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EQUIPMENT TYPE NO	EQUIPMENT PART NO	SERIAL NO
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Rockwell International has endeavored to furnish you with an accurate, up-to-date manual. We welcome your comments concerning this manual. Please use the following space to report any errors, discrepancies, or omissions as well as any general comments you wish to make.

REMARKS:

CHANGES AND/OR REVISIONS TO THIS INSTRUCTION BOOK, IF THEY SHOULD OCCUR, MAY BE PURCHASED BY CONTACTING:

ROCKWELL INTERNATIONAL CORPORATION
COLLINS AVIONICS &
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350 COLLINS ROAD, N.E.
CEDAR RAPIDS, IA 52498

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Logistics
Collins Avionics &
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Rockwell International Corporation
Cedar Rapids, Iowa 52498

**Rockwell**

| SERVICE BULLETIN

Collins Defense Communications Division/Rockwell International

● 350600

HF-8040 ANTENNA COUPLER (622-3384-XXX)
HF-8040A ANTENNA COUPLER (622-3515-XXX)
HF-8040M ANTENNA COUPLER (622-3513-XXX)
CHASSIS ASSEMBLY A7 (635-4773-001)

SERVICE BULLETIN NO 115

INTERLOCK SWITCH SHAFT CHANGE

This service bulletin applies to the following:

EQUIPMENT	APPLICABLE TO SERIAL NUMBERS	PRODUCTION CUT-IN SERIAL NUMBER
HF-8040 622-3384-XXX	426 and below, 435, 458 thru 461, 527 thru 538, 540 thru 559, and 561	427 thru 434, 436 thru 457, 462 thru 526, 539, 560, 562 and above
HF-8040A 622-3515-XXX	31 and below	32 and above
HF-8040M 622-3513-XXX	33 and below, 37, and 38	34, 35, 36, 39 and above

Due to a change in the gasket between the antenna coupler chassis and cover, the chassis-to-cover dimension is increased slightly. This change may prevent the interlock switch from closing under some environmental conditions.

This service bulletin compensates for the added distance between chassis and cover by lengthening the interlock switch actuator shaft.

Estimated time required is 0.2 man-hour.

The modification parts are listed in the material information paragraph. For additional information concerning parts, contact Collins Defense Communications Division/Rockwell International, Service Parts Department, Cedar Rapids, Iowa 52498. Reference HF-8040/8040A/8040M Service Bulletin No 115 in all correspondence.

No special tools or equipment are required.

MODIFICATION PROCEDURE

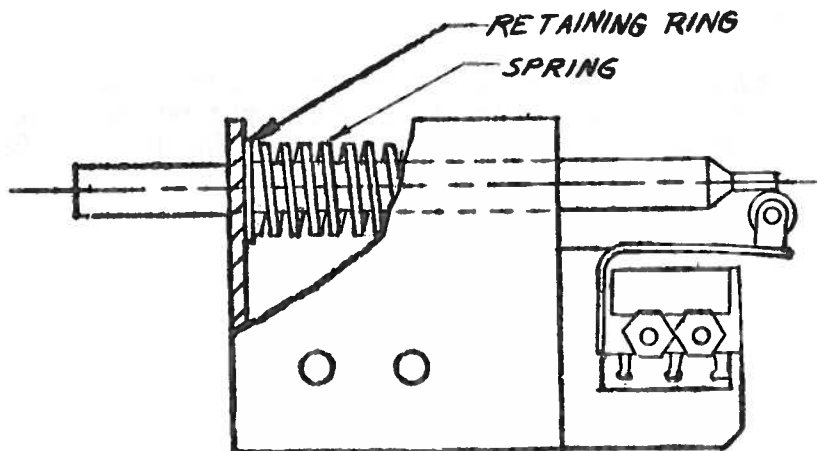
- A. Disconnect the antenna coupler from primary power.
- B. Loosen (unscrew) the manual pressure relief valve on the end of the case. Retighten valve immediately.
- C. Release 10 twist-lock fasteners that secure the cover to the chassis and remove the cover.
- D. Locate interlock switch A7S1 and refer to figure 1.
- E. Remove the interlock switch shaft and spring after removing the retaining ring.
- F. Install a new shaft (638-4897-001) using the retaining ring and spring removed in step E.
- G. Reinstall the cover and tighten the 10 twist-lock fasteners.
- H. Mark SB 115 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 name-plate.

MATERIAL INFORMATION

The parts listed below are required to modify one HF-8040, HF-8040A, or HF-8040M.

<u>COLLINS PART NUMBER</u>	<u>QTY</u>	<u>UNIT PRICE</u>	<u>DESCRIPTION</u>
638-4897-001	1		Shaft, actuator
*280-3778-010	1		Chart, information

*Order only if needed.



Interlock Switch A7S1
Figure 1

ADDENDUM 1 TO THE HF-8040A() ANTENNA COUPLER

INSTRUCTION BOOK

(523-0767458-00321A)

GENERAL

This addendum provides update information and schematic corrections for circuit card modules contained within the instruction book.

COIL MODULE (523-0767698-004211 dated 1 June 1983)

Page 9/10: Replace Coil Module Schematic Diagram Figure 4 with Figure 4 provided on page 3 of addendum.

COIL MODULE (523-0773118-001211 dated 1 June 1983)

Page 2: Replace Coil Module Block Diagram Figure 2 with one of the two Figure 2's provided on page 4 of addendum to correct the type of B2 blower shown to a dc model.

Page 9/10: Replace Coil Module Schematic Diagram Figure 4 with Figure 4 provided on page 5 of addendum.

COIL MODULE (523-0773119-001211 dated 1 June 1983)

Page 9/10: Replace Coil Module Schematic Diagram Figure 4 with Figure 4 provided on page 6 of addendum.

COIL MODULE (523-0773120-001211 dated 1 June 1983)

Page 2: Replace Coil Module Block Diagram Figure 2 with one of the two figure 2's provided on page 4 of the addendum to correct the type of B2 blower shown to a dc model.

Page 8: Parts List (Cont) Insert the following at the end of the parts list.

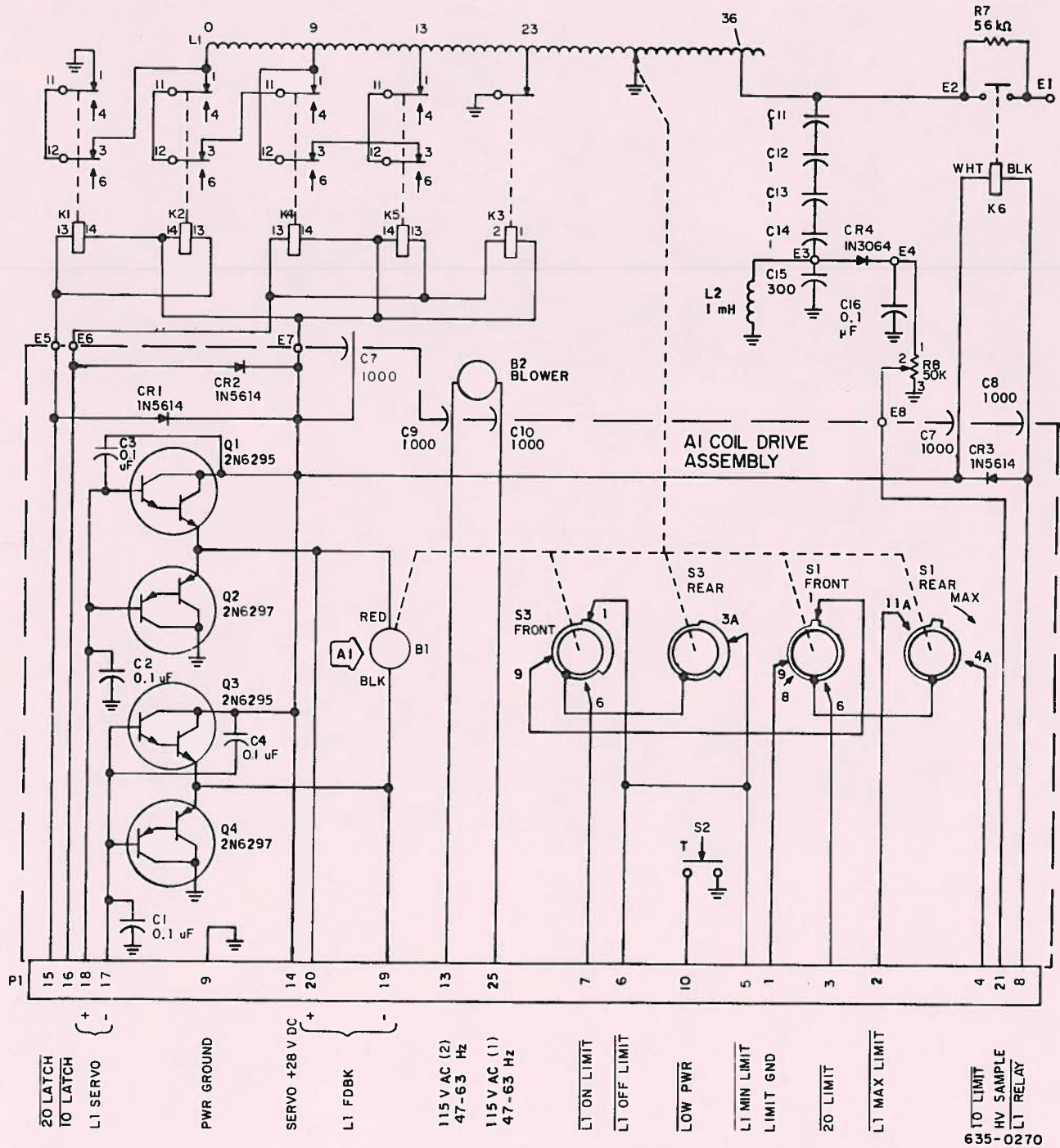
MODIFICATION HISTORY

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A1	Changed P/N of A1B1 from 230-0620-030 to 230-0662-010.	635-4720-001 REV J and above SB 48

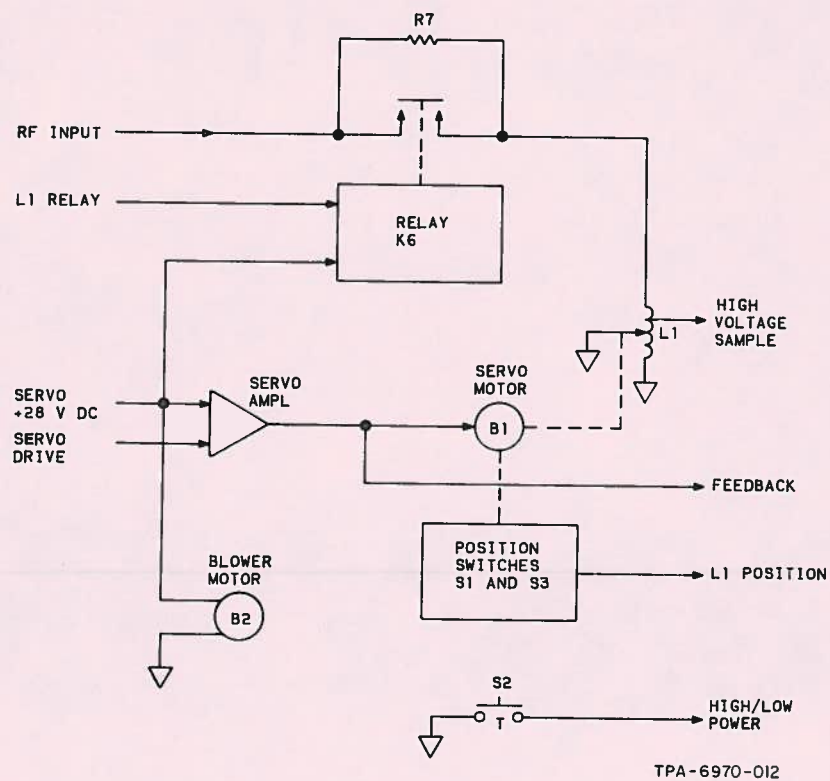
Page 9/10: Replace Coil Module Schematic Diagram Figure 4 with Figure 4 provided on page 7 of addendum.

NOTES:

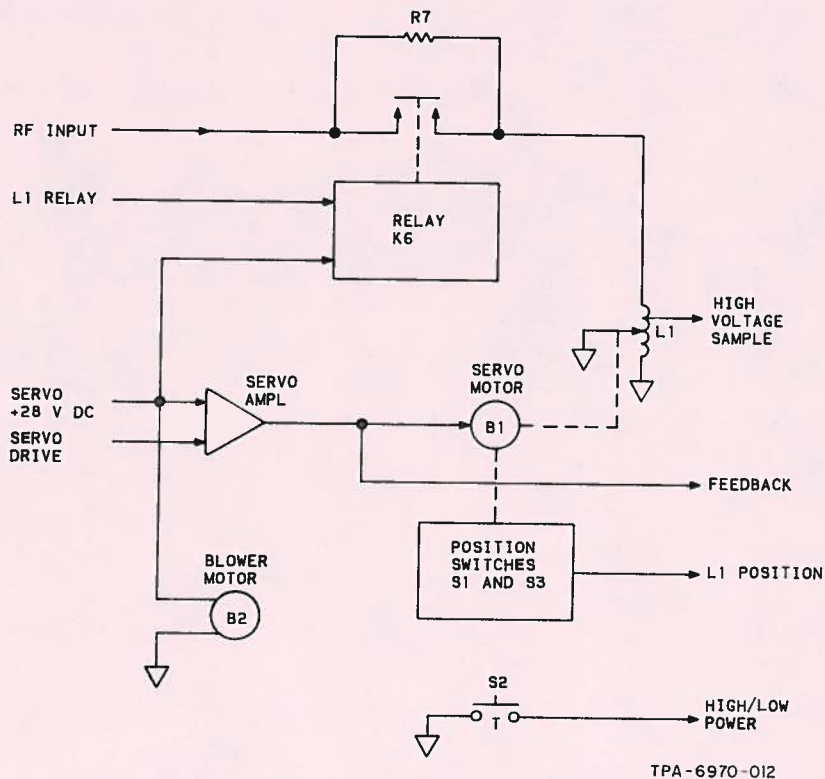
1. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN PICO FARADS.
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
3. S1 AND S3 SHOWN AT L1 OFF LIMIT POSITION.
4. ROTATION OF L1 CORRESPONDS TO ROTATION OF S1 AND S3.



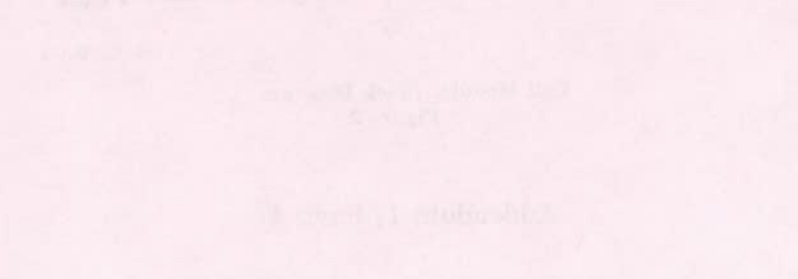
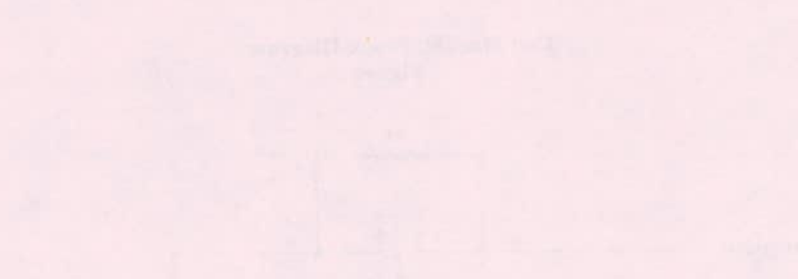
Coil Module, Schematic Diagram
Figure 4



**Coil Module, Block Diagram
Figure 2**

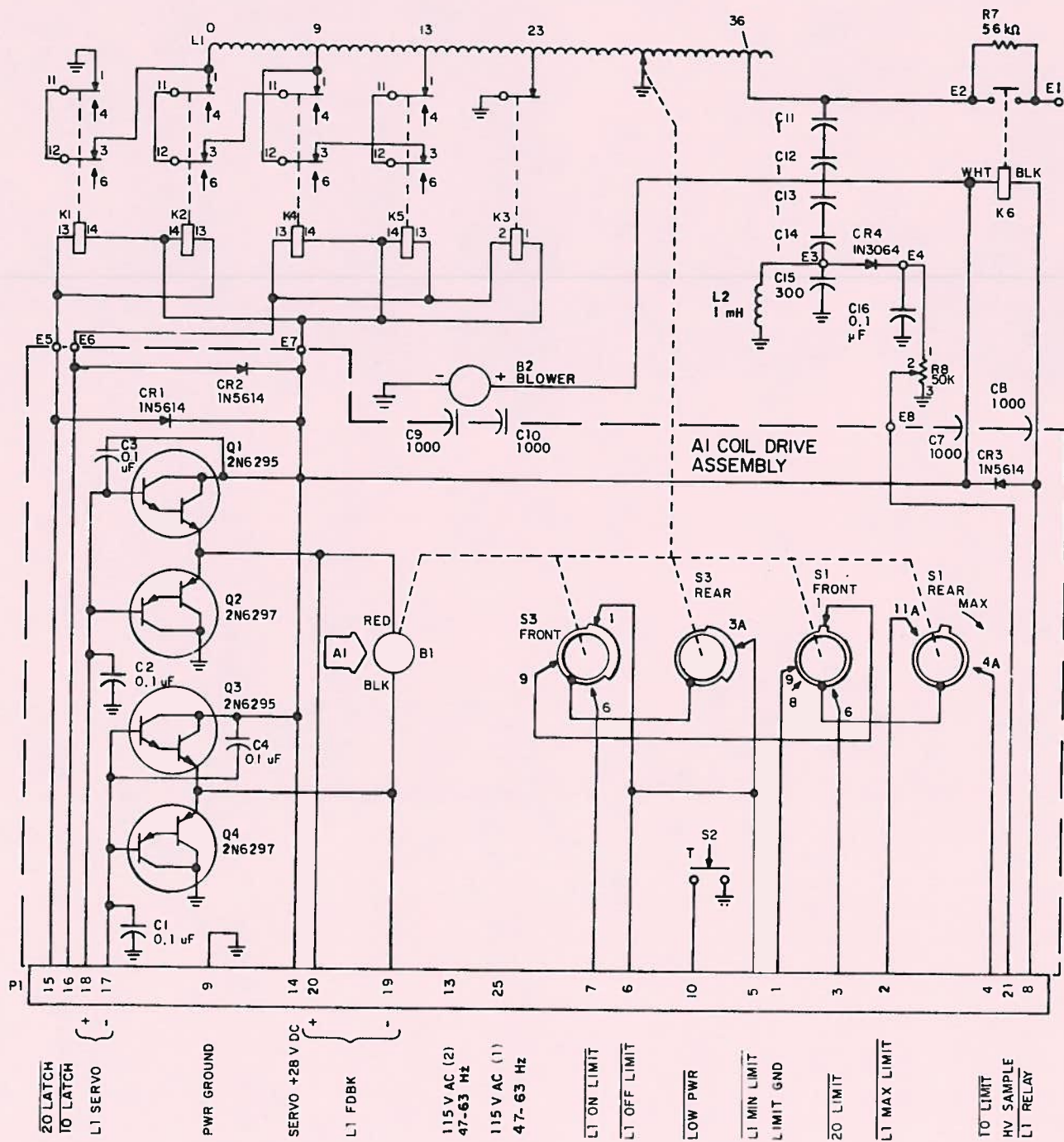


**Coil Module, Block Diagram
Figure 2**



NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN PICOFARADS.
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
3. S1 AND S3 SHOWN AT L1 OFF LIMIT POSITION.
4. ROTATION OF L1 CORRESPONDS TO ROTATION OF S1 AND S3.



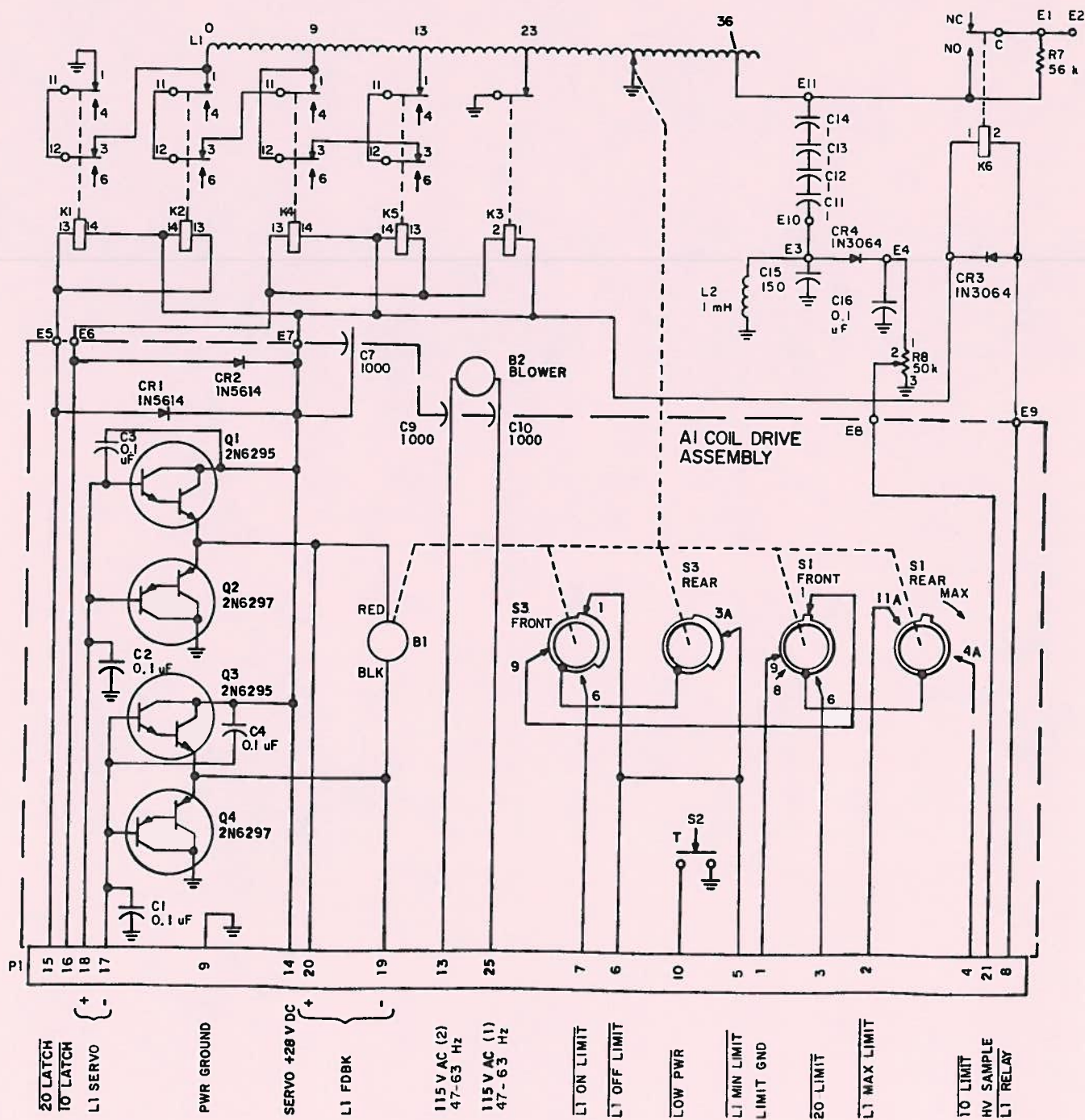
TPA-6662-011

Coil Module, Schematic Diagram
Figure 4



NOTES:

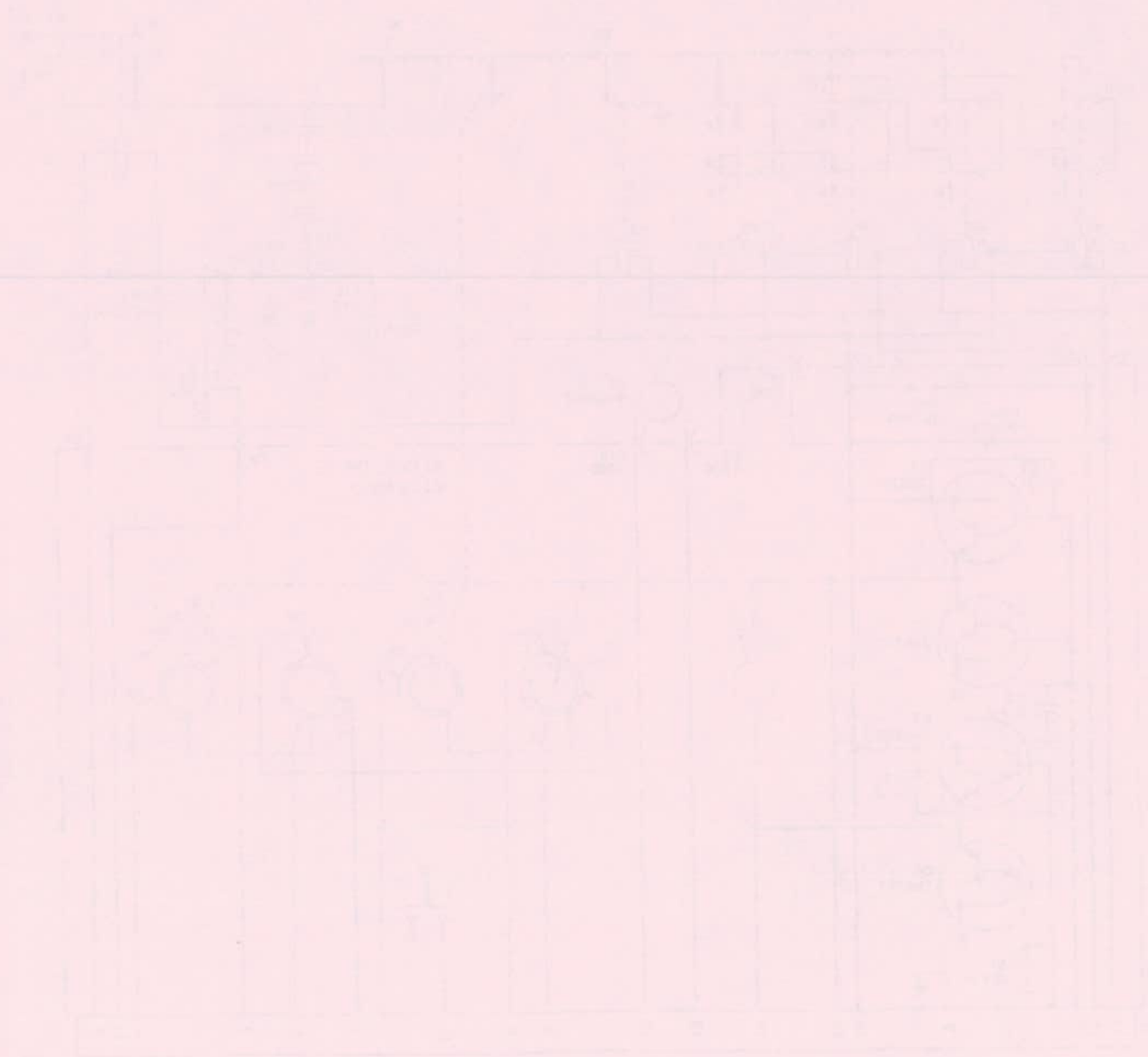
1. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN PICOFARADS.
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN, FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
3. S1 AND S3 SHOWN AT L1 OFF LIMIT POSITION.
4. ROTATION OF L1 CORRESPONDS TO ROTATION OF S1 AND S3.



Coil Module, Schematic Diagram
Figure 4

1. The purpose of this study was to determine the effect of the independent variable on the dependent variable.

2. The results of the study are as follows:

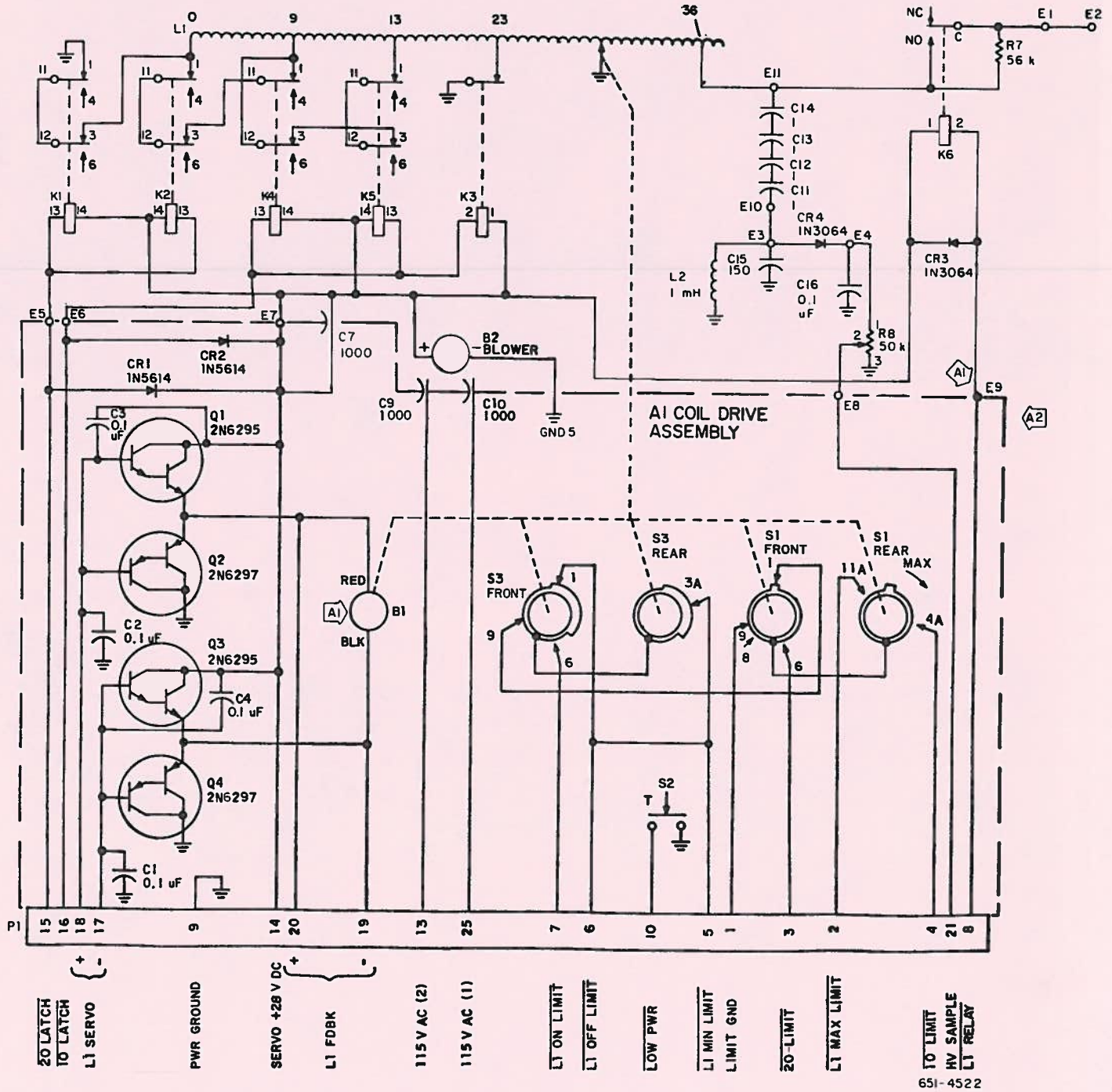


3. The conclusion of the study is that the independent variable has a significant effect on the dependent variable.

4. The study was conducted by [Name] and [Name].

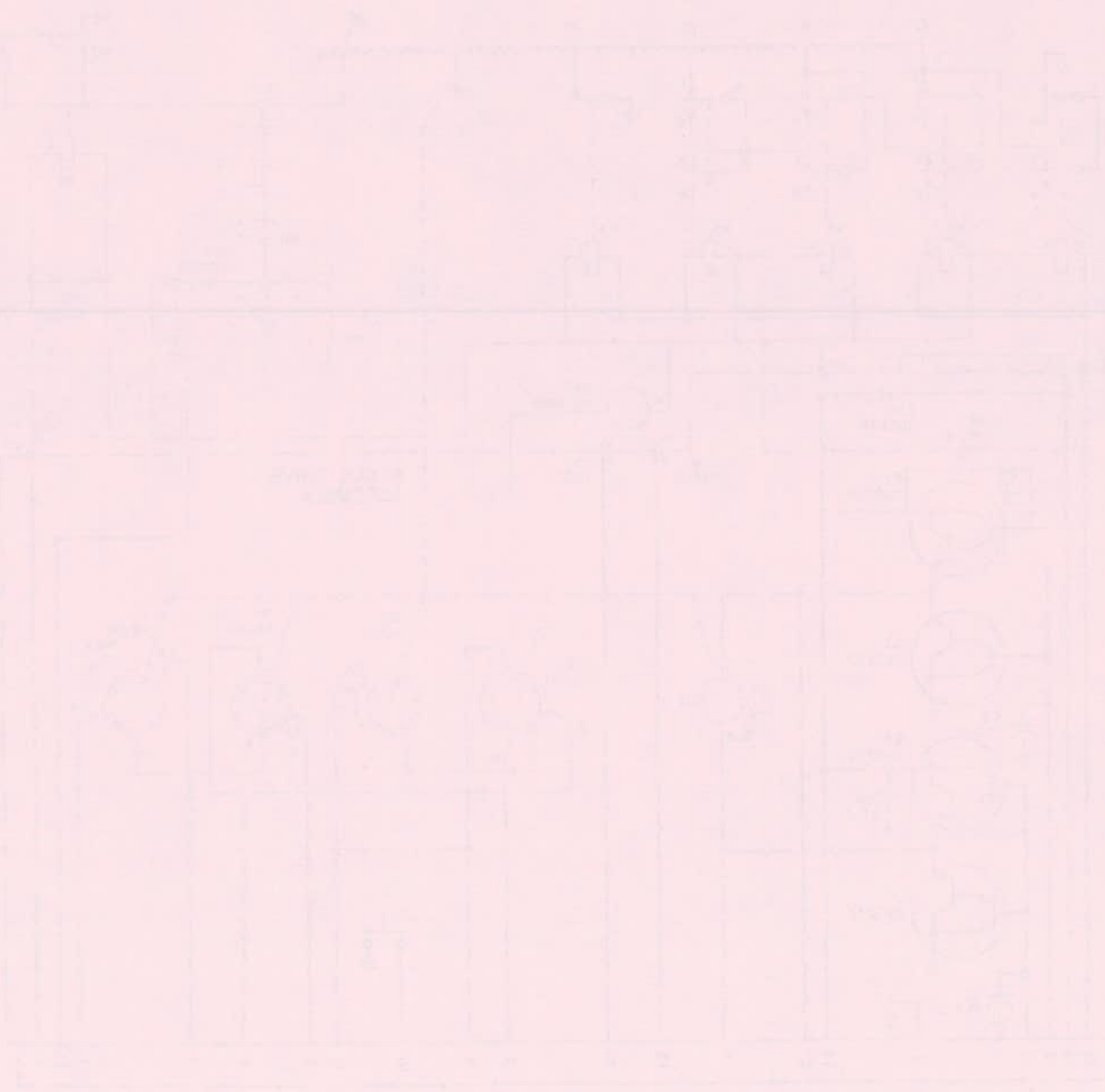
NOTES

1. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN PICOFARADS.
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN, FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
3. S1 AND S3 SHOWN AT $\square$ OFF LIMIT POSITION.
4. ROTATION OF L1 CORRESPONDS TO ROTATION OF S1 AND S3.



Coil Module, Schematic Diagram
Figure 4

The following information is for the use of the
 user of this system. It is not to be used as a
 basis for any other system.



The following information is for the use of the
 user of this system. It is not to be used as a
 basis for any other system.

The following information is for the use of the
 user of this system. It is not to be used as a
 basis for any other system.

ADDENDUM 2 TO THE HF-8040A() ANTENNA COUPLER

INSTRUCTION BOOK

(523-0767458-00321A)

This addendum provides correction to the parts list modification history for Coil Module, part number 635-4720-001, which is documented in Instructions, part number 523-0767698 dated 1 June 1983.

Page 8: Replace the modification history with the following:

MODIFICATION HISTORY

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A1	Changed P/N of A1B1 from 230-0620-030 to 230-0662-010.	635-4687-001 REV J and above SB 48
	Changed P/N of A1B1 from 230-0662-010 to 230-0667-010.	635-4720-001 REV N and above

Addendum 1, dated 1 October 1983, contained information regarding addition of modification history for the parts list, page 8, of Coil Module Instructions, part number 523-0773120, dated 1 June 1983. Disregard this modification history, as all A1B1 items are part number 230-0667-010.

DESCRIPTION OF THE

(22) (22) (22)

This document provides information on the work of the Commission in the field of human rights. It is a summary of the work of the Commission in the field of human rights, which is documented in the following pages.

Page 61 - The Commission's history, with the following:

DESCRIPTION OF THE

REVISION	DESCRIPTION OF REVISION	REASON FOR CHANGE	EFFECTIVITY
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1	Changed the title of the document to "The Commission's history, with the following:"	to clarify the purpose of the document	1/1/2000
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2	Added the following text: "The Commission's history, with the following:"	to clarify the purpose of the document	1/1/2000
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3	Added the following text: "The Commission's history, with the following:"	to clarify the purpose of the document	1/1/2000
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Appendix 2, which contains information regarding the work of the Commission in the field of human rights, is a summary of the work of the Commission in the field of human rights, which is documented in the following pages.

ADDENDUM 3 TO THE HF-8040A() ANTENNA COUPLER
INSTRUCTION BOOK
(523-0767458-00321A)

GENERAL

This addendum provides alignment procedures for C2 and replaces the C1 ALIGNMENT/ADJUSTMENT procedures for Capacitor Module (part number 629-5655-001, -003), which is documented in instruction section part number 523-0767699, dated 1 June 1983.

Instructions - Capacitor Module (629-5655-001, -003) - 523-0767699

Pages 3 and 4 -- Replace paragraph 4. ALIGNMENT/ADJUSTMENT with the following.

4. ALIGNMENT/ADJUSTMENT

To align/adjust the capacitor module, perform the following. Refer to figures 3 and 4 for the following procedure.

4.1 Capacitor Module Removal Procedures

Remove the capacitor module as follows.

- a. Disconnect the wire from the base of C1 that is connected to the mounting post on the discriminator.
- b. Disconnect the antenna output wire shown in figure 4 that is connected to the base of C2.
- c. Remove the screw and disconnect the wire from the top of C2.
- d. Loosen the four captive screws that secure the capacitor module to the coupler.
- e. Carefully disengage the 25-pin connector and remove the capacitor module.

4.2 Capacitor C1 Alignment

Align C1 as follows.

- a. Remove the six screws and lockwashers and remove the housing cover (MP20) to observe AIS1 position.
- b. Connect a continuity tester across C1.

WARNING

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- c. Rotate the C1 lead screw assembly counterclockwise until continuity exists across the capacitor plates. Continue to turn counterclockwise 15 to 45 degrees past the point where continuity exists.
- d. Back off the three screws holding C1 capacitor spacer (MP19) to the capacitor module and move the assembly enough to disengage the gears.
- e. Rotate the mating gear clockwise until continuity exists between P1-20 and P1-23. Switch terminals A1S1-4A and A1S1-12 may be more convenient test points.
- f. Carefully position C1 back to the gear chassis and mesh the C1 spur gear to its mating gear.
- g. Secure C1 and the capacitor spacer to the gear chassis using the three screws loosened in step 4.2.d.
- h. Check mechanical stop position as follows.
 - 1. Connect a continuity tester between P1-20 and P1-23. Rotate C1 lead screw assembly clockwise about one half turn, then rotate counterclockwise until continuity exists.
 - 2. Use a pencil to mark the position of the C1 lead screw assembly.
 - 3. Rotate the C1 lead screw assembly counterclockwise approximately 90 degrees. Gear stop (MP4) should contact guide pin (MP5). Move gear stop (MP4) if required.
- i. Upon completion of alignment, reinstall the housing cover (MP20) over A1S1, insert the six screws and lockwashers removed in step 4.2.a., and tighten.

4.3 Capacitor C2 Alignment

Align C2 as follows.

- a. Remove the six screws and lockwashers and remove the housing cover (MP20) to observe A1S2 position.
- b. Connect a continuity tester across C2.
- c. Rotate the C2 lead screw assembly counterclockwise until continuity exists across the capacitor plates. Use a pencil to make a reference mark on the C2 lead screw assembly. Continue to turn counterclockwise 15 to 45 degrees past the point where continuity exists.
- d. Back off the three screws securing the C2 capacitor spacer (MP19) to the capacitor module and move the assembly to disengage the gears.
- e. Rotate the mating gear until continuity exists between P1-23 and P1-5. Switch terminals A1S2-12 and A1S2-8 may be more convenient test points.
- f. Reengage the gears and tighten the three screws on the C2 capacitor spacer (MP19).
- g. Upon completion of alignment, reinstall the housing cover (MP20) over A1S2, insert the six screws and lockwashers removed in step 4.3.a., and tighten.

4.4 Capacitor Module Installation Procedures

Reinstall the capacitor module as follows.

- a. Place the capacitor module in position in the coupler. Carefully mate the 25-pin connector.
- b. Secure the capacitor module to the coupler with four captive screws.
- c. Connect the wire from the coil module to the top of C2 with the screw removed in step 4.1.c.
- d. Connect the antenna output wire to the base of C2 as shown in figure 4.
- e. Connect the wire from the base of C1 to the mounting post on the discriminator.

WARNING

INFORMATION SUBJECT TO EXPORT CONTROL LAWS

This document may contain information subject to the International Traffic in Arms Regulation (ITAR) or the Export Administration Regulation (EAR) of 1979 which may not be exported, released, or disclosed to foreign nationals inside or outside of the United States without first obtaining an export license. A violation of the ITAR or EAR may be subject to a penalty of up to 10 years imprisonment and a fine of up to \$1,000,000 under 22 U.S.C. 2778 of the Arms Export Control Act of 1976 or Section 2410 of the Export Administration Act of 1979. Include this notice with any reproduced portion of this document.



**Rockwell
International**

instruction book

HF-8040() Antenna Coupler

Intermediate and Depot Maintenance

This instruction book includes:

<i>Description</i>	523-0767459
<i>Installation</i>	523-0767460
<i>Operation</i>	523-0767461
<i>Theory</i>	523-0767462
<i>Maintenance</i>	523-0767463
<i>Parts List</i>	523-0767464
<i>Diagrams</i>	523-0767465
<i>Circuit Card Repair</i>	523-0775410
<i>Control Module (642-3278-001)</i>	523-0773117
<i>Control Module (646-5781-001)</i>	523-0771620
<i>Coil Module (635-4720-001)</i>	523-0767698
<i>Coil Module (651-4240-001)</i>	523-0773118
<i>Coil Module (651-4523-001)</i>	523-0773119
<i>Coil Module (651-4524-001)</i>	523-0773120
<i>Capacitor Module (629-5655-001, -003)</i>	523-0767699
<i>Discriminator Module (629-5642-001)</i>	523-0767700
<i>Power Supply (637-4006-001)</i>	523-0767701

**Collins Avionics &
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Rockwell International Corporation
Cedar Rapids, Iowa 52498**

LIST OF EFFECTIVE PAGES

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Please be advised that completion and return of the enclosed Customer Service Information sheet to Rockwell International ensures you of manual revisions and service bulletin modifications to your equipment. Without the return of this sheet, 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:

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Rockwell International Corporation
Cedar Rapids, Iowa 52498

ATTN: Quality Control-Technical Publications 120-155

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i thru ii	0		
Description (523-0767459-004218) 4th Ed — 1 Jun 83		Theory (523-0767462-004218) 4th Ed — 1 Jun 83	
Title	0	Title	0
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Installation (523-0767460-004218) 4th Ed — 1 Jun 83		Maintenance (523-0767463-003218) 3rd Ed — 1 Jun 83	
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		7 thru 9	0
Circuit Card Repair (523-0775410-002811) 2nd Ed — 1 July 90		10 Blank	0
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Control Module (642-3278-001) (523-0773117-001211) 1st Ed — 1 Jun 83		1 thru 9	0
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Coil Module (651-4524-001)

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1st Ed — 1 Jun 83

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Capacitor Module (629-5655-001, -003)

(523-0767699-004211)

4th Ed — 1 Jun 83

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12 Blank	0

Discriminator Module (629-5642-001)

(523-0767700-004211)

4th Ed — 1 Jun 83

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Power Supply (637-4006-001)

(523-0767701-002211)

2nd Ed — 1 Jun 83

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introduction

DESIGN FEATURES

- The HF-8040() Antenna Couplers are designed to automatically match the impedance of various whip and long-wire antennas to the output impedance of a 1-kW power amplifier.
- The HF-8040() Antenna Coupler consists of a chassis assembly with plug-in modules for ease of replacement. The aluminum case is provided with a self-sealing cover that is secured by twist-lock fasteners for fast removal. An internally mounted fan is provided for cooling of the components.
- The HF-8040, HF-8040A, and HF-8040M Antenna Couplers are similar in configuration. Refer to the description section, paragraph 5 and table 1, for differences between the couplers.

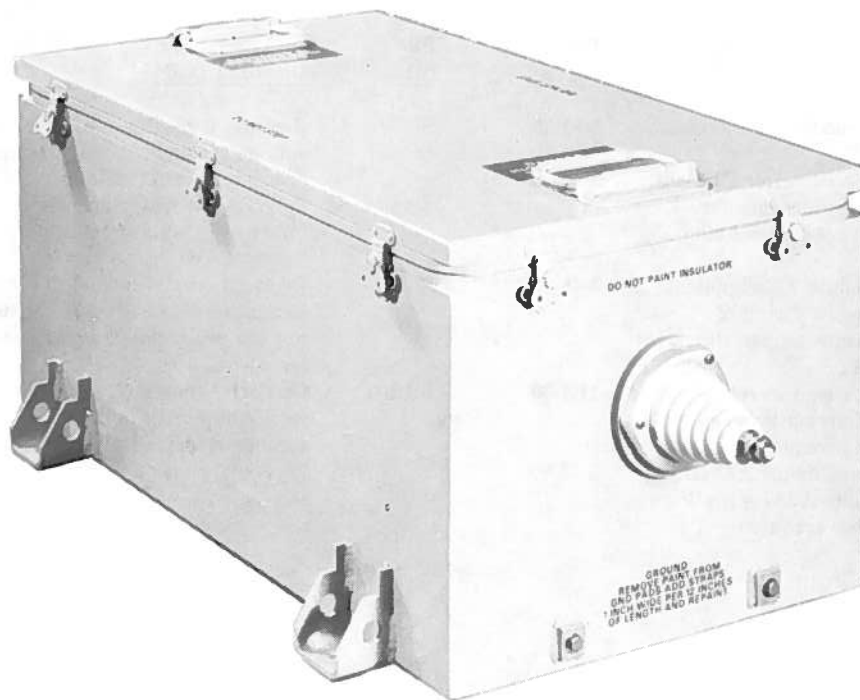
SERVICE BULLETINS/SERVICE INFORMATION LETTERS

The following listed service bulletins (SB) and service information letters (SIL) are those that are applicable to the unit 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.

Note

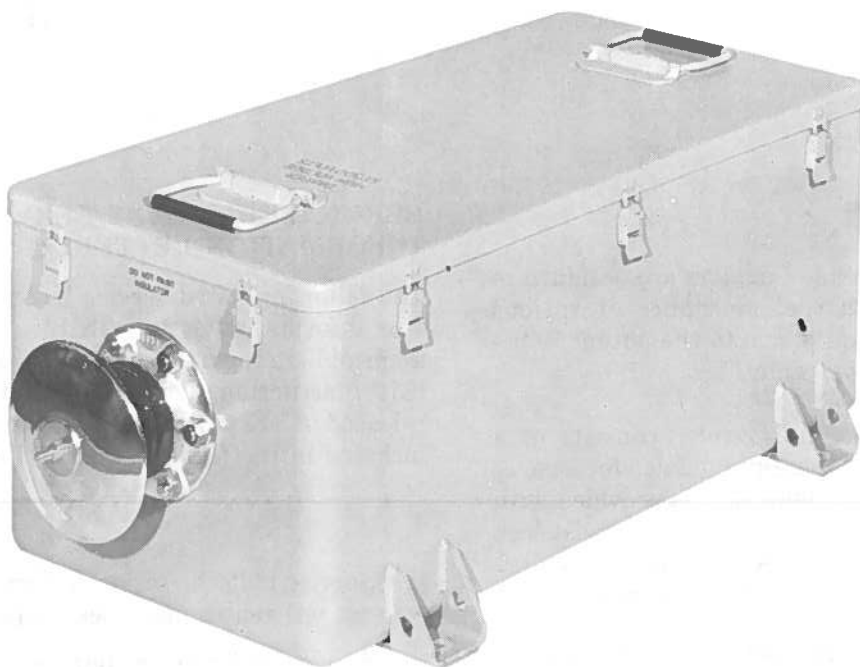
Service bulletin/service information letters are written in numerical sequence.

Service bulletins are numbered in sequence for the life of the equipments. Service information letters are numbered in sequence starting at 1 for each calendar year.



TP5-1892-017

HF-8040/8040A Antenna Coupler



TP4 - 9068 - 017

HF-8040M Antenna Coupler

<u>SB/ SIL</u>	<u>DESCRIPTION</u>	<u>ISSUE DATE</u>	<u>SB/ SIL</u>	<u>DESCRIPTION</u>	<u>ISSUE DATE</u>
SIL 1-77	Define common modules between HF-8040 and 490M-11.	10-1-77	SB 51	Replaces capacitor A4C3 with higher voltage rating capacitor to improve discriminator A4 reliability.	8-1-80
SIL 4-78	Provides variable capacitor C1 lead-screw reassembly procedure for modules without mechanical stop mechanism.	5-15-78	SB 54	Corrects the power strapping information silk-screened on power supply A6 cover.	11-1-80
SB 22	Provides coil module A2 alignment procedures to verify wiring of switches and ensure proper alignment of coil module A2.	3-15-79	SB 76	Replaces control module A1 with control module CPN 646-5781-001 to provide protection from rf power transients.	8-1-81
SB 44	Replaces antenna lead to reduce susceptibility of arcing between antenna lead and coupler case.	11-1-79	SB 103	Coil drive motor A2A1B1 is replaced by a motor with improved aging and torque performance characteristics.	3-1-83
SB 48	Replaces coil drive motor A2A1B1 in coil drive assembly A2A1 with drive motor with higher torque.	3-15-80			



Rockwell
International

HF-8040() Antenna Coupler

description

Collins Defense Communications

Printed in USA

523-0767459-004218
4th Edition, 1 June 1983

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description

1. GENERAL

The HF-8040() Antenna Coupler provides automatic impedance matching of various antennas to provide a 50-ohm load to the associated power amplifier.

Warning

When connected to a radio frequency transmitter and operated into an antenna, this device may produce electromagnetic fields in close proximity to the antenna that are in excess of Occupational Safety and Health Administration (OSHA) recommended maximum limits.

The antenna coupler operates over a frequency range of 1.6 to 30 MHz. Modes of operation include independent sideband (ISB), upper sideband (USB), lower sideband (LSB), continuous wave (CW), and amplitude modulation equivalent (AME). The maximum rf

input power is 1.26-kW pep and 1-kW average. The required tuning power is 100 to 200 watts.

The antenna coupler may be located at the antenna feedpoint to minimize antenna feedline losses. Provisions are made for attaching the antenna ground or radial system directly to the antenna coupler. This ensures maximum antenna efficiency.

The antenna coupler and antenna may be located up to 76.2 m (250 ft) from the associated power amplifier. High-level interface circuits and rfi filtering are used to reduce rf interference problems caused by interconnect cable routing.

2. EQUIPMENT SUPPLIED/ CONFIGURATION

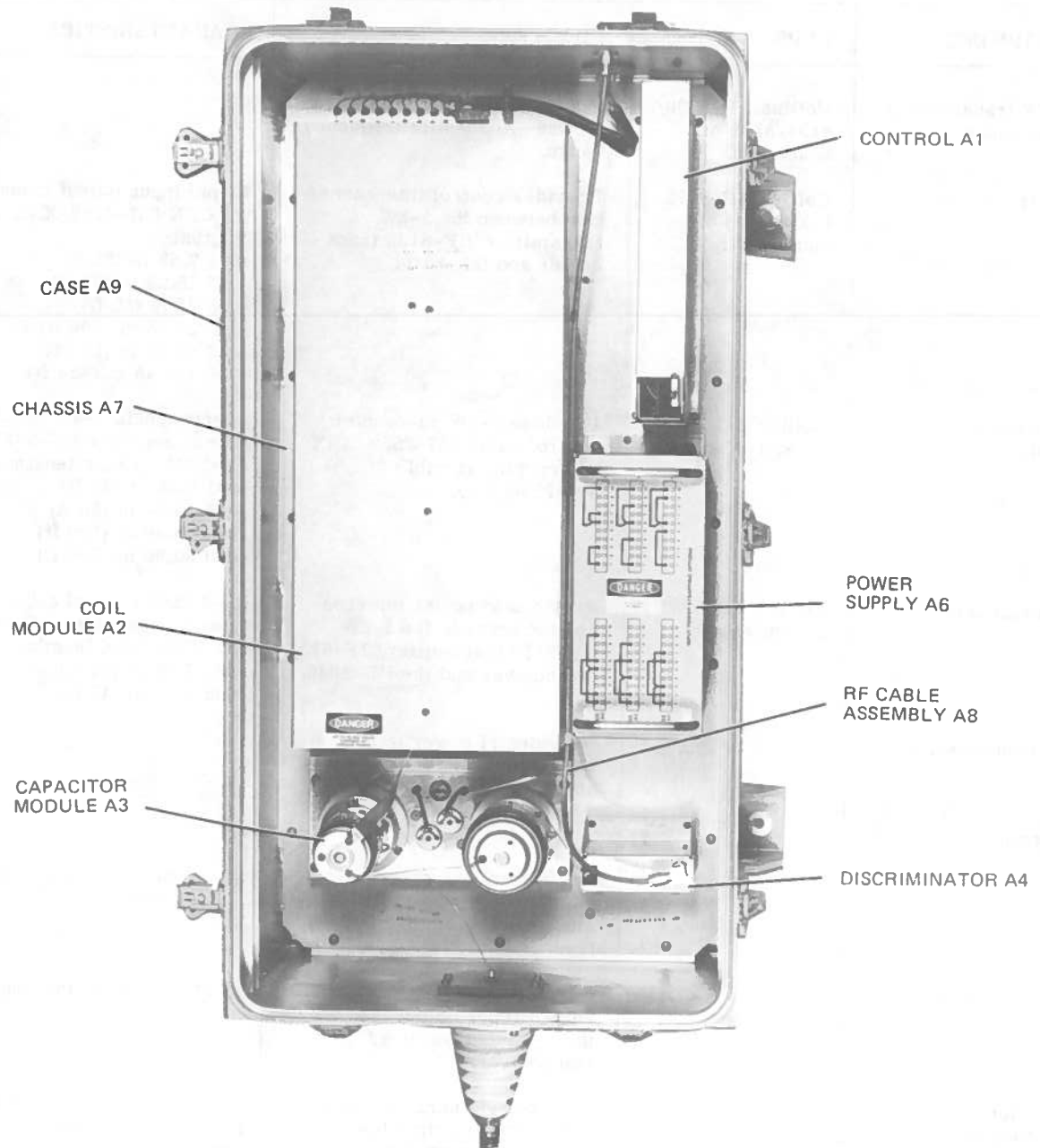
Table 1 lists the equipment supplied/configuration for the antenna coupler and figure 1 shows the location.

Table 1. HF-8040() Equipment Supplied/Configuration.

CIRCUIT CARD		HF-8040 622-3384		HF-8040A 622-3515-001	HF-8040M 622-3513	
TITLE	COLLINS PART NUMBER	-001	-002		-001	-002
Control A1	642-3278-001 (2)				X	
	646-5781-001 (3)	X	X	X	X	X
Coil module A2	635-4720-001	X			X	
	651-4240-001 (4)			X		
	651-4523-001		X			X
	651-4524-001 (5)			X		
Capacitor module A3	629-5655-001				X	X
	629-5655-003	X	X	X		
Discriminator A4	629-5642-001	X	X	X	X	X
Power supply A6	637-4006-001	X	X	X	X	X
Chassis A7	637-4007-001 (6)	X				
	635-4773-001 (7)	X	X	X	X	X
Rf cable A8	637-4008-001 (6)	X				
	635-4797-002 (7)	X	X	X	X	X
Case A9	637-4009-001	X	X	X		
	635-5179-002				X	X

Note

- (1) A5 is not used.
- (2) Effective to 622-3513-001 REV B
- (3) Effective 622-3513-001 REV B and above
- (4) Effective to 622-3515-001 REV D
- (5) Effective 622-3515-001 REV D and above
- (6) Effective to 622-3384-001 REV G
- (7) Effective 622-3384-001 REV G and above



TP5-1893-017

**Subassembly Location
Figure 1**

3. ASSOCIATED EQUIPMENT

Table 2 lists the associated equipment for the antenna coupler.

Table 2. Associated Equipment.

EQUIPMENT	TYPE	FUNCTION	CHARACTERISTICS
1-kW transmitter/ transceiver	Collins HF-8130/ 8134/8135 or equivalent	Provides 1-kW output power in the 1.6- to 30-MHz frequency range.	
Control cable	Collins AC-8073 (cable W6) or equivalent	Provides control interconnec- tion between the 1-kW transmitter/HF-8135 trans- ceiver and HF-8040.	15-pin input/output connectors. W6 CPN 637-4399-XXX cable lengths: -001 7.62 m (25 ft) -015 15.24 m (50 ft) -025 25 m (82 ft) -030 30.48 m (100 ft) -060 60.96 m (200 ft) -130 130.45 m (428 ft)
Control and rf cable	Collins AC-8073A or equivalent	Provides 1-kW pa-coupler control cable 647-2533-XXX and coupler rf cable 647-2554-XXX.	Interconnects 1-kW solid-state power amplifier HF-8023 and HF-8040. Cable lengths: -001 7.62 m (25 ft) -015 15.24 m (50 ft) -030 30.48 m (100 ft) -060 60.96 m (200 ft)
Coaxial cable	Collins cable W1 or equivalent	Provides rf power intercon- nection between the 1-kW HF-8130 transmitter/HF-8135 transceiver and the HF-8040.	RG-213/U coaxial cable with type-N connectors. Cable CPN 637-4768-XXX lengths: -001 7.62 m (25 ft) -002 3.66 m (12 ft)
Rf transmission line		Provides rf power intercon- nection between the antenna and the HF-8040.	
Antenna			
Whip		Radiates rf energy and pro- vides proper output load for the 1-kW transmitter/ transceiver.	10.668 m (35 ft) and longer, 1.6 to 30 MHz
Long wire		Radiates rf energy and pro- vides proper output load for the 1-kW transmitter/ transceiver.	13.716 m (45 ft) and longer
Shorter whips/ long wires		Radiates rf energy and pro- vides proper output load for the 1-kW transmitter/ transceiver.	Shorter whips and long wires may be used. Limited low- frequency selection is neces- sary due to extremely high antenna voltage. No damage to the coupler will result due to internal voltage fault protection.

4. EQUIPMENT SPECIFICATIONS

Table 3 lists the electrical, environmental, and physical specifications for the antenna coupler.

Table 3. Equipment Specifications.

CHARACTERISTIC	SPECIFICATION
Electrical	
Input power requirements	
HF-8040, HF-8040M	105, 115, 122, 210, 220, 230, or 244 $\pm 10\%$ V ac, single-phase, 47 to 63 Hz, 200 VA
HF-8040A	105, 115, 122, 210, 220, 230, or 244 $\pm 10\%$ V ac, single-phase, 47 to 63 or 380 to 420 Hz, 200 VA
Warmup time	None
Duty cycle	Continuous
Input impedance (tuned)	50 ohms, vswr 1.3:1 maximum, 1.1:1 typical
Tuning time	3 seconds typical, 7 seconds maximum
Frequency range	1.6 to 30 MHz
Rf input power	1.26 kW pep and 1 kW average, maximum
Tuning power	100 to 200 watts
Environmental	
Temperature	
Operating	-30 to +60 °C (-22 to +140 °F)
Storage	-65 to +70 °C (-85 to +158 °F)
Cooling	External surface convection and internal fan
Humidity	95% with temperature limited to +40 °C (+104 °F)
Vibration	0.31-mm (0.126-in) da (1 g maximum) at 0 to 12.5 Hz 0.81-mm (0.032-in) da (1 g maximum) at 12.5 to 25 Hz 0.2-mm (0.008-in) da (1 g maximum) at 25 to 50 Hz
Altitude	0 to 3048 m (0 to 10 000 ft)
Physical	
Size	
Height	387.4 mm (15.25 in)
Width	531.9 mm (20.94 in)
Depth	997.5 mm (39.27 in)
Weight	38.5 kg (85 lb)
Construction	Aluminum outer case with self-sealing cover secured by snap-lock clasps. The chassis forms the bottom of the unit.

5. DIFFERENCE DATA

Differences between HF-8040() configurations are shown in table 1. The following paragraphs discuss the differences in modules used in each configuration.

5.1 Control A1

Control modules with Collins part number (CPN) 646-5781-001 have an interlock delay circuit not used in control modules with CPN 642-3278-001. The interlock delay circuit delays the key interlock signal 200 ms at the start of TUNE B step of the coupler tuning sequence.

5.2 Coil Module A2

Coil modules with CPN 651-4523-001 and 651-4524-001 use a vacuum relay for switching the rf network. These modules must be used with control A1, CPN 646-5781-001. Coil modules with CPN 635-4720-001 and 651-4240-001 use a solenoid switch for switching the rf network.

Coil modules with CPN 635-4720-001 and 651-4523-001 contain an ac blower; therefore, they can be used only with 47- to 63-Hz primary input power to the

antenna coupler. Coil modules with CPN 651-4240-001 and 651-4524-001 contain a dc blower; therefore, they can be used with either 47- to 63-Hz or 380- to 420-Hz primary input power to the antenna coupler.

5.3 Capacitor Module A3

Capacitor modules with CPN 629-5655-001 have a relay that is energized during receive mode to bypass capacitors C1 and C2. Capacitor modules with CPN 629-5655-003 do not need the receive relay.

5.4 Chassis A7

Chassis A7 with CPN 637-4007-001 and 635-4773-002 have only minor mechanical differences and are completely interchangeable.

5.5 RF Cable A8

Rf cables with CPN 637-4008-001 and 635-4797-002 are similar and completely interchangeable.

5.6 Case A9

Case A9 with CPN 635-5179-002 has an insulator designed for use in salt water environment and provides watertight enclosure for the HF-8040M.



Rockwell
International

HF-8040() Antenna Coupler

installation

Collins Defense Communications

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installation

1. GENERAL

The HF-8040() Antenna Coupler is a weatherproof, rugged unit designed to be installed at the base of the antenna. The HF-8040 antenna coupler may be mounted in any position except cover down. In this position, the formation of ice may destroy the water-tight seal inside the cover.

Warning

When connected to a radio frequency transmitter and operated into an antenna, this device may produce electromagnetic fields in close proximity to the antenna that are in excess of Occupational Safety and Health Administration (OSHA) recommended maximum limits.

2. UNPACKING AND INSPECTING

Warning

The antenna coupler weighs approximately 38.5 kg (85 lb). Two men are required for handling.

The equipment should be unpacked and handled with care. Inspect the equipment for damage caused during shipment. In case of damage, notify the transportation agency immediately. Check the equipment received against the packing list. Save all boxes, fillers, and original packing containers for use when the equipment is repacked for storage or reshipment.

3. CABLING

Rf cabling is required from the associated power amplifier to the antenna coupler and from the antenna to the antenna coupler. Refer to figure 1. In addition, a control cable is required from the associated power amplifier to the antenna coupler.

4. INSTALLATION PROCEDURES

The outline and mounting dimensions of the HF-8040 and HF-8040A are shown in figure 2. The outline and mounting dimensions of the HF-8040M are shown in figure 3. Typical installations of the antenna coupler

are shown in figure 4. Mounting configurations are shown in figure 5.

To install the antenna coupler, proceed as follows:

- a. Secure the antenna coupler to a suitable mounting surface using four 6.35-mm (0.25-in) bolts.
- b. Ground the case of the antenna coupler. A ground strap is required for proper operation. The ground strap must be at least 25.4 mm (1 in) wide for each 304.8 mm (1 ft) of length required between the antenna coupler and the antenna ground radial system. Grounding may also be accomplished by mounting the antenna coupler on a metal surface and making electrical contact to the top of the mounting feet. The ground connection must be inspected and cleaned periodically if evidence of corrosion is present.

Caution

The antenna coupler is internally wired at the factory for 244-V ac supply voltage. For other supply voltages, refer to the power supply schematic in the diagrams section of this instruction book.

- c. Connect the control cable and the rf input connector to the antenna coupler.

Note

If the antenna coupler is to be mounted where it is subjected to weather conditions, the connectors should be moistureproofed. This is accomplished by filling each connector with Dow Corning DC-4 and wrapping it with weatherproof tape.

Caution

Ensure that the antenna feedline is clear of the antenna coupler case to prevent arcing voltage.

To avoid cracking the antenna insulator, do not overtighten the nut on the antenna terminal.

- d. Connect the antenna feedline to the antenna terminal on the antenna coupler.
- e. Tighten the 10 quick-release fasteners on the antenna coupler to ensure watertight integrity.

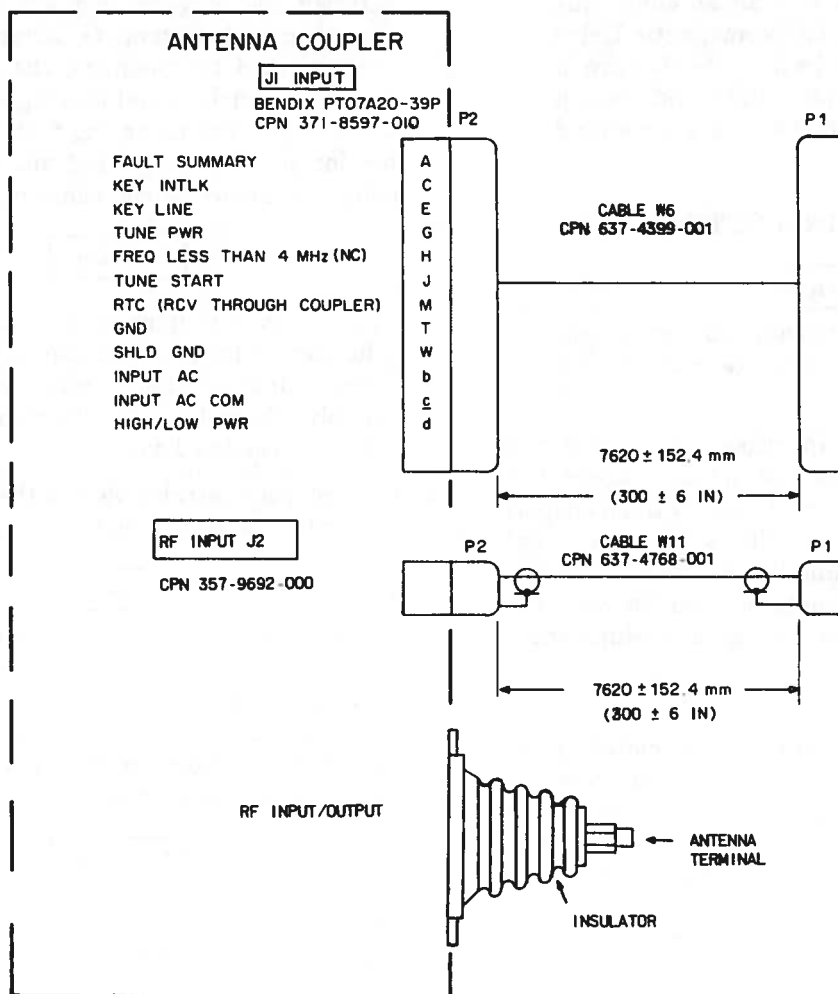
Caution

The pressure relief valve must be closed to ensure proper sealing.

- f. Tighten the pressure relief valve.

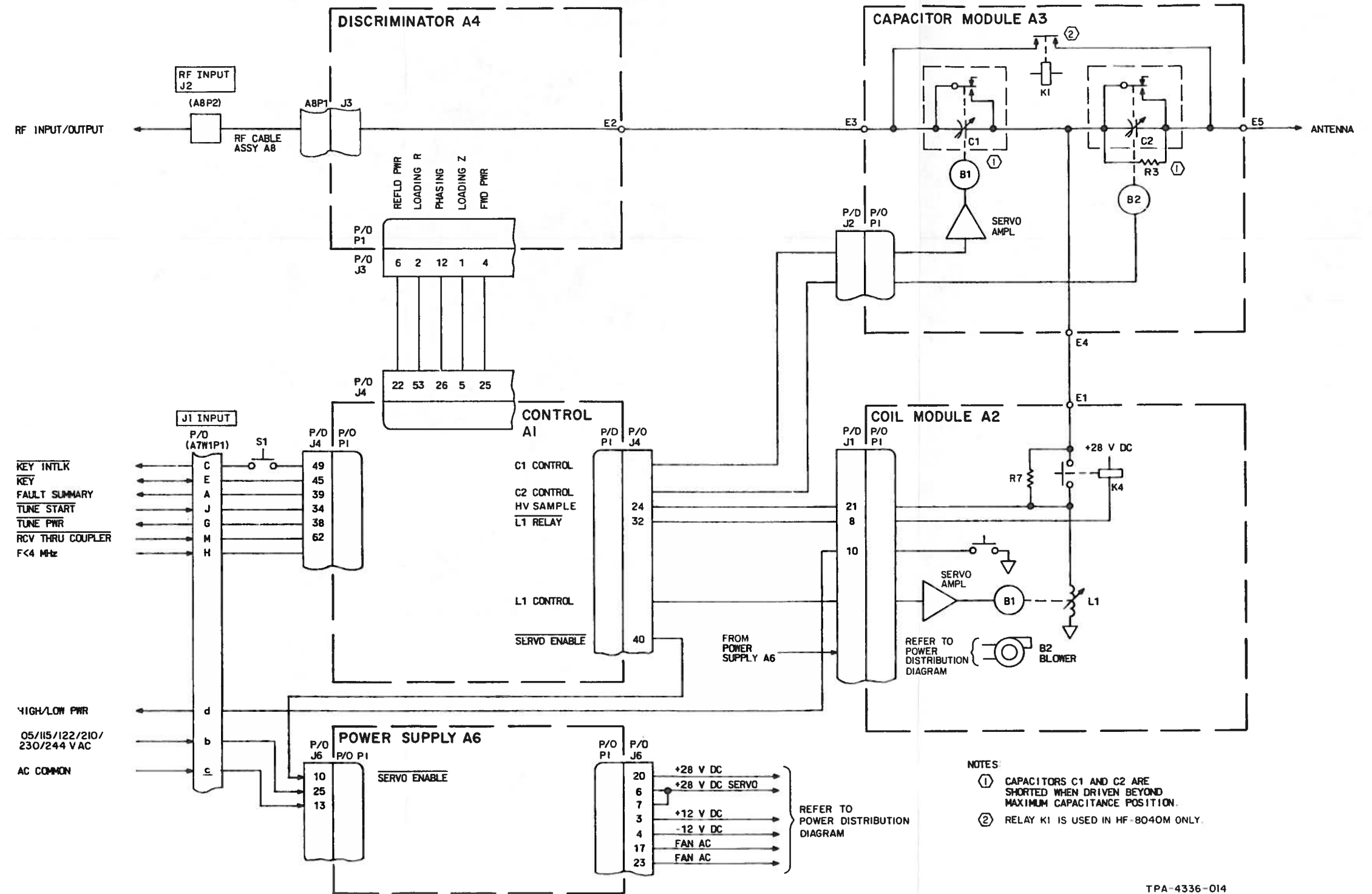
5. POSTINSTALLATION CHECK/REQUIREMENTS

After the antenna coupler has been installed and all cabling has been checked for proper installation, refer to the maintenance section of the appropriate system instruction book for testing.



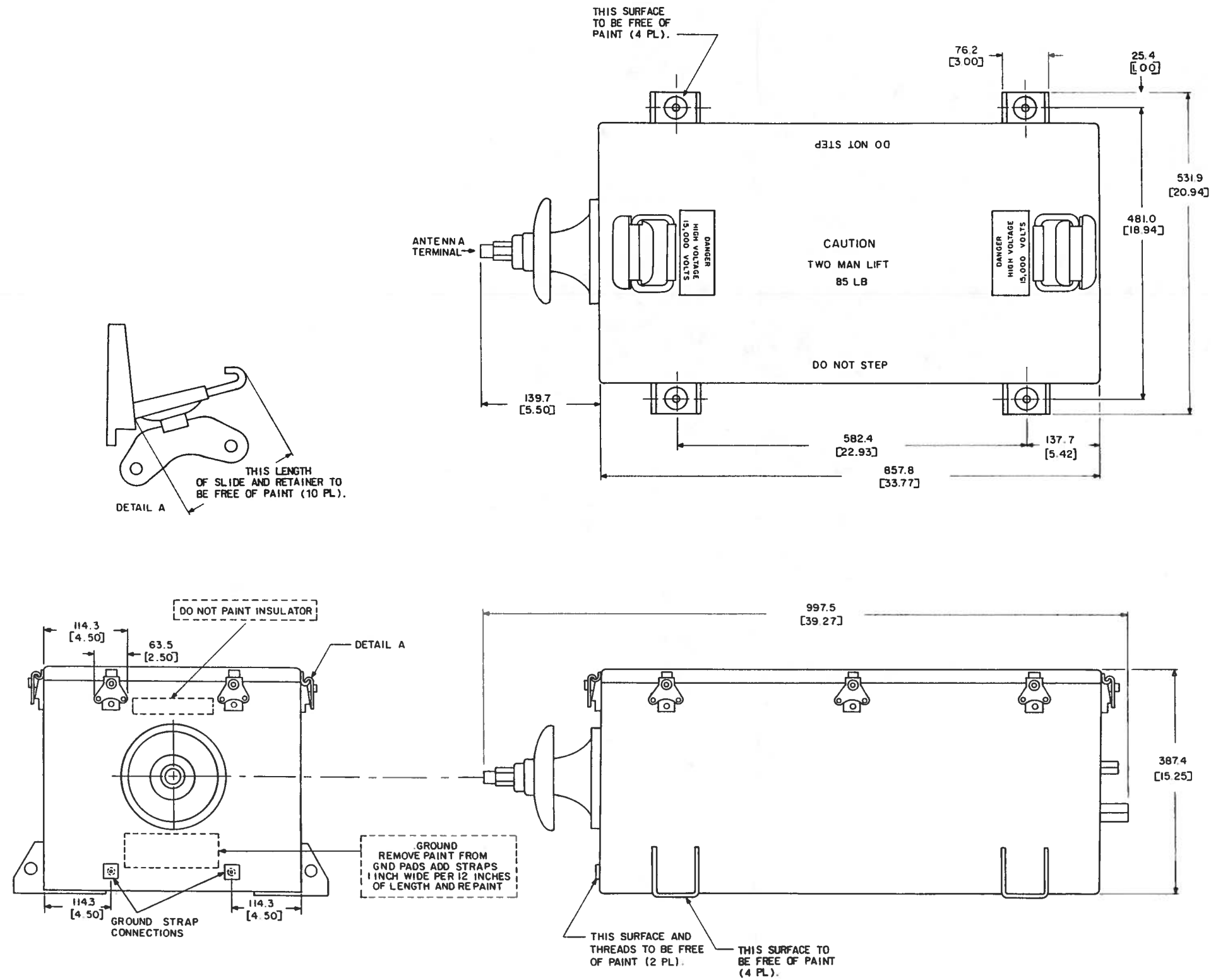
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External Wiring Diagram
Figure 1

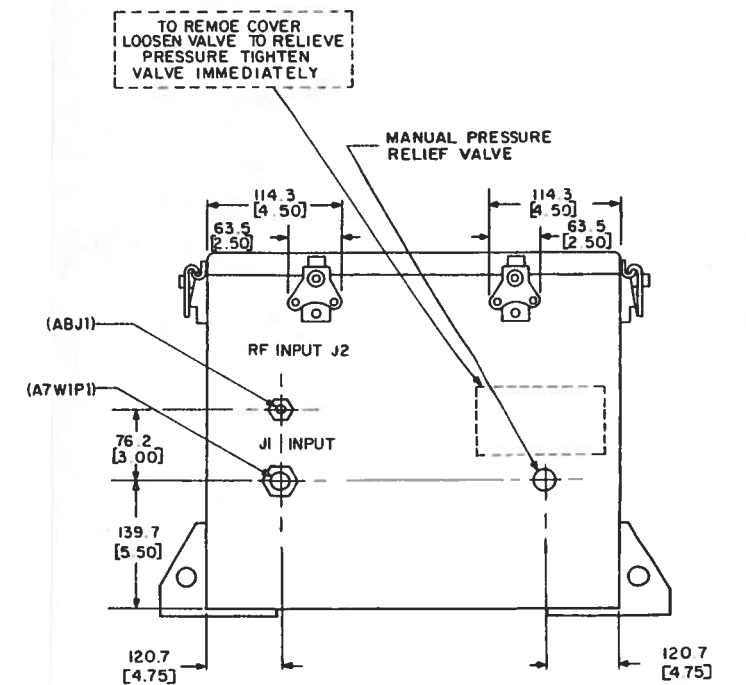


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Control and Signal Flow, Block Diagram
Figure 2

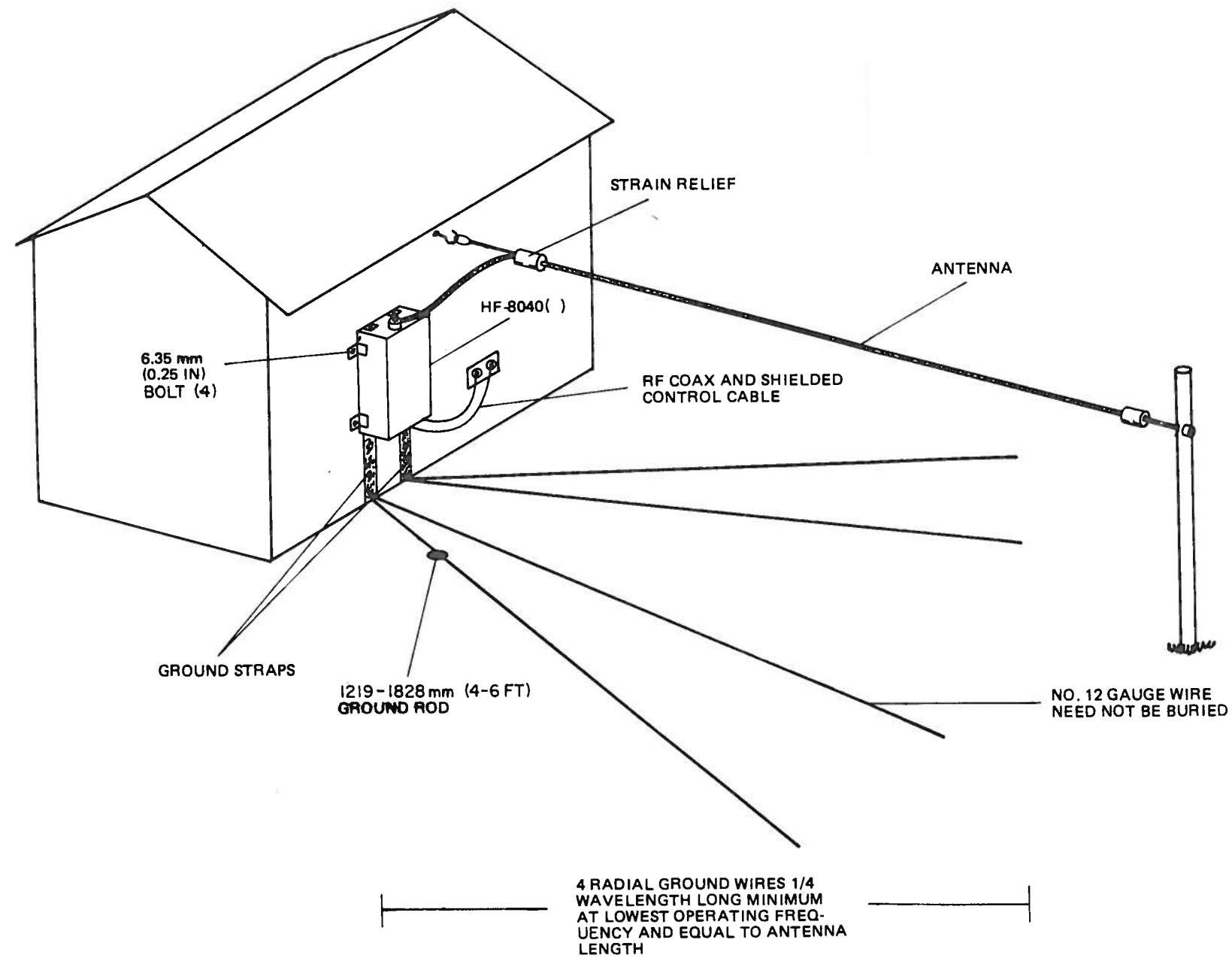


- NOTES:
1. UNLESS OTHERWISE SPECIFIED; DIMENSIONS ARE IN MILLIMETRES [INCHES].
 2. CONNECTOR PART NUMBERS:
A7W1P1 - BENDIX PTD7A20-39P (CPN 371-8597-010)
A8J1 - TYPE N (CPN 357-9692-000)
 3. WEIGHT - 38.5 kg [85.0 LBS].

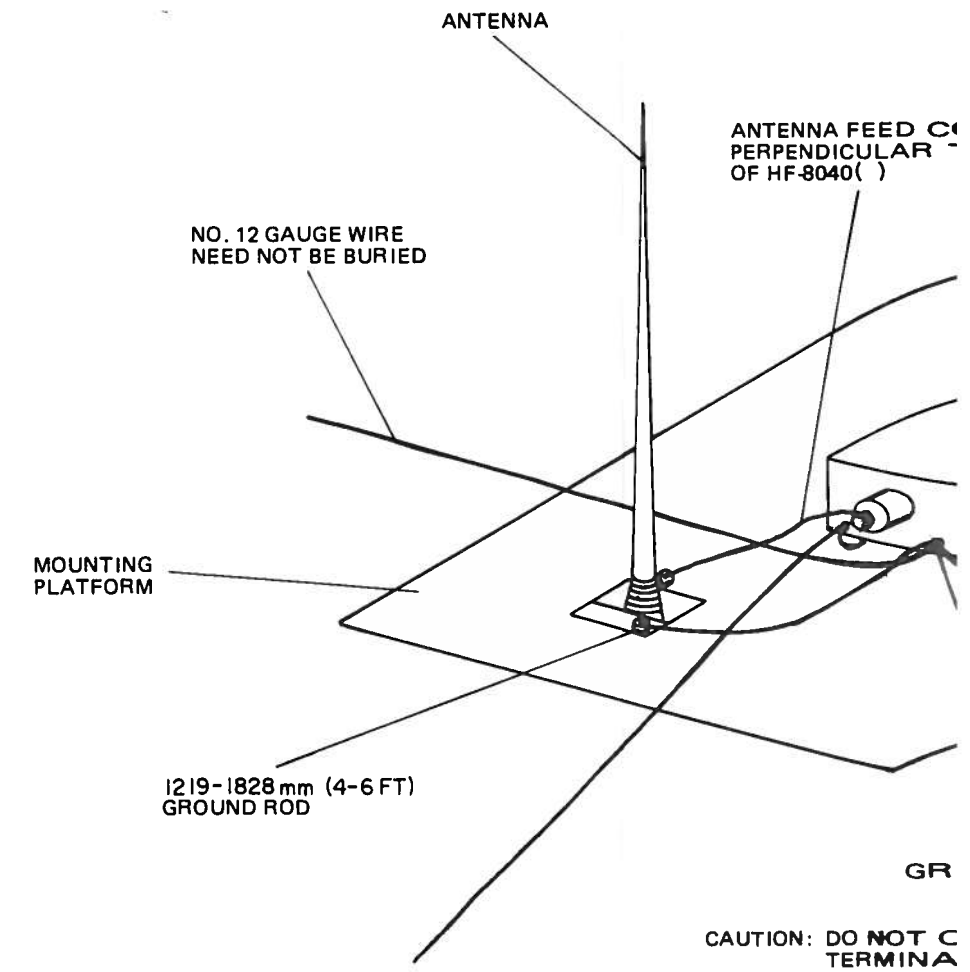


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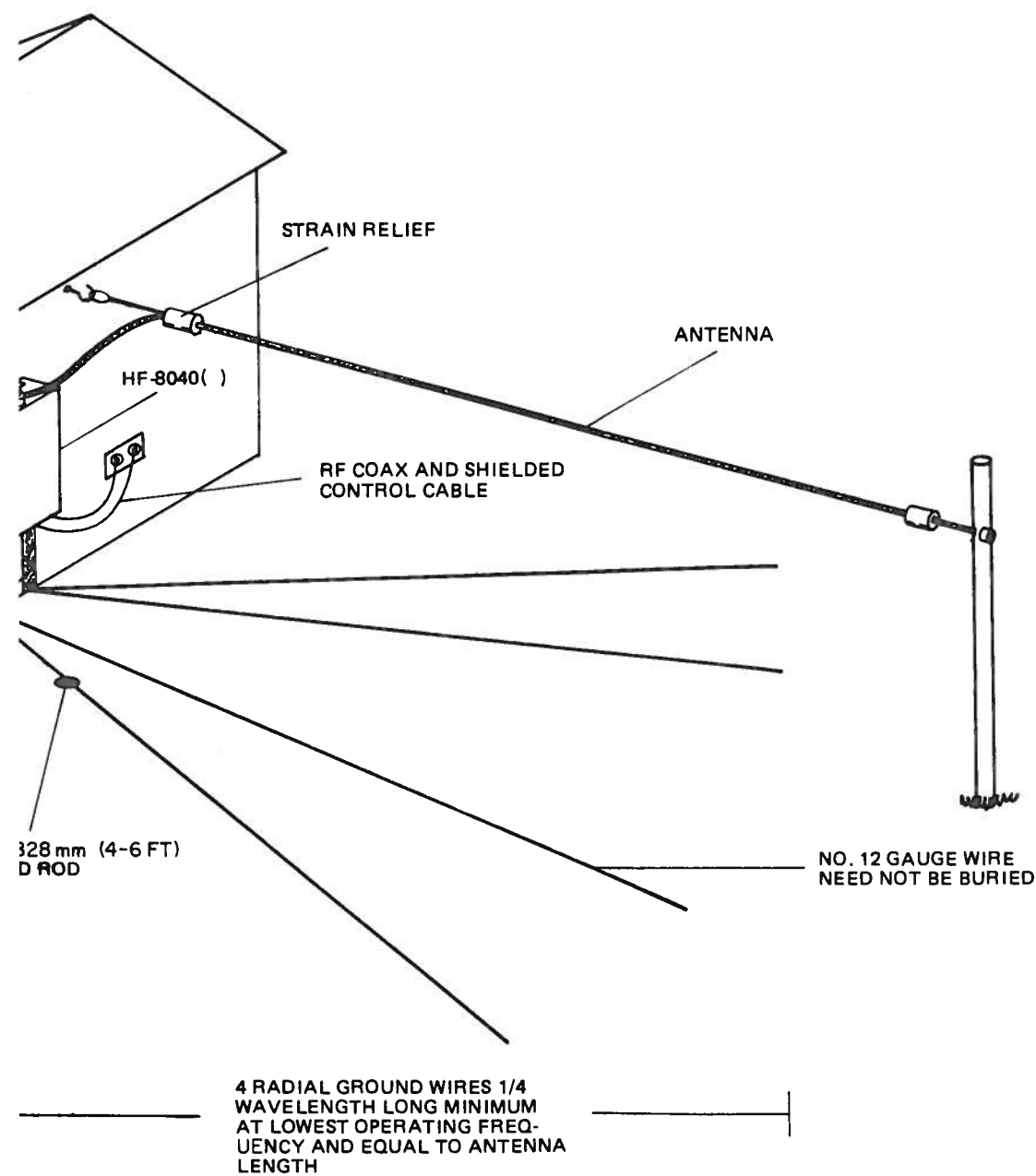
HF-8040M Antenna Coupler, Outline and Mounting Dimensions
Figure 3



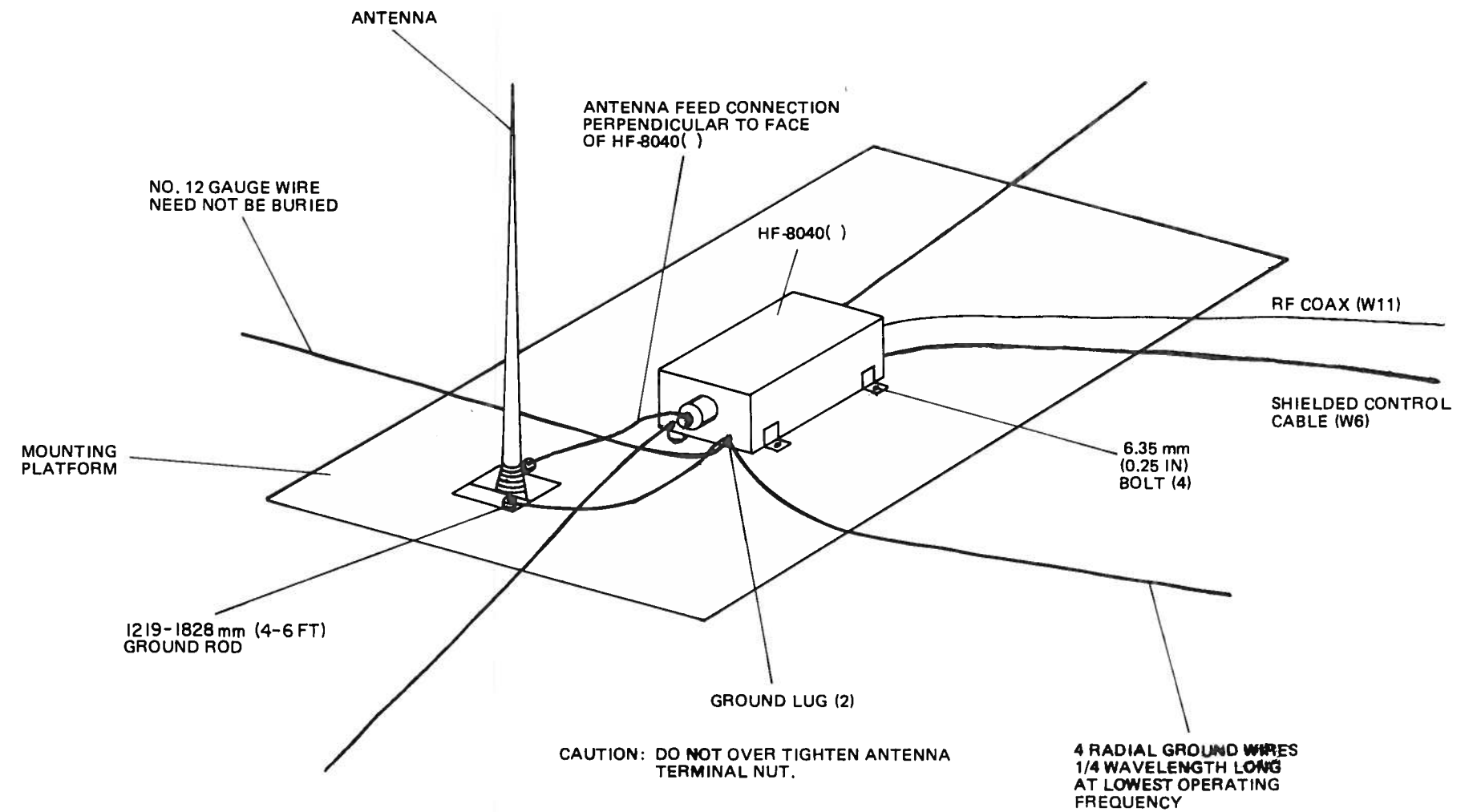
TYPICAL INSTALLATION WITH LONG-WIRE ANTENNA



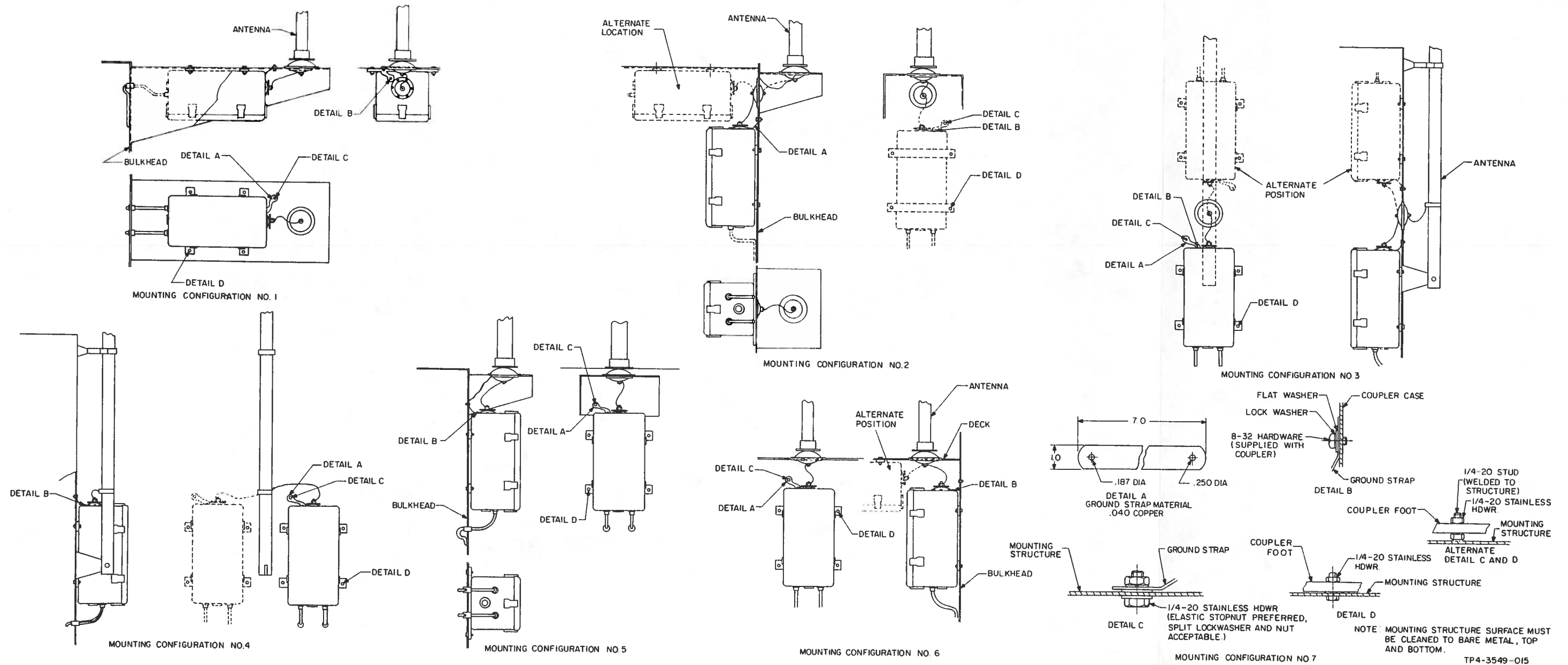
TYPICAL INSTALLATION WITH VERTICAL ANTENNA



TYPICAL INSTALLATION WITH LONG-WIRE ANTENNA



TYPICAL INSTALLATION WITH WHIP ANTENNA



Mounting Configuration Diagram
Figure 5



Rockwell
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HF-8040() Antenna Coupler

theory

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1. GENERAL

The functional theory of operation of the HF-8040() Antenna Coupler is presented in this section. An overall unit block diagram (figure 1) is used to show the interconnections of the subassemblies and to briefly explain the interaction of the subassemblies. A control and signal flow block diagram (figure 2) is used to show rf signal flow through the antenna coupler and the effect of control signals applied from an associated power amplifier. A power distribution diagram (figure 7) is used to show the production and distribution of ac and dc operating voltages.

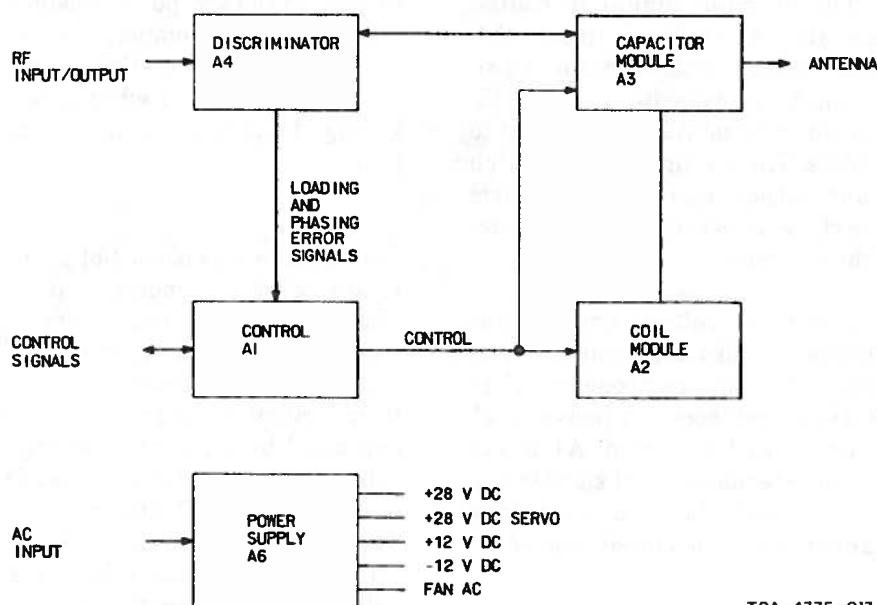
The block diagram theory of individual subassemblies is presented in the applicable module section of this instruction book.

2. FUNCTIONAL THEORY

In the following discussion, refer to the referenced block diagrams and to the diagrams section of this instruction book.

2.1 Overall Functional Theory

Refer to figure 1. The primary purpose of the antenna coupler is to provide the automatic impedance matching of various antennas to provide a 50-ohm load to the associated power amplifier. When these impedances are matched, the voltage standing-wave ratio (vswr) is 1.3:1 maximum or 1.1:1 typical. The operating frequency range is 1.6 to 30 MHz.



Overall Unit, Block Diagram
Figure 1

The tuning network (capacitor module A3 and coil module A2) matches the input and output impedance. Rf power is applied to the tuning network through discriminator A4. The antenna is connected to capacitor module A3.

Discriminator A4 samples the rf signal and provides loading and phasing error signals to control A1. These signals represent the status of the impedance match.

Control A1 receives phasing and loading signals from discriminator A4 and control signals from an associated power amplifier. The signals are converted into logic levels that provide control to capacitor module A3 and coil module A2. These control signals cause variable capacitors C1 and C2 in capacitor module A3 and a variable inductor in coil module A2 to tune to the correct position for impedance matching.

Power supply A6 receives input ac voltage from an associated power amplifier and provides ac and dc operating voltages for the antenna coupler.

2.2 Control and Signal Flow Theory

Refer to figure 2. The rf input signal is routed through rf cable assembly A8 to discriminator A4. The signal is coupled through discriminator A4 to series capacitors C1 and C2 in capacitor module A3. Shunt inductor L1 in coil module A2 is connected to the junction of C1 and C2. The tuning network, which matches the input and output impedances, consists of C1, C2, and L1. The rf signal is coupled from capacitor module A3 to the antenna.

Discriminator A4 contains rf voltage and current sampling devices. These samples are combined and rectified to dc error signals that are proportional to the impedance tune status and incoming power level. These error signals are routed to control A1 where they are combined with external control signals and used to determine the overall status of the tuning network. In this manner, a simple closed-loop servo system is formed.

The forward and reflected power signals from discriminator A4 are used by control A1 to determine overall tune status. The loading (impedance and resistance) and phasing signals are converted in control A1 to logic levels that are used to tune inductor L1 and capacitor C1. A 75-ohm magnitude sensor is used to correctly position capacitor C2 in the event

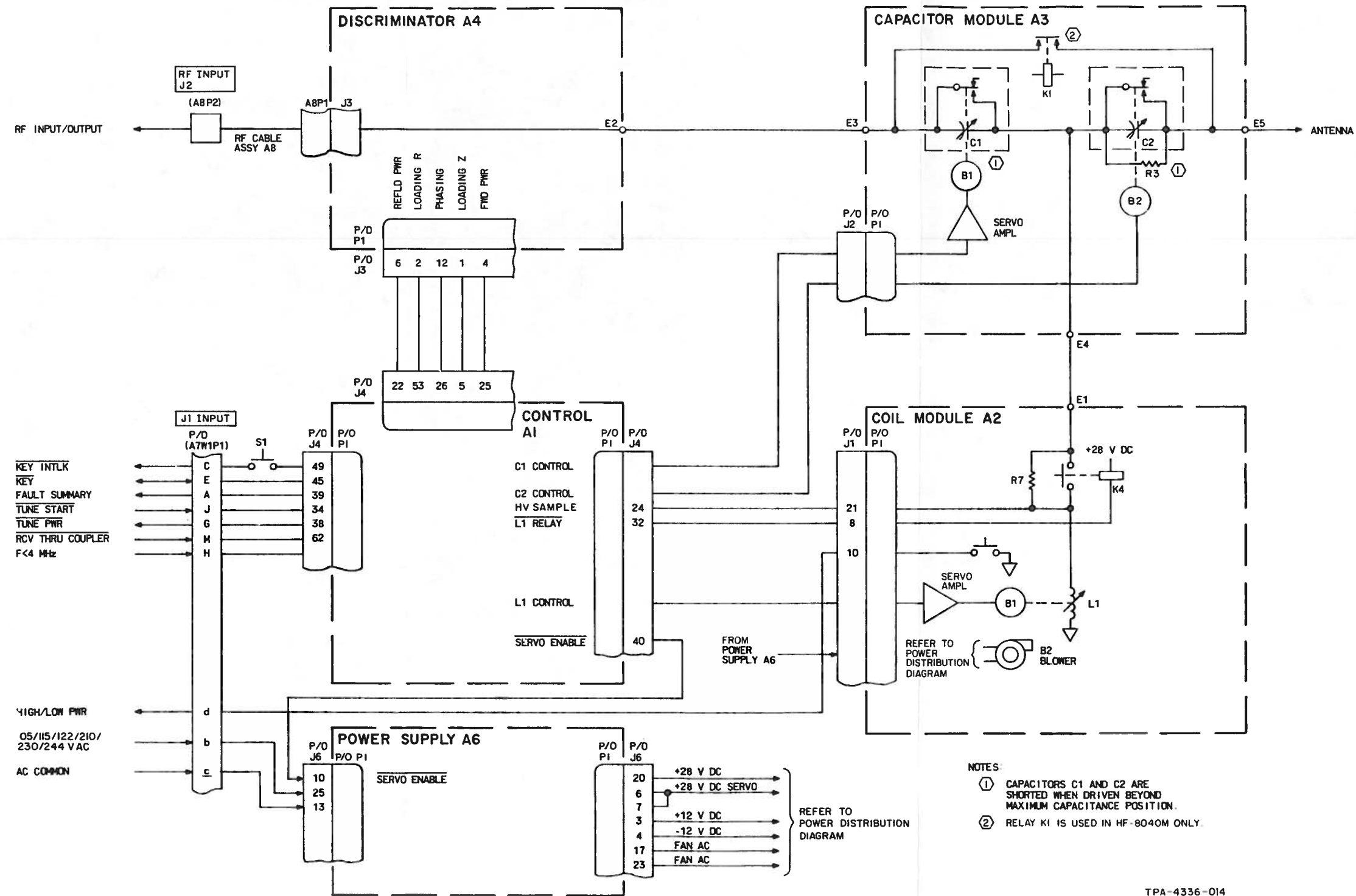
that the antenna impedance does not fall within the tune region of L1 and C1. The tuning network, consisting of L1 and C1, is capable of matching the impedance of most antennas.

Control A1 contains logic and interface circuits. The logic circuit consists of the tune scheme, protection circuits, and interlock circuits.

Several protective circuits are incorporated in the antenna coupler. If the antenna coupler fails to complete the HOME or TUNE step in approximately 6 seconds, a fault signal is generated. If the antenna voltage reaches a point where damage to the antenna coupler is possible, a fault signal is also generated. When a fault signal is generated, servo motor power is removed and the key interlock line is opened. Opening the key interlock line disables the associated power amplifier. The fault indication is routed to the associated power amplifier on the fault summary line for visual indication.

A temperature sensor is installed in coil module A2. When the temperature level reaches a point which may cause damage to the antenna coupler, a ground is applied to the associated power amplifier on the high/low power line. This causes the power amplifier to shift to the low power mode. It will remain in this mode until the temperature level drops to a safe operating level. Conditions such as high ambient temperatures, short whip antennas, and continuous keying of the power amplifier may cause this condition.

Coil module A2 consists of a servo-drive mechanism, relays, a blower motor, and a temperature sensor. The servo-drive mechanism consists of a servo amplifier, a dc motor, and variable inductor L1. The servo-drive mechanism is driven by control signals from control A1 as previously discussed. Relay K4 is energized by a logic 0 level signal from control A1. When energized, the contacts of relay K4 short static drain resistor R7 and place inductor L1 on line. Static drain resistor R7 provides a dc path to ground for the antenna when relay K4 is deenergized. A high voltage sample from the antenna is routed to control A1. If this voltage is excessive, a fault signal is generated. The temperature sensor is energized when the temperature is excessive. This logic 0 level signal is routed to the associated power amplifier. The power-amplifier output power is reduced until the temperature drops to a normal level. A blower motor provides internal cooling for the antenna coupler.



TPA-4336-014

Control and Signal Flow, Block Diagram
Figure 2

Capacitor module A3 consists of a servo-drive mechanism for capacitor C1, a transistorized drive system for capacitor C2, static drain resistor R3 and, in the HF-8040M only, a receive relay. The capacitor drive systems receive drive signals from control A1 as previously discussed. When driven beyond the maximum capacitance positions, both capacitors short. During receive mode in the HF-8040M, relay K1 is energized to bypass capacitors C1 and C2. Static drain resistor R3 is part of a voltage divider that provides a dc path to ground for the antenna.

Refer to table 1 for a definition of control interconnect requirements between antenna coupler and an associated power amplifier.

2.3 Tune Process

Refer to figure 3. The tune process consists of six basic steps: HOME, RECEIVE/STANDBY, TUNE A, TUNE B, TUNE C, and OPERATE. The process consists of two tuning operations: homing and tuning. The homing operation consists of setting the rf impedance matching elements to maximum capacitance and minimum inductance, and then placing them off line so that the discriminator is able to sample currents and voltages in the antenna circuit. The tuning operation begins with the start of TUNE A.

- a. HOME - The tune sequence counter is reset to the home step when:

1. Tune start is received from power amplifier, or
2. Primary power loss detector detects power applied to antenna coupler.

Capacitors C1 and C2 are driven to the maximum capacitance position and are then shorted out. Inductor (coil) L1 is driven to the minimum inductance position and is then placed off line. When homing is complete, the homing logic provides an advance command signal to the advance summary circuit. After a 100-millisecond delay, the tune sequence counter advances to the receive/standby step. Must be accomplished in 6 seconds or a fault indication is present.

- b. RECEIVE/STANDBY - The receive/standby step is the steady state or at rest position of the tuning process. The rf elements of the impedance matching network are bypassed. When a key signal is received and forward power is detected (tune power present) by the digital error sensor, an advance command signal is applied to the advance summary circuit. After a 100-millisecond delay, the tune sequence counter advances to the tune A step.

- c. TUNE A - During the tune A step, the rf impedance matching network is tuned to present an impedance of greater than 75 ohms with a capacitive phase angle as illustrated in figure 4.

The tune A step logic receives forward power, phase (ϕ), and impedance (Z) logic signals from the digital logic sensors. When the phase (ϕ) signal is positive or the impedance (Z) signal is negative, the short is removed from capacitor C2, and C2 is driven toward minimum capacitance. When the phase (ϕ) signal is negative (capacitive) and the impedance signal is greater than 75 ohms, an advance command signal is routed from the tune A step logic to the advance summary circuit. After a 100-millisecond delay, the tune sequence counter advances to tune B step.

- d. TUNE B - During the tune B step (coarse tune), the rf impedance matching network is tuned to present a resistance of 50 ohms or greater with a capacitive phase angle as illustrated in figure 5.

The tune B logic receives forward power, phase (ϕ), and resistance (R) logic signals from the digital error signals. The short is removed from capacitor C1 and the coil L1 is placed on line. When the phase signal is positive (inductive), capacitor C1 is driven toward minimum capacitance. When the phase signal is negative and resistance is negative (less than 50 ohms), coil L1 is driven toward maximum inductance. When the phase signal is negative and resistance signal is positive (50 ohms or greater), an advance command signal is routed from tune B step logic to the advance summary circuit. After a 100-millisecond delay, the tune sequence counter advances to the tune C step.

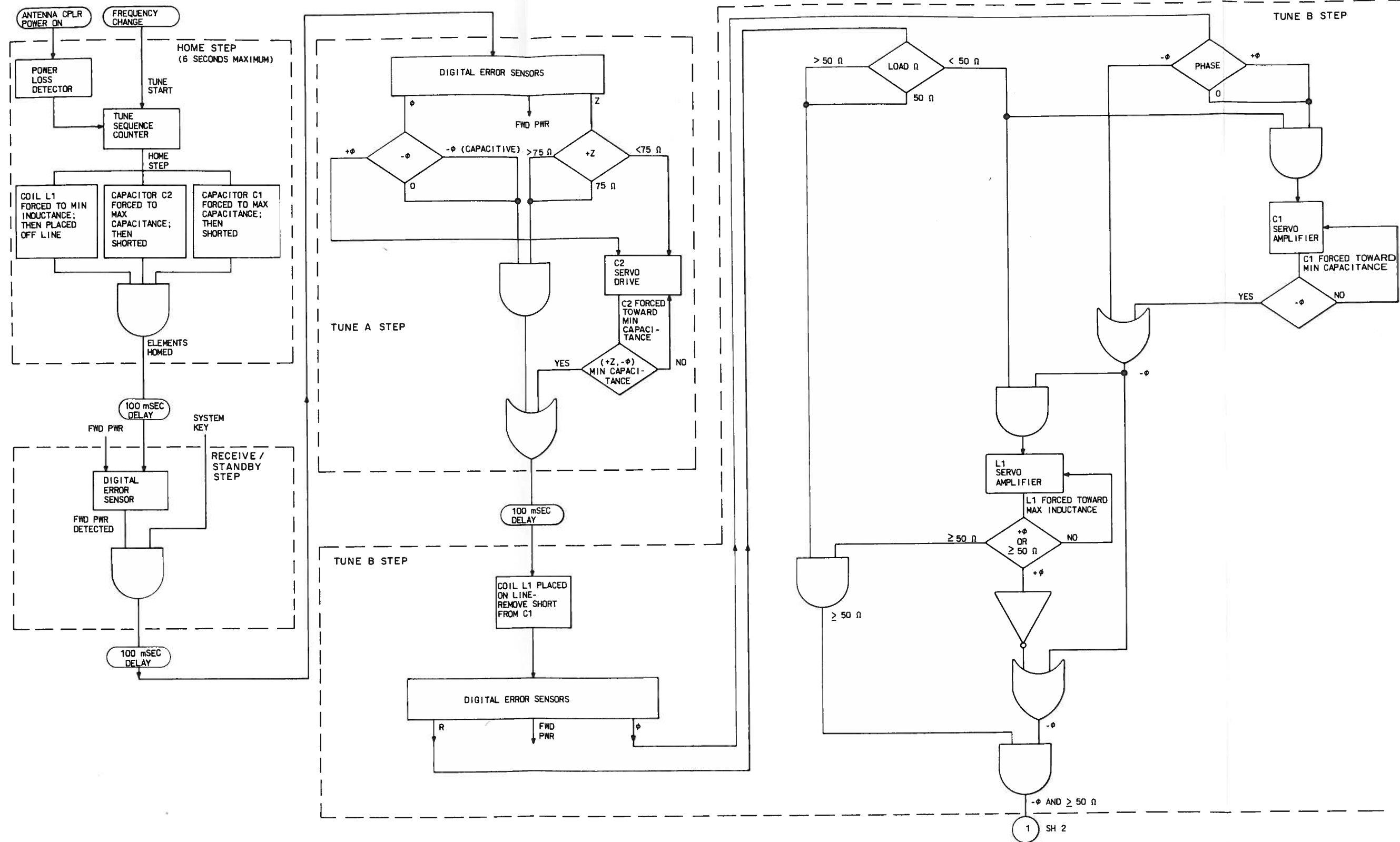
- e. TUNE C - The tune C step (fine tune) consists of two operations: tune C1 step and tune C2 step. The tune C1 step corrects for possible overshoot of coil L1 during tune B step. The tune C2 step tunes the rf impedance matching network to present a resistive component of 50 ohms with a phase angle of 0 degrees as illustrated in figure 6.

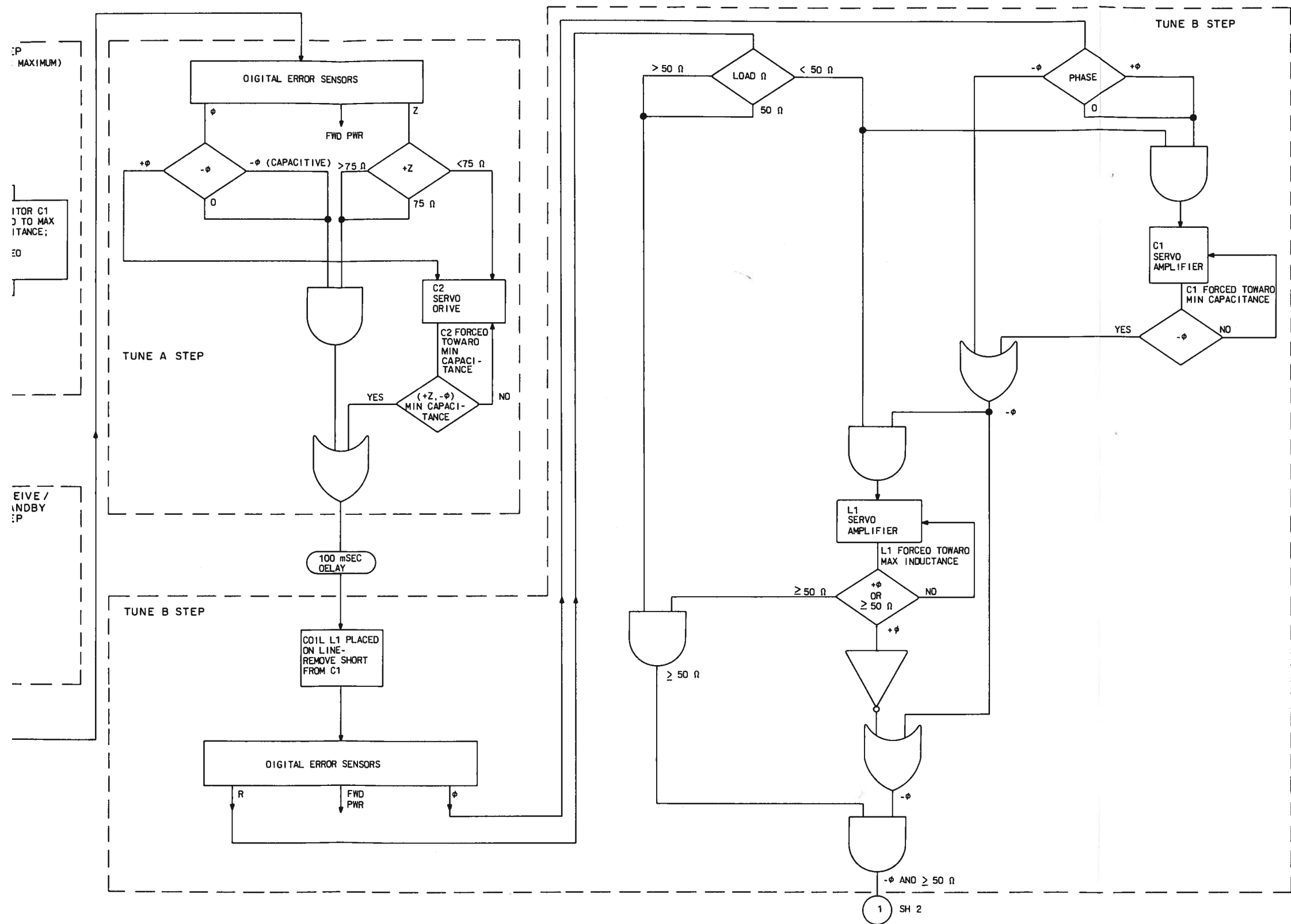
The tune C1 step logic receives forward power and impedance (Z) logic signals from the digital error sensors. When the impedance is positive (greater than 75 ohms), coil L1 is driven toward minimum until the impedance detected is negative. When this occurs, the logic advances to tune C2 step.

The tune C2 step logic receives phase (ϕ), resistance (R), forward power, and vswr signals from the digital error sensors. There are three comparisons/operations possible in tune C2 step.

Table 1. HF-8040() Control Interconnect Requirements.

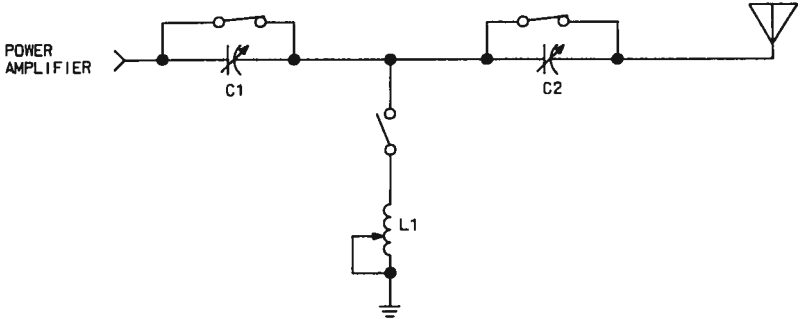
CONNECTOR	FUNCTION	DEFINITION
A	FAULT SUMMARY	The antenna coupler sends a logic 1 on this line when tune time exceeds 6 seconds or when excessive voltage is present at the antenna terminal.
C	KEY INTERLOCK	The antenna coupler sends a logic 0 on this line when ready to accept rf power from the power amplifier. This line is normally logic 1 and is latched at logic 1 when the antenna coupler is in the fault mode. This line will be at logic 0 approximately 100 milliseconds after the key line is at logic 0, to allow for the operation of the receive/transmit relays.
E	KEY LINE	The antenna coupler receives a logic 0 on this line to initiate a tune cycle. Once a tune cycle has started, the antenna coupler will latch the key line at logic 0 until the tune cycle is complete or a fault condition is detected.
G	TUNE POWER	The antenna coupler sends a logic 0 on this line to indicate it is not tuned. Rf power transmitted to the antenna coupler when this line is logic 0 must be a CW signal from 100 to 200 watts.
H	FREQ LESS THAN 4 MHZ	Not required for antenna coupler operation.
J	TUNE START	The antenna coupler receives a logic 0 pulse (50 to 200 milliseconds duration) each time the transmit frequency is changed. After a tune start pulse is received, the antenna coupler disables the key interlock and automatically positions the tuning elements to the home position.
M	RTC (RECEIVE THROUGH COUPLER)	The antenna coupler receives a logic 0 on this line to disable the receive/transmit relays. When this occurs, the rf tuning network remains in the transmit mode to allow reception through the tuned rf network.
T	GROUND	Common dc ground.
W	SHIELD GROUND	Shield ground for control cable.
<u>b</u>	INPUT AC	The antenna coupler requires 105/210-, 115/230-, or 122/244-V ac, single-phase, 47- to 63-Hz, or 380- to 420-Hz, 200-VA maximum input power. Internal strapping options are available for voltage used.
<u>c</u>	INPUT AC COMMON	Common ac ground.
<u>d</u>	HIGH/LOW POWER	The antenna coupler sends a logic 0 signal in this line when internal temperature is excessive. A logic 0 on this line causes the associated power amplifier to reduce rf output power until the temperature drops to a safe operating level.





NOTES:

1. RF ELEMENTS OF IMPEDANCE MATCHING NETWORK:

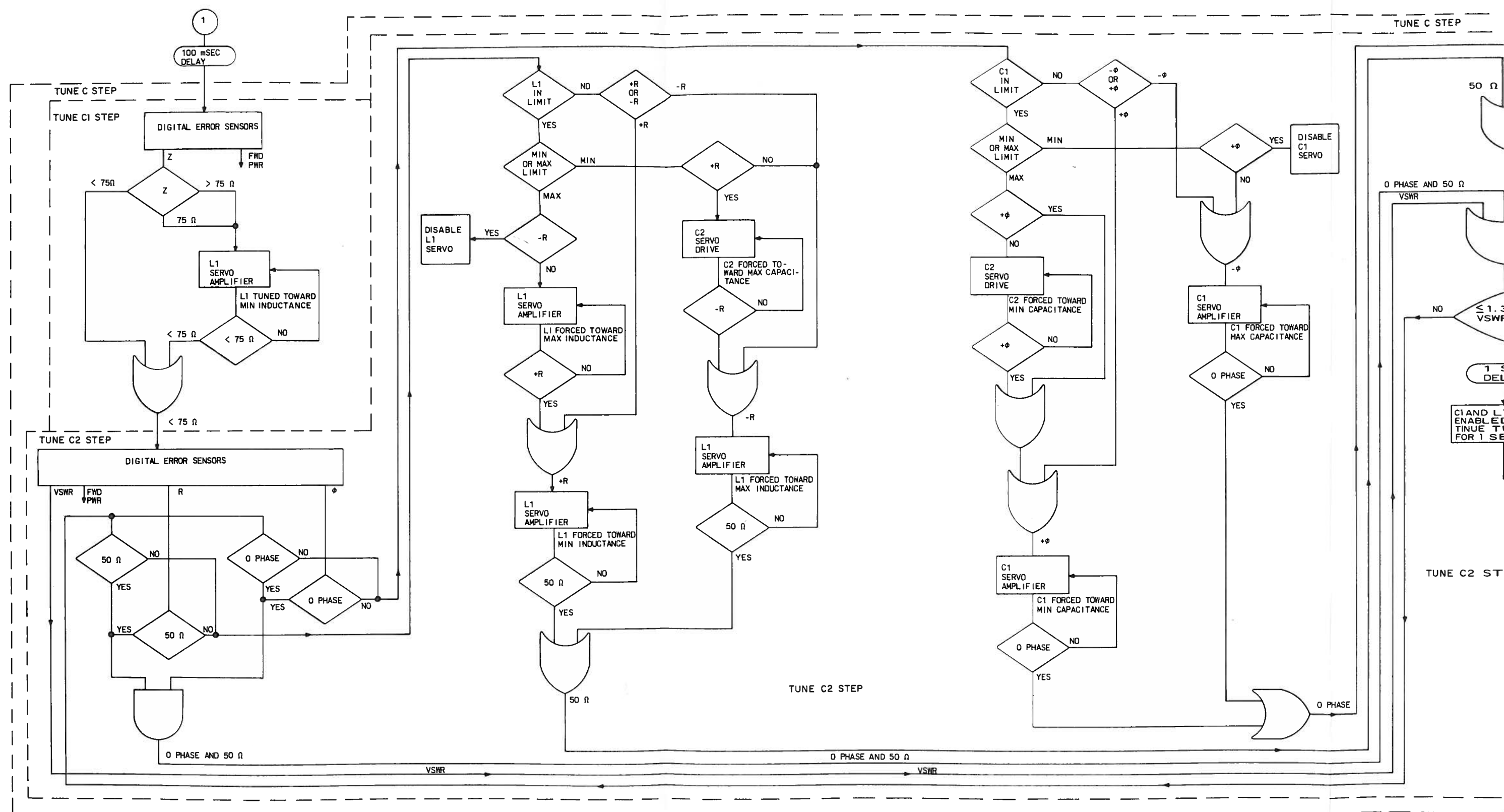


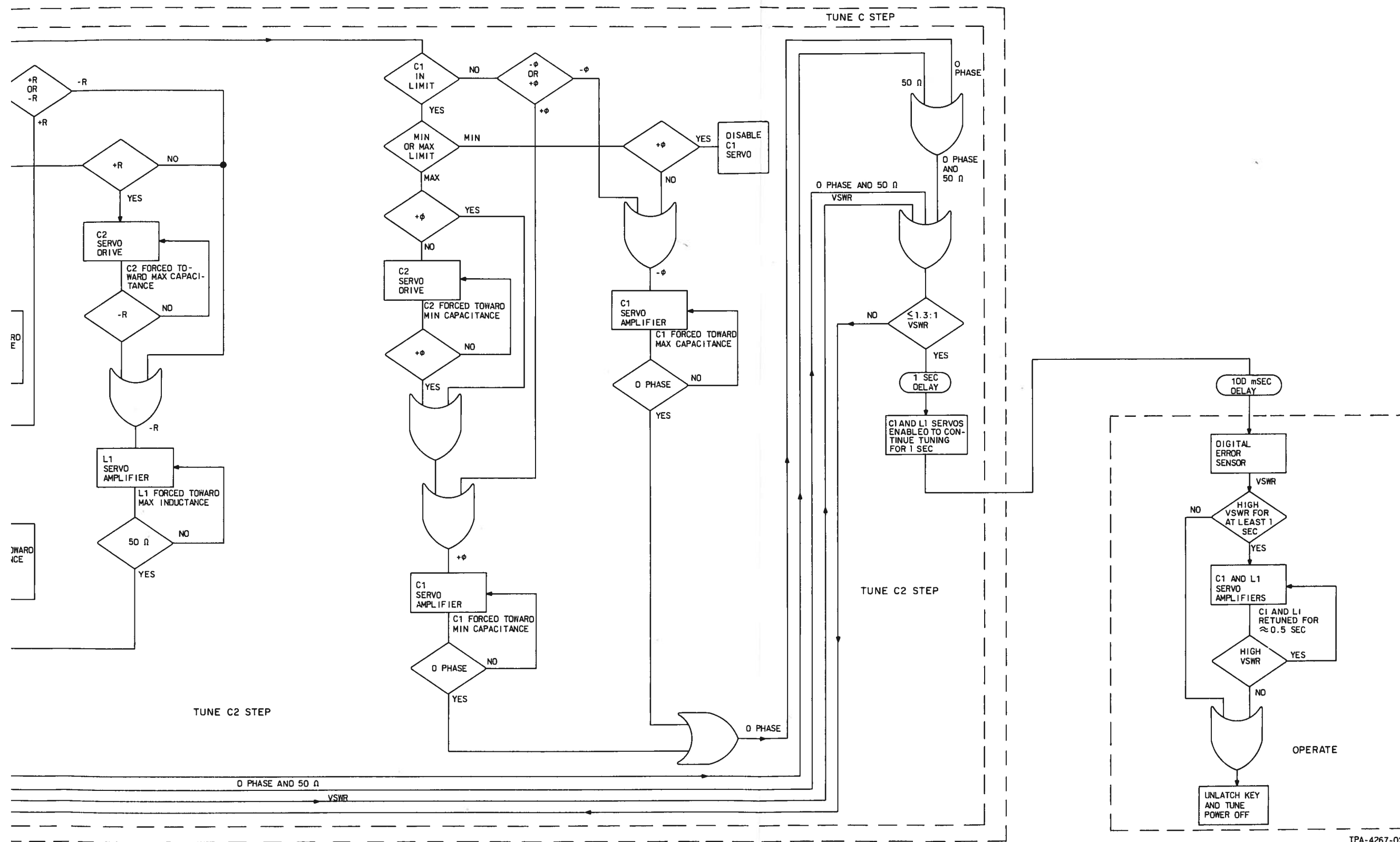
2. DEFINITIONS OF TERMS:

- +Z IMPLIES GREATER THAN 75 OHMS INPUT IMPEDANCE
- Z IMPLIES LESS THAN 75 OHMS INPUT IMPEDANCE
- +R IMPLIES GREATER THAN 50 OHMS INPUT IMPEDANCE
- R IMPLIES LESS THAN 50 OHMS INPUT IMPEDANCE
- $+\phi$ IMPLIES AN INDUCTIVE INPUT IMPEDANCE
- $-\phi$ IMPLIES A CAPACITIVE INPUT IMPEDANCE

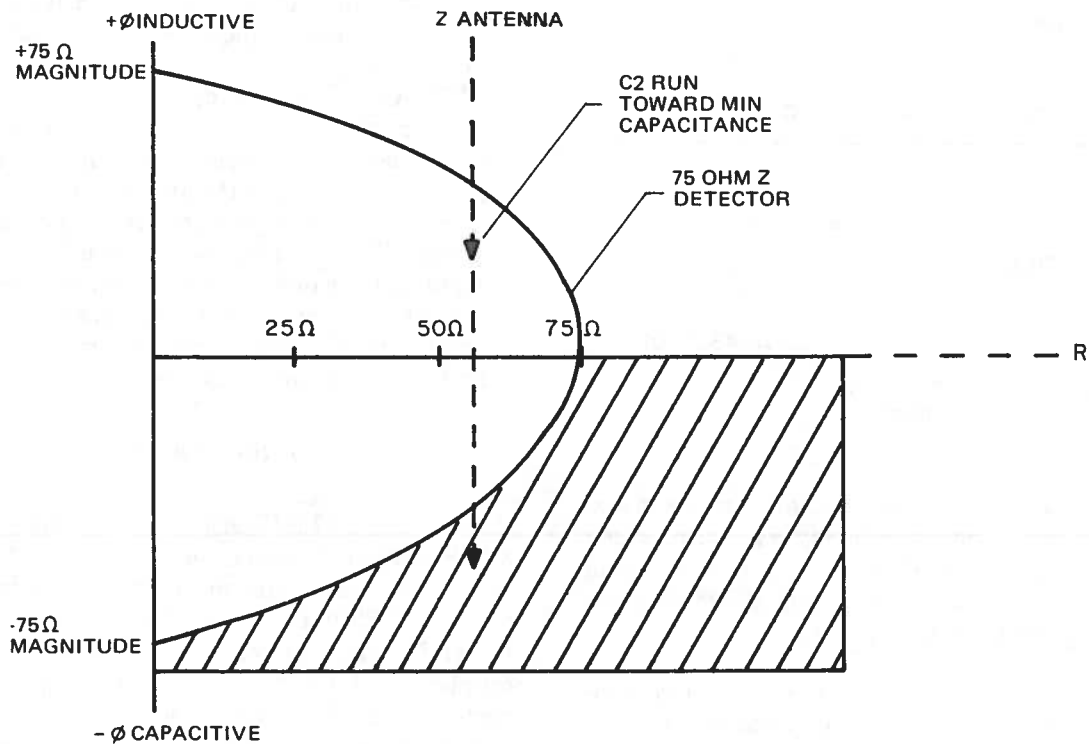
Tune Sequence
Figure 3 (Sheet 1 of 2)

TPA-4267-025



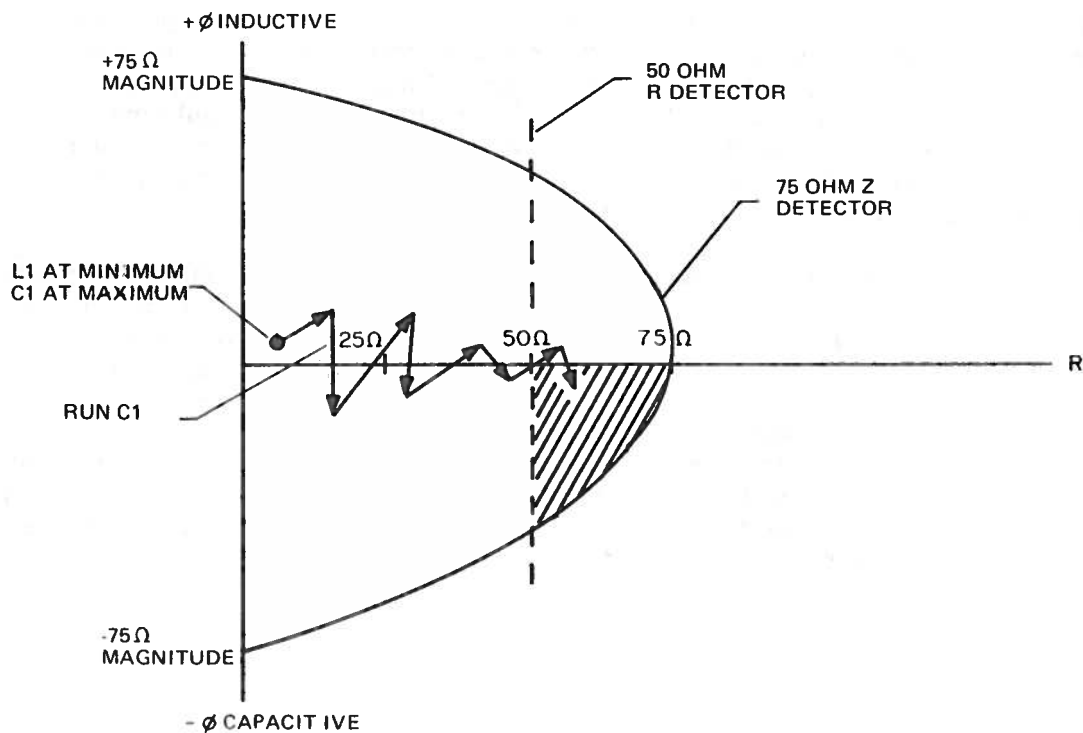


Tune Sequence
Figure 3 (Sheet 2)



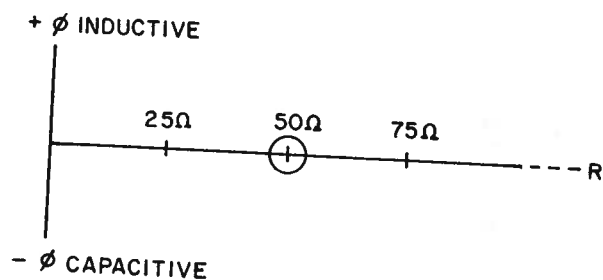
TPA-4299-011

Tune A Step
Figure 4



TPA-4300-011

Tune B Step
Figure 5



TPA-4301-011

Tune C Step
Figure 6

If the vswr detected from the digital error sensors is 1.3:1 or less, a one-second delay is enabled, which allows capacitor C1 and coil L1 to continue tuning for one second, after which the tune sequence counter advances to the operate step.

If the vswr is not 1.3:1 or less, the resistive component and phase angle of the rf impedance matching network are detected.

If the phase angle is not 0 degrees, a comparison is made to detect if capacitor C1 is in the limits. If it is not in the limits, comparisons are made which result in driving capacitor C1 to obtain the 0-degree phase angle. If capacitor C1 is in its maximum limit and the phase angle detected was negative, C1 is disabled and capacitor C2 is driven to obtain a positive phase angle. At this time, capacitor C1 is again driven to obtain the desired 0-degree phase angle. Driving capacitors C1 and/or C2 to obtain the desired detected phase angle changes the resistive (R) component detected. The changing resistive component causes the coil L1 to compensate. The moving of coil L1, in turn, changes the phase angle detected.

When the phase angle and resistive component satisfy the 1.3:1 or less vswr criteria, the one-second delay is enabled. C1 and L1 continue tuning until the one-second delay has expired, at which time an advanced command signal is routed to the

advance summary circuit. After a 100-millisecond delay, the tune sequence counter advances to the operate step.

- f. **OPERATE** - In the operate step, the antenna coupler is tuned to the desired rf input and the impedance is matched between the associated power amplifier and the antenna. The operate logic receives a vswr logic signal from the digital error sensor. When a high vswr signal is detected and sustained for one second, the servo amplifiers for capacitor C1 and coil L1 are enabled. The servo amplifiers will servo tune the components for one-half second to lower the vswr.

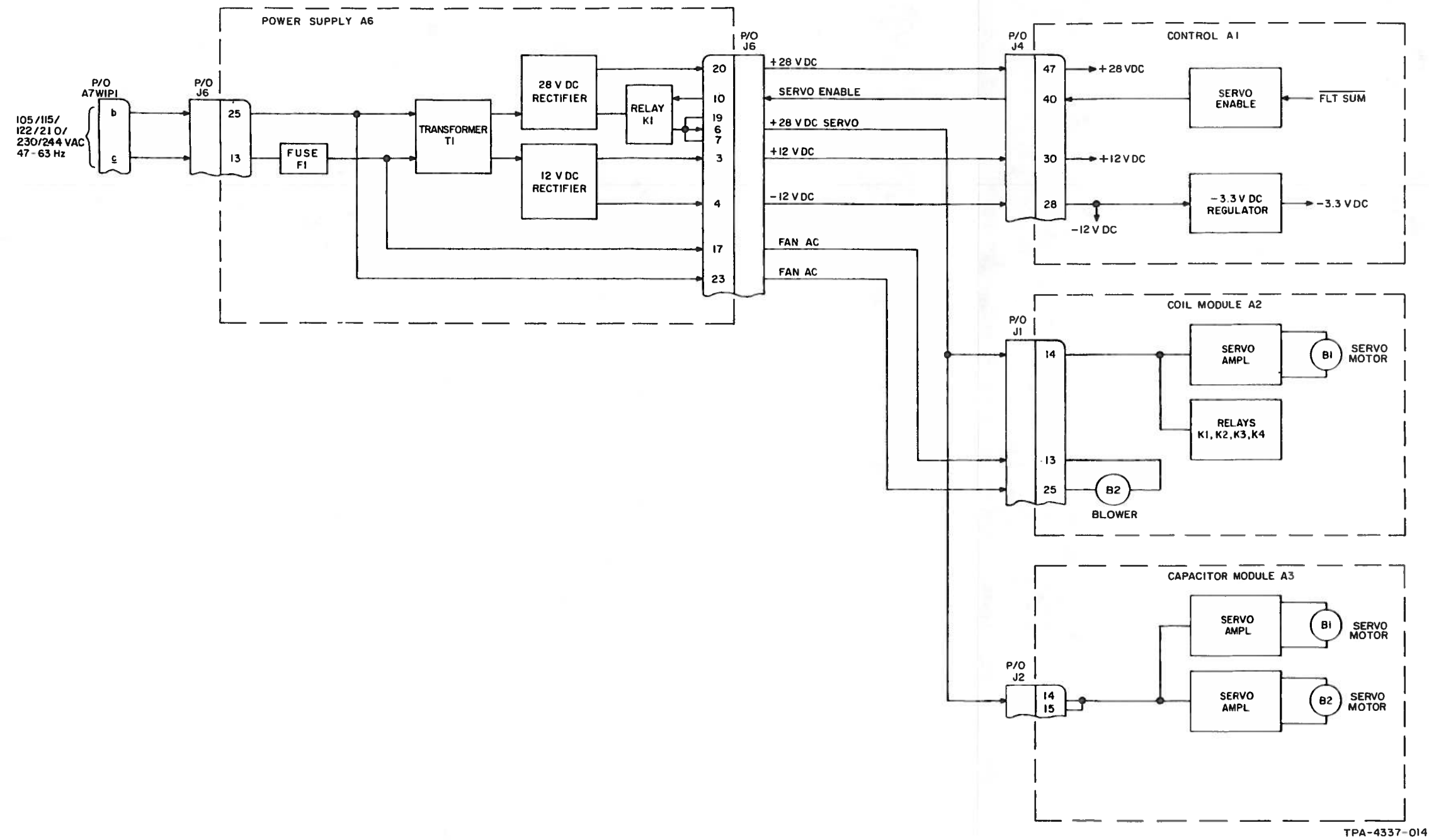
2.4 Power Distribution Theory

Refer to figure 7 (HF-8040 and HF-8040M) or figure 8 (HF-8040A). Input power of 105/210, 115/220/230, or 122/244 V ac, single phase, 200 VA maximum, 47 to 63 Hz (HF-8040, HF-8040A, HF-8040M) or 380 to 420 Hz (HF-8040A only) is applied to the antenna coupler at J1 (A7W1P1). This input power is connected to power supply A6. Fuse F1 provides protection in the event of a current overload. A terminal board provides strapping options depending on the input voltage used. The input voltage is applied from the terminal board to the input of transformer T1.

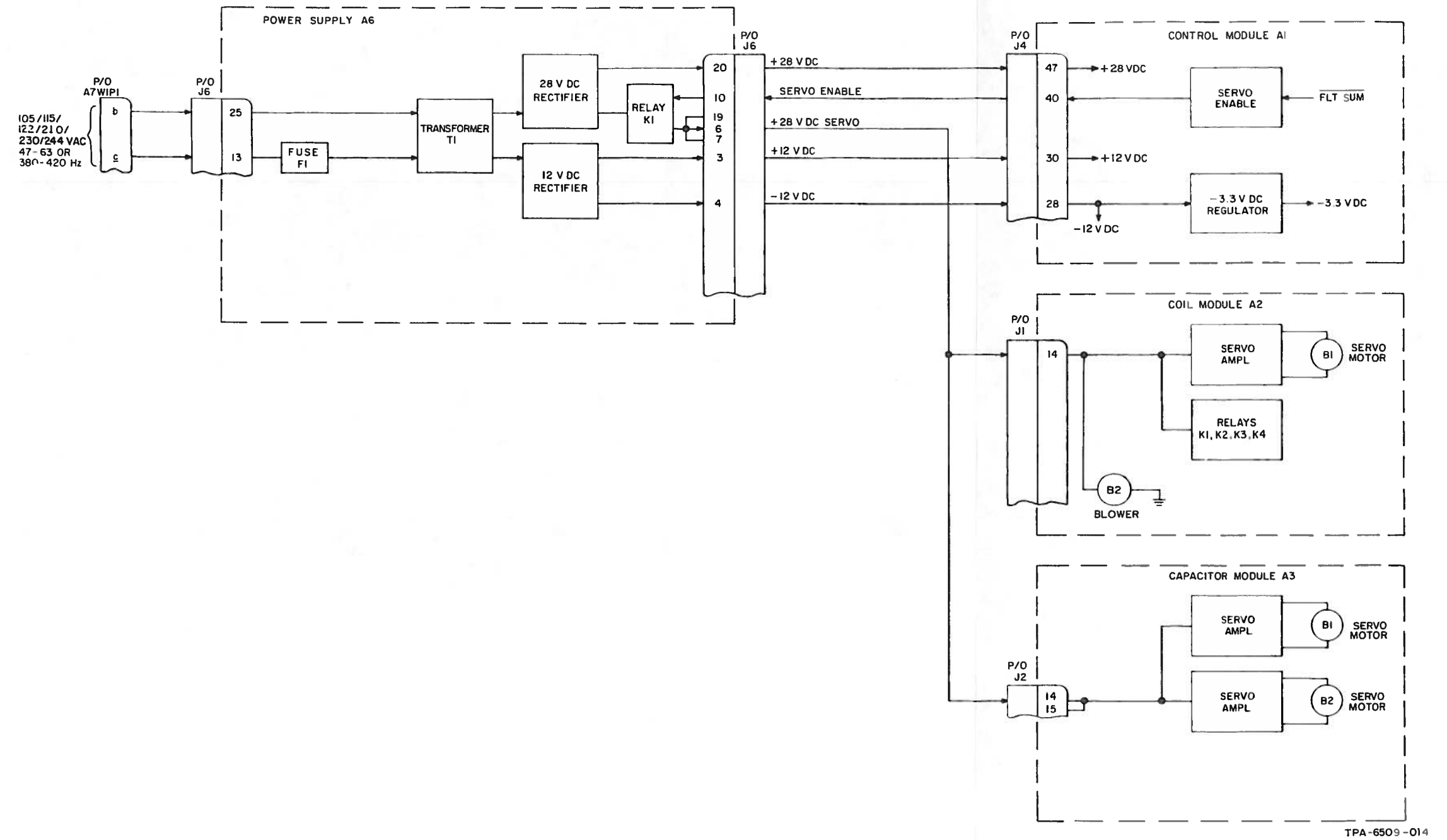
The 28-V dc rectifier in power supply A6 is a full-wave rectifier which supplies 28-V dc operating voltage to relay K1 and to control A1. Relay K1 is energized when a fault occurs. This fault summary signal is provided by control A1. When energized, relay K1 provides 28-V dc servo power to capacitor module A3 and coil module A2.

The 12-V dc rectifier in power supply A6 is a full-wave bridge rectifier which supplies -12- and +12-V dc operating voltages for control A1. A -3.3-V dc regulator in control A1 uses the -12-V dc input to provide -3.3-V dc operating voltage for internal use.

The ac voltage for the blower motor in coil module A2 is routed from the primary of T1 in power supply A6. The blower motor provides internal cooling for the antenna coupler.



HF-8040 and HF-8040M Antenna Coupler,
Power Distribution Diagram
Figure 7



HF-8040A Antenna Coupler, Power
Distribution Diagram
Figure 8



Rockwell
International

HF-8040() Antenna Coupler

parts list

Collins Defense Communications

Printed in USA

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4th Edition, 1 June 1983

list of illustrations

Figure

	Page
1 HF-8040() Antenna Coupler.....	4
2 Chassis A7.....	7
3 Case A9.....	11
4 Case A9.....	13

NOTICE: This section replaces third edition dated 1 January 1982.

List of Effective Pages

*Zero in this column indicates an original page.

Page No

*Change No

Title.....0
List of Effective Pages.....0
1 thru 18.....0

Record of Changes

CHG NO	CHANGE DATE	CHG NO	CHANGE DATE	CHG NO	CHANGE DATE	CHG NO	CHANGE DATE
1st Ed	1 Jun 77						
2nd Ed	1 Feb 78						
3rd Ed	1 Jan 82						
4th Ed	1 Jun 83						

parts list

1. INTRODUCTION

1.1 General

The purpose of this parts list, prepared by Collins Defense Communications, Rockwell International, is for identification and requisition of parts.

Parts listed meet critical equipment design specification requirements. Use only part numbers specified in this parts list for replacement of parts.

1.2 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.

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.

1.3 Numerical Index

PART NUMBER Column — Part numbers are listed in alphanumeric sequence.

FIG-ITEM Column — Digits preceding the dash refer to figure numbers. Digits following the dash are item numbers.

TTL REQ Column — Listed is the total quantity of parts or assemblies covered in the Group Assembly Parts List.

1.4 Reference Designation Index

REFERENCE DESIGNATION Column — Reference designations are listed in alphanumeric sequence.

FIG-ITEM Column — Digits preceding the dash refer to figure numbers. Digits following the dash are item numbers.

PART NUMBER Column — Part numbers listed are for items that have reference designations assigned.

1.5 How To Use This Parts List

To locate a part number if the assembly in which the part is used is known, turn to the List of Illustrations and find the page number for the assembly in which the part is used. 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 part number is known, refer to the Numerical Index and find the part number. Turn to the Group Assembly Parts List and find the first figure and index number indicated in the Numerical Index for that part. If this figure shows the part in a section or system of the equipment other than the one desired, refer to the other figure numbers listed in the Numerical Index.

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.

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 supporting parts list illustrations that contain ESDS items are shown with the following symbol.



1.6 Manufacturer's Code, Name, and Address

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

02660	BUNKER RAMO CORP AMPHENOL NORTH AMERICA DIV 2801 S 25TH AVE BROADVIEW IL 60153
04865	NYLTITE CORP OF AMERICA 3451 S CLINTON AVE SOUTH PLAINFIELD NJ 07080
05284	GASKET ENGINEERING CO INC 3123 WYANDOTTE KANSAS CITY MO 64111
05411	DU PAGE MFG CO 2250 CURTISS AVE DOWNERS GROVE IL 60515
05574	VIKING CONNECTORS INC 21001 NORDHOFF ST CHATSWORTH CA 91311

MFR
CODE

MANUFACTURER'S NAME
AND ADDRESS

06383	PANDUIT CORP 17301 RIDGELAND TINLEY PARK IL 60477
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 CORPORATION DEFENSE ELECTRONICS OPERATIONS COLLINS DEFENSE COMMUNICATIONS DIV 350 COLLINS ROAD NE CEDAR RAPIDS IA 52498
51406	MURATA CORP OF AMERICA 1148 FRANKLIN RD S E MARIETTA GA 30067
55943	AMRAD CORP 349 BONHAM ST P O BOX 876 PARIS TX 75460
57227	PICS SCREW MACHINE INC 51 REAR CANAL ST SALEM MA 01970
70318	ALLMETAL SCREW PRODUCTS CO INC 821 STEWART AVE GARDEN CITY NY 11530
71468	ITT CANNON ELECTRIC DIV OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORP 10550 TALBERT AVE P O BOX 8040 FOUNTAIN VALLEY CA 92708
72606	GASKET MFG CO 18001 S MAIN ST GARDENA CA 90248
72962	ESNA DIV OF AMERACE CORP 2330 VAUXHALL ROAD UNION NJ 07083
75539	LAPP INSULATOR DIV INTERPACE CORP GILBERT ST LEROY NY 14482
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
77820	BENDIX CORP THE ELECTRICAL COMPONENTS DIV SHERMAN AVE SIDNEY NY 13838

MFR CODE	MANUFACTURER'S NAME 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
79963	ZIERICK MFG CO RADIO CIRCLE MT KISCO NY 10549
80205	NATIONAL AEROSPACE STANDARD
81349	MILITARY SPECIFICATIONS
82240	SIMMONS FASTENER CORP ALBANY NY
83330	SMITH HERMAN H INC 812 SNEDIKER AVE BROOKLYN NY 11207
91314	LEWIS SPRING AND MFG CO 2652 W NORTH AVE CHICAGO IL 60647
91663	ARMEL ELECTRONICS INC 1601 75TH STREET NORTH BERGEN NJ 07047
91836	KINGS ELECTRONICS CO INC 40 MARBLEDAL ROAD TUCKAHOE NY 10707
91929	HONEYWELL INC MICRO SWITCH DIV 11 W SPRING ST FREEPORT IL 61032
96906	MILITARY STANDARD
98021	KIDDE INC HALKEY-ROBERTS CORP DIV 11600 NINTH ST N ST PETERSBURG FL 33702

1.7 Usable on Codes

The following usable on codes have been assigned in this manual:

USABLE ON CODE	UNIT PART NUMBER	FIG- ITEM
A	622-3384-001	1-
B	622-3384-002	1-
C	622-3515-001	1-
D	622-3513-001	1-
E	622-3513-002	1-
F	637-4007-001	2-
G	635-4773-001	2-
H	637-4009-001	3-
J	637-4009-002	3-

1.8 Reference Designation Prefixes

The following prefixes have been assigned in this manual:

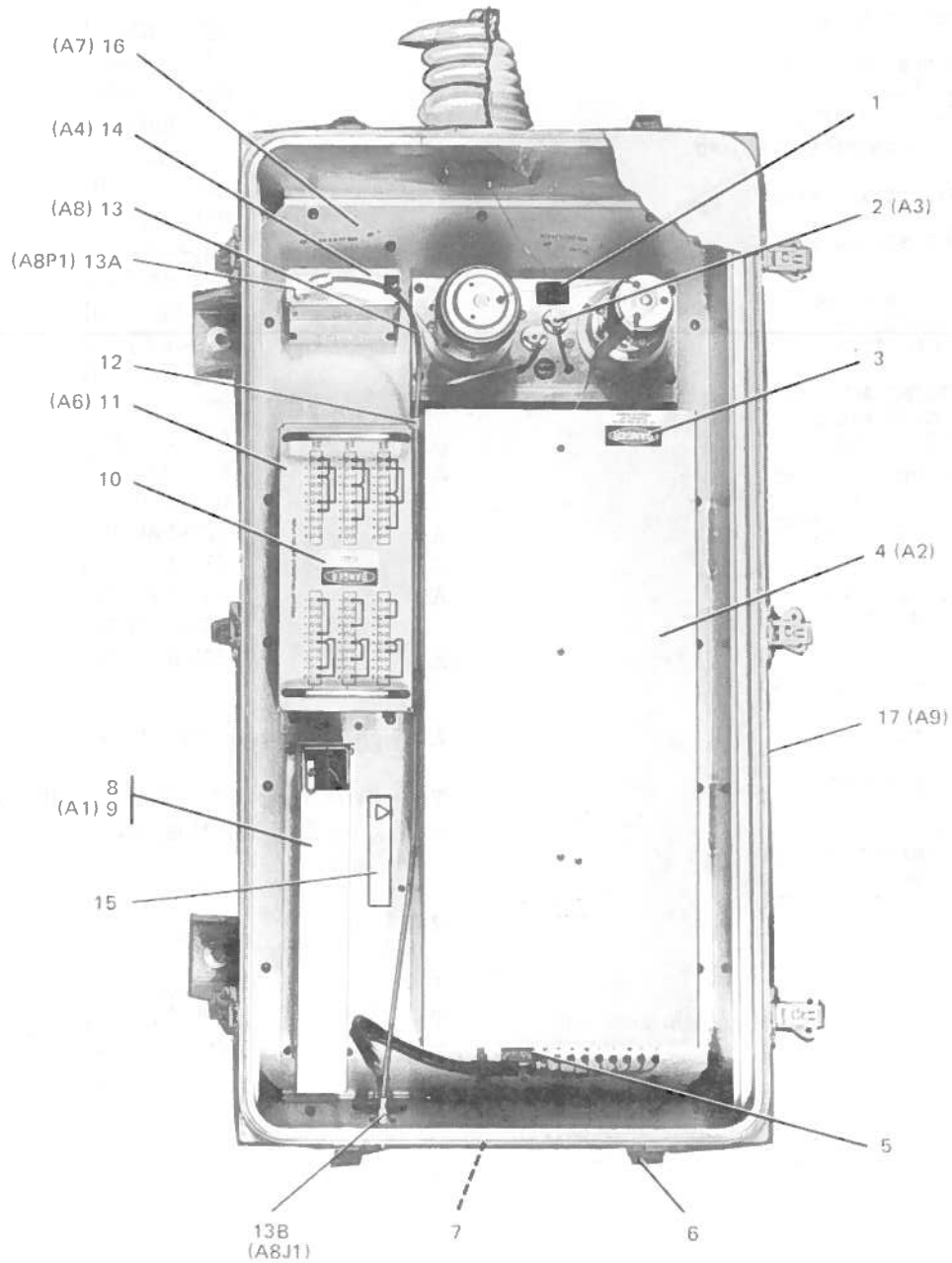
PREFIX	UNIT PART NUMBER	FIG- ITEM
A1	637-2665-001	1-9
A1	646-5781-001	1-9
A1	642-3278-001	1-9
A2	637-4005-001	1-4
A2	635-4720-001	1-4
A2	651-4523-001	1-4
A2	651-4240-001	1-4
A2	651-4524-001	1-4
A3	637-4002-001	1-2
A3	629-5655-001	1-2
A3	629-5655-003	1-2
A4	637-4003-001	1-14
A4	629-5642-001	1-14
A6	637-4006-001	1-11
A7	637-4007-001	2-
A7	635-4773-001	2-
A8	637-4008-001	1-13
A8	635-4797-002	1-13
A9	637-4009-002	3-
A9	637-4009-001	3-
A9	635-5179-002	4-

1.9 Configuration Identifiers

The following CI's/REV LTR's were used in compiling data for this manual:

CI/ REV LTR	UNIT PART NUMBER	FIG- ITEM
T	622-3384-001	1-
T	622-3384-002	1-
D	622-3515-001	1-
D	622-3513-001	1-
D	622-3513-002	1-
E	637-4007-001	2-
M	635-4773-001	2-
B	637-4009-001	3-
F	637-4009-002	3-
D	635-5179-002	4-

2. GROUP ASSEMBLY PARTS LIST



TP5-1341-017

**HF-8040() Antenna Coupler
Figure 1**

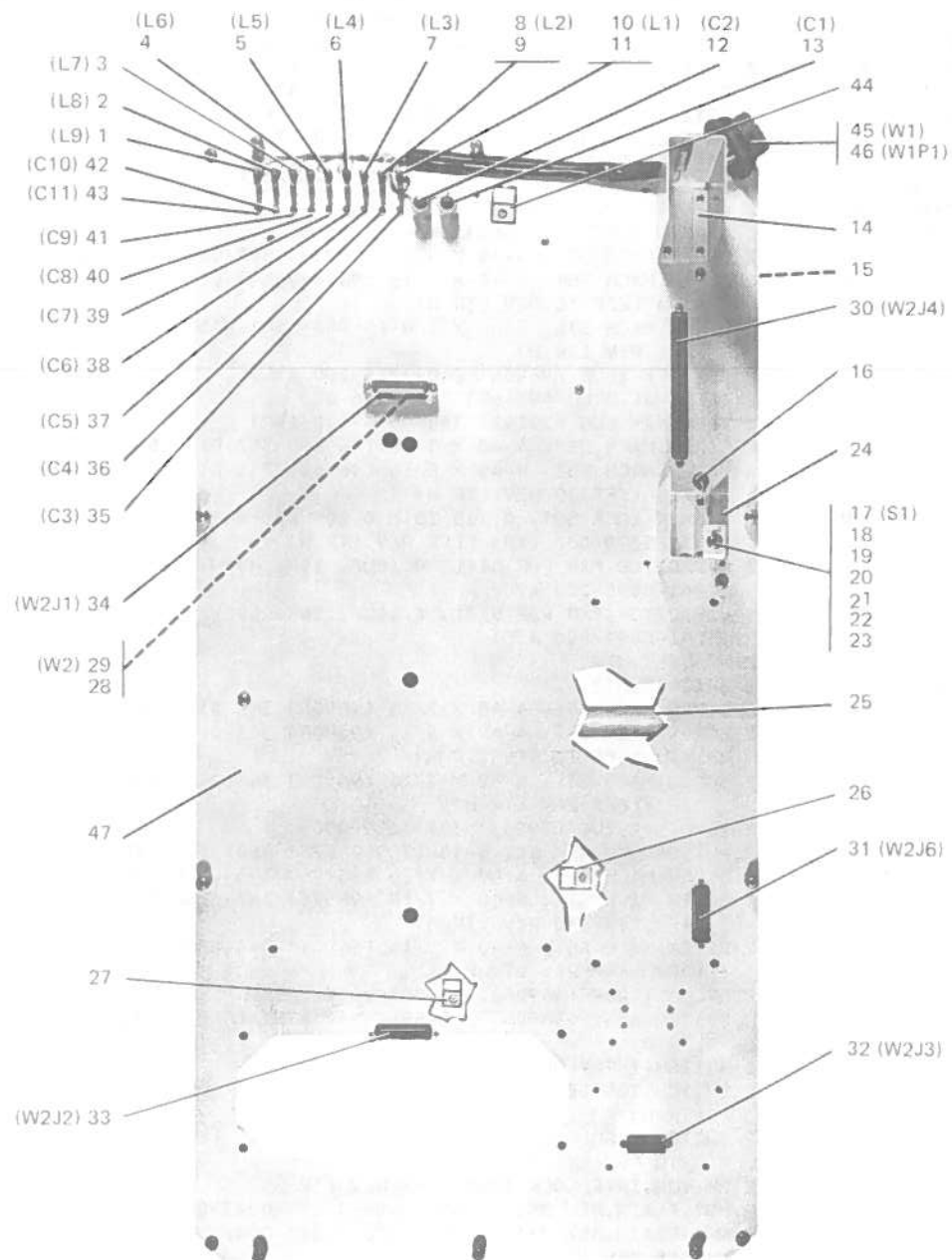
GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
1-	622-3384-001	1	ANTENNA COUPLER, HF-8040	1	A
	622-3384-002	1	ANTENNA COUPLER, HF-8040	1	B
	622-3515-001	1	ANTENNA COUPLER, HF-8040A	1	C
	622-3513-001	1	ANTENNA COUPLER, HF-8040M	1	D
	622-3513-002	1	ANTENNA COUPLER, HF-8040M	1	E
1	280-1368-360	2	LABEL,PRESSURE SENS (12998)	2	
2	637-4002-001	2	CAPACITOR MODULE (PART NUMBER OBSOLETE;REPLACE WITH 629-5655-003) A3	1	A
2	629-5655-003	2	CAPACITOR MODULE A3	1	A,B,C
2	629-5655-001	2	CAPACITOR MODULE A3	1	D,E
	4007-6HT	2	TERMINAL,LUG (77147) 304-0016-000 (AP) (EFF TO REV LTR J)	1	A
	NAS67C4	2	NUT,PLAIN,HEXAGON CD PL STL, 0.112-40 (80205) 313-0132-000 (AP) (EFF TO REV LTR J)	1	A
	MS35338-135	2	WASHER,LOCK SST, 0.115 ID X 0.209 OD (96906) 310-0279-000 (AP) (EFF TO REV LTR J)	1	A
	MS51957-13	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP)	1	A
	P343-0328-000	2	SCREW,MACH NP BRS, 6-32 X 1/4 (77250) 343-0328-000 (AP) (EFF REV LTR A)	1	C
	P343-0328-000	2	SCREW,MACH NP BRS, 6-32 X 1/4 (77250) 343-0328-000 (AP) (EFF REV LTR R)	1	A,B
	CD PL BRZ,0.141I DX0.239OD	2	WASHER,LOCK CD PL BRZ, 0.141 ID X 0.239 OD (79807) 310-0078-000 (AP) (EFF REV LTR A)	1	C
	CD PL BRZ,0.141I DX0.239OD	2	WASHER,LOCK CD PL BRZ, 0.141 ID X 0.239 OD (79807) 310-0078-000 (AP) (EFF REV LTR R)	1	A,B
3	280-1368-360	2	LABEL,PRESSURE SENS (12998)	1	
4	637-4005-001	2	COIL MODULE (PART NUMBER OBSOLETE;REPLACE WITH 635-4720-001) A2	1	A
4	635-4720-001	2	COIL MODULE A2	1	A,D
4	651-4523-001	2	COIL MODULE A2	1	B,E
4	651-4240-001	2	COIL MODULE A2 (EFF TO REV LTR D)	1	C
4	651-4524-001	2	COIL MODULE A2 (EFF REV LTR D)	1	C
5	280-1368-340	2	LABEL,PRESSURE SENS (12998)	1	
6	30AC	2	VALVE,PRESS RLF (98021) 013-1229-000	1	C,D,E
6	30AC	2	VALVE,PRESS RLF (98021) 013-1229-000 (EFF TO REV LTR R)	1	A,B
7	635-1907-000	2	PLATE,IDENT	1	A,B
7	642-0137-000	2	PLATE,IDENT	1	C
7	642-0075-000	2	PLATE,IDENT	1	D,E
8	637-4010-001	2	SHIELD,LOGIC BOARD	1	
	MS51957-32	2	SCREW,MACHINE CRES, 0.138-32 X 0.750IN (96906) 343-0174-000 (AP)	4	
	BRYLM COP, 0.155 DX0.125L	2	SLEEVE,SPRING (91314) 340-0641-000 (AP)	4	
9	637-2665-001	2	CONTROL MODULE (ESDS)(PART NUMBER OBSOLETE;REPLACE WITH A1 646-5781-001)	1	A
9	646-5781-001	2	CONTROL MODULE (ESDS) A1	1	A,B,C,E
9	642-3278-001	2	CONTROL MODULE (ESDS) A1 (EFF TO REV LTR B)	1	D
9	646-5781-001	2	CONTROL MODULE (ESDS) A1 (EFF REV LTR B)	1	D
10	280-1368-330	2	LABEL,PRESSURE SENS (12998)	1	
11	637-4006-001	2	POWER SUPPLY A6	1	
12	610-0003	2	CLAMP,LOOP (55943) 150-1540-000	1	
	NAS671C6	2	NUT,PLAIN,HEXAGON CRES, 0.138-32 (80205) 313-0045-000 (AP)	1	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	1	
	MS15795-805	2	WASHER,FLAT CRES, 0.164ID X 0.320 OD (96906) 310-0779-050 (AP) (EFF REV LTR K)	1	A
	MS15795-805	2	WASHER,FLAT CRES, 0.164ID X 0.320 OD (96906) 310-0779-050 (AP)	1	B,C,D,E
	MS51957-29	2	SCREW,MACHINE CRES, 0.138-32 X 0.437IN (96906) 343-0170-000 (AP)	1	
13	637-4008-001	2	CABLE ASSEMBLY,RF A8 (EFF TO REV LTR G)	1	A

GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
1-13	635-4797-002	2	CABLE ASSEMBLY,RF A8 (EFF REV LTR G)	1	A
13	635-4797-002	2	CABLE ASSEMBLY,RF A8	1	B,C,D,E
13A	M39012-20-0101	3	CONNECTOR,PLUG ELEC (81349) 357-9169-000 A8P1	1	
13B	KN-19-159	3	CONNECTOR,RCPT ELEC (91836) 357-9692-000 A8J1	1	
14	637-4003-001	2	DISCRIMINATOR MODULE (PART NUMBER OBSOLETE;REPLACE WITH A4 629-5642-001)	1	A
14	629-5642-001	2	DISCRIMINATOR MODULE A4	1	
	MS51957-29	2	SCREW,MACHINE CRES, 0.138-32 X 0.437IN (96906)	4	
			343-0170-000 (AP)		
15	280-2745-030	2	LABEL,ES WARNING (12998) (EFF REV LTR L)	1	A
15	280-2745-030	2	LABEL,ES WARNING (12998)	1	B,C
15	280-2745-020	2	LABEL,ES WARNING (12998)	1	D,E
16	637-4007-001	2	CHASSIS A7 (EFF TO REV LTR G)(SEE FIG 2)	1	A
16	635-4773-001	2	CHASSIS A7 (EFF REV LTR G)(SEE FIG 2)	1	A
16	635-4773-001	2	CHASSIS A7 (SEE FIG 2)	1	B,C,D,E
	MS51958-63	2	SCREW,MACHINE CRES, 0.190-32 X 0.500IN (96906)	16	
			343-0228-000 (AP)		
	MS35338-138	2	WASHER,LOCK SST, 0.194 ID X 0.334 OD (96906)	16	
			310-0284-000 (AP)		
17	637-4009-002	2	CASE A9 (EFF TO REV LTR G)(SEE FIG 3)	1	A
			OR		
17	637-4009-001	2	CASE A9 (SEE FIG 3)	1	A,B,C
17	635-5179-002	2	CASE A9 (SEE FIG 4)	1	D,E
	BRZ0.255IDX0.489	2	WASHER,LOCK BRZ, 0.255 ID X 0.489 OD (79807)	2	
	ODX0.047		310-0400-000 (AP)		
	NIPLBRS.265IDX.6	2	WASHER,FLAT NI PL BRS, 0.265 ID X 0.625 OD (79807)	2	
	250DX.040		310-0061-000 (AP)		
	MS90725-1	2	SCREW,CAP,HEX CD PL STL, 1/4-20 X 3/8 (96906)	2	
			326-0154-000 (AP)		

GROUP ASSEMBLY PARTS LIST



TPA-6777-017

Chassis A7
Figure 2

GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
2-	637-4007-001		1 CHASSIS A7 (SEE FIG 1-16 FOR NHA)		REF F
	635-4773-001		1 CHASSIS A7 (SEE FIG 1-16 FOR NHA)		REF G
1	MS75089-3		2 COIL,RF 22UH (96906) 240-2715-290 A7L9		1
2	MS75089-3		2 COIL,RF 22UH (96906) 240-2715-290 A7L8		1
3	MS75089-3		2 COIL,RF 22UH (96906) 240-2715-290 A7L7		1
4	MS75089-3		2 COIL,RF 22UH (96906) 240-2715-290 A7L6		1
5	MS75089-3		2 COIL,RF 22UH (96906) 240-2715-290 A7L5		1
6	MS75089-3		2 COIL,RF 22UH (96906) 240-2715-290 A7L4		1
7	MS75089-3		2 COIL,RF 22UH (96906) 240-2715-290 A7L3		1
8	MS75089-3		2 COIL,RF 22UH (96906) 240-2715-290 A7L2		1
9	RTMT12M		2 TERMINAL,STUD (91663) 306-0976-000		8
	MS51957-14		2 SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000 (AP)		8 F
	MS51957-14		2 SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000 (AP) (EFF TO REV LTR H)		8 G
	MS51957-13		2 SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP) (EFF REV LTR H)		8 G
10	MS75089-3		2 COIL,RF 22UH (96906) 240-2715-290 A7L1		1
11	RTMT12M		2 TERMINAL,STUD (91663) 306-0976-000		1
	4007-4HT		2 TERMINAL,LUG (77147) 304-0015-000 (AP)		1
	MS51957-14		2 SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000 (AP)		1 F
	MS51957-14		2 SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000 (AP) (EFF TO REV LTR H)		1 G
	MS35338-135		2 WASHER,LOCK SST, 0.115 ID X 0.209 OD (96906) 310-0279-000 (AP) (EFF REV LTR H)		1 G
12	CZ24BKF104		2 CAPACITOR,FXD PPR DIEL, 0.10UF, 10%, 600V (81349) 241-0090-000 A7C2		1
13	CZ24BKF104		2 CAPACITOR,FXD PPR DIEL, 0.10UF, 10%, 600V (81349) 241-0090-000 A7C1		1
14	637-4062-001		2 BRACKET,MTG		1 F
14	780-6429-001		2 BRACKET,MTG		1 G
	MS51957-16		2 SCREW,MACH STL, 4-40 X 7/16 (96906) 343-0136-000 (AP)		4 F
	MS51957-14		2 SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000 (AP) (EFF TO REV LTR H)		4 G
	MS51957-16		2 SCREW,MACH STL, 4-40 X 7/16 (96906) 343-0136-000 (AP) (EFF REV LTR H)		4 G
15	403		2 TERMINAL,LUG (79963) 304-1089-000		1
	68-1660-40		2 NUT,SLFLKG,HEX AL, 4-40 (72962) 333-0605-000 (AP)		1
	MS51957-16		2 SCREW,MACH STL, 4-40 X 7/16 (96906) 343-0136-000 (AP)		1 F
	MS51957-16		2 SCREW,MACH STL, 4-40 X 7/16 (96906) 343-0136-000 (AP) (EFF TO REV LTR H)		1 G
	MS51957-14		2 SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000 (AP) (EFF REV LTR H)		1 G
16	MS35489-33		2 GROMMET,RBR (96906) 201-0019-000		1
17	MS16106-4		2 SWITCH ASSY (96906) 266-8000-000 A7S1 (EFF TO REV LTR D)		1 F
17	638-4898-001		2 SWITCH,INTERLOCK A7S1 (EFF REV LTR D)		1 F
17	7301SYZQE		2 SWITCH,TOGGLE (09353) 266-5321-250 A7S1 (EFF TO REV LTR D)		1 G
17	7101SYZQE		2 SWITCH,TOGGLE (09353) 266-5321-150 A7S1 (EFF REV LTR D TO REV LTR G)		1 G
17	638-4898-001		2 SWITCH,INTERLOCK A7S1 (EFF REV LTR G)		1 G
	MS35649-244		2 NUT,PLAIN,HEX SST, 4-40 (96906) 313-0043-000 (AP)		2 F
	MS35649-244		2 NUT,PLAIN,HEX SST, 4-40 (96906) 313-0043-000 (AP) (EFF REV LTR G)		2 G
	MS35338-135		2 WASHER,LOCK SST, 0.115 ID X 0.209 OD (96906) 310-0279-000 (AP)		2 F
	MS35338-135		2 WASHER,LOCK SST, 0.115 ID X 0.209 OD (96906) 310-0279-000 (AP) (EFF REV LTR G)		2 G
	MS51957-14		2 SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000 (AP)		2 F
	MS51957-14		2 SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000 (AP) (EFF REV LTR G)		2 G
18	JX-45		3 ADAPTER,SW ACTR (91929) 266-7003-000		1
19	MS24547-1		3 SWITCH,SENS (96906) 266-7002-000		1

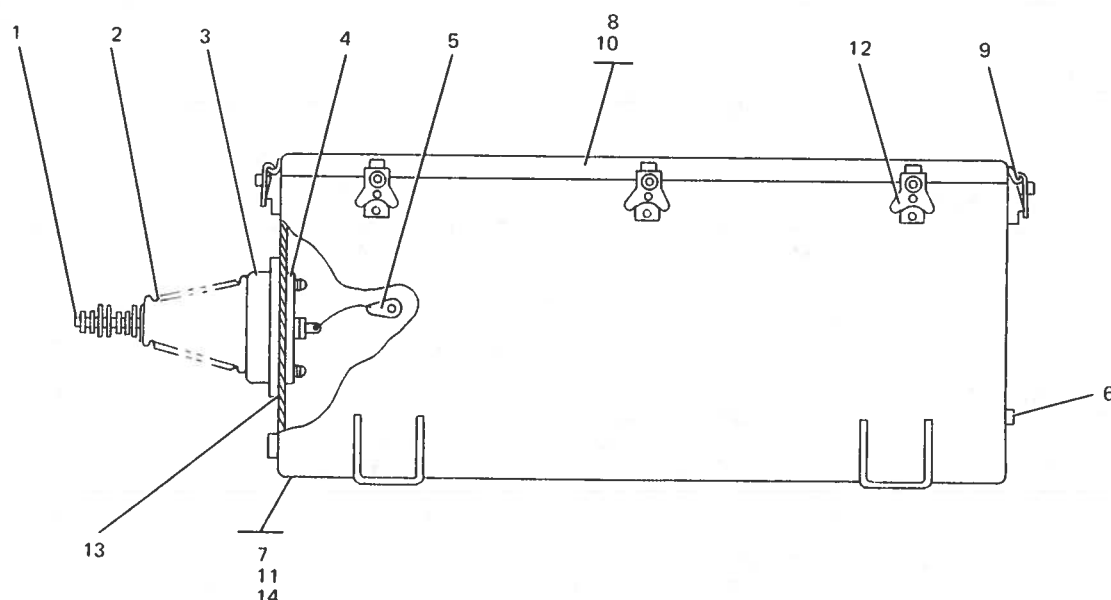
GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
2-20	638-4897-001	3	SHAFT	1	
21	MS16633-1018	3	RING,RTNG (96906) 340-0090-000	1	
22	340-1020-000	3	SPRING,HELICAL (91314)	1	
23	638-4896-001	3	BRACKET	1	
	BRS0.089IDX0.188	3	WASHER,FLAT BRS, 0.089 ID X 0.188 OD (05411)	2	
	ODX0.016		310-0129-000 (AP)		
24	637-4067-001	2	BRACKET,MTG	1 F	
24	635-5468-001	2	BRACKET,MTG (EFF TO REV LTR G)	1 G	
24	637-4067-001	2	BRACKET,MTG (EFF REV LTR G)	1 G	
	MS51957-16	2	SCREW,MACH STL, 4-40 X 7/16 (96906) 343-0136-000 (AP)	4 F	
	MS51957-14	2	SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000 (AP) (EFF TO REV LTR H)	4 G	
	MS51957-16	2	SCREW,MACH STL, 4-40 X 7/16 (96906) 343-0136-000 (AP) (EFF REV LTR H)	4 G	
25	637-4064-001	2	STIFFNER,FRAME,PRSD	1 F	
25	635-8196-001	2	STIFFNER,FRAME,PRSD	1 G	
26	610-0006	2	CLAMP,LOOP (55943) 150-1543-000 (EFF TO REV LTR H)	3 G	
26	610-0005	2	CLAMP,LOOP (55943) 150-1542-000 (EFF REV LTR H)	2 G	
	99NM-62	2	NUT,SLFLKG,HEX PL BRS, 0.138-32 (72962) 333-0369-000 (AP) (EFF TO REV LTR H)	3 G	
	99NM-62	2	NUT,SLFLKG,HEX PL BRS, 0.138-32 (72962) 333-0369-000 (AP) (EFF REV LTR H)	2 G	
	MS51957-30	2	SCREW,MACHINE CRES, 0.138-32 X 0.500IN (96906) 343-0171-000 (AP)	3 G	
	MS51957-29	2	SCREW,MACHINE CRES, 0.138-32 X 0.437IN (96906) 343-0170-000 (AP)	2 G	
27	SSC4SS10	2	CLAMP,LOOP (06383) 435-0001-040	2 F	
27	610-0004	2	CLAMP,LOOP (55943) 150-1541-000 (EFF REV LTR H)	1 G	
	99NM-62	2	NUT,SLFLKG,HEX PL BRS, 0.138-32 (72962) 333-0369-000 (AP)	2 F	
	99NM-62	2	NUT,SLFLKG,HEX PL BRS, 0.138-32 (72962) 333-0369-000 (AP) (EFF REV LTR H)	1 G	
	MS51957-30	2	SCREW,MACHINE CRES, 0.138-32 X 0.500IN (96906) 343-0171-000 (AP)	2 F	
	MS51957-29	2	SCREW,MACHINE CRES, 0.138-32 X 0.437IN (96906) 343-0170-000 (AP) (EFF REV LTR H)	1 G	
28	MS21266-1N	2	PLASTIC CHANNEL (96906) 150-0173-000 (EFF REV LTR H TO REV LTR K)	AR G	
28	MS21266-3N	2	PLASTIC CHANNEL (96906) 150-0177-000 (EFF REV LTR K)	AR G	
29	637-4065-001	2	WIRING HARNESS, NO 2 A7W2	1 F	
29	635-4944-001	2	WIRING HARNESS, NO 2 A7W2	1 G	
30	3VN31/1CN8	3	CONNECTOR,RCPT ELEC (05574) 372-0013-010 A7W2J4	1	
	68-1660-40	3	NUT,SLFLKG,HEX AL, 4-40 (72962) 333-0605-000 (AP)	2	
	MS51957-18	2	SCREW,MACH STL, 4-40 X 5/8 (96906) 343-0138-000 (AP)	2 F	
	MS51957-17	2	SCREW,MACH STL, 4-40 X 1/2 (96906) 343-0137-000 (AP) (EFF TO REV LTR H)	2 G	
	MS51957-18	2	SCREW,MACH STL, 4-40 X 5/8 (96906) 343-0138-000 (AP) (EFF REV LTR H)	2 G	
31	DBMF25S	3	CONNECTOR,RCPT ELEC (71468) 371-0166-000 A7W2J6	1	
	68-1660-26	3	NUT,SLFLKG,HEX AL, 2-56 (72962) 333-0604-000 (AP)	2	
	NPBR50.086-56X0.375IN	3	SCREW,MACHINE NP BRS, 0.086-56 X 0.375IN (77250) 342-0145-000 (AP)	2	
32	3VN6/1CND5	3	CONNECTOR,RCPT ELEC (05574) 372-7600-010 A7W2J3	1	
	68-1660-40	3	NUT,SLFLKG,HEX AL, 4-40 (72962) 333-0605-000 (AP)	2	
	CRES 0.125IDX0.2	3	WASHER,FLAT CRES, 0.125 ID X 0.281 OD (79807) 310-6340-000 (AP)	2	
	8100				
	MS51957-18	3	SCREW,MACH STL, 4-40 X 5/8 (96906) 343-0138-000 (AP)	2 F	
	MS51957-17	3	SCREW,MACH STL, 4-40 X 1/2 (96906) 343-0137-000 (AP) (EFF TO REV LTR H)	2 G	
	MS51957-18	3	SCREW,MACH STL, 4-40 X 5/8 (96906) 343-0138-000 (AP) (EFF REV LTR H)	2 G	
33	DBMF25S	3	CONNECTOR,RCPT ELEC (71468) 371-0166-000 A7W2J2	1	
	68-1660-26	3	NUT,SLFLKG,HEX AL, 2-56 (72962) 333-0604-000 (AP)	2	

GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
2-	NPBR50.086-56X0.375IN	3	SCREW,MACHINE NP BRS, 0.086-56 X 0.375IN (77250)	2	
34	DBMF25S	3	CONNECTOR,RCPT ELEC (71468) 371-0166-000 A7W2J1	1	
	540-9019-003	3	POST,HEX (AP)	2	
	CRES-.091IDX.162 OD	3	WASHER,LOCK CRES, 0.091 ID X 0.162 OD (79807)	4	
	MS51957-4	3	SCREW,MACH CD PL STL, 2-56 X 5/16 (96906)	4	
			343-0125-000 (AP)		
35	1270-047	2	FILTER,RFI (51406) 241-5002-010 A7C3	1	
36	1270-047	2	FILTER,RFI (51406) 241-5002-010 A7C4	1	
37	1270-047	2	FILTER,RFI (51406) 241-5002-010 A7C5	1	
38	1270-047	2	FILTER,RFI (51406) 241-5002-010 A7C6	1	
39	1270-047	2	FILTER,RFI (51406) 241-5002-010 A7C7	1	
40	1270-047	2	FILTER,RFI (51406) 241-5002-010 A7C8	1	
41	1270-047	2	FILTER,RFI (51406) 241-5002-010 A7C9	1	
42	1270-047	2	FILTER,RFI (51406) 241-5002-010 A7C10	1	
43	1270-047	2	FILTER,RFI (51406) 241-5002-010 A7C11	1	
44	SSC4SS10	2	CLAMP,LOOP (06383) 435-0001-040	1 F	
44	610-0008	2	CLAMP,LOOP (55943) 150-1545-000 (EFF TO REV LTR K)	1 G	
44	610-0006	2	CLAMP,LOOP (55943) 150-1543-000 (EFF REV LTR K)	1 G	
	99NM-62	2	NUT,SLFLKG,HEX PL BRS, 0.138-32 (72962) 333-0369-000 (AP)	1	
	MS51957-30	2	SCREW,MACHINE CRES, 0.138-32 X 0.500IN (96906)	1 F	
			343-0171-000 (AP)		
	MS51957-30	2	SCREW,MACHINE CRES, 0.138-32 X 0.500IN (96906)	1 G	
			343-0171-000 (AP) (EFF TO REV LTR H)		
	MS51957-29	2	SCREW,MACHINE CRES, 0.138-32 X 0.437IN (96906)	1 G	
			343-0170-000 (AP) (EFF REV LTR H)		
45	637-4063-001	2	WIRING HARNESS, NO 1 A7W1	1 F	
45	635-4943-001	2	WIRING HARNESS NO 1 A7W1	1 G	
46	PT07A20-39P	3	CONNECTOR,RCPT ELEC (77820) 371-8597-010 A7W1P1	1	
47	637-4061-001	2	PLATE,CHASSIS,PRSD	1 F	
47	629-5767-001	2	PLATE,CHASSIS,PRSD	1 G	
	MS51958-64	2	SCREW,MACHINE CRES, 0.190-32 X 0.625IN (96906)	2 F	
			343-0229-000 (AP)		
	MS51958-64	2	SCREW,MACHINE CRES, 0.190-32 X 0.625IN (96906)	2 G	
			343-0229-000 (AP) (EFF TO REV LTR J)		
	MS51958-63	2	SCREW,MACHINE CRES, 0.190-32 X 0.500IN (96906)	2 G	
			343-0228-000 (AP) (EFF REV LTR J)		
	MS51957-30	2	SCREW,MACHINE CRES, 0.138-32 X 0.500IN (96906)	1 F	
			343-0171-000 (AP)		
	MS51957-30	2	SCREW,MACHINE CRES, 0.138-32 X 0.500IN (96906)	1 G	
			343-0171-000 (AP) (EFF TO REV LTR H)		
	MS51957-29	2	SCREW,MACHINE CRES, 0.138-32 X 0.437IN (96906)	1 G	
			343-0170-000 (AP) (EFF REV LTR H)		
	MS51960-66	2	SCREW,MACHINE CRES, 0.190-32 X 0.62IN (96906)	1	
			342-0225-000 (AP)		
	MS51959-30	2	SCREW,MACHINE CRES, 6-32 X 1/2 (96906) 342-0064-000 (AP)	2	

GROUP ASSEMBLY PARTS LIST



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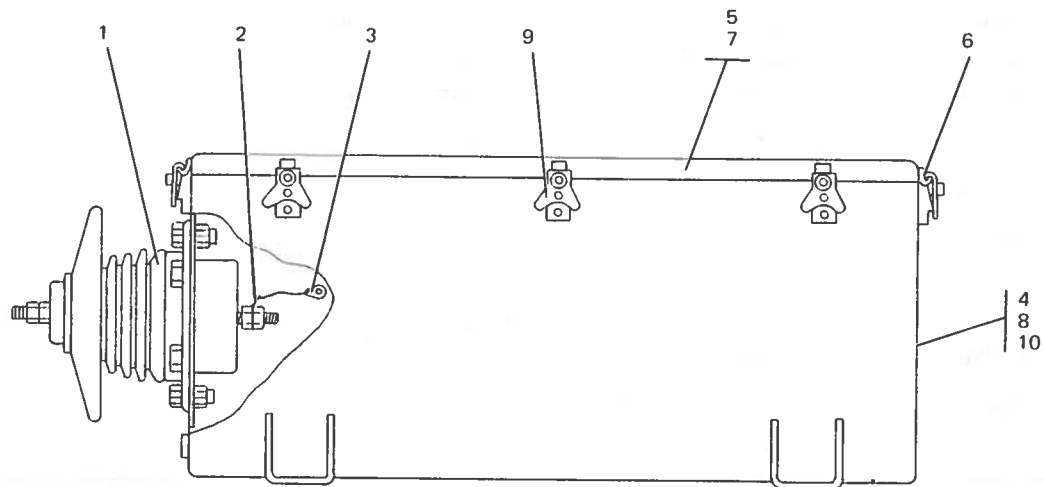
Case A9
Figure 3

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
3-	637-4009-001	1	CASE A9 (SEE FIG 1-17 FOR NHA)	REF H	
	637-4009-002	1	CASE A9 (SEE FIG 1-17 FOR NHA)	REF J	
1	637-4078-001	2	TERMINAL, POST	1	
	313-0154-000	2	NUT, PLAIN, HEXAGON NP PL BRS, 0.375-24 (AP)	3	
	BRZ0.382IDX0.678	2	WASHER, LOCK BRZ, 0.382 ID X 0.678 OD (79807)	1 H	
	ODX0.070		310-0403-000 (AP)		
	637-9873-001	2	CAP, TERMINAL POST (AP)	1 J	
	NIPLBRS.390IDX.8	2	WASHER, FLAT NI PL BRS, 0.390 ID X 0.875 OD (79807)	3 H	
	750DX.040		310-0063-000 (AP)		
	NIPLBRS.390IDX.8	2	WASHER, FLAT NI PL BRS, 0.390 ID X 0.875 OD (79807)	1 J	
	750DX.040		310-0063-000 (AP)		
2	9554	2	INSULATOR (83330) 190-0431-030	1	
	302-0044-000	2	WASHER, NM CK NPRN, 0.390 ID X 0.875 OD (05284) (AP)	1	
3	9591	2	FLANGE, MOUNTING (83330) 190-0431-040	1	
	MS51957-48	2	SCREW, MACHINE SST, 8-32 X 7/8 (96906) 343-0192-000 (AP)	3	
	MS35338-137	2	WASHER, LOCK CRES, 0.171 ID X 0.293 OD (96906) 310-0072-000 (AP)	3	
4	637-4043-001	2	PLATE, TERMINAL (EFF TO REV LTR B)	1	
4	637-4788-001	2	PLATE, TERMINAL (EFF REV LTR B)	1	
	MS51957-46	2	SCREW, MACHINE SST, 8-32 X 5/8 (96906) 343-0190-000 (AP)	4	
	310-0445-000	2	WASHER, FLAT SST 0.168 ID X 0.281 OD (72606) (AP)	4	
	MS35338-137	2	WASHER, LOCK CRES, 0.171 ID X 0.293 OD (96906) 310-0072-000 (AP)	4	
5	4007-6HT	2	TERMINAL, LUG (77147) 304-0016-000 (EFF TO REV LTR J-LOCATED ON T/L)	1	

GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
3-5	4007-4HT	2	TERMINAL,LUG (77147) 304-0015-000 (EFF REV C TO REV LTR D)	1	
5	2104-06-02-2520N	2	TERMINAL,LUG (78189) 304-0318-000 (EFF REV LTR D)	1	
	334-0260-000	2	NUT,HEXAGON,PLAIN NP BRS, 0.500-20 (AP)	1	
	638-4609-001	2	WASHER,KEY-STOP (AP)	1	
6	30AC	2	VALVE,PRESS RLF (98021) 013-1229-000 (EFF REV LTR E)	1	H
6	30AC	2	VALVE,PRESS RLF (98021) 013-1229-000	1	J
7	637-1872-001	2	CASE, COUPLER	1	
8	637-1871-001	3	COVER, CASE	1	
9	015-1913-000	4	KEEPER PLATE (82240)	10	
	MS20470AD4-7	4	RIVET,SOLID AL, 0.125 DIA X 7/16 (96906)	20	
			305-1172-000 (AP)		
10	637-1871-002	4	COVER,WELDED	1	
11	637-1812-001	3	CASE,ANTENNA COUPLER	1	
12	SL3	4	CATCH,LUGGAGE (82240) 015-1859-000	10	
	MS20470AD4-7	4	RIVET,SOLID AL, 0.125 DIA X 7/16 (96906)	10	
			305-1172-000 (AP)		
	MS20470AD4-5	4	RIVET,SOLID AL, 0.125 DIA X 5/16 (96906)	10	
			305-1170-000 (AP)		
13	629-5854-012	4	RING,MTG	1	
	MS20470AD4-10	4	RIVET,SOLID AL, 1/8 DIA X 5/8 (96906) 305-1175-000 (AP)	6	
14	637-1812-002	4	CASE,WELDED	1	
	NCN-10-1-4	4	NUT,CAPTIVE CRES, 0.190-32 (57227) 334-0436-000 (AP)	16	

GROUP ASSEMBLY PARTS LIST



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Case A9
Figure 4

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
4-	635-5179-002	1	CASE A9 (SEE FIG 1-17 FOR NHA)	REF	
1	190-0426-010	2	INSULATOR,STDF (75539)	1	
	XL3800BRNK	2	NUT,PLAIN,HEX NP BRS, 0.5-13 (70318) 313-0494-010 (AP)	6	
	XE3832BRN	2	SCREW,MACH NP BRS, 0.5-13 X 1 (70318) 325-0184-010 (AP)	6	
	50W	2	INSULATOR,WSHR NYL, 0.504 ID X 0.022 OD (04865) 302-0645-070 (AP)	6	
2	31-759	2	TERMINAL,LUG (02660) 304-0139-000	1	
3	2104-06-02-2520N	2	TERMINAL,LUG (78189) 304-0318-000	1	
4	637-1872-002	2	CASE, COUPLER	1	
5	637-1871-001	3	COVER, CASE	1	
6	015-1913-000	4	KEEPER PLATE (82240)	10	
	MS20470AD4-7	4	RIVET,SOLID AL, 0.125 DIA X 7/16 (96906) 305-1172-000 (AP)	20	
7	637-1871-002	4	COVER, WELDED	1	
8	635-5396-001	3	CASE, WATERTIGHT	1	
9	SL3	4	CATCH,LUGGAGE (82240) 015-1859-000	10	
	MS20470AD4-5	4	RIVET,SOLID AL, 0.125 DIA X 5/16 (96906) 305-1170-000 (AP)	10	
	MS20470AD4-7	4	RIVET,SOLID AL, 0.125 DIA X 7/16 (96906) 305-1172-000 (AP)	10	
10	635-5396-002	4	CASE	1	
	NCN-10-1-4	4	NUT,CAPTIVE CRES, 0.190-32 (57227) 334-0436-000 (AP)	16	

3. NUMERICAL INDEX

PART NUMBER	FIG-ITEM	TTL REQ	PART NUMBER	FIG-ITEM	TTL REQ
BR50.089IDX0.188	2-23	2	MS51957-14	2-17	
ODX0.016				2-24	31
BRYLM COP, 0.155	1-8	4	MS51957-16	2-14	
DX0.125L				2-14	
BRZ0.255IDX0.489	1-17	2		2-15	
ODX0.047				2-15	
BRZ0.382IDX0.678	3-1	1		2-24	
ODX0.070				2-24	18
CD PL BRZ,0.141I	1-2		MS51957-17	2-30	
DX0.2390D				2-32	4
	1-2	2	MS51957-18	2-30	
CRES 0.125IDX0.2	2-32	2		2-30	
8100				2-32	
CRES-.091IDX.162	2-34	4		2-32	8
OD			MS51957-29	1-12	
CZ24BKF104	2-12			1-14	
	2-13	2		2-26	
DBMF25S	2-31			2-27	
	2-33			2-44	
	2-34	3		2-47	10
JX-45	2-18	1	MS51957-30	2-26	
KN-19-159	1-13B	1		2-27	
MS15795-805	1-12			2-44	
	1-12	2		2-44	
MS16106-4	2-17	1		2-47	
MS16633-1018	2-21	1		2-47	9
MS20470AD4-10	3-13	6	MS51957-32	1-8	4
MS20470AD4-5	3-12		MS51957-4	2-34	4
	4-9	20	MS51957-46	3-4	4
MS20470AD4-7	3-9		MS51957-48	3-3	3
	3-12		MS51958-63	1-16	
	4-6			2-47	18
	4-9	60	MS51958-64	2-47	
MS21266-1N	2-28	AR		2-47	4
MS21266-3N	2-28	AR	MS51959-30	2-47	2
MS24547-1	2-19	1	MS51960-66	2-47	1
MS35338-135	1-2		MS75089-3	2-1	
	2-11			2-2	
	2-17			2-3	
MS35338-136	2-17	6		2-4	
MS35338-137	1-12	1		2-5	
	3-3			2-6	
	3-4	7		2-7	
MS35338-138	1-16	16		2-8	
MS35489-33	2-16	1		2-10	9
MS35649-244	2-17		MS90725-1	1-17	2
	2-17	4	M39012-20-0101	1-13A	1
MS51957-13	1-2		NAS67C4	1-2	1
	2-9	9	NAS671C6	1-12	1
MS51957-14	2-9		NCN-10-1-4	3-14	
	2-9			4-10	32
	2-11		NIPLBRS.265IDX.6	1-17	2
	2-11		250DX.040		
	2-14		NIPLBRS.390IDX.8	3-1	
	2-15		750DX.040		
	2-17			3-1	4

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PART NUMBER	FIG-ITEM	TTL REQ	PART NUMBER	FIG-ITEM	TTL REQ
NPBR50.086-56X0. 375IN	2-31		241-5002-010	2-42	
	2-33	4		2-43	9
PT07A20-39P	2-46	1	266-5321-150	2-17	1
P343-0328-000	1-2		266-5321-250	2-17	1
	1-2	2	266-7002-000	2-19	1
RTMT12M	2-9		266-7003-000	2-18	1
	2-11	9	266-8000-000	2-17	1
SL3	3-12		280-1368-330	1-10	1
	4-9	20	280-1368-340	1-5	1
SSC4SS10	2-27		280-1368-360	1-1	
	2-44	3		1-3	3
XE3832BRN	4-1	6	280-2745-020	1-15	1
XL3800BRNK	4-1	6	280-2745-030	1-15	
013-1229-000	1-6			1-15	2
	1-6		3VN31/1CN8	2-30	1
	3-6		3VN6/1CND5	2-32	1
	3-6	4	30AC	1-6	
015-1859-000	3-12			1-6	
	4-9	20		3-6	
015-1913-000	3-9			3-6	4
	4-6	20	302-0044-000	3-2	1
1270-047	2-35		302-0645-070	4-1	6
	2-36		304-0015-000	2-11	
	2-37			3-5	2
	2-38		304-0016-000	1-2	
	2-39			3-5	2
	2-40		304-0139-000	4-2	1
	2-41		304-0318-000	3-5	
	2-42			4-3	2
	2-43	9	304-1089-000	2-15	1
150-0173-000	2-28	AR	305-1170-000	3-12	
150-0177-000	2-28	AR		4-9	20
150-1540-000	1-12	1	305-1172-000	3-9	
150-1541-000	2-27	1		3-12	
150-1542-000	2-26	2		4-6	
150-1543-000	2-26			4-9	60
	2-44	4	305-1175-000	3-13	6
150-1545-000	2-44	1	306-0976-000	2-9	
190-0426-010	4-1	1		2-11	9
190-0431-030	3-2	1	31-759	4-2	1
190-0431-040	3-3	1	310-0061-000	1-17	2
201-0019-000	2-16	1	310-0063-000	3-1	
2104-06-02-2520N	3-5			3-1	4
	4-3	2	310-0070-000	2-34	4
240-2715-290	2-1		310-0072-000	3-3	
	2-2			3-4	7
	2-3		310-0078-000	1-2	
	2-4			1-2	2
	2-5		310-0129-000	2-23	2
	2-6		310-0279-000	1-2	
	2-7			2-11	
	2-8			2-17	
	2-10	9		2-17	6
241-0090-000	2-12		310-0282-000	1-12	1
	2-13	2	310-0284-000	1-16	16
241-5002-010	2-35		310-0400-000	1-17	2
	2-36		310-0403-000	3-1	1
	2-37		310-0445-000	3-4	4
	2-38		310-0779-050	1-12	
	2-39			1-12	2
	2-40		310-6340-000	2-32	2
	2-41		313-0043-000	2-17	
				2-17	4

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PART NUMBER	FIG-ITEM	TTL REQ	PART NUMBER	FIG-ITEM	TTL REQ
313-0045-000	1-12	1	343-0190-000	3-4	4
313-0132-000	1-2	1	343-0192-000	3-3	3
313-0154-000	3-1	3	343-0228-000	1-16	18
313-0494-010	4-1	6		2-47	
325-0184-010	4-1	6	343-0229-000	2-47	4
326-0154-000	1-17	2		2-47	
333-0369-000	2-26		343-0328-000	1-2	2
	2-26			1-2	
	2-27		357-9169-000	1-13A	1
	2-27		357-9692-000	1-13B	1
	2-44	9	371-0166-000	2-31	
333-0604-000	2-31			2-33	
	2-33	4		2-34	3
333-0605-000	2-15		371-8597-010	2-46	1
	2-30		372-0013-010	2-30	1
	2-32	5	372-7600-010	2-32	1
334-0260-000	3-5	1	4007-4HT	2-11	
334-0436-000	3-14			3-5	2
	4-10	32	4007-6HT	1-2	
340-0090-000	2-21	1		3-5	2
340-0641-000	1-8	4	403	2-15	1
340-1020-000	2-22	1	435-0001-040	2-27	
342-0064-000	2-47	2		2-44	3
342-0145-000	2-31		50W	4-1	6
	2-33	4	540-9019-003	2-34	2
342-0225-000	2-47	1	610-0003	1-12	1
343-0125-000	2-34	4	610-0004	2-27	1
343-0133-000	1-2		610-0005	2-26	2
	2-9	9	610-0006	2-26	
343-0134-000	2-9			2-44	4
	2-9		610-0008	2-44	1
	2-11		622-3384-001	1-	1
	2-11		622-3384-002	1-	1
	2-14		622-3513-001	1-	1
	2-15		622-3513-002	1-	1
	2-17		622-3515-001	1-	1
	2-17		629-5642-001	1-14	1
	2-24	31	629-5655-001	1-2	1
343-0136-000	2-14		629-5655-003	1-2	1
	2-14		629-5767-001	2-47	1
	2-15		629-5854-012	3-13	1
	2-15		635-1907-000	1-7	1
	2-24		635-4720-001	1-4	1
	2-24	18	635-4773-001	1-16	
343-0137-000	2-30			1-16	2
	2-32	4		2-	REF
343-0138-000	2-30		635-4797-002	1-13	
	2-30			1-13	2
	2-32		635-4943-001	2-45	1
	2-32	8	635-4944-001	2-29	1
343-0170-000	1-12		635-5179-002	1-17	1
	1-14			4-	REF
	2-26		635-5396-001	4-8	1
	2-27		635-5396-002	4-10	1
	2-44		635-5468-001	2-24	1
	2-47	10	635-8196-001	2-25	1
343-0171-000	2-26		637-1812-001	3-11	1
	2-27		637-1812-002	3-14	1
	2-44		637-1871-001	3-8	
	2-44			4-5	2
	2-47		637-1871-002	3-10	
	2-47	9		4-7	2
343-0174-000	1-8	4	637-1872-001	3-7	1

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637-2665-001	1-9	1			
637-4002-001	1-2	1			
637-4003-001	1-14	1			
637-4005-001	1-4	1			
637-4006-001	1-11	1			
637-4007-001	1-16	1			
	2-	REF			
637-4008-001	1-13	1			
637-4009-001	1-17	1			
	3-	REF			
637-4009-002	1-17	1			
	3-	REF			
637-4010-001	1-8	1			
637-4043-001	3-4	1			
637-4061-001	2-47	1			
637-4062-001	2-14	1			
637-4063-001	2-45	1			
637-4064-001	2-25	1			
637-4065-001	2-29	1			
637-4067-001	2-24				
	2-24	2			
637-4078-001	3-1	1			
637-4788-001	3-4	1			
637-9873-001	3-1	1			
638-4609-001	3-5	1			
638-4896-001	2-23	1			
638-4897-001	2-20	1			
638-4898-001	2-17				
	2-17	2			
642-0075-000	1-7	1			
642-0137-000	1-7	1			
642-3278-001	1-9	1			
646-5781-001	1-9				
	1-9	2			
651-4240-001	1-4	1			
651-4523-001	1-4	1			
651-4524-001	1-4	1			
68-1660-26	2-31				
	2-33	4			
68-1660-40	2-15				
	2-30				
	2-32	5			
7101SYZQE	2-17	1			
7301SYZQE	2-17	1			
780-6429-001	2-14	1			
9554	3-2	1			
9591	3-3	1			
99NM-62	2-26				
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A1	1-9	646-5781-001	A8	1-13	635-4797-002
A1	1-9	642-3278-001	A8J1	1-13B	KN-19-159
A1	1-9	646-5781-001	A8P1	1-13A	M39012-20-0101
A2	1-4	637-4005-001	A9	1-17	637-4009-002
A2	1-4	635-4720-001	A9	1-17	637-4009-001
A2	1-4	651-4523-001	A9	1-17	635-5179-002
A2	1-4	651-4240-001	A9	3-	637-4009-001
A2	1-4	651-4524-001	A9	3-	637-4009-002
A3	1-2	637-4002-001	A9	4-	635-5179-002
A3	1-2	629-5655-003			
A3	1-2	629-5655-001			
A4	1-14	637-4003-001			
A4	1-14	629-5642-001			
A6	1-11	637-4006-001			
A7	1-16	637-4007-001			
A7	1-16	635-4773-001			
A7	1-16	635-4773-001			
A7	2-	637-4007-001			
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A7C1	2-13	CZ24BKF104			
A7C10	2-42	1270-047			
A7C11	2-43	1270-047			
A7C2	2-12	CZ24BKF104			
A7C3	2-35	1270-047			
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A7C5	2-37	1270-047			
A7C6	2-38	1270-047			
A7C7	2-39	1270-047			
A7C8	2-40	1270-047			
A7C9	2-41	1270-047			
A7L1	2-10	MS75089-3			
A7L2	2-8	MS75089-3			
A7L3	2-7	MS75089-3			
A7L4	2-6	MS75089-3			
A7L5	2-5	MS75089-3			
A7L6	2-4	MS75089-3			
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A7L8	2-2	MS75089-3			
A7L9	2-1	MS75089-3			
A7S1	2-17	MS16106-4			
A7S1	2-17	638-4898-001			
A7S1	2-17	7301SYZQE			
A7S1	2-17	7101SYZQE			
A7S1	2-17	638-4898-001			
A7W1	2-45	637-4063-001			
A7W1	2-45	635-4943-001			
A7W1P1	2-46	PT07A20-39P			
A7W2	2-29	637-4065-001			
A7W2	2-29	635-4944-001			
A7W2J1	2-34	DBMF25S			
A7W2J2	2-33	DBMF25S			
A7W2J3	2-32	3VN6/1CND5			
A7W2J4	2-30	3VN31/1CN8			
A7W2J6	2-31	DBMF25S			
A8	1-13	637-4008-001			



Rockwell
International

HF-8040() Antenna Coupler

maintenance

Collins Defense Communications

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1. GENERAL

This section presents information necessary to maintain the HF-8040() Antenna Coupler. Procedures in this section isolate a fault to power supply A6 or to control A1 and/or rf tuning elements (coil module A2, capacitor module A3, and discriminator A4). Figure 1 shows the location of the antenna coupler sub-assemblies/modules.

Warning

When connected to a radio frequency transmitter and operated into an antenna, this device may produce electromagnetic fields in close proximity to the antenna that are in excess of Occupational Safety and Health Administration (OSHA) recommended maximum limits.

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be utilized to prevent equipment damage.

Caution

The antenna coupler is internally wired at the factory for 244-V ac supply voltage. For other supply voltages, refer to the power supply schematic in the diagrams section of this instruction book.

2. TEST EQUIPMENT

A multimeter is the only test equipment required to test and troubleshoot the antenna coupler to determine a faulty module.

3. TESTING AND TROUBLESHOOTING PROCEDURES

3.1 General

The testing and troubleshooting procedures (table 1) of the antenna coupler, while connected in the hf

system, consist of isolating faults to a module or modules, and replacing the suspect module or modules.

3.2 Preliminary Checks

Before performing the testing/troubleshooting procedures, the following preliminary checks must be performed.

- a. Unscrew the manual pressure relief valve at end of case to release air pressure. Tighten valve after pressure is released.

Note

Refer to paragraph 5 for disassembly/assembly procedures.

- b. Remove cover.
- c. Check for proper connection at antenna insulator at end of case.

Caution

The antenna insulator should be free of paint, clean, and should not be chipped or cracked.

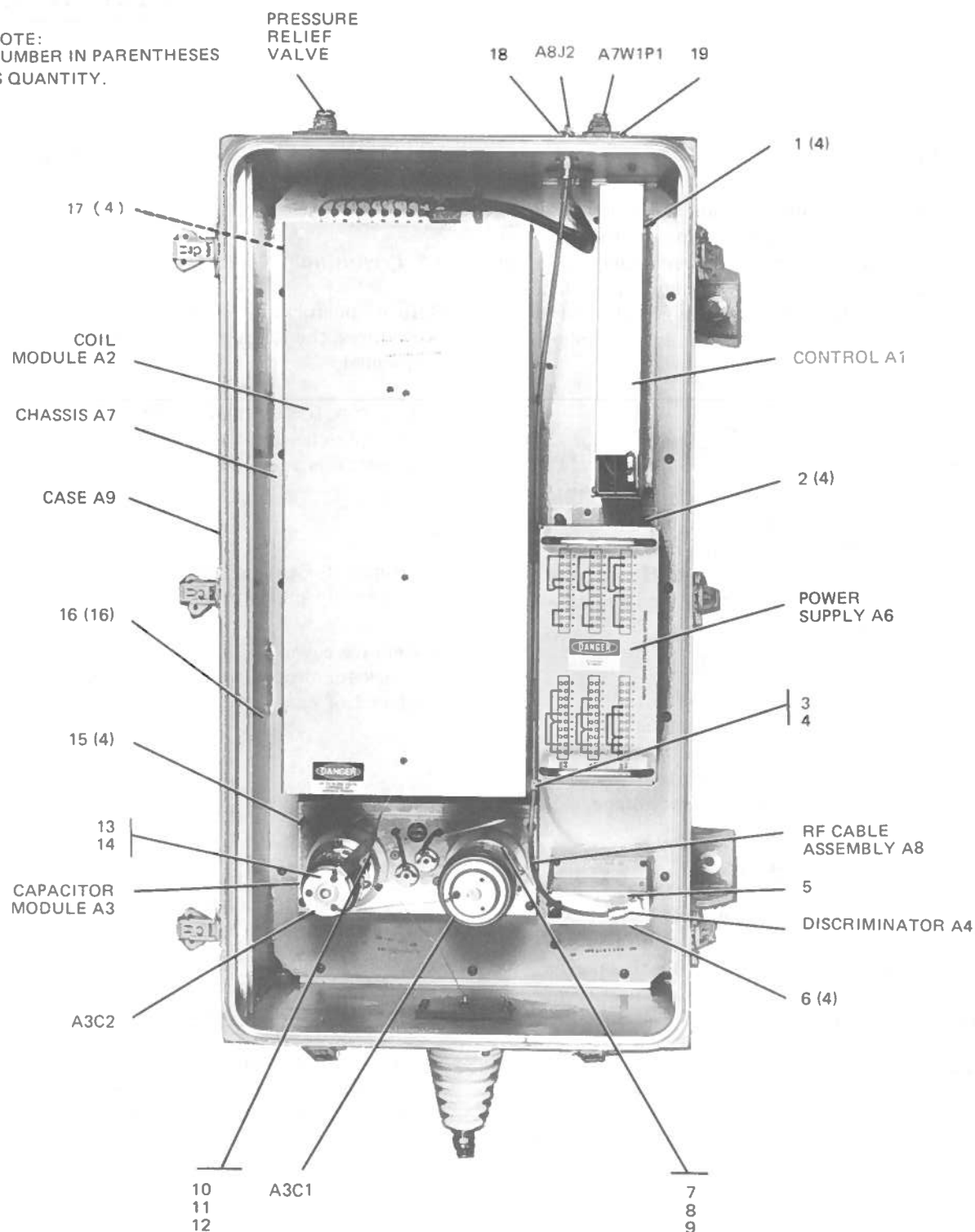
- d. Check that the surface and threads of the two ground pads (located below the antenna insulator) are clean and free of paint.

Caution

The antenna coupler is internally wired at the factory for a 244-V ac supply voltage. For other supply voltages, refer to the power supply section of this instruction book.

- e. Ensure that the antenna coupler is properly wired for the supply voltage used.
- f. Check the four mounting pads located on each side at the bottom of the antenna coupler. Both the top and bottom of these mounting pads should be clean and free of paint.

NOTE:
NUMBER IN PARENTHESES
IS QUANTITY.



TP5-1894-017

**Top View, Cover Removed
Figure 1**

3.3 Testing/Troubleshooting

Warning

Rf voltage as high as 15 000 volts is present on the antenna terminal, antenna feedline, and antenna when the system is keyed. This voltage can cause severe burning and severe electrical shock. Use extreme care to avoid contacting or coming in near proximity to this voltage.

The tests listed in table 1 determine the overall operational quality of the antenna coupler. The tests

should be performed in sequence. For any test that does not meet or exceed the requirements of the NORMAL INDICATION column, follow the directions of the IF INDICATION IS ABNORMAL column.

Caution

Do not remove or replace modules with power applied. Damage to components may result.

Interlock switch A7S1 must be closed to allow antenna coupler operation with the cover removed.

Table 1. Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. HOME	a. Perform procedures in paragraph 3.2. Warning Do not key system when performing HOME test procedures. b. Apply system power and observe coil L1 of coil module A2 and capacitors C1 and C2 of capacitor module A3.	Coil L1 of coil module A2 and capacitors C1 and C2 of capacitor module A3 drive to HOME position (minimum inductance and maximum capacitance). Solenoid switch plunger makes until coil stops; then releases. See module instructions for location of K6 plunger. Note If indications normal, proceed to test 1.h.	If neither coil L1 of coil module A2 or capacitors C1 or C2 of capacitor module A3 drive, perform test 1.c. If coil L1 of coil module A2 does not drive and capacitor C1 and C2 drive, replace coil module A2 and repeat test 1.b. If coil module A2 still doesn't drive, replace control A1 and repeat test 1.b. If coil module A2 drives and capacitors C1 and C2 do not drive, replace capacitor module A3 and repeat test 1.b. If capacitors still don't drive, replace control A1 and repeat test 1.b.
(Cont)	c. Generate a tune start signal.	Coil L1 of coil module A2 and capacitors C1 and C2 of capacitor module A3 drive to home position. Note If indications normal, replace control A1 and repeat test 1.b.	Proceed to test 1.d.

Table 1. Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. (Cont)	d. Remove power from system. e. Remove control A1 from antenna coupler. f. Apply system power. g. Use a digital multimeter to measure voltage at following points-of-test. Use J4-33 as reference (ground). J4-28 J4-30 J4-47 h. Use an ohmmeter to monitor between coil L1-E1 and ground on coil module A2. i. Use an ohmmeter to monitor between the top and bottom ring of capacitors C1 and C2 of capacitor module A3.	-10 to -14 V dc 10 to 14 V dc 23 to 33 V dc Note If indications normal, replace control A1 and repeat test 1.b. Ohmmeter indicates NLT 50 kΩ. Ohmmeter indicates a short.	Replace power supply A6 and repeat test 1.b. Replace coil module A2. If neither indication is correct, replace capacitor module A3. If indication of C2 is correct, and C1 is incorrect, remove capacitor module A3 and check capacitor C1 lead screw assembly. If disengaged from C1 gear, perform alignment/adjustment procedures as outlined in capacitor module instructions (523-0767699). If not disengaged, replace capacitor module A3.
2. TUNE	a. Tune the antenna coupler at the following frequencies while observing coil module A2 and capacitor module A3. 2.0000 MHZ 15.0000 MHZ 29.9999 MHZ	When a tune start signal is received, coil L1 of coil module A2 and capacitors C1 and C2 home; then the rf impedance matching network tunes as outlined in the tune process figure of the theory section of this instruction book.	Unless visual indications occur that warrant replacement of capacitor module A3 or coil module A2, replace the modules in the following order: control A1 discriminator A4 coil A2 capacitor A3

4. ALIGNMENT/ADJUSTMENT

Alignment/adjustment procedures for the antenna coupler are not performed at this maintenance level. For alignment/troubleshooting procedures of individual modules, refer to the appropriate section of this instruction book.

5. DISASSEMBLY/ASSEMBLY

Refer to figure 1 for location of mounting hardware.

Warning

Disconnect all input/output connectors from the antenna coupler before disassembly.

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be utilized to prevent equipment damage. Refer to paragraph 7, electrostatic discharge sensitive devices precautions, before removing modules.

5.1 Disassembly

5.1.1 Cover Removal

To remove the cover, proceed as follows:

- Loosen (unscrew) manual pressure relief valve on the end of the case. Retighten valve immediately.
- Release 10 twist-lock fasteners.
- Remove cover.

To remove control A1, proceed as follows:

5.1.2 Control A1 Removal

- Using the procedures of paragraph 5.1.1, remove cover.

Caution

When removing A1 cover, use care to prevent damage to the interlock switch.

- Loosen four captive screws (1) and remove A1 cover.

Caution

Use care when removing control A1 from card guide to prevent damage to variable resistor on bottom of module.

- Grasp module firmly on both sides and pull upward from chassis.

5.1.3 Coil Module A2 Removal

To remove coil module A2, proceed as follows:

- Using the procedures of paragraph 5.1.1, remove cover.
- Remove screw (13) and lockwasher (14) from ribbon connection at A3C2.
- Remove screw (3) and nut (4) from cable clamp on rf cable assembly A8.
- Loosen four captive mounting screws (17) on cover at bottom.
- Carefully lift A2 from chassis.

5.1.4 Capacitor Module A3 Removal

To remove capacitor module A3, proceed as follows:

- Using the procedures of paragraph 5.1.1, remove cover.
- Remove screw (7), nut (8), and lockwasher (9) from capacitor C1.
- Remove screw (10), nut (11), and lockwasher (12) from capacitor C2.
- Remove screw (13) and lockwasher (14) from ribbon connection at C2.
- Loosen four captive mounting screws (15).
- Carefully lift A3 from chassis.

5.1.5 Discriminator Module A4 Removal

To remove discriminator module A4, proceed as follows:

- Using the procedures of paragraph 5.1.1, remove cover.
- Remove screw (7), nut (8), and lockwasher (9) from capacitor A3C1.
- Remove coax connector A8P1 (5).
- Remove four screws (6).
- Carefully lift A4 from chassis.

5.1.6 Power Supply A6 Removal

To remove power supply A6, proceed as follows:

- Using the procedures of paragraph 5.1.1, remove cover.
- Loosen four captive mounting screws (2).
- Using handles, carefully lift A6 from chassis.

5.1.7 Chassis A7 Removal

- Using the procedures of paragraph 5.1.1 through 5.1.6, remove cover and subassemblies.

- b. Remove nut (18) from connector A8J2 (RF INPUT J2). Pull the connector inside the case until it is clear.
- c. Remove nut (19) from connector A7W1P1 (J1 INPUT). Pull the connector inside the case until it is clear.
- d. Loosen 16 captive mounting screws (16).
- e. Carefully lift A7 from case.

5.2 Assembly

Caution

When replacing subassemblies with plugs that mate with chassis connectors, use care to prevent damage to connectors.

To assemble the antenna coupler, perform the disassembly procedures in reverse order.

6. REPAIR

Repair of the antenna coupler consists of replacing subassemblies and chassis-mounted components. For replacement of subassemblies, refer to paragraph 5. Use standard shop practices to replace chassis-mounted components.

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be utilized to prevent equipment damage.



Rockwell
International

HF-8040() Antenna Coupler

diagrams

Collins Defense Communications

Printed in USA

523-0767465-004218
4th Edition, 1 June 1983

list of illustrations

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NOTICE: This section replaces third edition dated 1 January 1982.

List of Effective Pages

*Zero in this column indicates an original page.

Page No *Change No

Title 0
 List of Effective Pages 0
 1 0
 2 Blank 0
 3 0
 4 Blank 0
 5 0
 6 Blank 0

Record of Changes

CHG NO	CHANGE DATE	CHG NO	CHANGE DATE	CHG NO	CHANGE DATE	CHG NO	CHANGE DATE
1st Ed	1 Jun 77						
2nd Ed	1 Feb 78						
3rd Ed	1 Jan 82						
4th Ed	1 Jun 83						

1. CONFIGURATION STATUS CONTROL

Collins Defense Communications, Rockwell International, uses a 2-character (maximum) alphabetic identifier for configuration identification. The alphabetic identifier is preceded by the letters REV (revision) and starts with — (dash) if no changes have been made. The first change is identified as A, the second as B, and continuing through Z to AA, AB, and ultimately to ZZ.

Note

The alphabetic identifier is not a serial number; therefore, many units or sub-assemblies may exist with the same identifier.

Incorporation of design changes in a unit or subassembly that has been returned to Collins Defense Communications for repair or that has been removed from the company's finished goods inventory is defined as rework. At the time of rework, the unit or subassembly is marked again to reflect the design level to which it is being upgraded. This is done by leaving the original marking on the unit or subassembly and adding the letters RWK (rework) followed by the alphabetic identifier of the latest change incorporated in the rework. For example, unit one is marked REV B — RWK F and unit two is marked REV F indicating that both units are at the design level of revision F, but unit one is reworked and they may not look exactly the same.

Note

A reworked unit may not contain all design changes made prior to the reworked alphabetic identifier, but does contain all changes required to make unit operation identical to a newly manufactured unit with the same alphabetic identifier. Therefore, a unit reworked to a specific alphabetic identifier may physically appear different from a newly manufactured unit at the same alphabetic identifier.

Only alphabetic identifiers that result in schematic changes are covered in this section. Therefore, if a unit or subassembly has an identifier that alphabetically falls between identifiers on the schematic changes page or after the last identifier on the schematic changes page up to and including the latest effectivity listed below, the electrical configuration is represented by the earlier alphabetic identifier listed on the schematic changes page.

2. CONFIGURATION EFFECTIVITY

Refer to the schematic change page preceding each schematic for any changes that may have occurred and the corresponding effectivity identifier.

Listed below are the unit/subassemblies with the latest effectivity covered by this document.

<u>UNIT/SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
HF-8040 Antenna Coupler	622-3384-001	REV T
	622-3384-002	REV T
HF-8040A Antenna Coupler	622-3515-001	REV D
HF-8040M Antenna Coupler	622-3513-001	REV D
	622-3513-002	REV D

Configuration history before 1 July 1981 is not recorded in this section.

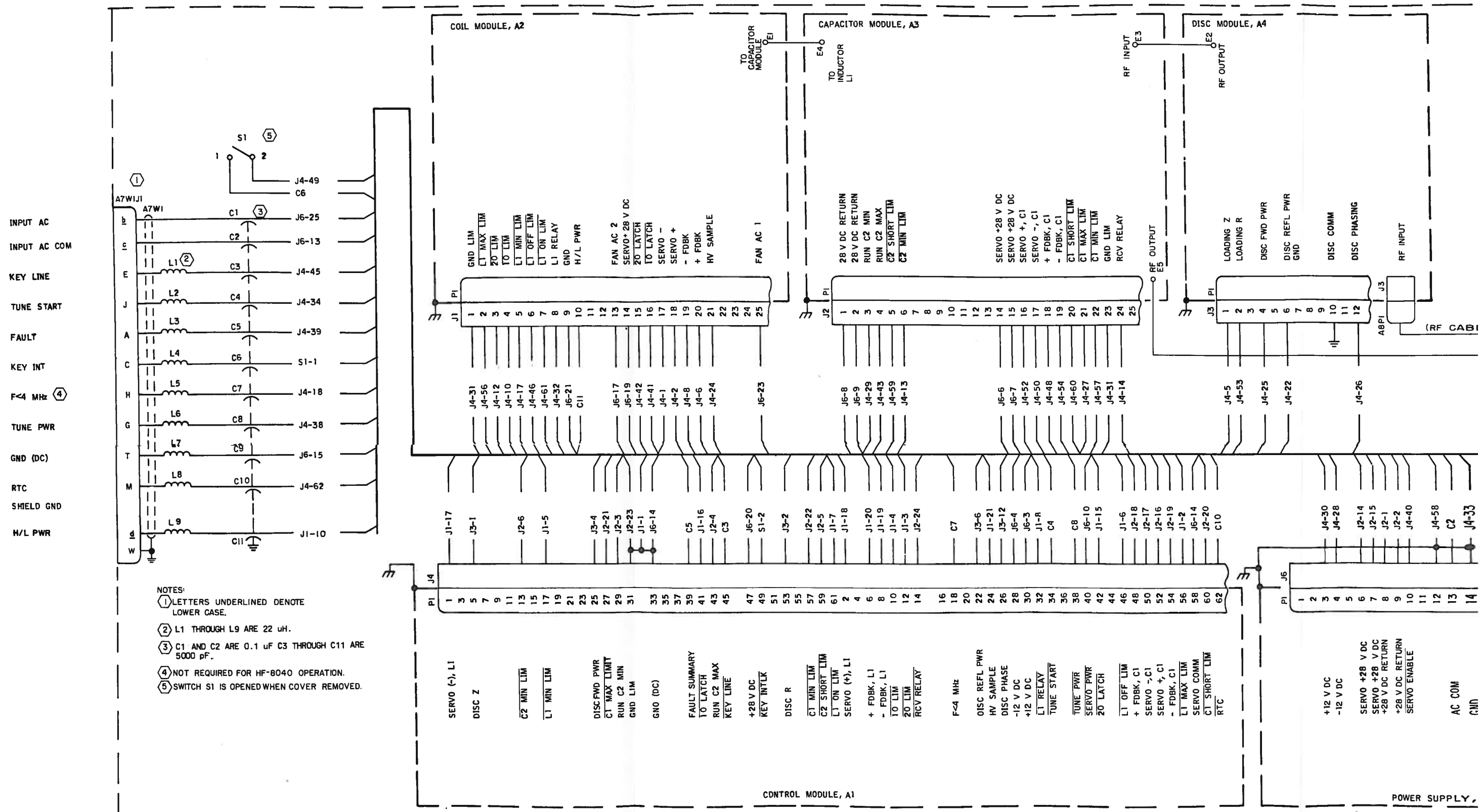
SCHEMATIC CHANGES

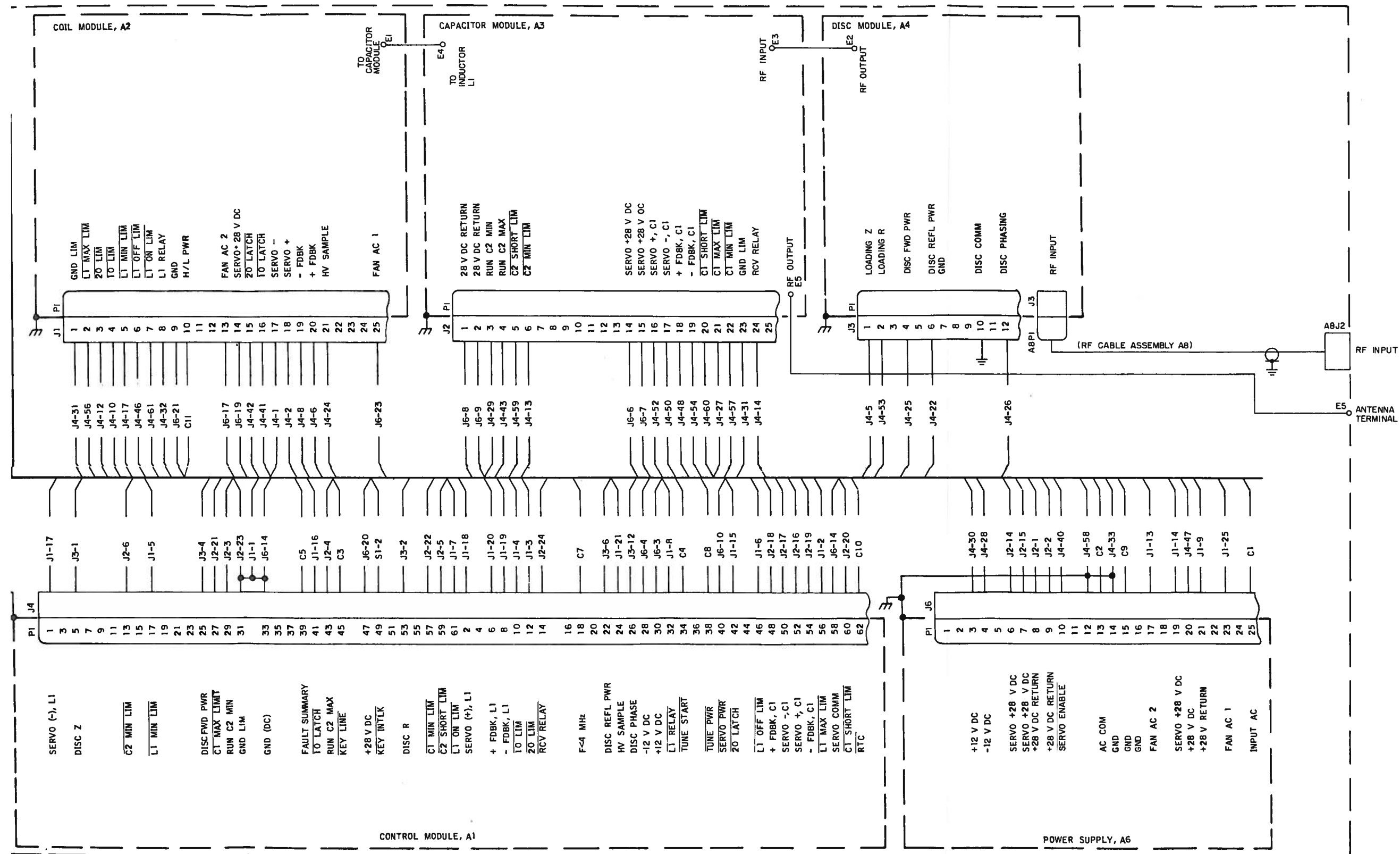
REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
	(This page will contain schematic revision information.)		

**Antenna Coupler Chassis, Schematic Diagram
Figure 1 (Sheet A)**

Table 1: Data Summary

Category	Sub-Category	Value 1	Value 2
A	A.1	100	200
A	A.2	150	300
B	B.1	200	400
B	B.2	250	500
C	C.1	300	600
C	C.2	350	700
D	D.1	400	800
D	D.2	450	900
E	E.1	500	1000
E	E.2	550	1100
F	F.1	600	1200
F	F.2	650	1300
G	G.1	700	1400
G	G.2	750	1500





Antenna Coupler Chassis, Schematic Diagram
Figure 1

635-0271

Control Module (642-3278-001)



Rockwell
International

instructions

Printed in USA

Collins Defense Communications

523-0773117-001211

1 June 1983

(642-3278-001)

1. DESCRIPTION

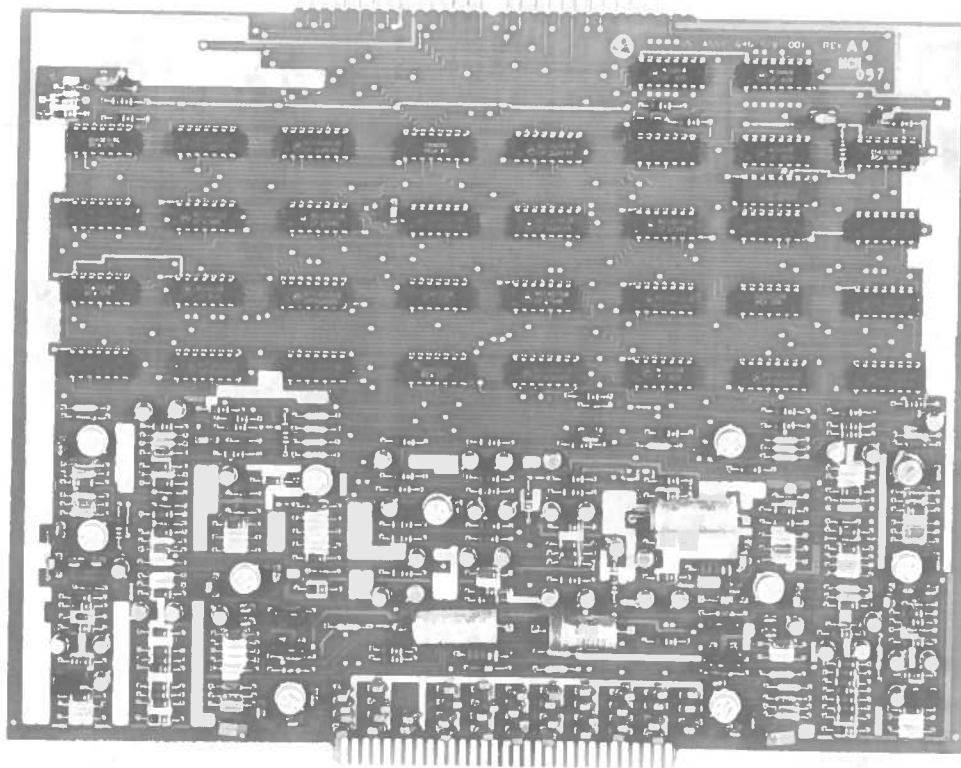
Control Module (642-3278-001), shown in figure 1, is a plug-in module with a 62-pin input/output connector.

The control module is a printed circuit card containing solid-state electronic circuits.

2. PRINCIPLES OF OPERATION

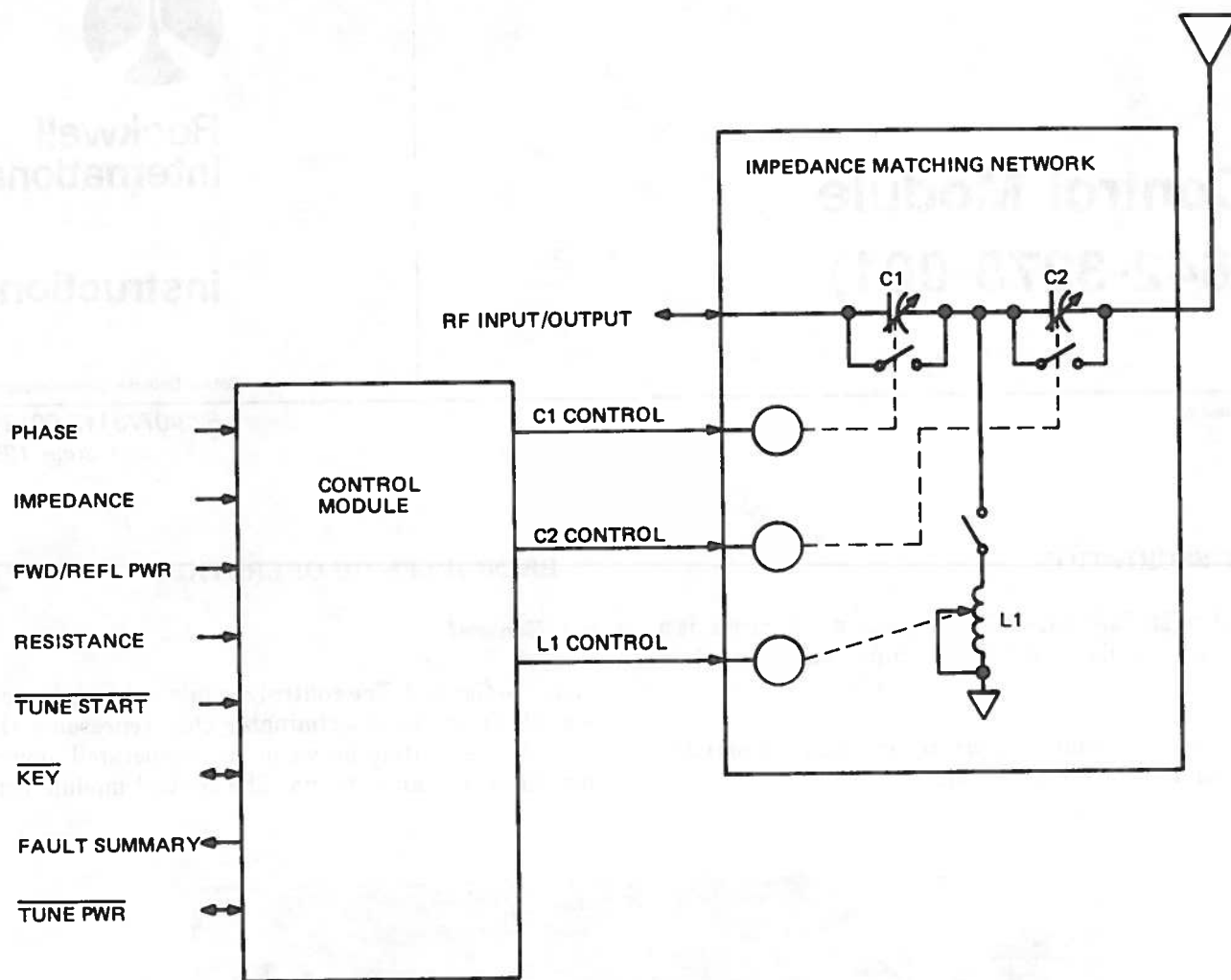
2.1 General

Refer to figure 2. The control module receives control signals from the discriminator that represents the impedance match between an associated power amplifier and an antenna. The control module con-



TPA-4408-017

Control Module
Figure 1



TP5-0949-011

Tune Sequence, Functional Block Diagram
Figure 2

verts these signals (phase, impedance, forward/reflected power, and resistance) to tuning drive signals that tune an impedance matching network. The tuning of the impedance matching components (C1, C2, and L1) are accomplished in a specific sequence. The six steps of the tuning sequence are as follows: home, receive/standby, tune A, tune B, tune C, and operate.

2.2 Functional Theory of Operation

Refer to figure 3 (block diagram) and figure 6 (schematic diagram) during the following discussion of the control module.

2.2.1 Timing and Enabling Circuits

The clock oscillator produces a square-wave output that is used as a master 10-millisecond time refer-

ence for the tune sequence counter and the delay circuits. The advance summary circuit provides an output signal when the tune logic circuits have completed a specific tune step. This output signal is routed through a 100-millisecond delay circuit and enables the tune sequence counter. The tune sequence counter then advances to the appropriate tuning step.

2.2.2 Fault Latch Circuit

The fault latch circuit receives a set input from the 6-second delay circuit if the home, tune A, tune B, or tune C step requires more than 6 seconds to complete. A set input is also applied when the high-voltage sample from the antenna exceeds a safe level. When a set input is received, the fault latch circuit

inhibits (opens) the key interlock circuit, disables the servo power, and inhibits the advance summary signal. The associated power amplifier cannot be keyed. The tuning components (L1, C1, and C2) of the external impedance matching network cannot be tuned. The tune sequence counter cannot advance to the next tuning step. The fault latch circuit is reset when a tune start signal is initiated.

2.2.3 Digital Error Sensors

The digital error sensor circuits receive analog error signals from an external discriminator module. These error signals represent the components of the impedance match between the associated power amplifier and the antenna. The error signals are compared to a reference signal. Depending on the ratio of these two signals, the digital error sensors provide either a logic 1 or a logic 0 output signal. The logic signals are routed to the tune logic circuits.

2.2.4 Servo Amplifiers

The servo amplifiers that drive capacitor C1 and coil L1 amplify the analog discriminator error signals to the level required to drive the servo amplifiers located on external modules. The force maximum and force minimum drive signals bypass the analog amplifiers and cause the output to go to a full positive or negative value.

The servo amplifier that drives capacitor C2 does not amplify analog error signals. The force minimum and force maximum signals cause the output to go to a full positive or negative value.

2.2.5 Coil L1 Relays Latch

Coil L1 (located in an external module) is a physically large inductor that is tuned by a movable tap. Coil shorting relays are used to short the unused portion of the coil. When these relays are deenergized, most of the coil turns are shorted. As the coil is tuned, position switches in the coil module detect the position of the movable tap, and this information is routed to the L1 relays latch circuits. The output of the relays latch circuit energizes the coil shorting relays and removes the short from coil L1. When the tune sequence is in the receive/standby step, the circuit is reset and the coil shorting relays are deenergized.

2.2.6 Tune Power and Key Line Circuits

During tuning, the antenna coupler provides a logic 0 control signal on the tune power control line to the

associated power amplifier. This signal energizes a relay in the power amplifier that places tune power resistors in the rf output circuit. The tune power resistors reduce the output power and provide proper loading of the power amplifier while the antenna coupler is tuning. When the antenna coupler is in the operate mode, the tune power control line is a logic 1. This deenergizes the relay in the power amplifier and removes the tune power resistors from the rf output circuit. The output power of the power amplifier returns to a normal level.

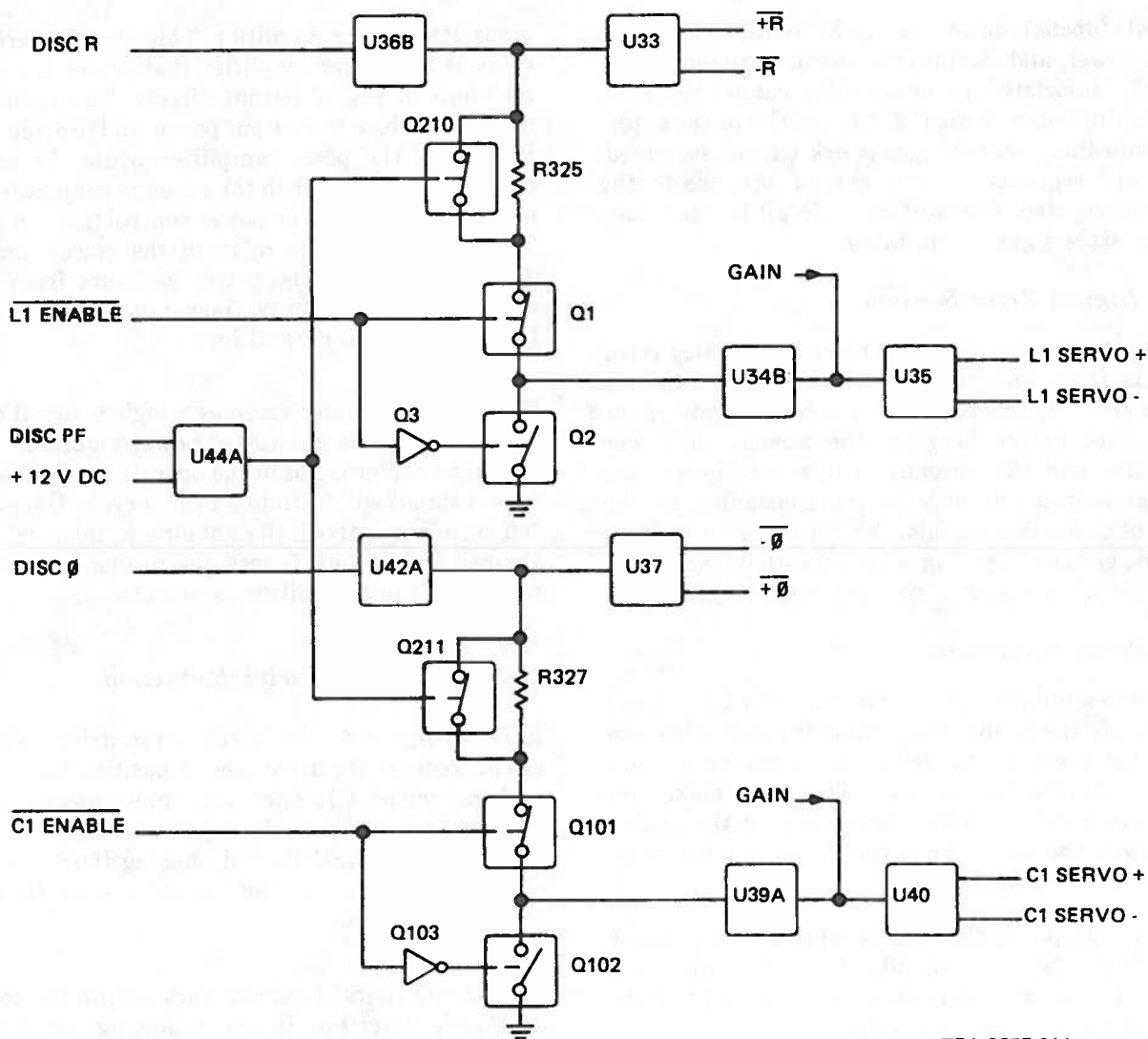
The antenna coupler receives a logic 0 signal on the key line from the associated power amplifier. If the antenna coupler is not in the operate mode, this logic 0 level signal will initiate a tuning cycle. Once a tuning cycle has started, the antenna coupler will latch the key line at logic 0 until the tuning cycle is complete or a fault condition is detected.

2.2.7 L1/C1 Servo Drive Reduction

Refer to figure 4. The L1/C1 servo drive reduction circuit reduces the drive used to position both coil L1 and capacitor C1, once the input power to the antenna coupler exceeds approximately 150 watts. Both loading (DISC R) and phasing (DISC ϕ) error signals are applied to the control module from discriminator module A4.

The loading (DISC R) signal flow within the control module is described in the following paragraphs. Because of the similarity of the loading and phasing signal circuits, the phasing signal is not described.

During normal loading sequence, with forward power input to the coupler below 150 watts (approximately), the following circuit conditions exist within the control module. The forward power input (DISC PF) is such that the output of U44A is a logic 0, which enables Q210; also, the L1 ENABLE signal input to Q1 and Q3 is a logic 0. This logic 0 enables Q1 and will, through Q3, disable Q2. With these conditions set, loading signal input (DISC R) is applied to U36B. The output of U36B is applied to U33 and to the junction of Q210/R325. With Q210 and Q1 enabled, the signal is applied to the input of U34B. The output of U34B is combined with the gain input and applied to U35. The amplitude and polarity of the signal input of U35 determines the level of L1 SERVO (+) and/or L1 SERVO (-) signals applied to coil module A2.



TPA-3677-011

L1/C1 Servo Drive Reduction, Simplified Diagram
Figure 4

When forward power to the coupler exceeds approximately 150 watts, the DISC PF input to the control module results in a logic 1 output from U44A. This logic 1 disables Q210. With Q210 disabled, the loading signal (DISC R) at the junction of Q210/R325 will now be applied through R325, Q1, and U34B to U35. This loading signal input to U35 is reduced by R325. This decreases the output level of L1 SERVO (+) and/or L1 SERVO (-) signal applied to coil module A2. The output level of C1 SERVO (+) and/or C1 SERVO (-) signal applied to capacitor module A3 is decreased in a manner similar to this description.

2.3 Tuning Logic Circuits

Refer to figure 3. The six steps of the tuning sequence are discussed in the following paragraphs.

2.3.1 Home Logic

When a tune start signal is received, the tune sequence counter is reset to the home step. When the antenna coupler is turned on, the power loss detector also resets the tune sequence counter to the home step. The home logic circuit is enabled by the tune

sequence counter. The home logic output is applied to the servo amplifiers that drive capacitors C1 and C2 and coil L1 of the impedance matching network. Capacitors C1 and C2 are forced to the maximum capacitance position and shorted. Coil L1 is forced to minimum inductance and placed off line. When the tuning is complete, the home logic circuit provides an advance command signal to the advance summary circuit. After a 100-millisecond delay, the tune sequence counter advances to the receive/standby step.

2.3.2 Receive/Standby Logic

The receive/standby step is the steady state or at rest position of the tuning process. The rf elements of the impedance matching network are bypassed. When a key signal is received and forward power is detected by the digital error sensor, the receive/standby logic circuit provides an advance command signal to the advance summary circuit. After a 100-millisecond delay, the tune sequence counter advances to the tune A step.

2.3.3 Tune A Logic

The tune A logic circuit receives forward power, phase, and impedance logic signals from the digital error sensors.

Note

Negative phase indicates a capacitive component, and positive phase indicates an inductive component. Negative impedance indicates less than 75 ohms, and positive impedance indicates more than 75 ohms.

When the phase signal is positive or the impedance signal is negative, an output signal is provided to capacitor C2 servo amplifier. Capacitor C2 is forced toward minimum capacitance. When the phase signal is negative and the impedance signal is positive, an advance command signal is routed from the tune A logic circuit to the advance summary circuit. After a 100-millisecond delay, the tune sequence counter advances to the tune B step.

2.3.4 Tune B Logic

The tune B logic circuit receives forward power, phase, and resistance logic signals from the digital error sensors.

Note

Negative resistance indicates less than 50 ohms, and positive resistance indicates greater than 50 ohms.

When the phase signal is positive, an output signal is provided to capacitor C2 servo amplifier. Capacitor C2 is forced toward minimum capacitance. When the phase is negative and the resistance is negative, an output signal is provided to coil L1 servo amplifier. Coil L1 is placed on line and tuned toward maximum inductance. When the phase signal is negative and the resistance signal is positive, an advance command signal is routed from the tune B logic circuit to the advance summary circuit. After a 100-millisecond delay, the tune sequence counter advances to the tune C step.

2.3.5 Tune C Logic

Due to the high-speed tuning of coil L1 during tune step B, the coil tunes past the desired tuning point. The tune C1 logic circuit compensates for this action. The tune C1 logic circuit receives forward power and impedance logic signals from the digital error sensors. When the impedance is positive, an output signal is provided to coil L1 servo amplifier. Coil L1 is tuned toward minimum until the impedance is negative. When this occurs, the logic advances to the tune C2 step.

The tune C2 logic circuits receive phase, resistance, forward power, and vswr logic signals from the digital error sensors.

Note

An impedance match is obtained when the resistive component is 50 ohms and the phase is zero. This represents a vswr of 1:3 to 1 or lower.

The output of the tune C2 logic circuit allows capacitor C1 and coil L1 to be tuned by analog phase and resistance error signals. If either C1 or L1 is driven past the end limit, the appropriate servo amplifier is disabled. If capacitor C1 is at the maximum capacitance position and the phase signal is negative or coil L1 is at the minimum position and the resistance signal is positive, both C1 and L1 servo amplifiers are disabled. Capacitor C2 is tuned toward minimum until the phase and resistance signals change. Then, servo tuning of capacitor C1 or coil L1 is enabled.

When a low vswr signal is detected, a 1-second delay is energized that enables capacitor C1 and coil L1 to continue tuning. After the 1-second delay has expired, an advance command signal is routed to the advance summary circuit. After a 100-millisecond delay, the tune sequence counter advances to the operate step.

2.3.6 Operate Logic

In the operate mode, the antenna coupler is tuned to the desired signal and the impedance is matched between the associated power amplifier and the antenna.

The operate logic circuit receives a vswr logic signal from the digital error sensor. When a high vswr signal is detected and sustained for 1 second, the servo amplifiers for capacitor C1 and coil L1 are enabled. The servo amplifiers will servo tune the components for one-half second to lower the vswr.

3. TESTING/TROUBLESHOOTING PROCEDURES

A defective control module can be returned to a Collins Defense Communications authorized repair facility for repair. For information and instructions, contact the nearest office or

Collins Defense Communications
Attention: HF Products
350 Collins Road NE
Cedar Rapids, Iowa 52498

4. ALIGNMENT/ADJUSTMENT

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

5. REPAIR

Repair of the control module is accomplished using standard shop practices and circuit card repair procedures.

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>
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
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

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
13499	ROCKWELL INTERNATIONAL CORPORATION DEFENSE ELECTRONICS OPERATIONS COLLINS DEFENSE COMMUNICATIONS DIV 350 COLLINS ROAD NE CEDAR RAPIDS IA 52498
14655	CORNELL-DUBILIER ELECTRONICS DIV OF FEDERAL PACIFIC ELECTRIC CO GOVT CONTRACTS DEPT 150 AVE L NEWARK NJ 07101
22229	SOLITRON DEVICES INC SEMICONDUCTOR GROUP SAN DIEGO OPERS 8808 BALBOA AVE SAN DIEGO CA 92123
27014	NATIONAL SEMICONDUCTOR CORP 2900 SEMICONDUCTOR DR SANTA CLARA CA 95051
31019	SOLID STATE SCIENTIFIC INC COMMERCE DR MONTGOMERYVILLE PA 18936
31433	UNION CARBIDE CORP ELECTRONICS DIV HWY 276 SE P O BOX 5928 GREENVILLE SC 29606
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
81349	MILITARY SPECIFICATIONS

6.5 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Control module	642-3278-001	REV D

Control Module (646-5781-001)



Rockwell
International

instructions

Collins Defense Communications

523-0771620-004211

4th Edition, 1 June 1983

Printed in USA

(646-5781-001)

1. DESCRIPTION

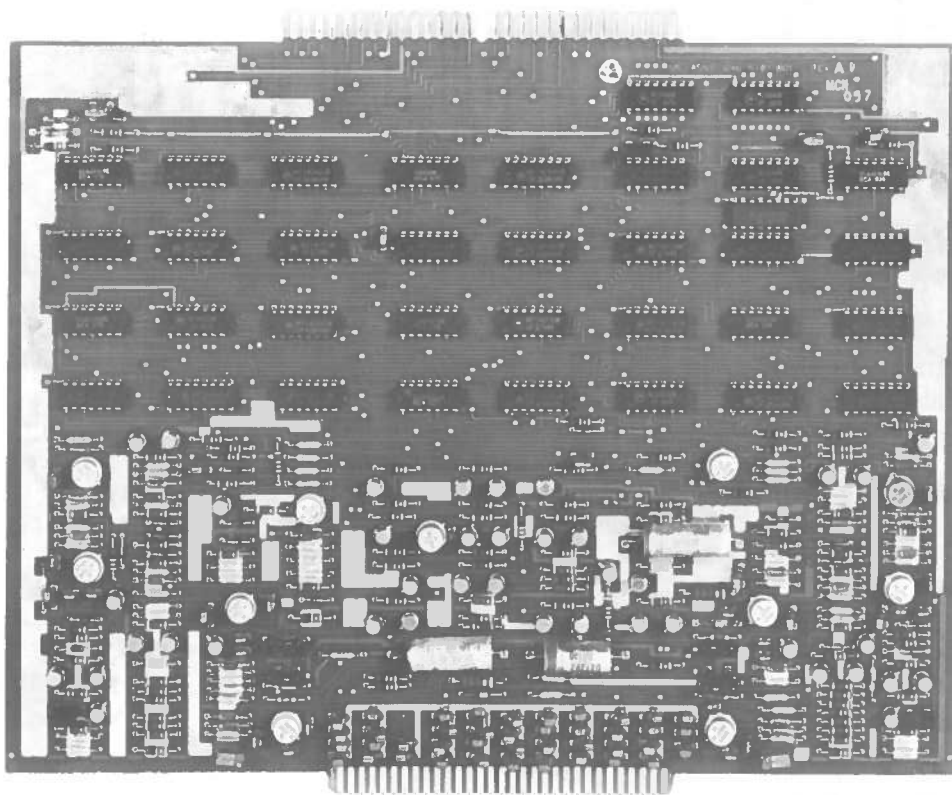
Control Module (646-5781-001), shown in figure 1, is a plug-in module with a 62-pin input/output connector.

The control module is a printed circuit card containing solid-state electronic circuits.

2. PRINCIPLES OF OPERATION

2.1 General

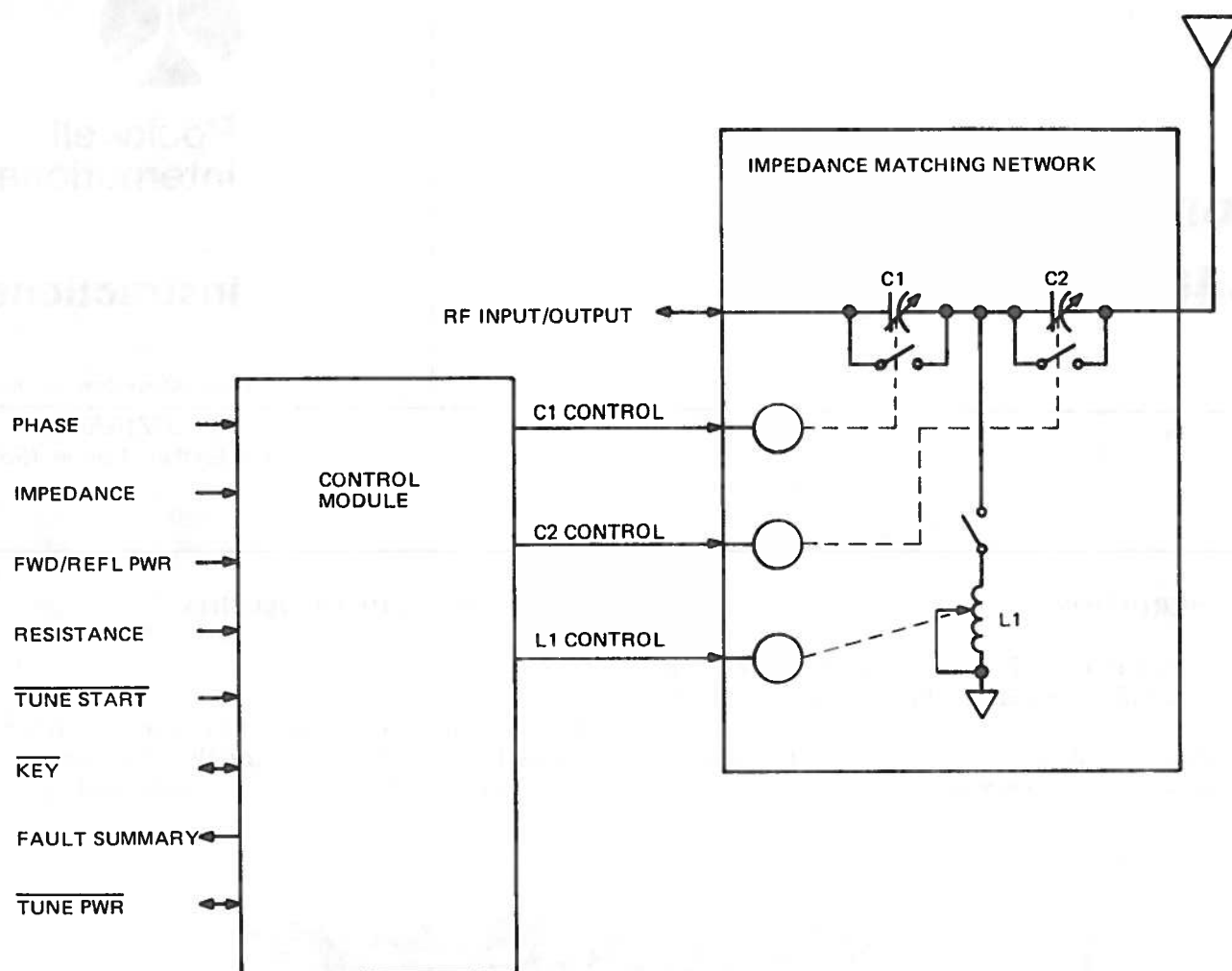
Refer to figure 2. The control module receives control signals from the discriminator that represents the impedance match between an associated power



TPA-4408-017

Control Module
Figure 1

NOTICE: This section replaces third edition dated 1 January 1982.



TP5-0949-011

Tune Sequence, Functional Block Diagram
Figure 2

amplifier and an antenna. The control module converts these signals (phase, impedance, forward/reflected power, and resistance) to tuning drive signals that tune an impedance matching network. The tuning of the impedance matching components (C1, C2, and L1) are accomplished in a specific sequence. The six steps of the tuning sequence are as follows: home, receive/standby, tune A, tune B, tune C, and operate.

2.2 Functional Theory of Operation

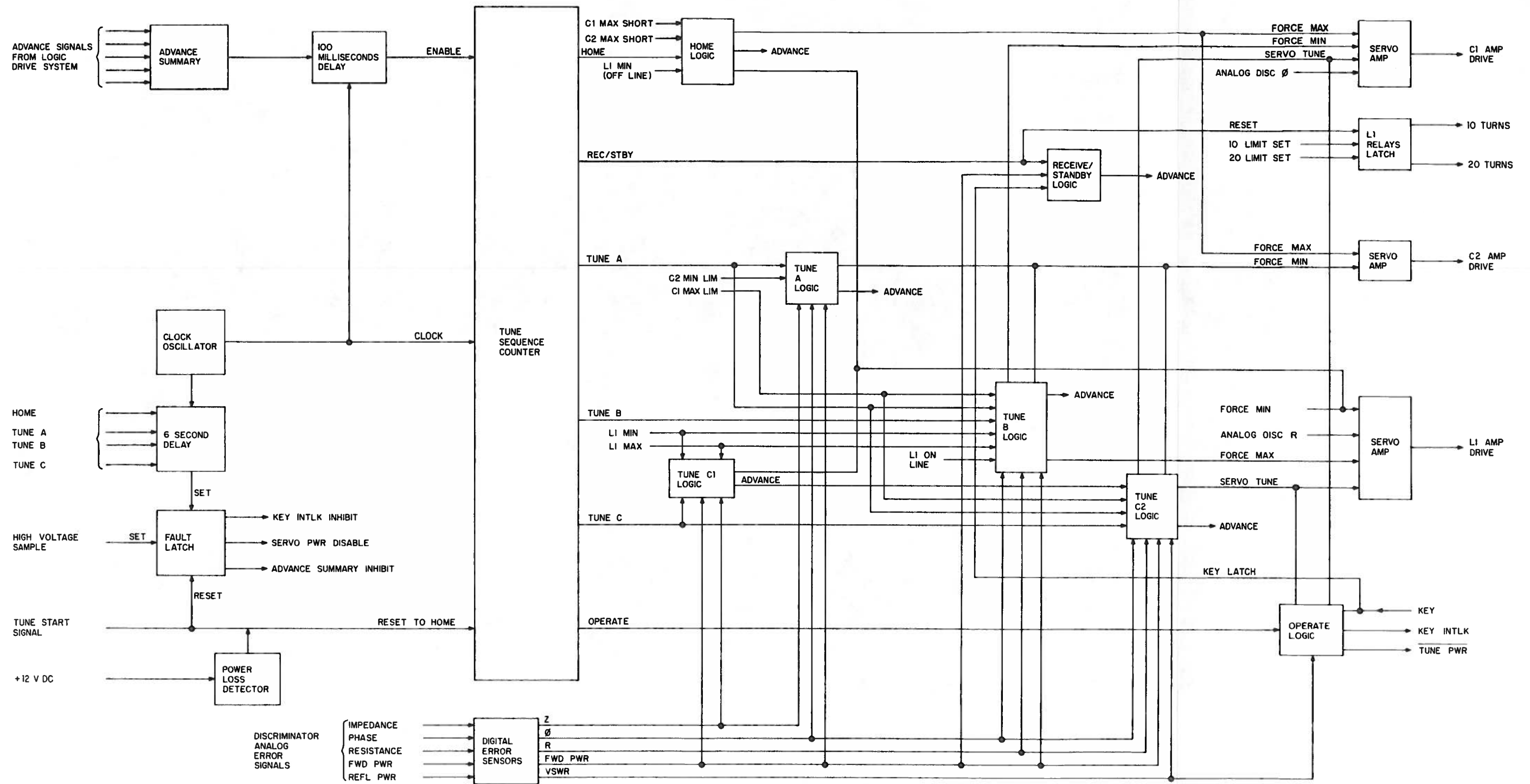
Refer to figure 3 (block diagram) and figure 6 (schematic diagram) during the following discussion of the control module.

2.2.1 Timing and Enabling Circuits

The clock oscillator produces a square-wave output that is used as a master 10-millisecond time reference for the tune sequence counter and the delay circuits. The advance summary circuit provides an output signal when the tune logic circuits have completed a specific tune step. This output signal is routed through a 100-millisecond delay circuit and enables the tune sequence counter. The tune sequence counter then advances to the appropriate tuning step.

2.2.2 Fault Latch Circuit

The fault latch circuit receives a set input from the 6-second delay circuit if the home, tune A, tune B, or



TP5-0950-014

Control Module, Block Diagram
Figure 3

tune C step requires more than 6 seconds to complete. A set input is also applied when the high-voltage sample from the antenna exceeds a safe level. When a set input is received, the fault latch circuit inhibits (opens) the key interlock circuit, disables the servo power, and inhibits the advance summary signal. The associated power amplifier cannot be keyed. The tuning components (L1, C1, and C2) of the external impedance matching network cannot be tuned. The tune sequence counter cannot advance to the next tuning step. The fault latch circuit is reset when a tune start signal is initiated.

2.2.3 Digital Error Sensors

The digital error sensor circuits receive analog error signals from an external discriminator module. These error signals represent the components of the impedance match between the associated power amplifier and the antenna. The error signals are compared to a reference signal. Depending on the ratio of these two signals, the digital error sensors provide either a logic 1 or a logic 0 output signal. The logic signals are routed to the tune logic circuits.

2.2.4 Servo Amplifiers

The servo amplifiers that drive capacitor C1 and coil L1 amplify the analog discriminator error signals to the level required to drive the servo amplifiers located on external modules. The force maximum and force minimum drive signals bypass the analog amplifiers and cause the output to go to a full positive or negative value.

The servo amplifier that drives capacitor C2 does not amplify analog error signals. The force minimum and force maximum signals cause the output to go to a full positive or negative value.

2.2.5 Coil L1 Relays Latch

Coil L1 (located in an external module) is a physically large inductor that is tuned by a movable tap. Coil shorting relays are used to short the unused portion of the coil. When these relays are deenergized, most of the coil turns are shorted. As the coil is tuned, position switches in the coil module detect the position of the movable tap, and this information is routed to the L1 relays latch circuits. The output of the relays latch circuit energizes the coil shorting relays and removes the short from coil L1. When the tune sequence is in the receive/standby step, the circuit is reset and the coil shorting relays are deenergized.

2.2.6 Tune Power and Key Line Circuits

During tuning, the antenna coupler provides a logic 0 control signal on the tune power control line to the associated power amplifier. This signal energizes a relay in the power amplifier that places tune power resistors in the rf output circuit. The tune power resistors reduce the output power and provide proper loading of the power amplifier while the antenna coupler is tuning. When the antenna coupler is in the operate mode, the tune power control line is a logic 1. This deenergizes the relay in the power amplifier and removes the tune power resistors from the rf output circuit. The output power of the power amplifier returns to a normal level.

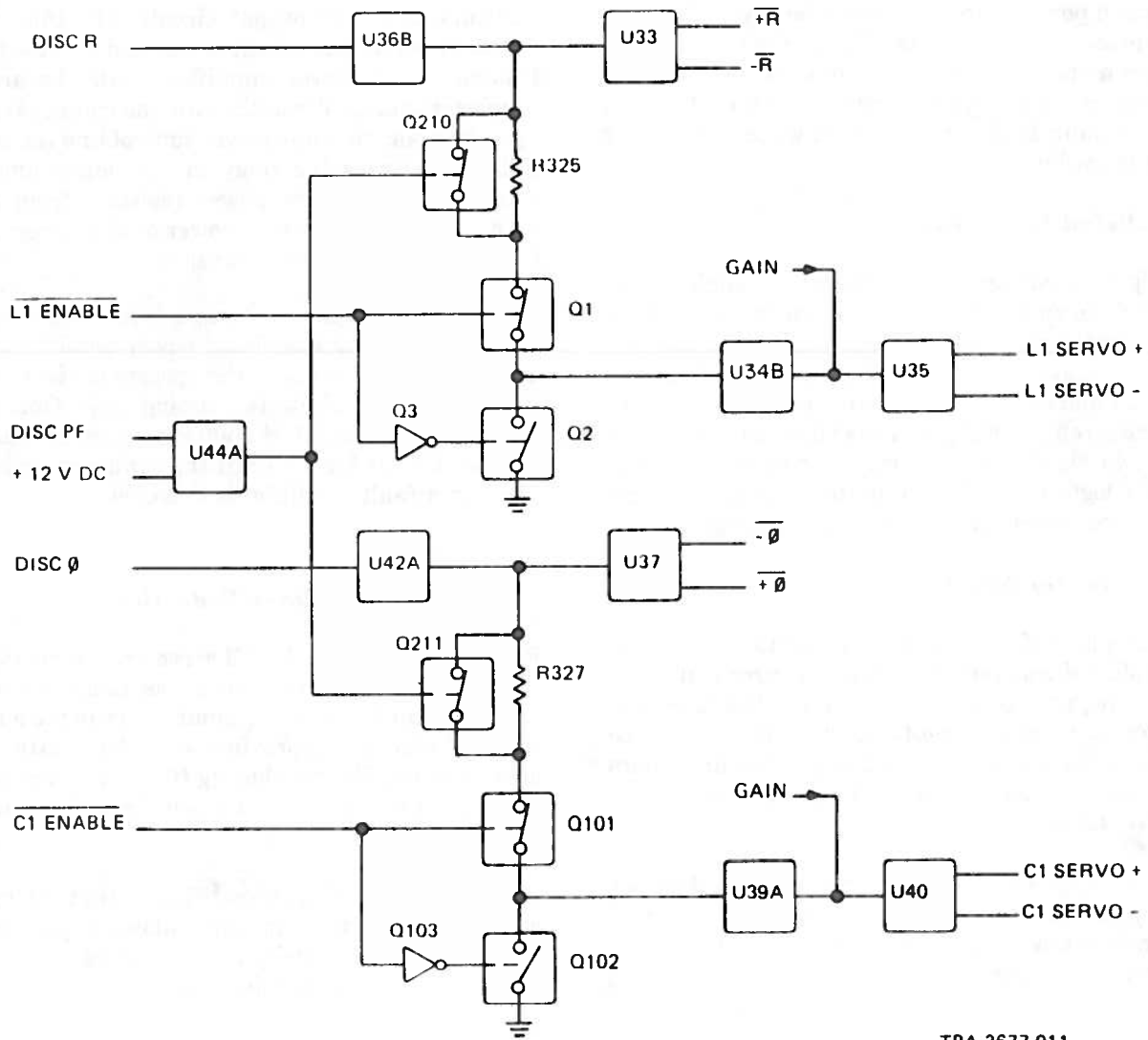
The antenna coupler receives a logic 0 signal on the key line from the associated power amplifier. If the antenna coupler is not in the operate mode, this logic 0 level signal will initiate a tuning cycle. Once a tuning cycle has started, the antenna coupler will latch the key line at logic 0 until the tuning cycle is complete or a fault condition is detected.

2.2.7 L1/C1 Servo Drive Reduction

Refer to figure 4. The L1/C1 servo drive reduction circuit reduces the drive used to position both coil L1 and capacitor C1, once the input power to the antenna coupler exceeds approximately 150 watts. Both loading (DISC R) and phasing (DISC ϕ) error signals are applied to the control module from discriminator module A4.

The loading (DISC R) signal flow within the control module is described in the following paragraphs. Because of the similarity of the loading and phasing signal circuits, the phasing signal is not described.

During normal loading sequence, with forward power input to the coupler below 150 watts (approximately), the following circuit conditions exist within control module A1. The forward power input (DISC PF) is such that the output of U44A is a logic 0, which enables Q210; also, the L1 ENABLE signal input to Q1 and Q3 is a logic 0. This logic 0 enables Q1 and will, through Q3, disable Q2. With these conditions set, loading signal input (DISC R) is applied to U36B. The output of U36B is applied to U33 and to the junction of Q210/R325. With Q210 and Q1 enabled, the signal is applied to the input of U34B. The output of U34B is combined with the gain input and applied to U35. The amplitude and polarity of the signal input to U35



TPA 3677 011

L1/C1 Servo Drive Reduction,
Simplified Diagram
Figure 4

determines the level of L1 SERVO (+) and/or L1 SERVO (-) signals applied to coil module A2.

When forward power to the coupler exceeds approximately 150 watts, the DISC PF input to control module A1 results in a logic 1 output from U44A. This logic 1 disables Q210. With Q210 disabled, the loading signal (DISC R) at the junction of Q210/R325 will now be applied through R325, Q1, and U34B to U35. This loading signal input to U35 is reduced by R325. This decreases the output level of L1 SERVO (+) and/or L1 SERVO (-) signal applied to coil module A2. The output level of C1 SERVO (+) and/or C1 SERVO (-) signal applied to capacitor module A3 is decreased in a manner similar to this description.

2.2.8 Key Interlock Delay

Refer to figure 5. The control module has an interlock delay circuit that delays the key interlock signal 200 milliseconds at the start of the TUNE B step of the coupler tuning sequence.

An OPERATE signal is applied to U29C, inverted, and applied to U24D. The other input to U24D is a 200 millisecond delayed TUNE B signal from U45. With both the OPERATE and delayed TUNE B signals applied, U24D outputs a logic 0. This logic 0 is inverted by U26F and applied to Q17 as a logic 1. With a logic 1 input, Q17 outputs a logic 0 key interlock signal to coil module A2.

2.3 Tuning Logic Circuits

Refer to figure 3. The six steps of the tuning sequence are discussed in the following paragraphs.

2.3.1 Home Logic

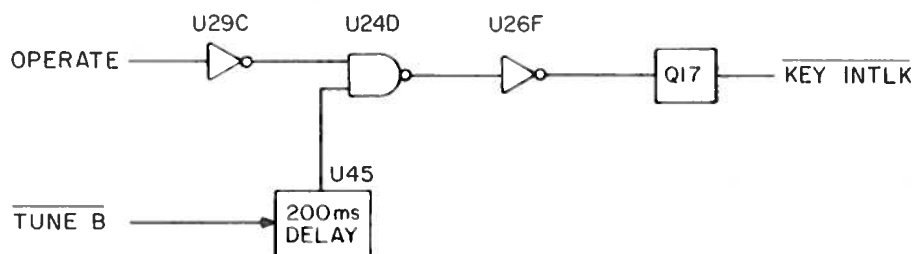
When a tune start signal is received, the tune sequence counter is reset to the home step. When the antenna coupler is turned on, the power loss detector also resets the tune sequence counter to the home step. The home logic circuit is enabled by the tune sequence counter. The home logic output is applied to the servo amplifiers that drive capacitors C1 and C2 and coil L1 of the impedance matching network. Capacitors C1 and C2 are forced to the maximum capacitance position and shorted. Coil L1 is forced to minimum inductance and placed off line. When the tuning is complete, the home logic circuit provides an advance command signal to the advance summary circuit. After a 100-millisecond delay, the tune sequence counter advances to the receive/standby step.

2.3.2 Receive/Standby Logic

The receive/standby step is the steady state or at rest position of the tuning process. The rf elements of the impedance matching network are bypassed. When a key signal is received and forward power is detected by the digital error sensor, the receive/standby logic circuit provides an advance command signal to the advance summary circuit. After a 100-millisecond delay, the tune sequence counter advances to the tune A step.

2.3.3 Tune A Logic

The tune A logic circuit receives forward power, phase, and impedance logic signals from the digital error sensors.



TPA -3678 -011

Key Interlock Delay,
Simplified Diagram
Figure 5

Note

Negative phase indicates a capacitive component, and positive phase indicates an inductive component. Negative impedance indicates less than 75 ohms, and positive impedance indicates more than 75 ohms.

When the phase signal is positive or the impedance signal is negative, an output signal is provided to capacitor C2 servo amplifier. Capacitor C2 is forced toward minimum capacitance. When the phase signal is negative and the impedance signal is positive, an advance command signal is routed from the tune A logic circuit to the advance summary circuit. After a 100-millisecond delay, the tune sequence counter advances to the tune B step.

2.3.4 Tune B Logic

The tune B logic circuit receives forward power, phase, and resistance logic signals from the digital error sensors.

Note

Negative resistance indicates less than 50 ohms, and positive resistance indicates greater than 50 ohms.

When the phase signal is positive, an output signal is provided to capacitor C2 servo amplifier. Capacitor C2 is forced toward minimum capacitance. When the phase is negative and the resistance is negative, an output signal is provided to coil L1 servo amplifier. Coil L1 is placed on line and tuned toward maximum inductance. When the phase signal is negative and the resistance signal is positive, an advance command signal is routed from the tune B logic circuit to the advance summary circuit. After a 100-millisecond delay, the tune sequence counter advances to the tune C step.

2.3.5 Tune C Logic

Due to the high-speed tuning of coil L1 during tune step B, the coil tunes past the desired tuning point. The tune C1 logic circuit compensates for this action. The tune C1 logic circuit receives forward power and impedance logic signals from the digital error sensors. When the impedance is positive, an output signal is provided to coil L1 servo amplifier. Coil L1 is tuned toward minimum until the impedance is negative. When this occurs, the logic advances to the tune C2 step.

The tune C2 logic circuits receive phase, resistance, forward power, and vswr logic signals from the digital error sensors.

Note

An impedance match is obtained when the resistive component is 50 ohms and the phase is zero. This represents a vswr of 1.3 to 1 or lower.

The output of the tune C2 logic circuit allows capacitor C1 and coil L1 to be tuned by analog phase and resistance error signals. If either C1 or L1 is driven past the end limit, the appropriate servo amplifier is disabled. If capacitor C1 is at the maximum capacitance position and the phase signal is negative or coil L1 is at the minimum position and the resistance signal is positive, both C1 and L1 servo amplifiers are disabled. Capacitor C2 is tuned toward minimum until the phase and resistance signals change. Then, servo tuning of capacitor C1 or coil L1 is enabled.

When a low vswr signal is detected, a 1-second delay is energized that enables capacitor C1 and coil L1 to continue tuning. After the 1-second delay has expired, an advance command signal is routed to the advance summary circuit. After a 100-millisecond delay, the tune sequence counter advances to the operate step.

2.3.6 Operate Logic

In the operate mode, the antenna coupler is tuned to the desired signal and the impedance is matched between the associated power amplifier and the antenna.

The operate logic circuit receives a vswr logic signal from the digital error sensor. When a high vswr signal is detected and sustained for 1 second, the servo amplifiers for capacitor C1 and coil L1 are enabled. The servo amplifiers will servo tune the components for one-half second to lower the vswr.

3. TESTING/TROUBLESHOOTING PROCEDURES

A defective control module can be returned to a Collins Defense Communications authorized repair facility for repair. For information and instructions, contact the nearest office or

Collins Defense Communications
Attention: HF Products
350 Collins Road NE
Cedar Rapids, Iowa 52498

4. ALIGNMENT/ADJUSTMENT

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

5. REPAIR

Repair of the control module is accomplished using the standard shop practices and circuit card repair procedures.

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
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02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
-------	--

MFR MANUFACTURER'S NAME
CODE AND ADDRESS

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

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

13499 ROCKWELL INTERNATIONAL CORPRATION
DEFENSE ELECTRONICS OPERATIONS
COLLINS DEFENSE COMMUNICATIONS DIV
350 COLLINS ROAD NE
CEDAR RAPIDS IA 52498

14655 CORNELL-DUBILIER ELECTRONICS
DIV OF FEDERAL PACIFIC ELECTRIC CO
GOVT CONTRACTS DEPT
150 AVE L
NEWARK NJ 07101

22229 SOLITRON DEVICES INC
SEMICONDUCTOR GROUP SAN DIEGO OPERS
8808 BALBOA AVE
SAN DIEGO CA 92123

27014 NATIONAL SEMICONDUCTOR CORP
2900 SEMICONDUCTOR DR
SANTA CLARA CA 95051

31019 SOLID STATE SCIENTIFIC INC
COMMERCE DR
MONTGOMERYVILLE PA 18936

31433 UNION CARBIDE CORP
ELECTRONICS DIV
HWY 276 SE
P O BOX 5928
GREENVILLE SC 29606

49956 RAYTHEON CO
EXECUTIVE OFFICES
141 SPRING ST
LEXINGTON MA 02173

56289 SPRAGUE ELECTRIC CO
87 MARSHALL ST
NORTH ADAMS MA 01247

MFR MANUFACTURER'S NAME
CODE AND ADDRESS

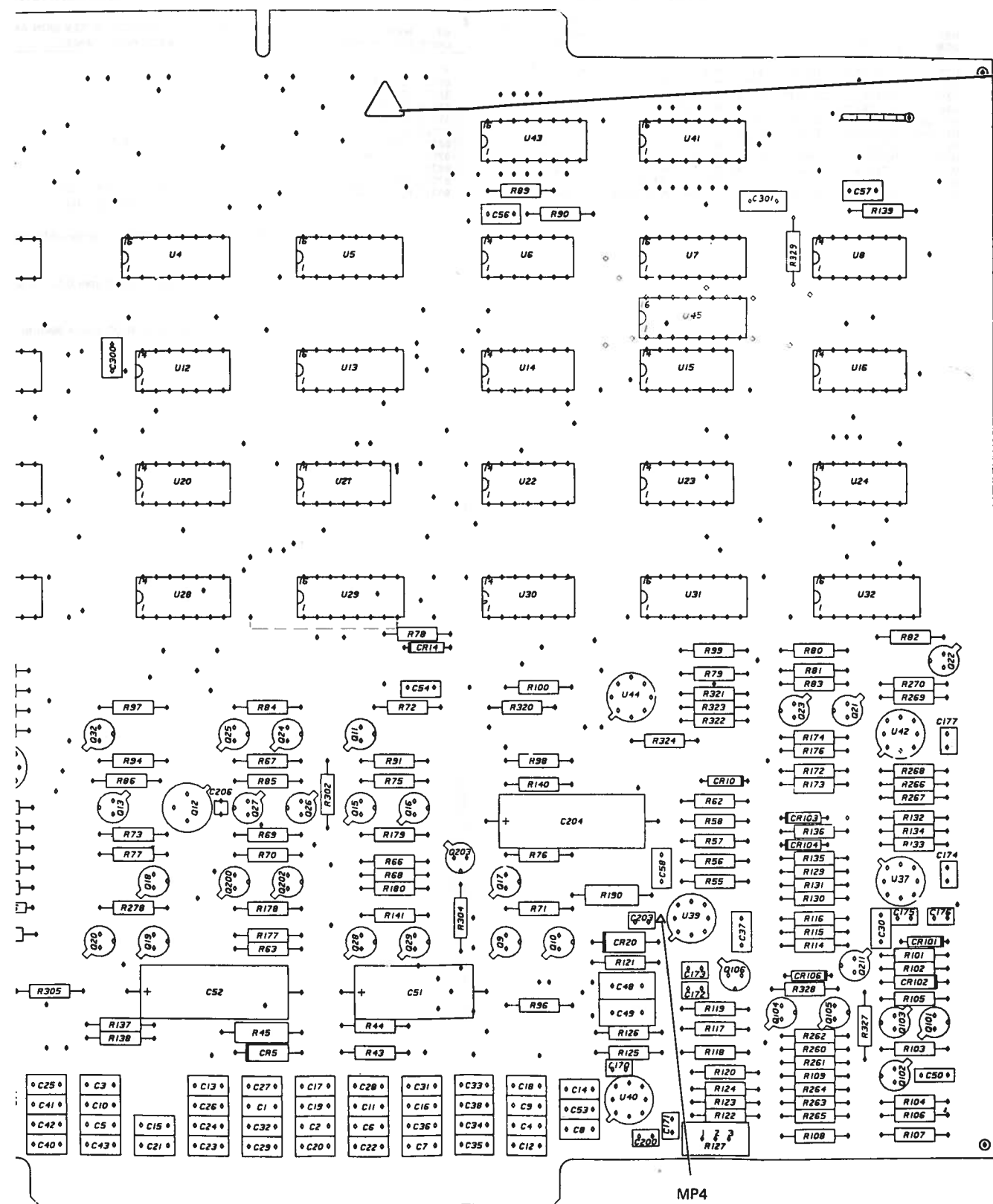
72982 ERIE TECHNOLOGICAL PRODUCTS INC
645 W 11TH ST
ERIE PA 16512

81349 MILITARY SPECIFICATIONS

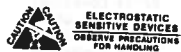
6.5 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Control Module	646-5781-001	REV G



MP1



TPA-4414-018

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	CONTROL MODULE (ESDS)	646-5781-001			646-5781-001
CR1	SEMICONV DEVICE	353-3644-010			31433 1M4454-1
CR2	SEMICONV DEVICE	353-2985-000			81349 JAN1N758A1
CR3,CR4	SEMICONV DEVICE	353-3644-010			31433 1M4454-1
CR5	SEMICONV DEVICE	353-2938-000			12954 1N746A
CR6-CR10	SEMICONV DEVICE (A2)	353-3644-010			31433 1M4454-1
CR11	SEMICONV DEVICE	353-3644-010			31433 1M4454-1
CR12	SEMICONV DEVICE	353-3644-010			31433 1M4454-1
CR14	NOT USED				
CR15	NOT USED				
CR19	NOT USED				
CR20	SEMICONV DEVICE	353-2938-000			12954 1N746A
CR21	SEMICONV DEVICE	353-3591-490			04713 1M4625
CR22	NOT USED				
CR100	NOT USED				
CR101	SEMICONV DEVICE	353-3644-010			31433 1M4454-1
CR102	SEMICONV DEVICE	353-2985-000			81349 JAN1N758A1
CR103	SEMICONV DEVICE	353-3644-010			31433 1M4454-1
CR106	NOT USED				
C1-C44	CAPACITOR, FIXED CER DIEI, 0.1UF, 20%, 50V	913-3279-200			72982 8131 M050 Z5U 10 4M
C45	CAPACITOR, FIXED CER DIEI, 0.22UF, 20%, 50VDC	913-5019-800			81349 CK06BX224M
C46-C49	CAPACITOR, FIXED MICA DIEI, 470PF, 5%, 500V	912-2864-000			14655 C015FD471J03
C50	CAPACITOR, FIXED CER DIEI, 0.22UF, 20%, 50VDC	913-5019-800			81349 CK06BX224M
C51	CAPACITOR, FXD ELCTLT, 10UF, P100ZM10%, 25VDC	183-1364-000			56289 D27282
C52	CAPACITOR, FXD ELCTLT, 100UF, P75ZM10%, 20V	183-1277-180			56289 600D10760200D5
C53	CAPACITOR, FIXED CER DIEI, 0.1UF, 20%, 50V	913-3279-200			72982 8131 M050 Z5U 10 4M
C54	CAPACITOR, FIXED CER DIEI, 0.47UF, 20%, 50V	913-3279-250			72982 8131 M050 Z5U 47 4M
C55	NOT USED				
C56	CAPACITOR, FIXED CER DIEI, 0.1UF, 10%, 100VDC	913-5019-440			81349 CK06BX104K
C57	CAPACITOR, FIXED CER DIEI, 0.1UF, 20%, 50V	913-3279-200			72982 8131 M050 Z5U 10 4M
C58	CAPACITOR, FIXED CER DIEI, 0.1UF, 20%, 50V (A2)	913-3279-200			72982 8131 M050 Z5U 10 4M
C58	CAPACITOR, FIXED CER DIEI, 1UF, 20%, 50V	913-3279-270			72982 8131 M050 Z5U 10 5M
C59	CAPACITOR, FIXED CER DIEI, 0.1UF, 20%, 50V	913-3279-200			72982 8131 M050 Z5U 10 4M
C60-C69	NOT USED				
C70-C77	CAPACITOR, FIXED CER DIEI, 0.01UF, 20%, 50V	913-3279-110			72982 8121 M050 Z5U 10 3M
C78-C169	NOT USED				
C170	CAPACITOR, FIXED CER DIEI, 0.01UF, 20%, 50V	913-3279-110			72982 8121 M050 Z5U 10 3M
C177	NOT USED				
C178	NOT USED				
C199	NOT USED				
C200	CAPACITOR, FIXED CER DIEI, 0.01UF, 20%, 50V	913-3279-110			72982 8121 M050 Z5U 10 3M
C203	NOT USED				
C204	CAPACITOR, FXD ELCTLT, 100UF, P75ZM10%, 20V	183-1277-180			56289 600D10760200D5
C205	CAPACITOR, FIXED CER DIEI, 1UF, 20%, 50V (A2)	913-3279-270			72982 8131 M050 Z5U 10 5M
C206	CAPACITOR, FIXED CER DIEI, 1000PF, 20%, 50V	913-3279-030			72982 8101 P050 Z5U 10 2M
C207	NOT USED				
C299	NOT USED				
C300	CAPACITOR, FIXED CER DIEI, 0.1UF, 20%, 50V	913-3279-200			72982 8131 M050 Z5U 10 4M
C301	CAPACITOR, FIXED CER DIEI, 1UF, 20%, 50V	913-3279-270			72982 8131 M050 Z5U 10 5M
C302	CAPACITOR, FIXED CER DIEI, 0.1UF, 10%, 100VDC (A1)(A3)	913-5019-440			81349 CK06BX104K
C302	CAPACITOR, FIXED CER DIEI, 0.01UF, 20%, 50V	913-3279-110			72982 8121 M050 Z5U 10 3M
MP1	LABEL, ES WARNING (ESDS)	280-2745-040			12998 280-2745-040
MP2	HANDLE	757-9241-018			757-9241-018
MP3	CONTACT, ELECTRICAL (QTY 2)(EFF REV LTR C TO REV LTR D)	372-2601-037			372-2601-037
MP3	CONTACT, ELECTRICAL (QTY 3)(EFF REV LTR D TO REV LTR E)	372-2601-037			372-2601-037
MP3	CONTACT, ELECTRICAL (QTY 2)(EFF REV LTR E)	372-2601-037			372-2601-037
MP4	TERMINAL, SPCL (EFF REV LTR E)	797-7253-002			797-7253-002
Q1, Q2	TRANSISTOR (ESDS)	352-0915-030			22229 2N5116
Q3	TRANSISTOR	352-0661-020			49956 2N2222A
Q4, Q5	TRANSISTOR	352-7500-190			81349 JAN2N2907A
Q6	TRANSISTOR (ESDS)	352-0759-020			27014 2N4092
Q7, Q8	NOT USED				
Q9-Q11	TRANSISTOR	352-0661-020			49956 2N2222A
Q12	TRANSISTOR	352-0661-010			49956 2N2219A
Q13-Q32	TRANSISTOR	352-0661-020			49956 2N2222A
Q33-Q100	NOT USED				
Q101	TRANSISTOR (ESDS)	352-0915-030			22229 2N5116
Q102	NOT USED				
Q103	TRANSISTOR	352-0661-020			49956 2N2222A
Q104	TRANSISTOR	352-7500-190			81349 JAN2N2907A
Q105	NOT USED				
Q106	TRANSISTOR (ESDS)	352-0759-020			27014 2N4092
Q107	NOT USED				
Q199	NOT USED				
Q200	TRANSISTOR	352-7500-190			81349 JAN2N2907A

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

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
Q201	NOT USED				
Q202	TRANSISTOR	352-7500-190		81349	JAN2N2907A
Q203	TRANSISTOR	352-0661-020		49956	2N2222A
Q204-Q209	NOT USED				
Q210, Q211	TRANSISTOR (ESDS)	352-0915-030		22229	2N5116
R1	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR076102KS
R2	RESISTOR, FIXED CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR076104KS
R3	RESISTOR, FIXED CHPSN, 3.3K, 10%, 1/4W	745-0767-000		81349	RCR076332KS
R4	RESISTOR, FIXED CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349	RCR076471KS
R5	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS
R6	RESISTOR, FIXED FILM, 19.6K, 1%, 1/8W	705-1058-000		81349	RN5501962F
R7	RESISTOR, FIXED FILM, 5.11K, 1%, 1/8W	705-1030-000		81349	RN5505111F
R8, R9	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS
R10-R13	NOT USED				
R14	RESISTOR, FIXED CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR076472KS
R15	RESISTOR, FIXED FILM, 7.32K, 1%, 1/8W	705-3605-410		81349	RN5507321F
R16	RESISTOR, FIXED FILM, 5.11K, 1%, 1/8W	705-1030-000		81349	RN5505111F
R17, R18	RESISTOR, FIXED FILM, 19.6K, 1%, 1/8W	705-1058-000		81349	RN5501962F
R19	RESISTOR, FIXED FILM, 14.7K, 1%, 1/8W	705-1052-000		81349	RN5501472F
R20	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R21	RESISTOR, FIXED FILM, 147K, 1%, 1/8W	705-1100-000		81349	RN5501473F
R22	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R23, R24	RESISTOR, FIXED FILM, 196K, 1%, 1/8W	705-1106-000		81349	RN5501963F
R25	RESISTOR, FIXED FILM, 147K, 1%, 1/8W	705-1100-000		81349	RN5501473F
R26	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R27	RESISTOR, VARIABLE NONWIRE-WOUND, 20K, 10%, 1/2W	380-1080-280		81349	RJ24CW203
R28	NOT USED				
R29, R30	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R31	RESISTOR, FIXED FILM, 33.2 OHMS, 1%, 1/8W	705-0925-000		81349	RN550332KF
R32, R33	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R34	RESISTOR, FIXED FILM, 33.2 OHMS, 1%, 1/8W	705-0925-000		81349	RN550332KF
R35, R36	RESISTOR, FIXED CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR076472KS
R37, R38	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R39	RESISTOR, FIXED FILM, 82.5K, 1%, 1/8W	705-1088-000		81349	RN5508252F
R40	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R41	RESISTOR, FIXED CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR076472KS
R42	RESISTOR, FIXED CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR076104KS
R43	RESISTOR, FIXED FILM, 4.99K, 1%, 1/8W	705-3605-330		81349	RN5504991F
R44	RESISTOR, FIXED FILM, 5.11K, 1%, 1/8W	705-1030-000		81349	RN5505111F
R45	RESISTOR, FIXED CHPSN, 220 OHMS, 10%, 1/2W	745-1324-000		81349	RCR206221KS
R46, R47	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R48	RESISTOR, FIXED FILM, 205 OHMS, 1%, 1/8W (A2)	705-0963-000		81349	RN5502050F
R49	RESISTOR, FIXED FILM, 110 OHMS, 1%, 1/8W	705-0950-000		81349	RN5501100F
R50	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R51	RESISTOR, FIXED FILM, 1.54K, 1%, 1/8W	705-1005-000		81349	RN5501541F
R52	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R53, R54	RESISTOR, FIXED CHPSN, 2.7K, 10%, 1/4W	745-0764-000		81349	RCR076272KS
R55	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R56	RESISTOR, FIXED FILM, 21.5K, 1%, 1/8W	705-1060-000		81349	RN5502152F
R57	RESISTOR, FIXED FILM, 14.7K, 1%, 1/8W	705-1052-000		81349	RN5501472F
R58	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R59, R63	RESISTOR, FIXED CHPSN, 6.8K, 5%, 1/4W	745-0778-000		81349	RCR076482JS
R64, R65	NOT USED				
R66	RESISTOR, FIXED CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR076472KS
R67-R70	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR076102KS
R71-R77	RESISTOR, FIXED CHPSN, 47K, 10%, 1/4W	745-0809-000		81349	RCR076473KS
R78	RESISTOR, FIXED CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR076104KS
R79, R80	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS
R81-R85	RESISTOR, FIXED CHPSN, 47K, 10%, 1/4W	745-0809-000		81349	RCR076473KS
R86	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS
R87	NOT USED				
R88	RESISTOR, FIXED CHPSN, 47K, 10%, 1/4W	745-0809-000		81349	RCR076473KS
R89, R90	RESISTOR, FIXED CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR076104KS
R91	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS
R92, R93	RESISTOR, FIXED CHPSN, 47K, 10%, 1/4W	745-0809-000		81349	RCR076473KS
R94-R100	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS
R101	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR076102KS
R102	RESISTOR, FIXED CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR076104KS
R103	RESISTOR, FIXED CHPSN, 3.3K, 10%, 1/4W	745-0767-000		81349	RCR076332KS
R104	RESISTOR, FIXED CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349	RCR076471KS
R105	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS
R106	RESISTOR, FIXED FILM, 19.6K, 1%, 1/8W	705-1058-000		81349	RN5501962F
R107	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R108	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS
R109					
R110-R113	NOT USED				
R114	RESISTOR, FIXED CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR076472KS
R115	RESISTOR, FIXED FILM, 7.32K, 1%, 1/8W	705-3605-410		81349	RN5507321F
R116	RESISTOR, FIXED FILM, 5.11K, 1%, 1/8W	705-1030-000		81349	RN5505111F
R117	RESISTOR, FIXED FILM, 19.6K, 1%, 1/8W	705-1058-000		81349	RN5501962F
R118					
R119	RESISTOR, FIXED FILM, 14.7K, 1%, 1/8W	705-1052-000		81349	RN5501472F
R120	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R121	RESISTOR, FIXED FILM, 147K, 1%, 1/8W	705-1100-000		81349	RN5501473F
R122	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R123	RESISTOR, FIXED FILM, 196K, 1%, 1/8W	705-1106-000		81349	RN5501963F
R124					
R125	RESISTOR, FIXED FILM, 147K, 1%, 1/8W	705-1100-000		81349	RN5501473F

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
R126	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R127	RESISTOR, VARIABLE NONWIRE-WOUND, 20K, 10%, 1/2W	380-1080-280		81349	RJ24CW203
R128	NOT USED				
R129, R130	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R131	RESISTOR, FIXED FILM, 33.2 OHMS, 1%, 1/8W	705-0925-000		81349	RN550332RF
R132, R133	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R134	RESISTOR, FIXED FILM, 33.2 OHMS, 1%, 1/8W	705-0925-000		81349	RN550332RF
R135, R136	RESISTOR, FIXED CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR076472KS
R137-R140	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS
R141	RESISTOR, FIXED CHPSN, 47K, 10%, 1/4W	745-0809-000		81349	RCR076473KS
R142-R159	NOT USED				
R160-R165	RESISTOR, FIXED CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR076472KS
R166	RESISTOR, FIXED FILM, 8.25K, 1%, 1/8W	705-1040-000		81349	RN5508251F
R167	RESISTOR, FIXED CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349	RCR076471KS
R168	RESISTOR, FIXED FILM, 14.7K, 1%, 1/8W	705-1052-000		81349	RN5501472F
R169	RESISTOR, FIXED FILM, 7.5K, 1%, 1/8W	705-1038-000		81349	RN5507501F
R170	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R171	RESISTOR, FIXED FILM, 14.7K, 1%, 1/8W	705-1052-000		81349	RN5501472F
R172	RESISTOR, FIXED CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349	RCR076471KS
R173	RESISTOR, FIXED FILM, 14.7K, 1%, 1/8W	705-1052-000		81349	RN5501472F
R174	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R175	NOT USED				
R176	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R177	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS
R178	RESISTOR, FIXED CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR076222KS
R179	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS
R180	RESISTOR, FIXED CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR076222KS
R181	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R182	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS
R183-R189	NOT USED				
R190	RESISTOR, FXD CHPSN, 220 OHMS, 10%, 1/2W	745-1324-000		81349	RCR206221KS
R191-R259	NOT USED				
R260-R265	RESISTOR, FIXED CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR076472KS
R266	RESISTOR, FIXED FILM, 14.7K, 1%, 1/8W	705-1052-000		81349	RN5501472F
R267	RESISTOR, FIXED CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349	RCR076471KS
R268	RESISTOR, FIXED FILM, 14.7K, 1%, 1/8W	705-1052-000		81349	RN5501472F
R269	RESISTOR, FIXED FILM, 7.5K, 1%, 1/8W	705-1038-000		81349	RN5507501F
R270	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R271-R277	NOT USED				
R278	RESISTOR, FIXED CHPSN, 47K, 10%, 1/4W	745-0809-000		81349	RCR076473KS
R279-R299	NOT USED				
R300	RESISTOR, FIXED CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR076104KS
R301					
R302	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR076103KS
R303, R304	RESISTOR, FIXED CHPSN, 47K, 10%, 1/4W	745-0809-000		81349	RCR076473KS
R305	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R306	RESISTOR, FIXED FILM, 19.6K, 1%, 1/8W	705-1058-000		81349	RN5501962F
R307-R319	NOT USED				
R320-R322	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R323	RESISTOR, FXD FILM, 4.99K, 1%, 1/8W (A4)	705-3605-330		81349	RN5504991F
R323	RESISTOR, FIXED FILM, 1.54K, 1%, 1/8W	705-1005-000		81349	RN5501541F
R324	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR076102KS
R325	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	705-3605-430		81349	RN5508061F
R326	RESISTOR, FIXED CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR076104KS
R327	RESISTOR, FXD FILM, 8.06K, 1%, 1/8W	705-3605-430		81349	RN5508061F
R328	RESISTOR, FIXED CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR076104KS
R329	RESISTOR, FIXED CHPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349	RCR076224KS
U1	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-060		02735	CD4023UBE
U2	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-040		31019	SCL4011UBE
U3	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-210		31019	SCL4049UBE
U4	INTEGRATED CIRCUIT ARRAY (ESDS)	351-8187-020		02735	CD4022BE
U5	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-210		31019	SCL4049UBE
U6	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-040		31019	SCL4011UBE
U7	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-240		02735	CD4040BE
U8	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-060		02735	CD4023UBE
U9-U12	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-040		31019	SCL4011UBE
U13	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-210		31019	SCL4049UBE
U14-U16	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-040		31019	SCL4011UBE
U17	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-060		02735	CD4023UBE
U18	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-040		31019	SCL4011UBE
U19	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-210		31019	SCL4049UBE
U20	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-060		02735	CD4023UBE
U21	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-040		31019	SCL4011UBE
U22	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-060		02735	CD4012UBE
U23	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-060		02735	CD4023UBE
U24, U25	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-040		31019	SCL4011UBE
U26	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-210		31019	SCL4049UBE

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR MFR CODE PART NUMBER
R126	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349 RN55D1002F
R127	RESISTOR, VARIABLE NONWIRE-WOUND, 20K, 10%, 1/2W	380-1080-280		81349 RJ24CM203
R128	NOT USED			
R129, R130	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349 RN55D1002F
R131	RESISTOR, FIXED FILM, 33.2 OHMS, 1%, 1/8W	705-0925-000		81349 RN55D33R2F
R132, R133	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349 RN55D1002F
R134	RESISTOR, FIXED FILM, 33.2 OHMS, 1%, 1/8W	705-0925-000		81349 RN55D33R2F
R135, R136	RESISTOR, FIXED CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349 RCR076472KS
R137- R140	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349 RCR076103KS
R141	RESISTOR, FIXED CHPSN, 47K, 10%, 1/4W	745-0809-000		81349 RCR076473KS
R142- R159	NOT USED			
R160- R165	RESISTOR, FIXED CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349 RCR076472KS
R166	RESISTOR, FIXED FILM, 8.25K, 1%, 1/8W	705-1040-000		81349 RN55D08251F
R167	RESISTOR, FIXED CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349 RCR076471KS
R168	RESISTOR, FIXED FILM, 14.7K, 1%, 1/8W	705-1052-000		81349 RN55D1472F
R169	RESISTOR, FIXED FILM, 7.5K, 1%, 1/8W	705-1038-000		81349 RN55D7501F
R170	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349 RN55D1002F
R171	RESISTOR, FIXED FILM, 14.7K, 1%, 1/8W	705-1052-000		81349 RN55D1472F
R172	RESISTOR, FIXED CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349 RCR076471KS
R173	RESISTOR, FIXED FILM, 14.7K, 1%, 1/8W	705-1052-000		81349 RN55D1472F
R174	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349 RN55D1002F
R175	NOT USED			
R176	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349 RN55D1002F
R177	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349 RCR076103KS
R178	RESISTOR, FIXED CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349 RCR076222KS
R179	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349 RCR076103KS
R180	RESISTOR, FIXED CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349 RCR076222KS
R181	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349 RN55D1002F
R182	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349 RCR076103KS
R183- R189	NOT USED			
R190	RESISTOR, FXD CHPSN, 220 OHMS, 10%, 1/2W	745-1324-000		81349 RCR206221KS
R191- R259	NOT USED			
R260- R265	RESISTOR, FIXED CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349 RCR076472KS
R266	RESISTOR, FIXED FILM, 14.7K, 1%, 1/8W	705-1052-000		81349 RN55D1472F
R267	RESISTOR, FIXED CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349 RCR076471KS
R268	RESISTOR, FIXED FILM, 14.7K, 1%, 1/8W	705-1052-000		81349 RN55D1472F
R269	RESISTOR, FIXED FILM, 7.5K, 1%, 1/8W	705-1038-000		81349 RN55D7501F
R270	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349 RN55D1002F
R271- R277	NOT USED			
R278	RESISTOR, FIXED CHPSN, 47K, 10%, 1/4W	745-0809-000		81349 RCR076473KS
R279- R299	NOT USED			
R300, R301	RESISTOR, FIXED CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349 RCR076104KS
R302	RESISTOR, FIXED CHPSN, 10K, 10%, 1/4W	745-0785-000		81349 RCR076103KS
R303, R304	RESISTOR, FIXED CHPSN, 47K, 10%, 1/4W	745-0809-000		81349 RCR076473KS
R305	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349 RN55D1002F
R306	RESISTOR, FIXED FILM, 19.6K, 1%, 1/8W	705-1058-000		81349 RN55D1962F
R307- R319	NOT USED			
R320- R322	RESISTOR, FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349 RN55D1002F
R323	RESISTOR, FXD FILM, 4.99K, 1%, 1/8W (A4)	705-3605-330		81349 RN55D4991F
R323	RESISTOR, FIXED FILM, 1.54K, 1%, 1/8W	705-1005-000		81349 RN55D1541F
R324	RESISTOR, FIXED CHPSN, 1K, 10%, 1/4W	745-0749-000		81349 RCR076102KS
R325	RESISTOR, FXD FILM, 8.06K, 1%, 1/8W	705-3605-430		81349 RN55D8061F
R326	RESISTOR, FIXED CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349 RCR076104KS
R327	RESISTOR, FXD FILM, 8.06K, 1%, 1/8W	705-3605-430		81349 RN55D8061F
R328	RESISTOR, FIXED CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349 RCR076104KS
R329	RESISTOR, FIXED CHPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349 RCR076224KS
U1	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-060		02735 CD4023UBE
U2	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-040		31019 SCL4011UBE
U3	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-210		31019 SCL4049UBE
U4	INTEGRATED CIRCUIT ARRAY (ESDS)	351-8187-020		02735 CD4022BE
U5	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-210		31019 SCL4049UBE
U6	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-040		31019 SCL4011UBE
U7	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-240		02735 CD4040BE
U8	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-060		02735 CD4023UBE
U9-U12	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-040		31019 SCL4011UBE
U13	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-210		31019 SCL4049UBE
U14-U16	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-040		31019 SCL4011UBE
U17	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-060		02735 CD4023UBE
U18	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-040		31019 SCL4011UBE
U19	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-210		31019 SCL4049UBE
U20	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-060		02735 CD4023UBE
U21	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-040		31019 SCL4011UBE
U22	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-050		02735 CD4012UBE
U23	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-060		02735 CD4023UBE
U24, U25	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-040		31019 SCL4011UBE
U26	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-210		31019 SCL4049UBE

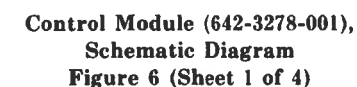
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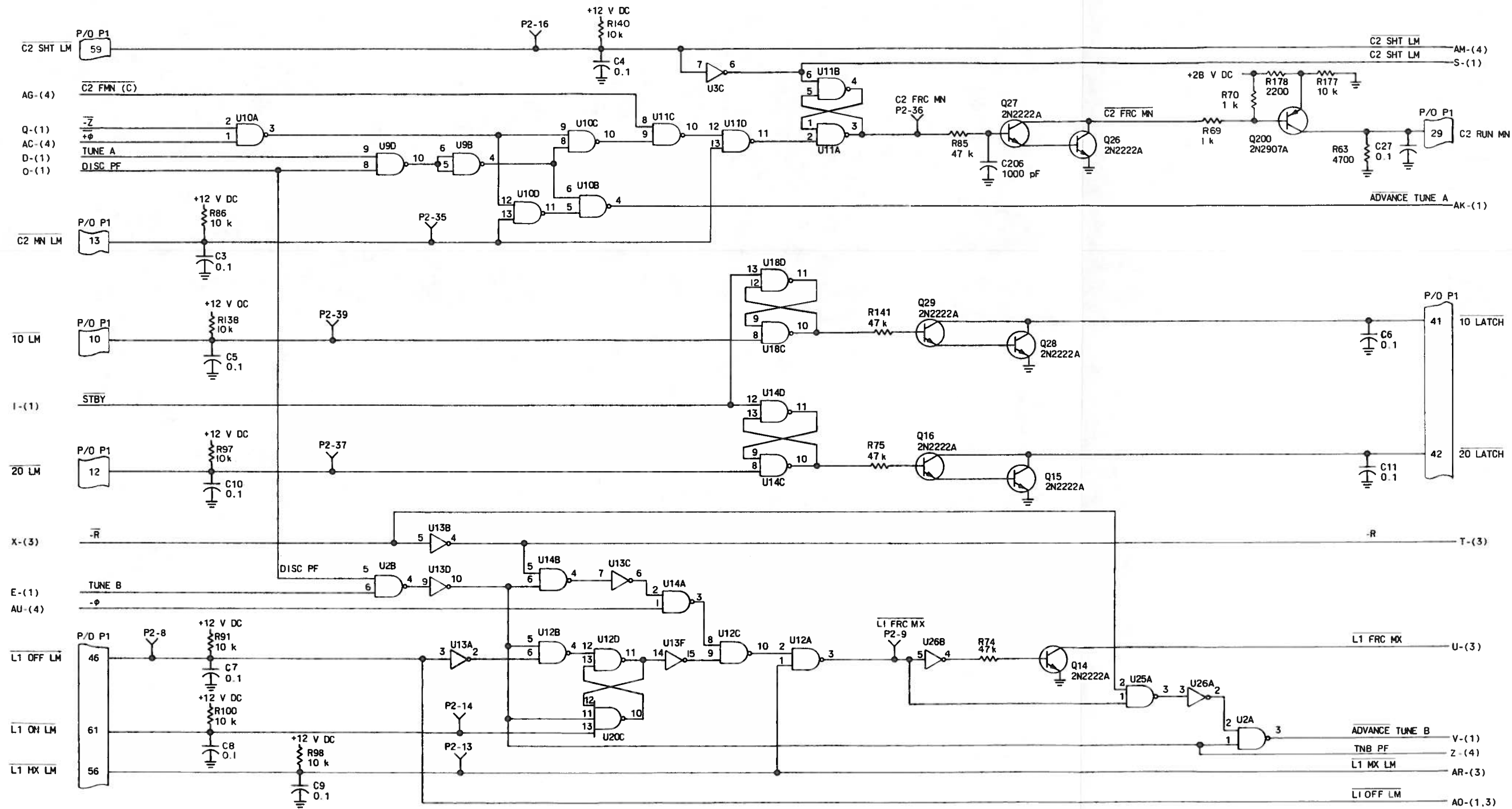
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR MFR CODE PART NUMBER
U27	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-040		31019 SCL4011UBE
U28	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-060		02735 CD4023UBE
U29	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-210		31019 SCL4049UBE
U30	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-040		31019 SCL4011UBE
U31, U32	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-210		31019 SCL4049UBE
U33-U40	INTEGRATED CIRCUIT OPRTNL AMPLIFIER (ESDS)	351-1071-020		07263 UA1558HM
U41	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-240		02735 CD4040BE
U42	INTEGRATED CIRCUIT OPRTNL AMPLIFIER (ESDS)	351-1071-020		07263 UA1558HM
U43	INTEGRATED CIRCUIT DIGITAL MOS (ESDS)	351-8159-240		02735 CD4040BE
U44	INTEGRATED CIRCUIT OPRTNL AMPLIFIER (ESDS)	351-1071-020		07263 UA1558HM
U45	INTEGRATED CIRCUIT DUAL MULTIVIBRATOR (ESDS)	351-8479-010		04713 MC14538BCP

MODIFICATION HISTORY

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A1	Added: C302, 0.1μF	REV C and above
A2	Deleted: CR11, 1N4454 C205, 1μF Changed: C58 from 0.1μF to 1.0μF R48 from 205Ω to 110Ω	REV D and above
NA	Documentation change and/or mechanical changes only.	REV E and above
A3	Changed: C302 from 0.1μF to 0.01μF	REV F and above
A4	Changed: R323 from 4.99kΩ to 1.54kΩ	REV G and an above

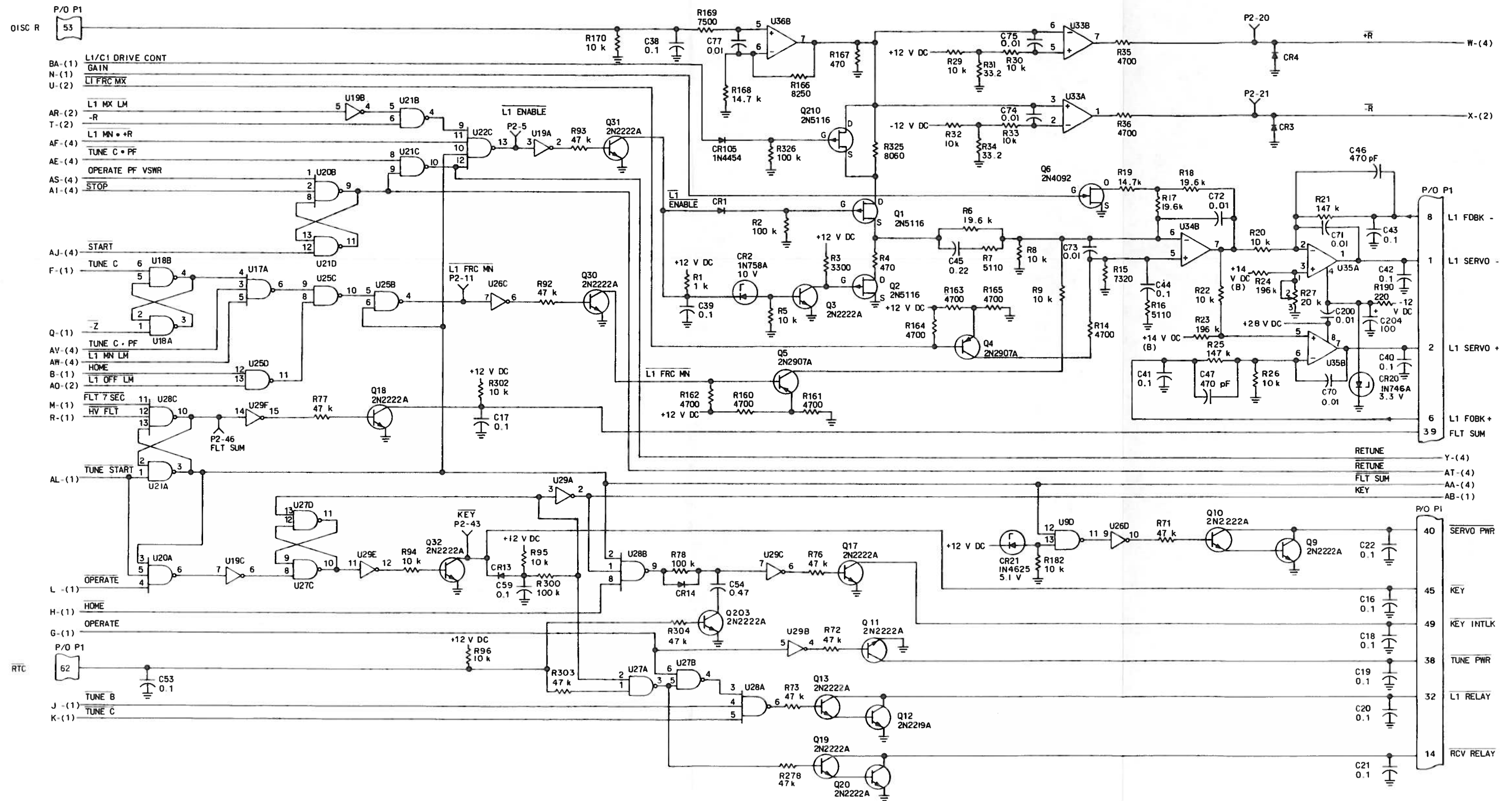
Control Module, Parts Location Diagram
Figure 6 (Sheet 2)



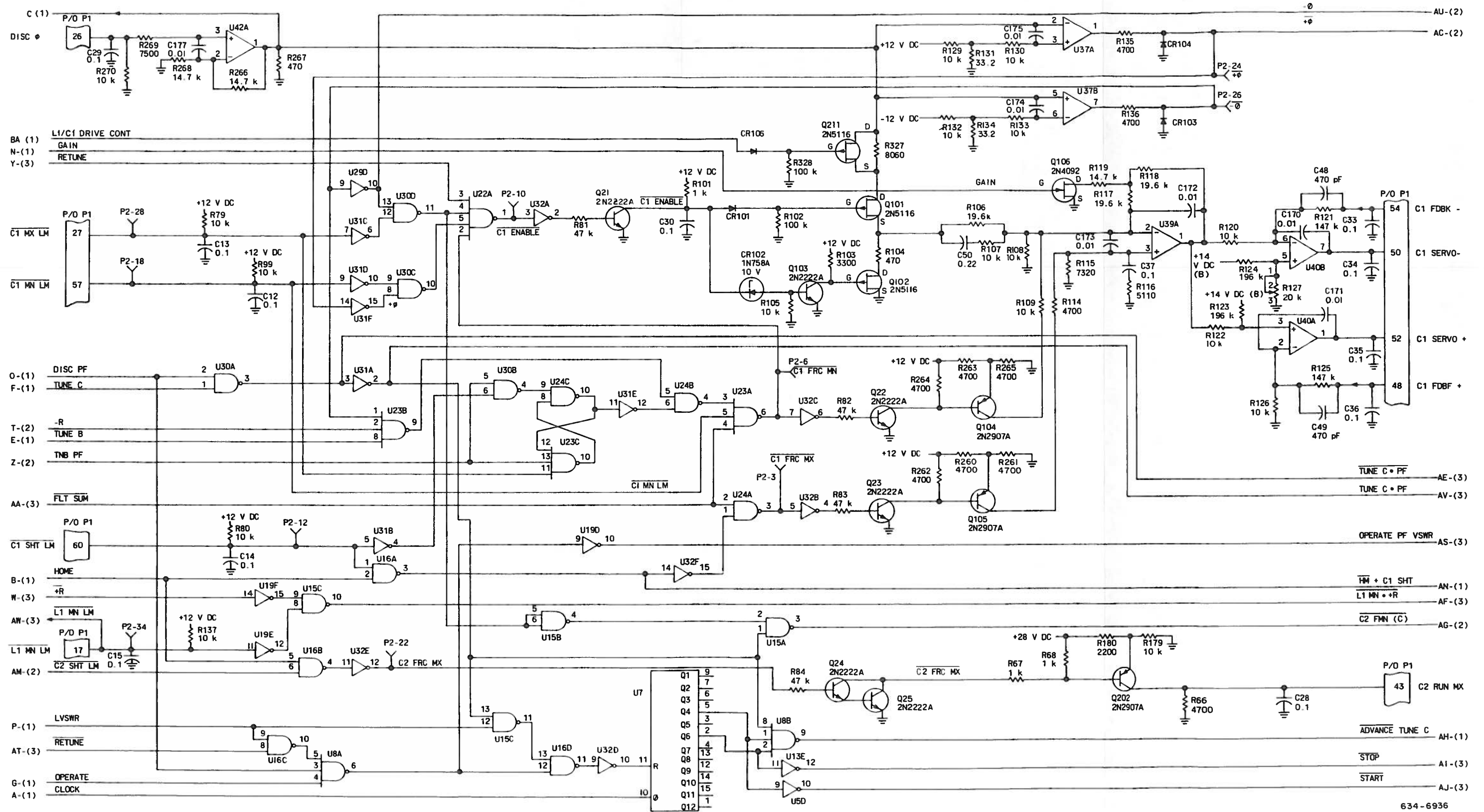


634-6936

Control Module (642-3278-001),
Schematic Diagram
Figure 6 (Sheet 2)



Control Module (642-3278-001),
Schematic Diagram
Figure 6 (Sheet 3)



Control Module, Schematic Diagram
Figure 7 (Sheet 4)



**Rockwell
International**

instructions

Collins Defense Communications

523-0767698-004211
4th Edition, 1 June 1983

(635-4720-001)

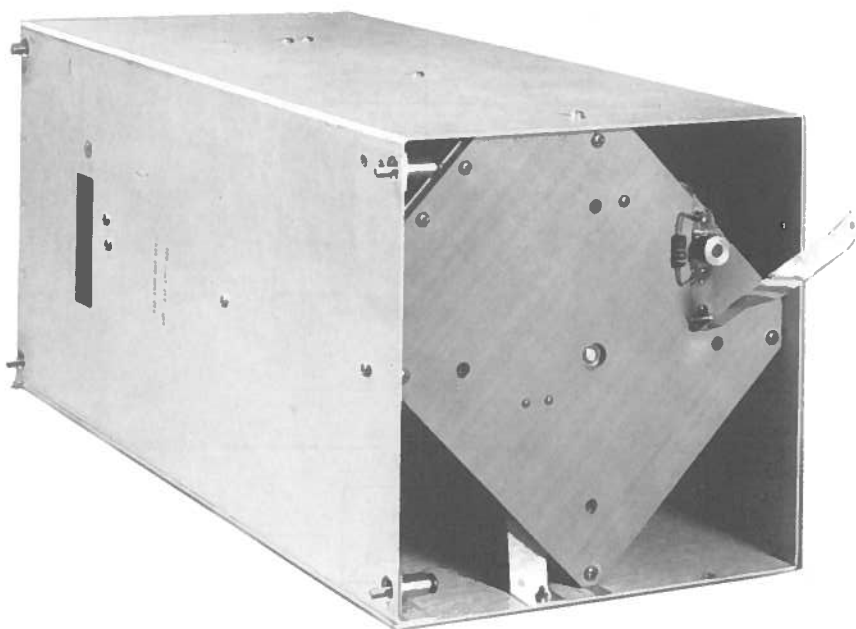
Coil Module (635-4720-001)

Printed in USA

I. DESCRIPTION

Coil Module (635-4720-001), shown in figure 1, is a plug-in module with a 25-pin input/output connector.

The coil module consists of a servo mechanism that controls a variable inductor, a blower motor, positioning switches, and relays.



TP3-1896-017

**Coil Module
Figure 1**

NOTICE: This section replaces third edition dated 1 January 1982.

2. PRINCIPLES OF OPERATION

2.1 General

The coil module is the inductive component of an impedance matching network. Variable inductor L1 is controlled by a servo mechanism. Refer to figure 2 (block diagram) and figure 4 (schematic diagram) during the following discussion.

2.2 Coil Shorting Relays

Relays K1, K2, and K3 prevent coil resonance by shorting out the unused portion of the coil. When all three relays are deenergized, most of the coil (inductor L1) turns are shorted. When the inductor is tuned, position switches S1 and S3 route information to a control module. The control module combines this positioning information with tuning logic and provides a logic 0 level signal to P1-15 and P1-16. When a logic 0 level signal is applied to P1-16, relay K3 energizes and removes a short from a portion of the coil. When a logic 0 level signal is applied to P1-15, relays K1 and K2 energize and remove a short from the remaining

portion of the coil. When all three relays are energized, the entire coil may be used for tuning by the movable tap.

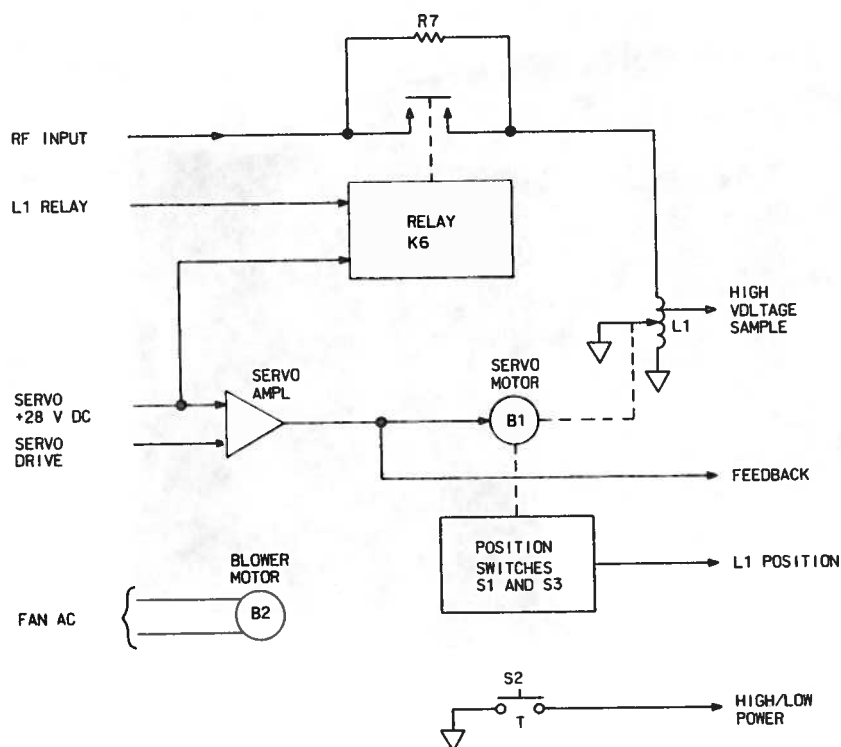
2.3 Servo Mechanism

The servo mechanism consists of a servo amplifier (Q1 through Q4), a dc motor (B1), and a variable inductor (L1). The servo mechanism receives signals from an external control module and drives the dc motor. A feedback signal is provided from the output of the servo amplifier to provide braking for the dc motor. The dc motor provides drive for the movable tap on inductor L1 and position switches S1 and S3.

2.4 On Line Relay

Relay K6 is energized by a logic 0 level signal from an external source. When energized, the contacts of relay K6 short static drain resistor R7 and place inductor L1 on line.

A high-voltage sample is detected from the junction of inductor L1 and static drain resistor R7 and routed



TP5-0257-013

Coil Module, Block Diagram
Figure 2

to an external control module. When the voltage is excessive, the control module generates a fault signal. Temperature sensor S2 is energized when the temperature becomes excessive. The logic 0 (ground) level signal is routed to an associated power amplifier. The power amplifier output power is reduced until the temperature drops to a normal level. Blower motor B2 provides internal cooling for the coil module and adjacent units.

3. TESTING/TROUBLESHOOTING PROCEDURES

A defective coil module can be returned to a Collins Defense Communications authorized repair facility for repair. For information and instructions, contact the nearest office or

Collins Defense Communications
Attention: HF Products
350 Collins Road NE
Cedar Rapids, Iowa 52498

4. ALIGNMENT/ADJUSTMENT

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

5. REPAIR

Repair of the coil module is accomplished using standard shop practices and repair procedures.

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
-------------	------------------------------------

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
08664	ACCO INDUSTRIES INC BRISTOL-BABCOCK DIV 40 BRISTOL ST WATERBURY CT 06708

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

12615 U S TERMINALS INC
7504 CAMARGO ROAD
CINCINNATI OH 45243

12969 UNITRODE CORP
580 PLEASANT ST
WATERTOWN MA 02172

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

13499 ROCKWELL INTERNATIONAL CORPORATION
DEFENSE ELECTRONICS OPERATIONS
COLLINS DEFENSE COMMUNICATIONS DIV
350 COLLINS ROAD NE
CEDAR RAPIDS IA 52498

14604 ELMWOOD SENSORS INC
1655 ELMWOOD AVENUE
CRANSTON RI 02907

16546 GLOBE-UNION INC
USCC/CENTRALAB ELECTRICS DIV
4561 COLORADO
LOS ANGELES CA 90039

16636 INDIANA GENERAL ELECTRO-MECHANICAL
PRODUCTS A DIV OF ELECTRONIC
MEMORIES AND MAGNETICS CORP
1168 BARRANCA DR
EL PASO TX 79935

21052 HIGH ENERGY CORP
LOCHER VALLEY RD
PARKESBURG PA 19305

25140 TRW INC
TRW GLOBE MOTOR DIV
2275 STANLEY AVE
DAYTON OH 45404

28478 DELTROL CONTROLS DIV
DELTROL CORP
2745 S 19TH ST
MILWAUKEE WI 53215

40920 MINIATURE BEARING DIV MPB CORP
OPTICAL AVE PRECISION PARK
KEENE NH 03431

59730 THOMAS AND BETTS CORP
HWY 218 S
IOWA CITY IA 52240

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

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

72962 ESNA DIV OF AMERACE CORP
2330 VAUXHALL ROAD
UNION NJ 07083

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

72982 ERIE TECHNOLOGICAL PRODUCTS INC
645 W 11TH ST
ERIE PA 16512

73905 ITT JENNINGS
970 MC LAUGHLIN AVE
SAN JOSE CA 95116

76854 OAK SWITCH SYSTEMS INC
SUB OF OAK TECHNOLOGY INC
100 S MAIN ST
P O BOX 517
CRYSTAL LAKE IL 60014

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

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

79963 ZIERICK MFG CO
RADIO CIRCLE
MT KISCO NY 10549

81349 MILITARY SPECIFICATIONS

88044 AERONAUTICAL STANDARD

91314 LEWIS SPRING AND MFG CO
2652 W NORTH AVE
CHICAGO IL 60647

91663 ARMEL ELECTRONICS INC
1601 75TH STREET
NORTH BERGEN NJ 07047

92702 IMC MAGNETICS CORP
EASTERN DIVISION
570 MAIN ST
WESTBURY LONG ISLAND NY 11591

93790 CORNELL-DUBILIER ELECTRONICS
DIV FEDERAL PACIFIC ELECTRIC CO
1605 RODNEY FRENCH BLVD
NEW BEDFORD MA 02741

96906 MILITARY STANDARD

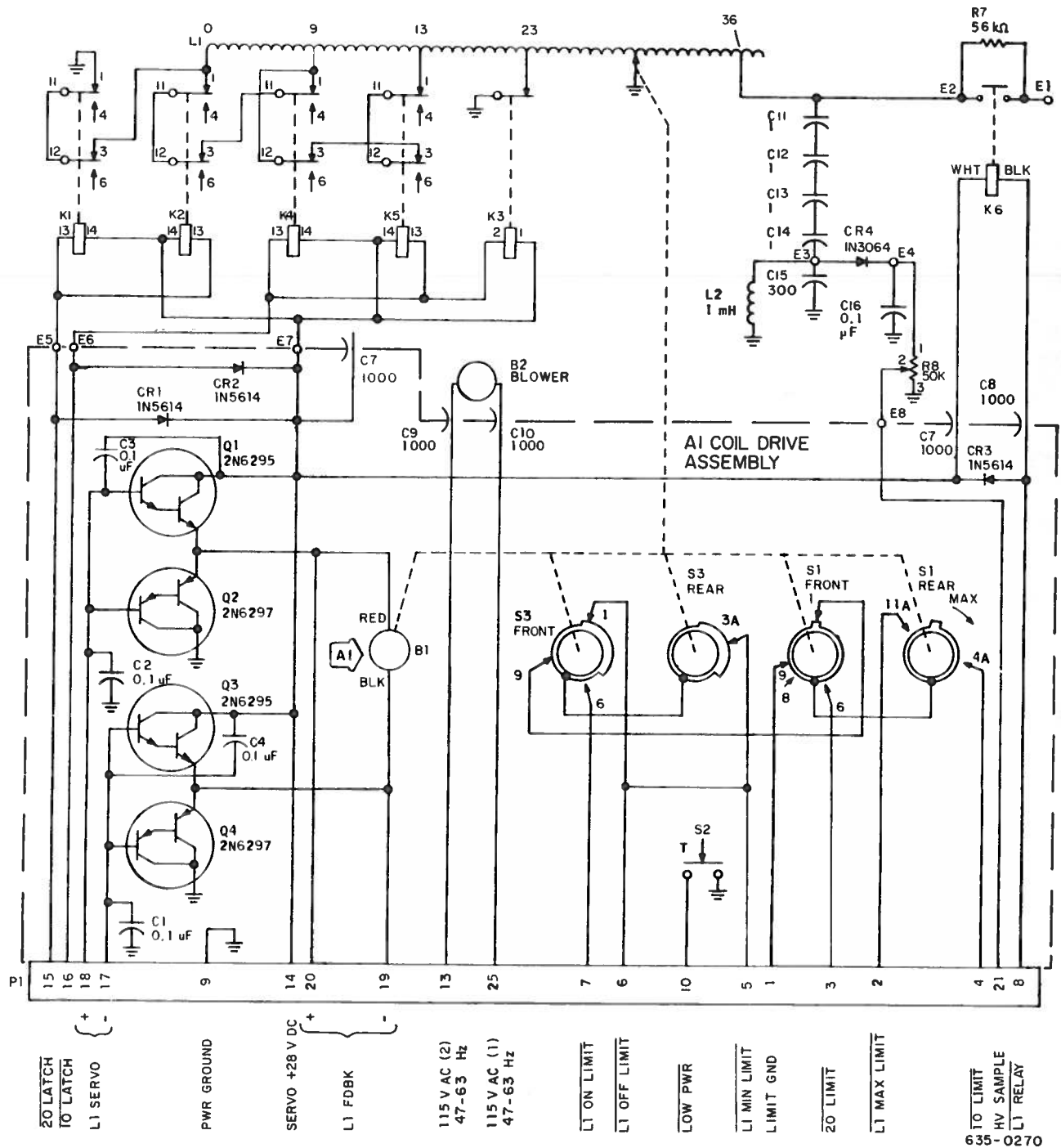
6.5 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Coil Module	635-4720-001	REV R
Coil Drive Assembly	635-4687-001	REV J

NOTES:

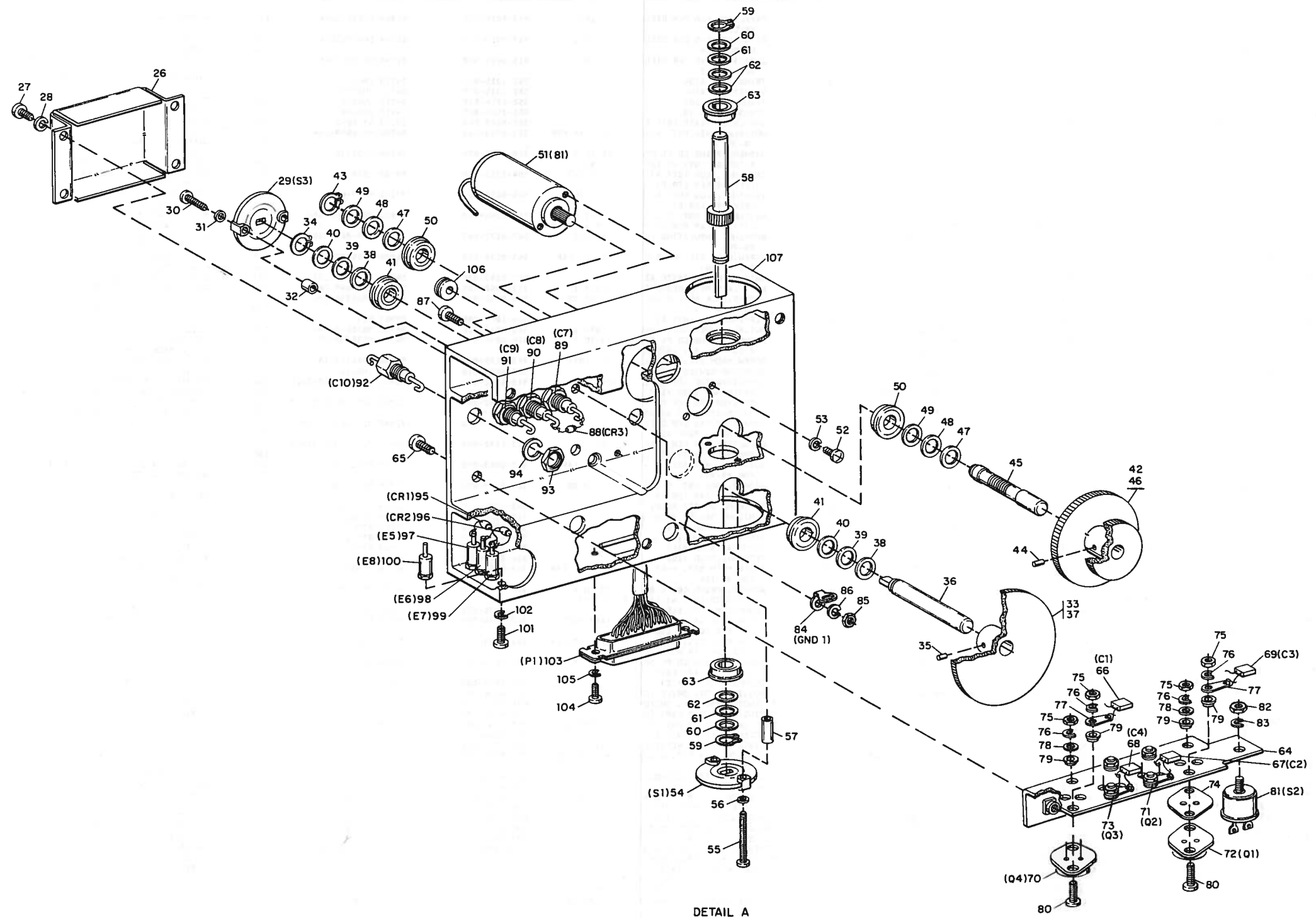
1. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN PICO FARADS.
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
3. S1 AND S3 SHOWN AT L1 OFF LIMIT POSITION.
4. ROTATION OF L1 CORRESPONDS TO ROTATION OF S1 AND S3.



Coil Module, Schematic Diagram
Figure 4

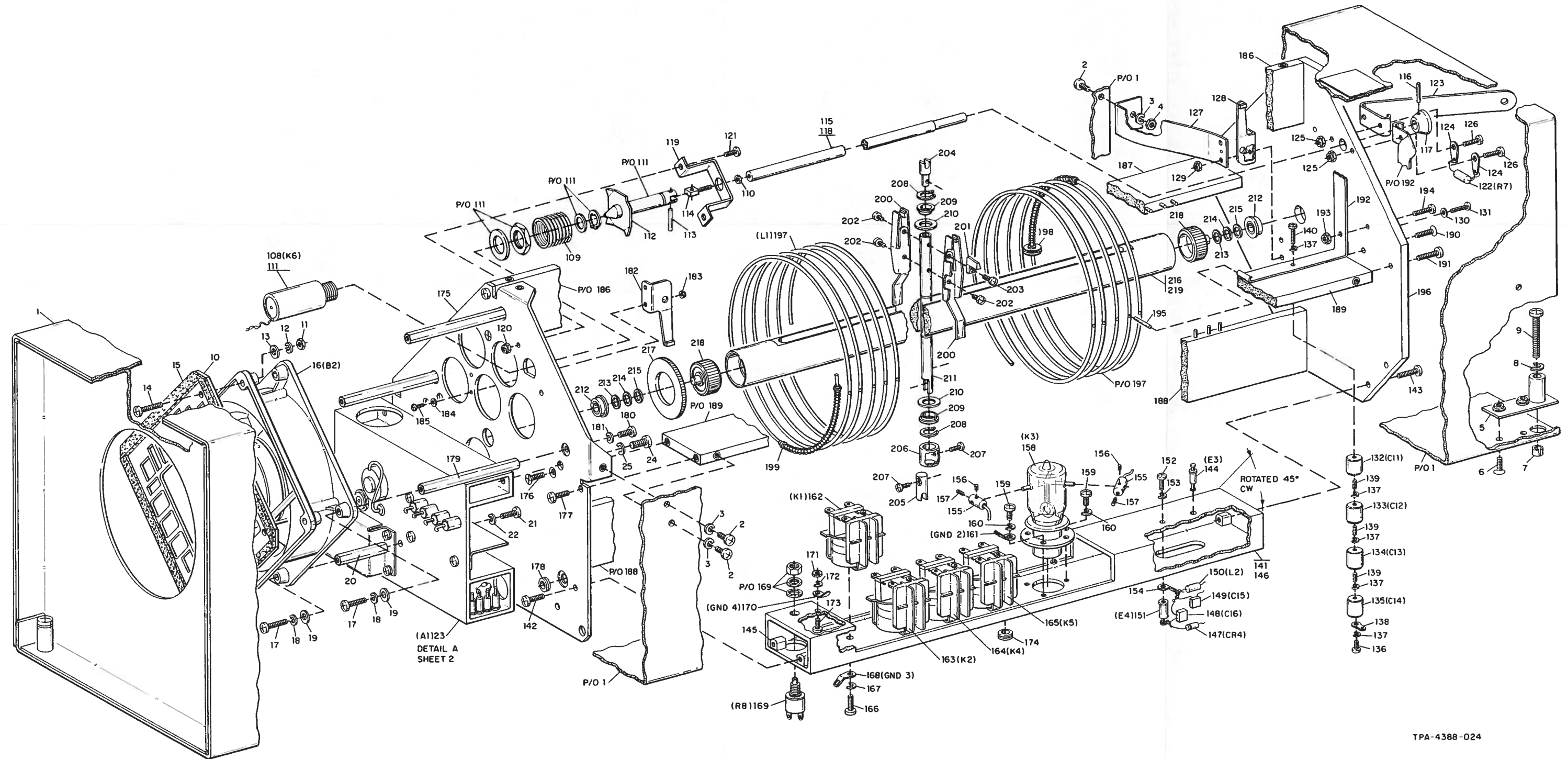
THE UNIVERSITY OF CHICAGO
LIBRARY
540 EAST 57TH STREET
CHICAGO, ILL. 60637
TEL: 773-936-5000
FAX: 773-936-5001
WWW.CHICAGO.EDU





TPA-4388-O24

Coil Module, Parts Location Diagram
Figure 3 (Sheet 2)



TPA-4388-024

Coil Module, Parts Location Diagram
Figure 3 (Sheet 1 of 3)

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
67	CAPACITOR,FXD CER DIEL, 0.1UF, 10%, 50VDC A1C2	913-5019-320		81349	CK05BX104K
68	CAPACITOR,FXD CER DIEL, 0.1UF, 10%, 50VDC A1C4	913-5019-320		81349	CK05BX104K
69	CAPACITOR,FXD CER DIEL, 0.1UF, 10%, 50VDC A1C3	913-5019-320		81349	CK05BX104K
70	TRANSISTOR A1Q4	352-1015-020		04713	2N6297
71	TRANSISTOR A1Q2	352-1015-020		04713	2N6297
72	TRANSISTOR A1Q1	352-1014-020		04713	2N6295
73	TRANSISTOR A1Q3	352-1014-020		04713	2N6295
74	INSULATOR,PLATE (QTY 2)	352-9605-040		13103	43-66-2
75	NUT,PLAIN,HEX SST, 4-40 (QTY 8) (AP FOR 70-74)	313-0043-000		96906	MS35649-244
76	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (QTY 8) (AP FOR 70-74)	310-0095-000		96906	MS35338-97
77	TERMINAL, LUG (QTY 4) (AP FOR 70-74) (EFF TO REV LTR E)	304-1015-000		59730	TG14
77	TERMINAL, LUG (QTY 4) (AP FOR 70-74) (EFF REV LTR E)	304-0015-000		77147	4007-4HT
78	WASHER,FLAT SST, 0.125 ID X 0.281 OD (QTY 4) (AP FOR 70-74) (EFF REV LTR E)	310-6340-000		79807	310-6340-000
79	BUSHING, INSULATING (QTY 8) (AP FOR 70-74)	547-8177-007			547-8177-007
80	SCREW,MACH STL, 4-40 X 3/8 (QTY 8) (AP FOR 70-74)	343-0135-000		96906	MS51957-15
81	SWITCH,THERMOSTATIC A1S2	267-0243-030		14604	3100-43-101
82	NUT,PLAIN,HEX CRES,6-32 (AP) (QTY 1)	313-0002-000		96906	MS35649-264
83	WASHER,LOCK SST, 0.141 ID X 0.250 OD (AP) (QTY 1)	310-0282-000		96906	MS35338-136
84	TERMINAL,LUG (QTY 1)	304-1089-000		79963	403
85	NUT,PLAIN,HEX SST, 4-40 (AP) (QTY 1)	313-0043-000		96906	MS35649-244
86	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (AP) (QTY 1)	310-0095-000		96906	MS35338-97
87	SCREW,MACH STL, 4-40 X 3/8 (AP) (QTY 1)	343-0135-000		96906	MS51957-15
88	SEMICOND DEVICE A1C3	353-6556-010		12969	1N5614
89	CAPACITOR,FXD CER DIEL, 1000PF, P80X20X, 500V A1C7	913-1292-000		72982	327-029XST0102Z
90	CAPACITOR,FXD CER DIEL, 1000PF, P80X20X, 500V A1C6	913-1292-000		72982	327-029XST0102Z
91	CAPACITOR,FXD CER DIEL, 1000PF, P80X20X, 500V A1C9	913-1292-000		72982	327-029XST0102Z
92	CAPACITOR,FXD CER DIEL, 1000PF, P80X20X, 500V A1C10	913-1292-000		72982	327-029XST0102Z
93	NUT,PLAIN,HEX SST, 1/4-28 (QTY 4) (AP FOR 89-92)	313-0083-000		77250	P313-0083-000
94	WASHER,LOCK SST, 0.255 ID X 0.489 OD (QTY 4) (AP FOR 89-92)	310-0288-000		96906	MS35338-139
95	SEMICOND DEVICE A1C1	353-6556-010		12969	1N5614
96	SEMICOND DEVICE A1C2	353-6556-010		12969	1N5614
97	TERMINAL,STUD A1E5	306-0976-000		91663	RTMT12M
98	TERMINAL,STUD A1E6	306-0976-000		91663	RTMT12M
99	TERMINAL,STUD A1E7	306-0976-000		91663	RTMT12M
100	TERMINAL,STUD A1E8	306-0976-000		91663	RTMT12M
101	SCREW,MACH SST, 4-40 X 5/16 (QTY 4) (AP FOR 97-100)	343-0134-000		96906	MS51957-14
102	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (QTY 4) (AP FOR 97-100)	310-0095-000		96906	MS35338-97
103	CONNECTOR,RCPT ELEC A1P1	371-0170-000		71468	DBM-25P
104	SCREW,MACH SST, 4-40 X 5/16 (AP) (QTY 2) (EFF TO REV LTR H)	343-0134-000		96906	MS51957-14
104	SCREW,MACH STL, 4-40 X 1/4 (AP) (QTY 2) (EFF REV LTR H)	343-0133-000		96906	MS51957-13
105	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (AP) (QTY 2)	310-0095-000		96906	MS35338-97
106	GROMMET,RBR (QTY 2)	201-1040-000		96906	MS35489-1
107	HOUSING, COIL DRIVE (QTY 1)	629-6186-001			
108	SOLENOID ASSEMBLY, SWITCH K6	635-4873-002			
109	SPRING, SOLENOID (AP) (QTY 1)	635-4709-001			
110	NUT,PLAIN,HEX NP BRS, 2-56 (AP) (QTY 1)	313-0050-000		77250	P313-0050-000
111	SOLENOID,ELEC (QTY 1)	411-0154-010		28478	53612-83
112	PLATE, SPRING, RETAINER (QTY 1)	635-4727-001			
113	PIN,STR,MDLS SST, 0.078 DIA X 9/16 (QTY 1)	311-0816-000		70318	311-0816-000
114	LUG, ADAPTER, SOLENOID (QTY 1)	635-4704-001			
115	CONTACT,SWITCH-COIL	635-4708-002			
116	PIN,SPR SST, 0.062 DIA X 9/16 (QTY 1)	311-0422-000			
117	SLEEVE, CONTACT (QTY 1)	635-4707-001		96906	MS16562-195
118	ROD, ACTUATOR (QTY 1)	635-4706-002			
119	BRACKET, SOLENOID LIMIT (QTY 1)	635-4703-001			
120	NUT,SLFLKG,HEX AL, 4-40 (AP) (QTY 2)	333-0346-000		72962	69NM40
121	SCREW,MACH STL, 4-40 X 3/8 (AP) (QTY 2)	343-0135-000		96906	MS51957-15
122	RESISTOR,FXD CHPSN, 56K, 10%, 1W R7	745-3426-000		81349	RCR32G563KS
123	CONDUCTOR,ELEC (QTY 1)	636-4643-001			
124	TERMINAL,LUG (QTY 2) (EFF TO REV LTR K)	304-0015-000		77147	4007-4HT
124	TERMINAL,LUG (QTY 2) (EFF REV LTR K)	304-0317-000		78189	2104-04-01-2520N
125	NUT,SLFLKG,HEX AL, 4-40 (QTY 2) (AP FOR 123,124)	333-0346-000		72962	69NM40
126	SCREW,MACH NP BRS, 4-40 X 1/2 (QTY 2) (AP FOR 123,124)	343-0289-000		77250	P343-0289-000
127	STRAP,GROUND (QTY 1)	609-2639-001			
128	CONTACT,GROUND- ROTOR (QTY 1)	609-2626-001			
129	NUT,SLFLKG,HEX AL, 2-56 (AP) (QTY 2)	333-0604-000		72962	68-1660-26

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
130	WASHER,FLAT SST, 0.092 X 0.219 OD (AP) (QTY 2)	310-6320-000		79807	310-6320-000
131	SCREW,MACH SST, 2-56 X 1/2 (AP) (QTY 2)	343-0128-000		96906	MS51957-7
132	CAPACITOR,FXD CER DIEL, 1PF, PORM 0.5PF,	913-0756-000		21052	HT54T109DK
133	CAPACITOR,FXD CER DIEL, 1PF, PORM 0.5PF, 500V C12	913-0756-000		21052	HT54T109DK
134	CAPACITOR,FXD CER DIEL, 1PF, PORM 0.5PF, 500V C13	913-0756-000		21052	HT54T109DK
135	CAPACITOR,FXD CER DIEL, 1PF, PORM 0.5PF, 500V C14	913-0756-000		21052	HT54T109DK
136	SCREW,MACH NP BRS, 2-56 X 1/8 (QTY 1) (AP FOR 132-135)	343-0297-000		77250	P343-0297-000
137	WASHER,LOCK BRZ, 0.088 ID X 0.165 OD (QTY 5) (AP FOR 132-135)	310-0075-000		79807	310-0075-000
138	TERMINAL,LUG (QTY 1) (AP FOR 132-135)	304-0014-000		77147	4040-2HT
139	STUD,CONT THD BRS, 2-56 X 3/16 (QTY 3) (AP FOR 132-135)	312-0222-000		77250	P312-0222-000
140	SCREW,MACH NP BRS, 2-56 X 7/16 (QTY 1) (AP FOR 132-135)	343-0302-000		77250	P343-0302-000
141	BRACKET,RELAY,PRSD (QTY 1)	637-9899-001			
142	SCREW,MACH SST, 6-32 X 1/2 (AP) (QTY 2)	343-0171-000		96906	MS51957-30
143	SCREW,MACH SST, 6-32 X 5/8 (AP) (QTY 2)	343-0173-000		96906	MS51957-31
144	TERMINAL,STUD E3	306-0788-030		12615	SL234-258
145	NUT,ANGLE (QTY 4)	764-7966-001			
146	HOUSING (QTY 1)	637-9899-002			
147	SEMICOND DEVICE CR4	353-3404-000		03508	1N3064
148	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V C16	913-3279-200		16546	CY30C104M
149	CAPACITOR,FXD MICA DIEL, 300PF, 5%, 50V C15	912-4141-480		93790	CD5FY301J0
150	COIL,RF 1000UH L2	240-2715-490			
151	TERMINAL,STUD E4	306-0976-000		96906	MS75089-23
152	SCREW,MACH NP BRS, 4-40 X 1/4 (AP) (QTY 1)	343-0285-000		91663	RTMT12M
153	WASHER,LOCK SST, 0.115 ID X 0.202 OD (AP) (QTY 1)	310-0278-000		77250	P343-0285-000
154	TERMINAL,LUG (AP) (QTY 1) (EFF TO REV LTR K)	304-0015-000		70318	310-0278-000
154	TERMINAL,LUG (AP) (QTY 1) (EFF REV LTR K)	304-0317-000			
155	CONNECTOR (QTY 2)	544-0090-002			
156	SETSCREW CD PL STL, 2-56 X 3/32 (AP) (QTY 2)	328-0368-000		08664	328-0368-000
157	SETSCREW CD PL STL, 2-56 X 1/8 (AP) (QTY 2)	335-0232-000		88044	AN565F2H2
158	RELAY,AMT K3	410-0342-000			
159	SCREW,MACH SST, 6-32 X 1/4 (AP) (QTY 3)	343-0167-000		73905	RBI028N302
160	WASHER,LOCK SST, 0.151 ID X 0.239 OD (AP) (QTY 3)	310-0071-000		96906	MS51957-26
161	TERMINAL,LUG (AP) (QTY 1) (EFF TO REV LTR K)	304-0015-000		79807	310-0071-000
161	TERMINAL,LUG (AP) (QTY 1) (EFF REV LTR K TO REV LTR R)	304-0317-000		77147	4007-4HT
161	TERMINAL,LUG (AP) (QTY 1) (EFF REV LTR R)	304-0318-000		78189	2104-04-01-2520N
162	RELAY,ARMATURE K1	304-0318-000			
163	RELAY,ARMATURE K2	970-2445-050		78189	2104-06-02-2520N
164	RELAY,ARMATURE K4	970-2445-050		28478	100RF27567-61
165	RELAY,ARMATURE K5	970-2445-050		28478	100RF27567-61
166	SCREW,MACH SST, 6-32 X 3/8 (QTY 4) (AP FOR 162-165)	343-0169-000		28478	100RF27567-61
167	WASHER,LOCK SST, 0.151 ID X 0.239 OD (QTY 4) (AP FOR 162-165)	310-0071-000		96906	MS51957-28
168	TERMINAL,LUG (QTY 1) (AP FOR 162) (EFF REV LTR K)	304-0318-000		79807	310-0071-000
169	RESISTOR,VAR 50K, 20%, 1/2W R8	380-2266-000		81349	RV6LAYS503B
170	TERMINAL,LUG (QTY 1) (EFF TO REV LTR K)	304-0015-000		77147	4007-4HT
170	TERMINAL,LUG (QTY 1) (EFF REV LTR K)	304-0317-000		78189	2104-04-01-2520N
171	NUT,PLAIN,HEX SST, 4-40 (AP) (QTY 1)	313-0043-000		96906	MS35649-244
172	WASHER,LOCK SST, 0.115 ID X 0.202 OD (AP) (QTY 1)	310-0278-000		70318	310-0278-000
173	SCREW,MACH SST, 4-40 X 5/16 (AP) (QTY 1)	343-0134-000		96906	MS51957-14
174	GROMMET,RBR (QTY 1)	201-0019-000		96906	MS35489-33
175	PLATE,COIL-FRONT, PRSD (QTY 1)	635-4674-001			
176	SCREW,MACH SST, 6-32 X 3/8 (AP) (QTY 4)	330-4058-030		77250	P330-4058-030
177	SCREW,MACH SST, 6-32 X 3/8 (AP) (QTY 4)	343-0169-000		96906	MS51957-28
178	GROMMET,RBR (QTY 1) (EFF TO REV LTR R)	201-0020-000		96906	MS35489-35
179	GROMMET,RBR (QTY 1) (EFF REV LTR R)	201-0019-000		96906	MS35489-33
180	POST, HEX (QTY 3)	540-9480-003			
181	SCREW,MACH SST, 6-32 X 3/8 (AP) (QTY 3)	343-0169-000		96906	MS51957-28
181	WASHER,LOCK SST, 0.151 ID X 0.239 OD (AP) (QTY 3)	310-0071-000		79807	310-0071-000
182	CONTACT,GROUND- ROTOR (QTY 1)	609-2626-001			
183	NUT,SLFLKG,HEX AL, 2-56 (AP) (QTY 2)	333-0604-000		72962	68-1660-26
184	WASHER,FLAT SST, 0.092 X 0.219 OD (AP) (QTY 2)	310-6320-000		79807	310-6320-000
185	SCREW,MACH CD PL STL, 2-56 X 1/4 (AP) (QTY 2)	343-0124-000		96906	MS51957-3
186	BAR,COIL,PRESSED, NO. 4 (QTY 1)	609-2622-004			
187	BAR,COIL,PRESSED, NO. 3 (QTY 1)	609-2622-003			
188	BAR,COIL,PRESSED, NO. 2 (QTY 1)	609-2622-002			
189	BAR,COIL,PRESSED, NO. 1 (QTY 1)	609-2622-001			
190	SCREW,MACH SST, 6-32 X 1/2 (QTY 4) (AP FOR 186-189)	330-4058-050		77250	P330-4058-050
191	SCREW,MACH SST, 6-32 X 1/2 (QTY 4) (AP FOR 186-189) (EFF TO REV LTR L)	343-0171-000		96906	MS51957-30

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
191	SCREW,MACH NP BRS, 6-32 X 5/8 (QTY 4) (AP FOR 186-189) (EFF REV LTR L)	343-0333-000		77250	P343-0333-000
192	CONDUCTOR,ELEC (QTY 1)	609-2640-001			
193	NUT,SLFLKG,HEX AL, 4-40 (AP) (QTY 2)	333-0346-000		72962	69NM40
194	SCREW,MACH NP BRS, 4-40 X 1/2 (AP) (QTY 2)	343-0289-000		77250	P343-0289-000
195	PIN,SPR COP, 0.062 DIA X 0.489 (QTY 1)	311-0598-000		72962	99-012-062-0687
196	PLATE,COIL-REAR (QTY 1)	609-2601-001			
197	COIL,RF L1	609-2623-001			
198	BUMPER,TOP SPRING (QTY 1)	630-0236-001			
199	BUMPER,BOTTOM SPRING (QTY 1)	630-0231-001			
200	CONTACT,ELEC-ROTOR (QTY 2)	609-2617-001			
201	STOP,ROTOR END (QTY 1)	630-0139-001			
202	SCREW,MACH NP BRS, 2-56 X 1/8 (QTY 3) (AP FOR 200,201)	343-0297-000		77250	P343-0297-000
203	SCREW,MACH NP BRS, 2-56 X 1/4 (QTY 1) (AP FOR 200,201)	343-0299-000		77250	P343-0299-000
204	GUIDE,COIL ROTOR - NO. 2 (QTY 1)	609-2642-001			
205	GUIDE,COIL ROTOR - NO. 1 (QTY 1)	609-2641-001			
206	COUNTERHEIGHT (QTY 1)	609-2615-001			
207	SCREW,MACH NP BRS, 2-56 X 5/16 (AP) (QTY 2)	343-0300-000		77250	P343-0300-00

PARTS LIST					
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	COIL MODULE	635-4720-001			
1	SHROUD, COIL-ROLLED (QTY 1)	609-2595-001			
2	SCREW,MACH SST, 6-32 X 5/16 (AP) (QTY 17)	343-0168-000		96906	MS51957-27
3	WASHER,LOCK SST, 0.151 ID X 0.239 OD (AP) (QTY 5) (EFF TO REV LTR N)	310-0071-000		79807	310-0071-000
3	WASHER,LOCK SST, 0.151 ID X 0.239 OD (AP) (QTY 17) (EFF REV LTR N)	310-0071-000		79807	310-0071-000
4	NUT,PLAIN,HEX SST, 6-32 (AP) (QTY 1)	313-0045-000		77250	P313-0045-000
5	PLATE, BUSHING-PRSD (QTY 1)	609-2597-001			
6	SCREW,MACHINE CRES, 6-32X5/16 (AP) (QTY 2) (EFF TO REV LTR L)	342-0061-000		96906	MS51959-27
6	SCREW,MACH NP BRS, 6-32 X 3/8 (AP) (QTY 2) (EFF REV LTR L)	342-0168-000		77250	P342-0168-000
7	SLEEVE,SPRING (AP) (QTY 4)	340-0643-000		91314	340-0643-000
8	WASHER,LOCK SST, 0.194 ID X 0.334 OD (AP) (QTY 4) (EFF TO REV LTR M)	310-0284-000		96906	MS35338-138
9	SCREW,MACH SST, 10-32 X 1-1/4 (AP) (QTY 4)	343-0233-000		96906	MS51958-68
10	GUARD, FAN (QTY 1)	609-2599-001			
11	NUT,PLAIN,HEX SST, 6-32 (AP) (QTY 4)	313-0045-000		77250	P313-0045-000
12	WASHER,LOCK SST, 0.151 ID X 0.239 OD (AP) (QTY 4)	310-0071-000		79807	310-0071-000
13	WASHER,FLAT SST, 0.149 ID X 0.375 OD (AP) (QTY 4)	310-0752-010		88044	AN960C6
14	SCREW,FLAT SST, 6-32 X 1/2 (AP) (QTY 4) (EFF TO REV LTR L)	343-0171-000		96906	MS51957-30
14	SCREW,MACH SST, 6-32 X 5/8 (AP) (QTY 4) (EFF REV LTR L)	343-0173-000		96906	MS51957-31
15	SEAL, AIR (QTY 4)	609-2604-001			
16	FAN,VENTURI B2	090-1840-020		92702	BS2107FL
17	SCREW,MACH SST, 6-32 X 5/8 (AP) (QTY 4)	343-0173-000		96906	MS51957-31
18	WASHER,LOCK SST, 0.151 ID X 0.239 OD (AP) (QTY 4)	310-0071-000		79807	310-0071-000
19	WASHER,FLAT SST, 0.149 ID X 0.375 OD (AP) (QTY 4)	310-0752-010		88044	AN960C6
20	POST, HEX (QTY 1)	540-9468-003			540-9468-003
21	SCREW,MACH SST, 6-32 X 3/8 (AP) (QTY 1)	343-0169-000		96906	MS51957-28
22	WASHER,LOCK SST, 0.151 ID X 0.239 OD (AP) (QTY 1)	310-0071-000		79807	310-0071-000
23	DRIVE ASSEMBLY,COIL A1	635-4687-001			
24	SCREW,MACH SST, 10-32 X 3/8 (AP) (QTY 3)	343-0226-000		96906	MS51958-61
25	WASHER,LOCK SST, 0.194 ID X 0.323 OD (AP) (QTY 3)	310-0073-000		79807	310-0073-000
26	SHIELD, RF SWITCH (QTY 1)	629-6189-001			
27	SCREW,MACH STL, 4-40 X 3/16 (AP) (QTY 4)	343-0132-000		96906	MS51957-12
28	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (AP) (QTY 4)	310-0095-000		96906	MS35338-97
29	SWITCH SECT,RTR A1S3	269-2635-590		76854	280274AM
30	SCREW,MACH NP BRS, 2-56 X 5/8 (AP) (QTY 2)	343-0361-000		77250	P343-0361-000
31	WASHER,NM FBR GLS, 0.088 ID X 0.150 OD (AP) (QTY 2)	269-8031-000		76854	15517-2
32	SPACER (AP) (QTY 2)	541-5949-002			541-5949-002
33	SHAFT-PINNED (QTY 1)	609-2602-002			
34	RING,RETAINING (AP) (QTY 1)	340-0038-000		96906	MS16624-5025
35	PIN,SPR SST, 0.062 DIA X 1/2 (QTY 1)	311-0421-000		96906	MS16562-194
36	SHAFT, SWITCH (QTY 1)	609-2598-001			
37	GEAR, SPUR (QTY 1)	609-2593-001			
38	WASHER, SHIM (QTY AR)	768-5768-001			768-5768-001
39	WASHER, SHIM (QTY AR)	768-5768-002			
40	WASHER, SHIM (QTY AR)	768-5768-003			
41	BEARING,BALL,AN (QTY 2)	309-1523-000		40920	S814FCHM3P15L02
42	WORMSHAFT-PINNED (QTY 1)	609-2620-002			609-2620-002
43	RING,RETAINING (AP) (QTY 1)	340-0038-000		96906	MS16624-5025
44	PIN,SPR SST, 0.062 DIA X 7/16 (QTY 1)	311-0420-000		96906	MS16562-193
45	WORMSHAFT (QTY 1)	609-0032-001			
46	GEAR, SPUR (QTY 1)	609-2605-001			
47	WASHER, SHIM (QTY AR)	768-5768-001			768-5768-001
48	WASHER, SHIM (QTY AR)	768-5768-002			
49	WASHER, SHIM (QTY AR)	768-5768-003			
50	BEARING,BALL,AN (QTY 2)	309-1523-000		40920	S814FCHM3P15L02
51	MOTOR,DC A1B1 (A1)	230-0620-030		16636	0909-25
51	MOTOR,DC A1B1	230-0662-010		25140	393A106
52	SCREW,MACH SST, 2-56 X 3/16 (AP) (QTY 2)	343-0123-000		96906	MS51957-2
53	WASHER,SPRING CD PL BRZ, 0.088 ID X 0.172 OD (AP) (QTY 2)	310-0093-000		96906	MS35338-96
54	SWITCH SECT,RTR A1S1	269-2635-580		76854	280273AM
55	SCREW,MACH SST, 2-56 X 7/8 (AP) (QTY 2)	343-0130-000		96906	MS51957-10
56	WASHER,NM FBR GLS, 0.088 ID X 0.150 OD (AP) (QTY 2)	269-8031-000		76854	15517-2
57	SLEEVE, SWITCH (AP) (QTY 2)	541-5957-002			541-5957-002
58	GEAR, HELICAL-PRSD (QTY 1)	609-2619-006			609-2619-006
59	RING,RETAINING (AP) (QTY 2)	340-0038-000		96906	MS16624-5025
60	WASHER, SHIM (QTY AR)	768-5768-001			768-5768-001
61	WASHER, SHIM (QTY AR)	768-5768-002			
62	WASHER, SHIM (QTY AR)	768-5768-003			
63	BEARING,BALL,AN (QTY 2)	309-1523-000		40920	S814FCHM3P15L02
64	BRACKET (QTY 1)	629-6187-001			
65	SCREW,MACH SST, 6-32 X 5/16 (AP) (QTY 2)	343-0168-000		96906	MS51957-27
66	CAPACITOR,FXD CER DIEL, 0.1UF, 10%, 50VDC A1C1	913-5019-320		81349	CK05BX104K

PARTS LIST (Cont)					
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
67	CAPACITOR,FXD CER DIEL, 0.1UF, 10%, 50VDC A1C2	913-5019-320		81349	CK05BX104K
68	CAPACITOR,FXD CER DIEL, 0.1UF, 10%, 50VDC A1C4	913-5019-320		81349	CK05BX104K
69	CAPACITOR,FXD CER DIEL, 0.1UF, 10%, 50VDC A1C3	913-5019-320		81349	CK05BX104K
70	TRANSISTOR A1Q4	352-1015-020		04713	2N6297
71	TRANSISTOR A1Q2	352-1015-020		04713	2N6297
72	TRANSISTOR A1Q1	352-1014-020		04713	2N6295
73	TRANSISTOR A1Q3	352-1014-020		04713	2N6295
74	INSULATOR,PLATE (QTY 2)	352-9605-040		13103	43-66-2
75	NUT,PLAIN,HEX SST, 4-40 (QTY 8) (AP FOR 70-74)	313-0043-000		96906	MS35649-244
76	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (QTY 8) (AP FOR 70-74)	310-0095-000		96906	MS35338-97
77	TERMINAL, LUG (QTY 4) (AP FOR 70-74) (EFF TO REV LTR E)	304-1015-000		59730	TG14
77	TERMINAL, LUG (QTY 4) (AP FOR 70-74) (EFF REV LTR E)	304-0015-000		77147	4007-4HT
78	WASHER,FLAT SST, 0.125 ID X 0.281 OD (QTY 4) (AP FOR 70-74) (EFF REV LTR E)	310-6340-000		79807	310-6340-000
79	BUSHING, INSULATING (QTY 8) (AP FOR 70-74)	547-8177-007			547-8177-007
80	SCREW,MACH STL, 4-40 X 3/8 (QTY 8) (AP FOR 70-74)	343-0135-000		96906	MS51957-15
81	SWITCH,THERMOSTATIC A1S2	267-0243-030		14604	3100-43-101
82	NUT,PLAIN,HEX CRES,6-32 (AP) (QTY 1)	313-0082-000		96906	MS35649-264
83	WASHER,LOCK SST, 0.141 ID X 0.250 OD (AP) (QTY 1)	310-0282-000		96906	MS35338-136
84	TERMINAL,LUG (QTY 1)	304-1089-000		79963	403
85	NUT,PLAIN,HEX SST, 4-40 (AP) (QTY 1)	313-0043-000		96906	MS35649-244
86	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (AP) (QTY 1)	310-0095-000		96906	MS35338-97
87	SCREW,MACH STL, 4-40 X 3/8 (AP) (QTY 1)	343-0135-000		96906	MS51957-15
88	SEMICOND DEVICE A1CR3	353-6556-010		12969	1N5614
89	CAPACITOR,FXD CER DIEL, 1000PF, P80X20%, 500V A1C7	913-1292-000		72982	327-029XST0102Z
90	CAPACITOR,FXD CER DIEL, 1000PF, P80X20%, 500V A1C8	913-1292-000		72982	327-029XST0102Z
91	CAPACITOR,FXD CER DIEL, 1000PF, P80X20%, 500V A1C9	913-1292-000		72982	327-029XST0102Z
92	CAPACITOR,FXD CER DIEL, 1000PF, P80X20%, 500V A1C10	913-1292-000		72982	327-029XST0102Z
93	NUT,PLAIN,HEX SST, 1/4-28 (QTY 4) (AP FOR 89-92)	313-0083-000		77250	P313-0083-000
94	WASHER,LOCK SST, 0.255 ID X 0.489 OD (QTY 4) (AP FOR 89-92)	310-0288-000		96906	MS35338-139
95	SEMICOND DEVICE A1CR1	353-6556-010		12969	1N5614
96	SEMICOND DEVICE A1CR2	353-6556-010		12969	1N5614
97	TERMINAL,STUD A1E5	306-0976-000		91663	RTMT12M
98	TERMINAL,STUD A1E6	306-0976-000		91663	RTMT12M
99	TERMINAL,STUD A1E7	306-0976-000		91663	RTMT12M
100	TERMINAL,STUD A1E8	306-0976-000		91663	RTMT12M
101	SCREW,MACH SST, 4-40 X 5/16 (QTY 4) (AP FOR 97-100)	343-0134-000		96906	MS51957-14
102	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (QTY 4) (AP FOR 97-100)	310-0095-000		96906	MS35338-97
103	CONNECTOR,RCPT ELEC A1P1	371-0170-000		71468	DBM-25P
104	SCREW,MACH SST, 4-40 X 5/16 (AP) (QTY 2) (EFF TO REV LTR H)	343-0134-000		96906	MS51957-14
104	SCREW,MACH STL, 4-40 X 1/4 (AP) (QTY 2) (EFF REV LTR H)	343-0133-000		96906	MS51957-13
105	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (AP) (QTY 2)	310-0095-000		96906	MS35338-97
106	GROMMET,RBR (QTY 2)	201-1040-000		96906	MS35489-1
107	HOUSING, COIL DRIVE (QTY 1)	629-6186-001			
108	SOLENOID ASSEMBLY, SWITCH K6	635-4873-002			
109	SPRING, SOLENOID (AP) (QTY 1)	635-4709-001			
110	NUT,PLAIN,HEX NP BRS, 2-56 (AP) (QTY 1)	313-0050-000		77250	P313-0050-000
111	SOLENOID,ELEC (QTY 1)	411-0154-010		28478	53612-83
112	PLATE, SPRING, RETAINER (QTY 1)	635-4727-001			
113	PIN,STR,HDLs SST, 0.078 DIA X 9/16 (QTY 1)	311-0816-000		70318	311-0816-000
114	LUG, ADAPTER, SOLENOID (QTY 1)	635-4704-001			
115	CONTACT,SWITCH-COIL	635-4708-002			
116	PIN,SPR SST, 0.062 DIA X 9/16 (QTY 1)	311-0422-000		96906	MS16562-195
117	SLEEVE, CONTACT (QTY 1)	635-4707-001			
118	ROD, ACTUATOR (QTY 1)	635-4706-002			
119	BRACKET, SOLENOID LIMIT (QTY 1)	635-4703-001			
120	NUT,SILFLKG,HEX AL, 4-40 (AP) (QTY 2)	333-0346-000		72962	69NM40
121	SCREW,MACH STL, 4-40 X 3/8 (AP) (QTY 2)	343-0135-000		96906	MS51957-15
122	RESISTOR,FXD CHPSN, 56K, 10%, 1W R7	745-3426-000		81349	RCR32G563KS
123	CONDUCTOR,ELEC (QTY 1)	638-4643-001			
124	TERMINAL,LUG (QTY 2) (EFF TO REV LTR K)	304-0015-000		77147	4007-4HT
124	TERMINAL,LUG (QTY 2) (EFF REV LTR K)	304-0317-000		78189	2104-04-01-2520N
125	NUT,SILFLKG,HEX AL, 4-40 (QTY 2) (AP FOR 123,124)	333-0346-000		72962	69NM40
126	SCREW,MACH NP BRS, 4-40 X 1/2 (QTY 2) (AP FOR 123,124)	343-0289-000		77250	P343-0289-000
127	STRAP,GROUND (QTY 1)	609-2639-001			
128	CONTACT,GROUND- ROTOR (QTY 1)	609-2626-001			
129	NUT,SILFLKG,HEX AL, 2-56 (AP) (QTY 2)	333-0604-000		72962	68-1660-26

PARTS LIST (Cont)						PARTS LIST (Cont)					
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
130	WASHER,FLAT SST, 0.092 X 0.219 OD (AP) (QTY 2)	310-6320-000		79807	310-6320-000	191	SCREW,MACH NP BRS, 6-32 X 5/8 (QTY FOR 186-189) (EFF REV LTR L)				
131	SCREW,MACH SST, 2-56 X 1/2 (AP) (QTY 2)	343-0128-000		96906	MS51957-7	192	CONDUCTOR,ELEC (QTY 1)				
132	CAPACITOR,FXD CER DIEL, 1PF, PORM 0.5PF,	913-0756-000		21052	HT54T109DK	193	NUT,SLFLKG,HEX AL, 4-40 (AP) (QTY 2)				
133	CAPACITOR,FXD CER DIEL, 1PF, PORM 0.5PF, 500V C12	913-0756-000		21052	HT54T109DK	194	SCREW,MACH NP BRS, 4-40 X 1/2 (AP)				
134	CAPACITOR,FXD CER DIEL, 1PF, PORM 0.5PF, 500V C13	913-0756-000		21052	HT54T109DK	195	PIN,SPR COP, 0.062 DIA X 0.689 (QTY 1)				
135	CAPACITOR,FXD CER DIEL, 1PF, PORM 0.5PF, 500V C14	913-0756-000		21052	HT54T109DK	196	PLATE,COIL-REAR (QTY 1)				
136	SCREW,MACH NP BRS, 2-56 X 1/8 (QTY 1) (AP FOR 132-135)	343-0297-000		77250	P343-0297-000	197	COIL,RF L1				
137	WASHER,LOCK BRZ, 0.088 ID X 0.165 OD (QTY 5) (AP FOR 132-135)	310-0075-000		79807	310-0075-000	198	BUMPER,TOP SPRING (QTY 1)				
138	TERMINAL,LUG (QTY 1) (AP FOR 132-135)	304-0014-000		77147	4040-2HT	199	BUMPER,BOTTOM SPRING (QTY 1)				
139	STUD,CONT THD BRS, 2-56 X 3/16 (QTY 3) (AP FOR 132-135)	312-0222-000		77250	P312-0222-000	200	CONTACT,ELEC-ROTOR (QTY 2)				
140	SCREW,MACH NP BRS, 2-56 X 7/16 (QTY 1) (AP FOR 132-135)	343-0302-000		77250	P343-0302-000	201	STOP,ROTOR END (QTY 1)				
141	BRACKET,RELAY,PRSD (QTY 1)	637-9899-001				202	SCREW,MACH NP BRS, 2-56 X 1/8 (QTY FOR 200,201)				
142	SCREW,MACH SST, 6-32 X 1/2 (AP) (QTY 2)	343-0171-000		96906	MS51957-30	203	SCREW,MACH NP BRS, 2-56 X 1/4 (QTY FOR 200,201)				
143	SCREW,MACH SST, 6-32 X 5/8 (AP) (QTY 2)	343-0173-000		96906	MS51957-31	204	GUIDE,COIL ROTOR - NO. 2 (QTY 1)				
144	TERMINAL,STUD E3	306-0788-030		12615	SL234-258	205	GUIDE,COIL ROTOR - NO. 1 (QTY 1)				
145	NUT,ANGLE (QTY 4)	764-7966-001				206	COUNTERWEIGHT (QTY 1)				
146	HOUSING (QTY 1)	637-9899-002				207	SCREW,MACH NP BRS, 2-56 X 5/16 (AP 2)				
147	SEMICON DEVICE CR4	353-3404-000		03508	1N3064	208	RING,RETAINING (QTY 2)				
148	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V C16	913-3279-200		16546	CY30C104M	209	BEARING,BALL,AN (QTY 2)				
149	CAPACITOR,FXD MICA DIEL, 300PF, 5%, 50V C15	912-4141-480		93790	C05FY301J0	210	WASHER, FLAT (QTY 2)				
150	COIL,RF 1000UH L2	240-2715-490		96906	MS75089-23	211	ARM,COIL ROTOR (QTY 1)				
151	TERMINAL,STUD E4	306-0976-000		91663	RMT12M	212	BEARING,BALL,AN (QTY 2)				
152	SCREW,MACH NP BRS, 4-40 X 1/4 (AP) (QTY 1)	343-0285-000		77250	P343-0285-000	213	WASHER, SHIM (QTY AR)				
153	WASHER,LOCK SST, 0.115 ID X 0.202 OD (AP) (QTY 1)	310-0278-000		70318	310-0278-000	214	WASHER, SHIM (QTY AR)				
154	TERMINAL,LUG (AP) (QTY 1) (EFF TO REV LTR K)	304-0015-000		77147	4007-4HT	215	ROTOR ASSY, PRESSED (QTY 1)				
155	CONNECTOR (QTY 2)	544-0090-002		78189	2104-04-01-2520N	216	GEAR, SPUR (QTY 1)				
156	SETSCREW CD PL STL, 2-56 X 3/32 (AP) (QTY 2)	328-0368-000		08664	328-0368-000	217	HUB,CONDUCTOR (QTY 2)				
157	SETSCREW CD PL STL, 2-56 X 1/8 (AP) (QTY 2)	335-0232-000		88044	AN565F2H2	218	CONDUCTOR,ELEC (QTY 1)				
158	RELAY,AMT K3	410-0342-000		73905	RBID28N302						
159	SCREW,MACH SST, 6-32 X 1/4 (AP) (QTY 3)	343-0167-000		96906	MS51957-26						
160	WASHER,LOCK SST, 0.151 ID X 0.239 OD (AP) (QTY 3)	310-0071-000		79807	310-0071-000						
161	TERMINAL,LUG (AP) (QTY 1) (EFF TO REV LTR K)	304-0015-000		77147	4007-4HT						
161	TERMINAL,LUG (AP) (QTY 1) (EFF REV LTR K TO REV LTR R)	304-0317-000		78189	2104-04-01-2520N						
161	TERMINAL,LUG (AP) (QTY 1) (EFF REV LTR R)	304-0318-000		78189	2104-06-02-2520N						
162	RELAY,ARMATURE K1	970-2445-050		28478	100RF27567-61	A1	Changed P/N of A1B1 to 230-0682-010.				
163	RELAY,ARMATURE K2	970-2445-050		28478	100RF27567-61						
164	RELAY,ARMATURE K4	970-2445-050		28478	100RF27567-61						
165	RELAY,ARMATURE K5	970-2445-050		28478	100RF27567-61						
166	SCREW,MACH SST, 6-32 X 3/8 (QTY 4) (AP FOR 162-165)	343-0169-000		96906	MS51957-28						
167	WASHER,LOCK SST, 0.151 ID X 0.239 OD (QTY 4) (AP FOR 162-165)	310-0071-000		79807	310-0071-000						
168	TERMINAL,LUG (QTY 1) (AP FOR 162) (EFF REV LTR K)	304-0318-000		78189	2104-06-02-2520N						
169	RESISTOR,VAR 50K, 20%, 1/2W R8	380-2266-000		81349	RV6LAYS503B						
170	TERMINAL,LUG (QTY 1) (EFF TO REV LTR K)	304-0015-000		77147	4007-4HT						
170	TERMINAL,LUG (QTY 1) (EFF REV LTR K)	304-0317-000		78189	2104-04-01-2520N						
171	NUT,PLAIN,HEX SST, 4-40 (AP) (QTY 1)	313-0043-000		96906	MS35649-244						
172	WASHER,LOCK SST, 0.115 ID X 0.202 OD (AP) (QTY 1)	310-0278-000		70318	310-0278-000						
173	SCREW,MACH SST, 4-40 X 5/16 (AP) (QTY 1)	343-0134-000		96906	MS51957-14						
174	GROMMET,RBR (QTY 1)	201-0019-000		96906	MS35489-33						
175	PLATE,COIL-FRONT, PRSD (QTY 1)	635-4674-001									
176	SCREW,MACH SST, 6-32 X 3/8 (AP) (QTY 4)	330-4058-030		77250	P330-4058-030						
177	SCREW,MACH SST, 6-32 X 3/8 (AP) (QTY 4)	343-0169-000		96906	MS51957-28						
178	GROMMET,RBR (QTY 1) (EFF TO REV LTR R)	201-0020-000		96906	MS35489-35						
178	GROMMET,RBR (QTY 1) (EFF REV LTR R)	201-0019-000		96906	MS35489-33						
179	POST, HEX (QTY 3)	540-9480-003			540-9480-003						
180	SCREW,MACH SST, 6-32 X 3/8 (AP) (QTY 3)	343-0169-000		96906	MS51957-28						
181	WASHER,LOCK SST, 0.151 ID X 0.239 OD (AP) (QTY 3)	310-0071-000		79807	310-0071-000						
182	CONTACT,GROUND- ROTOR (QTY 1)	609-2626-001									
183	NUT,SLFLKG,HEX AL, 2-56 (AP) (QTY 2)	333-0604-000		72962	68-1660-26						
184	WASHER,FLAT SST, 0.092 X 0.219 OD (AP) (QTY 2)	310-6320-000		79807	310-6320-000						
185	SCREW,MACH CD PL STL, 2-56 X 1/4 (AP) (QTY 2)	343-0124-000		96906	MS51957-3						
186	BAR,COIL,PRESSED, NO. 4 (QTY 1)	609-2622-004									
187	BAR,COIL,PRESSED, NO. 3 (QTY 1)	609-2622-003									
188	BAR,COIL,PRESSED, NO. 2 (QTY 1)	609-2622-002									
189	BAR,COIL,PRESSED, NO. 1 (QTY 1)	609-2622-001									
190	SCREW,MACH SST, 6-32 X 1/2 (QTY 4) (AP FOR 186-189)	330-4058-050		77250	P330-4058-050						
191	SCREW,MACH SST, 6-32 X 1/2 (QTY 4) (AP FOR 186- 189) (EFF TO REV LTR L)	343-0171-000		96906	MS51957-30						



**Rockwell
International**

instructions

Collins Defense Communications

523-0773118-001211

1 June 1983

Coil Module (651-4240-001)

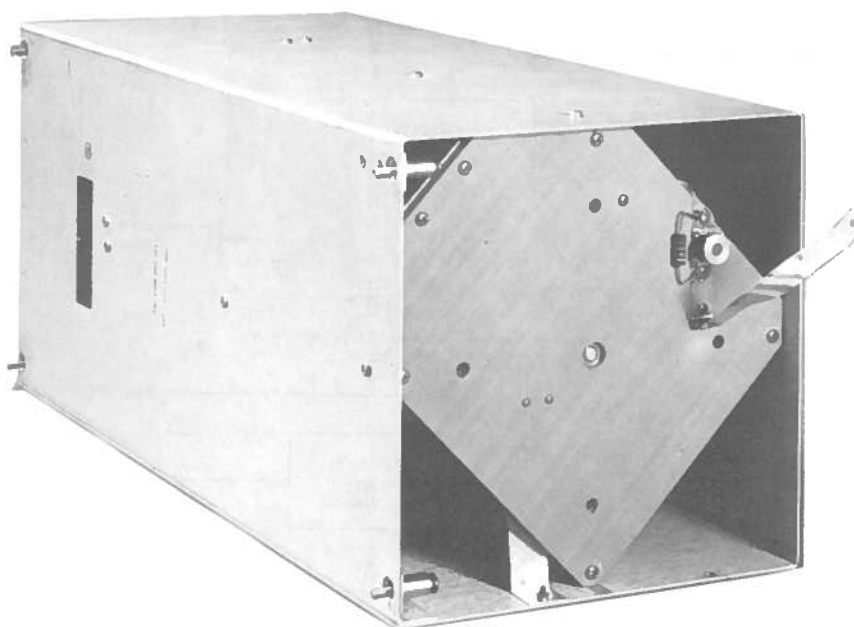
Printed in USA

(651-4240-001)

1. DESCRIPTION

Coil Module (651-4240-001), shown in figure 1, is a plug-in module with a 25-pin input/output connector.

The coil module consists of a servo mechanism that controls a variable inductor, a blower motor, positioning switches, and relays.



TP5-1896-017

**Coil Module
Figure 1**

2. PRINCIPLES OF OPERATION

2.1 General

The coil module is the inductive component of an impedance matching network. Variable inductor L1 is controlled by a servo mechanism. Refer to figure 2 (block diagram) and figure 4 (schematic diagram) during the following discussion.

2.2 Coil Shorting Relays

Relays K1, K2, and K3 prevent coil resonance by shorting out the unused portion of the coil. When all three relays are deenergized, most of the coil (inductor L1) turns are shorted. When the inductor is tuned, position switches S1 and S3 route information to a control module. The control module combines this positioning information with tuning logic and provides a logic 0 level signal to P1-15 and P1-16. When a logic 0 level signal is applied to P1-16, relay K3 energizes and removes a short from a portion of the coil. When a logic 0 level signal is applied to P1-15, relays K1 and K2 energize and remove a short from the remaining portion of the coil. When all three relays are energized, the entire coil may be used for tuning by the movable tap.

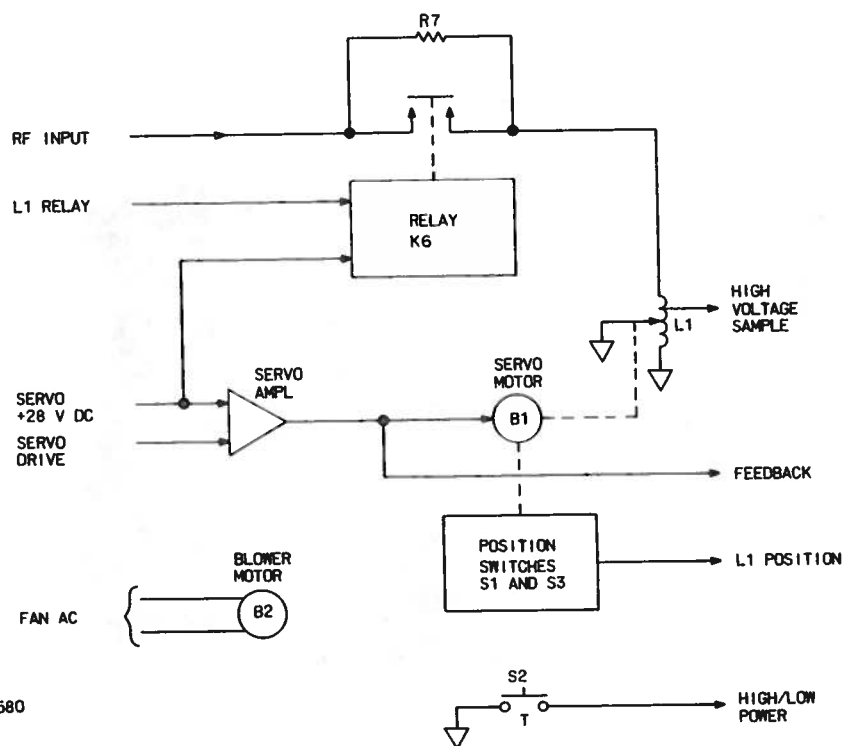
2.3 Servo Mechanism

The servo mechanism consists of a servo amplifier (Q1 through Q4), a dc motor (B1), and a variable inductor (L1). The servo mechanism receives signals from an external control module and drives the dc motor. A feedback signal is provided from the output of the servo amplifier to provide braking for the dc motor. The dc motor provides drive for the movable tap on inductor L1 and position switches S1 and S3.

2.4 On Line Relay

Relay K6 is energized by a logic 0 level signal from an external source. When energized, the contacts of relay K6 short static drain resistor R7 and place inductor L1 on line.

A high-voltage sample is detected from the junction of inductor L1 and static drain resistor R7, and routed to an external control module. When the voltage is excessive, the control module generates a fault signal. Temperature sensor S2 is energized when the temperature becomes excessive. The logic 0 (ground) level signal is routed to an associated power amplifier. The power amplifier output power is reduced until the temperature drops to a normal level.



Coil Module, Block Diagram
Figure 2

TPA-0173-013

Blower motor B2 provides internal cooling for the coil module and adjacent units.

3. TESTING/TROUBLESHOOTING PROCEDURES

A defective coil module can be returned to a Collins Defense Communications authorized repair facility for repair. For information and instructions, contact the nearest office or

Collins Defense Communications
Attention: HF Products
350 Collins Road NE
Cedar Rapids, Iowa 52498

4. ALIGNMENT/ADJUSTMENT

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

5. REPAIR

Repair of the coil module is accomplished using standard shop practices and repair procedures.

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
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
12969	UNITRODE CORP 580 PLEASANT ST WATERTOWN MA 02172
13103	THERMALLOY CO INC 2021 W VALLEY VIEW LANE P O BOX 340839 DALLAS TX 75234
13499	ROCKWELL INTERNATIONAL CORPORATION DEFENSE ELECTRONICS OPERATIONS COLLINS DEFENSE COMMUNICATIONS DIV 350 COLLINS ROAD NE CEDAR RAPIDS IA 52498
14604	ELMWOOD SENSORS INC 1655 ELMWOOD AVENUE CRANSTON RI 02907
18741	KILOVAC CORP P O BOX 4422 SANTA BARBARA CA 93103
21052	HIGH ENERGY CORP LOWER VALLEY RD PARKESBURG PA 19305
25140	TRW INC TRW GLOBE MOTOR DIV 2275 STANLEY AVE DAYTON OH 45404
28478	DELTROL CONTROLS DIV DELTROL CORP 2745 S 19TH ST MILWAUKEE WI 53215
40920	MINIATURE BEARING DIV MPB CORP OPTICAL AVE PRECISION PARK KEENE NH 03431
59660	TUSONIX INC 2155 N FORBES BLVD SUITE 107 TUCSON AZ 85705
70318	ALLMETAL SCREW PRODUCTS CO INC 821 STEWART AVE GARDEN CITY NY 11530
71468	ITT CANNON ELECTRIC DIV OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORP 10550 TALBERT AVE P O BOX 8040 FOUNTAIN VALLEY CA 92708

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
72962	ESNA DIV OF AMERACE CORP 2330 VAUXHALL ROAD UNION NJ 07083
72982	ERIE TECHNOLOGICAL PRODUCTS INC 645 W 11TH ST ERIE PA 16512
76854	OAK SWITCH SYSTEMS INC SUB OF OAK TECHNOLOGY INC 100 S MAIN ST P O BOX 517 CRYSTAL LAKE IL 60014
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
79807	WROUGHT WASHER MFG INC 2100 S BAY ST MILWAUKEE WI 53207
79963	ZIERICK MFG CO RADIO CIRCLE MT KISCO NY 10549
80205	NATIONAL AEROSPACE STANDARD
81349	MILITARY SPECIFICATIONS
82877	ROTRON INC CUSTOM DIV 7 HASBROUCK LN WOODSTOCK NY 12498
88044	AERONAUTICAL STANDARD
91314	LEWIS SPRING AND MFG CO 2652 W NORTH AVE CHICAGO IL 60647
91663	ARMEL ELECTRONICS INC 1601 75TH STREET NORTH BERGEN NJ 07047
93790	CORNELL-DUBILIER ELECTRONICS DIV FEDERAL PACIFIC ELECTRIC CO 1605 RODNEY FRENCH BLVD NEW BEDFORD MA 02741
96906	MILITARY STANDARD
98291	SEAELECTRO CORP 225 HOYT MAMARONECK NY 10544

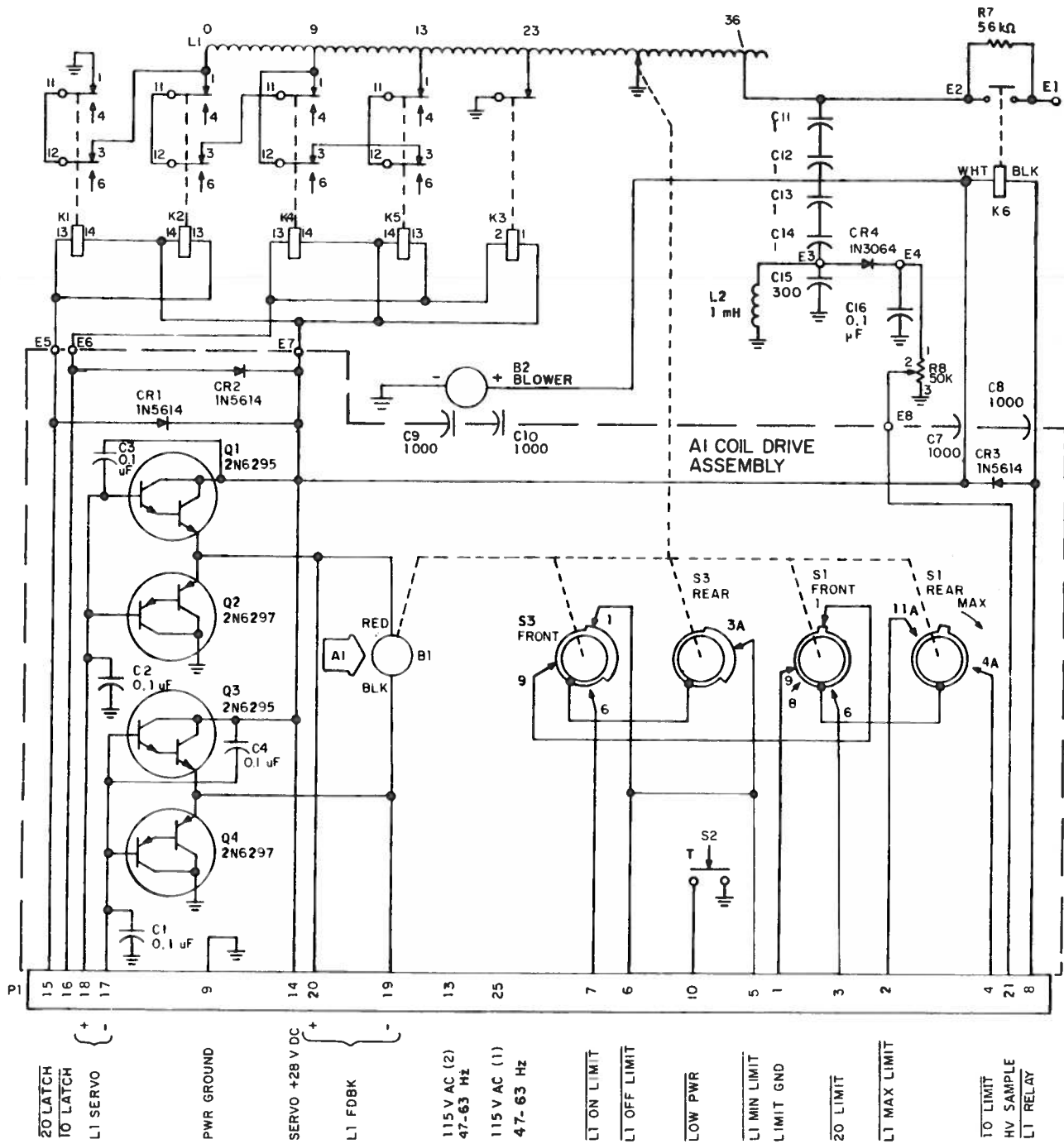
6.5 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

CIRCUIT CARD/ SUBASSEMBLY	COLLINS PART NUMBER	LATEST EFFECTIVITY
Coil Module	651-4240-001	REV —
Coil Drive Assembly A1	635-4687-001	REV N

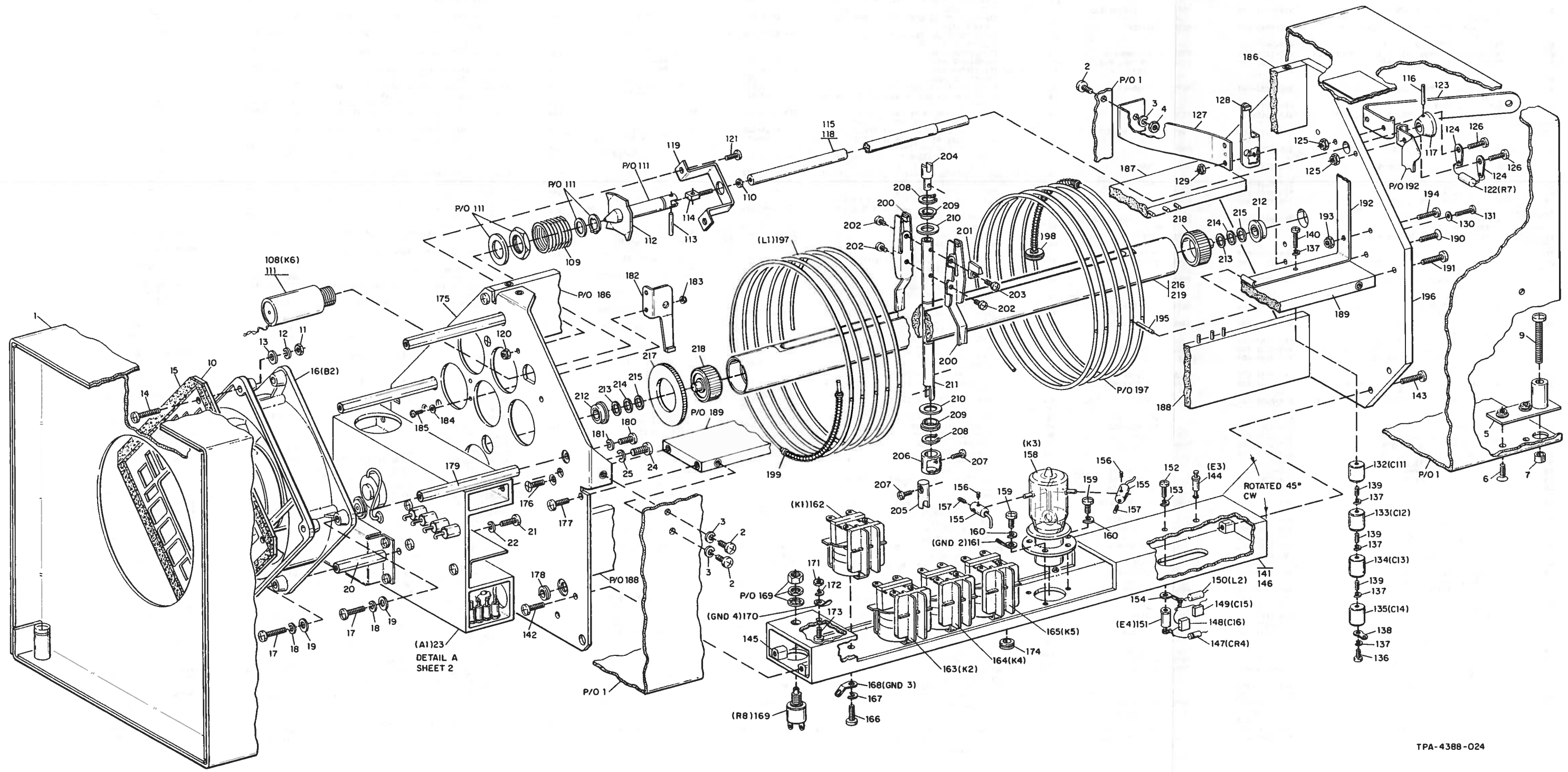
NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN PICOFARADS.
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN, FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
3. S1 AND S3 SHOWN AT LT OFF LIMIT POSITION.
4. ROTATION OF L1 CORRESPONDS TO ROTATION OF S1 AND S3



TPA-6662-011

Coil Module, Schematic Diagram
Figure 4



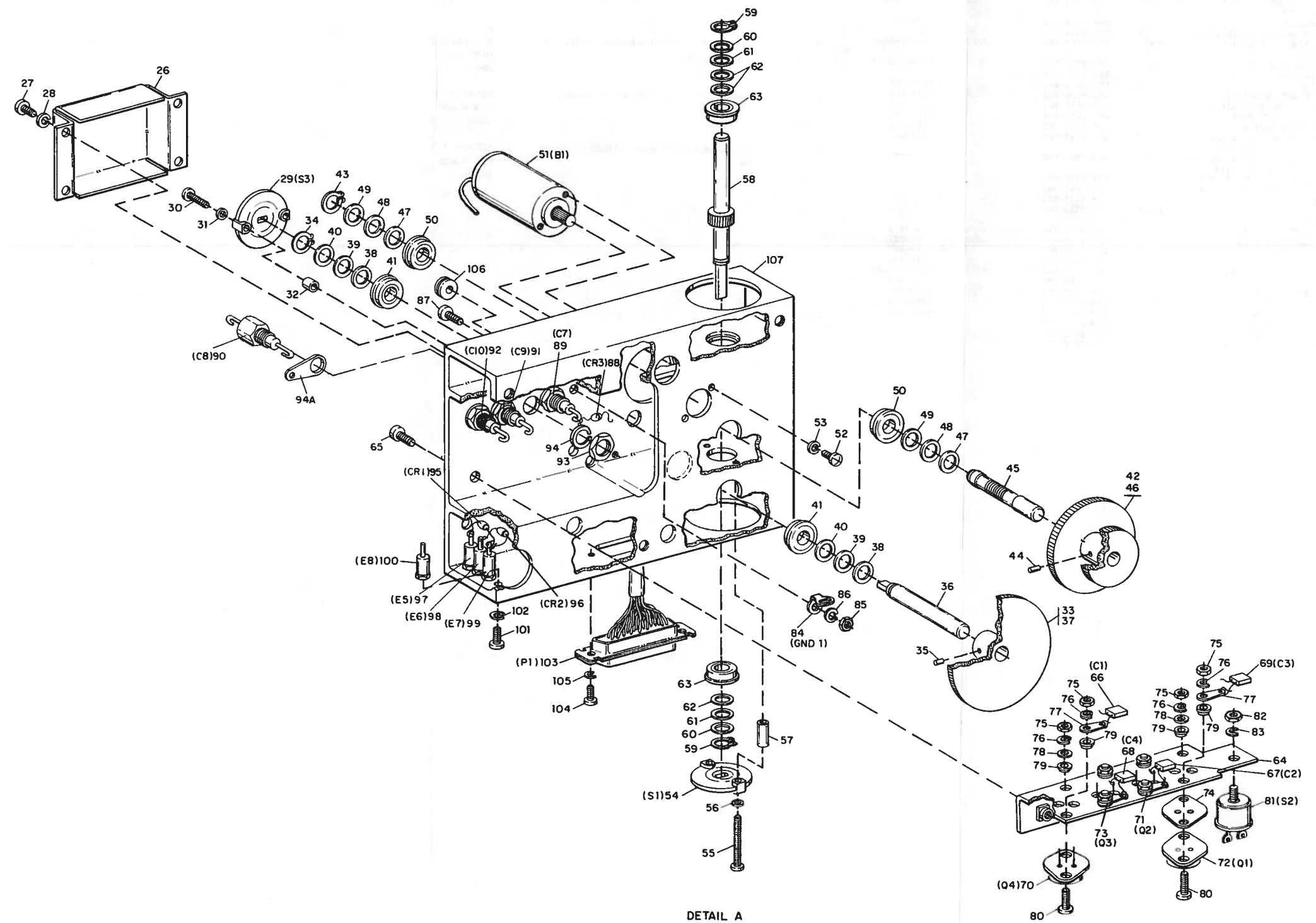
TPA-4388-024

Coil Module, Parts Location Diagram
Figure 3 (Sheet 1 of 4)

PARTS LIST				PARTS LIST (Cont)			
REF	DESCRIPTION	NUMBER	USABLE	REF	DESCRIPTION	NUMBER	USABLE

1	SHROUD, COIL-ROLLED (QTY 1)	609-2595-001		64	BRACKET (QTY 1)	629-6187-001	
2	SCREW,MACHINE CRCS, 0.130-32 X 0.312IN	343-0168-000		65	SCREW,MACHINE CRCS, 0.130-32 X 0.312IN	343-0168-000	
3	MASHER,LOCK CRCS, 0.145 ID X 0.236 OD	310-0071-000		66	CAPACITOR,FIXED CER DIEI, 0.1UF, 10%, 50VDC A1C2	913-5019-320	
4	MUT,PLAIN,HEXAGON CRCS, 0.130-32 (AP)	313-0045-000		67	CAPACITOR,FIXED CER DIEI, 0.1UF, 10%, 50VDC A1C2	913-5019-320	
5	PLATE,BUSHING-PRSD (QTY 1)	609-2597-001		68	CAPACITOR,FIXED CER DIEI, 0.1UF, 10%, 50VDC A1C2	913-5019-320	
6	SCREW,MACH NP BR5, 6-32 X 3/8 (AP)(QTY 2)	342-0168-000		69	CAPACITOR,FIXED CER DIEI, 0.1UF, 10%, 50VDC A1C3	913-5019-320	
7	SLEEVE,SPRING (AP) (QTY 4)	340-0643-000		70	TRANSISTOR A1Q4	352-1015-020	
8	NOT USED			71	TRANSISTOR A1Q2	352-1015-020	
9	SCREW,MACHINE CRCS, 0.190-32 X 1.250IN	343-0233-000		72	TRANSISTOR A1Q3	352-1014-020	
10	GUARD, FAN (QTY 1)	609-2599-001		73	INSULATOR,PLATE (QTY 2)	352-9605-040	
11	MUT,PLAIN,HEXAGON CRCS, 0.130-32 (AP)	313-0045-000		74	INSULATOR,PLATE (QTY 2)	352-9605-040	
12	MASHER,LOCK CRCS, 0.145 ID X 0.236 OD	310-0071-000		75	MUT,PLAIN,HEX SST, 4-40 (QTY 8) (AP FOR 70-74)	313-0043-000	
13	MASHER,FLAT SST, 0.149 ID X 0.375 OD (AP)	310-0752-010		76	MASHER,SPRING CD PL BR2, 0.115 ID X 0.209 OD (AP) (QTY 1)	310-0095-000	
14	SCREW,MACHINE CRCS, 0.130-32 X 0.625IN	343-0173-000		77	TERMINAL, LUG (QTY 4) (AP FOR 70-74)	304-0015-000	
15	SEAL, AIR (QTY 4)	609-2604-001		78	MASHER,FLAT SST, 0.125 ID X 0.261 OD	310-6340-000	
16	FAN,TUBEXIAL B2	009-0505-010		79	BUSHING, INSULATING (QTY 8) (AP FOR 70-74)	547-8177-007	
17	SCREW,MACHINE CRCS, 0.130-32 X 0.625IN	343-0173-000		80	SCREW,MACH STL, 4-40 X 3/8 (QTY 8) (AP FOR 70-74)	343-0135-000	
18	MASHER,LOCK CRCS, 0.145 ID X 0.236 OD	310-0071-000		81	MUT,PLAIN,HEX CRCS,6-32 (AP) (QTY 1)	313-0002-000	
19	MASHER,FLAT SST, 0.149 ID X 0.375 OD (AP)	310-0752-010		82	MUT,PLAIN,HEX CRCS,6-32 (AP) (QTY 1)	313-0002-000	
20	POST, HEX (QTY 1)	540-9468-003		83	MASHER,LOCK SST, 0.141 ID X 0.250 OD	310-0282-000	
21	SCREW,MACHINE CRCS, 0.130-32 X 0.375IN	343-0169-000		84	MUT,PLAIN,HEX SST, 4-40 (AP) (QTY 1)	313-0043-000	
22	MASHER,LOCK CRCS, 0.145 ID X 0.236 OD	310-0071-000		85	TERMINAL,LUG (QTY 1)	310-0043-000	
23	SCREW,ASSEMBLY,COIL A1	635-4687-001		86	MUT,PLAIN,HEX SST, 4-40 (AP) (QTY 1)	310-0043-000	
24	SCREW,MACHINE CRCS, 0.190-32 X 0.375IN	343-0226-000		87	SCREW,MACH STL, 4-40 X 3/8 (AP) (QTY 1)	343-0135-000	
25	MASHER,LOCK CRCS, 0.190 ID X 0.320 OD	310-0073-000		88	SCRECONO DEVICE A1C8	353-6556-010	
26	SHIELD, RF SWITCH (QTY 1)	629-6189-001		89	CAPACITOR,FIXED CER DIEI, 1000PF, 500V A1C3	913-1292-000	
27	MASHER,SPRING CD PL BR2, 0.115 ID X 0.209 OD (QTY 4)	343-0132-000		90	CAPACITOR,FIXED CER DIEI, 1000PF, 500V A1C3	913-1292-000	
28	MASHER,SPRING CD PL BR2, 0.115 ID X 0.209 OD (QTY 4)	343-0132-000		91	CAPACITOR,FIXED CER DIEI, 1000PF, 500V A1C3	913-1292-000	
29	SWITCH SECTION,RTYR A1S3	269-2635-590		92	CAPACITOR,FIXED CER DIEI, 1000PF, 500V A1C3	913-1292-000	
30	SCREW,MACHINE NP BR5, 0.086-56 X 0.625	343-0361-000		93	MUT,PLAIN,HEXAGON CRCS, 0.250-28 (QTY 1)	313-0083-000	
31	MASHER,NM FBR GLS, 0.086 ID X 0.150 OD	269-8031-000		94	TERMINAL,LUG (QTY 1)(EFF REV LTR K TO REV LTR L)	304-2800-000	
32	SPACER (AP) (QTY 2)	541-5949-002		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
33	SHAFT-PINDED (QTY 1)	609-2602-002		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
34	RING,RETAINING (AP) (QTY 1)	340-0030-000		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
35	PIN,SPR SST, 0.062 DIA X 3/8 (QTY 1)	311-0420-193		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
36	SHAFT, SPR (QTY 1)	609-2598-001		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
37	GEAR, SPUR (QTY 1)	629-6188-001		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
38	MASHER,SHM (QTY AR)	768-5768-001		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
39	MASHER,SHM (QTY AR)	768-5768-002		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
40	MASHER,SHM (QTY AR)	768-5768-003		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
41	BEARING,BALL,AM (QTY 2)	309-1523-000		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
42	MOMNSHFT-PINDED (QTY 1)	609-2620-002		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
43	RING,RETAINING (AP) (QTY 1)	340-0030-000		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
44	PIN,SPR SST, 0.062 DIA X 7/16 (QTY 1)	311-0420-193		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
45	MOMNSHFT (QTY 1)	609-2603-001		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
46	GEAR, SPUR (QTY 1)	609-2603-001		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
47	MASHER,SHM (QTY AR)	768-5768-001		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
48	MASHER,SHM (QTY AR)	768-5768-002		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
49	MASHER,SHM (QTY AR)	768-5768-003		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
50	BEARING,BALL,AM (QTY 2)	309-1523-000		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
51	MOTOR,DC A1B1 (A1)	230-0662-010		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
52	SCREW,MACH SST, 2-56 X 3/16 (AP) (QTY 2)	343-0123-000		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
53	MASHER,SPRING CD PL BR2, 0.086 ID X 0.150 OD	269-8031-000		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
54	SMITH SECTION,RTYR A1S1	269-2635-580		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
55	MASHER,MACH SST, 2-56 X 7/8 (AP) (QTY 2)	343-0130-000		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
56	MASHER,NM FBR GLS, 0.086 ID X 0.150 OD	269-8031-000		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
57	SLEEVE, SWITC (AP) (QTY 2)	541-5957-002		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
58	GEAR, HELICAL-PRSD (QTY 1)	609-2619-006		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
59	RING,RETAINING (AP) (QTY 1)	340-0030-000		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
60	MASHER,SHM (QTY AR)	768-5768-001		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
61	MASHER,SHM (QTY AR)	768-5768-002		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
62	MASHER,SHM (QTY AR)	768-5768-003		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	
63	BEARING,BALL,AM (QTY 2)	309-1523-000		94A	TERMINAL,LUG (QTY 1)(EFF REV LTR L)	304-2800-000	

Coil Module, Parts Location Diagram
Figure 3 (Sheet 2)



TPA-4388-024

Coil Module, Parts Location Diagram
Figure 3 (Sheet 3)

PARTS LIST (Cont)

REF	DESCRIPTION	COLLINS PART NUMBER	USABLE CODE	MFR CODE	MFR PART NUMBER
190	SCREW,MACH SST, 6-32 X 1/2 (QTY 4) (AP	330-4056-050		77250	P330-4056-050
191	FOR 186-189) SCREW,MACH NP BR5, 6-32 X 5/8 (QTY 4)(AP	343-0333-000		77250	P343-0333-000
192	CONDUCTOR,ELEC (QTY 1)	609-2640-001		72962	609-2640-001
193	MUT,SLFLKG,MEK AL, 0.112-40 (AP) (QTY 2)	333-0346-000		72962	69N4-40
194	SCREW,MACHINE NP BR5, 0.112-40 X 0.500IN (AP) (QTY 2)	343-0289-000		77250	NPBR50.112-40X0.500IN
195	PIN,SPR COP, 0.062 DIA X 0.689 (QTY 1)	311-0596-000		72962	99-012-062-0687
196	PLATE,COIL-REAR (QTY 1)	609-2601-001			609-2623-001
197	COIL,RF L1	609-2623-001			630-0236-001
198	BUMPER,TOP SPRING (QTY 1)	630-0236-001			630-0231-001
199	BUMPER,BOTTOM SPRING (QTY 1)	630-0231-001			609-2617-001
200	CONTACT,ELEC-ROTOR (QTY 2)	630-2617-001			630-0139-001
201	STOP,ROTOR END (QTY 1)	630-0139-001			343-0297-000
202	SCREW,MACHINE NP BR5, 0.086-56 X 0.125IN (QTY 3) (AP FOR 200,201)	343-0299-000			343-0299-000
203	SCREW,MACHINE NP BR5, 0.066-56 X 0.250IN (QTY 3) (AP FOR 200,201)	343-0299-000			0667-010
204	GUIDE,COIL ROTOR - NO. 2 (QTY 1) (QTY 1) (AP FOR 200,201)	609-2642-001			635-4687-001
205	GUIDE,COIL ROTOR - NO. 1 (QTY 1)	609-2642-001			REV N and
206	COUNTERWEIGHT (QTY 1)	609-2615-001			above
207	SCREW,MACHINE NP BR5, 0.066-56 X 0.312IN (AP) (QTY 2)	343-0300-000			635-4687-001
208	RING,RETAINING (QTY 2)	340-0038-000			
209	BEARING,BALL,AN (QTY 2)	509-1976-070		40920	N614FCHH5P25L02
210	MASHER, FLAT (QTY 2)	546-3017-003		546-3017-003	
211	ARM,COIL ROTOR (QTY 1)	609-2613-001		609-2613-001	
212	BEARING,BALL,AN (QTY 2)	309-1976-030		40920	N014FCHH5P25L02
213	MASHER, SHIM (QTY AP)	768-5768-001			
214	MASHER, SHIM (QTY AP)	768-5768-002			
215	MASHER, SHIM (QTY AP)	768-5768-003			
216	ROTOR ASSY, PRESSED (QTY 1)	609-2625-001			
217	GEAR, SPUR (QTY 1)	609-2612-001			
218	HUB,CONDUCTOR (QTY 2)	609-2618-001			
219	CONDUCTOR,ELEC (QTY 1)				

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
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MODIFICATION HISTORY

NA	Documentation and/or mechanical change only.	635-4687-001	above
REV K and			
NA	Documentation and/or mechanical change only.	635-4687-001	above
REV L and			
NA	Documentation and/or mechanical change only.	635-4687-001	above
REV M and			
NA	Documentation and/or mechanical change only.	635-4687-001	above
REV N and			
A1	Changed pn of A1B1 from 230-0662-010 to 230-0667-010	635-4687-001	above

Coil Module, Parts Location Diagram
Figure 3 (Sheet 4)



**Rockwell
International**

instructions

Collins Defense Communications

523-0773119-001211

1 June 1983

Coil Module (651-4523-001)

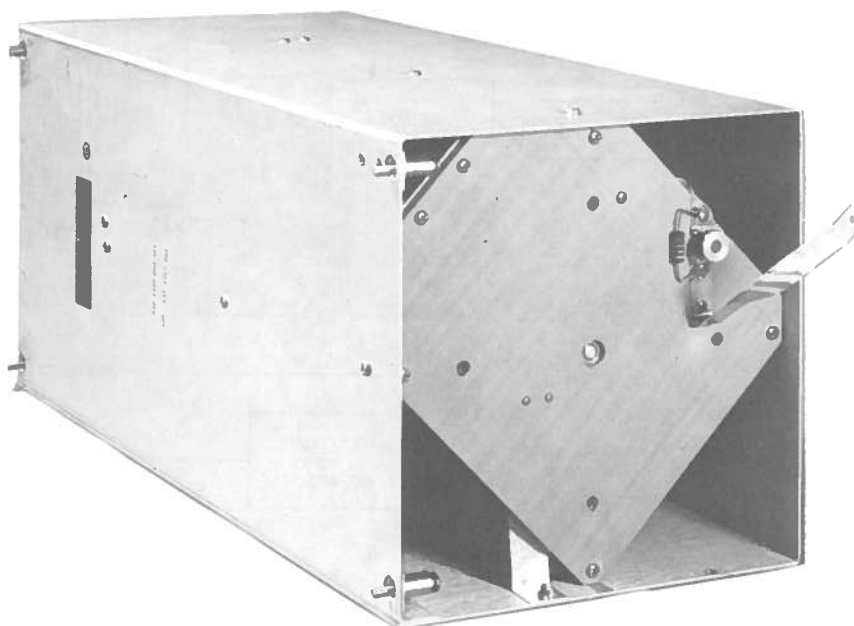
Printed in USA

(651-4523-001)

1. DESCRIPTION

Coil Module (651-4523-001), shown in figure 1, is a plug-in module with a 25-pin input/output connector.

The coil module consists of a servo mechanism that controls a variable inductor, a blower motor, positioning switches, and relays.



TP5-1896-017

**Coil Module
Figure 1**

2. PRINCIPLES OF OPERATION

2.1 General

The coil module is the inductive component of an impedance matching network. Variable inductor L1 is controlled by a servo mechanism. Refer to figure 2 (block diagram) and figure 4 (schematic diagram) during the following discussion.

2.2 Coil Shorting Relays

Relays K1, K2, and K3 prevent coil resonance by shorting out the unused portion of the coil. When all three relays are deenergized, most of the coil (inductor L1) turns are shorted. When the inductor is tuned, position switches S1 and S3 route information to a control module. The control module combines this positioning information with tuning logic and provides a logic 0 level signal to P1-15 and P1-16. When a logic 0 level signal is applied to P1-16, relay K3 energizes and removes a short from a portion of the coil. When a logic 0 level signal is applied to P1-15, relays K1 and K2 energize and remove a short from the remaining portion of the coil. When all three relays are energized, the entire coil may be used for tuning by the movable tap.

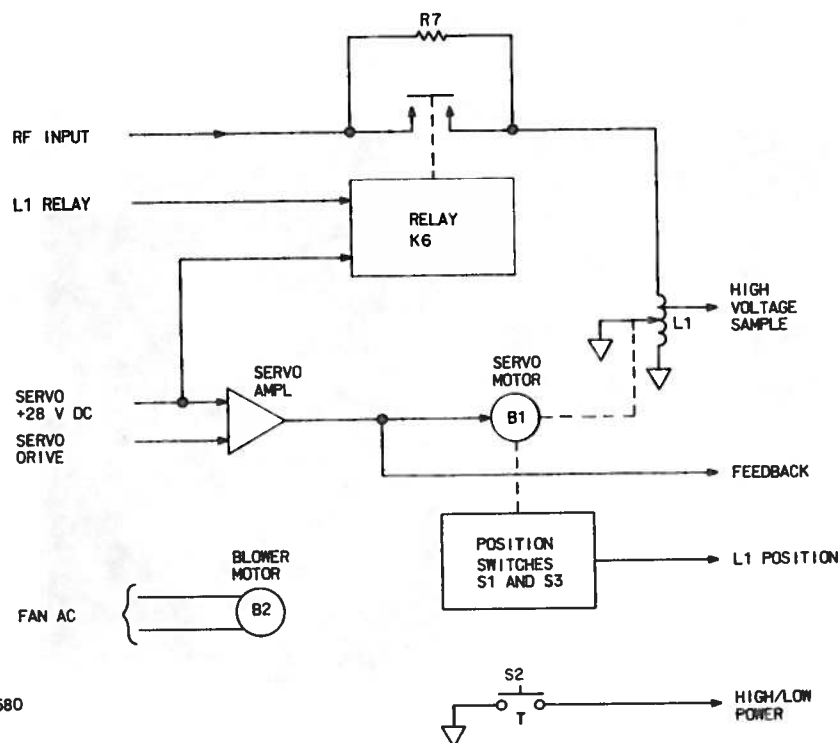
2.3 Servo Mechanism

The servo mechanism consists of a servo amplifier (Q1 through Q4), a dc motor (B1), and a variable inductor (L1). The servo mechanism receives signals from an external control module and drives the dc motor. A feedback signal is provided from the output of the servo amplifier to provide braking for the dc motor. The dc motor provides drive for the movable tap on inductor L1 and position switches S1 and S3.

2.4 On Line Relay

Relay K6 is energized by a logic 0 level signal from an external source. When energized, the contacts of relay K6 short static drain resistor R7 and place inductor L1 on line.

A high-voltage sample is detected from the junction of inductor L1 and static drain resistor R7 and routed to an external control module. When the voltage is excessive, the control module generates a fault signal. Temperature sensor S2 is energized when the temperature becomes excessive. The logic 0 (ground) level signal is routed to an associated power amplifier. The power amplifier output power is reduced until the temperature drops to a normal level.



NOTE:

B2 NOT USED IN AAC-580

TPA-0173-013

Coil Module, Block Diagram
Figure 2

Blower motor B2 provides internal cooling for the coil module and adjacent units.

3. TESTING/TROUBLESHOOTING PROCEDURES

A defective coil module can be returned to a Collins Defense Communications authorized repair facility for repair. For information and instructions, contact the nearest office or

Collins Defense Communications
Attention: HF Products
350 Collins Road NE
Cedar Rapids, Iowa 52498

4. ALIGNMENT/ADJUSTMENT

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

5. REPAIR

Repair of the coil module is accomplished using standard shop practices and repair procedures.

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
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
12969	UNITRODE CORP 580 PLEASANT ST WATERTOWN MA 02172

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

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

13499 ROCKWELL INTERNATIONAL CORPORATION
DEFENSE ELECTRONICS OPERATIONS
COLLINS DEFENSE COMMUNICATIONS DIV
350 COLLINS ROAD NE
CEDAR RAPIDS IA 52498

14604 ELMWOOD SENSORS INC
1655 ELMWOOD AVENUE
CRANSTON RI 02907

18741 KILOVAC CORP
P O BOX 4422
SANTA BARBARA CA 93103

21052 HIGH ENERGY CORP
LOWER VALLEY RD
PARKESBURG PA 19305

25140 TRW INC
TRW GLOBE MOTOR DIV
2275 STANLEY AVE
DAYTON OH 45404

28478 DELTROL CONTROLS DIV
DELTROL CORP
2745 S 19TH ST
MILWAUKEE WI 53215

40920 MINIATURE BEARING DIV MPB CORP
OPTICAL AVE PRECISION PARK
KEENE NH 03431

59660 TUSONIX INC
2155 N FORBES BLVD
SUITE 107
TUCSON AZ 85705

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

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

72962 ESNA DIV OF AMERACE CORP
2330 VAUXHALL ROAD
UNION NJ 07083

72982 ERIE TECHNOLOGICAL PRODUCTS INC
645 W 11TH ST
ERIE PA 16512

73905 ITT JENNINGS
970 MC LAUGHLIN AVE
SAN JOSE CA 95116

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

76854 OAK SWITCH SYSTEMS INC
SUB OF OAK TECHNOLOGY INC
100 S MAIN ST
P O BOX 517
CRYSTAL LAKE IL 60014

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

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

79963 ZIERICK MFG CO
RADIO CIRCLE
MT KISCO NY 10549

80205 NATIONAL AEROSPACE STANDARD

81349 MILITARY SPECIFICATIONS

88044 AERONAUTICAL STANDARD

91314 LEWIS SPRING AND MFG CO
2652 W NORTH AVE
CHICAGO IL 60647

91663 ARMEL ELECTRONICS INC
1601 75TH STREET
NORTH BERGEN NJ 07047

92702 IMC MAGNETICS CORP
EASTERN DIVISION
570 MAIN ST
WESTBURY LONG ISLAND NY 11591

96906 MILITARY STANDARD

98291 SEAELECTRO CORP
225 HOYT
MAMARONECK NY 10544

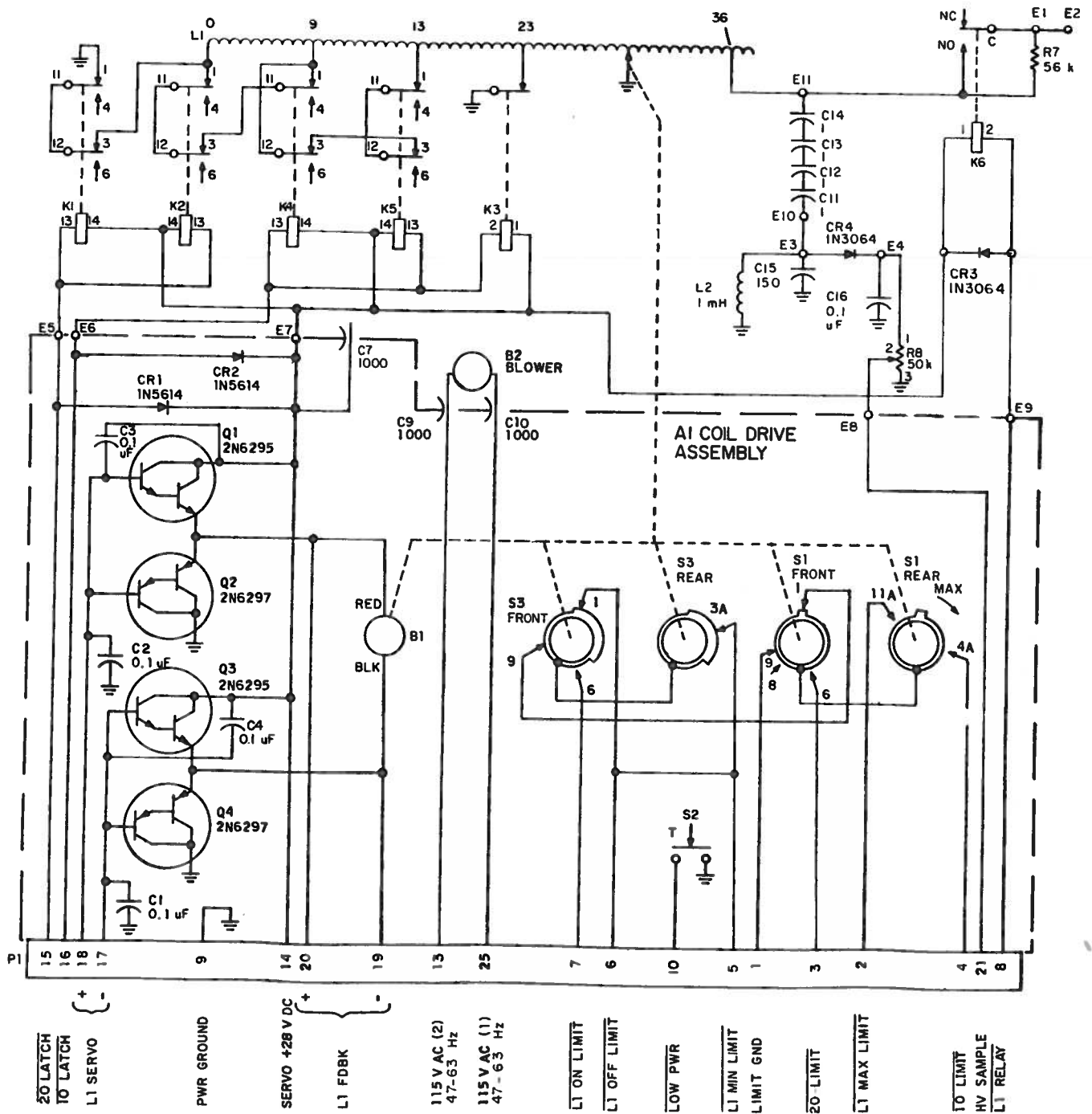
6.5 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Coil Module	651-4523-001	REV C
Coil Drive Assembly A1	635-4687-002	REV P

NOTES

1. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN PICOFARADS.
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
3. S1 AND S3 SHOWN AT L1 OFF LIMIT POSITION.
4. ROTATION OF L1 CORRESPONDS TO ROTATION OF S1 AND S3.

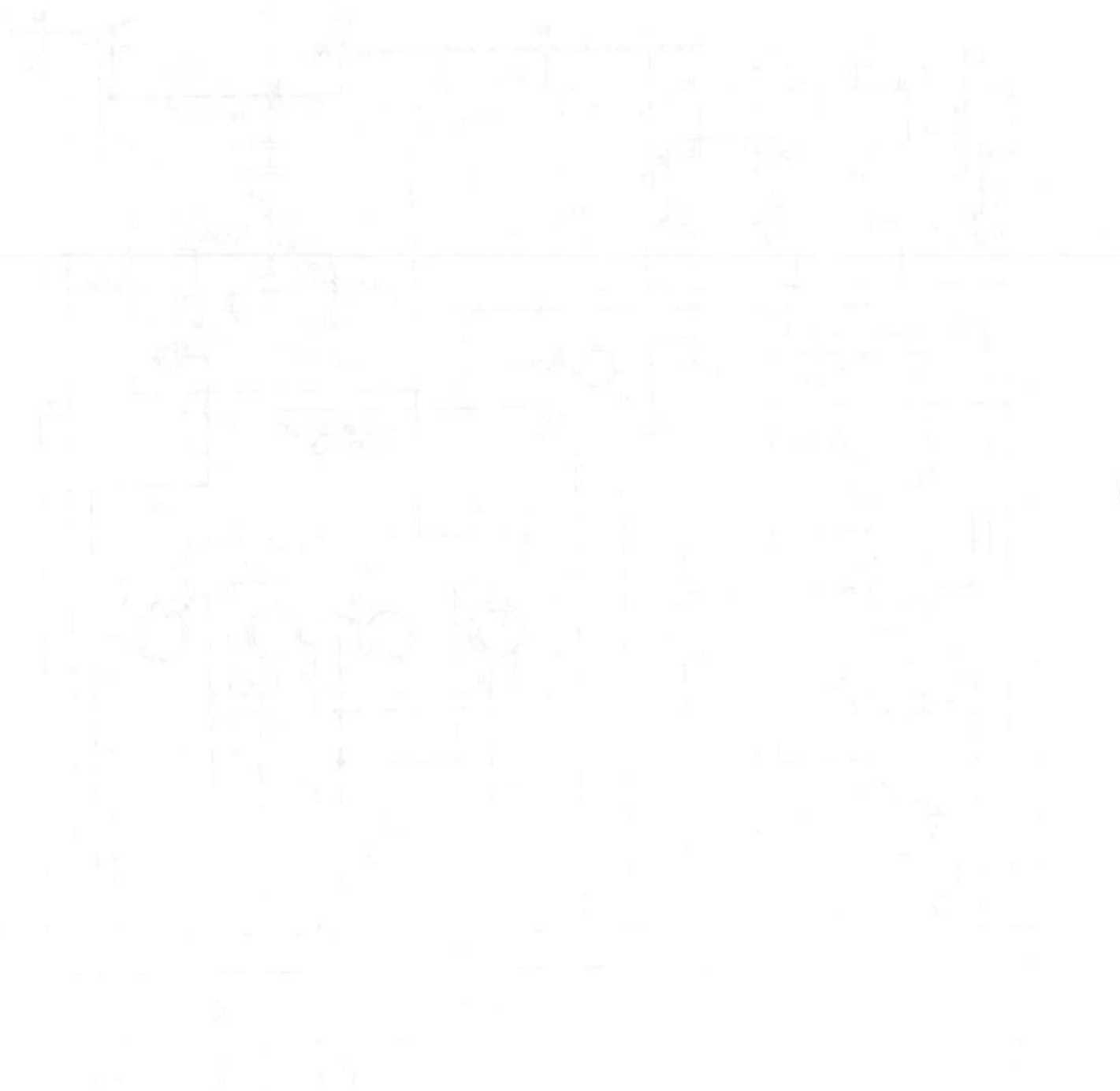


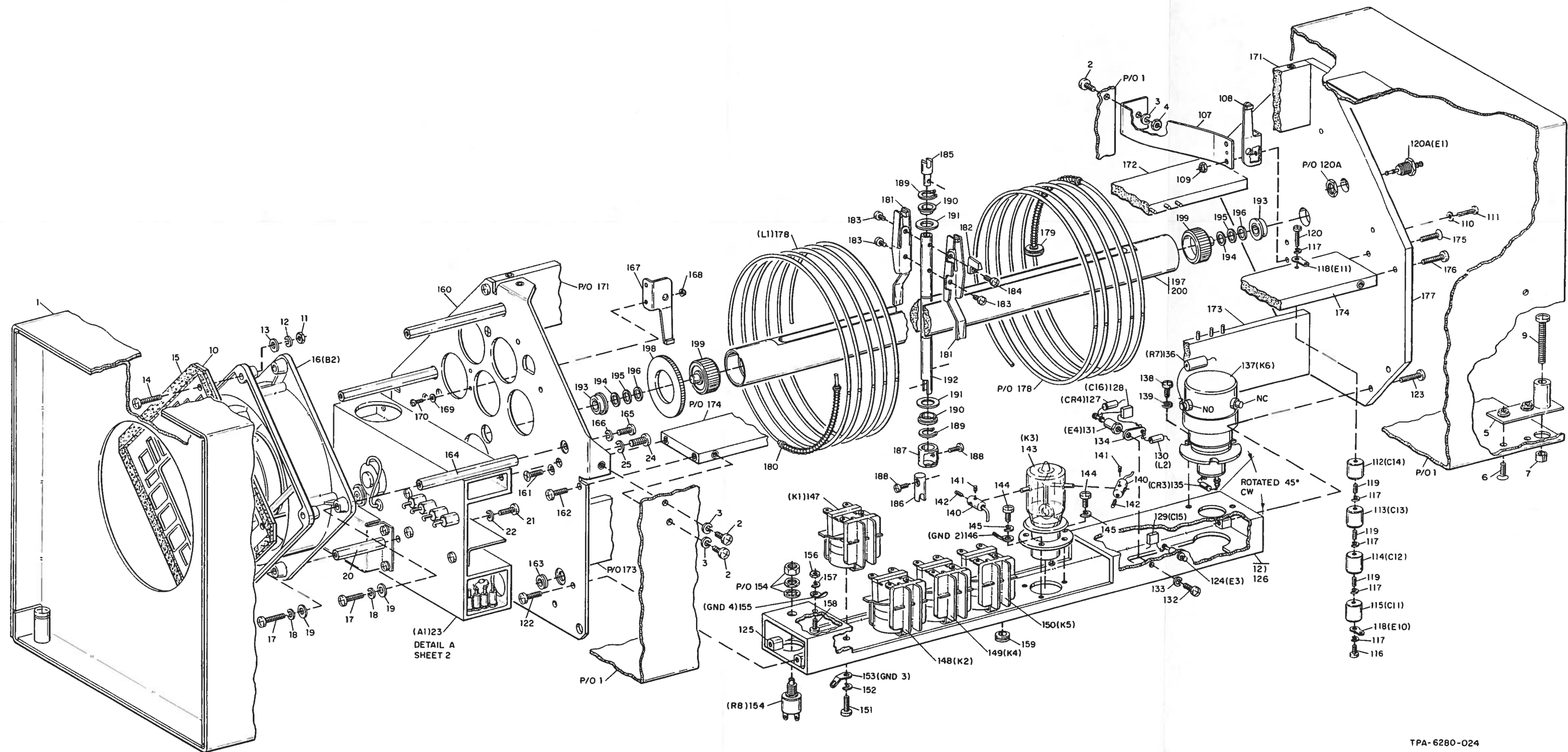
Coil Module, Schematic Diagram
Figure 4

2. The purpose of this report is to provide a summary of the results of the investigation of the cause of the failure of the engine.

3. The results of the investigation are as follows:

4. The cause of the failure was determined to be a failure of the engine.





Coil Module, Parts Location Diagram
Figure 3 (Sheet 1 of 3)



**Rockwell
International**

instructions

Collins Defense Communications

523-0773120-001211

1 June 1983

(651-4524-001)

Coil Module (651-4524-001)

Printed in USA

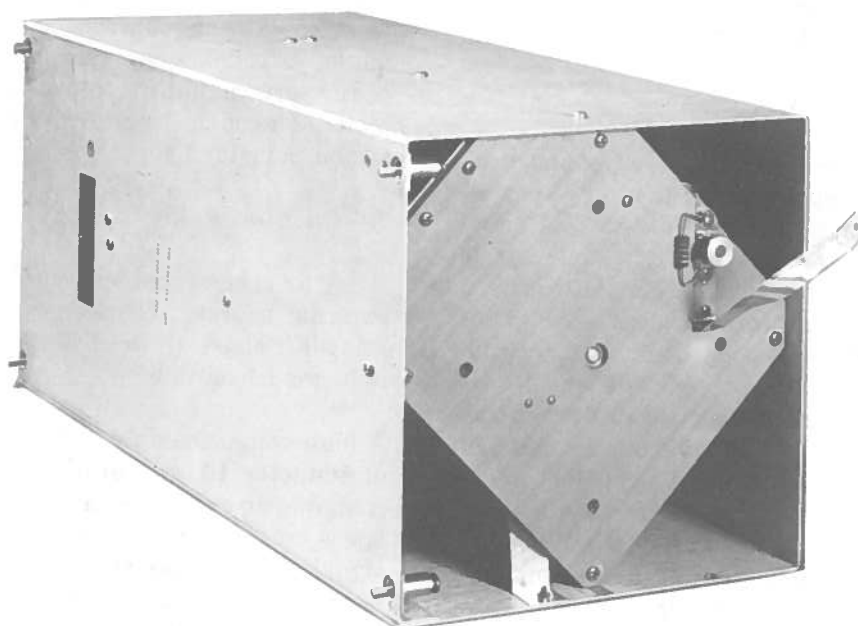
1. DESCRIPTION

Coil Module (651-4524-001), shown in figure 1, is a plug-in module with a 25-pin input/output connector. The coil module consists of a servo mechanism that controls a variable inductor, a blower motor, positioning switches, and relays.

2. PRINCIPLES OF OPERATION

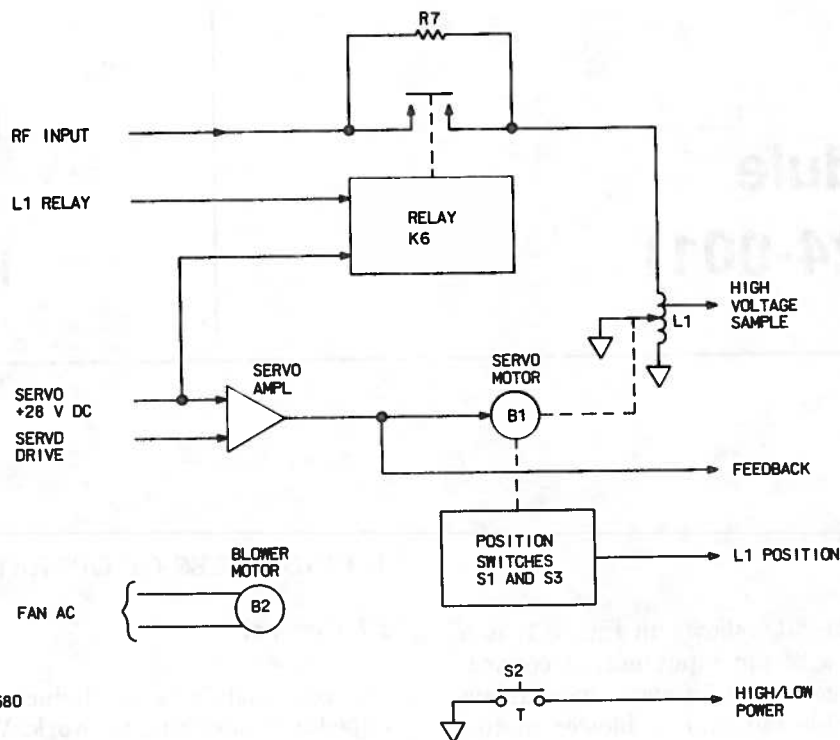
2.1 General

The coil module is the inductive component of an impedance matching network. Variable inductor L1 is controlled by a servo mechanism. Refer to figure 2



TP5-1896-017

**Coil Module
Figure 1**



NOTE:

B2 NOT USED IN AAC-580

TPA-0173-013

Coil Module, Block Diagram
Figure 2

(block diagram) and figure 4 (schematic diagram) during the following discussion.

2.2 Coil Shorting Relays

Relays K1, K2, and K3 prevent coil resonance by shorting out the unused portion of the coil. When all three relays are deenergized, most of the coil (inductor L1) turns are shorted. When the inductor is tuned, position switches S1 and S3 route information to a control module. The control module combines this positioning information with tuning logic and provides a logic 0 level signal to P1-15 and P1-16. When a logic 0 level signal is applied to P1-16, relay K3 energizes and removes a short from a portion of the coil. When a logic 0 level signal is applied to P1-15, relays K1 and K2 energize and remove a short from the remaining portion of the coil. When all three relays are energized, the entire coil may be used for tuning by the movable tap.

2.3 Servo Mechanism

The servo mechanism consists of a servo amplifier (Q1 through Q4), a dc motor (B1), and a variable

inductor (L1). The servo mechanism receives signals from an external control module and drives the dc motor. A feedback signal is provided from the output of the servo amplifier to provide braking for the dc motor. The dc motor provides drive for the movable tap on inductor L1 and position switches S1 and S3.

2.4 On Line Relay

Relay K6 is energized by a logic 0 level signal from an external source. When energized, the contacts of relay K6 short static drain resistor R7 and place inductor L1 on line.

A high-voltage sample is detected from the junction of inductor L1 and static drain resistor R7 and routed to an external control module. When the voltage is excessive, the control module generates a fault signal. Temperature sensor S2 is energized when the temperature becomes excessive. The logic 0 (ground) level signal is routed to an associated power amplifier. The power amplifier output power is reduced until the temperature drops to a normal level. Blower motor B2 provides internal cooling for the coil module and adjacent units.

3. TESTING/TROUBLESHOOTING PROCEDURES

A defective coil module can be returned to a Collins Defense Communications authorized repair facility for repair. For information and instructions, contact the nearest office or

Collins Defense Communications
Attention: HF Products
350 Collins Road NE
Cedar Rapids, Iowa 52498

4. ALIGNMENT/ADJUSTMENT

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

5. REPAIR

Repair of the coil module is accomplished using standard shop practices and repair procedures.

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.

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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
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
12969	UNITRODE CORP 580 PLEASANT ST WATERTOWN MA 02172
13103	THERMALLOY CO INC 2021 W VALLEY VIEW LANE P O BOX 340839 DALLAS TX 75234

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
13499	ROCKWELL INTERNATIONAL CORPORATION DEFENSE ELECTRONICS OPERATIONS COLLINS DEFENSE COMMUNICATIONS DIV 350 COLLINS ROAD NE CEDAR RAPIDS IA 52498
14604	ELMWOOD SENSORS INC 1655 ELMWOOD AVENUE CRANSTON RI 02907
18741	KILOVAC CORP P O BOX 4422 SANTA BARBARA CA 93103
21052	HIGH ENERGY CORP LOWER VALLEY RD PARKESBURG PA 19305
25140	TRW INC TRW GLOBE MOTOR DIV 2275 STANLEY AVE DAYTON OH 45404
28478	DELTROL CONTROLS DIV DELTROL CORP 2745 S 19TH ST MILWAUKEE WI 53215
40920	MINIATURE BEARING DIV MPB CORP OPTICAL AVE PRECISION PARK KEENE NH 03431
59660	TUSONIX INC 2155 N FORBES BLVD SUITE 107 TUCSON AZ 85705
70318	ALLMETAL SCREW PRODUCTS CO INC 821 STEWART AVE GARDEN CITY NY 11530
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
72962	ESNA DIV OF AMERACE CORP 2330 VAUXHALL ROAD UNION NJ 07083
72982	ERIE TECHNOLOGICAL PRODUCTS INC 645 W 11TH ST ERIE PA 16512
73905	ITT JENNINGS 970 MC LAUGHLIN AVE SAN JOSE CA 95116
76854	OAK SWITCH SYSTEMS INC SUB OF OAK TECHNOLOGY INC 100 S MAIN ST P O BOX 517 CRYSTAL LAKE IL 60014

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
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
79807	WROUGHT WASHER MFG INC 2100 S BAY ST MILWAUKEE WI 53207
79963	ZIERICK MFG CO RADIO CIRCLE MT KISCO NY 10549
80205	NATIONAL AEROSPACE STANDARD
81349	MILITARY SPECIFICATIONS
82877	ROTRON INC CUSTOM DIV 7 HASBROUCK LN WOODSTOCK NY 12498
88044	AERONAUTICAL STANDARD
91314	LEWIS SPRING AND MFG CO 2652 W NORTH AVE CHICAGO IL 60647
91663	ARMEL ELECTRONICS INC 1601 75TH STREET NORTH BERGEN NJ 07047
96906	MILITARY STANDARD
98291	SEAELECTRO CORP 225 HOYT MAMARONECK NY 10544

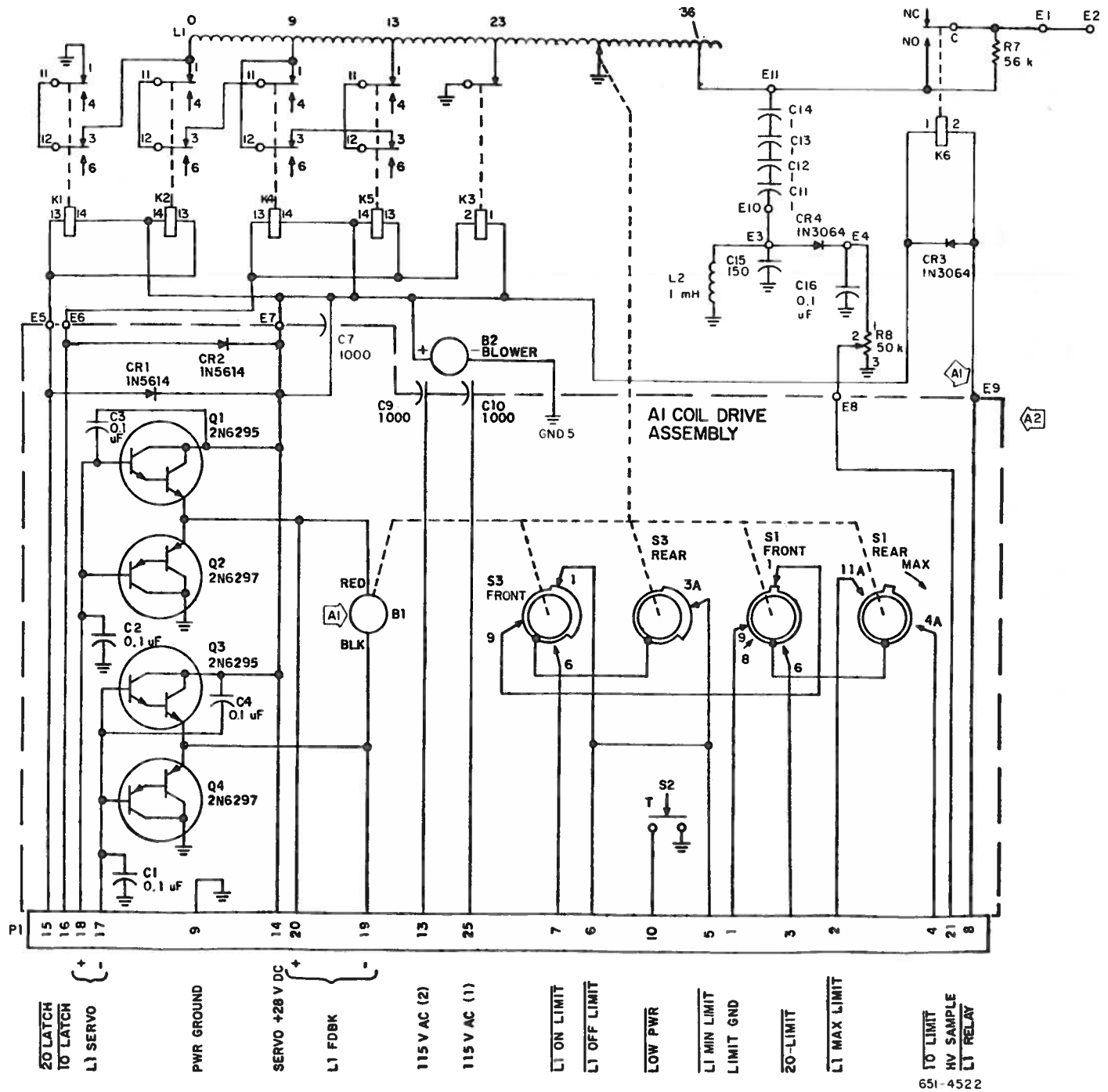
6.5 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

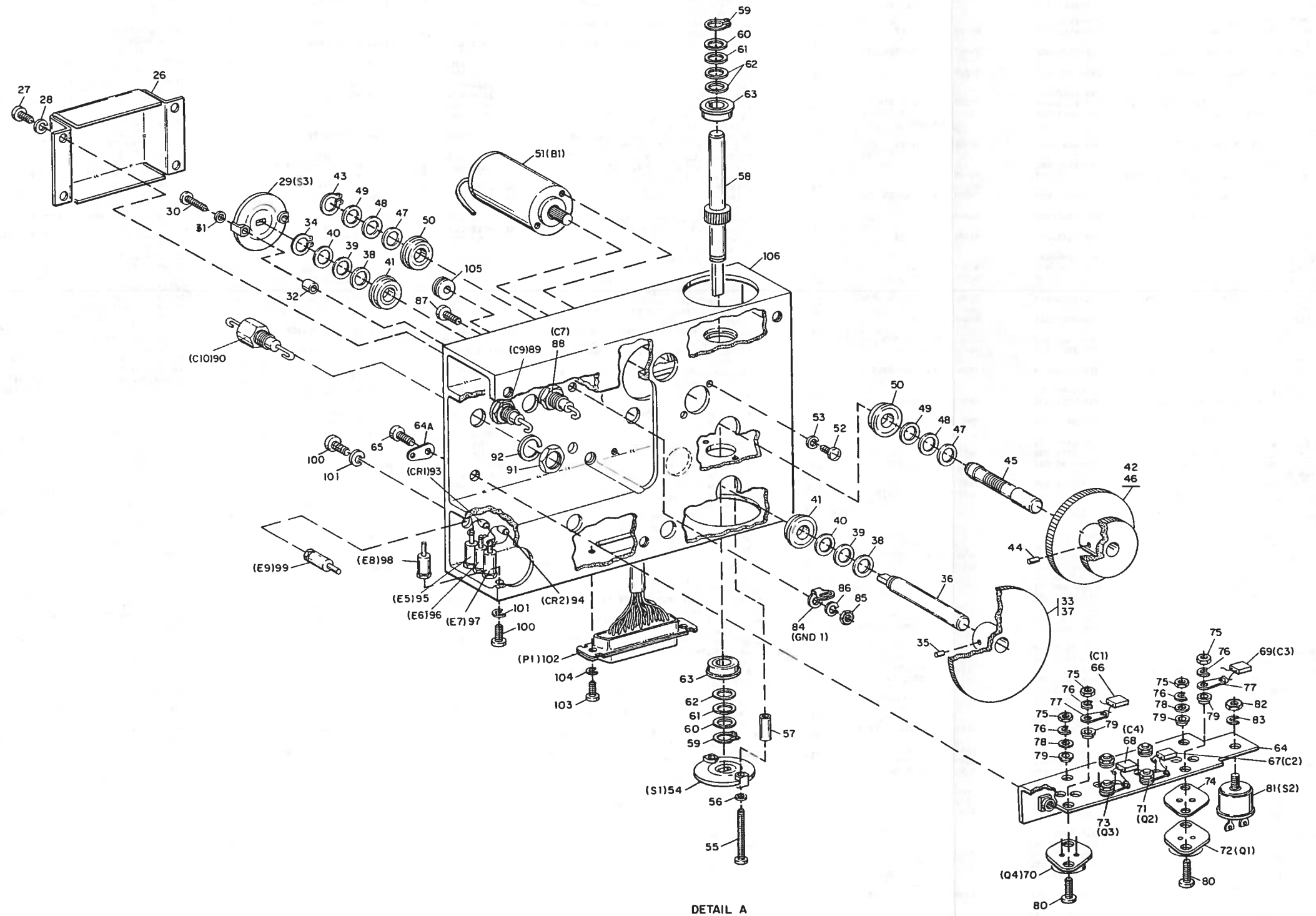
CIRCUIT CARD/ SUBASSEMBLY	COLLINS PART NUMBER	LATEST EFFECTIVITY
Coil Module	651-4524-001	REV D
Coil Drive Assembly A1	635-4687-002	REV P

NOTES

1. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN PICOFARADS.
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
3. S1 AND S3 SHOWN AT **L1 OFF LIMIT** POSITION.
4. ROTATION OF L1 CORRESPONDS TO ROTATION OF S1 AND S3.



Coil Module, Schematic Diagram
Figure 4



TPA-6280-024

Coil Module, Parts Location Diagram
Figure 3 (Sheet 2)

PARTS LIST

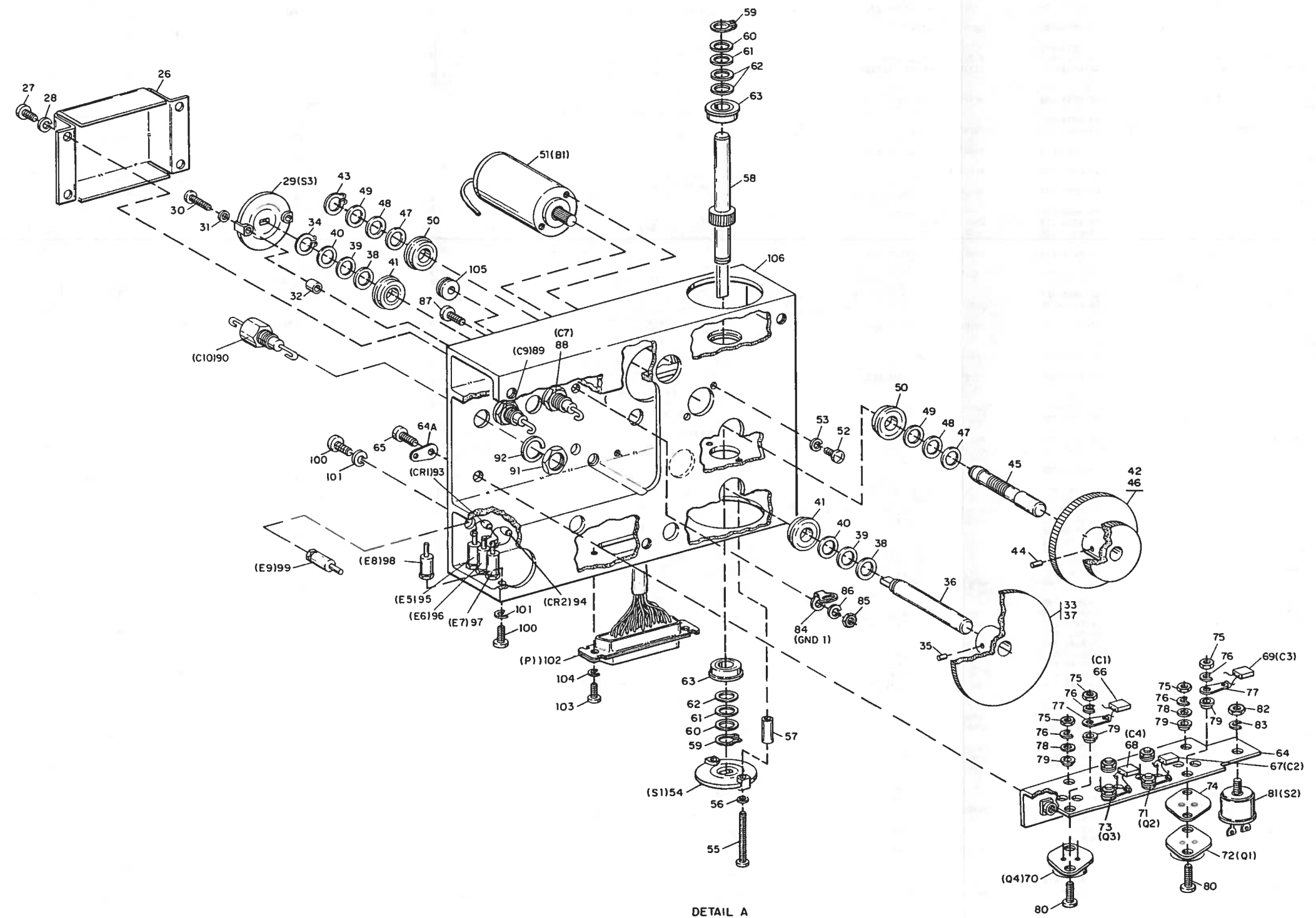
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	COIL MODULE	651-4523-001			651-4523-001
1	SHROUD, COIL-ROLLED (QTY 1)	609-2595-001			
2	SCREW,MACHINE CRES, 0.138-32 X 0.312IN (API)(QTY 17)	343-0168-000		96906	MS51957-27
3	WASHER,LOCK CRES, 0.145 ID X 0.236 OD (API)(QTY 17)	310-0071-000		79807	CRES-.145IDX.236 OD
4	NUT,PLAIN,HEXAGON CRES, 0.138-32 (API)(QTY 1)	313-0045-000		80205	NAS671C6
5	PLATE,BUSHING-PRSD (QTY 1)	609-2597-001			
6	SCREW,MACH NP BRS, 6-32 X 3/8 (API)(QTY 2)	342-0168-000		77250	P342-0168-000
7	SLEEVE,SPRING (API)(QTY 4)	340-0643-000		91314	BRYLM COP, 0.215 DX0.167L
8	NOT USED				
9	SCREW,MACHINE CRES, 0.190-32 X 1.250IN (API)(QTY 4)	343-0233-000		96906	MS51958-68
10	GUARD,FAN (QTY 1)	609-2599-001			
11	NUT,PLAIN,HEXAGON CRES, 0.138-32 (API)(QTY 4)	313-0045-000		80205	NAS671C6
12	WASHER,LOCK CRES, 0.145 ID X 0.236 OD (API)(QTY 4)	310-0071-000		79807	CRES-.145IDX.236 OD
13	WASHER,FLAT SST, 0.149 ID X 0.375 OD (API)(QTY 4)	310-0752-010		88044	AN960C6
14	SCREW,MACHINE CRES, 0.138-32 X 0.625IN (API)(QTY 4)	343-0173-000		96906	MS51957-31
15	SEAL,AIR (QTY 4)	609-2604-001			609-2604-001
16	FAN,VENTURI B2	009-1840-020		92702	BS2107FL
17	SCREW,MACHINE CRES, 0.138-32 X 0.625IN (API)(QTY 4)	343-0173-000		96906	MS51957-31
18	WASHER,LOCK CRES, 0.145 ID X 0.236 OD (API)(QTY 4)	310-0071-000		79807	CRES-.145IDX.236 OD
19	WASHER,FLAT SST, 0.149 ID X 0.375 OD (API)(QTY 4)	310-0752-010		88044	AN960C6
20	POST,HEX (QTY 1)	540-9468-003			540-9468-003
21	SCREW,MACHINE CRES, 0.138-32 X 0.375IN (API)(QTY 1)	343-0169-000		96906	MS51957-28
22	WASHER,LOCK CRES, 0.145 ID X 0.236 OD (API)(QTY 1)	310-0071-000		79807	CRES-.145IDX.236 OD
23	DRIVE ASSEMBLY,COIL A1	635-4687-002			
24	SCREW,MACHINE CRES, 0.190-32 X 0.375IN (API)(QTY 3)	343-0226-000		96906	MS51958-61
25	WASHER,LOCK CRES, 0.198 ID X 0.320 OD (API)(QTY 3)	310-0073-000		79807	CRES-.194IDX.323 OD
26	SHIELD,RF SWITCH (QTY 1)	629-6189-001			
27	SCREW,MACH STL, 4-40 X 3/16 (API)(QTY 4)	343-0132-000		96906	MS51957-12
28	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (API)(QTY 4)	310-0095-000		96906	MS35338-97
29	SWITCH SECTION,RTRY A1S3	269-2635-590		76854	4-1771-161
30	SCREW,MACHINE NP BRS, 0.086-56 X 0.625 (API)(QTY 2)	343-0361-000		77250	P343-0361-000
31	WASHER,NM FBR GLS, 0.088 ID X 0.150 OD (API)(QTY 2)	269-8031-000		76854	15517-2
32	SPACER (API)(QTY 2)	541-5949-002			541-5949-002
33	SHAFT-PINNED (QTY 1)	609-2602-002			609-2602-002
34	RING,RETAINING (API)(QTY 1)	340-0038-000		96906	MS16624-5025
35	PIN,SPR SST, 0.062 DIA X 3/8 (QTY 1)	311-0419-000		96906	MS16562-192
36	SHAFT,SWITCH (QTY 1)	609-2598-001			
37	GEAR, SPUR (QTY 1)	629-6188-001			
38	WASHER,SHIM (QTY AR)	768-5768-001			768-5768-001
39	WASHER,SHIM (QTY AR)	768-5768-002			768-5768-002
40	WASHER,SHIM (QTY AR)	768-5768-003			768-5768-003
41	BEARING,BALL,AN (QTY 2)	309-1523-000		40920	S814 FCHH-3P15L0 2
42	WORMSHAFT-PINNED (QTY 1)	609-2620-002			609-2620-002
43	RING,RETAINING (API)(QTY 1)	340-0038-000		96906	MS16624-5025
44	PIN,SPR SST, 0.062 DIA X 7/16 (QTY 1)	311-0420-000		96906	MS16562-193
45	WORMSHAFT (QTY 1)	609-0032-001			609-0032-001
46	GEAR, SPUR (QTY 1)	609-2605-002			
47	WASHER,SHIM (QTY AR)	768-5768-001			768-5768-001
48	WASHER,SHIM (QTY AR)	768-5768-002			768-5768-002
49	WASHER,SHIM (QTY AR)	768-5768-003			768-5768-003
50	BEARING,BALL,AN (QTY 2)	309-1523-000		40920	S814 FCHH-3P15L0 2
51	MOTOR A1B1	230-0667-010		25140	393A108
52	SCREW,MACH SST, 2-56 X 3/16 (API)(QTY 2)	343-0123-000		96906	MS51957-2
53	WASHER,SPRING CD PL BRZ, 0.088 ID X 0.172 OD (API)(QTY 2)	310-0093-000		96906	MS35338-96
54	SWITCH SECTION,RTRY A1S1	269-2635-580		76854	4-1141-811
55	SCREW,MACH SST, 2-56 X 7/8 (API)(QTY 2)	343-0130-000		96906	MS51957-10
56	WASHER,NM FBR GLS, 0.088 ID X 0.150 OD (API)(QTY 2)	269-8031-000		76854	15517-2
57	SLEEVE,SWITCH (API)(QTY 2)	541-5957-002			541-5957-002
58	GEAR,HELICAL-PRSD (QTY 1)	609-2619-006			609-2619-006
59	RING,RETAINING (API)(QTY 2)	340-0038-000		96906	MS16624-5025
60	WASHER,SHIM (QTY AR)	768-5768-001			768-5768-001
61	WASHER,SHIM (QTY AR)	768-5768-002			768-5768-002
62	WASHER,SHIM (QTY AR)	768-5768-003			768-5768-003
63	BEARING,BALL,AN (QTY 2)	309-1523-000		40920	S814 FCHH-3P15L0 2
64	BRACKET (QTY 1)	629-6187-001			
64A	TERMINAL,LUG (QTY 1)	304-3120-010		96906	MS77068-2
65	SCREW,MACHINE CRES, 0.138-32 X 0.312IN (API)(QTY 2)	343-0168-000		96906	MS51957-27
66	CAPACITOR,FIXED CER DIEI, 0.1UF, 10%, 50VDC A1C1	913-5019-320			81349 CK05BX104K

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
67	CAPACITOR,FIXED CER DIEI, 0.1UF, 10%, 50VDC A1C2	913-5019-320			
68	CAPACITOR,FIXED CER DIEI, 0.1UF, 10%, 50VDC A1C4	913-5019-320			
69	CAPACITOR,FIXED CER DIEI, 0.1UF, 10%, 50VDC A1C3	913-5019-320			
70	TRANSISTOR A1Q4	352-1015-020			
71	TRANSISTOR A1Q2	352-1015-020			
72	TRANSISTOR A1Q1	352-1014-020			
73	TRANSISTOR A1Q3	352-1014-020			
74	INSULATOR,PLATE (QTY 2)	352-9605-040			
75	NUT,PLAIN,HEX SST, 4-40 (AP FOR 70-74)(QTY 8)	313-0043-000			
76	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (AP FOR 70-74)(QTY 8)	310-0095-000		96906	MS35338-97
77	TERMINAL,LUG (AP FOR 70-74)(QTY 4)	304-0015-000		77147	4007-4HT
78	WASHER,FLAT CRES, 0.125 ID X 0.281 OD (AP FOR 70-74)(QTY 4)	310-6340-000		79807	CRES 0.125IDX0.2 810D
79	BUSHING,INSULATOR (AP FOR 70-74)(QTY 8)	547-8177-007			547-8177-007
80	SCREW,MACH STL, 4-40 X 3/8 (AP FOR 70-74)(QTY 8)	343-0135-000		96906	MS51957-15
81	SWITCH,THERMOSTATIC A1S2	267-0243-030		14604	3100-43-101
82	NUT,PLAIN,HEX CRES,6-32 (API)(QTY 1)	313-0002-000		96906	MS35649-264
83	WASHER,LOCK SST, 0.141 ID X 0.250 OD (API)(QTY 1)	310-0282-000		96906	MS35338-136
84	TERMINAL,LUG (QTY 1)	304-1089-000		79963	403
85	NUT,PLAIN,HEX SST, 4-40 (API)(QTY 1)	313-0043-000		96906	MS35649-244
86	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (API)(QTY 1)	310-0095-000		96906	MS35338-97
87	SCREW,MACH STL, 4-40 X 3/8 (API)(QTY 1)	343-0135-000		96906	MS51957-15
88	CAPACITOR,FIXED CER DIEI, 1000PF, P80ZH20%, 500V A1C7	913-1292-000		59660	327-000XST0102Z
89	CAPACITOR,FIXED CER DIEI, 1000PF, P80ZH20%, 500V A1C9	913-1292-000		59660	327-000XST0102Z
90	CAPACITOR,FIXED CER DIEI, 1000PF, P80ZH20%, 500V A1C10	913-1292-000			
91	NUT,PLAIN,HEXAGON CRES, 0.250-28 (AP FOR 88-90)(QTY 3)	313-0083-000			313-0081-000
92	WASHER,LOCK SST, 0.255 ID X 0.489 OD (AP FOR 88-90)(QTY 3)	310-0288-000		96906	MS35338-139
93	SEMICOND DEVICE A1CR1	353-6556-010		12969	1N5614
94	SEMICOND DEVICE A1CR2	353-6556-010		12969	1N5614
95	TERMINAL,STUD A1E5	306-0976-000		91663	RTHT12H
96	TERMINAL,STUD A1E6	306-0976-000		91663	RTHT12H
97	TERMINAL,STUD A1E7	306-0976-000		91663	RTHT12H
98	TERMINAL,STUD A1E8	306-0976-000		91663	RTHT12H
99	TERMINAL,STUD A1E9	306-0976-000		91663	RTHT12H
100	SCREW,MACH SST, 4-40 X 5/16 (AP FOR 95-99)(QTY 5)	343-0134-000		96906	MS51957-14
101	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (AP FOR 95-99)(QTY 5)	310-0095-000		96906	MS35338-97
102	CONNECTOR,RCPT ELEC A1P1	371-0170-000		71468	DBM-25P
103	SCREW,MACH STL, 4-40 X 1/4 (API)(QTY 2)	343-0133-000		96906	MS51957-13
104	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (API)(QTY 2)	310-0095-000		96906	MS35338-97
105	GROMMET,RBR (QTY 2)	201-1040-000		96906	MS35489-1
106	HOUSING,COIL DRIVE (QTY 1)	629-6186-001			
107	STRAP,GROUND (QTY 1)	609-2639-001			
108	CONTACT, GROUND-ROTOR (QTY 1)	609-2626-001			609-2626-001
109	NUT,SFLXKG,HEX AL, 2-56 (API)(QTY 2)	333-0604-000		72962	68-1660-26
110	WASHER,FLAT SST, 0.092 X 0.219 OD (API)(QTY 2)	310-6320-000		79807	310-6320-000
111	SCREW,MACH SST, 2-56 X 1/2 (API)(QTY 2)	343-0128-000		96906	MS51957-7
112	CAPACITOR,FXD CER DIEI, 1PF, PORM 0.5PF, 500V C14	913-0756-000		21052	HT54T1090K
113	CAPACITOR,FXD CER DIEI, 1PF, PORM 0.5PF, 500V C13	913-0756-000			
114	CAPACITOR,FXD CER DIEI, 1PF, PORM 0.5PF, 500V C12	913-0756-000			
115	CAPACITOR,FXD CER DIEI, 1PF, PORM 0.5PF, 500V C11	913-0756-000			
116	SCREW,MACHINE NP BRS, 0.086-56 X 0.125IN (AP FOR 112-115)(QTY 1)	343-0297-000			343-0297-000
117	WASHER,LOCK CD PL BRZ, 0.088 ID X 0.165 OD (AP FOR 112-115)(QTY 5)	310-0075-000		79807	CD PL BRZ,0.088I DX0.1650D
118	TERMINAL,LUG (AP FOR 112-115)(QTY 2)	304-0014-000		79963	634
119	STUD,CONT THD BRS, 2-56 X 3/16 (AP FOR 112-115)(QTY 3)	312-0222-000		77250	P312-0222-000
120	SCREW,MACHINE NP BRS, 0.086-56 X 0.437IN (AP FOR 112-115)(QTY 1)	343-0302-000			343-0302-000
120A	TERMINAL,FEEDTH E1	306-2629-020		71279	FT01XA02
121	BRACKET,RELAY,PRSD (QTY 1)	651-4308-001			
122	SCREW,MACHINE CRES, 0.138-32 X 0.500IN (API)(QTY 2)	343-0171-000		96906	MS51957-30
123	SCREW,MACHINE CRES, 0.138-32 X 0.625IN (API)(QTY 2)	343-0173-000		96906	MS51957-31
124	TERMINAL,STUD E3	306-0788-030		98291	012-2401-00-0-59 9
125	NUT,ANGLE (QTY 4)	764-7966-001			
126	HOUSING (QTY 1)	651-4308-002			
127	SEMICOND DEVICE CR4	353-3404-000		03508	1N3064
128	CAPACITOR,FIXED CER DIEI, 0.1UF, 20%, 50V C16	913-3279-200		72982	6131 M050 Z5U 10 4M

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
129	CAPACITOR, FIXED CER DIEI, 150PF, 10%, 200V C1	913-4008-000		81349	CK05BX151K
130	COIL, RF 1000UH L2	240-2715-490		96906	MS75089-23
131	TERMINAL, STUD E4	306-0976-000		91663	RTHT12H
132	SCREW, MACHINE NP BRS, 0.112-40 X 0.250IN (API)(QTY 1)	343-0285-000		77250	NPBR50.112-40X0. 250IN
133	WASHER, LOCK SST, 0.115 ID X 0.202 OD (API)(QTY 1)	310-0278-000		70318	310-0278-000
134	TERMINAL, LUG (API)(QTY 1)	304-0317-000		78189	2104-04-01-2520N
135	SEMICOND DEVICE CR3	353-3404-000		03508	1N3064
136	RESISTOR, FXD CMPSN, 56K, 10%, 1W R7	745-3426-000		81349	RCR32G563KS
137	RELAY, AMT K6	410-0469-030		73905	RJ2C26N801
138	SCREW, MACHINE CRES, 0.138-32 X 0.250IN (API)(QTY 3)	343-0167-000		96906	MS51957-26
139	WASHER, LOCK CRES, 0.145 ID X 0.236 OD (API)(QTY 3)	310-0071-000		79807	CRES-.145IDX.236 OD
140	CONNECTOR (QTY 2)	544-0090-002			544-0090-002
141	SETSCREW CD PL STL, 0.086-56 X 0.094 (API)(QTY 2)	328-0368-000			328-0368-000
142	SETSCREW CD PL STL, 2-56 X 1/8 (API)(QTY 2)	335-0232-000		88044	AN565F2H2
143	RELAY, ARMATURE K3	410-0342-000		18741	H-8/S10
144	SCREW, MACHINE CRES, 0.138-32 X 0.250IN (API)(QTY 3)	343-0167-000		96906	MS51957-26
145	WASHER, LOCK CRES, 0.145 ID X 0.236 OD (API)(QTY 3)	310-0071-000		79807	CRES-.145IDX.236 OD
146	TERMINAL, LUG (API)(QTY 1)	304-0318-000		78189	2104-06-02-2520N
147	RELAY, ARMATURE K1	970-2445-050		28478	100RF27567-61
148	RELAY, ARMATURE K2	970-2445-050		28478	100RF27567-61
149	RELAY, ARMATURE K4	970-2445-050		28478	100RF27567-61
150	RELAY, ARMATURE K5	970-2445-050		28478	100RF27567-61
151	SCREW, MACHINE CRES, 0.138-32 X 0.375IN (AP FOR 147-150)(QTY 4)	343-0169-000		96906	MS51957-26
152	WASHER, LOCK CRES, 0.145 ID X 0.236 OD (AP FOR 147-150)(QTY 4)	310-0071-000		79807	CRES-.145IDX.236 OD
153	TERMINAL, LUG (AP FOR 147)(QTY 1)	304-0318-000		78189	2104-06-02-2520N
154	RESISTOR, VARIABLE 50K, 20%, 1/2W R8	380-2266-000		81349	RVL6YSA503B
155	TERMINAL, LUG (QTY 1)	304-0317-000		78189	2104-04-01-2520N
156	NUT, PLAIN, HEX SST, 4-40 (API)(QTY 1)	313-0043-000		96906	MS35649-244
157	WASHER, LOCK SST, 0.115 ID X 0.202 OD (API)(QTY 1)	310-0278-000		70318	310-0278-000
158	SCREW, MACH SST, 4-40 X 5/16 (API)(QTY 1)	343-0134-000		96906	MS51957-14
159	GROMMET, RBR (QTY 1)	201-0019-000		96906	MS35489-33
160	PLATE, COIL-FRONT, PRSD (QTY 1)	635-4674-001			
161	SCREW, MACH SST, 6-32 X 3/8 (API)(QTY 4)	330-4058-030		77250	P330-4058-030
162	SCREW, MACHINE CRES, 0.138-32 X 0.375IN (API)(QTY 4)	343-0169-000		96906	MS51957-28
163	GROMMET, RBR (QTY 1)	201-0019-000		96906	MS35489-33
164	POST, HEX (QTY 3)	540-9480-003			540-9480-003
165	SCREW, MACHINE CRES, 0.138-32 X 0.375IN (API)(QTY 3)	343-0169-000		96906	MS51957-28
166	WASHER, LOCK CRES, 0.145 ID X 0.236 OD (API)(QTY 3)	310-0071-000		79807	CRES-.145IDX.236 OD
167	CONTACT, GROUND-ROTOR (QTY 1)	609-2626-001			609-2626-001
168	NUT, SLFLGX, HEX AL, 2-56 (API)(QTY 2)	333-0604-000		72962	68-1660-26
169	WASHER, FLAT SST, 0.092 X 0.219 OD (API)(QTY 2)	310-6320-000		79807	310-6320-000
170	SCREW, MACH CD PL STL, 2-56 X 1/4 (API)(QTY 2)	343-0124-000		96906	MS51957-3
171	BAR, COIL, PRESSED NO.4 (QTY 1)	609-2622-004			609-2622-004
172	BAR, COIL, PRESSED NO.3 (QTY 1)	609-2622-003			609-2622-003
173	BAR, COIL, PRESSED NO.2 (QTY 1)	609-2622-002			609-2622-002
174	BAR, COIL, PRESSED NO.1 (QTY 1)	609-2622-001			609-2622-001
175	SCREW, MACH SST, 6-32 X 1/2 (AP FOR 171-174)(QTY 4)	330-4058-050		77250	P330-4058-050
176	SCREW, MACH NP BRS, 6-32 X 5/8 (AP FOR 171-174)(QTY 4)	343-0333-000		77250	P343-0333-000
177	PLATE, COIL-REAR (QTY 1)	609-2601-001			
178	COIL, RF L1	609-2623-001			609-2623-001
179	BUMPER, TOP SPRING (QTY 1)	630-0236-001			630-0236-001
180	BUMPER, BOTTOM SPRING (QTY 1)	630-0231-001			630-0231-001
181	CONTACT, ELEC-ROTOR (QTY 2)	609-2617-001			609-2617-001
182	STOP, ROTOR END (QTY 1)	630-0139-001			630-0139-001
183	SCREW, MACHINE NP BRS, 0.086-56 X 0.125IN (AP FOR 181,182)(QTY 3)	343-0297-000			343-0297-000
184	SCREW, MACHINE NP BRS, 0.086-56 X 0.250IN (AP FOR 181,182)(QTY 1)	343-0299-000			343-0299-000
185	GUIDE, COIL ROTOR NO.2 (QTY 1)	609-2642-001			
186	GUIDE, COIL ROTOR NO.1 (QTY 1)	609-2641-001			
187	COUNTERWEIGHT (QTY 1)	609-2615-001			609-2615-001
188	SCREW, MACHINE NP BRS, 0.086-56 X 0.312IN (AP FOR 186,187)(QTY 2)	343-0300-000			343-0300-000
189	RING, RETAINING (QTY 2)	340-0038-000		96906	MS16624-5025
190	BEARING, BALL, AN (QTY 2)	309-1976-070		40920	N614FCMHSP25L02
191	WASHER, FLAT (QTY 2)	546-3017-003			546-3017-003
192	ARM, COIL ROTOR (QTY 1)	609-2613-001			609-2613-001
193	BEARING, BALL, AN (QTY 2)	309-1976-030		40920	N614FCMHSP25L02
194	WASHER, SHIM (QTY AR)	768-5768-001			768-5768-001
195	WASHER, SHIM (QTY AR)	768-5768-002			768-5768-002
196	WASHER, SHIM (QTY AR)	768-5768-003			768-5768-003
197	ROTOR ASSY, PRESSED (QTY 1)	609-2625-001			609-2625-001
198	GEAR, SPUR (QTY 1)	609-2600-001			
199	HUB, CONDUCTOR (QTY 2)	609-2612-001			
200	CONDUCTOR, ELEC (QTY 1)	609-2618-001			



Coil Module, Parts Location Diagram
Figure 3 (Sheet 2)

PARTS LIST

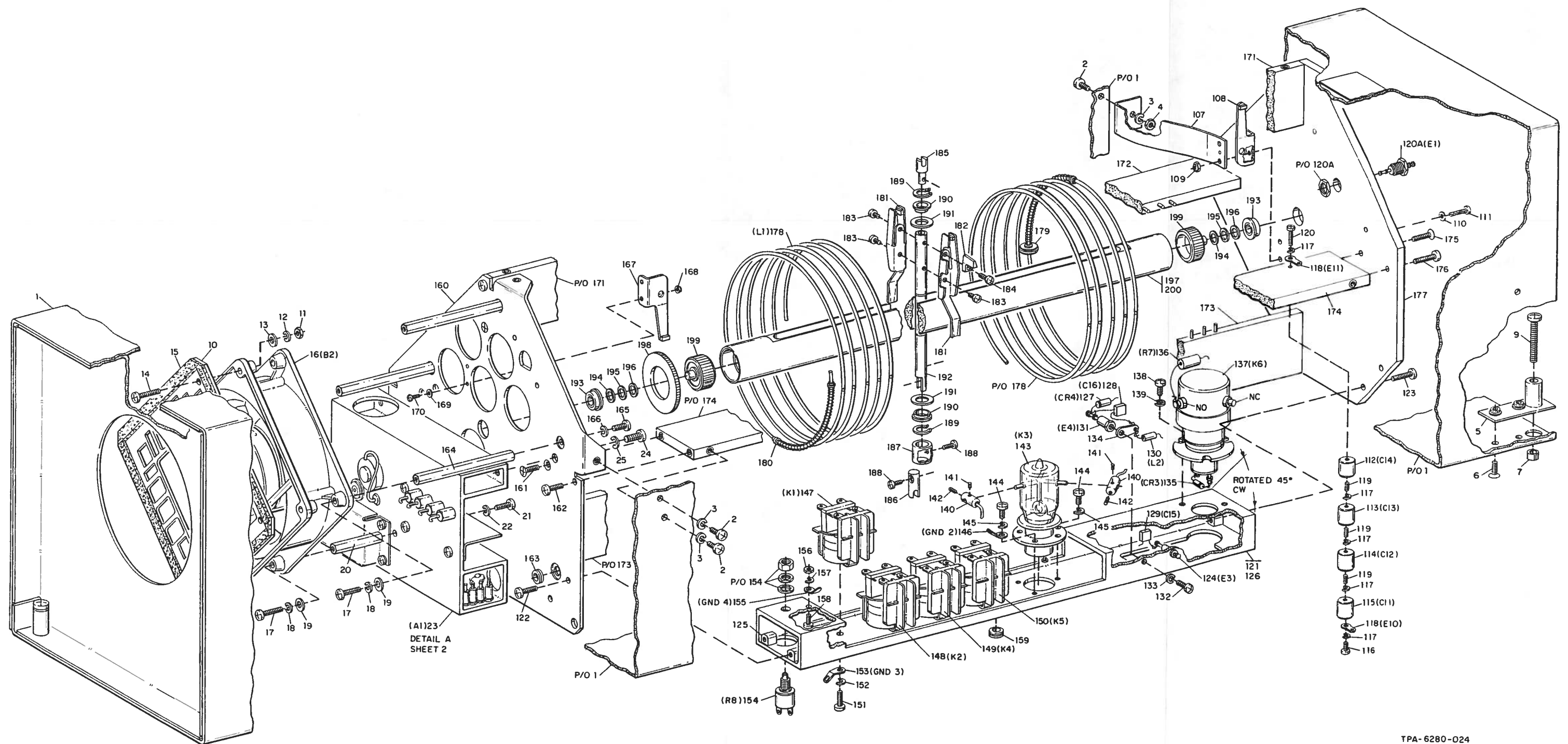
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	COIL MODULE	651-4524-001			651-4524-001
1	SHROUD, COIL-ROLLED (QTY 1)	609-2595-001			
2	SCREW,MACHINE CRES, 0.138-32 X 0.312IN (AP)(QTY 17)	343-0168-000		96906	MS51957-27
3	WASHER,LOCK CRES, 0.145 ID X 0.236 OD (AP)(QTY 17)	310-0071-000		79807	CRES-.145IDX.236 OD
4	NUT,PLAIN,HEXAGON CRES, 0.138-32 (AP)(QTY 1)	313-0045-000		80205	MSA671C6
5	PLATE,BUSHING-PRSD (QTY 1)	609-2597-001			
6	SCREW,MACH NP BRS, 6-32 X 3/8 (AP)(QTY 2)	342-0168-000		77250	P342-0168-000
7	SLEEVE,SPRING (AP)(QTY 4)	340-0643-000		91314	BRYLM COP, 0.215 DX0.187L
8	NOT USED				
9	SCREW,MACHINE CRES, 0.190-32 X 1.250IN (AP)(QTY 4)	343-0233-000		96906	MS51958-68
10	GUARD,FAN (QTY 1)	609-2599-001			
11	NUT,PLAIN,HEXAGON CRES, 0.138-32 (AP)(QTY 4)	313-0045-000		80205	MSA671C6
12	WASHER,LOCK CRES, 0.145 ID X 0.236 OD (AP)(QTY 4)	310-0071-000		79807	CRES-.145IDX.236 OD
13	WASHER,FLAT SST, 0.149 ID X 0.375 OD (AP)(QTY 4)	310-0752-010		88044	AN960C6
14	SCREW,MACHINE CRES, 0.138-32 X 0.625IN (AP)(QTY 4)	343-0173-000		96906	MS51957-31
15	SEAL,AIR (QTY 4)	609-2604-001			609-2604-001
16	FAN,TUBEAXIAL B2	009-0505-010		82877	011035
17	SCREW,MACHINE CRES, 0.138-32 X 0.625IN (AP)(QTY 4)	343-0173-000		96906	MS51957-31
18	WASHER,LOCK CRES, 0.145 ID X 0.236 OD (AP)(QTY 4)	310-0071-000		79807	CRES-.145IDX.236 OD
19	WASHER,FLAT SST, 0.149 ID X 0.375 OD (AP)(QTY 4)	310-0752-010		88044	AN960C6
20	POST,HEX (QTY 1)	540-9468-003			540-9468-003
21	SCREW,MACHINE CRES, 0.138-32 X 0.375IN (AP)(QTY 1)	343-0169-000		96906	MS51957-28
22	WASHER,LOCK CRES, 0.145 ID X 0.236 OD (AP)(QTY 1)	310-0071-000		79807	CRES-.145IDX.236 OD
23	DRIVE ASSEMBLY,COIL A1	635-4687-002			
24	SCREW,MACHINE CRES, 0.190-32 X 0.375IN (AP)(QTY 3)	343-0226-000		96906	MS51958-61
25	WASHER,LOCK CRES, 0.190 ID X 0.320 OD (AP)(QTY 3)	310-0073-000		79807	CRES-.194IDX.323 OD
26	SHIELD,RF SWITCH (QTY 1)	629-6189-001			
27	SCREW,MACH STL, 4-40 X 3/16 (AP)(QTY 4)	343-0132-000		96906	MS51957-12
28	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (AP)(QTY 4)	310-0095-000		96906	MS35338-97
29	SWITCH SECTION,RTRY A1S3	269-2635-590		76854	4-1771-161
30	SCREW,MACHINE NP BRS, 0.086-56 X 0.625 (AP)(QTY 2)	343-0361-000		77250	P343-0361-000
31	WASHER,NM FBR GLS, 0.088 ID X 0.150 OD (AP)(QTY 2)	269-8031-000		76854	15517-2
32	SPACER (AP)(QTY 2)	541-5949-002			541-5949-002
33	SHAFT-PINNED (QTY 1)	609-2602-002			609-2602-002
34	RING,RETAINING (AP)(QTY 1)	340-0038-000		96906	MS16624-5025
35	PIN,SPR SST, 0.062 DIA X 3/8 (QTY 1)	311-0419-000		96906	MS16562-192
36	SHAFT,SWITCH (QTY 1)	609-2598-001			
37	GEAR,SPUR (QTY 1)	629-6188-001			
38	WASHER,SHIM (QTY AR)	768-5768-001			768-5768-001
39	WASHER,SHIM (QTY AR)	768-5768-002			768-5768-002
40	WASHER,SHIM (QTY AR)	768-5768-003			768-5768-003
41	BEARING,BALL,AN (QTY 2)	309-1523-000		40920	S814 FCHM-3P15L0 2
42	WORMSHAFT-PINNED (QTY 1)	609-2620-002			609-2620-002
43	RING,RETAINING (AP)(QTY 1)	340-0038-000		96906	MS16624-5025
44	PIN,SPR SST, 0.062 DIA X 7/16 (QTY 1)	311-0420-000		96906	MS16562-193
45	WORMSHAFT (QTY 1)	609-0032-001			609-0032-001
46	GEAR,SPUR (QTY 1)	609-2605-002			
47	WASHER,SHIM (QTY AR)	768-5768-001			768-5768-001
48	WASHER,SHIM (QTY AR)	768-5768-002			768-5768-002
49	WASHER,SHIM (QTY AR)	768-5768-003			768-5768-003
50	BEARING,BALL,AN (QTY 2)	309-1523-000		40920	S814 FCHM-3P15L0 2
51	MOTOR A1B1	230-0667-010		25140	393A108
52	SCREW,MACH SST, 2-56 X 3/16 (AP)(QTY 2)	343-0123-000		96906	MS51957-2
53	WASHER,SPRING CD PL BRZ, 0.088 ID X 0.172 OD (AP)(QTY 2)	310-0093-000		96906	MS35338-96
54	SWITCH SECTION,RTRY A1S1	269-2635-580		76854	4-1141-811
55	SCREW,MACH SST, 2-56 X 7/8 (AP)(QTY 2)	343-0130-000		96906	MS51957-10
56	WASHER,NM FBR GLS, 0.088 ID X 0.150 OD (AP)(QTY 2)	269-8031-000		76854	15517-2
57	SLEEVE,SWITCH (AP)(QTY 2)	541-5957-002			541-5957-002
58	GEAR,HELICAL-PRSD (QTY 1)	609-2619-006			609-2619-006
59	RING,RETAINING (AP)(QTY 2)	340-0038-000		96906	MS16624-5025
60	WASHER,SHIM (QTY AR)	768-5768-001			768-5768-001
61	WASHER,SHIM (QTY AR)	768-5768-002			768-5768-002
62	WASHER,SHIM (QTY AR)	768-5768-003			768-5768-003
63	BEARING,BALL,AN (QTY 2)	309-1523-000		40920	S814 FCHM-3P15L0 2
64	BRACKET (QTY 1)	629-6187-001			
64A	TERMINAL,LUG (QTY 1)	304-3120-010		96906	MS77068-2
65	SCREW,MACHINE CRES, 0.138-32 X 0.312IN (AP)(QTY 2)	343-0168-000		96906	MS51957-27

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
66	CAPACITOR,FIXED CER DIEI, 0.1UF, 10%, 50VDC A1C1	913-5019-320		81349	CK05BX104K
67	CAPACITOR,FIXED CER DIEI, 0.1UF, 10%, 50VDC A1C2	913-5019-320		81349	CK05BX104K
68	CAPACITOR,FIXED CER DIEI, 0.1UF, 10%, 50VDC A1C4	913-5019-320		81349	CK05BX104K
69	CAPACITOR,FIXED CER DIEI, 0.1UF, 10%, 50VDC A1C3	913-5019-320		81349	CK05BX104K
70	TRANSISTOR A1Q4	352-1015-020		04713	2N6297
71	TRANSISTOR A1Q2	352-1015-020		04713	2N6297
72	TRANSISTOR A1Q1	352-1014-020		04713	2N6295
73	TRANSISTOR A1Q3	352-1014-020		04713	2N6295
74	INSULATOR,PLATE (QTY 2)	352-9605-040		13103	43-66-2
75	NUT,PLAIN,HEX SST, 4-40 (AP FOR 70-74)(QTY 8)	313-0043-000		96906	MS35649-244
76	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (AP FOR 70-74)(QTY 8)	310-0095-000		96906	MS35338-97
77	TERMINAL,LUG (AP FOR 70-74)(QTY 4)	304-0015-000		77147	4007-4HT
78	WASHER,FLAT CRES, 0.125 ID X 0.281 OD (AP FOR 70-74)(QTY 4)	310-6340-000		79807	CRES 0.125IDX0.2 8100
79	BUSHING,INSULATOR (AP FOR 70-74)(QTY 8)	547-8177-007			547-8177-007
80	SCREW,MACH STL, 4-40 X 3/8 (AP FOR 70-74)(QTY 8)	343-0135-000		96906	MS51957-15
81	SWITCH,THERMOSTATIC A1S2	267-0243-030		14604	3100-43-101
82	NUT,PLAIN,HEX CRES,6-32 (AP)(QTY 1)	313-0002-000		96906	MS35649-264
83	WASHER,LOCK SST, 0.141 ID X 0.250 OD (AP)(QTY 1)	310-0282-000		96906	MS35338-136
84	TERMINAL,LUG (QTY 1)	304-1089-000		79963	403
85	NUT,PLAIN,HEX SST, 4-40 (AP)(QTY 1)	313-0043-000		96906	MS35649-244
86	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (AP)(QTY 1)	310-0095-000		96906	MS35338-97
87	SCREW,MACH STL, 4-40 X 3/8 (AP)(QTY 1)	343-0135-000		96906	MS51957-15
88	CAPACITOR,FIXED CER DIEI, 1000PF, P80ZHX20%, 500V A1C7	913-1292-000		59660	327-000X5T0102Z
89	CAPACITOR,FIXED CER DIEI, 1000PF, P80ZHX20%, 500V A1C9	913-1292-000		59660	327-000X5T0102Z
90	CAPACITOR,FIXED CER DIEI, 1000PF, P80ZHX20%, 500V A1C10	913-1292-000		59660	327-000X5T0102Z
91	NUT,PLAIN,HEXAGON CRES, 0.250-28 (AP FOR 88-90)(QTY 3)	313-0083-000			313-0081-000
92	WASHER,LOCK SST, 0.255 ID X 0.489 OD (AP FOR 88-90)(QTY 3)	310-0288-000		96906	MS35338-139
93	SEMICONV DEVICE A1C1	353-6556-010		12969	IN5614
94	SEMICONV DEVICE A1C2	353-6556-010		12969	IN5614
95	TERMINAL,STUD A1E5	306-0976-000		91663	RTHT12M
96	TERMINAL,STUD A1E6	306-0976-000		91663	RTHT12M
97	TERMINAL,STUD A1E7	306-0976-000		91663	RTHT12M
98	TERMINAL,STUD A1E8	306-0976-000		91663	RTHT12M
99	TERMINAL,STUD A1E9	306-0976-000		91663	RTHT12M
100	SCREW,MACH SST, 4-40 X 5/16 (AP FOR 95-99)(QTY 5)	343-0134-000		96906	MS51957-14
101	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (AP FOR 95-99)(QTY 5)	310-0095-000		96906	MS35338-97
102	CONNECTOR,RCPT ELEC A1P1	371-0170-000		71468	DBM-25P
103	SCREW,MACH STL, 4-40 X 1/4 (AP)(QTY 2)	343-0133-000		96906	MS51957-13
104	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (AP)(QTY 2)	310-0095-000		96906	MS35338-97
105	GROMMET,RBR (QTY 2)	201-1040-000		96906	MS35469-1
106	HOUSING,COIL DRIVE (QTY 1)	629-6186-001			
107	STRAP,GROUND (QTY 1)	609-2639-001			
108	CONTACT, GROUND-ROTOR (QTY 1)	609-2626-001			609-2626-001
109	NUT,SLFLKG,HEX AL, 2-56 (AP)(QTY 2)	333-0604-000		72962	68-1660-26
110	WASHER,FLAT SST, 0.092 X 0.219 OD (AP)(QTY 2)	310-6320-000		79807	310-6320-000
111	SCREW,MACH SST, 2-56 X 1/2 (AP)(QTY 2)	343-0128-000		96906	MS51957-7
112	CAPACITOR,FXD CER DIEI, 1PF, PORM 0.5PF, 500V C14	913-0756-000		21052	HT54T1090K
113	CAPACITOR,FXD CER DIEI, 1PF, PORM 0.5PF, 500V C13	913-0756-000		21052	HT54T1090K
114	CAPACITOR,FXD CER DIEI, 1PF, PORM 0.5PF, 500V C12	913-0756-000		21052	HT54T1090K
115	CAPACITOR,FXD CER DIEI, 1PF, PORM 0.5PF, 500V C11	913-0756-000		21052	HT54T1090K
116	SCREW,MACHINE NP BRS, 0.086-56 X 0.125IN (AP FOR 112-115)(QTY 1)	343-0297-000			343-0297-000
117	WASHER,LOCK CD PL BRZ, 0.088 ID X 0.165 OD (AP FOR 112-115)(QTY 5)	310-0075-000		79807	CD PL BRZ,0.088I DX0.1650D
118	TERMINAL,LUG (AP FOR 112-115)(QTY 2)	304-0014-000		79963	634
119	STUD,CONT THD BRS, 2-56 X 3/16 (AP FOR 112-115)(QTY 3)	312-0222-000		77250	P312-0222-000
120	SCREW,MACHINE NP BRS, 0.086-56 X 0.437IN (AP FOR 112-115)(QTY 1)	343-0302-000			343-0302-000
120A	TERMINAL,FEEDTH E1	306-2629-020		71279	F701XA02
121	BRACKET,RELAY,PRSD (QTY 1)	651-4308-001			
122	SCREW,MACHINE CRES, 0.138-32 X 0.500IN (AP)(QTY 2)	343-0171-000		96906	MS51957-30
123	SCREW,MACHINE CRES, 0.138-32 X 0.625IN (AP)(QTY 2)	343-0173-000		96906	MS51957-31
124	TERMINAL,STUD E3	306-0788-030		98291	012-2401-00-0-59 9
125	NUT,ANGLE (QTY 4)	764-7966-001			
126	HOUSING (QTY 1)	651-4308-002			
127	SEMICONV DEVICE CR4	353-3404-000		03508	IN3064

PARTS LIST (Cont)

REF DES	DESCRIPTION	PART PART NUMBER	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
128	CAPACITOR, FIXED CER DIEI, 0.1UF, 20%, 50V C16		913-3279-200		72982	8131 M050 Z5U 10 4H
129	CAPACITOR, FIXED CER DIEI, 150PF, 10%, 200V C15		913-4008-000		81349	CK05BX151K
130	COIL, RF 1000UH L2		240-2715-490		96906	MS75089-23
131	TERMINAL, STUD E4		306-0976-000		91663	RTHT12M
132	SCREW, MACHINE NP BRS, 0.112-40 X 0.250IN (AP)(QTY 1)		343-0285-000		77250	NPBRS0.112-40X0. 250IN
133	WASHER, LOCK SST, 0.115 ID X 0.202 OD (AP)(QTY 1)		310-0278-000		70318	310-0278-000
134	TERMINAL, LUG (AP)(QTY 1)		304-0317-000		78189	2104-04-01-2520N
135	SEMICONV DEVICE CR3		353-3404-000		03508	IN3064
136	RESISTOR, FXD CHPSN, 56K, 10%, 1W R7		745-3426-000		81349	RCR32G563KS
137	RELAY, AMT K6		410-0469-030		73905	RJ2C26N801
138	SCREW, MACHINE CRES, 0.138-32 X 0.250IN (AP)(QTY 3)		343-0167-000		96906	MS51957-26
139	WASHER, LOCK CRES, 0.145 ID X 0.236 OD (AP)(QTY 3)		310-0071-000		79807	CRES-.145IDX.236 OD
140	CONNECTOR (QTY 2)		544-0090-002			544-0090-002
141	SETSCREW CD PL STL, 0.086-56 X 0.094 (AP)(QTY 2)		328-0368-000			328-0368-000
142	SETSCREW CD PL STL, 2-56 X 1/8 (AP)(QTY 2)		335-0232-000		88044	AN565F2H2
143	RELAY, ARMATURE K3		410-0342-000		18741	H-8/S10
144	SCREW, MACHINE CRES, 0.138-32 X 0.250IN (AP)(QTY 3)		343-0167-000		96906	MS51957-26
145	WASHER, LOCK CRES, 0.145 ID X 0.236 OD (AP)(QTY 3)		310-0071-000		79807	CRES-.145IDX.236 OD
146	TERMINAL, LUG (AP)(QTY 1)		304-0318-000		78189	2104-06-02-2520N
147	RELAY, ARMATURE K1		970-2445-050		28478	100RF27567-61
148	RELAY, ARMATURE K2		970-2445-050		28478	100RF27567-61
149	RELAY, ARMATURE K4		970-2445-050		28478	100RF27567-61
150	RELAY, ARMATURE K5		970-2445-050		28478	100RF27567-61
151	SCREW, MACHINE CRES, 0.138-32 X 0.375IN (AP FOR 147-150)(QTY 4)		343-0169-000		96906	MS51957-26
152	WASHER, LOCK CRES, 0.145 ID X 0.236 OD (AP FOR 147-150)(QTY 4)		310-0071-000		79807	CRES-.145IDX.236 OD
153	TERMINAL, LUG (AP FOR 147)(QTY 1)		304-0318-000		78189	2104-06-02-2520N
154	RESISTOR, VARIABLE 50K, 20%, 1/2W R8		380-2266-000		81349	RV6LAYSA503B
155	TERMINAL, LUG (QTY 1)		304-0317-000		78189	2104-04-01-2520N
156	NUT, PLAIN, HEX SST, 4-40 (AP)(QTY 1)		313-0043-000		96906	MS35649-244
157	WASHER, LOCK SST, 0.115 ID X 0.202 OD (AP)(QTY 1)		310-0278-000		70318	310-0278-000
158	SCREW, MACH SST, 4-40 X 5/16 (AP)(QTY 1)		343-0134-000		96906	MS51957-14
159	GROMMET, RBR (QTY 1)		201-0019-000		96906	MS35489-33
160	PLATE, COIL-FRONT, PRSD (QTY 1)		635-4674-001			
161	SCREW, MACH SST, 6-32 X 3/8 (AP)(QTY 4)		330-4058-030		77250	P330-4058-030
162	SCREW, MACHINE CRES, 0.138-32 X 0.375IN (AP)(QTY 4)		343-0169-000		96906	MS51957-28
163	GROMMET, RBR (QTY 1)		201-0019-000		96906	MS35489-33
164	POST, HEX (QTY 3)		540-9480-003			540-9480-003
165	SCREW, MACHINE CRES, 0.138-32 X 0.375IN (AP)(QTY 3)		343-0169-000		96906	MS51957-28
166	WASHER, LOCK CRES, 0.145 ID X 0.236 OD (AP)(QTY 3)		310-0071-000		79807	CRES-.145IDX.236 OD
167	CONTACT, GROUND-ROTOR (QTY 1)		609-2626-001			609-2626-001
168	NUT, SLFLKG, HEX AL, 2-56 (AP)(QTY 2)		333-0604-000		72962	68-1660-26
169	WASHER, FLAT SST, 0.092 X 0.219 OD (AP)(QTY 2)		310-6320-000		79807	310-6320-000
170	SCREW, MACH CD PL STL, 2-56 X 1/4 (AP)(QTY 2)		343-0124-000		96906	MS51957-3
171	BAR, COIL, PRESSED NO.4 (QTY 1)		609-2622-004			609-2622-004
172	BAR, COIL, PRESSED NO.3 (QTY 1)		609-2622-003			609-2622-003
173	BAR, COIL, PRESSED NO.2 (QTY 1)		609-2622-002			609-2622-002
174	BAR, COIL, PRESSED NO.1 (QTY 1)		609-2622-001			609-2622-001
175	SCREW, MACH SST, 6-32 X 1/2 (AP FOR 171-174)(QTY 4)		330-4058-050		77250	P330-4058-050
176	SCREW, MACH NP BRS, 6-32 X 5/8 (AP FOR 171-174)(QTY 4)		343-0333-000		77250	P343-0333-000
177	PLATE, COIL-REAR (QTY 1)		609-2601-001			609-2623-001
178	COIL, RF L1		609-2623-001			630-8236-001
179	BUMPER, TOP SPRING (QTY 1)		630-8236-001			630-8231-001
180	BUMPER, BOTTOM SPRING (QTY 1)		630-8231-001			609-2617-001
181	CONTACT, ELEC-ROTOR (QTY 2)		609-2617-001			630-0139-001
182	STOP, ROTOR END (QTY 1)		630-0139-001			343-0297-000
183	SCREW, MACHINE NP BRS, 0.086-56 X 0.125IN (AP FOR 181,182)(QTY 3)		343-0297-000			
184	SCREW, MACHINE NP BRS, 0.086-56 X 0.250IN (AP FOR 181,182)(QTY 1)		343-0299-000			343-0299-000
185	GUIDE, COIL ROTOR NO.2 (QTY 1)		609-2642-001		96906	MS16624-5025
186	GUIDE, COIL ROTOR NO.1 (QTY 1)		609-2641-001		40920	N814FCHMS25L02
187	COUNTERWEIGHT (QTY 1)		609-2615-001			546-3017-003
188	SCREW, MACHINE NP BRS, 0.086-56 X 0.312IN (AP FOR 186,187)(QTY 2)		343-0300-000			609-2613-001
189	RING, RETAINING (QTY 2)		340-0038-000			40920 N814FCHMS25L02
190	BEARING, BALL, AN (QTY 2)		309-1976-070		96906	MS16624-5025
191	WASHER, FLAT (QTY 2)		546-3017-003			768-5768-001
192	ARM, COIL ROTOR (QTY 1)		609-2613-001			768-5768-002
193	BEARING, BALL, AN (QTY 2)		309-1976-030		40920	768-5768-003
194	WASHER, SHIM (QTY AR)		768-5768-001			609-2625-001
195	WASHER, SHIM (QTY AR)		768-5768-002			609-2600-001
196	WASHER, SHIM (QTY AR)		768-5768-003			609-2612-001
197	ROTOR ASSY, PRESSED (QTY 1)		609-2625-001			609-2618-001
198	GEAR, SPUR (QTY 1)		609-2600-001			
199	HUB, CONDUCTOR (QTY 2)		609-2612-001			
200	CONDUCTOR, ELEC (QTY 1)		609-2618-001			



TPA-6280-024

Coil Module, Parts Location Diagram
Figure 3 (Sheet 1 of 3)



Rockwell
International

instructions

Collins Defense Communications

523-0767699-004211

4th Edition, 1 June 1983

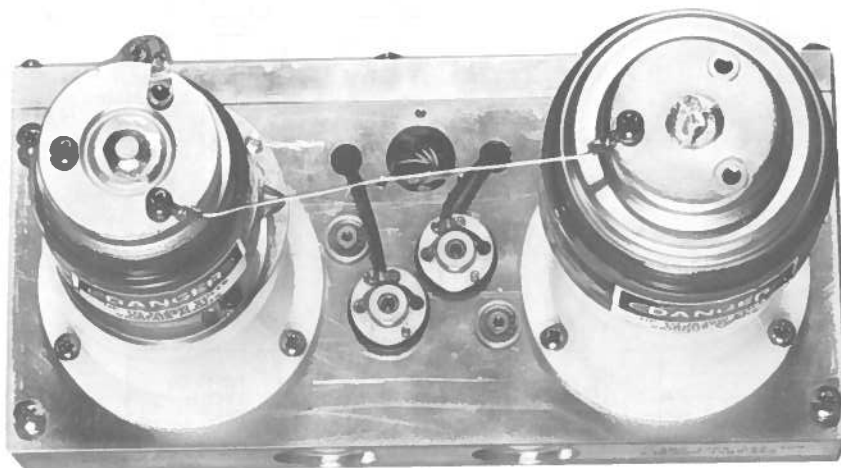
Capacitor Module (629-5655-001, -003)

Printed in USA

1. DESCRIPTION

Capacitor Module (629-5655-001, -003), shown in figure 1, is a plug-in module with a 25-pin input/output

connector. The capacitor module consists of two servo-drive mechanisms that drive variable capacitors C1 and C2 and two positioning switches.



TP5-1897-017

Capacitor Module
Figure 1

NOTICE: This section replaces third edition dated 1 January 1982.

2. PRINCIPLES OF OPERATION

2.1 General

The capacitor module is the capacitive component of an impedance matching network. Two variable capacitors (C1 and C2) are connected in series. Receive relay K1 in capacitor module 629-5655-001 is energized during receive mode to bypass capacitors C1 and C2. Refer to figure 2 (block diagram) and figure 5 (schematic diagram) during the following discussion.

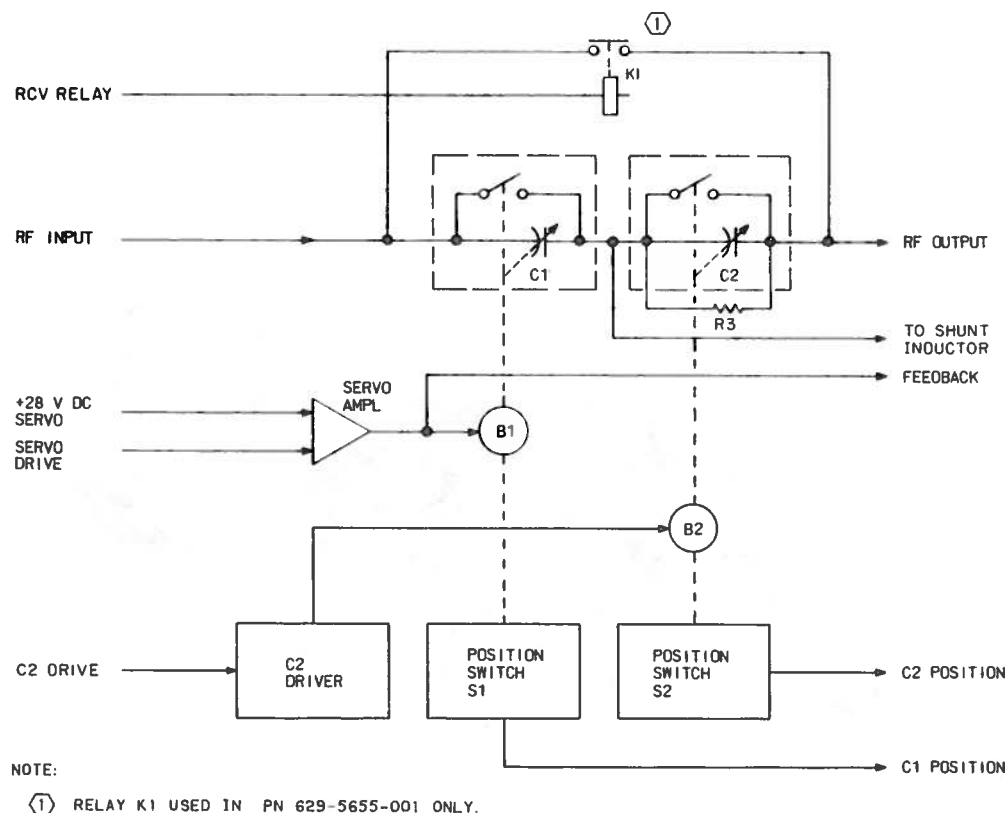
2.2 Capacitor C1 Operation

A servo-drive signal from an external control module is amplified by servo amplifiers Q1 through Q4 and

applied to dc motor B1. The servo motor drives capacitor C1 and position switch S1. When capacitor C1 is driven to the maximum capacitance position, internal contacts short the capacitor. Position switch S1 provides information to an external control module to indicate the tuning position of capacitor C1. A feedback signal is provided from the output of the servo amplifier to provide stability for the servo system and provide braking for the dc motor.

2.3 Capacitor C2 Operation

A drive signal from an external control module is applied to transistors Q5 through Q8. These transistors drive dc motor B2 that is mechanically linked



TP5-0258-013

Capacitor Module, Block Diagram
 Figure 2

to capacitor C2 and position switch S2. Depending on the input signal, capacitor C2 is driven toward either the maximum or minimum capacitance position. When in the maximum capacitance position, internal contacts short the capacitor. Position switch S2 provides information to an external control module to indicate the tuning position of capacitor C2.

3. TESTING/TROUBLESHOOTING PROCEDURES

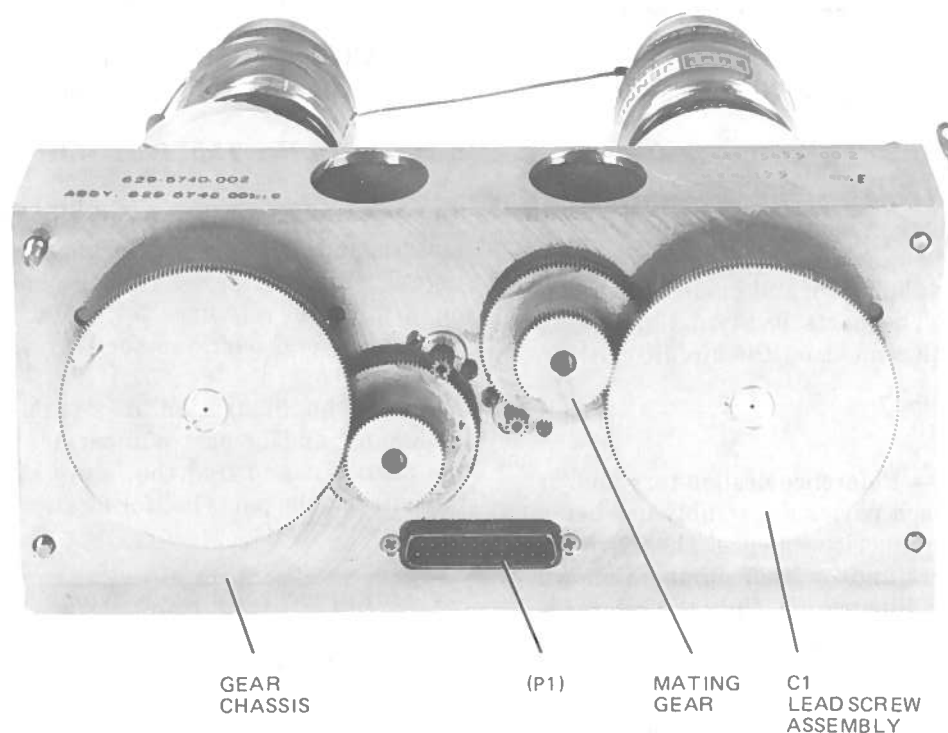
A defective capacitor module can be returned to a Collins Defense Communications authorized repair facility for repair. For information and instructions, contact the nearest office or

Collins Defense Communications
Attention: HF Products
350 Collins Road NE
Cedar Rapids, Iowa 52498

4. ALIGNMENT/ADJUSTMENT

Turning the HF-8040 on and off without tuning it can cause the C1 lead-screw assembly to back off and disengage the C1 gear. If the problem occurs, follow the reassembly procedure given below. Refer to figure 3.

- a. Screw the C1 lead-screw assembly into the capacitor, rotating the gear cw.
- b. Being careful to avoid burring the gear teeth, mesh the C1 gear with its mating gear.
- c. Connect a continuity tester across C1. Continuity will exist because the capacitor will be shorted.
- d. Rotate the C1 gear cw until continuity is broken. Then rotate the C1 gear back ccw until continuity is just made, and mark the position of the gear.
- e. Rotate the C1 gear ccw 15 to 45 degrees from the mark made in step d.
- f. Hold the C1 gear in this position, and remove the three screws holding the C1 insulator block to the gear chassis.



TP5-4213-017

Capacitor Module, C1 Alignment Illustration
Figure 3

- g. Carefully lift C1 away from the gear chassis far enough to unmesh the C1 gear from its mating gear. The C1 lead-screw gear shaft will slide through the hole in the gear chassis to permit this.
- h. Connect a continuity tester to P1-20 and P1-23.
- i. Rotate the C1 mating gear cw until continuity is just made between P1-20 and P1-23. Several gear revolutions may be required due to the gear reduction.
- j. Carefully remesh the C1 gear to its mating gear.
- k. Secure C1 to the gear chassis using the three screws removed in step f.
- l. Check the setting as follows:
 1. Rotate the C1 gear about five turns cw.
 2. Connect a continuity tester across C1 and rotate the C1 gear ccw until continuity is just made. Mark the position of the gear.
 3. Connect a continuity tester between P1-20 and P1-23.
 4. Rotate the C1 gear ccw until continuity is just made between P1-20 and P1-23. The additional rotation of the gear from the mark made in step 2 should be between 15 and 90 degrees.

5. REPAIR

Repair of the capacitor module is accomplished using standard shop practices and repair procedures.

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
-------------	------------------------------------

04713	MOTOROLA INC SEMICONDUCTOR GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
-------	---

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
05284	GASKET ENGINEERING CO INC 3123 WYANDOTTE KANSAS CITY MO 64111
05411	DU PAGE MFG CO 2250 CURTISS AVE DOWNERS GROVE IL 60515
08337	WALLACE BARNES CO LTD THE ASSOCIATED SPRING OPERATIONS SUB OF BARNES GROUP INC 3100 MAINWAY BURLINGTON ONTARIO CANADA L7M 1A3
12969	UNITRODE CORP 530 PLEASANT ST WATERTOWN MA 02172
13103	THERMALLOY CO INC 2021 W VALLEY VIEW LANE P O BOX 340839 DALLAS TX 75234
13499	ROCKWELL INTERNATIONAL CORPORATION DEFENSE ELECTRONICS OPERATIONS COLLINS DEFENSE COMMUNICATIONS DIV 350 COLLINS ROAD NE CEDAR RAPIDS IA 52498
14099	SEMTECH CORP 652 MITCHELL ROAD NEWBURY PARK CA 91320
16636	INDIANA GENERAL ELECTRO-MECHANICAL PRODUCTS A DIV OF ELECTRONIC MEMORIES AND MAGNETICS CORP 1168 BARRANCA DR EL PASO TX 79935
40920	MINIATURE BEARING DIV MPB CORP OPTICAL AVE PRECISION PARK KEENE NH 03431
71468	ITT CANNON ELECTRIC DIV OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORP 10550 TALBERT AVE P O BOX 8040 FOUNTAIN VALLEY CA 92708
72962	ESNA DIV OF AMERACE CORP 2330 VAUXHALL ROAD UNION NJ 07083
73905	ITT JENNINGS 970 MC LAUGHLIN AVE SAN JOSE CA 95116
75042	TRW INC TRW ELECTRONIC COMPONENTS IRC FIXED RESISTORS PHILADELPHIA DIV 401 N BROAD ST PHILADELPHIA PA 19108
76854	OAK SWITCH SYSTEMS INC SUB OF OAK TECHNOLOGY INC 100 S MAIN ST P O BOX 517 CRYSTAL LAKE IL 60014

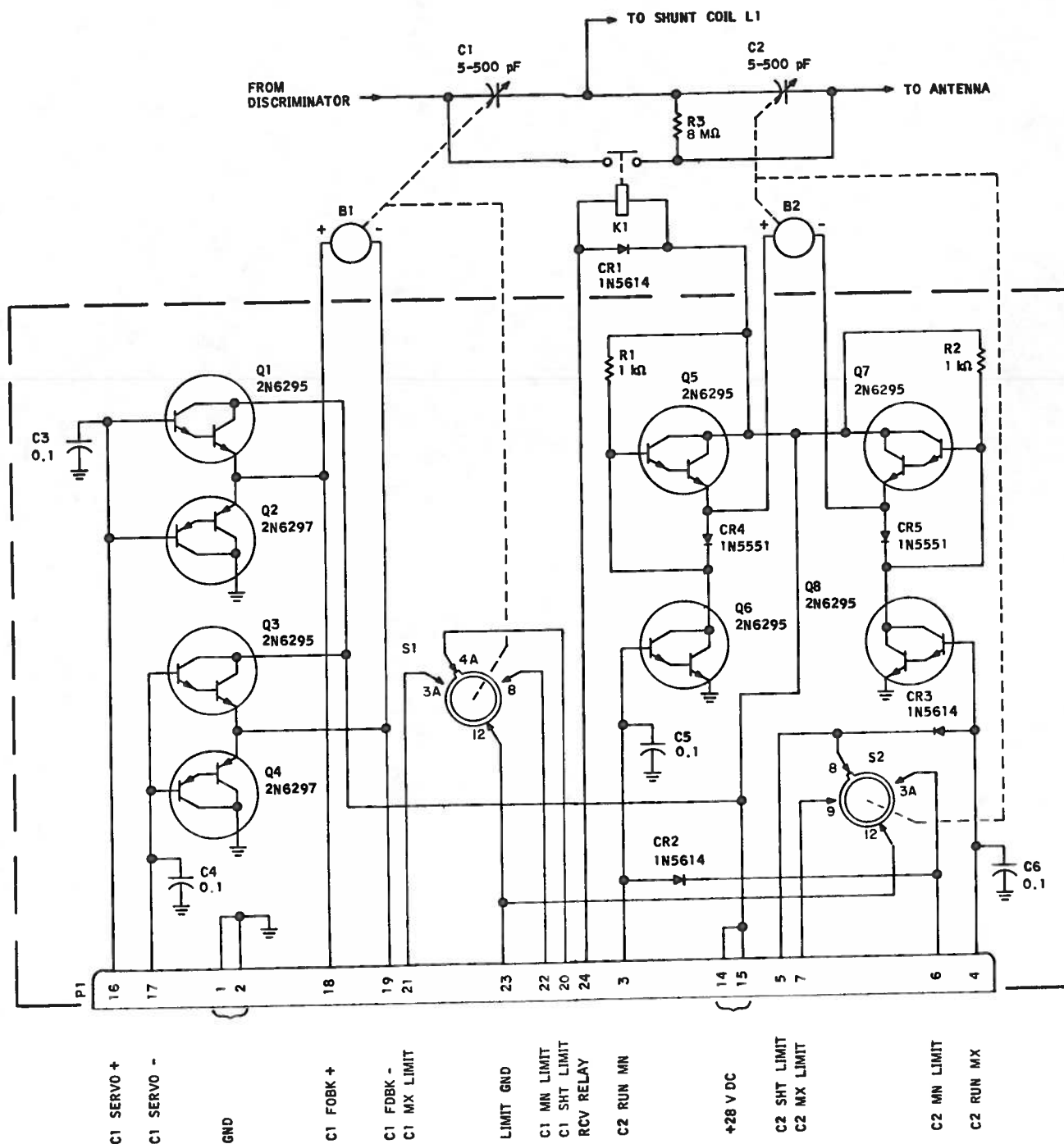
MFR CODE	MANUFACTURER'S NAME AND ADDRESS
77147	PATTON-MACGUYER CO DIV OF AVID CORP 17 VIRGINIA AVE PROVIDENCE RI 02905
77250	ALLIED PRODUCTS CORP PHEOLL MFG CO DIV 5700 W ROOSEVELT RD CHICAGO IL 60650
79807	WROUGHT WASHER MFG INC 2100 S BAY ST MILWAUKEE WI 53207
79963	ZIERICK MFG CO RADIO CIRCLE MT KISCO NY 10549
80205	NATIONAL AEROSPACE STANDARD
81349	MILITARY SPECIFICATIONS
88044	AERONAUTICAL STANDARD
91314	LEWIS SPRING AND MFG CO 2652 W NORTH AVE CHICAGO IL 60647
96906	MILITARY STANDARD

6.5 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Capacitor Module	629-5655-001	REV V
Capacitor Module	629-5655-003	REV V

Date	Description	Amount
1/1/2020	Initial deposit	1000.00
2/1/2020	Withdrawal	50.00
3/1/2020	Interest	10.00
4/1/2020	Withdrawal	20.00
5/1/2020	Interest	10.00
6/1/2020	Withdrawal	30.00
7/1/2020	Interest	10.00
8/1/2020	Withdrawal	40.00
9/1/2020	Interest	10.00
10/1/2020	Withdrawal	50.00
11/1/2020	Interest	10.00
12/1/2020	Withdrawal	60.00
1/1/2021	Interest	10.00
2/1/2021	Withdrawal	70.00
3/1/2021	Interest	10.00
4/1/2021	Withdrawal	80.00
5/1/2021	Interest	10.00
6/1/2021	Withdrawal	90.00

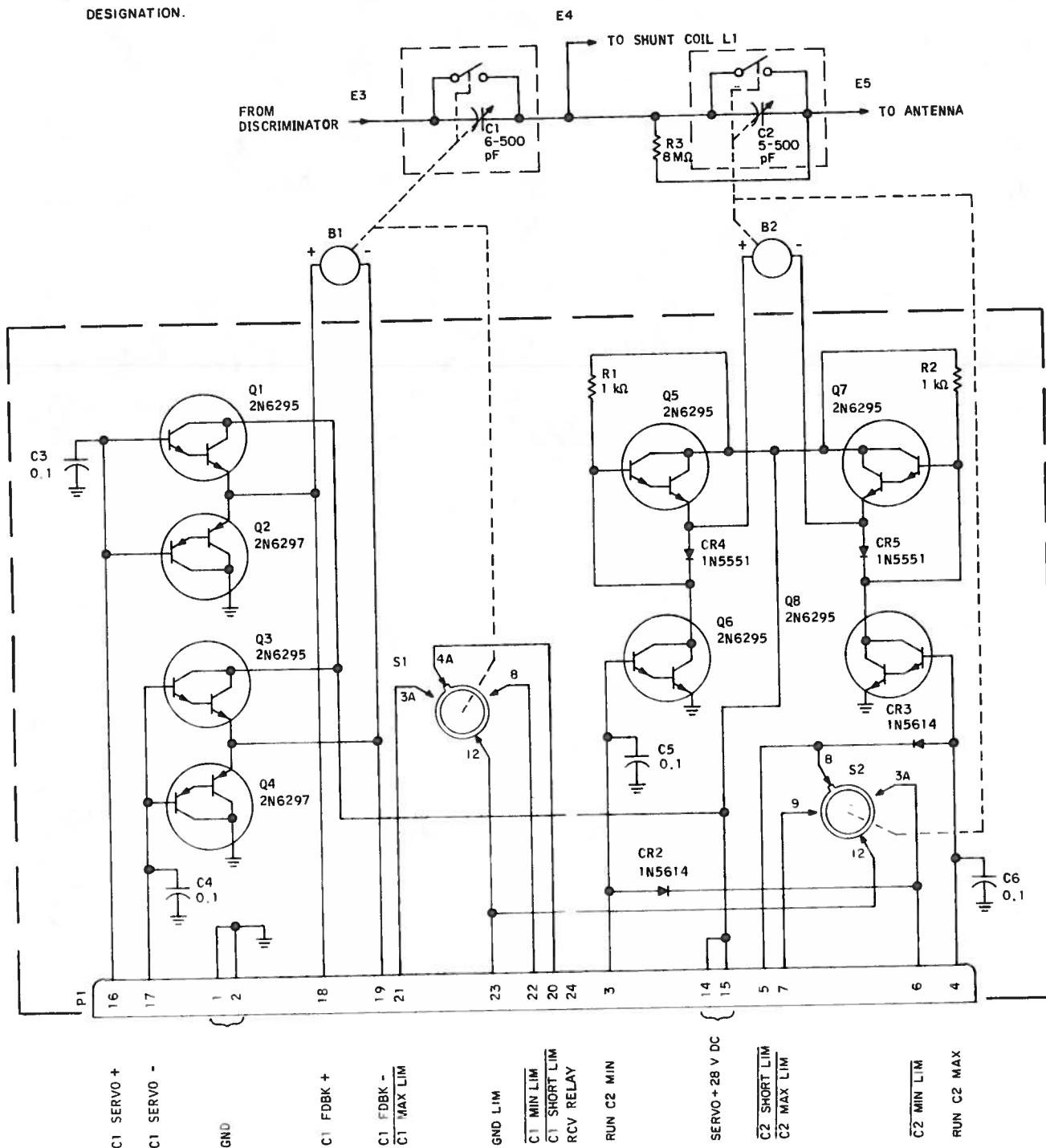


635-0259

Capacitor Module, CPN 629-5655-001, Schematic Diagram
Figure 5

NOTE:

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 AND/OR ASSEMBLY DESIGNATION.



637-4072

Capacitor Module, CPN 629-5655-003, Schematic Diagram
Figure 6



**Rockwell
International**

instructions

Discriminator Module (629-5642-001)

Collins Defense Communications

523-0767700-004211

4th Edition, 1 June 1983

Printed in USA

(629-5642-001)

1. DESCRIPTION

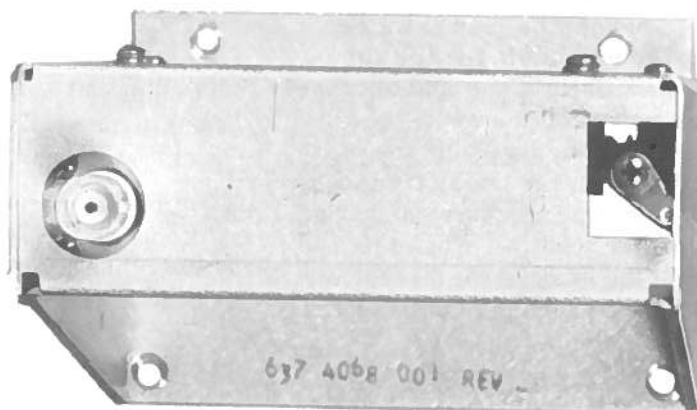
Discriminator Module (629-5642-001), shown in figure 1, is a plug-in module with a 12-pin input/output connector.

The discriminator module samples the rf signal between the input to the antenna coupler and to an impedance matching network.

2. PRINCIPLES OF OPERATION

2.1 General

The rf input signal to the discriminator module is provided by an associated power amplifier. The rf output signal is applied to an impedance matching network that is connected to an antenna. The discriminator samples the rf signal and provides control



**Discriminator Module
Figure 1**

TP5-1898-017

NOTICE: This section replaces third edition dated 1 January 1982.

signals to an external control module. These control signals tune the impedance matching network to provide an impedance match between the associated power amplifier and the antenna. The control signals from the discriminator module are as follows:

- a. Reflected and forward power
- b. Impedance
- c. Resistance
- d. Phase

2.2 Resistance Control Signal

Refer to figure 3. The resistance control signal is developed by transformer T2 and associated circuits. Transformer T2 samples the rf line current. This current is rectified by diode CR8 and a voltage is developed across resistor R7. Capacitor C2 and inductor L3 sample the rf line voltage. This voltage is rectified by diode CR3 and a voltage is developed across resistor R6. The output control signal is the sum of the voltage developed across R6 and R7. When these voltages are equal, the output control signal is 0 volt. Capacitor C2 is factory adjusted so that, when the line impedance is 50 ohms, the output control signal is zero. When an imbalance occurs between the voltages across R6 and R7, the output control signal is either positive or negative depending on the magnitude of the line impedance.

2.3 Phase Control Signal

Refer to figure 3. The phase control signal is developed by transformer T3 and associated circuits. Transformer T3 samples the rf line current and capacitors C3 and C6 sample the rf line voltage. Diodes CR5 and CR6 rectify the phase control signal that is developed across resistors R10, R11, and R12. Resistor R12 is used to balance the circuit. The phase control signal is proportional to the phase relationship between the line voltage and the line current. When the line impedance is resistive, the line voltage and line current are in phase, and the phase control signal is 0 volt. When the line impedance is capacitive, the line current leads the line voltage and the phase control signal is negative. When the load impedance is inductive, the line current lags the line voltage and the phase control signal is positive.

2.4 Reflected Power Control Signal

Refer to figure 3. The reflected power control signal is developed by transformer T1 and associated circuits. The output signal is proportional to the deviation of the vswr from 1:1. This occurs when the antenna impedance is 50 ohms and resistive.

Transformer T1 samples the rf line current which is rectified by diode CR1. Capacitors C1 and C22 and inductor L2 sample the rf line voltage. The rf line

voltage is connected to diode CR1 through inductor L1. Capacitor C1 is factory adjusted to balance the circuit when the vswr is 1:1. When the vswr is 1:1, equal voltage is applied to the anode and cathode of CR1, and the dc output level is 0 volt. When the vswr is not 1:1 and the load impedance is reactive, an imbalance occurs which causes diode CR1 to conduct. When this occurs, a dc output signal is produced that is proportional to the reflected power.

2.5 Forward Power Control Signal

Refer to figure 3. Transformer T4 samples the rf line forward power. The forward power sample is rectified by diode CR4 and filtered by inductor L7 and C10. A positive dc voltage proportional to the magnitude of the forward power is routed to P1-4.

2.6 Impedance Control Signal

Refer to figure 3. Transformer T4 samples the rf line current. This current is rectified by diode CR7 and a voltage is developed across resistor R14. Capacitor C4 and inductor L13 sample the rf line voltage. This voltage is rectified by diode CR2 and a voltage is developed across resistor R13. The dc output signal represents the impedance of the rf line. When the voltage and current are equal in magnitude and opposite in polarity, the dc output level is zero. When the line impedance is greater than 80 ohms, the voltage sample is larger than the current sample and the dc output level is positive. When the line impedance is less than 80 ohms, the current sample is larger than the voltage sample and the dc output level is negative.

3. TESTING/TROUBLESHOOTING PROCEDURES

A defective discriminator module can be returned to a Collins Defense Communications authorized repair facility for repair. For information and instructions, contact the nearest office or

Collins Defense Communications
Attention: HF Products
350 Collins Road NE
Cedar Rapids, Iowa 52498

4. ALIGNMENT/ADJUSTMENT

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

5. REPAIR

Repair of the discriminator is accomplished using standard shop practices and circuit card repair procedures.

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.

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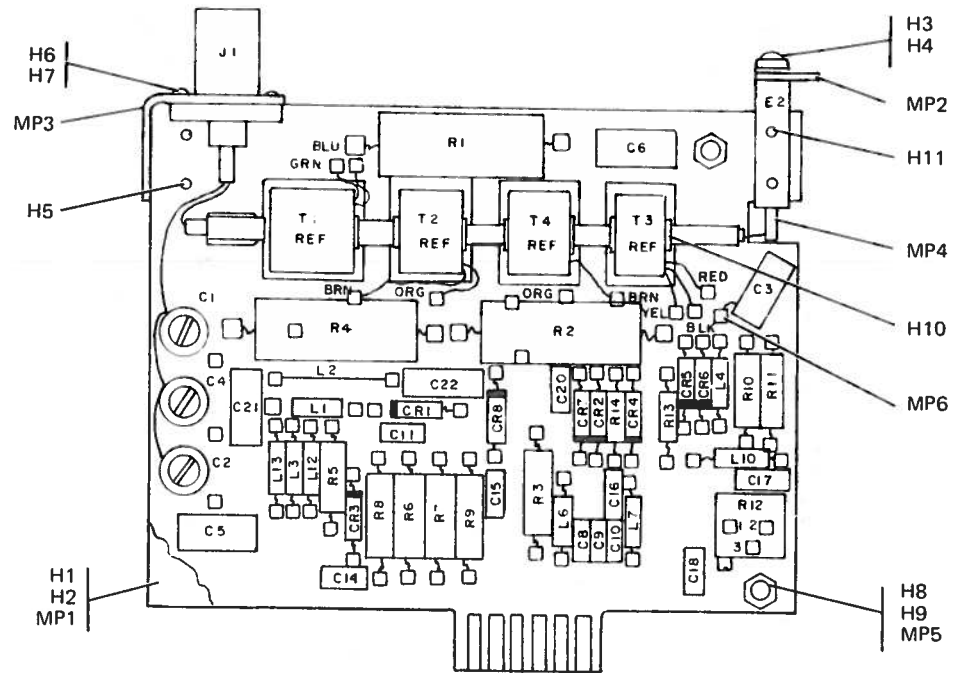
6.4 Manufacturer's Code, Name, and Address

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
08289	BLINN DELBERT CO INC THE 1678 E MISSION BLVD P O BOX 2007 POMONA CA 91766
13499	ROCKWELL INTERNATIONAL CORPORATION DEFENSE ELECTRONICS OPERATIONS COLLINS DEFENSE COMMUNICATIONS DIV 350 COLLINS ROAD NE CEDAR RAPIDS IA 52498
14655	CORNELL-DUBILIER ELECTRONICS DIV OF FEDERAL PACIFIC ELECTRIC CO GOVT CONTRACTS DEPT 150 AVE L NEWARK NJ 07101
19647	CADDOCK ELECTRONICS INC 1717 CHICAGO AVE RIVERSIDE CA 92507
52769	SPRAGUE-GOODMAN ELECTRONICS INC 134 FULTON AVE GARDEN CITY PARK NY 11040
73899	JFD ELECTRONICS COMPONENTS CORP 112 MOTT ST OCEANSIDE NY 11572
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
79807	WROUGHT WASHER MFG INC 2100 S BAY ST MILWAUKEE WI 53207
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.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Discriminator Module	629-5642-001	REV F
Discriminator Circuit Card Assembly	601-3889-001	REV T



TPA-4399-019

Discriminator Module, Parts Location Diagram
Figure 2 (Sheet 1 of 3)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	DISCRIMINATOR MODULE	629-5642-001			629-5642-001
	DISCRIMINATOR CIRCUIT CARD ASSEMBLY	601-3889-001			
H1	SCREW,MACH SST, 4-40 X 5/16 (QTY 4) (EFF TO REV LTR F)	343-0134-000		96906	MS51957-14
H1	SCREW,MACH SST, 4-40 X 5/16 (QTY 5) (EFF REV LTR F)	343-0134-000		96906	MS51957-14
H2	WASHER,LOCK SST, 0.115 ID X 0.209 OD (QTY 4) (EFF TO REV LTR F)	310-0279-000		96906	MS35338-135
H2	WASHER,LOCK SST, 0.115 ID X 0.209 OD (QTY 5) (EFF REV LTR F)	310-0279-000		96906	MS35338-135
H3	SCREW,MACH SST, 4-40 X 5/16 (EFF TO REV LTR C)	343-0134-000		96906	MS51957-14
H3	SCREW,MACHINE NP BRS, 0.112-40 X 0.250IN (EFF REV LTR C)	343-0285-000		77250	NPBRS0.112-40X0.250IN
H4	WASHER,LOCK SST, 0.115 ID X 0.209 OD (EFF TO REV LTR C)	310-0279-000		96906	MS35338-135
H4	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (EFF REV LTR C)	310-0095-000		96906	MS35338-97
MP1	DISCRIMINATOR COVER	629-5643-001			
MP2	TERMINAL,LUG (EFF TO REV LTR C)	304-0015-000		77147	4007-4HT
	DISCRIMINATOR CIRCUIT CARD ASSEMBLY	601-3889-001			
CR1-CR8	SEMICOND DEVICE	353-3338-000		81349	JANIN914
C1,C2	CAPACITOR,VARIABLE 6L DIEI, 1 TO 8.5PF, 750V (A3)	922-3031-020		52769	GS6113A
C1,C2	CAPACITOR,VARIABLE 6L DIEI, 0.8 TO 8.5PF, 1250V	922-3036-150		52769	GGR8R500
C3	CAPACITOR,FIXED MICA DIEI, 10PF, FORM 0.5PF, 500V (A1)	912-2753-000		81349	CM05CD100D03
C3	CAPACITOR,FXD CER DIEI, 10PF, 5%, 1000V	914-3080-000		73899	FCJ345B
C4	CAPACITOR,VARIABLE 6L DIEI, 1 TO 8.5PF, 750V (A3)	922-3031-020		52769	GS6113A
C4	CAPACITOR,VARIABLE 6L DIEI, 0.8 TO 8.5PF, 1250V	922-3036-150		52769	GGR8R500
C5	CAPACITOR,FIXED MICA DIEI, 390PF, 5%, 500V	912-2858-000		81349	CM05FD391J03
C6	CAPACITOR,FIXED MICA DIEI, 300PF, 5%, 500V	912-2849-000		81349	CM05FD301J03
C7	NOT USED				
C8-C11	CAPACITOR,FIXED CER DIEI, 0.01UF, 20%, 100VDC	913-5019-660		81349	CK05BX103M
C12,C13	NOT USED				
C14-C18	CAPACITOR,FIXED CER DIEI, 0.01UF, 20%, 100VDC	913-5019-660		81349	CK05BX103M
C19	NOT USED				
C20	CAPACITOR,FIXED CER DIEI, 0.01UF, 20%, 100VDC	913-5019-660		81349	CK05BX103M
C21	CAPACITOR,FIXED MICA DIEI, 510PF, 5%, 500V (A2)	912-2867-000		14655	CD15FD511J03
C21	CAPACITOR,FIXED MICA DIEI, 470PF, 5%, 500V (B1)	912-2864-000		14655	CD15FD471J03
C21	CAPACITOR,FIXED MICA DIEI, 510PF, 5%, 500V	912-2867-000		14655	CD15FD511J03
C22	CAPACITOR,FIXED MICA DIEI, 82PF, 5%, 500V	912-2810-000		81349	CM05ED820J03
E1	NOT USED				
E2	POST,CONTACT	609-2630-001			609-2630-001
H1-H4	NOT USED				
H5	RIVET,TUBULAR BRS, 0.061 DIA X 0.156 (QTY 2)	305-1712-000			305-1712-000
H6	SCREW,MACHINE NP BRS, 3-56 X 3/16 (QTY 4)	343-1563-000		77250	P343-1563-000
H7	WASHER,LOCK BRZ, 0.102 ID X 0.188 OD (QTY 4)	310-0394-000		79807	BRZ0.102IDX0.188ODX0.020
H8	SCREW,MACH STL, 4-40 X 1/4 (QTY 4)	343-0133-000		96906	MS51957-13
H9	WASHER,LOCK BRZ, 0.115 ID X 0.202 OD (QTY 4)	310-0396-000		79807	BRZ0.115IDX0.202ODX0.020
H10	INSULATOR,WASHER MICA, 0.140 ID X 0.375 OD (QTY 8) (EFF TO REV LTR K)	302-0640-090		08289	MM-375-140
H11	RIVET,TUBULAR BRS, 0.061 DIA X 0.281 (QTY 2)	305-1716-000			305-1716-000
J1	CONNECTOR,RCPT ELEC	357-9111-000		81349	M39012-22-0001
L1	COIL,RF 1UM	240-2023-000		96906	MS75083-13
L2	WIRE,ELECTRICAL	428-4824-000		81349	M16878/48FA9
L3	COIL,RF 1.80UM (A3)	240-2026-000		96906	MS75084-03
L3	COIL,RF 1.80UM	240-2715-160		96906	MS75088-4
L4	COIL,RF 1000UM	240-2723-010		96906	MS75085-19
L5	NOT USED				
L6,L7	COIL,RF 1000UM	240-2723-010		96906	MS75085-19
L8,L9	NOT USED				
L10	COIL,RF 1000UM	240-2723-010		96906	MS75085-19
L11	NOT USED				
L12	COIL,RF 1000UM	240-2723-010		96906	MS75085-19
L13	COIL,RF 0.68UM (A2)	240-2021-000		96906	MS75083-11
L13	COIL,RF 0.39UM (B1)	240-2018-000		96906	MS75083-08
L13	COIL,RF 0.68UM	240-2021-000		96906	MS75083-11
MP1,MP2	NOT USED				
MP3	CONNECTOR BRACKET	629-5793-001			
MP4	STUD,CONT THD BRS, 4-40 X 3/8	312-3460-000		77250	P312-3460-000
MP5	POST (QTY 4)	540-9164-003			540-9164-003
MP6	TERMINAL,SPCL (EFF REV LTR J)	797-7253-004			797-7253-004
R1	RESISTOR,FIXED FILM, 34.8 OHMS, 1%, 8W	714-3248-070		19647	MS281-34R8F
R2	RESISTOR,FIXED FILM, 19.6 OHMS, 1%, 8W	714-3248-060		19647	MS281-19R6F
R3	RESISTOR,FXD FILM, 1.47K, 1%, 1/8W	705-6277-000		81349	RN60C1471F
R4	RESISTOR,FIXED FILM, 19.6 OHMS, 1%, 8W	714-3248-060		19647	MS281-19R6F
R5	RESISTOR,FXD FILM, 19.6 OHMS, 1%, 1/4W	705-6514-000		81349	RN60D19R6F
R6,R7	RESISTOR,FIXED FILM, 12.1K, 1%, 1/8W	705-1048-000		81349	RN55D1212F
R8,R9	RESISTOR,FXD FILM, 3.83K, 1%, 1/8W	705-6287-000		81349	RN60C3831F
R10,R11	RESISTOR,FXD FILM, 9.09K, 1%, 1/4W (A4)	705-6642-000		81349	RN60D9091F
R10,R11	RESISTOR,FXD FILM, 6.81K, 1%, 1/4W (B1)	705-6636-000		81349	RN60D6811F
R10,R11	RESISTOR,FXD FILM, 9.09K, 1%, 1/4W	705-6642-000		81349	RN60D9091F

Discriminator Module, Parts Location Diagram
Figure 2 (Sheet 2)

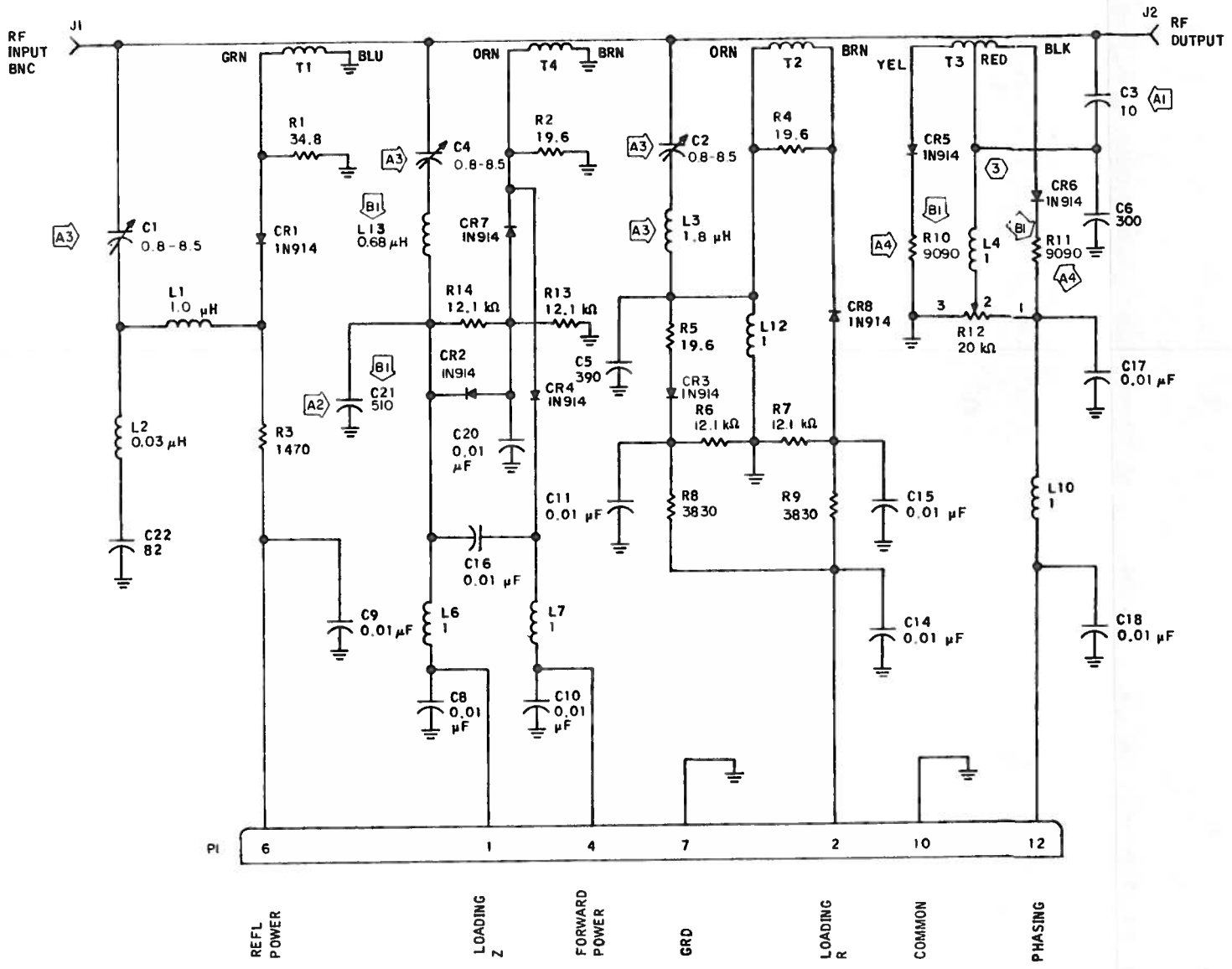
PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
R12	RESISTOR, VARIABLE NONWIRE-WOUND, 20K, 10%, 1/2W	380-1080-110		81349	RJ24CP203
R13, R14	RESISTOR, FIXED FILM, 12.1K, 1%, 1/8W	705-1048-000		81349	RN55D1212F
T1	COIL, XMFR	756-8257-004			756-8257-004
T2	COIL, TRANSFORMER	756-8258-004			756-8258-004
T3	REACTOR	756-8308-004			756-8308-004
T4	COIL, TRANSFORMER	756-8258-004			756-8258-004

MODIFICATION HISTORY

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A1	Changed: C3 from 912-2753-000 to 914-3080-000	601-3889-001 REV H and above SB 51
A2	Changed: C21 from 510 pF to 470 pF L13 from 0.68 μ H to 0.39 μ H	601-3889-001 REV M and above
A3	Changed: C1 from 922-3031-020 to 922-3036-150 C2 from 922-3031-020 to 922-3036-150 C4 from 922-3031-020 to 922-3036-150 L3 from 240-2026-000 to 240-2715-160	601-3889-001 REV N and above
A4	Changed: R10 from 9090 Ω to 6810 Ω R11 from 9090 Ω to 6810 Ω	601-3889-001 REV P and above
B1	Changed: C21 from 470 pF to 510 pF L13 from 0.39 μ H to 0.68 μ H R10, R11 from 6810 Ω to 9090 Ω	601-3889-001 REV R and above
NA	Documentation and/or mechanical change only	629-5642-001 REV F and above
NA	Documentation and/or mechanical change only	601-3889-001 REV T and above

Discriminator Module, Parts Location Diagram
Figure 2 (Sheet 3)



- NOTES:
- ① UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN PICOFARADS AND INDUCTANCE VALUES ARE IN MILLIHENRYS.
 - ② PARTIAL REFERENCE DESIGNATIONS ARE SHOWN FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.

635-0256

Discriminator Module, Schematic Diagram
Figure 3



Rockwell
International

instructions

Power Supply (637-4006-001)

Printed in USA

Collins Defense Communications

523-0767701-003211
3rd Edition, 1 June 1983

(637-4006-001)

1. DESCRIPTION

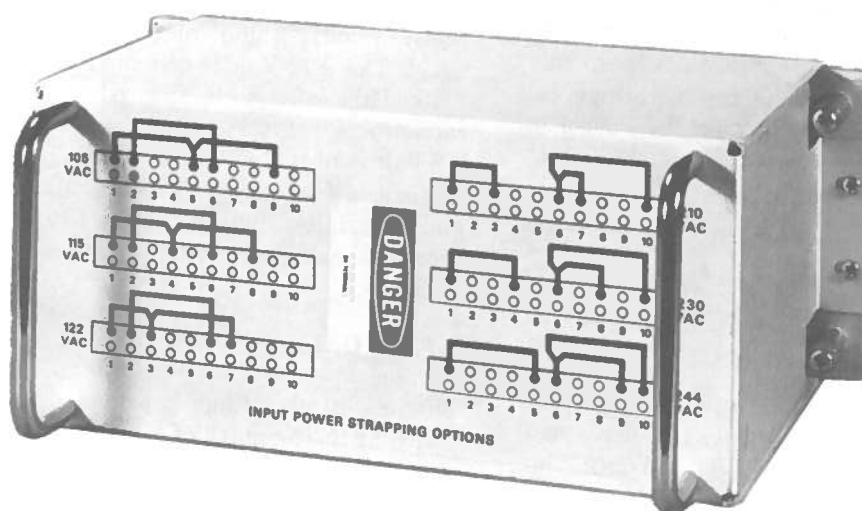
Power Supply 637-4006-001, shown in figure 1, is a plug-in module with a 25-pin input/output connector.

The power supply consists of an input power transformer, a relay, a 28-V dc rectifier, and a 12-V dc rectifier. An ac output voltage is provided from the primary of the input transformer.

2. PRINCIPLES OF OPERATION

2.1 General

The power supply receives ac input voltage from an external source and provides ac and dc operating voltages to associated subassemblies. Refer to figure 2 (block diagram) and figure 4 (schematic diagram) during the following discussion.

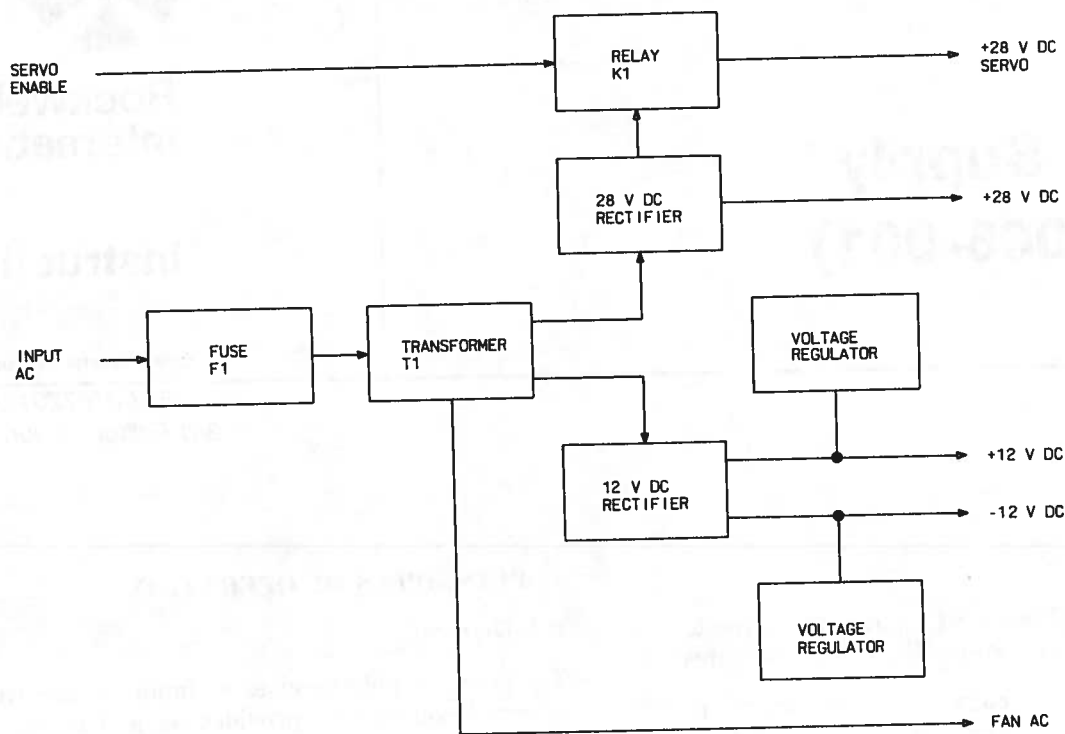


Power Supply
Figure 1

NOTICE: This section replaces second edition dated 1 February 1978.

TP5-1899-017

523-0767701-003211



TP5-0259-013

**Power Supply, Block Diagram
Figure 2**

2.2 Input Voltage

The input voltage may be 105, 115, 122, 210, 230, or 244 V ac, single-phase, 47 to 63 or 380 to 420 Hz. The input terminal board must be wired to correspond with the input voltage used. The input voltage is applied to the primary of transformer T1. Fuse F1 provides protection for the power supply in the event of current overload.

2.3 28-V DC Output Voltage

The 28-V dc rectifier is connected to the secondary of transformer T1. This rectifier provides full-wave rectification and consists of rectifiers CR1 and CR2. The output voltage is filtered by capacitors C1 and C2 and resistor R1. The 28 V dc is routed to external circuits and to relay K1. Relay K1 is energized when a servo enable signal (ground) is applied from external circuits. The output voltage from the energized contacts of relay K1 provides operating voltage for associated servo-amplifier circuits.

2.4 12-V DC Output Voltage

The 12-V dc rectifier is connected to the secondary of transformer T1. This rectifier is a full-wave bridge rectifier consisting of rectifiers CR4, CR5, CR10, and CR11. The +12 V dc is provided by rectifiers CR4 and CR5. This voltage is filtered by resistor R60 and capacitor C3 and regulated by regulator CR60. The -12 V dc is provided by rectifiers CR10 and CR11. This voltage is filtered by resistor R61 and capacitor C5 and regulated by regulator CR61. The 12 V dc provides operating voltage for associated electronic circuits.

2.5 AC Output Voltage

The ac output voltage is provided from the terminal board at the primary of transformer T1. This voltage provides operating voltage for an associated blower motor.

3. TESTING/TROUBLESHOOTING PROCEDURES

A defective power supply module can be returned to a Collins Defense Communications repair facility for

repair. For information and instructions, contact the nearest office or

Collins Defense Communications
Attention: HF Products
350 Collins Road NE
Cedar Rapids, Iowa 52498

4. REPAIR

Repair of the power supply is accomplished using standard shop practices and circuit card repair procedures.

5. PARTS LIST/DIAGRAMS

5.1 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.

5.2 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.

5.3 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.

5.4 Manufacturer's Code, Name, and Address

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
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
05791	LYN-TRON INC 3625 W PACIFIC AVE BURBANK CA 91505
13103	THERMALLOY CO INC 2021 W VALLEY VIEW LANE P O BOX 340839 DALLAS TX 75234
13499	ROCKWELL INTERNATIONAL CORPORATION DEFENSE ELECTRONICS OPERATIONS COLLINS DEFENSE COMMUNICATIONS DIV 350 COLLINS ROAD NE CEDAR RAPIDS IA 52498
14433	ITT SEMICONDUCTOR DIV WEST PALM BEACH FL

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
17117	ELECTRONIC MOLDING CORP 96 MILL ST WOONSOCKET RI 02895
28478	DELTROL CONTROLS DIV DELTROL CORP 2745 S 19TH ST MILWAUKEE WI 53215
52814	TECH-ETCH INC PLYMOUTH INDUSTRIAL PARK 45 ALDRIN RD PLYMOUTH MA 02360
55943	AMRAD CORP 349 BONHAM ST P O BOX 876 PARIS TX 75460
56289	SPRAGUE ELECTRIC CO 87 MARSHALL ST NORTH ADAMS MA 01247
71400	MCGRAW-EDISON CO BUSSMANN MFG DIV 502 EARTH CITY PLAZA P O BOX 14460 ST LOUIS MO 63178
71468	ITT CANNON ELECTRIC DIV OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORP 10550 TALBERT AVE P O BOX 8040 FOUNTAIN VALLEY CA 92708
71785	TRW INC TRW CINCH CONNECTORS DIV 1501 MORSE AVE ELK GROVE VILLAGE IL 60007
73386	FREED TRANSFORMER CO INC 1718 WIERFIELD ST RIDGEWOOD QUEENS NY 11385
77250	ALLIED PRODUCTS CORP PHEOLL MFG CO DIV 5700 W ROOSEVELT RD CHICAGO IL 60650
79807	WROUGHT WASHER MFG INC 2100 S BAY ST MILWAUKEE WI 53207
80205	NATIONAL AEROSPACE STANDARD
81349	MILITARY SPECIFICATIONS
91314	LEWIS SPRING AND MFG CO 2652 W NORTH AVE CHICAGO IL 60647
96906	MILITARY STANDARD

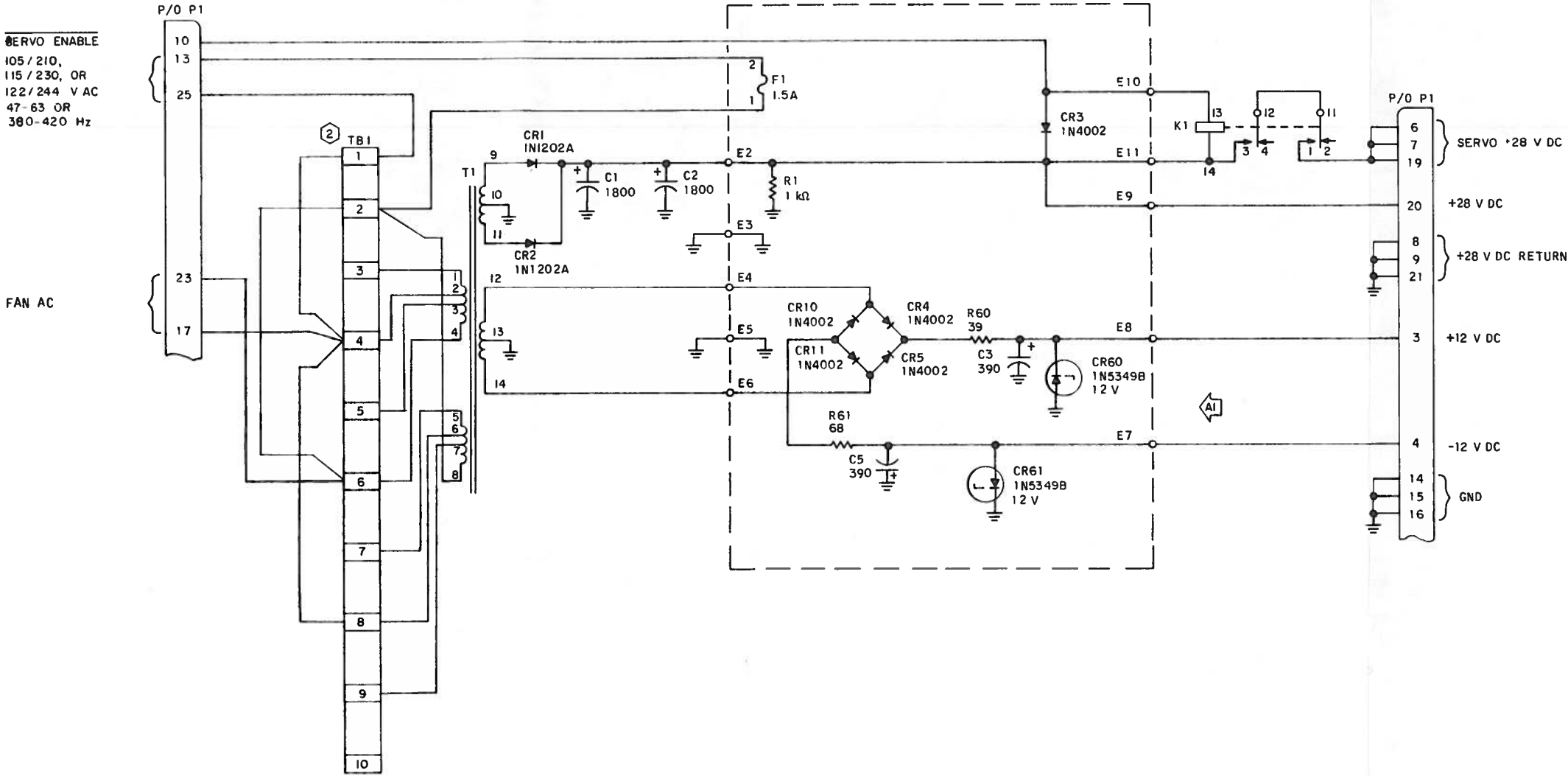
5.5 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

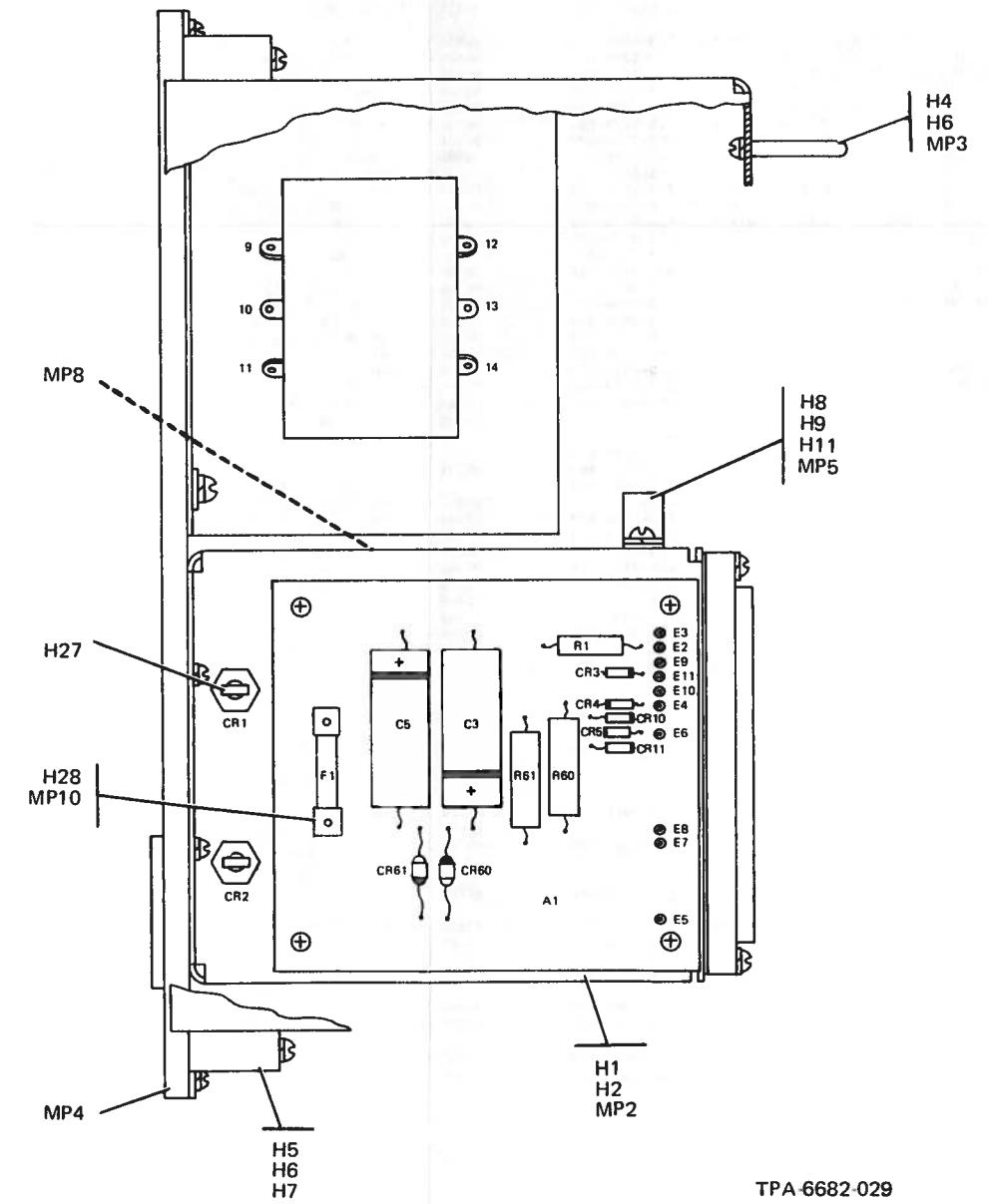
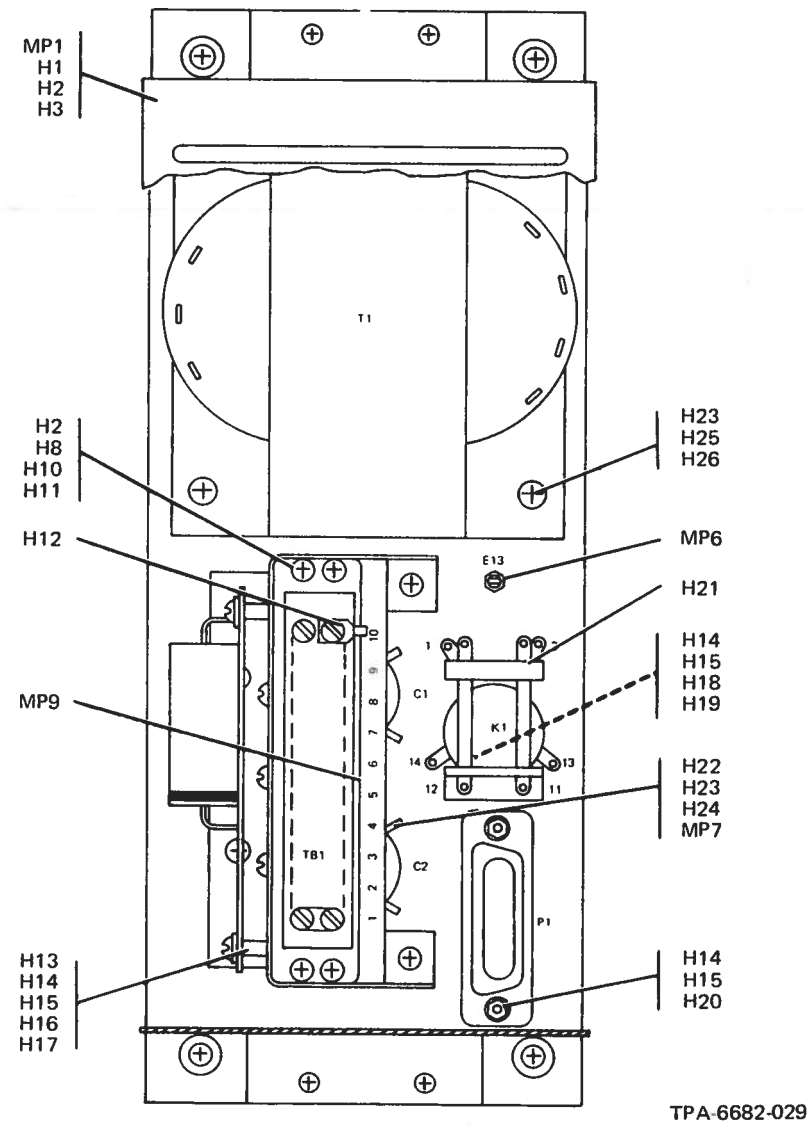
<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Power Supply	637-4006-001	REV G
Power Supply Subassembly A1	637-2846-001	REV D

NOTES:
1. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS
AND CAPACITANCE VALUES ARE IN MICROFARADS
2. SOLID LINE STRAPPING IS FOR 115 VAC OPERATION SEE CHART
FOR OTHER INPUT VOLTAGES.

	INPUT VOLTS AC						
	105	115	122	210	220	230	244
STRAPPING	1-5	1-4	1-3	1-5	1-5	1-4	1-3
	5-9	4-8	3-7	6-9	6-8	6-8	6-7
	6-2	6-2	6-2	6-10	6-10	6-10	6-10



Power Supply, Schematic Diagram
Figure 4

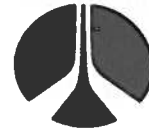


Power Supply, Parts Location Diagram
Figure 3 (Sheet 1 of 2)

PARTS LIST				
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE PART NUMBER
	POWER SUPPLY	637-4006-001		637-4006-001
A1	POWER SUPPLY SUBASSEMBLY	637-2846-001		
CR1,CR2	SEMICOND DEVICE	353-1889-000		03508 1N1202A
C1,C2	CAPACITOR, FIXED ELCTLT, 1800UF, P75/2M10%, 50V	183-1282-040		56289 6010188G050JT6
H1	SCREW, MACHINE CRES, 0.138-32 X 0.312IN (QTY 8)	343-0168-000		96906 MS51957-27
H2	WASHER, LOCK SST, 0.141 ID X 0.250 OD (QTY 13)	310-0282-000		96906 MS35338-136
	(EFF TO REV LTR E)			
H2	WASHER, LOCK SST, 0.141 ID X 0.250 OD (QTY 12)	310-0282-000		96906 MS35338-136
	(EFF REV LTR E)			
H3	WASHER, FLAT NI PL BRS, 0.147 ID X 0.375 OD (QTY 4) (EFF REV LTR D)	310-0056-000		79807 NIPLBRS.147IDX.37500X.032
H4	SCREW, MACHINE CRES, 0.190-32 X 0.625IN (QTY 4)	343-0229-000		96906 MS51958-64
H5	SLEEVE, SPRING	340-0643-000		91314 BRYLM COP, 0.215 DX0.187L
H6	WASHER, LOCK SST, 0.194 ID X 0.334 OD (QTY 8)	310-0284-000		96906 MS35338-138
H7	SCREW, MACHINE CRES, 0.190-32 X 1.750IN (QTY 4)	343-0236-000		96906 MS51958-70
H8	NUT, PLAIN, HEXAGON CRES, 0.138-32 (QTY 5)	313-0045-000		80205 NAS671C6
H9	SCREW, MACHINE CRES, 0.138-32 X 0.375IN	343-0169-000		96906 MS51957-28
H10	SCREW, MACHINE CRES, 0.138-32 X 0.625IN (QTY 4)	343-0173-000		96906 MS51957-31
H11	WASHER, FLAT CRES, 0.164ID X 0.320 OD (QTY 5)	310-0779-050		96906 MS15795-805
H12	TERMINAL, LUG (QTY 15) (EFF TO REV LTR E)	367-7108-000		96906 MS17143-10
H12	TERMINAL, LUG (QTY 14) (EFF REV LTR E)	367-7108-000		96906 MS17143-10
H13	SPACER, SLEEVE (QTY 4)	541-5979-002		541-5979-002
H14	NUT, PLAIN, HEXAGON CD PL STL, 0.112-40 (QTY 7)	313-0132-000		80205 NAS67C4
H15	WASHER, SPRING SST, 0.115 ID X 0.212 OD (QTY 7)	310-0463-000		96906 MS35338-135B
H16	WASHER, FLAT CRES, 0.125ID X 0.250 OD (QTY 4)	310-0779-030		96906 MS15795-803
H17	SCREW, MACH STL, 4-40 X 5/8 (QTY 4)	343-0138-000		96906 MS51957-18
H18	TERMINAL, LUG	547-5305-002		547-5305-002
H19	SCREW, MACH STL, 4-40 X 1/4	343-0133-000		96906 MS51957-13
H20	SCREW, MACHINE CRES, 0.112-40 X 0.31 (QTY 2)	342-0045-000		96906 MS51959-14
H21	SCREW, MACHINE CRES, 6-32 X 1/2	342-0064-000		96906 MS51959-30
H22	NUT, PLAIN, HEX SST, 6-32 (QTY 4)	313-0046-000		77250 P313-0046-000
H23	WASHER, FLAT CRES, 0.196ID X 0.390 OD (QTY 8)	310-0779-070		96906 MS15795-807
H24	SCREW, MACHINE SST, 8-32 X 5/16 (QTY 4)	343-0186-000		96906 MS51957-42
H25	WASHER, LOCK CRES, 0.171 ID X 0.293 OD (QTY 4)	310-0072-000		96906 MS35338-137
H26	SCREW, MACHINE SST, 8-32 X 3/8 (QTY 4)	343-0187-000		96906 MS51957-43
H27	MOUNTING KIT, DIODE (QTY 2)	352-9971-000		13103 352-9971-000
K1	RELAY, ARMATURE	970-2445-030		28478 100RF26834-60
MP1	COVER	637-4653-001		
MP2	BRACKET, COMPONENT	637-4654-001		
MP3	HANDLE, BOM (QTY 2)	015-1451-060		05791 7112
MP4	PLATE, BASE	637-4651-001		
MP5	CLAMP, LOOP (EFF TO REV LTR D)	150-1543-000		55943 610-0006
MP5	CLAMP, LOOP (EFF REV LTR D)	150-1542-000		55943 610-0005
MP6	TERMINAL, STD	306-2519-020		17117 3096-14-1
MP7	CLIP, SPR TNSH (QTY 4)	139-0255-070		52814 BFC307-0T
MP8	PLASTIC CHANNEL (EFF REV LTR D)	150-0175-000		96906 MS21266-2N
MP9	STRIP, MARKER	367-1845-600		71785 MS10-140
P1	CONNECTOR, RCPT ELEC	371-0170-000		71468 DBM-25P
TB1	TERMINAL BOARD	367-1436-000		81349 37TB10
T1	TRANSFORMER	662-0617-010		73386 42393
	POWER SUPPLY SUBASSEMBLY A1	637-2846-001		
CR1,CR2	NOT USED			
CR3-CR5	SEMICOND DEVICE	353-6442-020		14433 1N4002
CR6-CR9	NOT USED			
CR10, CR11	SEMICOND DEVICE	353-6442-020		14433 1N4002
CR12-CR59	NOT USED			
CR60, CR61	SEMICOND DEVICE (A1)	353-6550-060		04713 1N5338B
CR60, CR61	SEMICOND DEVICE	353-6550-170		04713 1N5349B
C1,C2	NOT USED			
C3	CAPACITOR, FIXED ELCTLT, 390UF, P75/2M10%, 30V	183-1282-080		56289 6010397G030FJ6
C4	NOT USED			
C5	CAPACITOR, FIXED ELCTLT, 390UF, P75/2M10%, 30V	183-1282-080		56289 6010397G030FJ6
F1	FUSE, CRTG	264-0296-000		71400 MDL1 1-2
H1-H27	NOT USED			
H28	RIVET, TUBULAR BRS, 0.123 DIA X 0.156 (QTY 2)	305-1788-000		305-1788-000
MP1-MP9	NOT USED			
MP10	CLIP, ELECTRICAL	265-1250-010		71400 5678-04
R1	RESISTOR, FXD CHPSH, 1K, 10%, 2W	745-5652-000		81349 RCR426102KS
R2-R59	NOT USED			
R60	RESISTOR, FIXED WM, 39 OHMS, 5%, 6.5W	747-5492-000		81349 RM67V390
R61	RESISTOR, FIXED WM, 68 OHMS, 5%, 6.5W	747-5437-000		81349 RM67V680

MODIFICATION HISTORY		
REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
	Configuration history for 637-4006-001, before REV D, is not carried in this section.	
	Configuration history for 637-2846-001, before REV D, is not carried in this section.	
A1	Changed: A1CR60 from 1N5338B to 1N5349B A1CR61 from 1N5338B to 1N5349B	637-2846-001 REV D and above
NA	Documentation and/or mechanical change only	637-4006-001 REV D and above
NA	Documentation and/or mechanical change only	637-4006-001 REV E and above
NA	Documentation and/or mechanical change only	637-4006-001 REV F and above
NA	Documentation and/or mechanical change only	637-4006-001 REV G and above

Power Supply, Parts Location Diagram
Figure 3 (Sheet 2)



**Rockwell
International**

Circuit Card Repair

instructions

Collins Defense Communications

Printed in USA

523-0775410-002811
2nd Edition, 1 July 1990

1. GENERAL

Circuit card repair procedures encompass a wide spectrum of skills and knowledge and should only be attempted by skilled trained repair personnel. Rockwell International, Collins Defense Communications, assumes no responsibility or liability for any repair work performed or injury incurred by attempting circuit card repair based on these instructions. If the ability to properly perform circuit card repair is in doubt, please contact Rockwell International, Collins Defense Communications, for repair.

Repair procedures which are considered to be standard or routine are not covered in this instructions. The procedures can be found in technical publications available from the INSTITUTE FOR INTERCONNECTING AND PACKAGING ELECTRONIC CIRCUITS (IPC). Refer to table 1 for a listing of referenced publications. To obtain these publications contact IPC directly at the following address:

IPC
7380 Lincoln Ave.
Lincolnwood, IL 60466
Fax order number 312-677-9570 (Include PO number and complete mailing address.)
Telex order number 510-601-6005 (Answerback: IPC)(Include PO number and complete mailing address.)

2. SPECIAL TOOLS AND MATERIALS

Ensure that the proper tools and replacement parts are on hand before beginning repair. When replacement parts are required, refer to the equipment parts lists in the equipment instruction book for correct nomenclature and part number. Special tools and materials specified in the circuit card repair procedures will be found in tables 2 through 4. Table 2 lists special tools (tools commonly available are not listed). Materials such as solder, flux, tape, adhesives, and sealants are listed in table 3. Table 4 lists cleaning materials.

NOTICE: This instruction section replaces first edition dated 1 May 1988.

Table 1. Referenced Publications.

PUBLICATION TITLE	SUPPLIER
ANSI/IPC-R-700C SUGGESTED GUIDELINES FOR MODIFICATION, REWORK AND REPAIR OF PRINTED BOARDS AND ASSEMBLIES	Institute for Interconnecting and Packaging Electronic Circuits (IPC)
ANSI/IPC-S-815B GENERAL REQUIREMENTS FOR SOLDERING	Institute for Interconnecting and Packaging Electronic Circuits (IPC)

Table 2. Equipment for Circuit Card Repair.

NOMENCLATURE	MANUFACTURER'S MODEL/PART NUMBER AND SOURCE	APPLICATION OR SPECIAL CONSIDERATION
Crimping tool	WT-401 Thomas and Betts Corp Hwy 218 S Iowa City, IA 52440	Repair of coax T-209
Crimping tool	WT-409 Thomas and Betts Corp	Repair of coax RG-223
Crimping tool	CCT-DM ITT-Cannon Electric 10550 Talbert Ave PO Box 8040 Fountain Valley, CA 92708 (Rockwell International part number 372-8091-050)	Repair of coax RG-58 and RG-188/U
Crimping tool	90202-2 Amp Inc PO Box 3608 Harrisburg, PA 17105	Repair of blue-line connectors
Crimping tool	GMT-221 Daniels Mfg. Corp. Bloomfield Hills, MI 48303 (Rockwell International part number 359-0697-010)	Repair of snap-in, tuning- fork type contacts, part number 372-2514-010, in thin-line I type connectors

Table 2. Equipment for Circuit Card Repair (Cont).

NOMENCLATURE	MANUFACTURER'S MODEL/PART NUMBER AND SOURCE	APPLICATION OR SPECIAL CONSIDERATION
Extraction tool	DRK-188 Daniels Mfg. Corp. (Rockwell International part number 359-0697-060)	Extraction of snap-in tuning fork type contacts in thin-line I type connectors
Extraction tool	DRK-230 Daniels Mfg. Corp. (Rockwell International part number 359-0697-020)	Extraction of snap-in tuning fork type contacts in thin-line II type connectors
Extraction tool	CET-C6B ITT-Cannon Electric (Rockwell International part number 370-8040-010)	Repair of high-voltage, high-current, and coaxial contacts in thin-line connectors
Backup tool	772-5936-001 Rockwell International Corp.	Extraction of sideboard connectors
Insertion tool	772-5938-001 Rockwell International Corp.	Insertion of sideboard connectors
Insertion tool	DAK-188 Daniel Mfg. Corp. (Rockwell International part number 359-0697-050)	Insertion of tuning-fork contacts in thin-line II connectors
Hot-air repair terminal	Nu-Concept Computer Systems, Inc. 2725 Advance Lane Colmar, PA 18915	For large (high) pin count package removal (training recommended)
Soldering iron, temperature controlled	Edsyn Co. 15958 Arminta St Van Nuys, CA 91406	Used to solder and unsolder (recommended for ESD components)
Soldering iron, dual element	Pak-X-Trac Nu-Concept Computer Systems, Inc.	Unsoldering leadless components
Brush, soft bristles of natural material (eg, hog bristle)	8839 Klinger Paint Co. Inc. 333 5th Ave SE Cedar Rapids, IA 52401	Cleaning and applying coatings

Table 2. Equipment for Circuit Card Repair (Cont).

NOMENCLATURE	MANUFACTURER'S MODEL/PART NUMBER AND SOURCE	APPLICATION OR SPECIAL CONSIDERATION
Gloves, lint free (nonsynthetic)	MAGID Glove Mfg. 2060 N Kolmar Chicago, IL 60639	Circuit card handling
Flatpack lead forming tool	Henry Mann, Inc. 925 Pennsylvania Blvd Feasterville, PA 19047	Forming leads on flat- packs
Thermal strippers	STRIPALL Teledyne Kinetics 410 S Cedros Ave Solana Beach, CA 92075	Used for removing wire insulation
Square pin, tool	117-0069-376 Rockwell International Corp.	Replacement of square pin contacts
Variable speed moto-tool	Dremel Division/Cooper Group PO 728 Apex, NC 27502	Used to drill holes, buff coatings, sand finishes
Vacuum solder removal tool	Pace, Inc. Laurel, MD 20708	Used to remove solder from circuit card components
Fiber-optic installation kit	687-2882-001 Rockwell International Corp.	Fiber-optic connector installation
Procedure	751-2216-001	
Stripping tool	247-0022-120	
Syringe	246-0258-010	
Sapphire scribe	247-0022-110	
Instructions	247-0022-100	
Epoxy	247-0022-090	
Glass plate	247-0022-080	
Polishing tool	247-0022-070	
Lapping film	247-0022-060	0.3 micron
Lapping film	247-0022-050	3.0 micron
Lapping film	247-0022-040	15.0 micron
Microscope	247-0022-030	
Crimp tool	247-0022-020	
Stripping tool	247-0022-010	
Cleaving tool	Optelecom CT-1 Ensign-Bickford Optics Co. 16-18 Ensign Drive Avon, CT 06001	Fiber-optic cutting

Table 2. Equipment for Circuit Card Repair (Cont).

NOMENCLATURE	MANUFACTURER'S MODEL/PART NUMBER AND SOURCE	APPLICATION OR SPECIAL CONSIDERATION
Crimping tool	OFTI-047 or 048 Optical Fiber Technology, Inc. 5 Fortune Drive Billerica, MA 01821	Crimping fiber-optic connector components
Cable stripping tool	OFTI-14 Optical Fiber Technology, Inc.	Stripping fiber-optic cables for connector installation
Polishing tool	OFTI-15 (SMA) or 15A (CFC) Optical Fiber Technology, Inc.	Polishing fiber-optic connector ends
Polishing plate	OFTI-19 Optical Fiber Technology, Inc.	Holding lapping paper for fiber-optic polishing
Flush cutting tool	Model 8142 Lindstrom America, Inc. 880 N Eckhoff St Orange, CA 92668	Component lead trimming

Table 3. Materials for Circuit Card Repair.

NOMENCLATURE	PART NUMBER AND MANUFACTURER NAME	APPLICATION
Solder-wick #3/#4	Marshall Industries Distributor Plymouth, MN 55447	Aid to remove solder
Nonrosin solder	XERSIN 2000 Multicore Solder Westbury, NY 11590	Soldering components (nonrosin and noncorrosive)
Insulating tape, double sided, 25.4-mm (1.0-in) wide	CHRK 109-1in CHR Industries, Inc. 407 East St New Haven, CT 06509	Insulating components from circuit card
Adhesive	Metagrip 3803 MetaChem Resins Corp. 1505 Main St West Warwick, RI 02893	Used for filleting components
Epoxy	BB-2106T Tra-Con, Inc. 55 North St Medford, MA 02155	Epoxy bonding of components, card material, circuit cards
Dennis 1169	1169-A/B Dennis Chemical Co. 2701 Papin St St. Louis, MO 63103	Postcoating circuit card assemblies
HumiSeal 1B31	Columbia Chase Corp. HumiSeal Division Woodside, NY 11377	Postcoating circuit card assemblies
Adhesive	Loctite 410 Loctite Corp. Newington, CT 06111	Staking and component bonding (light duty) and wire bonding
Rubberized sealant	RTV-3140 Dow Corning Corp. Midland, MI 48640	Sealing and postcoating components
Rubberized sealant	RTV-3145 Dow Corning Corp.	Staking and vibration dampening of components

Table 3. Materials for Circuit Card Repair.

NOMENCLATURE	PART NUMBER AND MANUFACTURER NAME	APPLICATION
Epoxy adhesive	OFTI 353ND-4G Optical Fiber Technology, Inc. Billerica, MA 01821	Fiber-optic connector installation
Epoxy adhesive	HYSOL Hysol-Electronic Chemical Division 211 Franklin St Olean, NY 14760	Epoxy of pads and circuitry
Primer for sealant	RTV-1200 Dow Corning Corp.	Priming area to be sealed with RTV

3. INSPECTION/CLEANING**WARNING**

When using any solvent, work in a vented hood with exhaust fan operating. Use rubber gloves and eye protection.

CAUTION

Do not use air pressure cleaning methods on equipment containing ESDS devices unless ionized air is employed.

CAUTION

Use only alcohol-type solvents on circuitry containing variable components.

CAUTION

Use only natural bristle brushes when cleaning circuit cards containing ESDS devices.

Visually inspect the circuit card to detect "hot spots" or other abnormal deterioration of components and connections. Use a magnifying lens to inspect foil runs for broken runs or shorts between runs. Inspect card surfaces for cracks, breaks, or voids.

Clean card thoroughly with a soft natural bristle brush. In some instances it may be necessary to use a solvent to remove heavy deposits. Cleaning materials are listed in table 4.

Table 4. Cleaning Materials.

TYPE OF CLEANER	COMMON NAME
Polar solvents	
Alcohols	*Isopropanol, TT-1-735 *Ethanol, denatured 190 to 200 proof
Water	Distilled water Deionized water
Nonpolar solvents	
Chlorinated hydrocarbons	*Trichloroethane Trichlorobenzene *Perchloroethylene
Ethers and esters	*Ethyl ether Butyl ether Cellosolve Carbitol Naphtha
Ketones	*Acetone *Methyl isobutyl ketone Amyl ketone
Detergents	
Alconox	Alconox Alconox Inc 217 Park Ave S New York, NY 10003
Alcojet	Alcojet NAZ-PAR Co. 0187 N North Bench St Chicago, IL 60622

*Use proper precautions against potential fire and health hazards which may be encountered under certain concentrations or environments. Use with proper ventilation and avoid exposure to flame or sparks. Consult the Code of Federal Regulations, Title 29, for specific exposure limits.

Clean areas damaged by electrolyte that has leaked from electrolytic capacitors with a strong pure detergent and warm water. Then, rinse the area with warm water. Dry the card before placing it in operation.

4. REPAIR

4.1 General

Observe the following precautions during repair.

- a. Avoid flexing printed circuit card. This could crack or delaminate metal foil.
- b. Exercise care when using sharp or pointed instruments that could damage metal foil.
- c. Individual printed circuit cards should not be stacked. Store in slotted trays or in a manner that precludes damage.
- d. Avoid excessive heat; apply the least possible heat to do the job properly. Allow the connection to cool before reheating. Avoid working on adjacent pads successively.
- e. All postcoating should be removed from leads and pads prior to heating.

4.2 Electrostatic Discharge Sensitive (ESDS) Devices

ESDS devices (such as CMOS logic) are very sensitive to excess voltages and static discharges. Static discharge from the human body or from any nonconductive garment or floor covering can destroy or severely damage an ESDS device. In order to adequately protect ESDS devices, the device and everything that contacts it must be brought to ground potential.

4.2.1 ESDS Precautions

A conductive wrist strap worn by the repair operator and attached to the associated conductive work surface is the recommended method of avoiding ESDS damage. Added precautions may include an ionized air blower in the work area where personnel are handling ESDS devices provided that personnel work in the path of the ionized air. If used, the blower should be operated for 3 minutes before handling an ESDS device so that residual static charges may be removed. A conductive ankle strap in contact with bare skin and associated conductive work surface can also be used.

WARNING

When a conductive wrist strap is used, make sure that no hazardous voltages are in the workstation area.

CAUTION

Wrist or ankle straps should be connected for at least 5 seconds before personnel touch ESDS devices.

4.2.2 Handling and Storage of ESDS Devices and Assemblies

CAUTION

Do not use gloves of nylon or other synthetic material when handling ESDS devices. Handle ESDS devices by their conductive containers; avoid touching the leads or contacts.

When transporting or storing unmounted ESDS devices, all device leads should be effectively shorted together. This is accomplished by inserting devices in high-density conductive foam, aluminum foil-lined individual packages, dual-in-line carrier tubes made of aluminum, or conductive containers. Use only carriers that are labeled as static discharge dissipative. Do not place paperwork inside the bag with an ESDS assembly or component or tape the bag shut. Assemblies not in the unit should be on a conductive surface or in a conductive container.

CAUTION

When a device or assembly is inserted in or removed from a container, the technician should maintain contact with the conductive portion of the container.

A caution statement as shown below, or equivalent, should be shown on all individual part containers.

CAUTION

This component can be damaged by static electricity.
Special handling methods and materials must be used.

4.2.3 Testing of ESDS Devices in Subassemblies

Observe the following precautions when testing any subassembly containing ESDS devices.

CAUTION

Meters that supply more than 1 milliampere of short-circuit current are unacceptable.

- a. Remove power from test fixtures or equipment before inserting/removing any device or subassembly.
- b. Ground all test equipment, but do not ground test equipment to mat used for technician grounding.
- c. Apply source power to subassembly before applying signal voltages.
- d. Remove all signal voltages from subassembly before removing source power.
- e. Do not make dielectric strength or insulation resistance checks on any ESDS device or subassembly.

4.2.4 Replacement of ESDS Devices

WARNING

When a conductive wrist strap is used, make sure that no hazardous voltages are present in the workstation area.

CAUTION

Place protective carriers on grounded conductive surfaces.

Observe the following precautions.

- a. Ground soldering iron tips, special tools, and handtools before using.
- b. Use only uninsulated metal handtools. Place all handtools on conductive workstation surface when they are not in use.
- c. Keep leads of ESDS devices in contact with conductive material, except when being installed.
- d. Do not install (insert) or remove any devices from circuits with power applied.
- e. Do not blow hot air on the device unless the air is ionized or is from a hot-air repair terminal.

4.3 Soldering and Desoldering

4.3.1 Safety Precautions

Soldering is a safe process if normal safety precautions are observed.

WARNING

- Exercise caution when handling soldering irons and soldered connections or parts that have not cooled sufficiently.
- Support large workpieces securely while soldering.
- Use suitable respiratory equipment and eye protection.
- Do not flip excess solder from tip of soldering iron. (Use clean damp sponge or cloth for cleaning hot soldering tips.)
- Do not wear rings or watches while soldering.
- Provide adequate ventilation. Vapors from solvents and fluxes may contain toxic gases.
- Do not allow solvents or fluxes to remain on the skin. Wash immediately with water.
- Wash hands thoroughly after soldering or desoldering.
- Special care must be exercised during solder removal to prevent overheating of the circuit pad as overheating may result in a lifted circuit pad. (A pad should not be heated longer than 5 seconds at a time during a soldering or desoldering operation.)

- Pads must be allowed to cool to room temperature between heating steps. This cooling takes approximately 30 seconds.
- When desoldering multileaded components, avoid working on adjacent leads to prevent localized heat buildup. A good procedure is to do the corners first and then do every other lead.
- Care should be exercised when handling chip components as these components have no visible means of identification if mixed. Unidentified chips which get mixed must be scrapped.
- Leads to be soldered should be tinned with solder prior to the soldering operation.

4.3.2 Tools and Materials

4.3.2.1 Soldering Irons and Tips

Soldering irons suitable for circuit card repair should meet the following requirements: not more than 20 watts if used on leadless components, grounded heating element to prevent inductive damage to ESDS devices, and comfortable handling qualities for optimum technician use. A temperature controlling feature and interchangeable tip capability is desirable. A variety of soldering iron tips are available. The selection of size and shape depends upon its use. Generally speaking, the smallest tip that conducts sufficient heat to the joint is preferred. Tin the tip properly and form a solder bridge to ensure adequate heat transfer.

A hot-air repair terminal has several advantages over conventional soldering apparatus. It permits desoldering and resoldering with controlled temperature and optimum accessibility to components. Information concerning the hot-air repair terminal can be obtained by contacting the manufacturer listed in table 2.

4.3.2.2 Solder

Soldering is accomplished using a noncorrosive type of rosin flux core (Type R only) or solid solder. For general purpose use, XERSIN 2000 solder is recommended. Where temperature limitations are critical, type SN63 (63/37) solder is recommended. The smallest diameter solder is preferred where excessive heat would present problems.

4.3.2.3 Flux

Adequate noncorrosive type flux must be used to ensure proper wetting of the solder connection. Liquid flux is recommended. All flux residue should be removed after soldering.

4.3.2.4 Solvents

WARNING

Provide adequate ventilation when using cleaning solvents. Avoid prolonged breathing of vapors and minimize skin contact. Eye protection is required.

Use solvents sparingly and only when necessary. Apply with cotton-tipped swab.

CAUTION

Ultrasonic cleaning and some solvents can damage the components on the card and may remove decals and labels. Use only alcohol for assemblies with variable components.

4.3.3 Preparation

4.3.3.1 Cleanliness

Soldering should be done in a clean area. Tools should be clean.

Clean parts thoroughly before applying solder. Apply a noncorrosive solvent and dry with clean lint-free wipers. Varnish not removable with solvent and corroded parts may be cleaned by mechanical means.

4.3.3.2 Wire and Cable

Wire size and insulation characteristics should duplicate the wire or cable removed. Cut wires to required lengths. Strip, clean, tin, and inspect prior to attachment.

Wires with cut, split, or burnt insulation should not be used. Some discoloration from thermal stripping is acceptable. Wires with conductors that have been stretched, nicked, cut, scraped, or otherwise damaged should not be used.

4.3.3.3 Shielded Wire and Cable

A separation of wire and shield is made in preparation for a solder connection.

CAUTION

Exercise care to avoid damaging shield or insulated wire.

- a. Refer to figure 1. Using strippers, trim shielding back sufficiently.
- b. Place heat-resistant sleeving under shielding.
- c. Wrap pigtail, if used, around shielding and solder in place.
- d. Place heat-shrinkable sleeving over pigtail and shielding. Shrink sleeving around cable until tight.

4.3.4 Soldering

Connections should be mechanically secure prior to soldering.

CAUTION

Take care not to heat 2 adjacent leads.

- a. Apply a thin even coat of flux to the surfaces being joined.
- b. Form solder bridge by applying soldering iron to lead at a 45 degree angle and applying a small amount of solder to junction of lead/wire and the termination area.

CAUTION

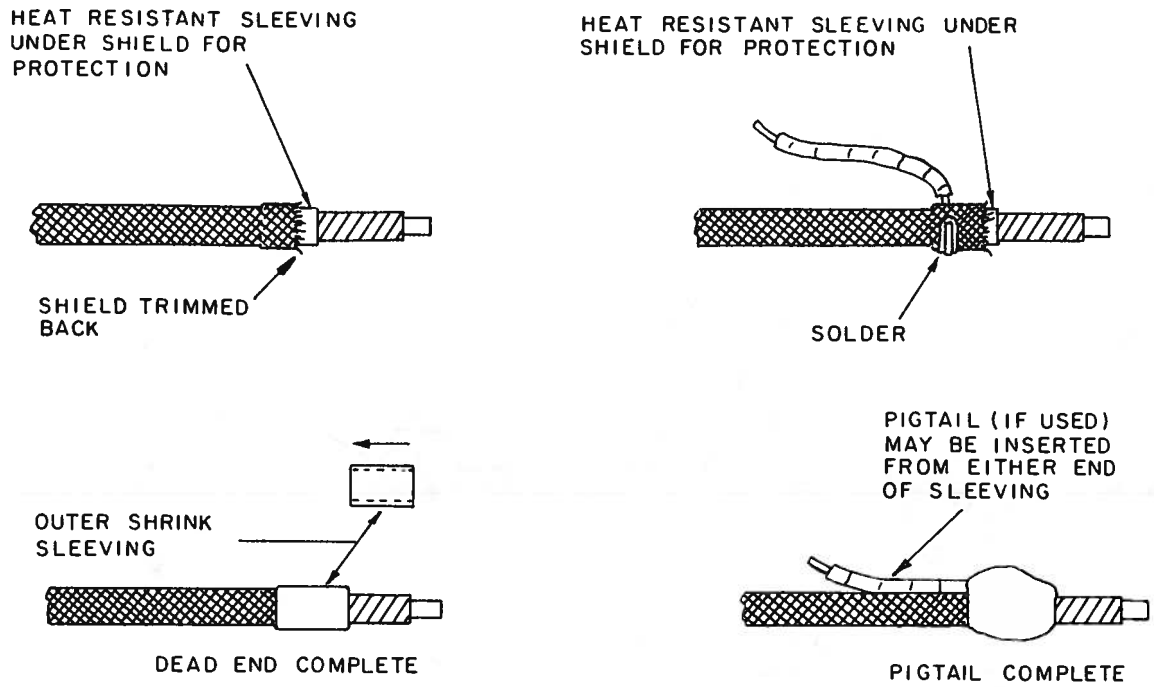
Do not apply excessive soldering iron tip pressure to pad because of danger of lifting the pad.

- c. After the areas have been heated to the correct temperature, apply solder to the connection not the soldering iron.

NOTE

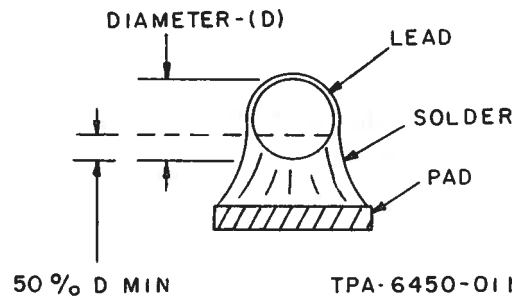
Use solder sparingly.

- d. Maintain contact of soldering tip with connection until all flux is boiled out and solder fuses smoothly into the connection.
- e. Remove soldering iron from joint without disturbing the connection. Permit solder joint to cool to room temperature.
- f. Clean the joint to remove residue.
- g. Examine all solder connections for a shiny, bright appearance with no pits or holes, a good fillet, and no excess solder. Refer to figures 2, 3, 4, and 5.



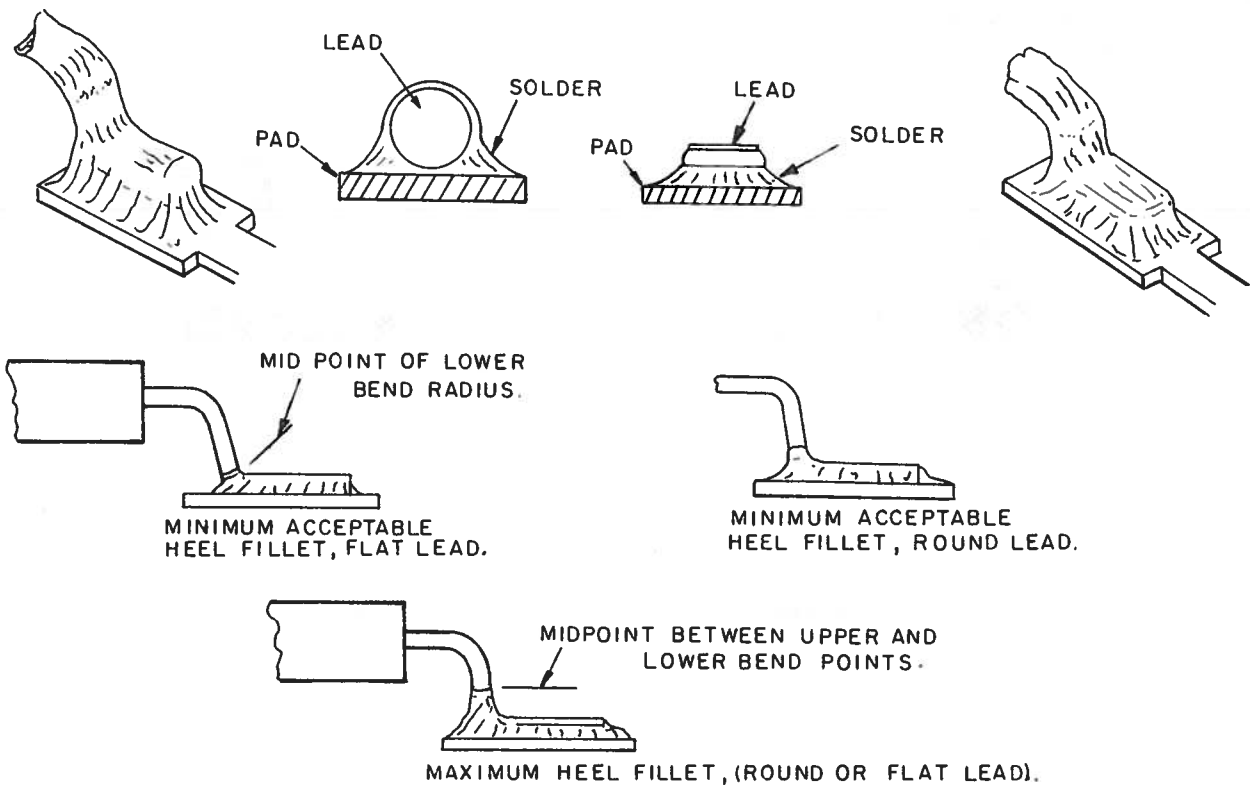
TPA-6555-011

Shielded Wire and Cable Preparation
Figure 1



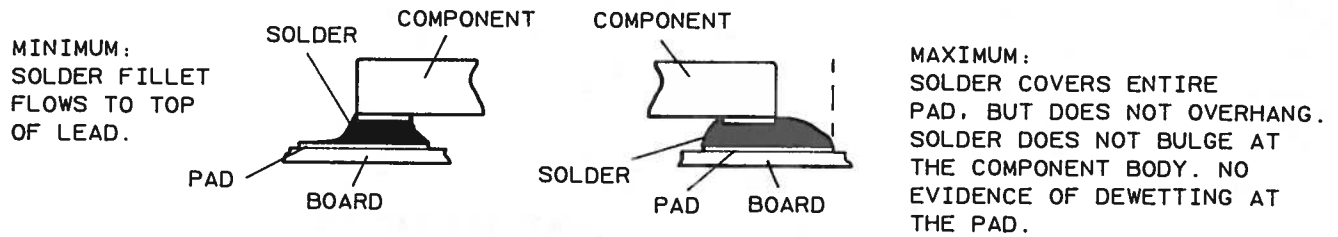
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Proper Solder Connection
Figure 2

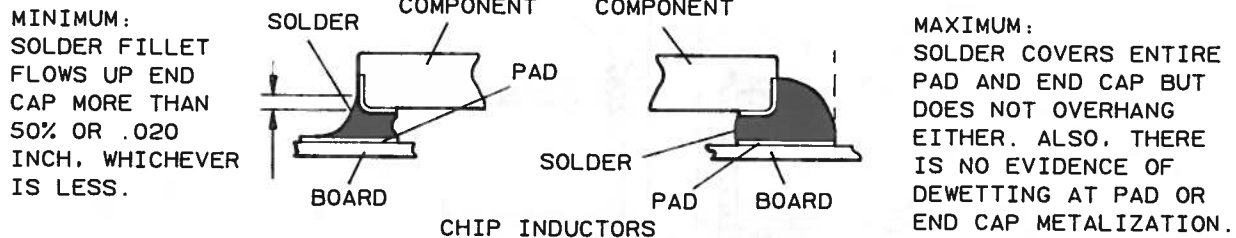


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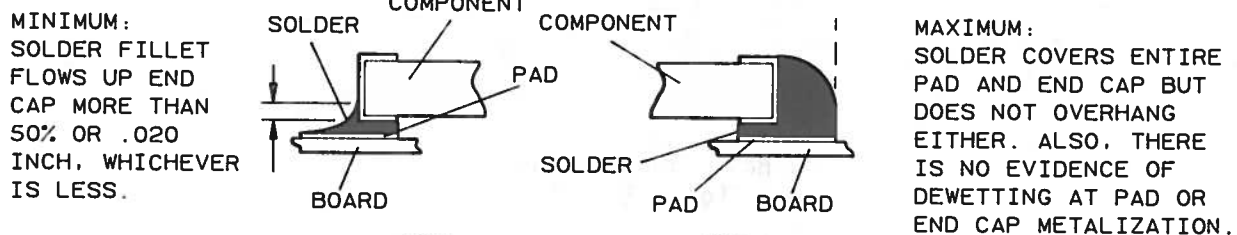
Solder Joints
Figure 3



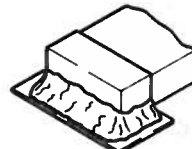
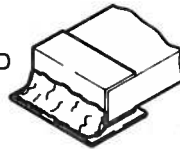
COMPONENTS WITH ONLY BOTTOM METALIZATION



CHIP INDUCTORS

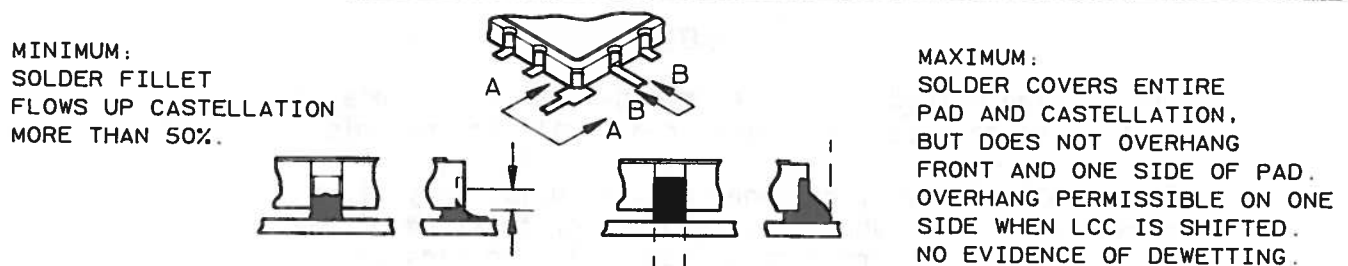


COMPONENTS WITH END
METALIZATION ONLY

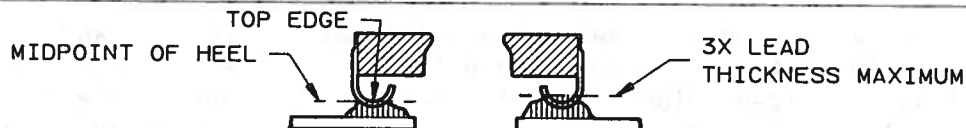


COMPONENTS WITH ADDITIONAL
SIDE METALIZATION

CHIP RESISTORS AND CAPACITORS



LEADLESS CHIP CARRIERS



MINIMUM- THE SOLDER FILLET SHALL:

- FLOW TO THE TOP EDGE OF THE LEAD
- COVER THE LEAD AT THE BOTTOM OF THE "J"
- EXTEND TO THE MIDPOINT OF THE HEEL

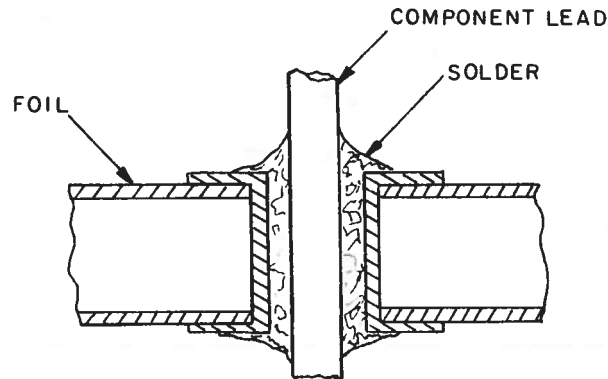
MAXIMUM- THE SOLDER FILLET SHALL NOT:

- COVER THE END OF THE LEAD
- OVERHANG ANY PORTION OF THE PAD

LEADED DEVICE SOLDERING

TPA-6452-013

Leadless Connections
Figure 4



TPA-6453-011

Thru Hole Connections
Figure 5

4.3.5 Desoldering Procedures

Desoldering is accomplished by wicking or by using a desoldering tool.

4.3.5.1 Braid Wicking

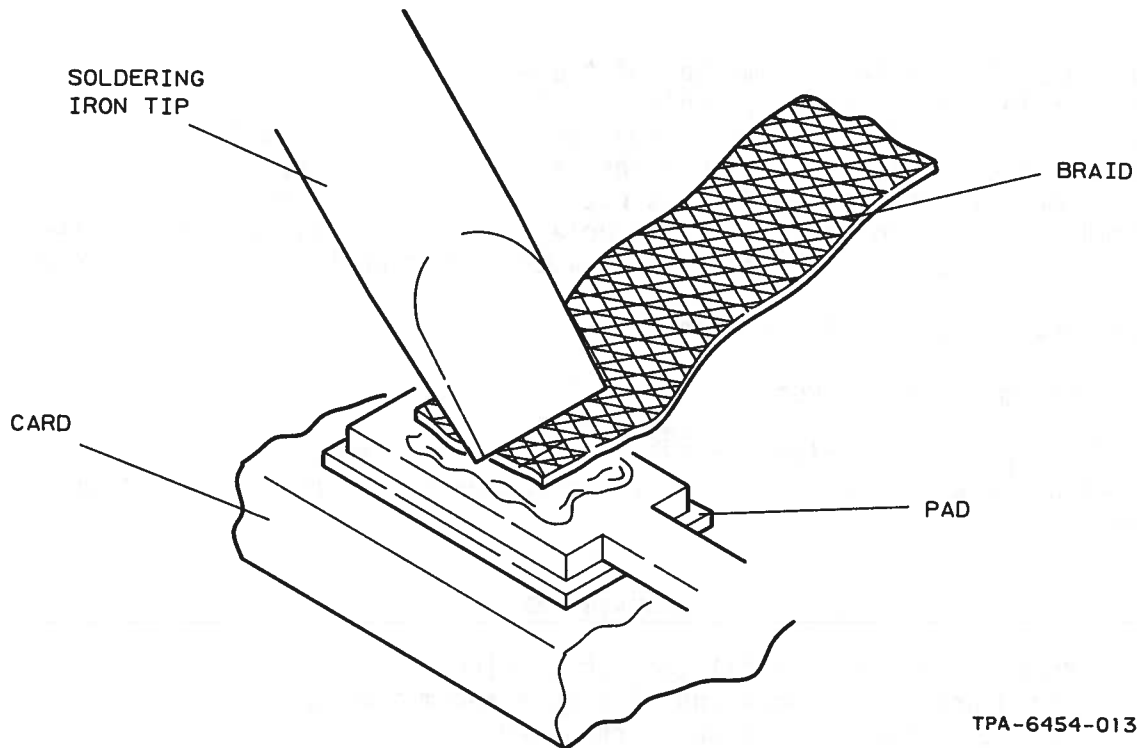
CAUTION

The wicking method is not recommended for use on plated thru holes because some solder can remain in the hole.

The desoldering must be done quickly, using only light pressure with no rubbing, scrubbing, or twisting of the wick to prevent board damage such as lifted pads or measling.

Wicking uses either stranded copper wire or braid saturated with flux and applied to a solder joint between the solder and a heated soldering iron tip. The combination of heat, molten solder, and air spaces in an appropriate sized braid creates a capillary action which causes the solder to be drawn into the wick.

The wicking method is recommended for removing surface solder joints only. The wicking technique is shown in figure 6.



TPA-6454-013

Exampler of Wicking
Figure 6

- Apply a drop of liquid flux to the solder joint to promote a good thermal linkage.
- Position wick on the solder to be removed. Always use a new end of the wick each time it is used.
- Place soldering iron tip on wick directly over the solder to be removed. When the solder begins to melt, gently slide the iron and the wick across the lead/pad.
- If the majority of the solder has not been removed, allow time for the connection to cool and repeat steps a through c until solder is removed.

4.3.5.2 Vacuum Pulse Wicking

The desoldering tool employs a single pulse of vacuum from either a squeeze bulb or a mechanical plunger.

In general, the application of both the soldering iron tip and the desoldering tool tip simultaneously to a solder joint depends upon the size of the joint. Where the joints are large, this method is feasible. However, as with most modern assemblies, the solder joints are relatively small and both the iron and tool tips cannot be applied simultaneously.

- Apply a drop of liquid flux to the solder joint to promote a good thermal linkage between the oxidized solder and the iron tip.

- b. Apply heat to the largest member of the solder connection.
- c. Once the lead moves freely, indicating that the solder is fully melted through the plated thru hole, remove the soldering iron and quickly position the soldering iron tip over the lead/pad and release the plunger.
- d. If the majority of the solder has not been removed, allow time for the plated thru hole to cool, fill the hole with solder, allow time for the connection to cool, and repeat steps a through c until solder is removed.

4.4 Conformal Coating (Postcoating)

4.4.1 Conformal Coating Removal

Refer to the procedures given in IPC-R-700C for the removal of conformal (postcoating) coating removal. The following warnings and cautions should be observed.

WARNING

Provide adequate ventilation when using cleaning solvents. Avoid prolonged breathing of vapors and minimize skin contact. Eye protection is required.

CAUTION

Use care around all variable components when using solvents or the adjustment may be frozen or permanently seized into one position.

4.4.2 Conformal Coating Application

WARNING

Conformal coating (postcoating) should be performed only in a well-ventilated area. Eye and skin protection are required.

Refer to the procedures given in IPC-R-700C for procedures on Preparation Prior to Recoating, and Conformal Coating Replacement. The following additional notes apply.

NOTE

The circuit card should be recoated with the same type of coating as originally used. The coating may be identified as follows: RTV is a rubber-like compound; HumiSeal 1B31 is solvent-dissolvable; and Dennis 1169 is not affected by solvents. Care should be taken to see that no bare spots are left.

No coated area should be rubbed, bumped, or handled in any way until specified cure cycle is complete.

Protective glove(s) must be worn during all procedures involving handling of cleaned boards. This is necessary to prevent contamination of cleaned surfaces by perspiration, skin oils, hand creams, etc.

Safety glasses with side shields must be worn when preparing or handling conformal coating.

If skin comes in contact with solvents or uncured coating materials, affected area should be washed thoroughly with water.

If eyes come in contact with solvents or coating materials, flush with water for 10 to 15 minutes, then seek medical attention.

All boards should be handled in such a manner so that electrostatic discharge does not damage the assemblies.

4.4.2.1 HumiSeal 1B31 Application

Apply HumiSeal where required with an artist's brush for accessible areas, and with a small syringe in restricted areas. If coating does not flow or smooth properly, or coating shows brush marks, obtain a fresh batch of conformal coating. New coating should overlap existing coating approximately 1/8 inch.

Allow fresh coating material to air-dry at least 30 minutes before oven cure to allow coating solvents to evaporate. Cure should be performed at one of the following rates and temperatures.

- a. 2 hours at 50 ± 5 °C
- b. 1 hour at 75 ± 5 °C
- c. 30 minutes at 100 ± 5 °C
- d. 24 hours at room temperatures

4.4.2.2 Dennis 1169 Application

Apply Dennis 1169 where required with an artist's brush for accessible areas, and with a small syringe in restricted areas. If coating does not flow or smooth properly, or coating shows brush marks, obtain a fresh batch of conformal coating. New coating should overlap existing coating approximately 1/8 inch.

Allow fresh coating material to air-dry at least 30 minutes before oven cure to allow coating solvents to evaporate. Cure should be performed at one of the following rates and temperatures.

- a. 3 hours at 50 ± 5 °C
- b. 2 hour at 75 ± 5 °C
- c. 1 hour at 90 ± 5 °C
- d. 45 minutes at 100 ± 5 °C

4.4.2.3 RTV Application

Clean and dry card. Brush a thin coating of RTV-1200 primer on surfaces to be coated. Allow primer to dry for 6 hours. Apply RTV evenly to surface to be coated.

Allow newly coated areas to air-dry until no longer tacky (about 2 hours) or for 72 hours for complete cure.

NOTE

Thicknesses greater than 3.2 mm (0.125 in) in any direction will require longer curing period.

4.5 Terminal Connections

Terminal connections are to be performed following the procedures in IPC-S-815B General Requirements for Soldering Electronic Interconnections. Refer to that document for procedures.

4.6 Leadless Components

4.6.1 General

NOTE

The hot-air repair terminal is recommended for removal of all leadless components.

Manual repair techniques for cards having leadless components require more care than conventional circuit cards.

One must constantly be aware of the physical size of the pads to which the components are attached. Many of the pads are secured to the circuit card only by the bond between the copper foil and the glass reinforced resin. This "glue joint" becomes extremely weak at the elevated temperatures required for repair. If the temperature is excessive, even the surface tension between the molten solder and the copper pad is enough to lift the pad from the card. Do not attempt to remove a component until all of the solder involved has melted.

Treat the components with care, especially if they are to be reinstalled. Exercise care to protect those components adjacent to the defective one.

CAUTION

Make sure that tools used are properly grounded to prevent damage to ESDS components.

Caution should be exercised while soldering to prevent "bridges."

4.6.2 Leadless Resistors and Capacitors

4.6.2.1 Removal

4.6.2.1.1 Hot-Air Repair Terminal Method

- a. Adjust air temperature and flow rate in accordance with hot-air repair terminal manufacturer's instructions.
- b. Align component under hot airstream.
- c. When solder melts, lift component from card with tweezers.
- d. Remove card from hot airstream and allow card to cool.
- e. After the connection has cooled to room temperature, remove the remaining solder from the pads using the wick method.
- f. Clean the pads thoroughly.

4.6.2.1.2 Multiple Soldering Iron Method

- a. Apply a drop of liquid flux to the solder joint to promote a good thermal linkage between the oxidized solder and the iron tip.
- b. Using two soldering irons heat both end terminations of the chip component simultaneously. Once the component moves freely, indicating that the solder is fully melted, gently lift the component off the pads.

CAUTION

If a component does not move freely on the pad, it is because the end terminations have resoldered to the pads.
DO NOT force it for pad damage will occur.

- c. After the connection has cooled to room temperature, remove the remaining solder from the pads using the wick method.

4.6.2.1.3 Single Soldering Iron Method

- a. Apply a drop of liquid flux to the solder joint to provide a thermal linkage between the oxidized solder and the soldering iron tip.
- b. Heat one end of the chip until solder melts.
- c. Repeat step b for opposite end.
- d. Continue this process until solder at both ends is molten and the chip can be removed with either tweezers or a vacuum pick.
- e. After the connection has cooled to room temperature, remove the remaining solder from the pads using the wick method.
- f. Clean pads thoroughly.

4.6.2.2 Replacement Using Soldering Iron Method

- a. Apply flux to component terminations and pads.
- b. Place component on pads and hold in place with a soft probe.

CAUTION

Take care not to apply excess heat to the card and component.

- c. Use single-tip iron to reflow the existing solder on the pad at one end of the chip, thus tacking the component in place.
- d. Solder the terminations using a soldering iron and wire solder. Solder the loose termination first.

4.6.3 Leadless Multiconnection Components

4.6.3.1 Removal

Use the procedure of paragraph 4.6.2.1.1.

4.6.3.2 Replacement Using Soldering Iron Method

- a. Apply liquid flux to pads.
- b. Place carrier on pads. (Critical placement is important.)
- c. Adjust tip temperature control to 316 °C (600 °F).
- d. Hold carrier down. Melt solder.

4.7 Two-Lead Components (Resistors, Diodes, Capacitors, etc)

4.7.1 Removal

CAUTION

Do not apply heat at a plated thru hole for more than 5 seconds at a time. Never put iron on pad as the pad will lift. Do not try to remove any component unless all coating holding component to the card has been removed.

NOTE

Before removing diodes or polarized capacitors, note polarity markings and orientation on the circuit card.

4.7.1.1 Hot-Air Repair Terminal Method

Use the procedure of paragraph 4.6.2.1.1.

4.7.1.2 Soldering Iron Method

- a. Refer to figure 7. On component side of card, clip leads as shown. Remove component.
- b. Refer to figure 8. On back of card, place soldering iron on lead until solder melts. If required, add solder to tip of iron to aid in transferring heat to hole.
- c. Remove lead from hole with needle-nose pliers.
- d. Repeat procedures for remaining lead.
- e. Clean plated thru hole thoroughly.

4.7.2 Replacement Using Soldering Iron Method

- a. Shape leads of component so leads fit freely into plated thru holes.

NOTE

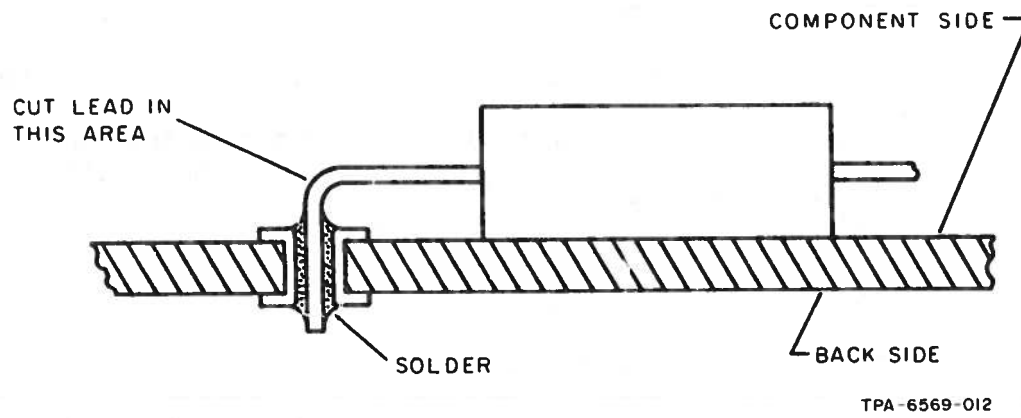
Do not crimp or bend leads to hold the component in position for soldering. The protruding portion of the lead should remain straight to prevent damage to the circuit card if subsequent replacement is required.

- b. Observe polarity markings and properly orient the component before installing.

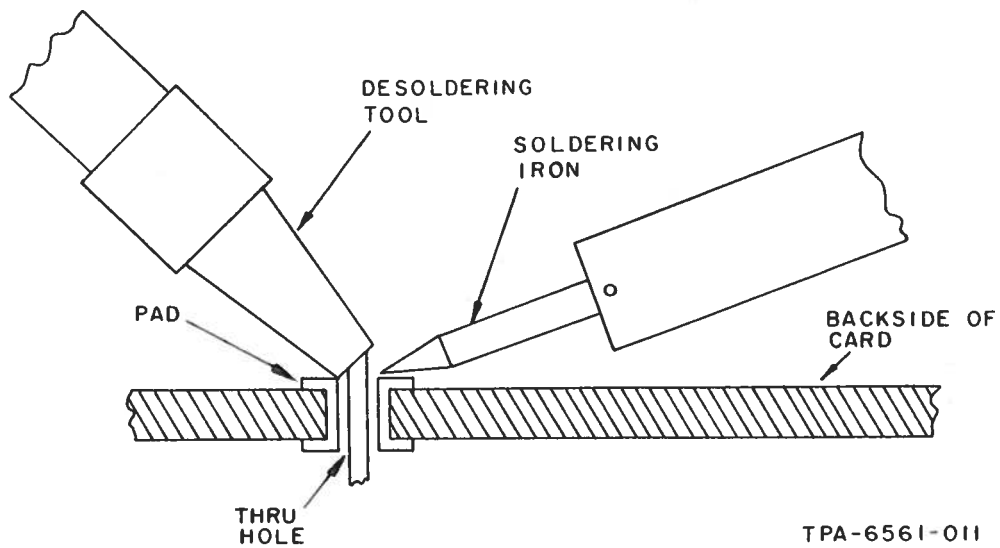
CAUTION

Do not apply heat at a plated thru hole for longer than 5 seconds at a time.

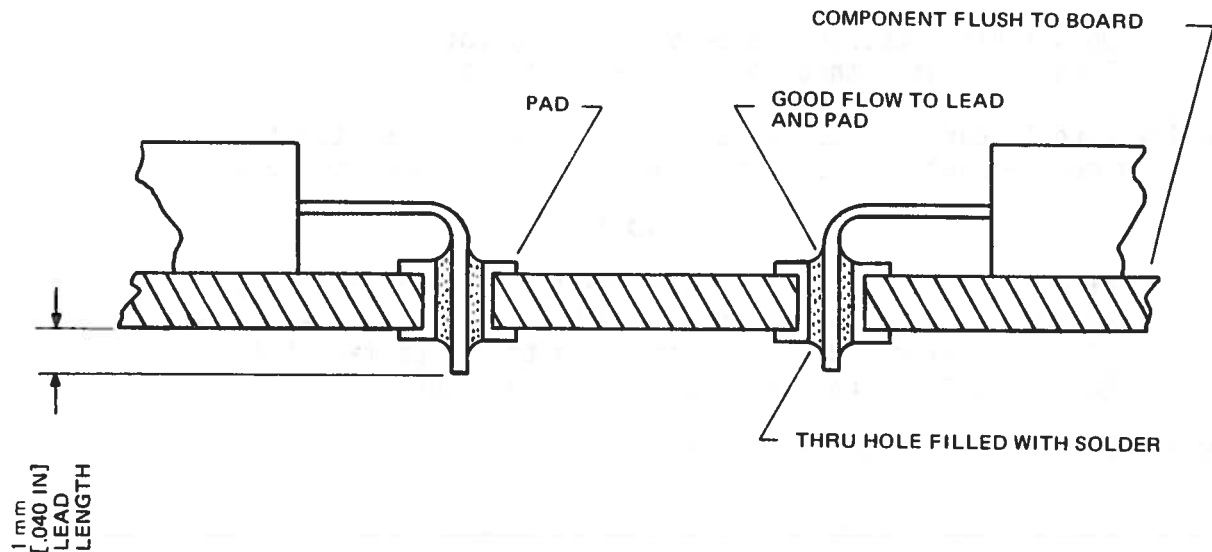
- c. Heat plated thru hole and apply solder. Solder should completely fill hole without excess. Refer to figure 9.
- d. Remove heat, allow solder to cool.
- e. Repeat steps c and d for other lead.
- f. Using small flush cutters, cut leads so that protruding length matches that of other components (approximately 1.0 mm (0.040 in)).



Lead Removal Diagram
Figure 7



Two-Lead Component Removal Diagram
Figure 8



TP2 4249 011

Two-Lead Component Installation Diagram
Figure 9

4.8 Multilead Components (Transistors, Transformers, Filters, etc)

4.8.1 Removal

4.8.1.1 Hot-Air Repair Terminal Method

Use the procedure of paragraph 4.6.2.1.1.

4.8.1.2 Soldering Iron Method

- a. Locate component to be removed. Note position, lead conformation, spacing of component off printed circuit board, and physical alignment of component. Observe position of orientation tab (if any). Determine pads and plated thru holes used for mounting.
- b. Lay circuit card flat on a clean surface with component side facing down.

CAUTION

Do not apply heat at a thru hole for longer than 5 seconds at a time.

- c. Place soldering iron tip on one pad and lead until solder begins to melt. Use a desoldering tool to remove excess solder. More solder may be required to conduct heat into hole and to provide better suction for solder removal.

CAUTION

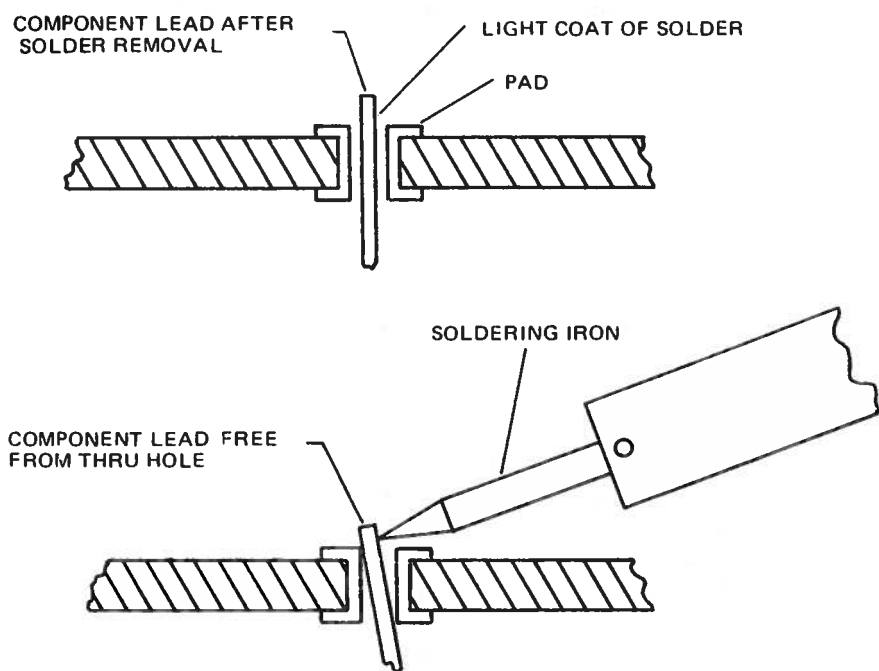
Do not use excessive force or twisting motion when removing leads or plated thru hole may be pulled out.

- d. Allow circuit card to cool before applying heat to plated thru holes in same area. Repeat procedure for each lead and remove component.

NOTE

It may be necessary to reheat some thru holes because of residual solder in the holes. While reheating, use the tip of a soldering aid to push the lead to the center of the hole to prevent resoldering. Refer to figure 10.

- e. Clean plated thru holes thoroughly.



TP2 4252 012

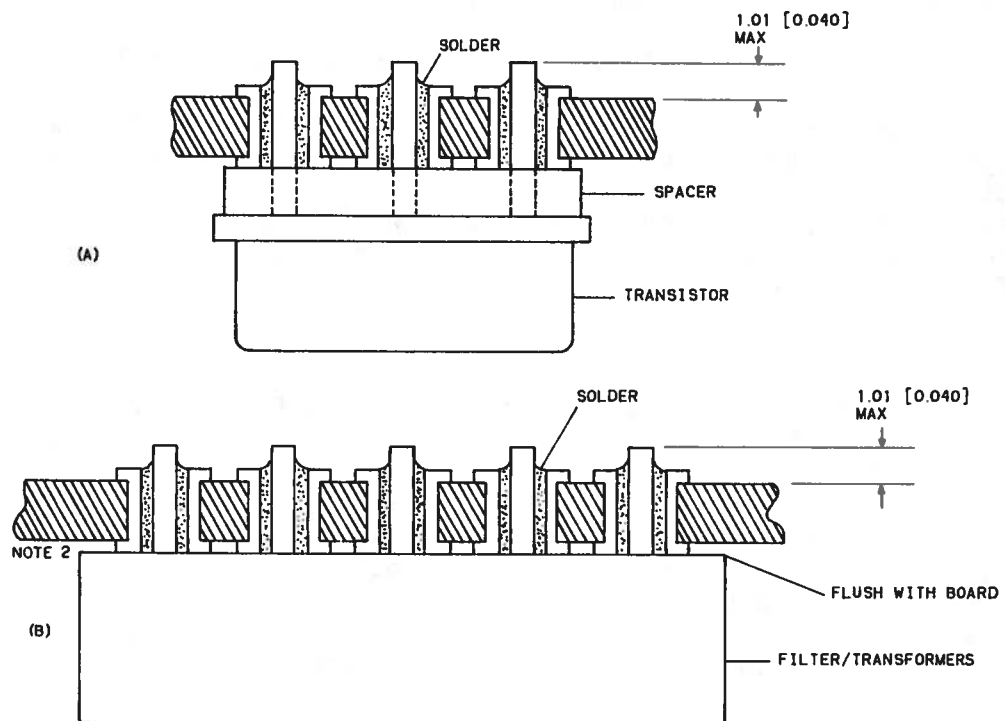
Multilead Component Removal Diagram
Figure 10

4.8.2 Replacement Using Soldering Iron Method

NOTE

Do not crimp or bend leads to hold the component in position for soldering. The protruding portion of the lead should remain straight to prevent damage to the circuit card if subsequent replacement is required.

- Carefully form leads of component to same configuration as the old one so that leads fit freely into plated thru holes. Do not cut leads. Refer to figure 11. Install spacer if required.
- Gently maneuver the component, inserting the leads into the proper plated thru holes.

**NOTES:**

- DIMENSIONS ARE IN MILLIMETRES (INCHES).
- FLUSH MOUNTING PERMITTED ONLY IF REQUIRED BY DESIGN. IF DESIGN HAS ROOM, SPACE ≈ 0.010 INCH OFF BOARD, TO PROVIDE STRESS RELIEF, CLEANING AREA AND SOLDER FLOW TO TOP OF BOARD.

TPA-6551-012

Multilead Component Installation Diagram
Figure 11

CAUTION

Do not apply heat at a plated thru hole for longer than 5 seconds.

- c. Use flux and solder sparingly. Refer to figure 11. Solder each lead at side of card opposite component. Allow circuit card to cool before applying heat to adjacent leads. During soldering, ensure that component does not shift position.
- d. Use small flush cutters, cut the leads so that the protruding length matches that of other components (approximately 1.0 mm (0.040 in)).

4.9 Microelectronic/Integrated Circuit

4.9.1 Removal

4.9.1.1 Hot-Air Repair Terminal Method

Use the procedure of paragraph 4.6.2.1.1.

4.9.1.2 Soldering Iron Method for Dual In-Line Packages (DIP's)

- a. Locate component to be removed. Note position, lead conformation, and physical alignment of component. Observe position of orientation notch or dot.
- b. Lay circuit card flat on a clean surface with component side facing up.
- c. Use cutters to carefully clip off DIP leads close to DIP, on component side of card. Remove and discard DIP.

CAUTION

Do not apply heat at a plated thru hole for longer than 5 seconds at a time. Use a 20-watt soldering iron. Observe ESDS precautions.

- d. Place the soldering iron tip on one DIP lead and thru hole. When solder melts, remove lead from plated thru hole.
- e. Allow the area to cool.
- f. Repeat steps d and e to remove remaining clipped DIP leads.
- g. Desolder and clean plated thru holes thoroughly.

4.9.1.3 Soldering Iron Method for Integrated Circuits (Flatpacks and Thin Films)

- a. Before removing component, note position of printed dot in corner component relative to position of component on circuit card.

CAUTION

Excessive heat will damage the circuit card.

- b. Heat each lead until solder melts and lift lead just far enough to break connection with mounting pad. Hold lead away from pad for a few seconds until pad cools. When all leads have been unsoldered, remove component. (Pressure-sensitive tape may be used under component.)
- c. Desolder and clean all pads thoroughly.

4.9.2 Replacement

4.9.2.1 Soldering Iron Method for Replacement of Dual In-Line Packages (DIP's)

- a. Fit leads of new DIP into correct plated thru holes. Do not cut the leads at this time.

NOTE

Do not crimp or bend leads to hold the component in position for soldering.

CAUTION

Do not apply heat at a plated thru hole for longer than 5 seconds at a time.

- b. Use flux and solder sparingly. Solder each lead on the side opposite the component. Ensure that the component does not shift position during the soldering procedure.
- c. Allow circuit card to cool before applying heat to the other plated thru holes.
- d. Refer to figure 11. Carefully inspect all new solder connections for evidence of improper wetting action, holes, cold or excess solder, or short circuits. Solder should completely fill the hole without excess.
- e. Use small flush cutters, cut the leads so that the protruding length matches that of other components (approximately 1.0 mm (0.040 in)).

4.9.2.2 Soldering Iron Method for Flatpacks and Thin Films

NOTE

The pressure-sensitive adhesive tape (CHRK 109-1in) is required to insulate the component from the printed circuit card.

- a. Cut tape to proper size using the component as a guide and attach to surface of component that is to be placed against printed circuit card.

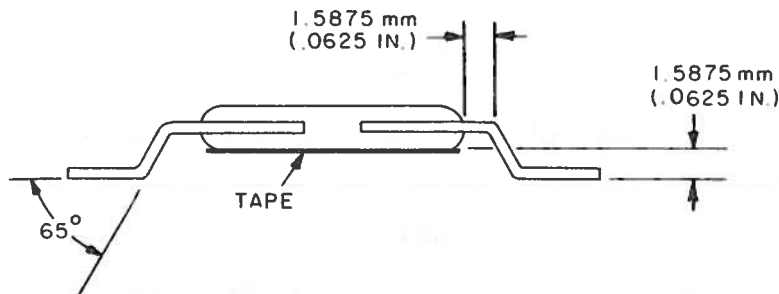
CAUTION

Do not use pliers to bend the leads because damage to component may occur. Use lead forming tool listed in table 2.

- b. Refer to figure 12. Ensure that component leads are properly formed.

NOTE

Dimensions and angles shown in figure 12 are approximate but should be maintained as closely as possible to provide strain relief.



TPA-6556 - 011

Component Mounting Diagram
Figure 12

CAUTION

Do not use diagonal cutters to cut component leads. Use a flush cutter.

- c. Position component on circuit card. Each lead must extend to the end of, but not beyond, its respective mounting pad. If leads are too long, cut to proper length.

CAUTION

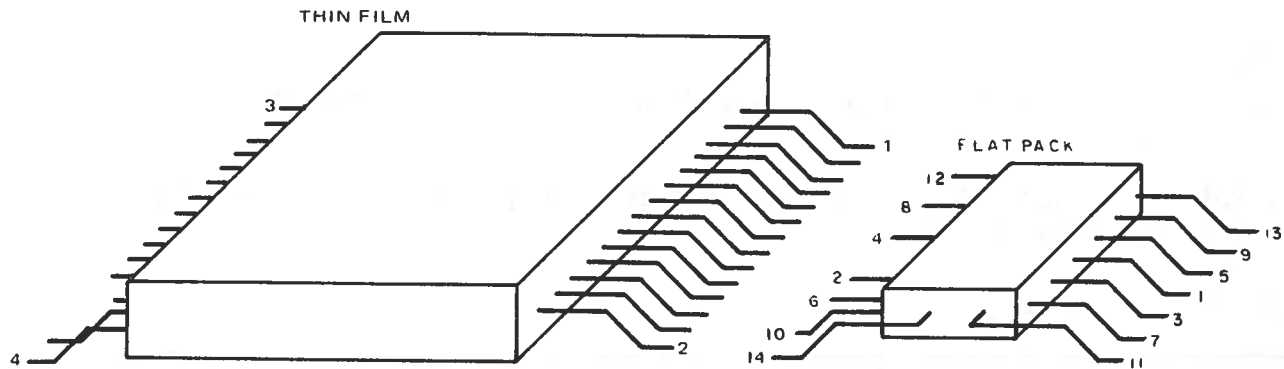
Do not allow solder nearer than 1.6 mm (0.0625 in) to component. Damage to component may occur.

- d. Use flux and solder sparingly and pretin each lead up to the first bend.
e. Apply flux to the pads.
f. Position component on mounting pads. Ensure that leads of component lie flat onto the pads for soldering. Observe placement of orientation marker to ensure proper orientation. Temporarily solder the opposite ends.

CAUTION

Avoid use of excessive heat.

- g. Place soldering tip on the lead. Refer to figure 13 for soldering sequence.
- h. Slide the tip 0.4 to 1.1 mm (0.0156 to 0.0417 in) toward the end of the lead when the solder melts.
- i. Remove soldering iron tip while holding lead motionless with auxiliary tool.



LEADS ARE TO BE FORMED SO THEY ARE NOT TOUCHING ONE ANOTHER AND TINNED END IS STRAIGHT AND FLAT

SOLDER EACH LEAD IN ORDER AS NUMBERED

TP2 42E3 011

Flatpack and Thin-Film Soldering Sequence Diagram
Figure 13

4.10 Connectors

Connectors supply the means to plug circuit cards into an interconnection sideboard or another circuit board. Connectors used may be mounted perpendicular or parallel to the circuit board. Connectors (except sideboard connector pins) typically have press in contacts, mounted in a solid housing. Contacts used may be square pins, flat blades, snap-in tuning forks, high-voltage contacts, high-current contacts, or coaxial contacts. Wiring to the contacts may be soldered or crimped in place depending upon the contact type used.

4.10.1 Removal

4.10.1.1 Connectors Using Square Pin Adapter Mounting

- a. Place card on a flat surface with component side facing up and thin-line connector toward technician.
- b. Locate contact to be removed.

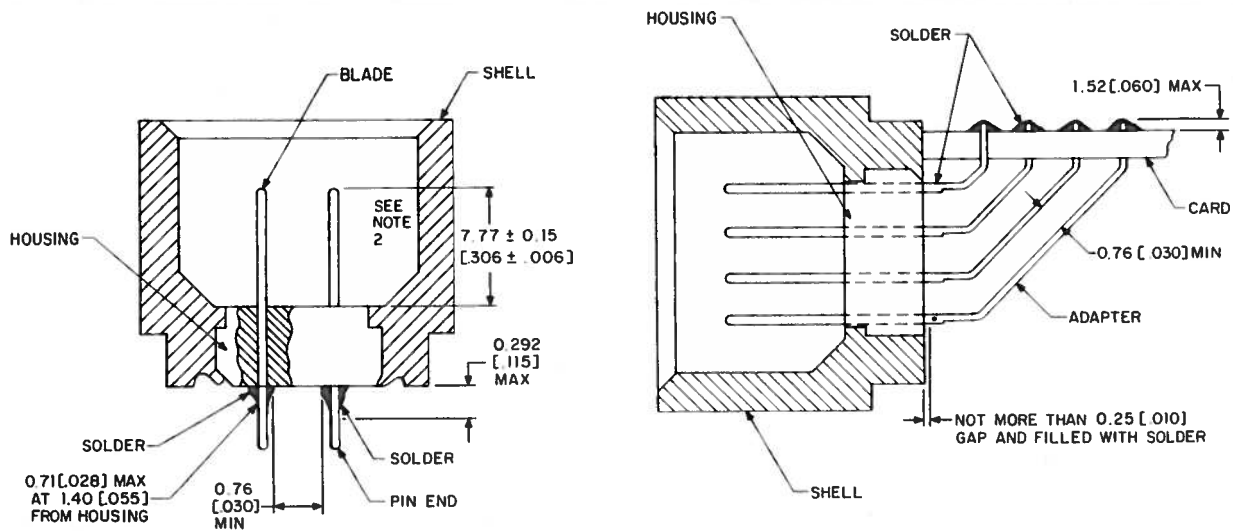
NOTE

If contact to be removed is not readily accessible, it is necessary to remove interfering wires (adapters) from connector to sideboard to gain access to defective contact. Note the placement of each adapter before removal.

CAUTION

Do not apply heat at a plated thru hole for longer than 5 seconds at a time.

- c. Refer to figure 14. If removal of interfering wires is required, perform the following procedure.



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES [INCHES].
2. FAULT INDICATOR BLADE IS 7.19 ± 0.15 [283 ± .006].

TPA-6557-013

Connector Using Square Pin Adapter Mounting
Figure 14

1. Apply a small quantity of flux to the junction of the adapter and the wiring side of the contact.
2. Use small, curved needle-nosed pliers. Grasp top row adapter at angle area.
3. Apply soldering iron tip to the fluxed junction. When the solder begins to melt, carefully bend the adapter away from the contact just far enough to break the solder bond. Avoid excessive pressure at the junction of the adapter and the sideboard.
4. Apply a small quantity of flux to the junction of the adapter and the sideboard thru hole.
5. Apply soldering iron tip to the fluxed junction. When solder begins to melt, extract adapter from thru hole. Save adapter for reinstallation.

CAUTION

Allow the sideboard to cool before reapplying heat to the same area on the sideboard.

6. Repeat procedure to remove additional adapters as necessary to gain access to the contact that is to be removed.
7. Desolder and clean each plated thru hole thoroughly.
- d. Use a lightweight hammer and small drift punch. At the wiring side of the connector, gently tap the contact. Drive the contact clear of the housing.

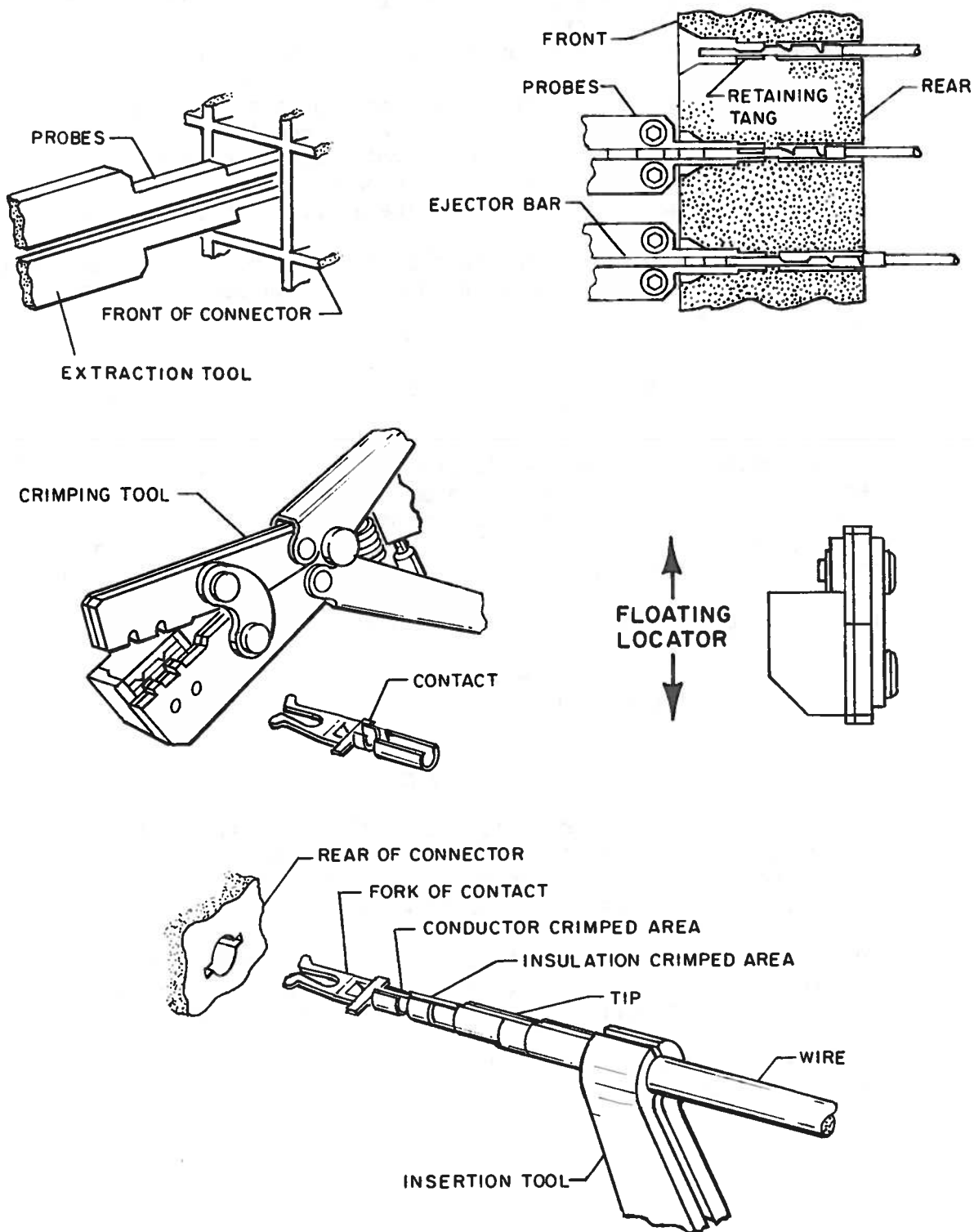
4.10.1.2 Connectors Using Snap-in Tuning Fork Contacts

- a. Place card on a flat surface with component side facing up and thin-line connector toward technician.
- b. Locate contact to be removed.

NOTE

If contact to be removed is not readily accessible, it is necessary to remove interfering wires (adapters) from connector to sideboard to gain access to defective contact. Note the placement of each adapter before removal.

- c. Refer to figure 15. Insert extraction tool (part number 359-0697-060) probes fully into slots in contact cavity from mating side of connector.
- d. Push ejector of extraction tool forward until contact protrudes from rear of connector.
- e. Pull contact out from rear of connector.
- f. To disconnect contact from wire, clip wire as close as possible to contact.



TPA-8282-019

Connector Using Snap-in Tuning Fork Contacts
Figure 15

4.10.1.3 Sideboard Connector Pins

NOTE

Replacement of bent connector contacts is usually not required; with care, most pins can be straightened. Broken contacts, however, must be replaced.

- a. Ensure that the special tools are available before starting the removal procedure. Refer to figure 16. The backup tool (part number 772-5936-010), insertion tool (part number 772-5938-001), and impact tool can be fabricated locally or ordered by part number from Rockwell International.
- b. Lay the sideboard flat on a clean work surface, component side face up. Locate the contact to be removed.
- c. Refer to figure 16. Use small diagonal cutters or end nippers; cut off mating side of broken contact approximately 2.12 mm (0.125 in) above the sideboard surface.

CAUTION

Do not apply heat at a mounting pad for longer than 5 seconds at a time. Allow the sideboard to cool between applications of heat.

- d. Remove all solder from both sides of contact plated thru hole.

NOTE

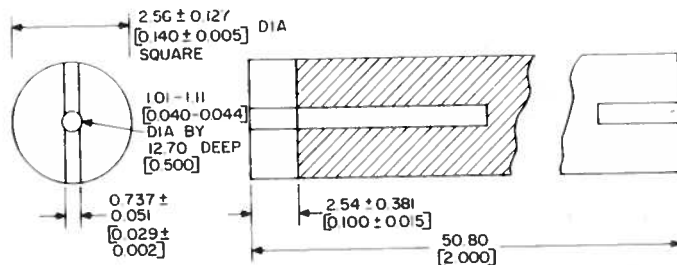
Note the position of the shoulder of the contact to be removed. The replacement contact must be seated in the same position.

- e. Lift sideboard and position it so that component side faces down. Refer to figure 17. Carefully place backup tool over contact to be removed. Ensure that slot in backup tool is aligned with the long portion of contact shoulder.

CAUTION

Sideboard should be resting on and completely supported by backup tool. Ensure that sideboard is parallel with surface of backup tool.

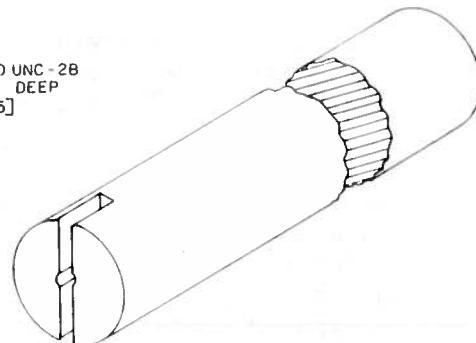
- f. Use impact tool and a lightweight hammer. Place small tip of impact tool at base of contact. Lightly tap impact tool until contact drops out of housing into slot of backup tool.



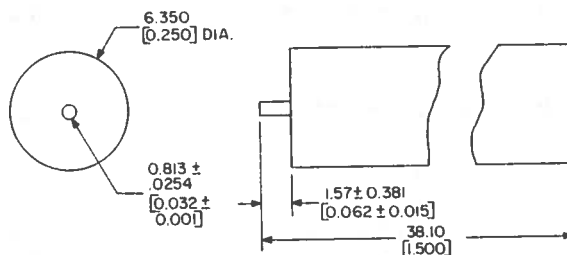
BACKUP TOOL

CPN 772-5936-001
MATL - TOOL STEEL
HEAT TREAT - HEAT TREAT TO FULL HARD
AND REMOVE SCALE

4-40 UNC-2B
9.53 DEEP
[0.375]

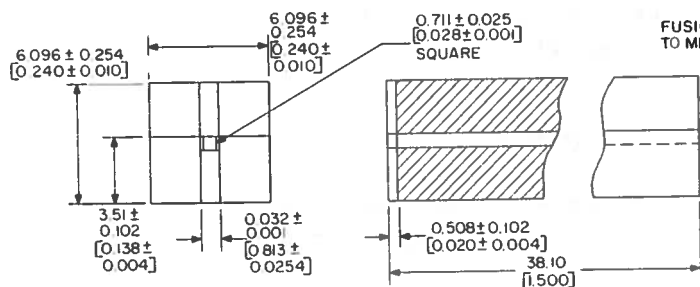


NOTE: DIMENSIONS ARE IN MILLIMETRES [INCHES]



IMPACT TOOL

MATL - TOOL STEEL
HEAT TREAT - HEAT TREAT TO FULL HARD
AND REMOVE SCALE



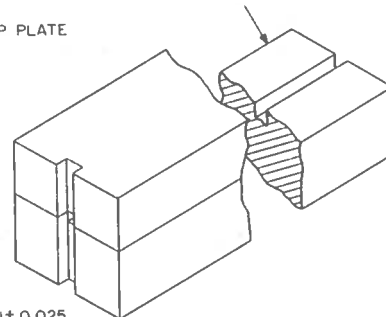
INSERTION TOOL

CPN 772-5938-001
MATL - 2 PIECES TOOL STEEL
HEAT TREAT - HEAT TREAT TO FULL HARD
AND REMOVE SCALE AFTER
MILLING AND FUSION WELDING

FUSION WELD TOP PLATE
TO MILLED BODY

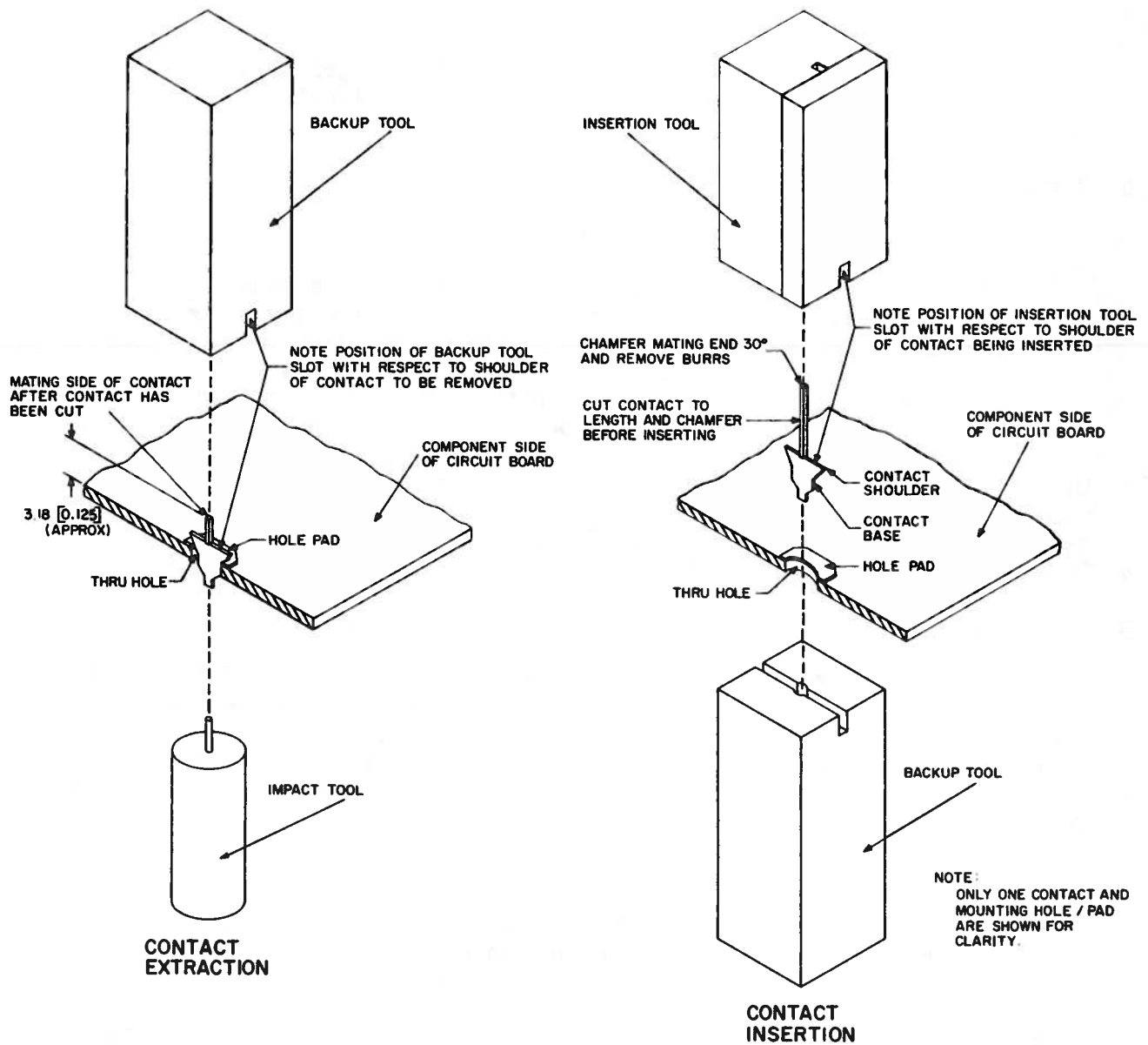
0.711 ± 0.025
MILL [0.028 ± 0.001]
DEEP AND WIDE
IN MAIN BODY

TOP PLATE NOT SHOWN ON REAR
PART OF TOOL SO THAT MILLING
DETAIL CAN BE SEEN



TPI-1952-011

Impact, Backup, and Insertion Tools Diagram
Figure 16



TP2-4861-019

Sideboard Contact Extraction/Insertion Diagram
Figure 17

4.10.1.4 Connectors Using Square Pin or Flat Blade Contacts

- a. Place card flat on a clean work surface with wiring side up. Identify contact to be removed.

CAUTION

Do not apply heat at a plated thru hole for longer than 5 seconds at a time. Permit circuit card to cool between applications of heat.

- b. Remove all solder from contact plated thru hole.

NOTE

If contact to be removed is in a lower cavity of a double row housing and a contact is in upper cavity directly above contact to be removed, use soldering iron and solder sucker to desolder securing tabs of upper contact. Use a scribe or other pointed tool and push tab through card. Bend tab slightly with pliers so lower row cavity is not obstructed.

- c. Use a soldering aid or a blunt probe. Press contact through connector housing. It may be necessary to straighten contact-securing tabs to permit removal. Reheat plated thru hole if necessary.
- d. Desolder and clean contact mounting pad and plated thru hole thoroughly.

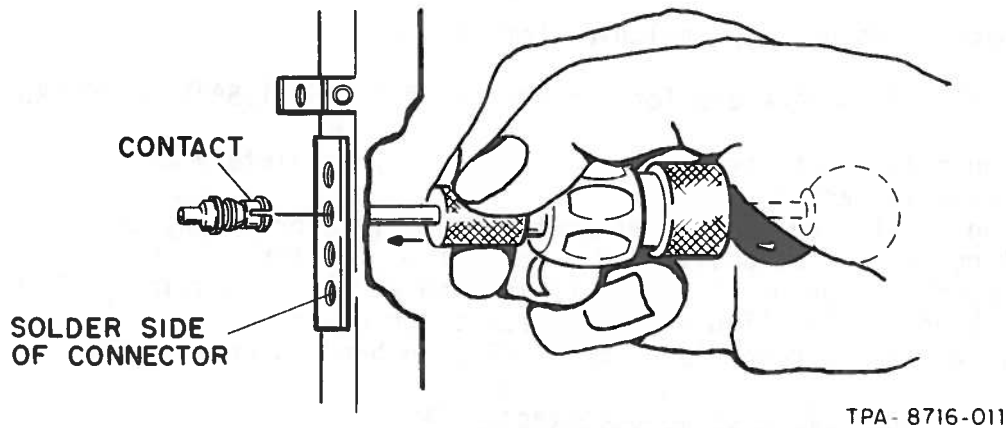
4.10.1.5 Connectors Using Coaxial, High-Voltage, or High-Current Contacts

- a. Using extraction tool (Cannon part number CET-C6B-1) from mating side of contact, insert barrel of tool over contact. Exert enough pressure on tool frame to cause barrel of tool to seat over contact. Refer to figure 18.
- b. Slowly press inward on tool plunger until plunger touches contact.
- c. Hold handle down firmly with thumb and forefinger and depress plunger with palm of hand.

NOTE

A common tendency is to pull thumb and finger back rather than push with the palm. This action will let retaining rings expand and contact cannot be removed.

- d. Contact should release and move out of connector housing toward wiring side of card.



TPA - 8716-011

Connector Using Coaxial Contact
Figure 18

4.10.2 Replacement

4.10.2.1 Connectors Using Square Pin Adapter Mounting

- Insert a new contact, part number 372-2513-020, from mating side of connector housing. Use fingers until contact begins to seat and finger pressure is no longer effective.
- Use a lightweight hammer. Gently tap contact into housing until fully seated. When properly seated, both ends of contact should protrude from housing the same distance as other contacts.
- Inspect the adapter removed from this position. If reusable, skip to step e.
- If the adapter is damaged or badly deformed, replace it with a new one (part number 768-3771-001).
- Use small, curved needle-nose pliers. Carefully shape adapter to same shape as the other adapters in the same horizontal row. The cup portion should just touch and rest under the contact. The other end should protrude through the appropriate thru hole at the sideboard.

CAUTION

Do not apply heat at a plated thru hole for longer than 5 seconds at a time.

- Use flux and solder sparingly. Solder adapter to contact.
- Use flux and solder sparingly. Solder adapter into the plated thru hole.
- Use small diagonal cutters or end nippers to cut adapter to match the length of the others.
- Repeat steps c through h to install adapters that were removed to permit access to defective contact.

- j. Carefully inspect all newly soldered joints for evidence of poor connection, cold or excess solder, or short circuit. Solder should completely fill the plated thru holes without excess.

4.10.2.2 Connectors Using Snap-in Tuning Fork Contacts

- a. Strip insulation from wire end for a distance of 3.175 ± 1.5875 mm (0.125 ± 0.0625 in).
- b. Refer to figure 15. Open crimping tool GMT-221 by completely closing handles to release ratchet.
- c. Push floating locator up and insert contact into locator. Contact retaining tangs should be positioned into slot of locator.
- d. Insert stripped portion of wire into crimp band as far as possible. The front crimp band should align with the insulation of the wire.
- e. Hold wire in place and complete crimp by closing handles until ratchet releases.
- f. Open crimp tool and remove crimped contact.
- g. Grasp wire with insertion tool. Align forks of contact with slots in connector housing from the rear of the connector.
- h. Push contact into connector from the rear until contact snaps into position.

4.10.2.3 Sideboard Connectors

- a. Refer to figure 17. Carefully measure a contact installed on the sideboard. Cut a new contact, part number 372-2236-010, to the same length.
- b. Chamfer mating end 30° and remove burrs as shown in figure 17.

NOTE

The insertion tool has a square hole to maintain contact alignment during insertion. The depth of the slot ensures proper depth of insertion and proper alignment of the contact shoulder.

- c. Refer to figure 17. Insert prepared contact into insertion tool.
- d. Tilt sideboard and insert contact into proper plated thru hole from the component side.
- e. Position backup tool under hole on wiring side. Ensure that slot is aligned with contact shoulder.
- f. Position sideboard so that the wiring side is parallel with backup tool. Ensure that the contact shoulder is in the same position as the one removed. If not properly aligned, position the insertion tool over contact and engage shoulder in slot. Rotate as required to properly align the shoulder.
- g. Inspect the vertical alignment of the contact. Straighten if necessary.

CAUTION

Do not apply heat at a plated thru hole for longer than 5 seconds. Permit the circuit card to cool between applications of heat.

- h. Use solder and flux sparingly. Solder contact into plated thru hole. Solder should completely fill hole and just cover upper edge of contact shoulder.

4.10.2.4 Connectors Using Square Pin or Flat Blade Contacts

- a. Place circuit card flat on a clean work surface with mating side of connector up.
- b. Note orientation of securing tabs in the installed contacts.
- c. Refer to equipment parts list for correct replacement part number. Insert a new contact into the housing. Ensure that securing tabs are oriented to match installed tabs. Do not cut securing tabs at this time.
- d. Press contact from mating side; exert enough pressure to seat contact in housing. Seat contact to match existing contacts.
- e. Turn circuit card over so that wiring side of connector faces up. Use fingers to bend long securing tabs alongside mounting pad.
- f. Use small diagonal cutters; cut tabs to match length of installed tabs. Ensure that tab ends are flush with top surface of mounting pad.

CAUTION

Ensure that no solder flows into contact.

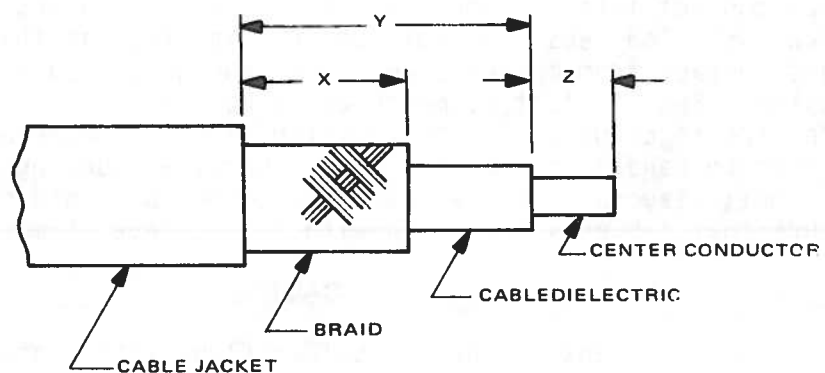
- g. Use solder and flux sparingly. Solder contact to mounting pad.

4.10.2.5 Connectors Using Coaxial, High-Voltage, or High-Current Contacts

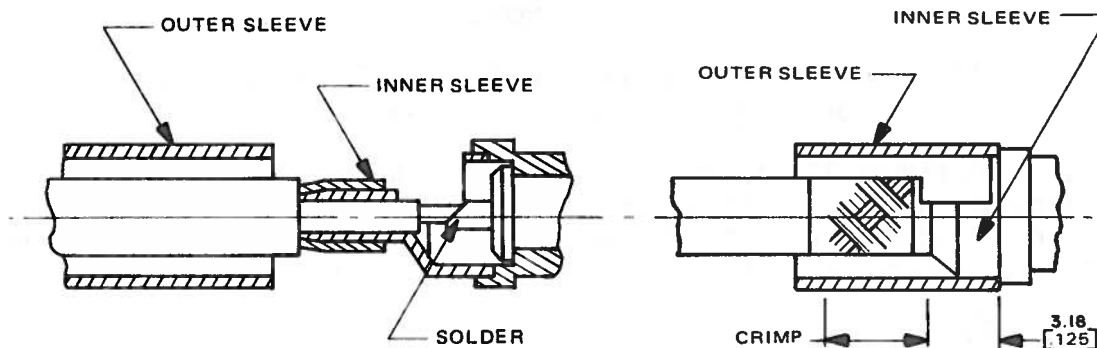
NOTE

This procedure covers the instructions for attaching coaxial connector part number 273-2519-XXX.

- a. Refer to figure 19, detail A. Use a sharp knife and a small pair of diagonal cutters. Prepare the cable in accordance with table 5.
- b. Slide outer sleeve of the connector onto the coaxial cable with large end toward the end of cable.



A. TRIM



B. SOLDER

C. CRIMP

NOTE:
DIMENSIONS ARE IN MILLIMETRES [INCHES].

TP2 4245 011

Coaxial Cable Connector Preparation Diagram
Figure 19

Table 5. Cable Data.

PART NUMBER	COAXIAL CABLE	STRIPPING DIMENSIONS			CRIMP TOOL	
		X mm (in)	Y mm (in)	Z mm (in)	MANUFAC- TURER'S PART NUMBER	PART NUMBER
372-2519-240	RG-196/U	6.60 (0.260)	8.18 (0.322)	2.24 (0.088)	NA	NA
372-2519-250	RG-196/U	6.60 (0.260)	8.18 (0.322)	2.24 (0.088)	NA	NA
372-2519-030	RG-58/U	5.00 (0.197)	6.20 (0.244)	3.02 (0.119)	CCT-DM	372-8091-050
372-2519-040	RG-58/U	5.00 (0.197)	6.20 (0.244)	3.02 (0.119)	CCT-DM	372-8091-050
372-2519-050	T-209	8.18 (0.322)	9.78 (0.385)	2.24 (0.088)	WT-401	359-8018-040
372-2519-060	T-209	8.18 (0.322)	9.78 (0.385)	2.24 (0.088)	WT-401	359-8018-040
372-2519-090	RG-223	8.18 (0.322)	9.78 (0.385)	2.24 (0.088)	WT-409	359-8018-090
372-2519-100	RG-223	8.18 (0.322)	9.78 (0.385)	2.24 (0.088)	WT-409	359-8018-090
372-2519-210	RG-188/U	6.60 (0.260)	8.18 (0.322)	2.24 (0.088)	CCT-DM	372-8091-050
372-2519-220	RG-188/U	6.60 (0.260)	8.18 (0.322)	2.24 (0.088)	CCT-DM	372-8091-050

NOTE

In some instances, the sleeve will be a straight piece of tubing in which case either end may face the prepared end of the cable.

- c. Refer to figure 19, detail B. Insert trimmed cable into inside diameter of inner sleeve until center conductor bottoms in connector solder cup. The cable braid should not extend beyond inner sleeve.

CAUTION

Do not overheat the connection.

- d. Use solder and flux sparingly, solder center conductor connection.
- e. Smooth braid of cable over inner sleeve. Slide outer sleeve over braid until it is against back face of connector.
- f. Use crimping tool specified in table 5. Crimp outer sleeve on braid as shown in figure 19, detail C.
- g. Position approximately 19.05-mm (0.75-in) shrink sleeving over outer sleeve and shrink in place.

CAUTION

Do not use pliers or any other tool to facilitate insertion as this may permanently damage the contact.

- h. Grasp wire and back of contact between thumb and forefinger. Hold contact straight and start it into thin-line housing.
- i. Push contact in with a straight and even pressure until contact clicks. When in position, contact will rotate easily.
- j. Rotate and pull lightly on wire to ensure contact is properly seated.

4.11 Fiber-Optics

CAUTION

Care should be taken to observe the fiber-optic cable minimum 5-cm (2-in) bend radius at all times to prevent cable breakage.

Optical fibers are transparent, dielectric cylinders surrounded by a second dielectric cylinder. There are a great number of types on the market. Each is manufactured for some specific need such as dispersion, attenuation, bandwidth, and tensile strength. Cables are constructed usually for the ability to protect the fibers within from ambient dangers such as water, humidity, heat, and cold. Fibers are encased within the cable using protective jackets (usually polyurethane). Strength members surround the fibers. Fibers and cables are first of all selected for specific parameters of transmission. The cables covered here are those currently in use by Rockwell International, Collins Defense Communications.

Operating temperature range for standard installed cable is -20 to +50 °C (-4.0 to +122 °F). The minimum bend radius and maximum tensile load parameters of fiber optic cable interact, and both have an effect on the optical characteristics of the cable. During installation, to guarantee no permanent effects on cable optical properties, maximum tensile force should be limited to 400 N (90 lb). Minimum bend radius with this tensile force applied is 15.0 cm (5.9 in). Maximum crushing force (evenly distributed over parallel surfaces) to which the cable can be subjected without mechanical damage is 100 N/cm (57 lb/in).

4.11.1 Ofti RB-1 Style Connector (Part Number 357-0148-010) Procedures

Fiber-optic cable used is Brand Rex OC-1008 Flight-Light, part number 424-0397-010. This cable has a 100-micrometer glass core with 140-micrometer glass cladding. Unique tools and supplies are provided in the fiber optic installation kit, part number 687-2882-001 (refer to table 2). Other equipment needed but not supplied are as follows.

<u>ITEM</u>	<u>QUANTITY</u>
Connector gluing fixture (refer to figure 20)	1
Masking tape	As required
Ruler	1
Wire stripper, mechanical (14 gauge)	1
Scissors	1
Tissue wipers	As required
Side cutters	1
Hot-air gun	1
Water	As required
Alcohol	As required

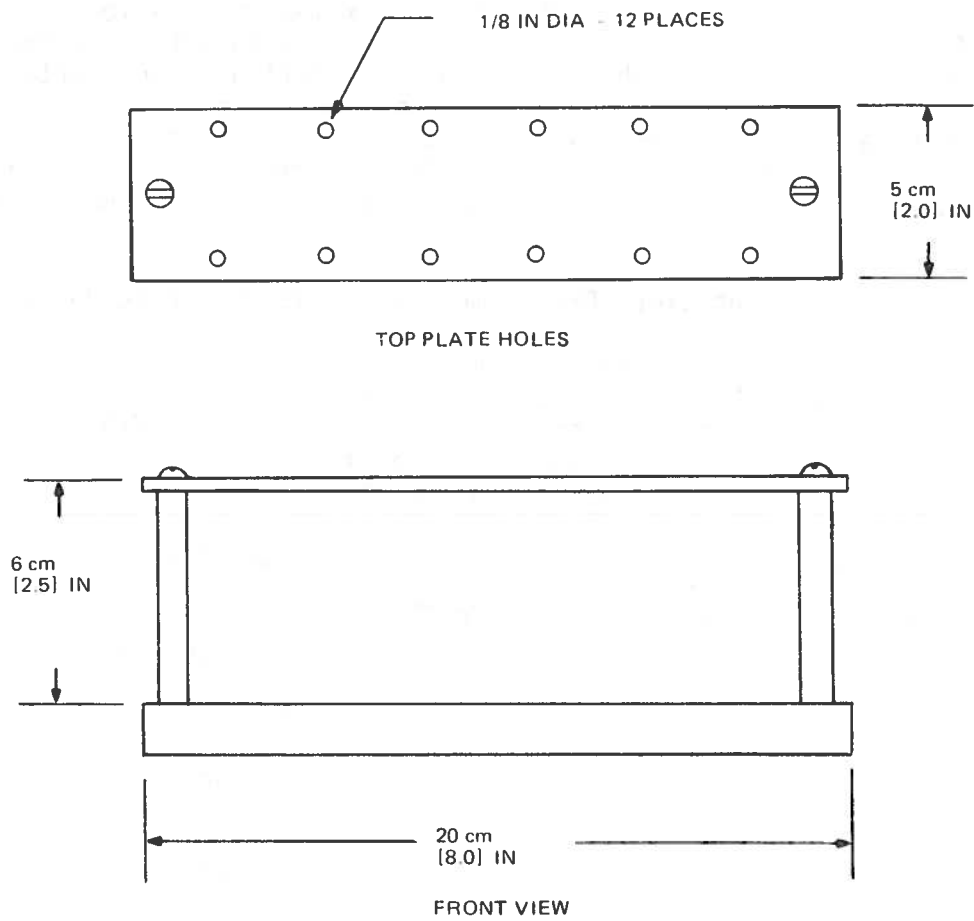
The procedure is divided into five parts: 1) connector preparation, 2) cable preparation, 3) connector installation, 4) epoxy curing, and 5) connector polishing. The connector gluing fixture should be assembled prior to beginning the procedure.

4.11.1.1 Connector Preparation

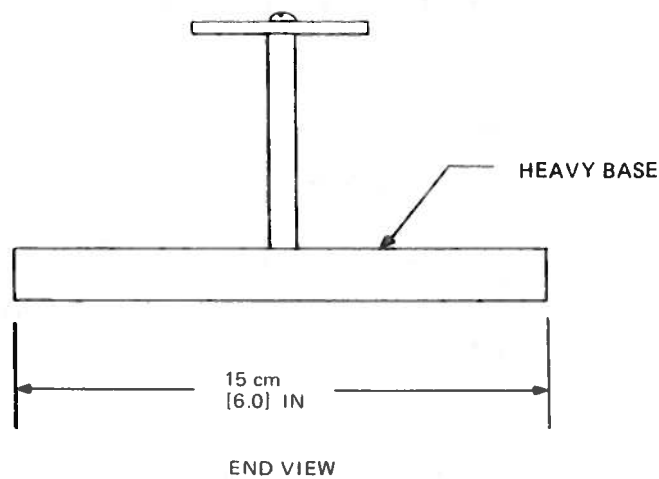
NOTE

Terminate one end of each cable completely before terminating the second end. Perform the connector preparation first before the cable preparation to allow time for the epoxy to flow into the connector.

- Prepare epoxy glue according to the manufacturer's instructions and load into a syringe.
- With the connector (refer to figure 21) held vertically in the connector gluing fixture and secured in place with masking tape, put four drops of epoxy into the rear of the connector. Refer to figure 22.

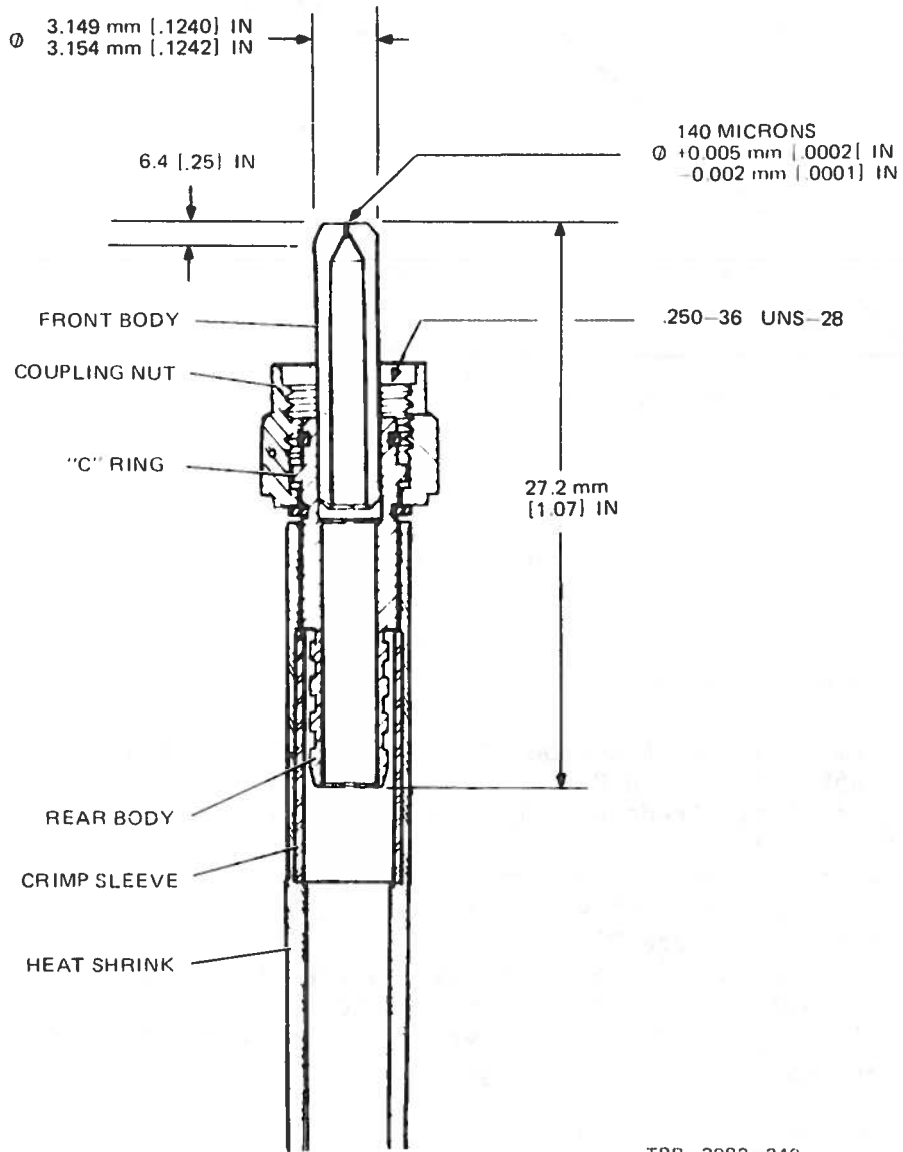


ALL ALUMINUM MATERIALS



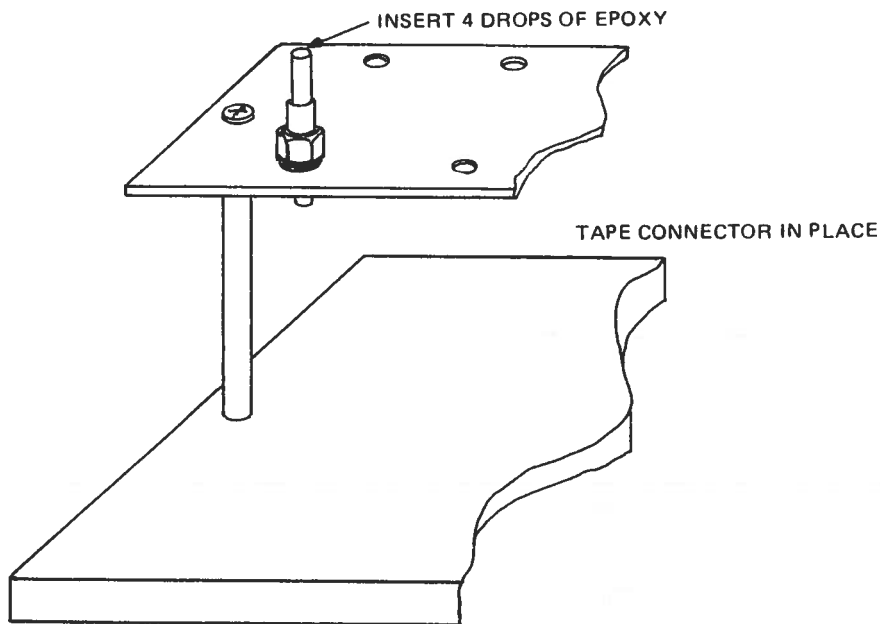
TPB-2982-249

Connector Gluing Fixture
Figure 20



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Ofti RB-1 Connector, Part Number 357-0148-010
Figure 21



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Connector Gluing
Figure 22

4.11.1.2 Cable Preparation

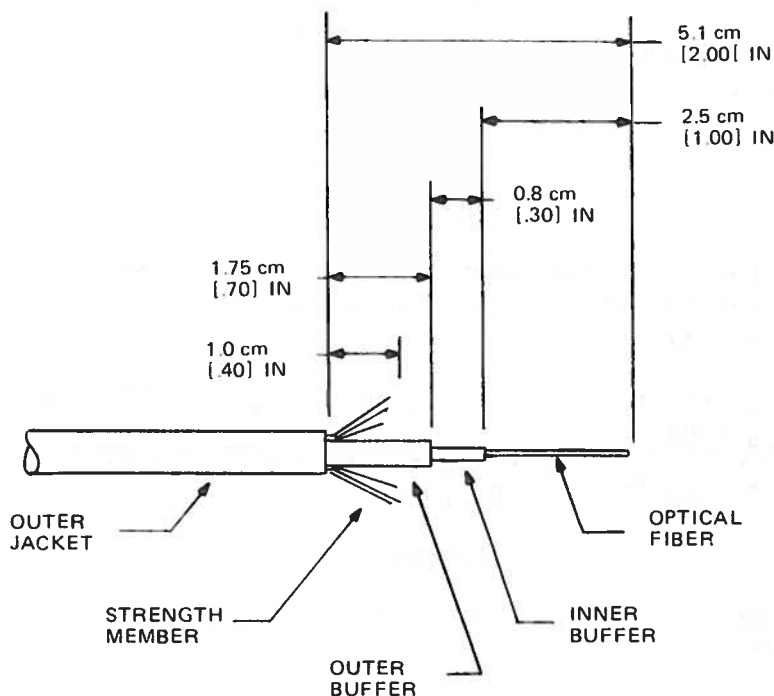
- Remove 5.8 cm (2.3 in) of the outer jacket of the cable using the wire stripper. Refer to figure 23.
- Trim the fiberglass strength member to 1.0 cm (0.4 in) long with scissors. Refer to figure 23.
- Insert fiber into outer buffer stripping tool until outer jacket stops insertion. Strip outer buffer leaving 1.75 cm (0.7 in) of the outer buffer exposed. Refer to figure 23.
- Trim fiber to 2.3 cm (0.9 in) from outer buffer to tip of the fiber.
- Insert fiber into inner buffer stripping tool until the fiber reaches the 2.54-cm (1-in) stop. Strip the inner buffer leaving 0.8 cm (0.3 in) of the inner buffer exposed. Refer to figure 23.

4.11.1.3 Connector Installation

- Place the heat-shrink tubing and the metal crimp sleeve over the cable.

NOTE

Do not force the cable as the glass fiber will break.



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Fiber Optic Cable Stripping
Figure 23

- b. Insert the fiber into the connector. With the optical fiber carefully threaded through the center hole, carefully slide the connector down the fiber. Make sure that the strength members ride up over the knurled part of the connector rear body. Continue to slide the connector on until the rear body contacts the cable outer jacket. Refer to figure 24.

CAUTION

Do not get any epoxy on the external connector or the connector nut.

- c. Wipe away any excess epoxy that squeezed out.
- d. Slide the crimp sleeve over the strength member and crimp using position C on the crimp tool. With the side cutters, trim the strength member flush with the connector after crimping. Refer to figure 25.
- e. Slide the heat-shrink tubing over the connector to within 0.25 cm (0.1 in) of the nut. Shrink the sleeving using the hot-air gun.

CAUTION

Do not exceed the diameter of the connector with the epoxy.

- f. Place a small bead of epoxy on the fiber at the tip of the connector.
Refer to figure 26.

4.11.1.4 Epoxy Curing

NOTE

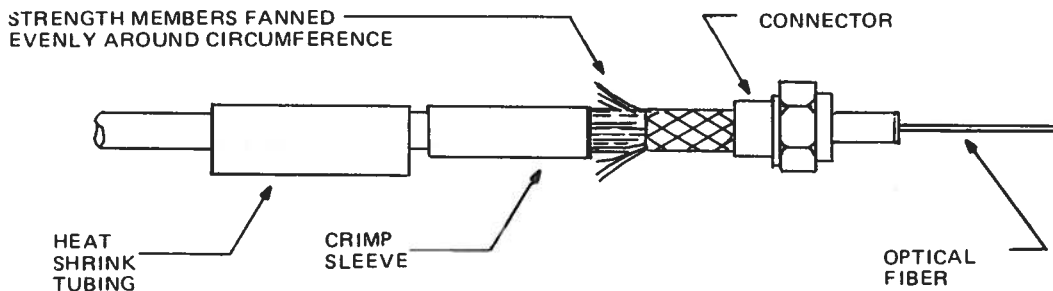
The proper curing of the epoxy adhesive is critical to a successful and reliable cable termination. Follow this procedure exactly.

- a. Place the connector vertically in the connector gluing fixture and tape in place with masking tape.
- b. Place the cable and the connector mounted to the gluing fixture in an oven and cure at 100 °C (212 °F) for 30 minutes.

CAUTION

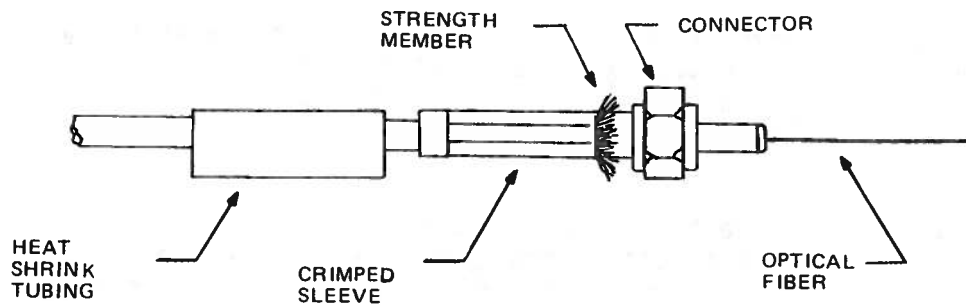
If the connector cools down too fast, the optical fiber will fracture.

- c. After 30 minutes, turn the oven off and allow it and the cables inside to gradually cool down to room temperature.



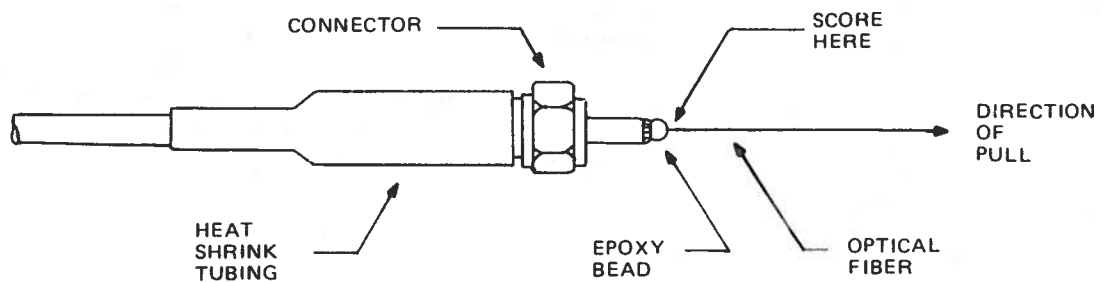
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Connector Assembly
Figure 24



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Crimped Connector
Figure 25



TPB-2982-249

Optical Fiber Cleaving
Figure 26

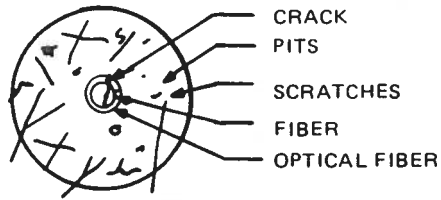
4.11.1.5 Connector Polishing

WARNING

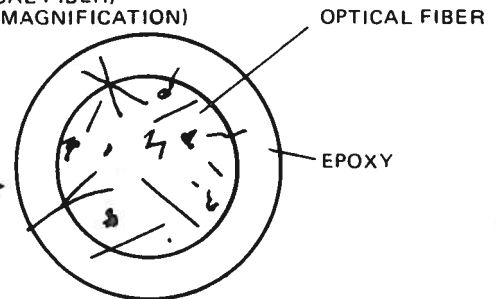
Dispose of broken pieces of optical glass fiber by sticking them on a piece of tape and disposing of them. Glass fibers are difficult to see and can easily penetrate the skin. Eyes should not be rubbed when working with glass fibers.

- a. With the sapphire scribe blade, score the optical fiber at the end of the connector as close as possible to the epoxy bead. Refer to figure 26. Only a slight pressure and only 0.15 cm (0.0625 in) travel is needed to score the fiber. Gently pull off the excess fiber. Do not bend the optical fiber or apply any side pressure when pulling. The fiber should pull away very easily. If it does not break, score again with slightly more pressure.
- b. Insert the connector into the polishing tool.
- c. Apply the 15-micron, 3-micron, and 0.3-micron lapping film to the glass plate and wet with water.
- d. Carefully stroke the polishing tool over the wet 15-micron lapping film in a smooth, light, figure-eight pattern. DO NOT PRESS HEAVILY. Very light pressure should be used for initial grinding until a flat surface develops on the epoxy bead. After the epoxy bead has been removed, continue grinding until the excess connector ferrule had been removed and the full face of the polishing tool fully contacts the lapping film. About 20 to 30 strokes should complete the rough grind.
- e. Thoroughly rinse the connector and polishing tool in clean running water.
- f. Carefully stroke the polishing tool over the wet 3-micron lapping film with the same smooth, light, figure-eight pattern. Use the same firm, but not heavy, pressure. Polish the connector until the end face shows reflections. This should be achieved in about 25 strokes.
- g. Thoroughly rinse the connector and polishing tool in clean running water.
- h. Carefully stroke the polishing tool over the wet 0.3-micron lapping film with the same smooth, light, figure-eight pattern. Use the same firm, but not heavy, pressure. Polish the connector until the end face has a mirror finish. This should be achieved in about 25 strokes.
- i. Thoroughly rinse the connector and polishing tool in clean running water and dry with air and/or wiping tissues. Examine the fiber finish quality using the microscope. If the fiber surface is acceptable, remove the connector from the polishing tool and wipe clean. Refer to figure 27. If the fiber surface is not acceptable, repeat step h until the fiber surface is free of scratches, pits, and chips. If the fiber is cracked, cut the connector off of the cable and reterminate the cable with a new connector.
- j. Repeat entire procedure for other end of cable to be terminated.
- k. Rinse the glass plate in clean running water when polishing is completed. If the lapping film is damaged or worn, remove the lapping film and clean the adhesive from the glass plate with alcohol before applying new lapping film.
- l. (Optional) When both ends of the cable have been terminated, test the cable loss with the Fiberlink S-1800 fiber-optic multimeter.

UNSATISFACTORY POLISH
CONNECTOR TIP
(5X MAGNIFIED)

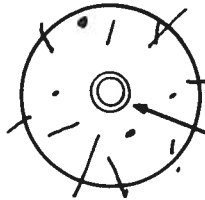


UNSATISFACTORY POLISH
(OPTICAL FIBER)
(100X MAGNIFICATION)

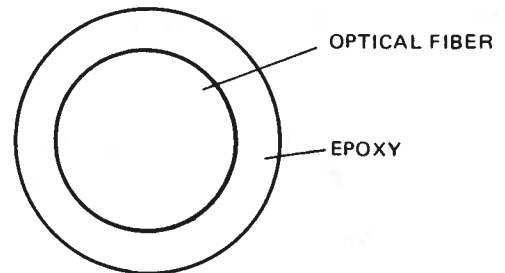


UNSATISFACTORY FIBER AND POLISH
QUALITY. NOTE PITS AND SCRATCHES
ON END FACE OF FIBER.
REQUIRES ADDITIONAL INTERMEDIATE
(STEP 8) AND FINAL (STEP 8) POLISHING

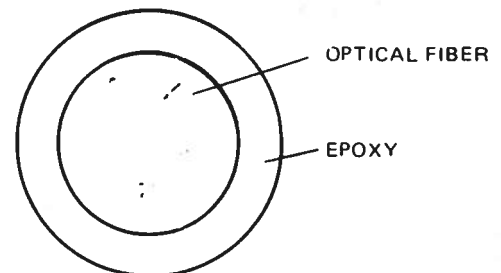
SATISFACTORY POLISH
CONNECTOR TIP
(5X MAGNIFIED)



SATISFACTORY POLISH
(100X MAGNIFICATION)



SATISFACTORY FIBER AND POLISH
QUALITY. NOTE CLEAN AND CLEAR
FIBER END AND FIBER CORE DEFINITION
FREE OF PITS AND MAJOR SCRATCHES.



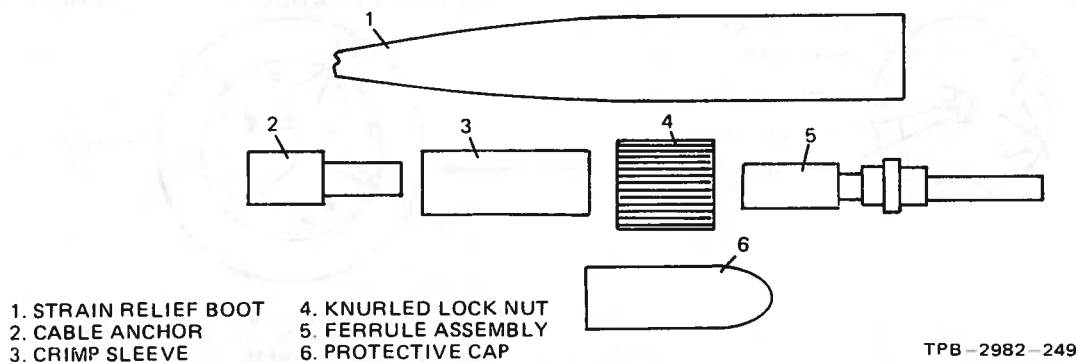
ACCEPTABLE FIBER AND POLISH QUALITY
NOTE A FEW MINOR SCRATCHES ON RIGHT
SIDE OF FIBER

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Fiber Polish Quality
Figure 27

4.11.2 Ensign-Bickford Crimp and Cleave SMA Connector to Hard Clad Silica Optical Cable Type A200T

- a. Check connector for all parts. Refer to figure 28.



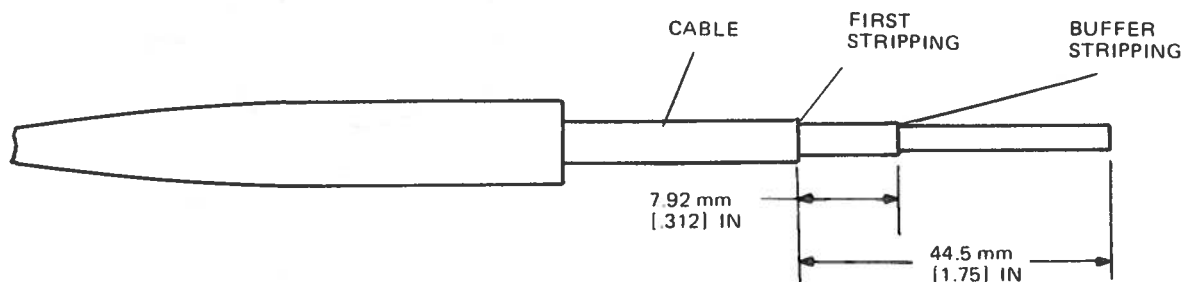
Ensign-Bickford Crimp and Cleave SMA Connector
Figure 28

- b. Slide strain relief boot, tapered end first, onto the cable.

NOTE

Attempting to clamp and pull at the same time will stretch, not cut, the cable jacket.

- c. Using cable stripper, strip off 4.5 cm (1.75 in) of cable as shown in figure 29. To strip cable, first determine cable diameter. Select notch size on stripper jaw that is slightly smaller than cable diameter. Insert cable in notch (4.5 cm (1.75 in) should protrude from jaw). Firmly clamp handles together, this will cut and separate cable jacket. Remove separated pieces.



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Hard Clad Silica Optical Cable Stripping
Figure 29

NOTE

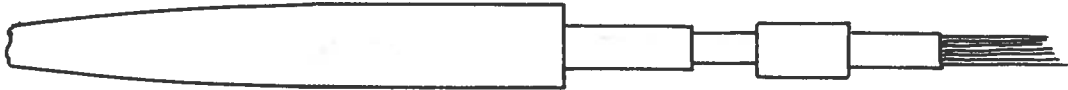
Keep tool free of dirt. Failure to do so may cause damage to fiber.

- d. Feed the fiber through hole at end of fiber stripper until cable bottoms out in brass fitting. Clamp and pull straight away from cable end. This will strip buffer to within 0.8 cm (0.3125 in) of the cable.
- e. Feed the Kevlar® strength member and fiber through the large end of the cable anchor as shown in figure 30. Continue to feed until cable end is sealed completely inside large end of cable anchor as shown in figure 31.

NOTE

Twist slightly on cable to verify that crimp is effective and cable does not twist out of anchor.

- f. While maintaining a snug fit, crimp large portion of cable anchor onto cable end. Refer to figure 32.



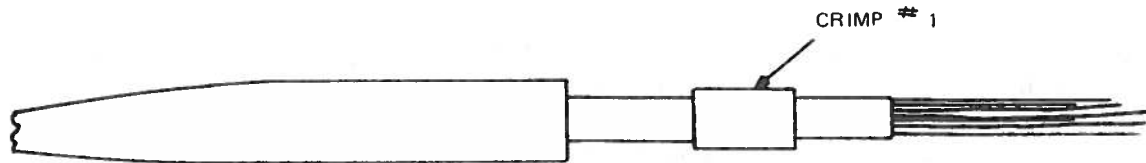
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Cable Anchor Positioning
Figure 30



TPB-2982-249

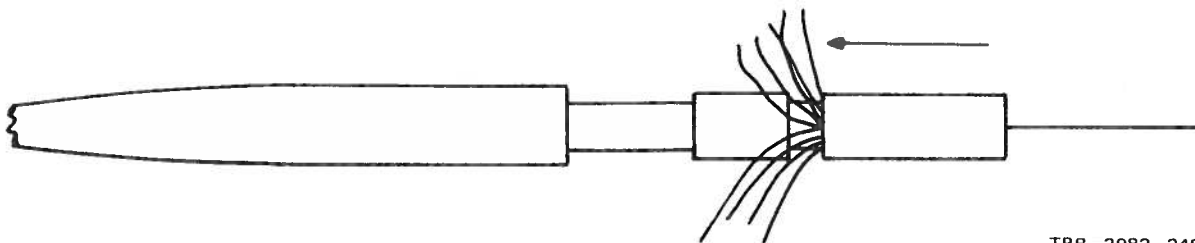
Preparation for Crimping
Figure 31



TPB-2982-249

Crimping
Figure 32

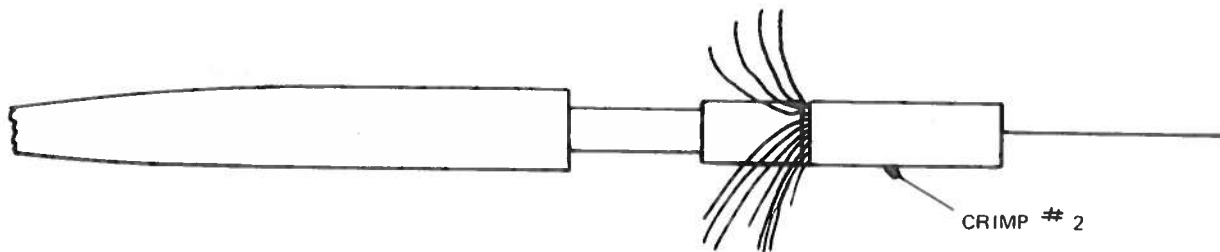
- g. Fold Kevlar® back over cable anchor symmetrically. Slide the crimp sleeve on until it fits snugly on smaller cylinder of cable anchor. Refer to figure 33.



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Placing Crimp Sleeve
Figure 33

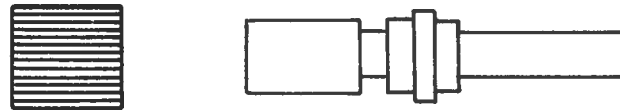
- h. Using crimp tool, crimp rear half of crimp sleeve onto Kevlar® and anchor as shown in figure 34.



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Second Crimp
Figure 34

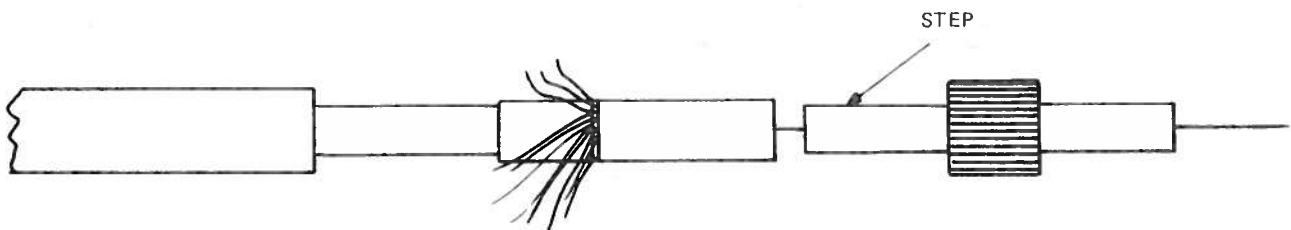
- i. Slide knurled locknut, threaded end first, onto large end of ferrule.
Refer to figure 35.



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Applying Knurled Locknut
Figure 35

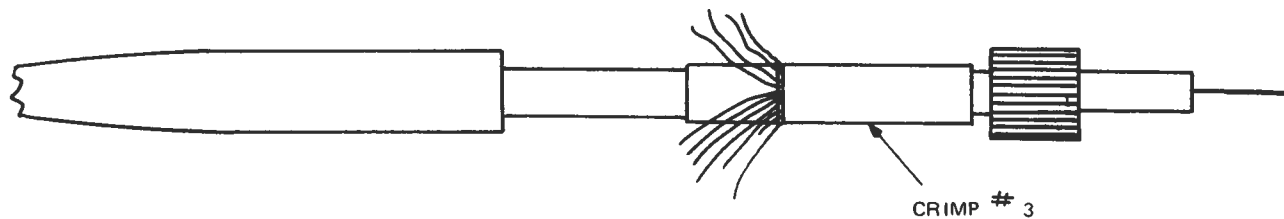
- j. Feed fiber through small hole in back of ferrule assembly as shown in figure 36. Insert ferrule assembly in crimp sleeve and push forward until sleeve meets small step on ferrule assembly. Refer to figure 37.



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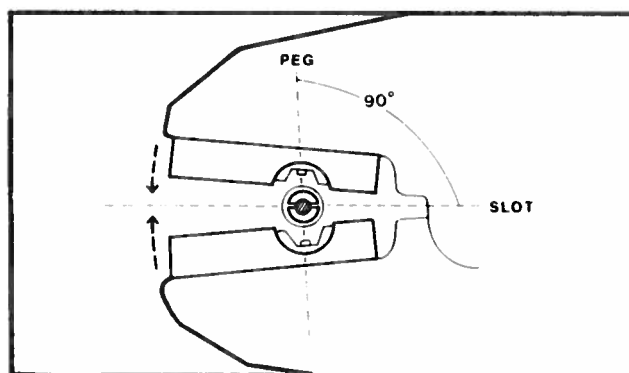
Applying Ferrule Assembly
Figure 36

- k. Making sure small die pegs in crimp jaw are at a right angle (90°) to slot in ferrule (refer to figure 38), crimp front portion of crimp sleeve to ferrule as shown in figure 37.



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Applying Third Crimp
Figure 37

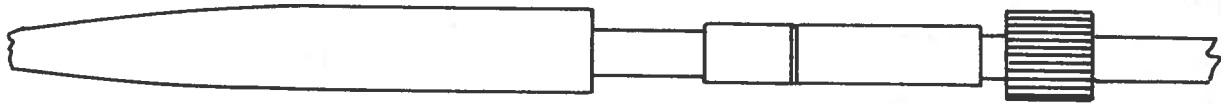


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Crimp Tool Alignment
Figure 38

1. Cleave fiber with Optelcom cleaving tool.
 1. Set the scribing force on the cleaving tool midway between LO and HI.
 2. Insert the ferrule into the keyway on the tool at an angle. This will keep the fiber away from obstructions.
 3. Slide the ferrule gently but fully into the cleaving tool, making sure the blade does not hang up on the ferrule. The blade should slide into contact with the fiber.
 4. Holding the ferrule with the fiber pointing straight up, rotate the cleaving tool three full turns in each direction. Exert slight downward pressure on the cleaving tool while rotating. Do not touch the fiber.
 5. Carefully remove the ferrule from the cleaving tool.
 6. Steadying your hands on a firm flat surface, gently grip the protruding fiber and pull it straight away from the ferrule.
 7. If the fiber does not cleave, increase the scribe pressure by rotating the dial towards HI. Repeat steps 1 through 6.
 8. Clean the blade with acetone or alcohol after each use. When the blade becomes dull (ie, dial is set to HI and fiber will not cleave), rotate blade to a new edge.

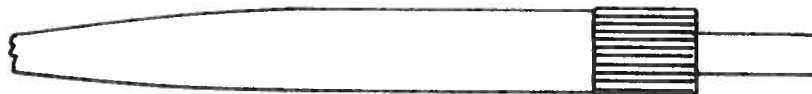
m. With scissors, trim excess Kevlar®. Refer to figure 39.



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Trimming
Figure 39

n. Slide strain relief boot completely over cable anchor as shown in figure 40.



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Strain Relief Boot Positioning
Figure 40

o. Clean ferrule assembly tip with alcohol or compressed air.
p. Place connector protective cap on ferrule tip. Refer to figure 41.

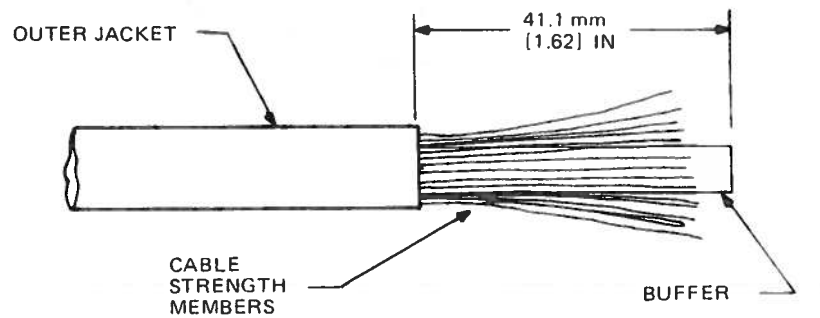


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Connector Protective Cap Positioning
Figure 41

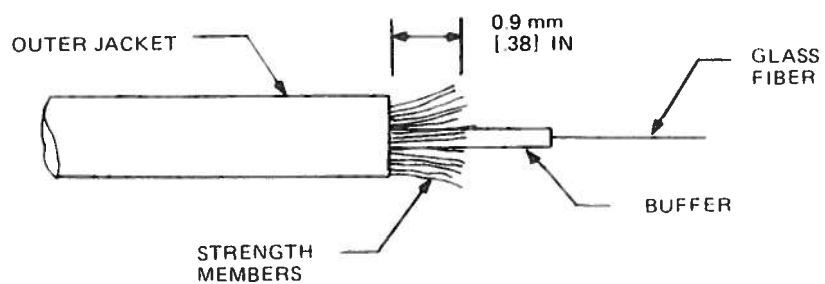
4.11.3 Ofti Epoxy Style Connectors Type 200 to Brand Rex Fiber Optic Cable

- a. Strip outer cable jacket back 4.128 cm (1.625 in).
- b. Remove outer cable jacket using a cable stripper or X-acto knife.
- c. Cut away exposed cable strength members with scissors or X-acto knife. Cable members should be cut away as flush as possible to the outside cable jacket. Refer to figure 42.
- d. Snip 0.15 to 0.30 cm (0.0625 to 0.125 in) from top of exposed buffered fiber.
- e. Remove 0.6 to 0.9 cm (0.25 to 0.375 in) of additional cable outer jacket with the cable strip tool or X-acto knife.
- f. Install heat-shrink tubing over cable.
- g. Install crimp sleeve over cable.
- h. Using a buffer stripping tool, remove the buffer of the fiber. Best results are achieved when 0.15 to 0.3 cm (0.0625 to 0.125 in) of buffer is removed at a time. Continue stripping the fiber until the front face of the buffer stripping tool contacts the outer cable jacket prohibiting the fiber from being inserted into the strip tool any further.
- i. If a buffer stripping tool is not being used, strip 2.69 cm (1.125 in) of buffer from the tight buffered fiber and 3.81 cm (1.5 in) of buffer from the loose tube fiber. Wipe the stripped fiber with a tissue dampened with acetone or alcohol to remove any foreign debris. Refer to figure 43.
- j. Mix epoxy in accordance with manufacturer's instructions.
- k. Using carbide, sapphire, or diamond scribe, scribe and break off 0.635 to 0.953 cm (0.25 to 0.375 in) of bare fiber. This is to remove any jagged edges and improve fiber insertion into the connector.
- l. With a toothpick, dental pick, or other small probe, apply epoxy to the entire length of the fiber. Alternately, inject epoxy into the connector using an industrial syringe. Be careful not to inject too much epoxy if this method is used.
- m. Insert fiber into the connector. Sometimes a tight rotation of the connector between the thumb and index finger will help the fiber to thread through the precision hole in the connector. Once the fiber has exited the precision hole in the connector, carefully slide the connector down the fiber, making sure that the strength members of the cable ride up over the knurled part of the connector's rear body. Continue to slide the connector down until the rear body butts against the strength members and cable outer jacket.
- n. Carefully slide crimp sleeve over the cable strength members and crimp. Crimp using Ofti-047 crimp tool cavity C for rear body size RB-1, RB-2, and RB-2.7.
- o. Using a toothpick, place a small drop of epoxy onto the face of the connector at the point where the fiber exits the precision hole. This will help support the fiber during the initial grinding procedure.
- p. Cure the epoxy in accordance with the manufacturer's instructions.
- q. Using a carbide, sapphire, or diamond scribe, remove the excess fiber protruding from the connector.
- r. Install heat-shrinkable tubing over rear crimped area and shrink.
- s. Perform the procedures in paragraph 4.11.1.5.



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Cable Stripping
Figure 42



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Cable Preparation
Figure 43

4.12 Printed Circuit Cards Repair, Single-Sided and Double-Sided

Printed circuit card repair should be performed according to the procedures given in IPC-R-700C Repair and Modification of Printed Wiring Boards. Refer to that document for the appropriate procedures.

5. TESTING

Upon completion of a repair, perform applicable performance test as indicated in the equipment instruction book. This test is necessary to ensure that the assembly has been restored to proper working order and has no new discrepancies.