuit supplies a crowbar enable signal when the 35-V dc input goes too high. The 35-V dc input is supplied to the positive side of a differential amplifier. When the 35-V dc input exceeds the reference input to the differential amplifier, a logic 1 output is supplied through two inverters and supplies a logic 1 crowbar enable signal to the associated crowbar circuit.



TPA-5362-012

Crowbar Control Circuits  
Figure 2

### 2.3 Power Enable Control Circuits (Refer to figure 3)

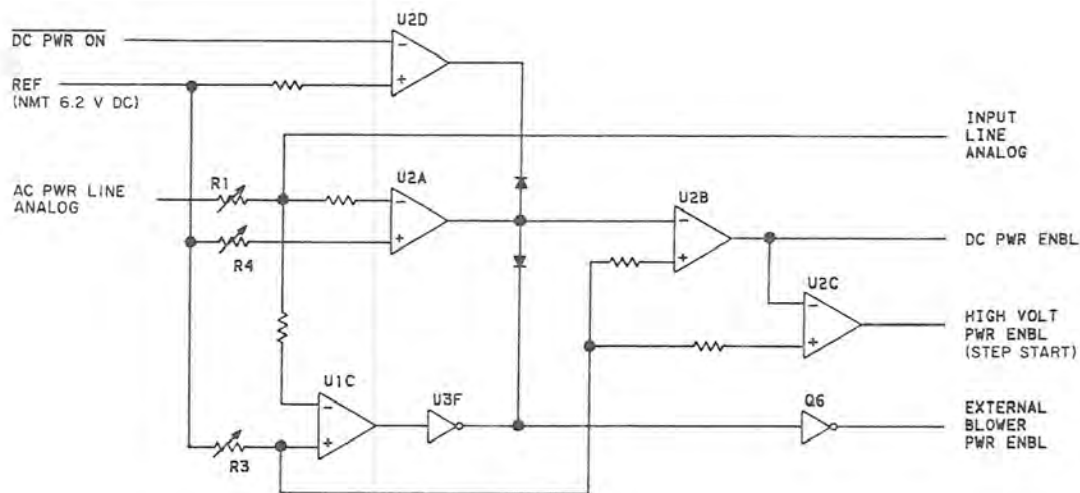
The power enable control circuits receive a control signal (dc power on) and an analog signal (ac power line analog) and provide four output signals: input line analog, dc power enable, high-voltage power enable, and external blower power enable.

The input line analog is directly proportional to the ac power line analog and can be monitored as a reference of the applied ac input voltage.

The dc power enable signal output is supplied when the reference signal input is supplied, the dc power on signal input (logic 0) is supplied, and the ac power line analog is supplied.

The high-voltage power enable output is supplied when a reference signal is applied and the dc power enable output (logic 0) is supplied.

The external blower power enable output is supplied when the reference signal input is supplied and the dc control enable input is supplied.



POWER ENABLE CONTROL CIRCUITS

TPA-5361-012

Power Enable Control Circuits  
Figure 3

**3. TESTING/TROUBLESHOOTING PROCEDURES**

A defective crowbar/logic card can be returned to a Rockwell-Collins authorized repair facility for repair. Contact the nearest Rockwell-Collins office or

Collins Telecommunications Products Division  
Attention: HF Products  
400 Collins Road, NE  
Cedar Rapids, Iowa 52498

for information and instructions.

**4. ALIGNMENT/ADJUSTMENT**

Alignment/adjustment is performed in conjunction with testing/troubleshooting.

**5. REPAIR**

Repair is accomplished using standard shop practices.

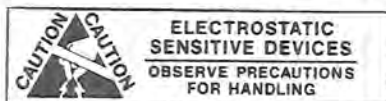
## 6. PARTS LIST/DIAGRAMS

### 6.1 Introduction

**Caution**

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All parts list illustrations containing ESDS items are shown with the following symbol:



This paragraph assists in identification and requisition of parts. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included. The parts location illustration shows component placement on the circuit cards.

### 6.2 Parts List

REF DES Column — Reference designators and/or item numbers for each part/subassembly are listed in alphanumeric or numeric sequence. These are the reference designators and/or item numbers shown on the parts location illustration. Only the reference designators are shown on the schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modification.

Modifications are identified by two methods: An alphanumeric identifier is assigned to each electrical design change and listed in the REVISION IDENT column of the modification history. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change.

NA (not applicable) in the REVISION IDENT column indicates a documentation change and/or mechanical change. This revision activity will be noted in the DESCRIPTION column of the parts list only. This change does not affect the circuit card/subassembly components or the schematic. Each change relates to

the REV (revision identifier) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history. Dash (—) denotes original; letter A first change; letter B second change, etc.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

### 6.3 How To Use This Parts List

To locate a part number, locate the part and its item number and/or reference designator on the illustration. Turn to the parts list page and find the item number and/or reference designator to determine its description and part number.

To locate the illustration for a part, if the reference designator and/or part number are known, refer to the parts list and find the figure and item number indicated in the parts list for location on the illustration.

### 6.4 Manufacturer's Code, Name, and Address

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
00779	AMP INC P O BOX 3608 HARRISBURG PA 17105
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49 DALLAS TX 75265
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
04713	MOTOROLA INC SEMICONDUCTOR GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008

MFR      MANUFACTURER'S NAME  
CODE     AND ADDRESS

12040    NATIONAL SEMICONDUCTOR CORP  
          COMMERCE DR  
          P O BOX 443  
          DANBURY CT 06810

12954    SIEMENS CORP COMPONENTS GROUP  
          8700 E THOMAS RD  
          P O BOX 1390  
          SCOTTSDALE AZ 85252

12998    QUALITY NAME PLATE INC  
          MILL ROAD  
          EAST GLASTONBURY CT 06025

14433    ITT SEMICONDUCTOR DIV  
          WEST PALM BEACH FL

31433    UNION CARBIDE CORP  
          ELECTRONICS DIV  
          HWY 276 SE  
          P O BOX 5928  
          GREENVILLE SC 29606

56289    SPRAGUE ELECTRIC CO  
          87 MARSHALL ST  
          NORTH ADAMS MA 01247

80294    BOURNS INSTRUMENTS INC  
          6135 MAGNOLIA AVE  
          RIVERSIDE CA 92506

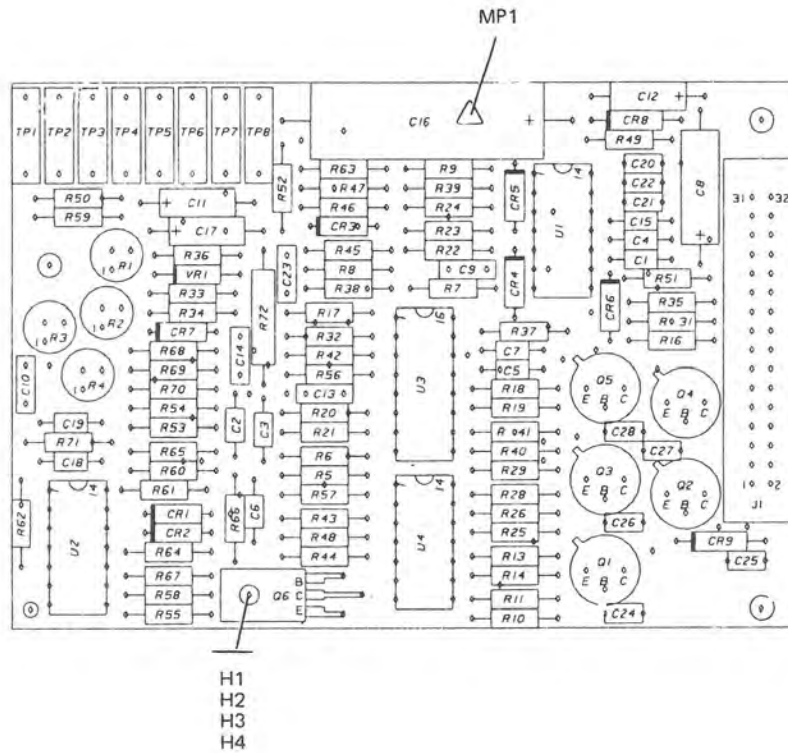
81349    MILITARY SPECIFICATIONS

96906    MILITARY STANDARD

**6.5 Equipment Covered**

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions. Configuration history before 1 April 1982 is not recorded in this section.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Crowbar/Logic Card	642-3579-001	REV F



TPA-4897-019

Crowbar/Logic Card, Parts Location Diagram  
Figure 4 (Sheet 1 of 2)

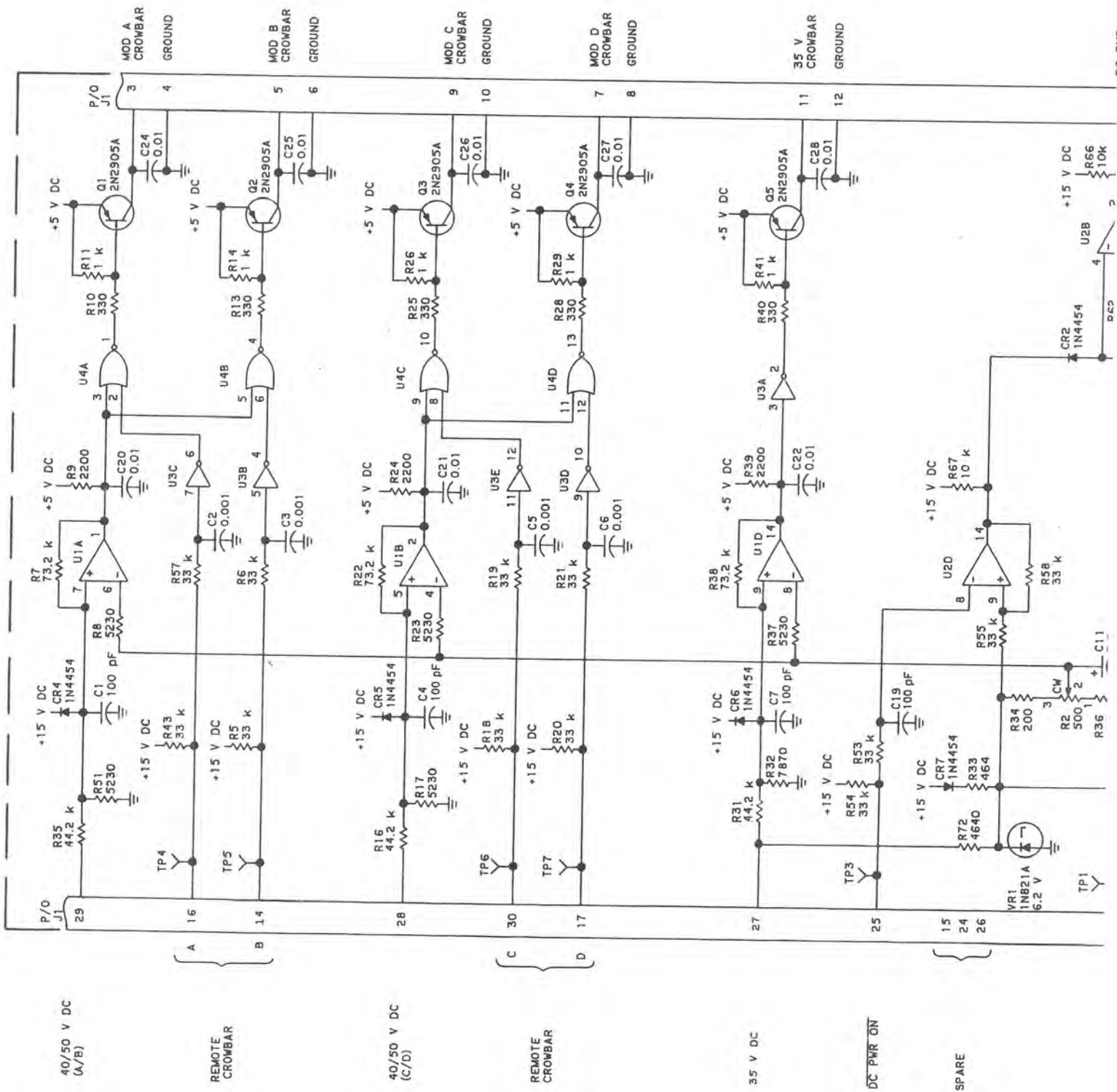


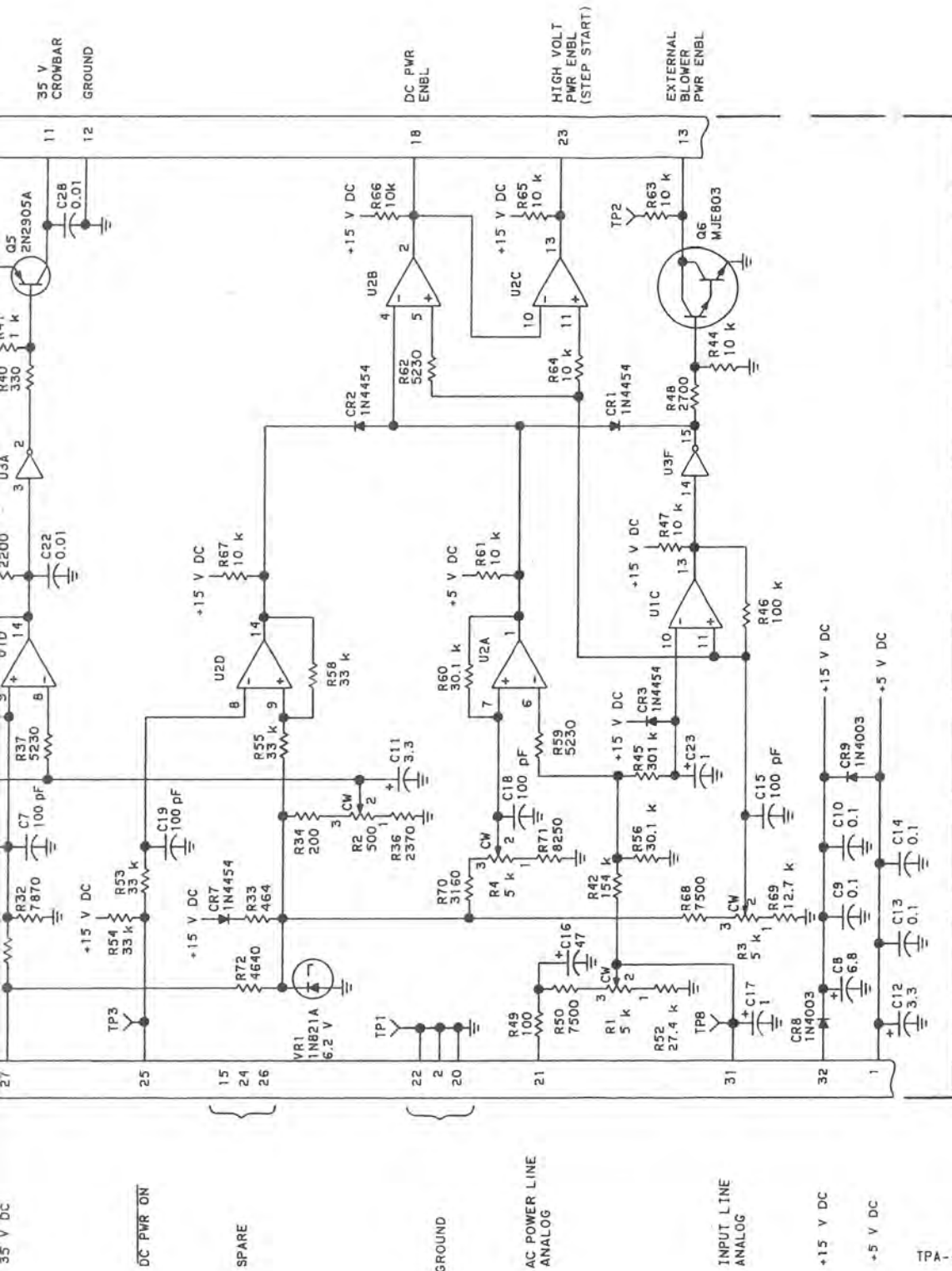
PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE	REF DES	DESCRIPTION
CR1-CR7	CROWBAR/LOGIC CARD (ESDS)	642-3579-001					R70	RESISTOR,FXD FILM, 3.16K, 1%, 1/8W
CR8,CR9	SEMICOND DEVICE	353-3644-010		31433	1M4454		R71	RESISTOR,FXD FILM, 8.25K, 1%, 1/8W
C1	CAPACITOR,FXD CER DIEI, 100PF, 10%, 100V	353-6442-030		14433	1M4003		R72	RESISTOR,FXD FILM, 4.64K, 1%, 1/4W
C2,C3	CAPACITOR,FXD CER DIEI, 1000PF, 10%, 100V	913-5020-150		81349	CK12BX101K		TP1	JACK,TIP BRN
C4	CAPACITOR,FXD CER DIEI, 100PF, 10%, 100V	913-4778-000		81349	CK12BX102K		TP2	JACK,TIP RED
C5,C6	CAPACITOR,FXD CER DIEI, 1000PF, 10%, 100V	913-5020-150		81349	CK12BX101K		TP3	JACK,TIP GRN
C7	CAPACITOR,FXD CER DIEI, 1000PF, 10%, 100V	913-4778-000		81349	CK12BX102K		TP4	JACK,TIP YEL
C8	CAPACITOR,FIXED ELCTLT, 6.8UF, 10%, 35V	913-5020-150		81349	CK12BX101K		TP5	JACK,TIP GRN
C9,C10	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC	184-9086-640		81349	M39003-01-2304		TP6	JACK,TIP BLU
C11,C12	CAPACITOR,FIXED ELCTLT, 3.3UF, 10%, 15V	913-5019-440		81349	CK06BX104K		TP7	JACK,TIP VIO
C13,C14	CAPACITOR,FXD CER DIEI, 0.1UF, 10%, 100VDC	184-9086-280		81349	M39003-01-2268		TP8	JACK,TIP GRA
C15	CAPACITOR,FXD CER DIEI, 100PF, 10%, 100V	913-5019-440		81349	CK06BX104K		U1,U2	INTEGRATED CIRCUIT COMPARATOR
C16	CAPACITOR,FXD ELCTLT, 47UF, P75ZHI0Z, 50V	913-5020-150		81349	CK12BX101K		U3	MICROCIRCUIT BUFFER (ESDS)
C17	CAPACITOR,FIXED ELCTLT, 1UF, 10%, 50V	184-9087-430		56289	600D4760S0DE5		U4	INTEGRATED CIRCUIT QUAD,2-INPUT GATE
C18,C19	CAPACITOR,FXD CER DIEI, 100PF, 10%, 100V	913-5020-150		81349	CK12BX101K		VR1	SEMICOND DEVICE
C20-C22	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K			
C23	CAPACITOR,FXD CER DIEI, 1UF, 10%, 50VDC	913-5019-560		81349	CK06BX105K			
C24-C26	CAPACITOR,FXD CER DIEI, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K			
H1	NUT,PLAIN,HEX SST, 2-56 (QTY 1)	313-0037-000		96906	MS35649-224			
H2	WASHER,LOCK SST, 0.088 ID X 0.172 OD (QTY 1)	310-0275-000		96906	MS35330-134			
H3	WASHER,FLAT CPES, 0.094ID X 0.250 OD (QTY 1)	310-0779-020		96906	MS15795-802			
H4	SCREW,MACH SST, 2-56 X 3/8 (QTY 1)	343-0126-000		96906	MS51957-5			
J1	HOUSING,CONN,EL	372-0043-440		00779	1-87478-8			
MP1	LABEL,PRESS SEMS (ESDS)	280-2745-040		12998	280-2745-040			
Q1-Q5	TRANSISTOR	352-0550-000		12040	2M2905A			
Q6	TRANSISTOR	352-1083-020		04713	MJE803			
R1	RESISTOR,VARIABLE 5K, 10%, 0.5W	382-0027-090		80294	3329H-CY3-502			
R2	RESISTOR,VARIABLE 500 OHMS, 10%, 0.5W	382-0027-060		80294	3329H-CY3-501			
R3,R4	RESISTOR,VARIABLE 5K, 10%, 0.5W	382-0027-090		80294	3329H-CY3-502			
R5	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/4W	745-0755-000		81349	RCR07G152KS			
R6	RESISTOR,FXD CHPSN, 33K, 10%, 1/4W	745-0803-000		81349	RCR07G333KS			
R7	RESISTOR,FXD FILM, 73.2K, 1%, 1/8W	705-3605-890		81349	RN5507322F			
R8	RESISTOR,FXD FILM, 5.23K, 1%, 1/8W	705-3605-340		81349	RN5505231F			
R9	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR07G222KS			
R10	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS			
R11	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS			
R12	NOT USED							
R13	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS			
R14	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS			
R15	NOT USED							
R16	RESISTOR,FXD FILM, 44.2K, 1%, 1/8W	705-1075-000		81349	RN5504422F			
R17	RESISTOR,FXD FILM, 5.23K, 1%, 1/8W	705-3605-340		81349	RN5505231F			
R18	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/4W	745-0755-000		81349	RCR07G152KS			
R19	RESISTOR,FXD CHPSN, 33K, 10%, 1/4W	745-0803-000		81349	RCR07G333KS			
R20	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/4W	745-0755-000		81349	RCR07G152KS			
R21	RESISTOR,FXD CHPSN, 33K, 10%, 1/4W	745-0803-000		81349	RCR07G333KS			
R22	RESISTOR,FXD FILM, 73.2K, 1%, 1/8W	705-3605-890		81349	RN5507322F			
R23	RESISTOR,FXD FILM, 5.23K, 1%, 1/8W	705-3605-340		81349	RN5505231F			
R24	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR07G222KS			
R25	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS			
R26	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS			
R27	NOT USED							
R28	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS			
R29	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS			
R30	NOT USED							
R31	RESISTOR,FXD FILM, 44.2K, 1%, 1/8W	705-1075-000		81349	RN5504422F			
R32	RESISTOR,FXD FILM, 8.25K, 1%, 1/8W	705-1040-000		81349	RN5506251F			
R33	RESISTOR,FXD W4, 464 OHMS, 1%, 1W	747-2183-650		81349	WR8154640FR			
R34	RESISTOR,FXD FILM, 200 OHMS, 1%, 1/8W	705-3600-630		81349	RN5502000F			
R35	RESISTOR,FXD FILM, 44.2K, 1%, 1/8W	705-1075-000		81349	RN5504422F			
R36	RESISTOR,FXD FILM, 2.37K, 1%, 1/8W	705-1014-000		81349	RN5502371F			
R37	RESISTOR,FXD FILM, 5.23K, 1%, 1/8W	705-3605-340		81349	RN5505231F			
R38	RESISTOR,FXD FILM, 73.2K, 1%, 1/8W	705-3605-890		81349	RN5507322F			
R39	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR07G222KS			
R40	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS			
R41	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS			
R42	RESISTOR,FXD FILM, 154K, 1%, 1/8W	705-1101-000		81349	RN5501543F			
R43	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/4W	745-0755-000		81349	RCR07G152KS			
R44	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS			
R45	RESISTOR,FXD FILM, 301K, 1%, 1/8W	705-1115-000		81349	RN5503013F			
R46	RESISTOR,FXD FILM, 287K, 1%, 1/8W	705-1114-000		81349	RN5502873F			
R47	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS			
R48	RESISTOR,FXD CHPSN, 2.7K, 10%, 1/4W	745-0764-000		81349	RCR07G272KS			
R49,R50	RESISTOR,FXD FILM, 100 OHMS, 1%, 1/8W	705-0948-000		81349	RN5501000F			
R51	RESISTOR,FXD FILM, 5.23K, 1%, 1/8W	705-3605-340		81349	RN5505231F			
R52	RESISTOR,FXD FILM, 27.4K, 1%, 1/8W	705-1065-000		81349	RN5502742F			
R53-R55	RESISTOR,FXD CHPSN, 33K, 10%, 1/4W	745-0803-000		81349	RCR07G333KS			
R56	RESISTOR,FXD FILM, 30.1K, 1%, 1/8W	705-1067-000		81349	RN5503012F			
R57,R58	RESISTOR,FXD CHPSN, 33K, 10%, 1/4W	745-0803-000		81349	RCR07G333KS			
R59	RESISTOR,FXD FILM, 5.23K, 1%, 1/8W	705-3605-340		81349	RN5505231F			
R60	RESISTOR,FXD FILM, 154K, 1%, 1/8W	705-1101-000		81349	RN5501543F			
R61	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS			
R62	RESISTOR,FXD FILM, 5.23K, 1%, 1/8W	705-3605-340		81349	RN5505231F			
R63-R67	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS			
R68,R69	RESISTOR,FXD FILM, 7.5K, 1%, 1/8W	705-1038-000		81349	RN5507501F			

Crowbar/Logic Card, Parts Location Diagram  
Figure 4 (Sheet 2)







NOTES:

- ① UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS, AND INDUCTANCE VALUES ARE IN MICROHENRYS.
- ② PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATIONS, PREFIX WITH UNIT NUMBER AND/OR ASSEMBLY DESIGNATION.
- ③ TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.
- ④ THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.

TPA-4596-014

Crowbar/Logic Card, Schematic Diagram  
Figure 5

# 400 to 57 Hz Converter Module (651-4140-001)



Rockwell  
International

instructions

Collins Telecommunications Products Division

523-0771764-001211

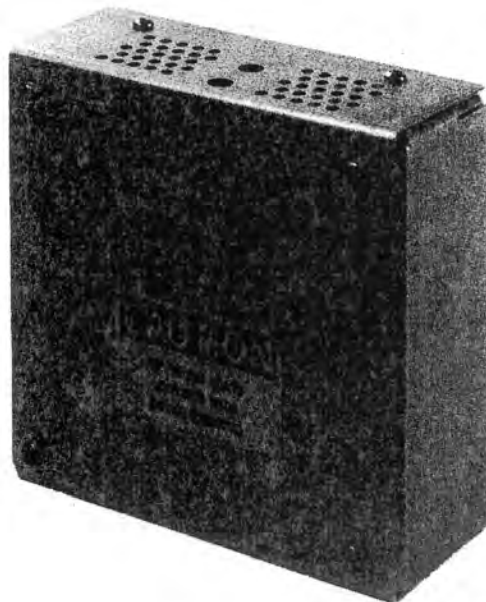
15 September 1982

Printed in USA

## 1. DESCRIPTION

The 400 to 57 Hz Converter Module 651-4140-001 (figure 1) is a plug-in modular assembly consisting of three printed circuit cards and a wiring harness. These cards and harness are attached to a protective

covering to form the module. All electrical connections to the 400 to 57 Hz converter module are made through a 9-pin Cannon connector (P1). Circuit cards are connected internally with hard-wired stand-offs on each circuit card.



TPA-4661-017

400 to 57 Hz Converter Module  
Figure 1

INSTRUCTIONS

400 TO 57 HZ CONVERTER MODULE  
(651-4140-001)

523-0771764-001211

## 2. PRINCIPLES OF OPERATION

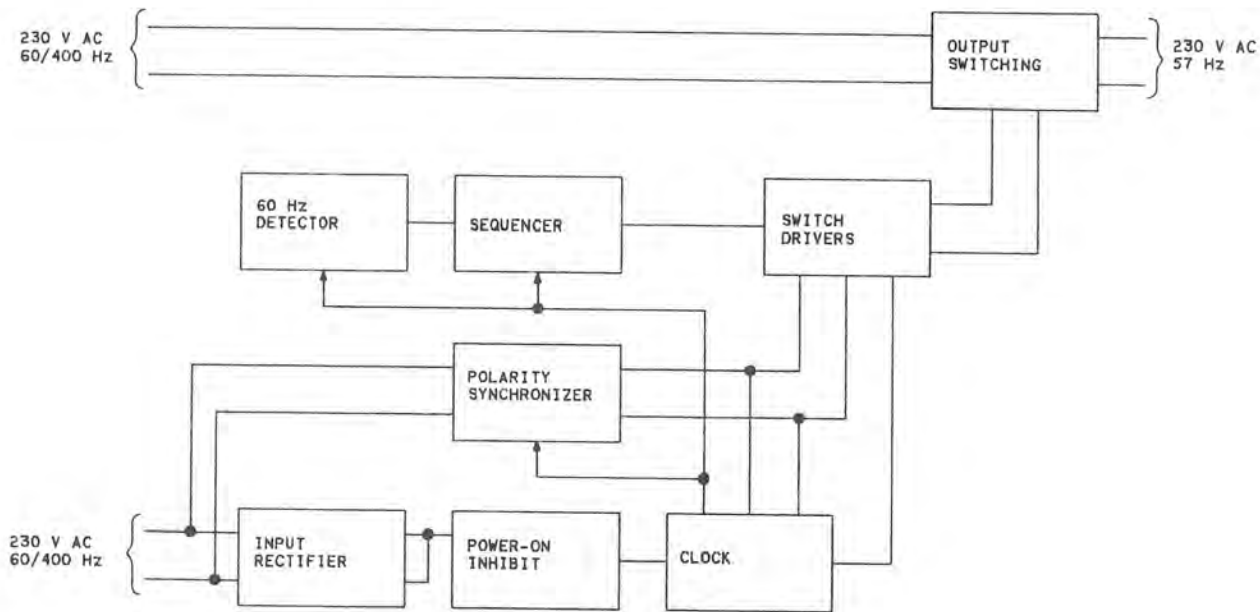
### 2.1 General

The 400 to 50 Hz converter module consists of logic control circuits and two switching circuits, high switching and low switching.

### 2.2 Block Diagram Theory (Refer to figure 2)

The 400 to 57 Hz converter module is supplied with 230 V ac, 50-60 or 400 Hz input and provides a 230 V ac, 57 Hz output.

The 230 V ac, 50 to 60- or 400-Hz control input is supplied to an input rectifier and polarity synchronizer. From the input rectifier, an output is supplied to the power-on inhibit circuit. The output of the power-on inhibit circuit enables clock circuit which is used to control the polarity synchronizer, the 60-Hz detector, the sequencer, and the switch drivers. If a 400-Hz input is provided, the switch drivers turn the output switching on and off at a rate to produce a 57-Hz ac output. If a 47 to 63-Hz input is provided, switch drivers turn the output switching on continuously to provide an output constant with the input.



TPA-5539-013

400 to 57 Hz Converter Module, Block Diagram  
Figure 2

### 2.3 Logic Circuits (Refer to figure 3)

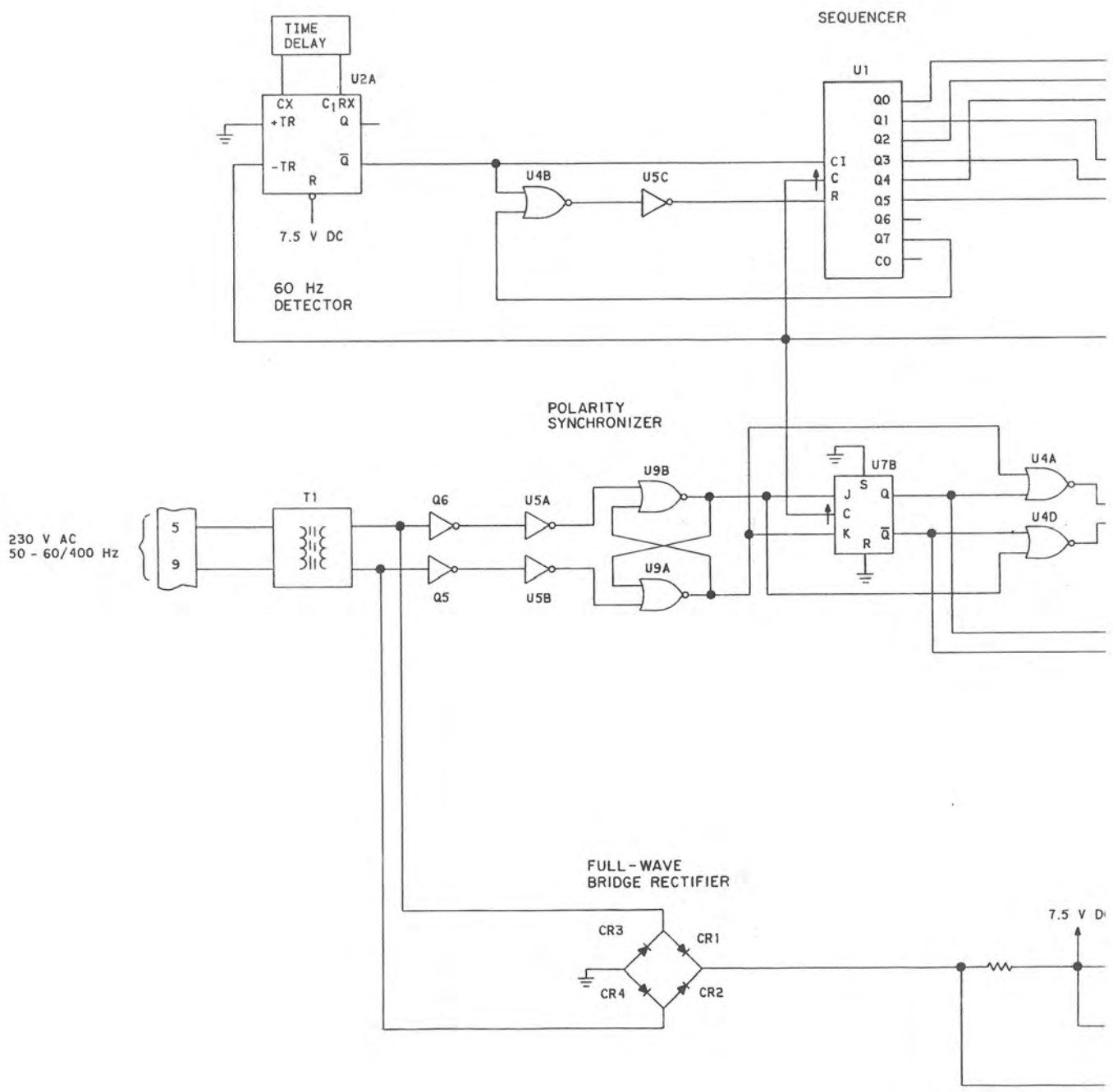
The logic circuits receive a 50 to 60-Hz or 400-Hz ac signal. This input is supplied through a step-down transformer T1, to a full-wave bridge rectifier and to a polarity synchronizer.

The full-wave bridge rectifier produces a dc voltage for use by output switching circuits and 7.5-V dc source for logic and control functions.

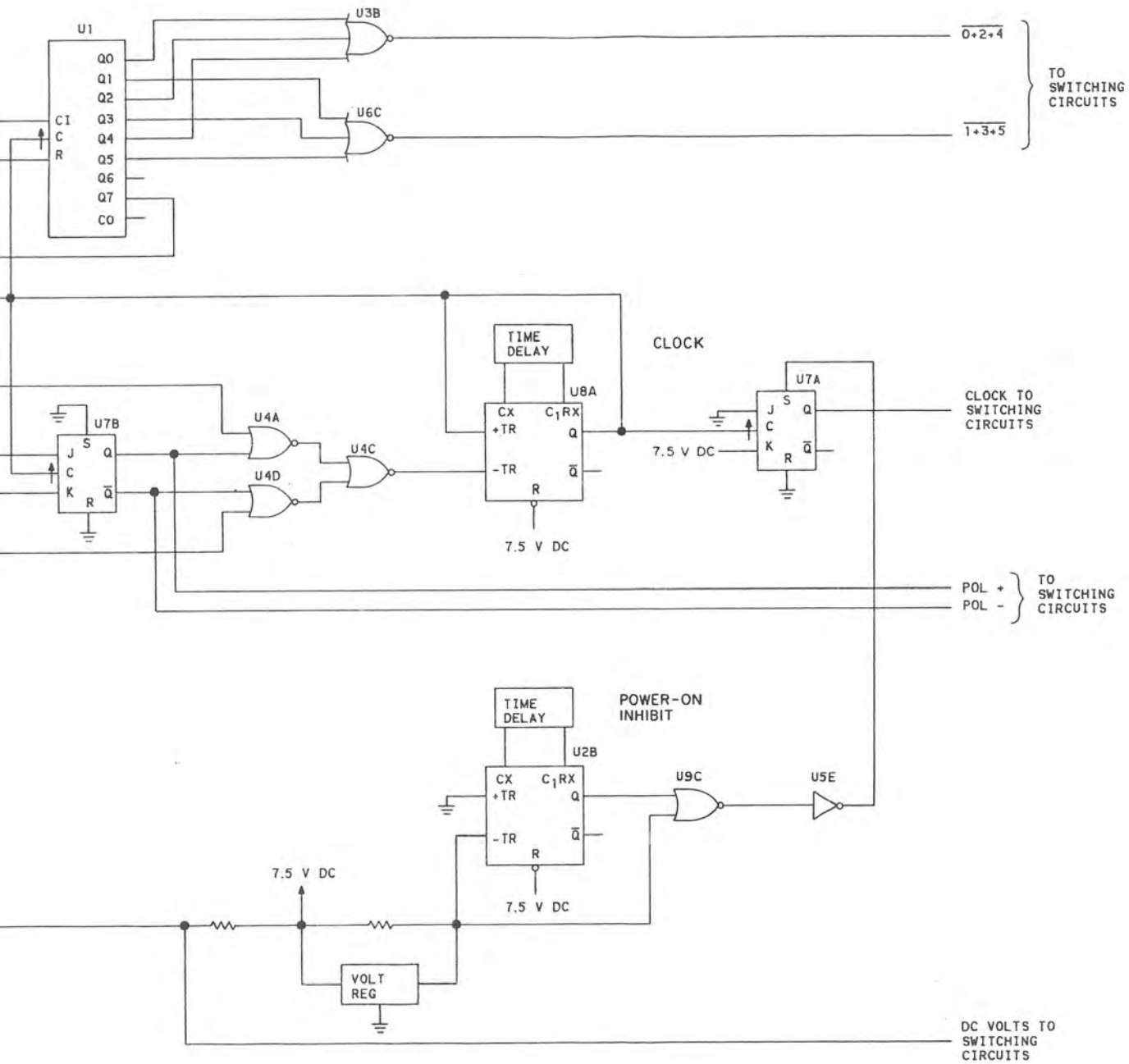
The polarity synchronizer provides inputs to control the clock circuit and output switching circuits.

The clock circuit provides inputs to the 60-Hz detector, the sequencer, the polarity synchronizer, and the switching circuits.

The polarity synchronizer when enabled and used with the output switching circuits provides a divide-by-7 circuit, thus with a 400-Hz input, the resulting output is 57.14 Hz (57 Hz).



SEQUENCER



TPA-5538-014

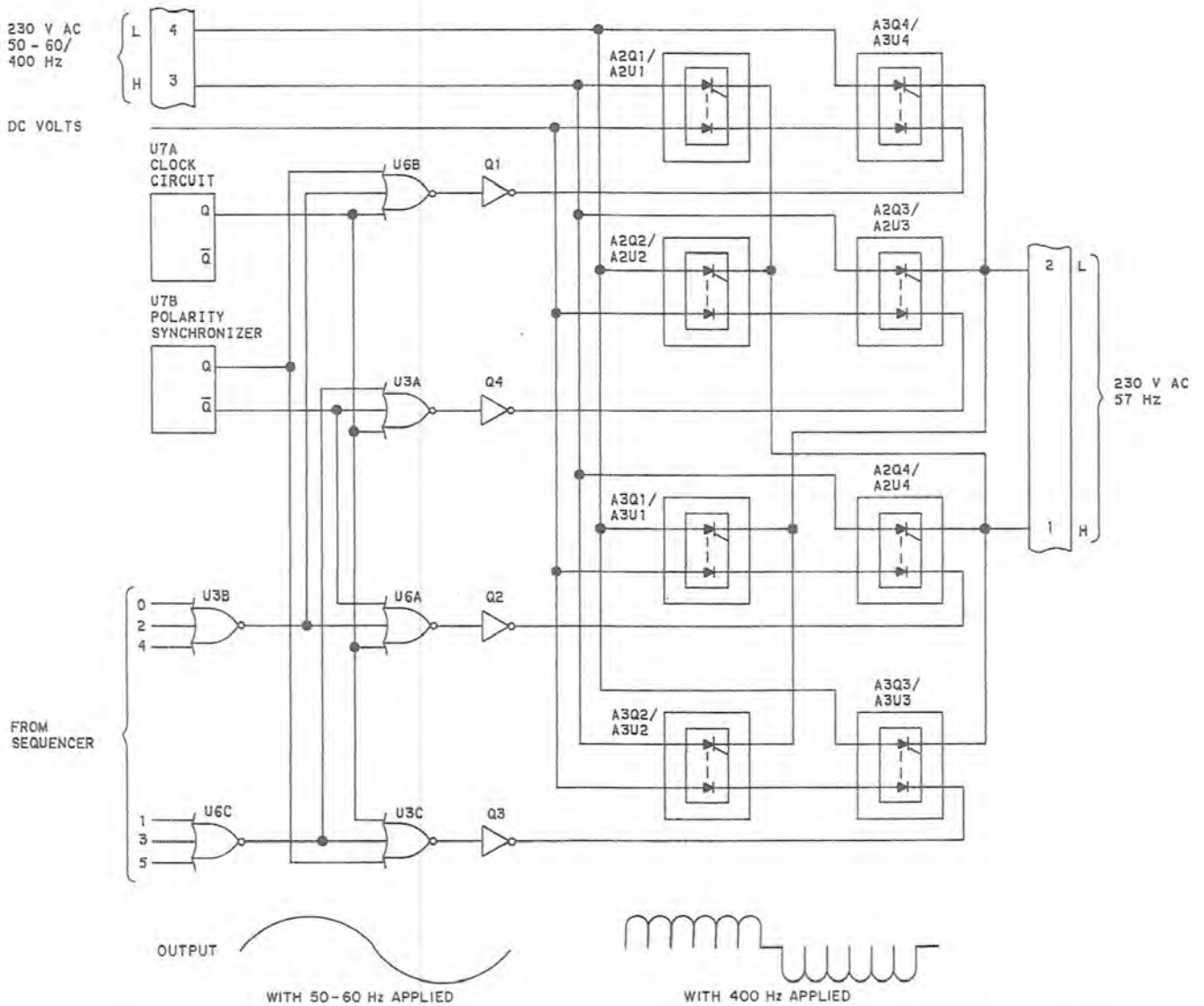
Logic Circuits  
Figure 3



2.4 Switching Circuits (Refer to figure 4)

The switching circuits are supplied with inputs from the clock circuit, the polarity synchronizer, the sequencer, and a 230-V ac source, and provide a 230-V ac, 57-Hz output.

Refer to the switching circuits-logic truth table to see the relative state of each circuit with reference to the inputs.



SWITCHING CIRCUITS - LOGIC TRUTH TABLE

INPUTS					OUTPUTS								SWITCHING CIRCUITS			
U7B-Q POL +	U7B-Q̄ POL -	U3B-9 0+2+4	U6C-10 1+3+5	U7A-Q CLK	U6B	Q1	U6A	Q2	U3C	Q3	U3A	Q4	A2Q1 A3Q4	A2Q2 A2Q3	A3Q1 A2Q4	A3Q2 A3Q3
0	1	0	1	0	1	0	0	1	0	1	0	1	ENBL	DSBL	DSBL	DSBL
1	0	0	1	0	0	1	1	0	0	1	0	1	DSBL	DSBL	ENBL	DSBL
0	1	1	0	0	0	1	0	1	1	0	0	1	DSBL	DSBL	DSBL	ENBL
1	0	1	0	0	0	1	0	1	0	1	1	0	DSBL	ENBL	DSBL	DSBL
0	1	0	1	1	0	1	0	1	0	1	0	1	DSBL	DSBL	DSBL	DSBL
1	0	0	1	1	0	1	0	1	0	1	0	1	DSBL	DSBL	DSBL	DSBL
0	1	1	0	1	0	1	0	1	0	1	0	1	DSBL	DSBL	DSBL	DSBL
1	0	1	0	1	0	1	0	1	0	1	0	1	DSBL	DSBL	DSBL	DSBL

TPA-5540-014

Switching Circuits  
Figure 4



**3. TESTING/TROUBLESHOOTING PROCEDURES**

A defective 400 to 57 Hz converter module can be returned to a Rockwell-Collins authorized repair facility for repair. Contact the nearest Rockwell-Collins office or

Collins Telecommunications Products Division  
Attention: HF Products  
400 Collins Road, NE  
Cedar Rapids, Iowa 52498

for information and instructions.

**4. ALIGNMENT/ADJUSTMENT**

Alignment/adjustment is performed in conjunction with testing/troubleshooting.

**5. REPAIR**

Repair is accomplished using standard shop practices.



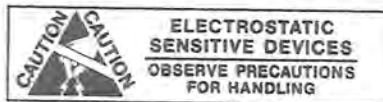
## 6. PARTS LIST/DIAGRAMS

### 6.1 Introduction

**Caution**

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All parts list illustrations containing ESDS items are shown with the following symbol:



This paragraph assists in identification and requisition of parts. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included. The parts location illustration shows component placement on the circuit cards.

### 6.2 Parts List

REF DES Column — Reference designators and/or item numbers for each part/subassembly are listed in alphanumeric or numeric sequence. These are the reference designators and/or item numbers shown on the parts location illustration. Only the reference designators are shown on the schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modification.

Modifications are identified by two methods: An alphanumeric identifier is assigned to each electrical design change and listed in the REVISION IDENT column of the modification history. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change.

NA (not applicable) in the REVISION IDENT column indicates a documentation change and/or mechanical change. This revision activity will be noted in the DESCRIPTION column of the parts list

only. This change does not affect the circuit card/subassembly components or the schematic. Each change relates to the REV (revision identifier) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history. Dash (—) denotes original; letter A first change; letter B second change, etc.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

### 6.3 How To Use This Parts List

To locate a part number, locate the part and its item number and/or reference designator on the illustration. Turn to the parts list page and find the item number and/or reference designator to determine its description and part number.

To locate the illustration for a part, if the reference designator and/or part number are known, refer to the parts list and find the figure and item number indicated in the parts list for location on the illustration.

### 6.4 Manufacturer's Code, Name, and Address

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
04713	MOTOROLA INC SEMICONDUCTOR GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008



<u>MFR</u> <u>CODE</u>	<u>MANUFACTURER'S NAME</u> <u>AND ADDRESS</u>
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV SUB OF SCHLUMBERGER LTD NORTH AMERICAN SALES MAIL STOP 14-1053 401 ELLIS ST P O DRAWER 7284 MOUNTAIN VIEW CA 94042
08779	SIGNAL TRANSFORMER CO INC 500 BAYVIEW AVE INWOOD NY 11696
12615	U S TERMINALS INC 7504 CAMARGO ROAD CINCINNATI OH 45243
12998	QUALITY NAME PLATE INC MILL ROAD EAST GLASTONBURY CT 06025
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV 855 35TH ST NE P O BOX 728 CEDAR RAPIDS IA 52498
14433	ITT SEMICONDUCTOR DIV WEST PALM BEACH FL
27014	NATIONAL SEMICONDUCTOR CORP 2900 SEMICONDUCTOR DR SANTA CLARA CA 95051
49956	RAYTHEON CO EXECUTIVE OFFICES 141 SPRING ST LEXINGTON MA 02173
74970	JOHNSON E F CO 299 10TH AVE S W WASECA MN 56093
77250	ALLIED PRODUCTS CORP PHEOLL MFG CO DIV 5700 W ROOSEVELT RD CHICAGO IL 60650
80205	NATIONAL AEROSPACE STANDARD
81349	MILITARY SPECIFICATIONS
96906	MILITARY STANDARD

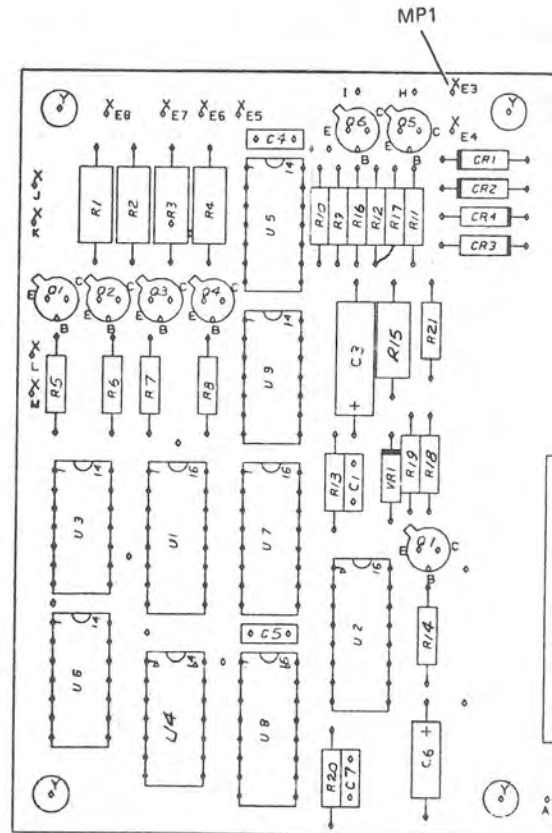
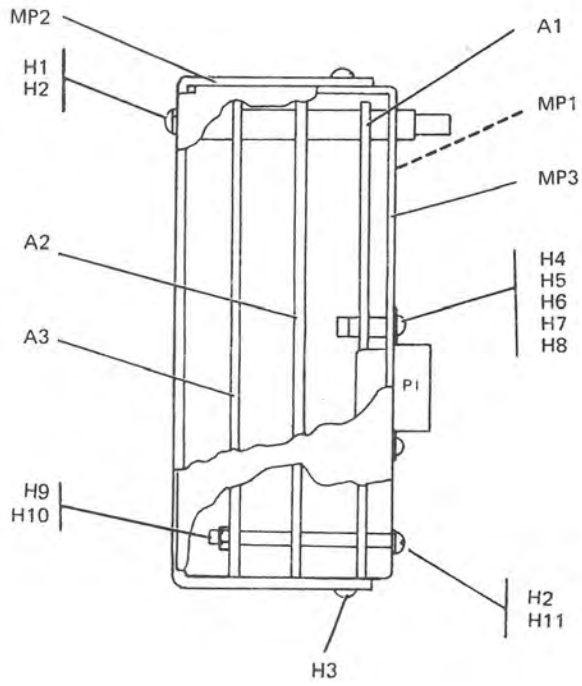
**6.5 Equipment Covered**

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions. Configuration history before 1 April 1982 is not recorded in this section.

<u>CIRCUIT CARD/</u> <u>SUBASSEMBLY</u>	<u>COLLINS</u> <u>PART</u> <u>NUMBER</u>	<u>LATEST</u> <u>EFFECTIVITY</u>
400 to 57 Hz Converter	651-4140-001	REV A
Logic Board A1	646-5656-001	REV B
Switching Board A2, A3	646-5655-001	REV A

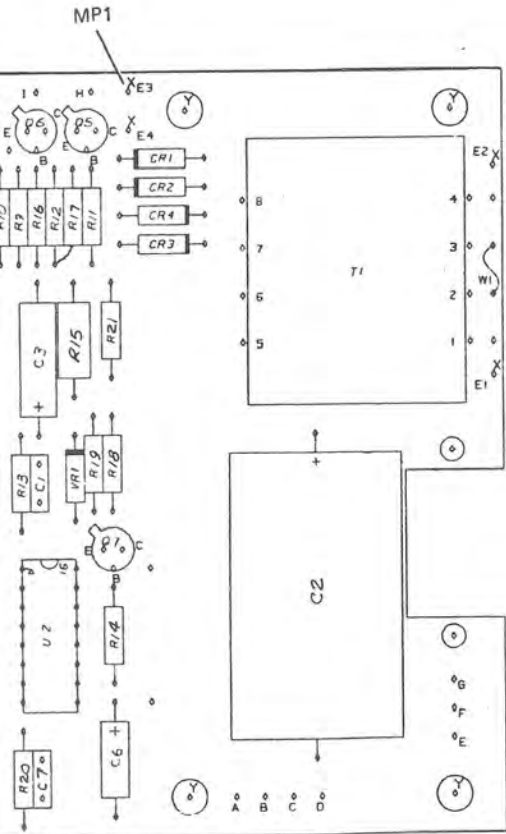




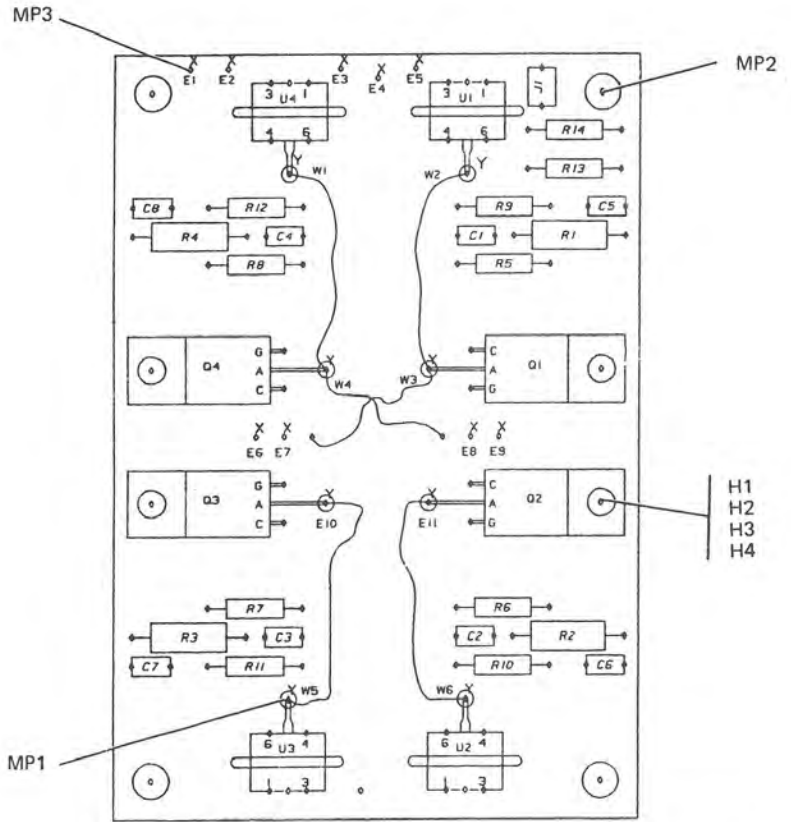


A1





A1



A2 AND A3

**CAUTION**  
ELECTROSTATIC SENSITIVE DEVICES  
OBSERVE PRECAUTIONS FOR HANDLING

TPA-4610-018

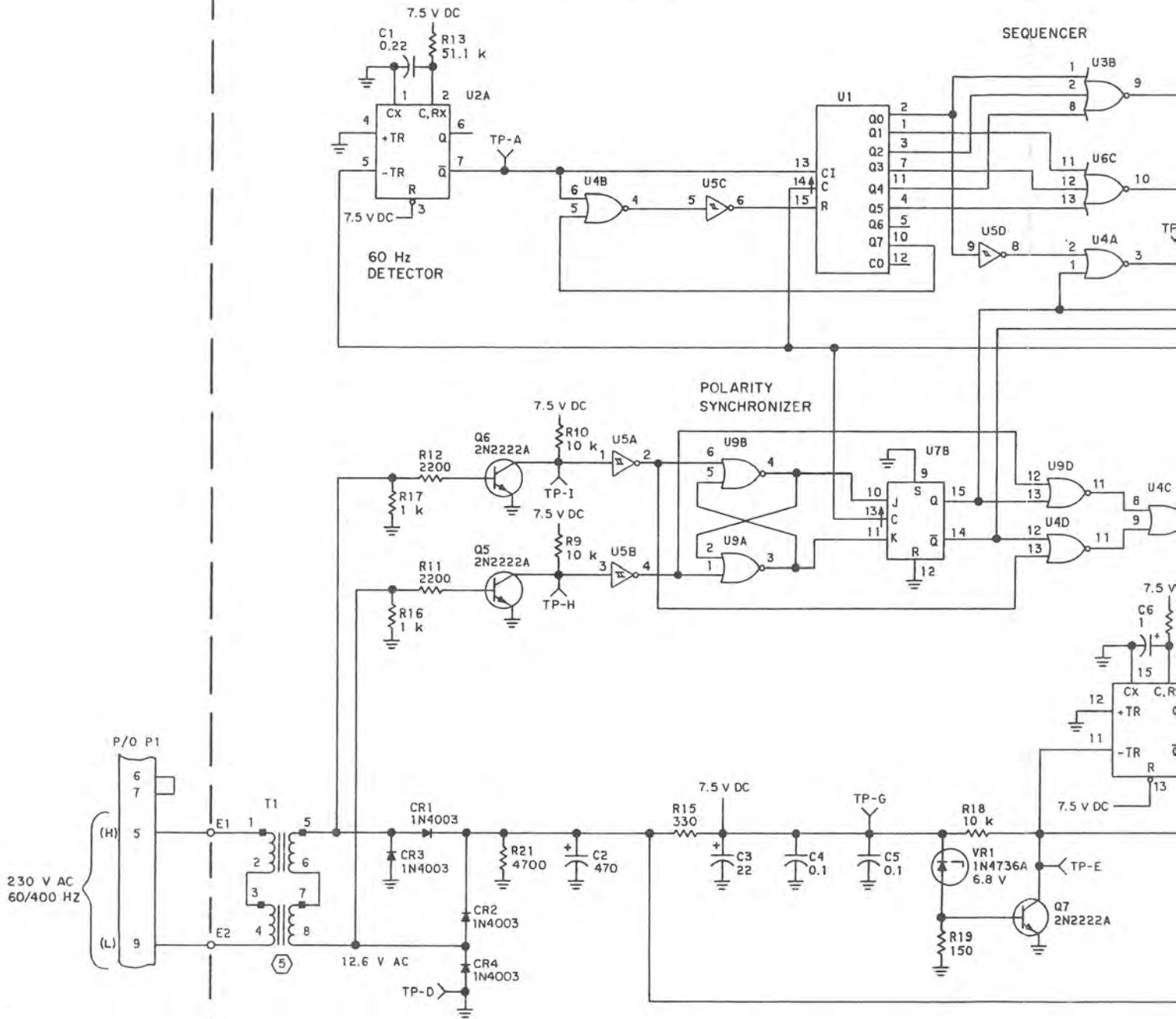
400 to 57 Hz Converter Module,  
Parts Location Diagram  
Figure 5 (Sheet 1 of 2)

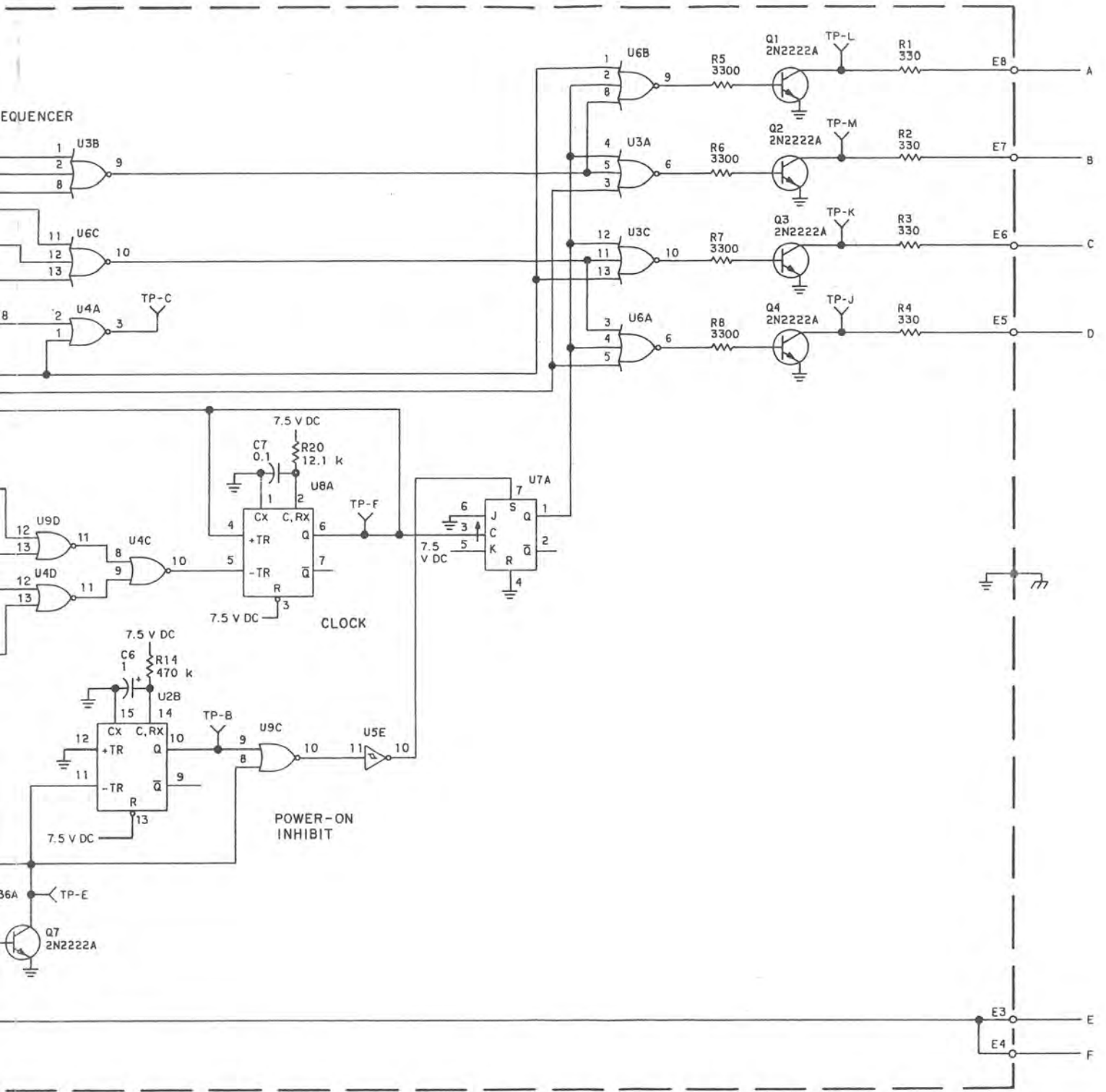
PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	SMR CODE
A1	400 TO 57 HZ CONVERTER MODULE (ESDS)	651-4140-001				
A2,A3	LOGIC BOARD (ESDS)	646-5656-001				
H1	SWITCHING BOARD	646-5655-001				
H2	SCREW,EXT RLVD BODY CRES, 6-32X2 1/4 (QTY 4)	330-1679-030		77250		
H3	WASHER,LOCK SST, 0.141 ID X 0.250 OD (QTY 6)	310-0282-000		96906	MS35338-136	
H4	SCREW,MACH STL, 4-40 X 1/4 (QTY 4)	343-0133-000		96906	MS51957-13	
H5	NUT,PLAIN,HEX SST, 4-40 (QTY 2)	313-0132-000		77250	P313-0132-000	
H6	WASHER,LOCK SST, 0.115 ID X 0.209 OD (QTY 2)	310-0279-000		96906	MS35338-135	
H7	WASHER,FLAT CRES, 0.125ID X 0.250 OD (QTY 2)	310-0779-030		96906	MS15795-803	
H8	SLEEVE,SPACER (QTY 2)	541-5962-002			541-5962-002	
H9	SCREW,MACH STL, 4-40 X 5/8 (QTY 2)	343-0138-000		96906	MS51957-18	
H10	NUT,PLAIN,HEX SST, 6-32 (QTY 2)	313-0045-000		77250	P313-0045-000	
H11	WASHER,FLAT CRES, 0.164ID X 0.320 OD (QTY 2)	310-0779-050		96906	MS15795-805	
MP1	SCREW,MACH SST, 6-32 X 1-1/2 (QTY 2)	343-0180-000		96906	MS51957-36	
MP2	LABEL,PRESSURE SENS	280-1368-350		12998	280-1368-350	
MP3	COVER,MODULE	651-4134-001				
MP3	CHASSIS,MODULE	651-4132-001				
	LOGIC BOARD (ESDS) A1	646-5656-001				
CRI-CR4	SEMICOND DEVICE	353-6442-030		14433	1N4003	
C1	CAPACITOR,FXD CER DIEL, 0.22UF, 10%, 50VDC	913-5019-480		81349	CK06BX224K	
C2	CAPACITOR,FXD ELCTLT, 470UF, M10%P75%, 30V	184-5102-700		81349	M39018-03-0729	
C3	CAPACITOR,FIXED ELCTLT, 22UF, 10%, 15V	184-9086-310		81349	M39003-01-2271	
C4,C5	CAPACITOR,FXD CER DIEL, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K	
C6	CAPACITOR,FIXED ELCTLT, 1UF, 10%, 50V	184-9087-430		81349	M39003-01-2356	
C7	CAPACITOR,FXD CER DIEL, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K	
MP1	CONTACT,ELECTRICAL (QTY 13)(EFF REV LTR B)	372-2601-033			372-2601-033	
Q1-Q7	TRANSISTOR	352-0661-020		49956	2N222A	
R1-R4	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/2W	745-1331-000		81349	RCR20G331KS	
R5-R8	RESISTOR,FIXED CHPSN, 3.3K, 10%, 1/4W	745-0767-000		81349	RCR07G332KS	
R9,R10	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS	
R11,R12	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR07G222KS	
R13	RESISTOR,FXD FILM, 51.1K, 1%, 1/8W	705-1078-000		81349	RN5505112F	
R14	RESISTOR,FXD CHPSN, 0.47MEGO, 10%, 1/4W	745-0845-000		81349	RCR07G474KS	
R15	RESISTOR,FIXED CHPSN, 330 OHMS, 10%, 1/2W	745-1331-000		81349	RCR20G331KS	
R16,R17	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS	
R18	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS	
R19	RESISTOR,FXD CHPSN, 150 OHMS, 10%, 1/4W	745-0719-000		81349	RCR07G151KS	
R20	RESISTOR,FXD FILM, 12.1K, 1%, 1/8W	705-1048-000		81349	RN5501212F	
R21	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS	
T1	TRANSFORMER,HIN	662-0654-030		08779	D5T3-12	
U1	INTEGRATED CIRCUIT ARRAY (ESDS)	351-8187-020		02735	CD4022BE	
U2	INTEGRATED CIRCUIT MULTIVIBRATOR (ESDS)	351-8278-010		02735	CD4098BE	
U3	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-370		07263	4025BPC	
U4	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-320		07263	4001BPC	
U5	INTEGRATED CIRCUIT TRIGGER GATE (ESDS)	351-8332-030		27014	CD40106BMJ	
U6	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-370		07263	4025BPC	
U7	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-160		07263	4027BPC	
U8	INTEGRATED CIRCUIT MULTIVIBRATOR (ESDS)	351-8278-010		02735	CD4098BE	
U9	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-320		07263	4001BPC	
VR1	SEMICOND DEVICE	353-6401-170		04713	1N4736A	
	SWITCHING BOARD A2,A3	646-5655-001				
C1-C8	CAPACITOR,FXD CER DIEL, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K	
H1	NUT,PLAIN,HEX NP BRS, 6-32 (QTY 4)	313-0140-000		77250	P313-0140-000	
H2	WASHER,SPRING CD PL BRZ, 0.141 ID X 0.250 OD (QTY 4)	310-0096-000		96906	MS35338-98	
H3	WASHER,FLAT PSVT CRES, 0.143 ID X 0.267 OD (QTY 4)	310-0740-360		80205	NAS620C6L	
H4	SCREW,MACH NP BRS, 6-32 X 5/16 (QTY 4)	343-0329-000		77250	P343-0329-000	
J1	JACK,TIP RED	360-0484-020		74970	105-1102-011	
MP1	TERMINAL,STDF (QTY 8)	306-2222-100		12615	SL441-434MMT	
MP2	SLEEVE,CARD SPACING (QTY 4)	651-4210-003				
MP3	CONTACT,ELEC (QTY 9)	372-2601-033			372-2601-033	
Q1-Q4	SEMICOND DEVICE	353-6612-020		04713	2N6404	
R1-R4	RESISTOR,FXD CHPSN, 150 OHMS, 10%, 1/2W	745-1317-000		81349	RCR20G151KS	
R5-R8	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS	
R9-R12	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS	
R13	RESISTOR,FXD CHPSN, 0.27MEGO, 10%, 1/4W	745-0836-000		81349	RCR07G274KS	
R14	RESISTOR,FXD CHPSN, 33K, 10%, 1/4W	745-0803-000		81349	RCR07G333KS	
U1-U4	ISOLATOR,COUPLED	262-2359-010		03508	H11C4	

400 to 57 Hz Converter Module,  
Parts Location Diagram  
Figure 5 (Sheet 2)

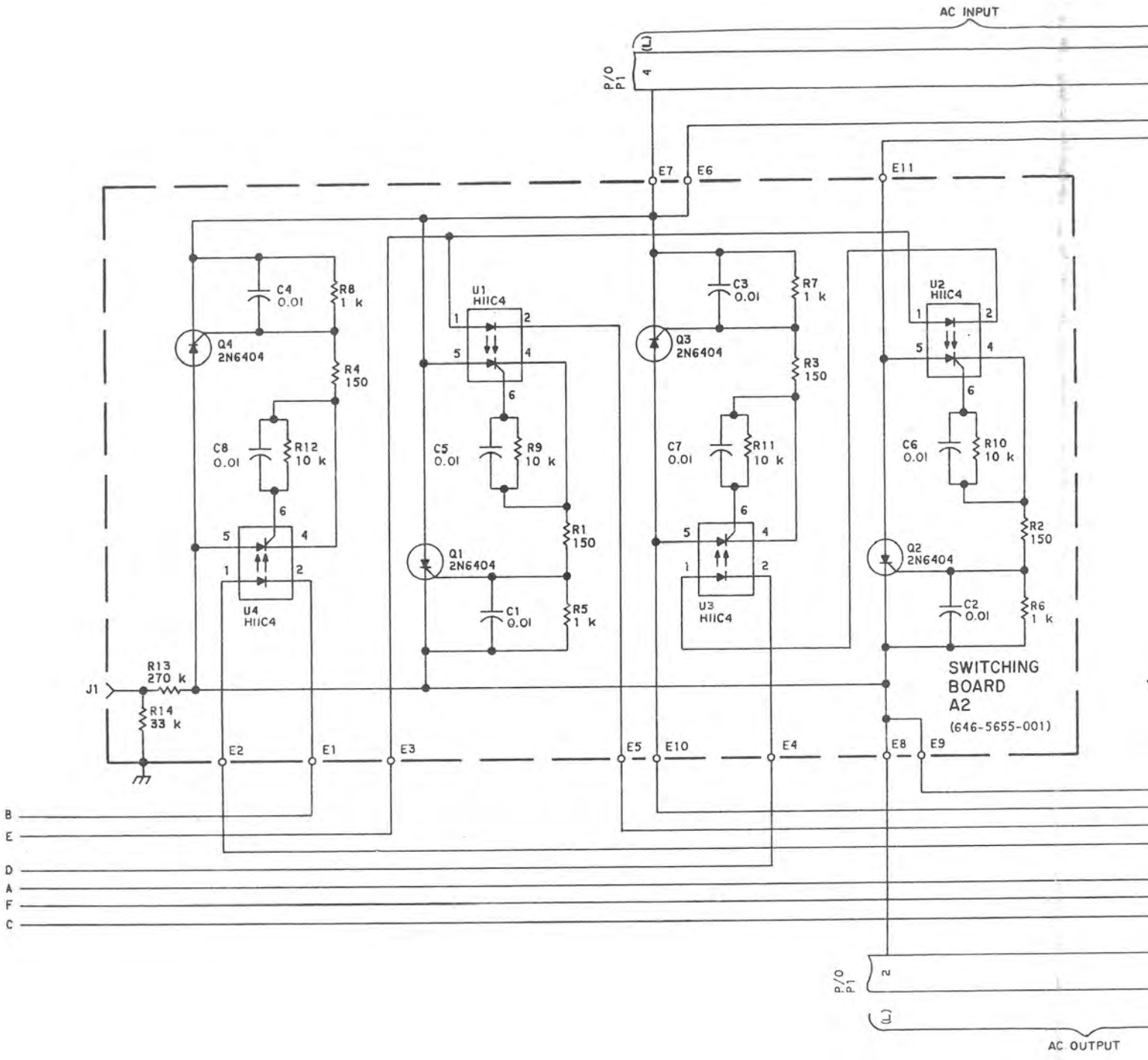
LOGIC BOARD  
A1  
(646-5656-001)

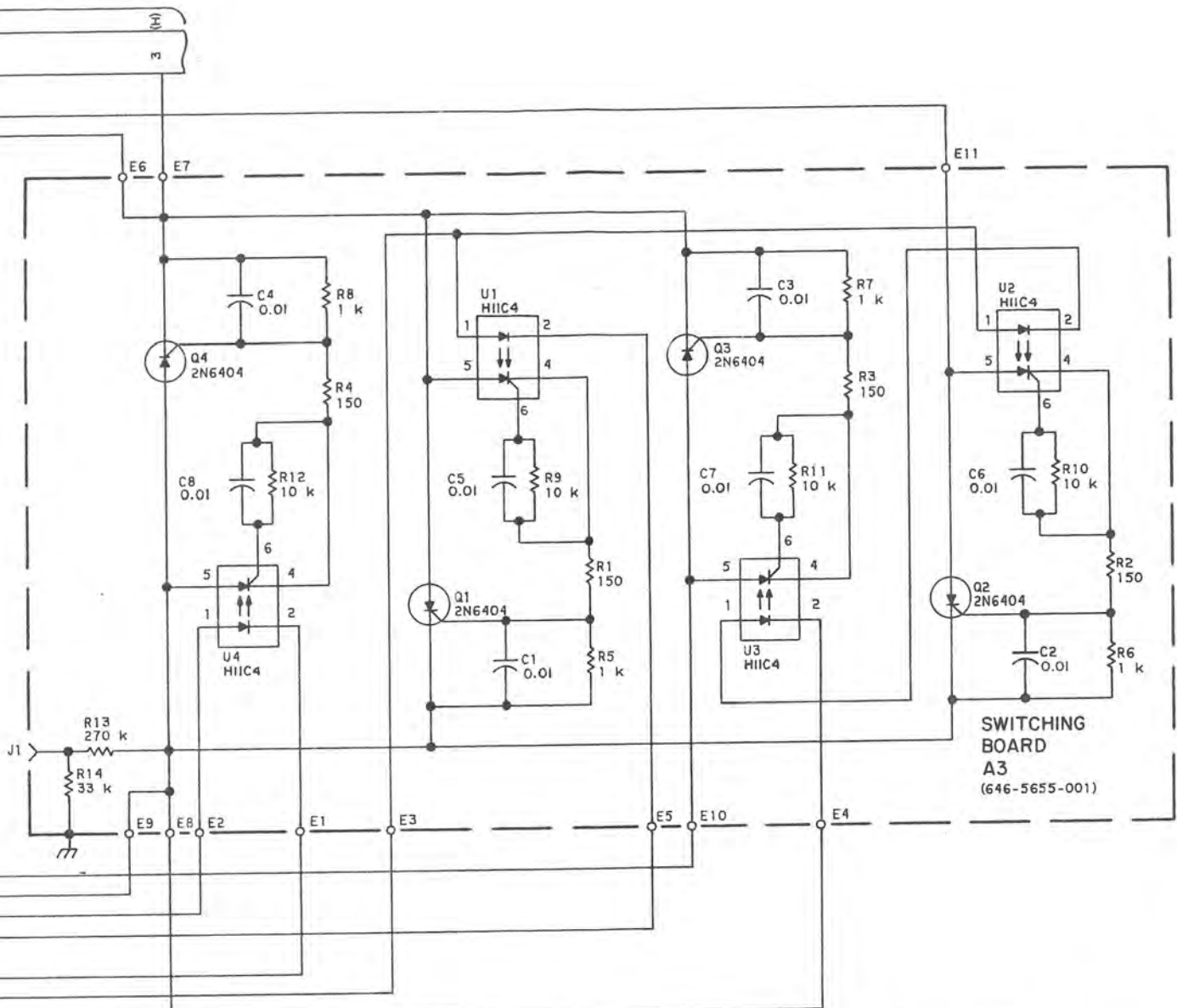




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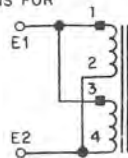
400 to 57 Hz Converter Module, Schematic Diagram  
Figure 6 (Sheet 1 of 2)





NOTES:

- ① UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MICROFARADS.
- ② PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND/OR ASSEMBLY DESIGNATION.
- ③ TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.
- ④ THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.
- ⑤ T1 PRIMARY CONNECTIONS FOR 115 V AC APPLICATION:



MICROCIRCUIT INFO FOR A1

U NO	TYPE	PWR (V DC)	GND
U1	4022	16	8
U2	4098	16	8
U3	4025	14	7
U4	4001	14	7
U5	40106	14	7
U6	4025	14	7
U7	4027	16	8
U8	4098	16	8
U9	4001	14	7

651-5045

400 to 57 Hz Converter Module, Schematic Diagram  
Figure 6 (Sheet 2)