

NWA



**overhaul manual**

*Collins Radio Company*

**180R - 12  
Antenna Coupler  
and  
309A - 9/9A  
Antenna Coupler Control**

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15 March 1965



October 1, 1967

Cedar Rapids, Iowa 52406

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TO: HOLDERS OF 180R-12 ANTENNA COUPLER AND 309A-9/9A ANTENNA COUPLER  
CONTROL OVERHAUL MANUAL (523-0756467)

REVISION NO. 4 HIGHLIGHTS

This manual has been revised to conform to the latest version of ATA Specification No. 100 and this 4th revision replaces all previous editions of the 180R-12 Antenna Coupler and 309A-9/9A Antenna Coupler Control Overhaul Manual (523-0756467) including the overhaul manual (523-0756465) and the illustrated parts catalog (523-0756466).

The illustrated parts catalog and the overhaul manual have been combined into a single manual.

All information has been updated to reflect current production configurations with documented revision history for previous configurations.

The disassembly and assembly sections have been revised to present the procedures in a more practicable format that is annotated for ease of application.

The testing and troubleshooting sections have been expanded and include the use of the special testers now available.

PUBLICATIONS ENGINEERING DEPARTMENT



523-0756467-401113  
1 April 1964  
4th Revision, 1 October 1967

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**overhaul manual**

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**180R - 12  
Antenna Coupler  
and  
309A - 9 / 9A  
Antenna Coupler Control**

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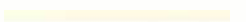
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FOREWORD

This manual has been prepared in accordance with Air Transport Association Specification No. 100 for Manufacturer's Technical Data. This manual will facilitate the effective, continued operation of the 180R-12 Antenna Coupler and the 309A-9/9A Antenna Coupler Control.

This manual contains all information required for shop testing, repair, and mechanical overhaul and presents detailed circuit theory with emphasis on that which will be especially helpful for effective troubleshooting. It contains complete performance tests and functional checks that may be used to determine whether the equipment needs repair. Information included in the illustrated parts list makes it possible to determine the Collins part number and physical location of a part if its reference designation is known or the Collins part number when only the physical location is known.

The following is a list of related publications.

PUBLICATION	COLLINS PART NUMBER
180R-12 Antenna Coupler and 309A-9/9A Antenna Coupler Control Maintenance Manual	523-0756464
Radio Set AN/ARC-58 Technical Manual Overhaul	T.O. 12R2-2ARC58-3
618T-1, 618T-1B, 618T-2, 618T-2B, 618T-3, 618T-3B Airborne SSB Transceivers Overhaul Manual	520-5970003
18S-4C Transmitter-Receiver Instruction Book	520-5138000
618S-1 and 618S-4 Transceiver Instruction Book	520-5754000
878L-13, 878L-18, and 878L-19 Antenna Coupler Module Testers Instruction Book	523-0759584
Electromechanical Components Overhaul Manual	523-0757895

The following is a list of unusual or uncommon abbreviations and symbols that are used throughout this manual.

SYMBOL/ABBREVIATION	DEFINITION
P/O	Part of
AR	As required



180R-12



309A-9



399V-1



399W-1



C1026-68-P

309A-9A

180R-12 Antenna Coupler, 309A-9/9A Antenna Coupler  
Control, and 399V-1/399W-1 Adapters  
Figure 1



## 180R - 12 Antenna Coupler and 309A - 9/9A Antenna Coupler Control - Description and Operation

### 1. GENERAL.

This section presents the purpose, specifications, general description, and general theory of operation of the 180R-12 Antenna Coupler and 309A-9/9A Antenna Coupler Control. Refer to figure 1 for an overall view of the equipment. Figure 2 is a list of the equipment covered in this manual.

NOTE: The nomenclature 309A-9/9A Antenna Coupler Control will be used throughout this manual when the information applies to both the 309A-9 Antenna Coupler Control and the 309A-9A Antenna Coupler Control.

EQUIPMENT	DESCRIPTION	COLLINS PART NUMBER
180R-12 Antenna Coupler	Electrically matches antenna to coaxial transmission line over carrier frequency range of transmitter.	522-3159-00
309A-9 Antenna Coupler Control	Controls the operation of and supplies the servo and associated power to the 180R-12.	522-3375-00
309A-9A Antenna Coupler Control	Same as 309A-9 Antenna Coupler Control but designed for compatible replacement of original equipment.	522-4159-00
399V-1 Adapter	Adapter used with 618S-4 Transceiver and 18S-4C Transmitter-Receiver.	522-3559-00
399W-1 Adapter	Adapter used with Radio Set AN/ARC-58.	522-3560-00

Equipment Covered  
Figure 2

### 2. PURPOSE OF EQUIPMENT.

The 180R-12 Antenna Coupler and 309A-9/9A Antenna Coupler Control form an automatic hf impedance matching system that permits efficient operation of a transceiver throughout the frequency range of 2 to 30 MHz by maintaining the swr encountered with a probe type antenna below 1.3:1.



Figure 3 is a list of associated equipment.

EQUIPMENT	COLLINS PART NUMBER	DESCRIPTION	FUNCTION
618S-1/4	522-0060-006/522-1020-016	Transceiver	Transmit and receive rf
18S-4C	522-2106-004	Transceiver	Transmit and receive rf
618T-1/2/3	522-1230-000/522-1501-000/ 522-1660-000	Transceiver	Transmit and receive rf
618T-1B/2B/3B	522-4828-001/522-4829-001/ 522-4830-001	Transceiver	Transmit and receive rf
AN/ARC-58	522-0831-000	Transceiver	Transmit and receive rf

Associated Equipment  
Figure 3

**3. EQUIPMENT SPECIFICATIONS.**

Figure 4 lists the specifications of the 180R-12 Antenna Coupler and 309A-9/9A Antenna Coupler Control.

CHARACTERISTIC	SPECIFICATION				
Design specifications					
ARINC characteristic	309A-9/9A: 3/8 short ATR				
TSO	FAA TSO C-31 (Category b).				
Physical specifications	<u>180R-12</u>	<u>399V-1</u>	<u>399W-1</u>	<u>309A-9</u>	<u>309A-9A</u>
Weight (pounds)	23	1.0	0.8	10	9.7
Size (inches)					
Length	18.75 maximum	3-5/16 ±1/16	3-5/16 ±1/16	14-1/2	14-3/4
Width (Cont)	8.310 maximum	2-1/4 ±1/32	2-1/4 ±1/32	3-11/16	3-11/16



CHARACTERISTIC	SPECIFICATION				
Size (inches) (Cont)	<u>180R-12</u>	<u>399V-1</u>	<u>399W-1</u>	<u>309A-9</u>	<u>309A-9A</u>
Height	7.50 maximum	4-3/4 ±1/32	4-3/4 ±1/32	7-23/32	7-23/32
Environmental specifications					
Ambient temperature					
180R-12	-73 to +71 °C (-99 to +160 °F).				
309A-9/9A	-54 to +71 °C (-65 to +71 °F).				
Ventilation	<p>The coupler unit is cooled by radiation and convection with the ambient air in the vertical fin area. An internal blower transfers heat from the equipment to the case.</p> <p>The coupler control unit is cooled with external ambient air flowing at the rate of 24 pounds/hour at 55 °C (131 °F) with 1 inch of water pressure differential between rear intake and bottom exhaust. The 399V-1 Adapter unit is cooled with external ambient air flowing at the rate of 5 pounds/hour with 0.15 inch of water pressure differential across the chassis.</p>				
Shock	Meets paragraph 4.5, procedure V, MIL-E-5272C amended January 20, 1960. Electrical operation of units during shock is not required, but operation is required after test.				
Humidity	Meets paragraph 4.4, procedure I, MIL-E-4272C, except only 5 cycles (120 hours) and 100% humidity.				
Altitude	Withstands 18 kv peak at 45,000 feet when 180R-12 Antenna Coupler is mated with aircraft lightning arrester.				
Vibration	Refer to figure 5.				
Explosion	The 180R-12 is sealed and considered not to be an explosion hazard. The 390A-9/9A has no requirement to be explosion proof.				
Pressurization	<u>180R-12</u>	<u>399V-1</u>	<u>399W-1</u>	<u>309A-9</u>	<u>309A-9A</u>
	22 psia (7.5 psig)	None	None	None	None
Leak rate	5 micron cubic feet/hour maximum.				



CHARACTERISTIC	SPECIFICATION																				
Electrical specifications																					
Carrier frequency range	2.0 to 30.0 MHz.																				
Power requirements																					
Ac input power	105 to 125 volts, 380 to 420 Hz, 3-phase, 0.6 ampere maximum.																				
Dc input power	26 to 30 volts, approximately 250 ma.																				
Rf input power	1200 watts pep. maximum, 500 watts average; 100 to 150 watts during tuning.																				
Antenna terminal voltage	Withstands 18,000 volts peak at 45,000 feet when 180R-12 Antenna Coupler is mated with aircraft lightning arrester.																				
Type of emission	Proper matching (tuning) possible with steady CW or AM carrier. Operation with CW, AM, SSB, and FSK.																				
Tuning accuracy	Within 1.3:1 swr with 100 watts of input power when the swr is greater than 1.6:1 and with 72 watts of input power when the swr is greater than 1.7:1.																				
Duty cycle																					
2 to 3 MHz	5 minutes on and 5 minutes off.																				
3 to 30 MHz	Continuous duty.																				
	Duty cycle is dependent upon antenna impedance, transmitter duty cycle, transmitter power output, and ambient temperature.																				
Tuning time	16 seconds maximum; this is in addition to the basic transmitter tuning time.																				
Efficiency	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="width: 30%;">f (MHz)</th> <th colspan="2" style="text-align: center;">EFFICIENCY</th> </tr> <tr> <th style="text-align: center;">NOMINAL (%)</th> <th style="text-align: center;">MINIMUM (%)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">2.0</td> <td style="text-align: center;">23.6</td> <td style="text-align: center;">20.0</td> </tr> <tr> <td style="text-align: center;">2.2</td> <td style="text-align: center;">40.0</td> <td style="text-align: center;">34.0</td> </tr> <tr> <td style="text-align: center;">2.4</td> <td style="text-align: center;">43.1</td> <td style="text-align: center;">37.0</td> </tr> <tr> <td style="text-align: center;">2.8</td> <td style="text-align: center;">57.8</td> <td style="text-align: center;">50.0</td> </tr> <tr> <td style="text-align: center;">3.0</td> <td style="text-align: center;">62.5</td> <td style="text-align: center;">56.0</td> </tr> </tbody> </table>	f (MHz)	EFFICIENCY		NOMINAL (%)	MINIMUM (%)	2.0	23.6	20.0	2.2	40.0	34.0	2.4	43.1	37.0	2.8	57.8	50.0	3.0	62.5	56.0
f (MHz)	EFFICIENCY																				
	NOMINAL (%)	MINIMUM (%)																			
2.0	23.6	20.0																			
2.2	40.0	34.0																			
2.4	43.1	37.0																			
2.8	57.8	50.0																			
3.0	62.5	56.0																			
(Cont)																					

Equipment Specifications (Sheet 3 of 5)  
Figure 4



CHARACTERISTIC	SPECIFICATION			
Efficiency (Cont)	EFFICIENCY			
	f (MHz)	NOMINAL (%)	MINIMUM (%)	
	3.1 3.2 3.3 3.4 3.6	68.2 73.2 73.8 73.9 74.0	61.0 66.0 66.0 66.0 67.0	
	4.0 4.5 5.2 6.5 7.0	61.5 56.0 38.6 44.6 56.0	52.0 48.0 32.0 37.0 47.0	
	8.0 9.0 10.0 11.5 12.0	67.0 64.0 60.0 66.0 80.0	60.0 58.0 54.0 59.0 75.0	
	13.4 14.0 15.0 16.0 17.2	52.0 45.0 67.0 82.0 85.0	45.0 40.0 62.0 78.0 81.0	
	19.0 21.0 23.0 24.0 25.0	90.0 90.0 90.0 90.0 90.0	85.0 85.0 85.0 85.0 85.0	
	27.0 29.0 30.0	90.0 90.0 90.0	85.0 85.0 85.0	
	Output impedance	Matches the characteristics of either the Boeing 727 tail probe hf antenna or the Boeing 707 hf antenna.		



CHARACTERISTIC	SPECIFICATION
Protective devices	The 180R-12 has pressurized construction. A thermo switch is provided that prevents operation of the coupler above a safe operating temperature. In the event of coupler arcing, the system is disabled until a new frequency is selected.

Equipment Specifications (Sheet 5 of 5)  
Figure 4

#### 4. EQUIPMENT DESCRIPTION.

##### A. Mechanical Description.

###### (1) 180R-12 Antenna Coupler. (Refer to figure 6.)

The mechanical components of the 180R-12 Antenna Coupler include two drum assemblies (one ceramic and one metal), a tap assembly, two servo motors, a gear train, and a phasing-loading discriminator assembly.

All components of the 180R-12 Antenna Coupler, except for the phasing-loading discriminator assembly, are packaged in a pressurized case. The phasing-loading discriminator assembly is mounted externally on the coupler unit and may be removed without breaking the pressurization seal. An internal blower circulates pressurized dry nitrogen around the tuning elements and through the double-walled case that serves as a heat exchanger.

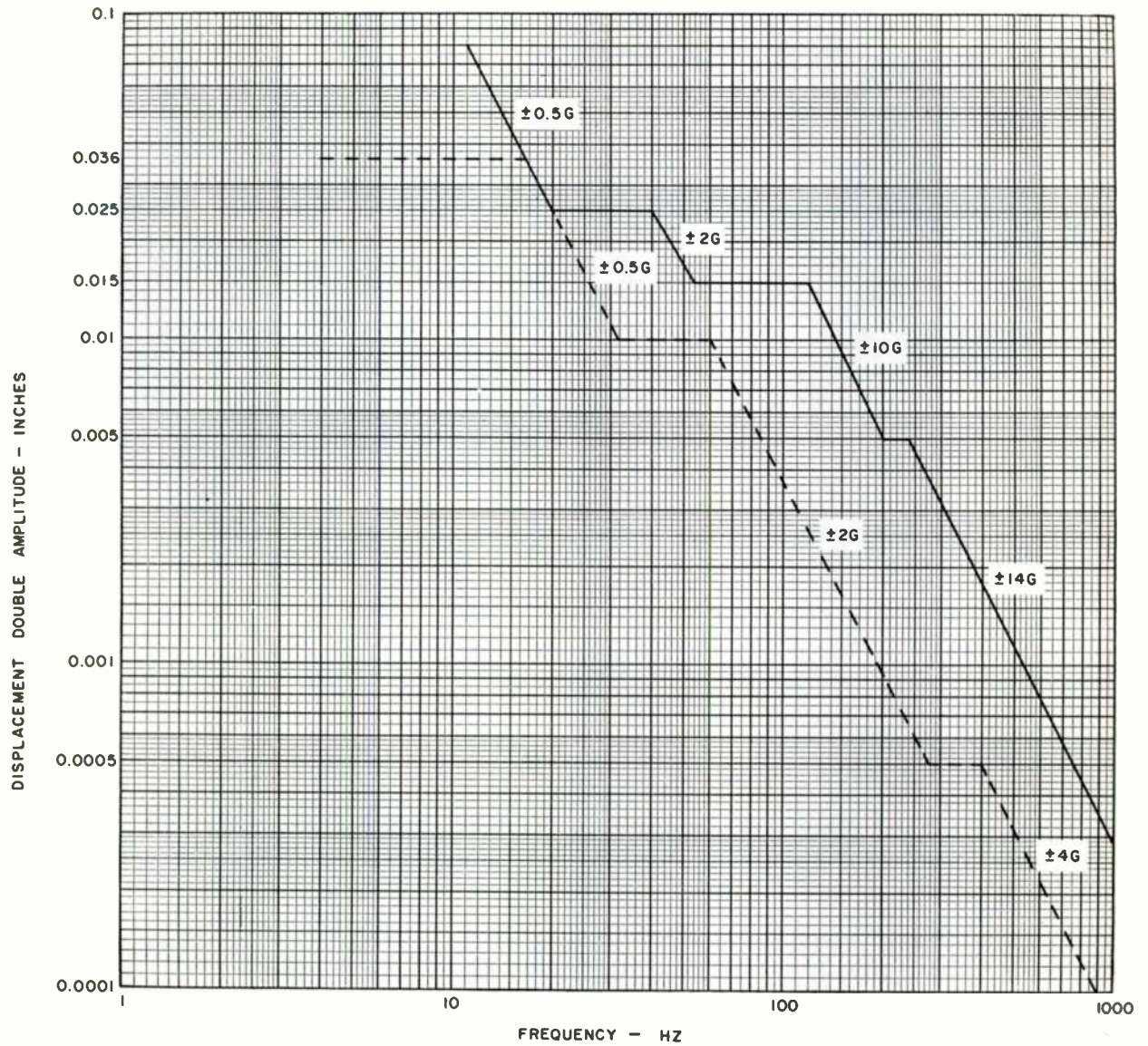
Primary power and control connections are made through connector J7. Rf input power is connected to connector J1, and rf output power is connected through P6 to the antenna.

###### (2) 309A-9/9A Antenna Coupler Control.

Housed in a 3/8 short ATR case, the 309A-9/9A Antenna Coupler Control is nonpressurized and is intended for installation in the equipment rack of the aircraft. Control cable plugs and an air inlet are located on the rear of the unit. The 309A-9A version has two rf connectors mounted on the front panel. Removal of the cover provides access to the main chassis and four plug-in electronic modules.

The 309A-9/9A requires external cooling air at the rate of 24 pounds per hour at 55 °C (131 °F) with 1 inch of water pressure differential between rear intake and bottom exhaust.

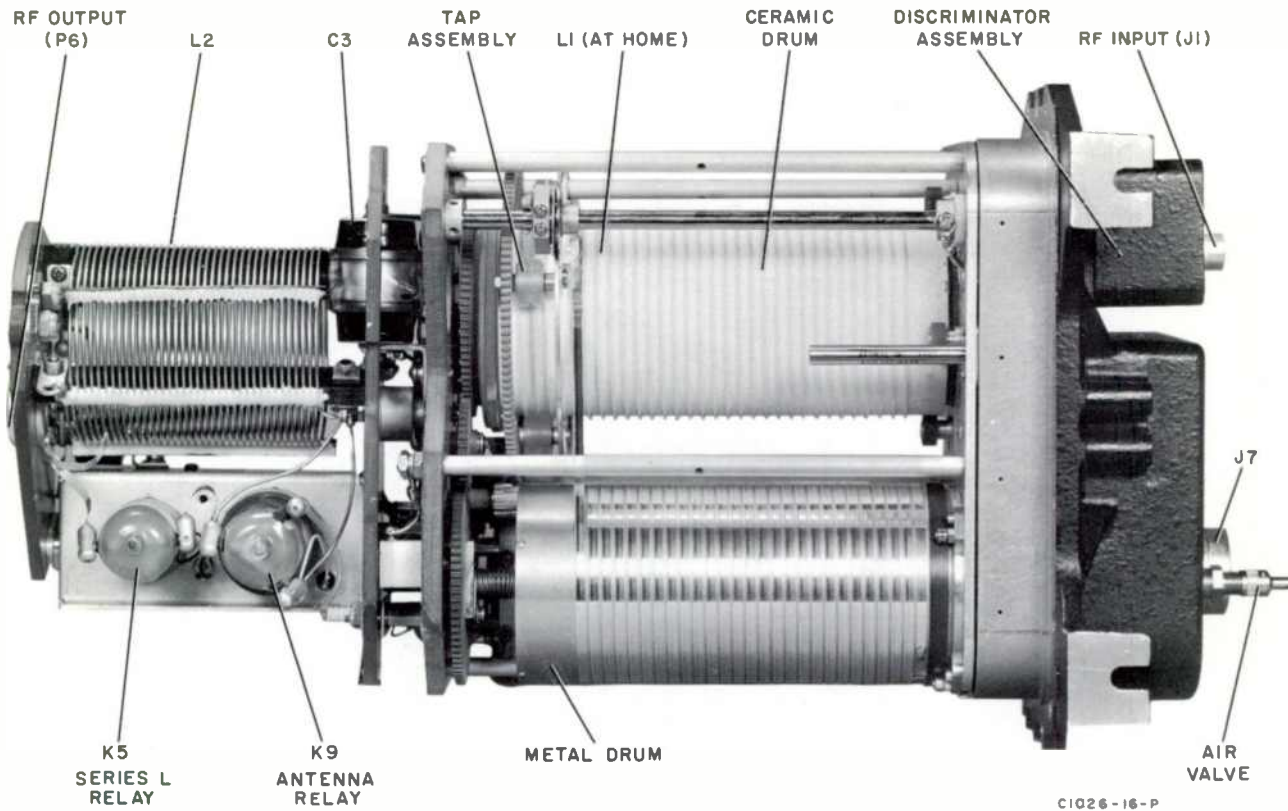




--- 309A-9/9A  
— 180R-12

TPO-5656-017

Vibration Chart  
Figure 5



180R-12 Antenna Coupler Removed From Case  
Figure 6

(3) 399V-1 Adapter.

The 399V-1 Adapter is housed in a 2-1/4- by 2-7/8- by 4-3/4-inch ventilated junction box designed for convenient stud mounting in the equipment rack of the aircraft.

The adapter requires external cooling air at the rate of 5 pounds per hour with 0.15 inch of water pressure differential across the chassis.

(4) 399W-1 Adapter.

The 399W-1 Adapter is housed in a 2-1/4- by 2-7/8- by 4-3/4-inch junction box designed for convenient stud mounting in the equipment rack of the aircraft.

B. Electrical Description.

(1) 180R-12 Antenna Coupler.

The 180R-12 Antenna Coupler matches antenna impedance to a nominal 50-ohm line, provides a receive only rf signal path directly from the antenna when the



network is not tuned, transforms antenna impedances to values the tapped coil can tune, compares rf line voltage and current to provide polarized error signals that control tuning, and protects the entire hf system from high-voltage arc-over and lightning-caused transients.

(2) 309A-9/9A Antenna Coupler Control.

The 309A-9/9A Antenna Coupler Control converts 3-phase primary power to the voltages required for coupler operation, interprets the error signals from the coupler, automatically controls the coupler and transceiver during the tuning cycle, and filters all interconnecting control lines to the transmitter.

(3) 399V-1 Adapter.

The 399V-1 Adapter is a relay switch and series resistor that reduces rf power from the 18S or 618S transceiver to the coupler during the coupler tuning phase.

(3) 399W-1 Adapter.

The 399W-1 Adapter is a relay switch that provides transmitter-receiver switching of Radio Set AN/ARC-58.

C. Controls and Indicators.

(1) 180R-12 Antenna Coupler.

No operating controls or switches are located on the 180R-12.

(2) 309A-9/9A Antenna Coupler Control. (Refer to figures 7 and 8.)

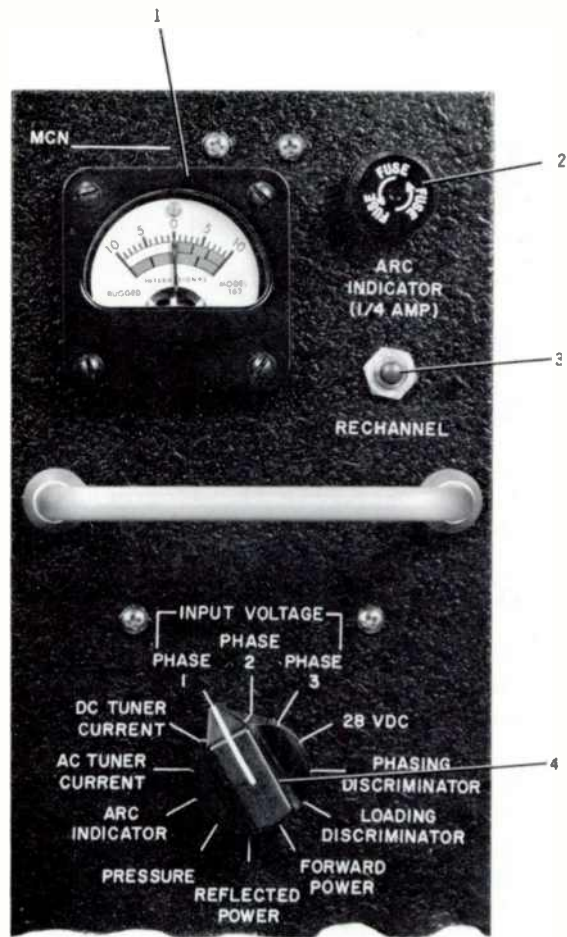
The 309A-9/9A includes a performance monitoring system consisting of a 12-position selector switch and a center-0 meter. The switch permits convenient checking of the operation of the antenna coupler systems.

The meter consists of a  $\pm 50$ -microampere movement from center 0 with a scale calibrated from 0 to +10 and 0 to -10. Go or no-go conditions are indicated by red-green scales located beneath the units scale. When the selector switch is rotated, indications in the green scale designate normal operating conditions, and indications in the red scale designate abnormal conditions.

5. THEORY OF OPERATION.

A. General.

The 180R-12 Antenna Coupler, with the 309A-9/9A Antenna Coupler Control, automatically matches the antenna input impedance to the output impedance of the transceiver each time a new transmitter frequency is chosen.



TPO-5709-017

309A-9/9A Antenna Coupler Control,  
Controls and Indicators  
Figure 7



NO.	CONTROL	DESCRIPTION	FUNCTION
1	Meter	A $\pm 50$ -microampere, center-0 meter	Indicates normal and abnormal operating conditions in the antenna coupler system.
2	ARC INDICATOR (1/4 AMP)	Indicator fuse	When open indicates that arcing has occurred in the 180R-12 as a result of excessive voltage or insufficient internal pressure.
3	RECHANNEL	Pushbutton switch	Initiates a complete new tuning cycle for the 180R-12 to retune at the selected operating frequency.
4	Selector switch  INPUT VOLTAGE  PHASE 1 PHASE 2 PHASE 3  28 VDC  PHASING DISCRIMINATOR LOADING DISCRIMINATOR FORWARD POWER REFLECTED POWER PRESSURE  ARC INDICATOR  AC TUNER CURRENT DC TUNER CURRENT	12-position wafer switch	Checks operation of antenna coupler system in conjunction with meter.  Measures each phase of the 400-Hz, 3-phase power required to operate the 180R-12 and 309A-9/9A.  Measures the rectified power supply voltage.  Monitors the operation of discriminator if rf power is available.  Monitors the operation of discriminator if rf power is available.  Measures the forward component of transmitting power.  Measures the reflected component of transmitting power.  Checks for a minimum pressure level in the 180R-12 case.  Checks the condition of the arc indicator fuse.  Monitors the ac component of tuning loop control power.  Monitors the dc component of tuning loop control power.

309A-9/9A Antenna Coupler Control, Functions of Controls and Indicators  
Figure 8



The following is a block diagram discussion of the theory of operation of the 180R-12 Antenna Coupler and the 309A-9/9A Antenna Coupler Control in an hf communication system.

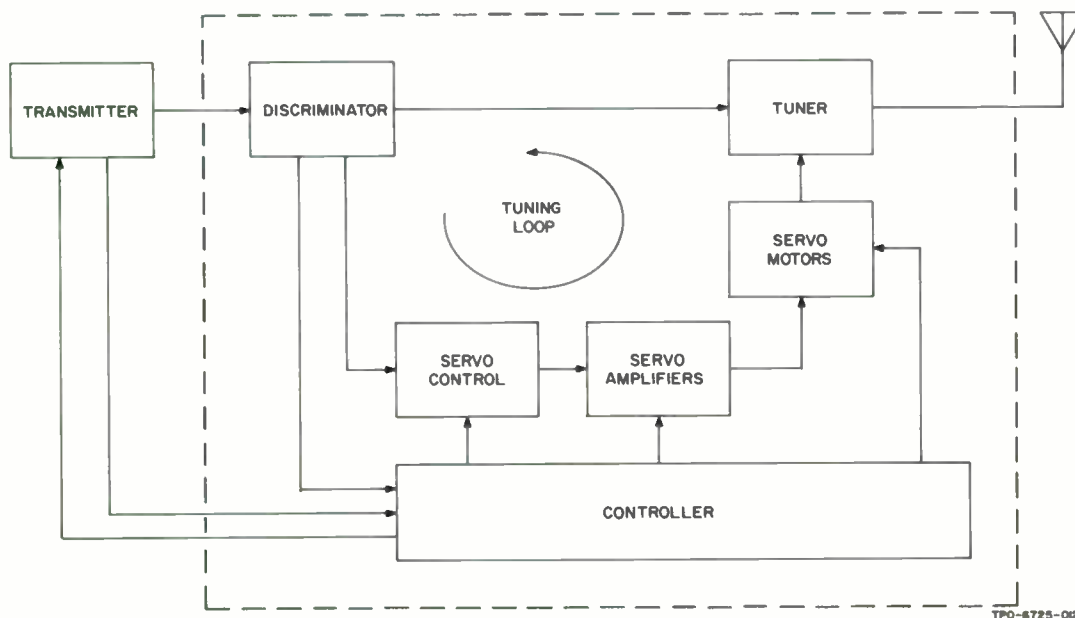
B. Simplified Theory of Operation.

(1) General.

An automatic antenna coupler is essentially a closed tuning loop with a controller. The tuning loop performs the actual matching, while the controller provides the necessary control and coordinating functions.

(2) Tuning Loop.

As shown in figure 9, the tuning loop consists of the discriminator, the servo control, the servo amplifiers, the servo motors, and the tuner. The discriminator sends signals that indicate the extent of phasing and loading error to the servo control for interpretation. The servo control determines corrective action and provides outputs that are amplified to drive the servo motors that adjust the tuning elements in the tuner. As the tuner is adjusted, the phasing and loading error sensed by the discriminator changes, thus completing the loop. The tuning loop performs only when it is turned on by the controller.



Automatic Antenna Coupler, Simplified Block Diagram  
Figure 9



(3) Controller.

The controller turns on the tuning loop when either demand surveillance or command surveillance conditions exist.

Demand surveillance conditions exist when information from the discriminator indicates the presence of excessive reflected power during a normal transmission. The tuning loop is turned on and kept on until the reflected power has diminished sufficiently. This self-monitoring method automatically maintains an efficient match.

Command surveillance conditions exist when information from the transmitter control indicates that a new frequency has been selected. In this case, the controller shifts into an automatic tuning sequence where transmitter rf power and keying are controlled, in addition to tuning loop control, until an efficient match at the new frequency has been achieved. This method ensures an immediate tuneup when the frequency is changed.

C. Functional Theory of Operation.

(1) General.

Operational control of the 180R-12 Antenna Coupler is automatically maintained by the 309A-9/9A Antenna Coupler Control. The basic controlling element is a 12-position, motor-driven, stepper switch located in the relay control module. Six of the positions set the individual modes of home, standby, rf-on, tune, operate, and fault. The remaining six positions provide reset control functions when recycling to begin a new tuning sequence.

When a new transmitter frequency is chosen or when there is a manual rechannel command to the control, the 309A-9/9A Antenna Coupler Control is alerted and resets its circuits and the tuning elements of the 180R-12 Antenna to the home (starting) condition. When this condition is satisfied, the control and coupler advance to a standby (receive only) mode and wait for the transmitter to be keyed.

When the transmitter is keyed, the control holds the key and advances to the rf-on mode. This enables the transmitter at reduced rf power, connects the tuner into the rf circuit, and activates the tuning loop. The discriminator senses the presence of forward power and commands the relay control to advance to the tune mode. In the tune mode, the relay control monitors the performance of the tuning operation and, if required, controls the extension of the low-frequency range of the tuner. Highfrequency range extension is automatically accomplished by the tuner from band information obtained from the transceiver control. When the tuner has reduced the reflected power sufficiently, the relay control delays the advance to the operate mode for an additional second to ensure that an efficient match does exist. When the relay control advances to the operate mode, the tuning loop is deactivated, the transmitter key hold is released, and the transmitter is restored to full rf power capability.



In the operate mode, reflected power is monitored every time the transmitter is keyed, and if excessive swr is in evidence, the relay control activates the tuning loop to regain and thereby maintain an efficient match.

If arc-over should occur in the coupler at any time (except while tuning) or if the coupler, during the tuning phase, is unable to provide an efficient match within 30 seconds, the relay control switches to the fault mode, disabling transmitter rf output. The tuner is also disconnected from the circuit, and a bypass path is provided to permit reception with minimum attenuation. The fault mode is canceled by a normal rechannell command.

Figure 15 is a functional block diagram of the 180R-12 Antenna Coupler and the 309A-9/9A Antenna Coupler Control. The tuning loop consists of loading discriminator T2, phasing discriminator T3, the servo-control module, two servo-amplifier modules, coil and tap servo motors B1 and B2, and tuner L1. The relay control module, which functions as the controller that turns on the tuning loop by supplying controlled ac and controlled dc power, contains the basic controlling element; 12-position stepper switch S1 driven by switch-drive motor B1.

(2) Functional Details.

- (a) Recycle and Homing Function (Reset, Home, and Standby Modes). (Refer to figure 15.)

The coupler and control are normally in one of three stable modes: standby, operate, or fault. A rechannell command will recycle the coupler and control from the operate or fault mode through the resets and home modes to the standby mode, where the coupler and control are ready to tune. If the coupler and control are already in standby mode, a rechannell command is disregarded.

When the coupler and control are in the standby mode, a ground on the rechannell line is prevented from energizing motor control relay K8 by recycle/fault sequencer section S1D(R) being open in position 2 (standby mode). Therefore, switch-drive motor B1 will not operate, and the coupler and control remain in the standby mode ready to tune. However, the ground on the rechannell line does energize standby interlock relay K5 to open the standby line and thereby prevent a premature advance of the coupler and control to the rf-on mode during the rechannelling operating of the transceiver control.

When the coupler and control are in one of the other stable modes of operate or fault, a momentary ground on the rechannell line is permitted, by the recycle/fault sequencer in position 5 or 6, to energize motor control relay K8 and initiate the recycle function.

**NOTE:** The recycle/fault sequencer also permits the initiation of the recycle function in position 3 (rf-on mode), position 4 (tune mode), and positions 7 through 12 (resets mode). This is to synchronize the system at installation or after repairs have been made.





Energized motor control relay K8 applies a ground through energized standby interlock relay K5 to the rechannel line to ensure the completion of the recycle function through the resets mode. The ground from the motor control relay is also applied to the gear locks in the coupler, releasing them, and to the AM control line to set a SSB/AM transceiver for AM operation. At the same time, the motor control relay applies power to switch-drive motor B1, which advances all sections of stepper switch S1 through the resets mode (positions 7 through 12 of S1).

As the stepper switch advances through the resets mode, the fault timer is reset and inhibited, and the tuning loop is turned on preparatory to the homing function as follows:

1. Fault timer CR54 is reset and inhibited by mode support section S1D(F).
2. Choppers G1 and G2 (in the servo-control module) are turned on because ac control relay K2 is energized through mode status section S1C(F).
3. The mode status section disables the transmitter by placing a ground on the transmitter hold line and inhibits delay timer CR52 to ensure that tune/operate gate relay K9 is deenergized to allow controlled ac power to be applied to coil and tap servo motors B1 and B2 from the energized ac control relay.
4. Controlled dc power is applied to the coil and tap servo motors and to the servo-amplifier modules by dc override section S1A(F).

The tuning loop is now turned on and ready for the homing function.

When the recycle/fault sequencer section has been driven to position 1 (home mode) by switch-drive motor B1, the rechannel ground circuit to motor control relay K8 is opened, deenergizing the motor control relay, which then turns off the switch-drive motor. The standby interlock relay remains energized if the rechanneling operation of the transceiver control is still in progress to prevent a premature advance to the rf-on mode after the homing function of the coupler is completed.

With the stepper switch in position 1 (home mode), the tuning elements are set to their home or starting positions and bypassed to permit normal receiver operation. Tuner coil L1 is driven home (with the tap mechanically following) by the application of a positive coil homing voltage from coil override section S1A(R) through chopper G1 and the coil servo-amplifier module to coil servo motor B1. Enable section S1E(R) ensures that series coil L2 is shorted out of the rf circuit by opening the hold circuit to low-set relay K7 and allowing relay K5 to deenergize. Series capacitor C3 is shorted out of the rf circuit by mode support section S1D(F) in positions 12 and 1 by energizing cap-out solenoid K1 and setting the capacitor knife switch to its closed position. A receiving path to the antenna, bypassing the



tuning elements, is provided by tuner bypass section S1C(R) by energizing coupler bypass relay K8 and antenna/interlock relay K9. The dual purpose antenna/interlock relay also opens the key interlock line through thermostat S3 and causes interlock relay K4 to drop out, opening the keying interlock lines and disabling transmitter rf output.

When tuner coil L1 reaches its home position, as sensed by coil limits switch S2, the sequence hold line is grounded, causing motor control relay K8 to energize through tune sequencer S1E(F) in position 1. Stepper switch motor B1 operates until the sequence hold circuit is opened by the tune sequencer advancing from position 1 to position 2 (standby mode).

In the standby mode, the tuning loop is turned off by the mode status and dc override switches in the control. The fault timer, which was momentarily enabled by the recycle/fault sequencer during the recycle function, is disabled. The tuner remains bypassed and the keying interlocks are still open. Tune indicator S1B(R) opens the circuit to the normally open tune indicator control line.

(b) Tuning Function (RF-On and Tune Modes).

Advance from the standby mode to the rf-on mode occurs when the transmitter is keyed. Keying the transmitter applies a ground through the interconnect wiring to the standby line, energizing motor control relay K8 and operating the step switch motor until the circuit is opened by tune sequencer section S1E(F) advancing to position 3 (rf-on mode). Tuner bypass control section S1C(R) transfers the rf circuit back through the tuner by deenergizing coupler bypass relay K8 and antenna/interlock relay K9. The antenna/interlock relay also completes the interlock circuit, enabling transmitter rf power. The tuning loop is turned on by mode support section S1D(F) energizing key/dc control K1 and ac control K2. The mode support section also provides a ground on the tune power control line requesting reduced transmitter rf power. Enable control section S1E(R), which has enabled the forward power trigger since the recycle function, now holds the transmitter keyed by maintaining a ground on the key line through energized key/dc control K1. Had the transmitter been keyed during the recycle/homing phase, the control would have automatically advanced from the standby mode to the rf-on mode when standby interlock relay K5 dropped out.

**NOTE:** This is a general description of the transition from standby to rf-on modes. Refer to the control chassis, control line interconnect wiring, and transceiver diagrams to determine variations peculiar to a specific installation.

The fault timer and the arc relay are now enabled through recycle/fault sequencer section S1D(R) in position 3. Enable section S1E(R) provides a holding circuit for the arc relay should it receive a momentary energizing pulse from the coupler.

Since the transmitter is now enabled by the keying interlocks, rf power is present in the antenna coupler. Reflected power detector T1 senses the



presence of reflected power, caused by the tuner being in the home position, and fires reflected power trigger CR51. The reflected power trigger inhibits the delay timer to ensure that tune/operate gate relay K9 remains de-energized to hold the gear locks released. Forward power detector CR2 senses the presence of forward power and fires enabled forward power trigger CR53, energizing rf-on relay K10. The rf-on relay completes a ground circuit from the normally closed contacts of tune/operate gate relay K9 through the tune sequencer to energize motor control relay K8. Stepper switch motor B1 operates until the tune sequencer opens the circuit in position 4 (tune mode). Blower control section S1B(F) now applies voltage to fan B3 in the coupler.

Tuner L1 tuning, which began in the rf-on mode, continues in the tune mode. The loading and phasing discriminators (T2 and T3) sense the presence and magnitude of mismatch and control the outputs of servo-control choppers G1 and G2. The outputs are amplified to drive the coil and tap servo motors (B1 and B2) that adjust the tuning elements of the tuner to reduce the mismatch. The input sensitivity of the servo-control module is selected by the band information from the transceiver to compensate for the varying sensitivity of the discriminators in different frequency ranges.

Band C or D information (when applicable) is applied to motor-driven high-set switch S1, completing the circuit to insert series capacitor C3 into the rf circuit when the position of the tuner coil requests it.

If the tap, which was driven away from home position when the tuner began tuning in the rf-on mode, returns to the home position, limit switch S6 energizes coil add relay K3. This allows coil override section S1A(R) (in position 4) to apply a negative coil homing voltage to servo-control chopper G1. The tuner coil is forced further away from its home position until the tap follows, opening limit switch S6. If the tuner coil reaches its high limit, limit switch S2 energizes low-set relay K7 that, in turn, energizes coil-in relay K5, inserting series coil L2 in the rf circuit. Series coil L2 stays in the rf circuit through the holding action of enable section S1E(R). This additional inductance allows the tuner coil to tune away from its limit.

As tuning progresses, reflected power decreases to a point where the signal from the reflected power detector can no longer fire reflected power trigger CR51. With the inhibit removed, delay timer CR52 permits tuning to continue for one more second to ensure that an efficient match is achieved before energizing tune/operate gate relay K9. The energized tune/operate gate relay allows the gear locks to be applied to the tuner elements, removes controlled ac power from the coil and tap servos, and energizes motor control relay K8 through its normally open contacts, energized rf-on relay K10, and tune sequencer section S1E(F). Stepper switch drive motor B1 operates until the tune sequencer, advancing to position 5, opens the circuit, placing the control in the operate mode. The holding of the transmitter key is now released by the opening of enable switch section S1E(R). The tuning loop and the coupler fan are turned off by mode support section S1D(F) opening and deenergizing ac control relay K2 and key/dc control relay K1.



Mode support section S1D(F) also returns the transmitter to full rf power and SSB capability by removing the ground from the tune power and AM control control lines. Fault timer CR54 is reset and inhibited by mode support section S1D(F). Mode status section S1C(F) supplies a ground on the complete tune line, and tune indicator control section S1B(R) opens the circuit to the normally open tune indicator control line once again.

(c) Operate Mode.

Each time the transmitter is keyed, ac control relay K2 and key/dc control relay K1 are energized, applying power to the fan and partially activating the tuning loop; controlled ac power is not applied to the tap and coil servo motors because tune/operate gate relay K9 is energized. If reflected power becomes excessive, reflected power trigger CR51 fires to inhibit and reset delay timer CR52, deenergizing tune/operate gate K9. Controlled ac power is applied to the tap and coil servo motors, and the gear locks are released, allowing the tuning loop to make the adjustment necessary to regain and thus maintain an efficient match. The delay timer again ensures that a true match is achieved before applying the gear locks and deactivating the tuning loop.

(d) Fault Mode.

The coupler and control are placed in the fault mode if arc-over occurs in the coupler or if the tuning function is not completed within 30 seconds. If arc-over occurs across coupler gap G1 or G2, a momentary pulse will initially energize arc indicator relay K6. Enable section S1E(R) will hold the arc indicator relay energized and complete a circuit through recycle/fault sequencer section S1D(R) to energize motor control relay K8. If fault timer CR54 has been enabled by the recycle/fault sequencer in positions 3 through 4 for 30 seconds, it fires through recycle/fault sequencer section S1D(R) to energize motor control relay K8. In either case, stepper switch drive motor B1 operates until the particular circuit is opened by the recycle/fault sequencer advancing to position 6 (fault mode).

In position 6, mode status section S1C(F) completes a circuit, overriding the delay timer, and energizes tune/operate gate relay K9, ensuring that the tuning loop is deactivated. Tuner bypass control section S1C(R) allows coupler bypass relay K8 and antenna/interlock relay K9 to switch the tuner out of, and the receiver load into, the rf circuit. The antenna/interlock relay also opens the key interlock line, causing interlock relay K4 to de-energize and thereby to disable transmitter rf power.

(e) Coupler Temperature Protection.

Thermoswitch S4 provides phase 2 ac power to the coil and tap servo-motor reference windings, allowing them to act as heaters when the temperature falls below -25 °C.

Thermoswitch S5 provides phase 2 ac power to the coupler fan when the temperature rises above 50 °C.





Rf line voltage is sampled by voltage divider C12 and C13. Voltage  $e_3$  across capacitor C13 is in phase with the line voltage. Positive half-cycles of this voltage ( $e_3$ ) forward bias both diodes, as shown by  $e'_3$ , through bypass capacitors C14 and C17.

Figure 10B shows the conditions that exist when the antenna is properly tuned. Line voltage and line current are in phase. Induced voltage  $e_1 + e_2$  is  $90^\circ$  out of phase with line current because of the transformer coupling. During positive half-cycles of line voltage, both diodes are forward biased by voltage  $e'_3$ . During the period that both diodes are forward biased by  $e'_3$ , induced voltage  $e_1 + e_2$  is first negative and then positive. When the induced voltage is negative, diode CR5 is forward biased by  $e'_2$ , which aids bias voltage  $e'_3$ ; diode CR5 conducts, causing voltage drop  $E_2$  across resistor R9. Voltage drop  $E_2$  creates a charge on filter capacitor C15. Also, when the induced voltage is negative, diode CR6 is reverse biased by voltage  $e'_1$ , which cancels forward bias  $e'_3$ ; diode CR6 does not conduct. Then, and still during the positive half-cycle of line voltage, the polarity of induced voltage  $e_1 + e_2$  reverses. Now diode CR6 conducts, causing voltage drop  $E_1$  across resistor R9; CR5 ceases to conduct. Voltage drop  $E_1$  creates a charge on filter capacitor C16. Because line current and line voltage are in phase when the antenna is properly tuned, the phase difference (introduced by the transformer) between the bias voltages is exactly  $90^\circ$  (1/4 of a cycle). Each diode conducts for an equal period of time, and the effect of the equal and opposing resultant voltages  $E_1$  and  $E_2$  is canceled in the filters. No dc error voltage is generated.

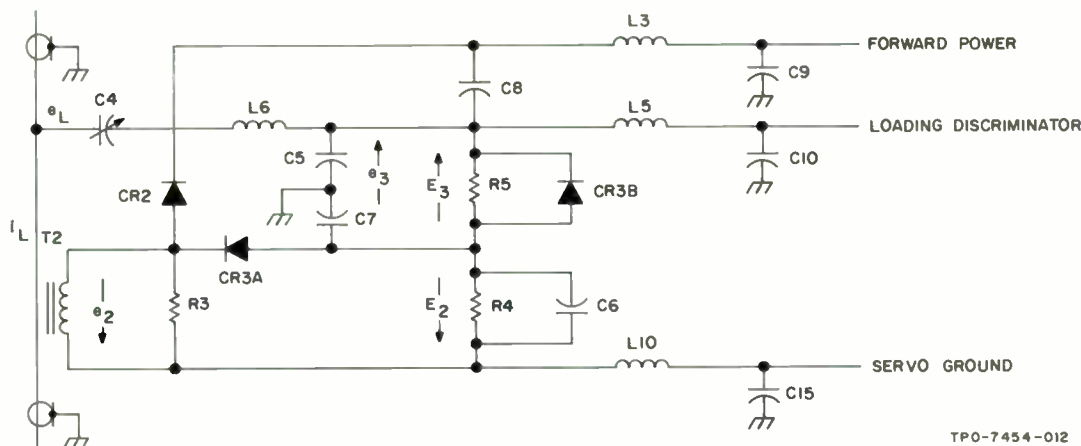
Figure 10C shows the effect that a capacitive or inductive antenna has on induced voltage  $e_1 + e_2$  during the positive half-cycle of  $e_3$ .

When the antenna is capacitive, line current leads line voltage. Induced voltage  $e_1 + e_2$  still leads line current by  $90^\circ$ , but it now leads line voltage by the sum of  $90^\circ$  plus the phase shift caused by the capacitive antenna. The sine wave represented by dashes in the figure shows this relationship of voltage  $e_1 + e_2$  to voltage  $e_3$ . Diode CR6 conducts for a longer period of time than does diode CR5. The resultant positive charge on capacitor C16 is greater than that on capacitor C15. The output is positive and proportional to the phase shift of line current leading line voltage.

The sine wave represented by dots in figure 10C shows the relationship of induced voltage  $e_1 + e_2$  to voltage  $e_3$  when the antenna appears inductive. Diode CR6 conducts for a shorter period of time than does diode CR5. The resultant charge on capacitor C16 is less positive than the charge on capacitor C15 so that the output appears negative and is proportional to the phase shift of line current lagging line voltage.

(2) Loading Discriminator. (Refer to figure 11.)

For efficient power transfer, the 180R-12 coupler must present a 50-ohm load to the transmitter. A relationship exists between the magnitudes of rf voltage and rf current when the load is 50 ohms. When the load impedance is less than 50 ohms, rf current increases and rf voltage decreases. The opposite is true when the load impedance is greater than 50 ohms. The loading discriminator



Loading Discriminator and Forward Power Detector,  
Simplified Schematic Diagram  
Figure 11

compares the magnitude of rf current with the magnitude of rf voltage and generates a polarized dc error signal that represents the amount and direction of loading mismatch.

Line current induces voltage  $e_2$  into the secondary of transformer T2. Phase shift is eliminated by the swamping effect of resistor R3. Diode CR3A conducts during half-cycles of voltage  $e_2$ , developing voltage drop  $E_2$  across resistor R4. At the same time, line voltage is applied to voltage divider C4 and C5 (coil L6 compensates for distributed circuit capacity). Voltage  $e_3$  across capacitor C5 causes half-cycle current to flow through R5, developing voltage drop  $E_3$ . When the amplitude relationship of line current to line voltage indicates proper loading, voltage drop  $E_2$  is equal and opposite to voltage drop  $E_3$ , and the dc error voltage across the output is zero. If the load is less than 50 ohms, line current increases while line voltage decreases, causing voltage drop  $E_2$  to be greater than voltage drop  $E_3$ . The dc error voltage output becomes proportionately negative. The opposite is true if the load is greater than 50 ohms. Diode CR3B shorts out resistor R5 during the unused half-cycle of line voltage. Diode CR3A blocks current flow during the unused half-cycle of line current. Capacitor C4 is adjusted to give 0 error voltage output when the load is a pure resistance of 50 ohms.

(3) Forward Power Detector. (Refer to figure 11.)

Diode CR2 samples induced voltage  $e_2$  that represents line current during the half-cycle not used by the loading discriminator. A positive signal output is generated when line current is present.

(4) Reflected Power Detector. (Refer to figure 12.)

The reflected power detector develops a dc error signal proportional to the deviation of the swr from 1.0:1. The swr deviates from 1.0:1 when the antenna impedance is not 50 ohms and resistive.

Line current induces voltage  $e_2$  into the secondary of transformer T1. Voltage  $e_2$  appears across resistor R1 and is in phase with line current because of the low value of resistance presented by resistor R1.

Line voltage is sampled by voltage divider C1 and C2

(coil L2 compensates for distributed circuit capacitance). The voltage across C2 appears across resistor R2 and is shown by  $e_1$ .

The values of the circuit elements are such that when the swr is 1.0:1 (line current in phase with line voltage and a load of 50 ohms), voltage  $e_1$  equals voltage  $e_2$ . Since the voltages ( $e_1$  and  $e_2$ ) are equal and opposite, they cancel and diode CR1 does not conduct. No signal output is generated.

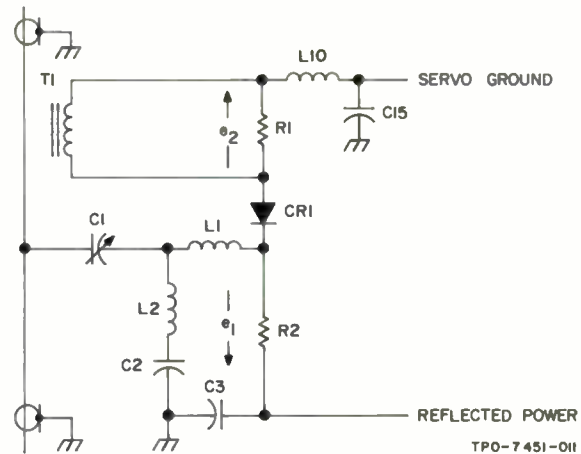
A positive signal output is generated whenever diode CR1 conducts. When the load is less than 50 ohms, line current increases and line voltage decreases. Voltage  $e_2$  increases and voltage  $e_1$  decreases. Diode CR1 will conduct during the half-cycles when its anode is more positive than its cathode. When the load is greater than 50 ohms, line current decreases and line voltage increases. Diode CR1 will conduct during the half-cycles when its cathode is more negative than its anode.

When the antenna is not resistive, line current is not in phase with line voltage. Voltage  $e_2$  is not in phase with voltage  $e_1$  and, therefore, they do not cancel each other even when they are equal. Diode CR1 conducts during the half-cycles when voltage  $e_2$  causes its anode to be more positive and also during the half-cycles when voltage  $e_1$  causes its cathode to be more negative.

(5) Fault Timer. (Refer to figure 13.)

The fault timer uses CR54, an scr (silicon-controlled rectifier). When triggered at its gate, an scr conducts and continues to conduct until the anode circuit is opened.

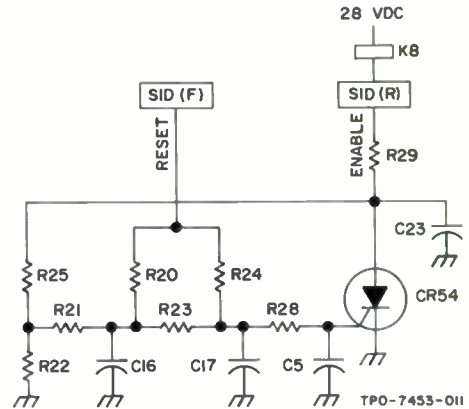
The timer is enabled by motor driven switch S1D(R) at the beginning of the tuning phase, and a small current (insufficient to energize motor control relay K8) flows in the RC network. This develops a charge on capacitors C16 and C17.



Reflected Power Detector, Simplified  
Schematic Diagram  
Figure 12



When the coupler becomes properly tuned, the motor-driven switch advances to the operate mode, and section S1D(F) shorts capacitors C16 and C17 to ground. The control must advance to the operate mode within 30 seconds or the charge on capacitor C17 will reach the threshold of the scr gate. If this occurs, CR54 will conduct and energize motor control relay K8. The motor-driven switch in the control advances until switch section S1D(R) opens the anode circuit of the scr in the fault mode position.

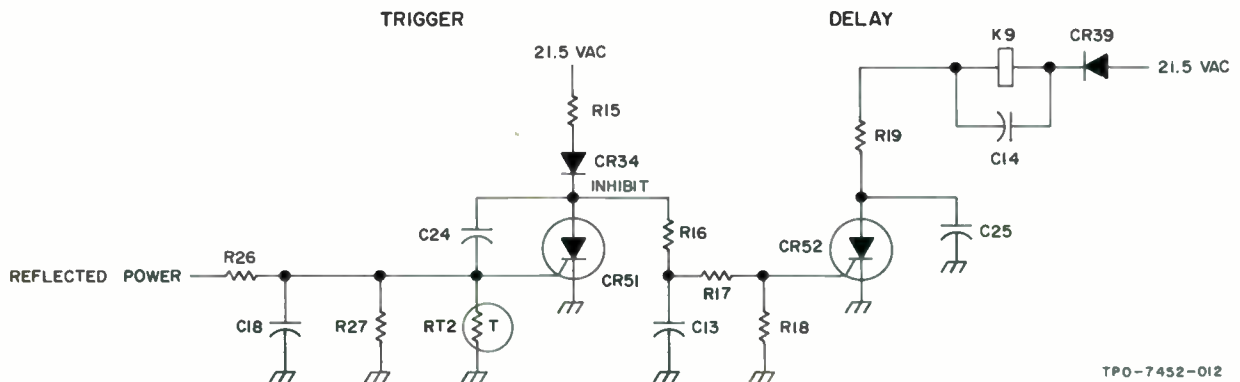


Fault Timer, Simplified  
Schematic Diagram  
Figure 13

- (6) Reflected Power Trigger and Delay Timer. (Refer to figure 14.)

The reflected power trigger and delay timer use scr's CR51 and CR52.

A positive signal, indicating the presence of reflected power, gates scr CR51 during positive half-cycles of the 21.5 volts ac. The negative half-cycles of the ac voltage reverse bias diode CR34 and open the anode circuit. The gate circuit continues to operate as long as the positive reflected power signal is present. Capacitor C13 (in the RC network of the delay timer) is prevented from developing a charge and thus inhibits the timer. When the reflected power signal diminishes sufficiently, scr CR51 no longer fires, and capacitor C13 charges through diode CR34. After 1 second, the charge on capacitor C13 gates on scr CR52, energizing relay K9 on positive half-cycles of the ac voltage. The negative half-cycles reverse bias diode CR39, opening the anode circuit of the scr. As long as



Reflected Power Trigger and Delay Timer, Simplified Schematic Diagram  
Figure 14



reflected power is not present, the charge on capacitor C13 will continue to gate on scr CR52. Relay K9 is held energized during the negative half-cycles of the ac voltage by capacitor C14.

(7) Forward Power Trigger.

The operation of the forward power trigger circuit (CR53) is similar to the operation of the reflected power trigger and delay timer. The input circuit of both trigger circuits is essentially the same. The output circuit of the forward power trigger is like that of the delay timer.



NOTES:

1. Arrowheads indicate direction of signal flow.
2. Numbers beside output lines of stepper switch S1 in relay control module indicate mode position. Refer to schematic diagram for the actual switch terminal.
3. The 309A-9A configuration differs from the 309A-9 configuration shown in the figure as follows:

Power relay K1 is connected between external 28 volts dc and ground (primary power control line not used).

The tune indicator common line and the interlock common line are connected directly to the external 28 volts dc.

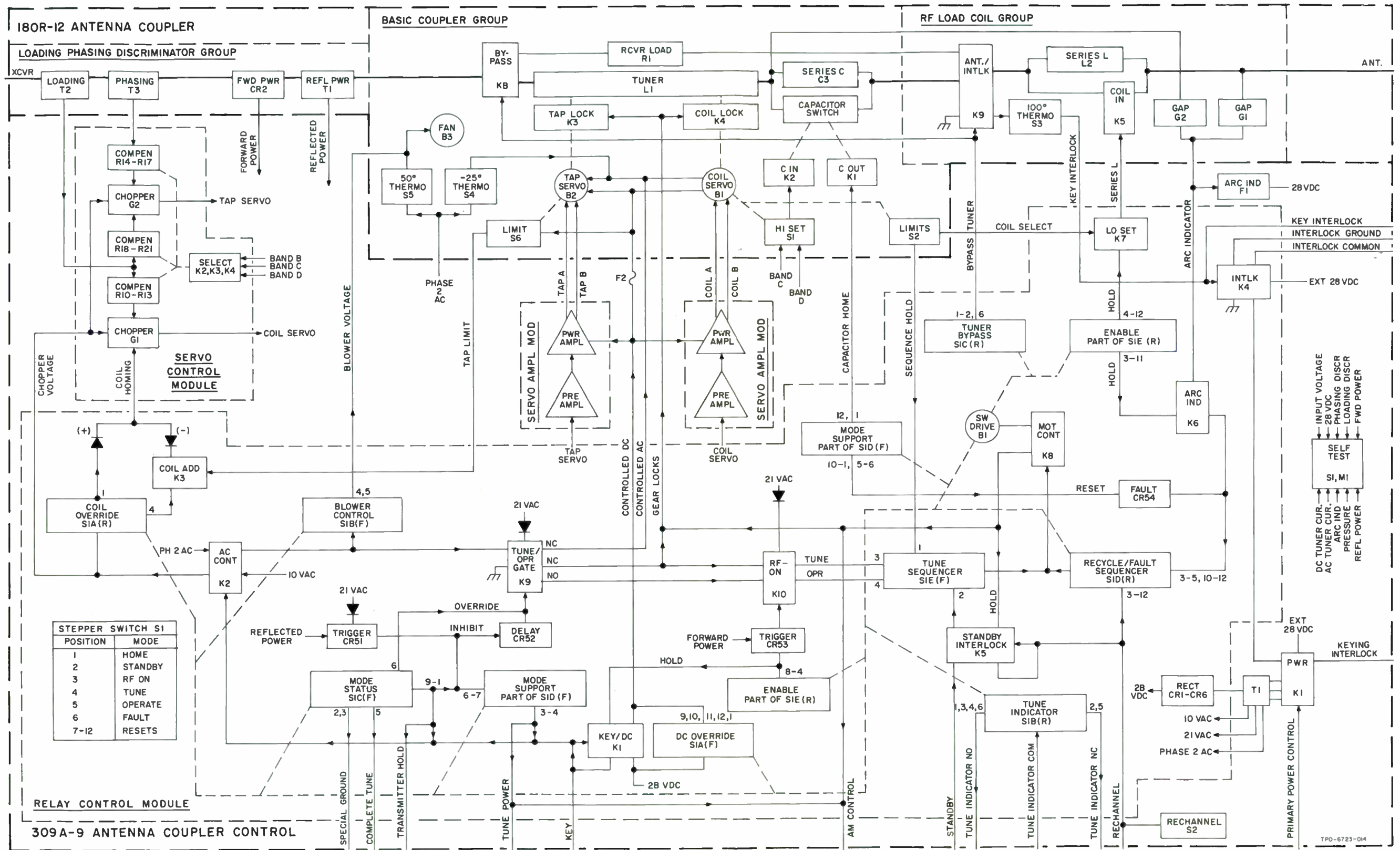
A signal path is provided between the key line and the standby line.

A vox relay, K2, activated by a signal on a receive only control line, interrupts the standby line signal path.

180R-12 Antenna Coupler and 309A-9/9A Antenna Coupler Control,  
Functional Block Diagram (Sheet 1 of 2)

Figure 15





180R-12 Antenna Coupler and 309A-9/9A Antenna Coupler Control,  
Functional Block Diagram (Sheet 2 of 2)  
Figure 15

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## 180R - 12 Antenna Coupler and 309A - 9/9A Antenna Coupler Control - Disassembly

### 1. GENERAL.

This section presents instructions for disassembling the 180R-12 Antenna Coupler and the 309A-9/9A Antenna Coupler Control. This equipment should be disassembled only when repair is necessary.

Procedures are in order of disassembly from the highest to the lowest subassembly. Disassemble only as far as indicated by the nature of the fault. The order of disassembly of electronic equipment can usually be determined by inspection, but special techniques, cautions, warnings, and unique procedures, when required, are in this section. Refer to the Electromechanical Components Overhaul Manual for disassembly of motors, synchros, and meters.

### 2. PRECAUTIONS AND GENERAL TECHNIQUES.

Identify all disconnected electrical wiring. Make note of color coding, placement of leads, and methods of applying insulation (if any) before unsoldering or removing any electrical parts.

Use a compartmentalized tray and/or tags to identify disassembled parts and hardware with the corresponding figure-item numbers used in the illustrated parts list section of this manual.

Liquid staked hardware that appears to be seized can normally be loosened by heating with a soldering iron.

**CAUTION:** WHEN UNSOLDERING A SOLID-STATE DEVICE, USE A HEAT SINK ON THE LEAD TO PREVENT DAMAGE TO THE SEMICONDUCTOR.

BE SURE THAT THE POWER CABLE IS REMOVED BEFORE DISASSEMBLING ANY PORTION OF THE EQUIPMENT. DISASSEMBLING THE EQUIPMENT WITH THE POWER CABLE CONNECTED MAY CAUSE VOLTAGE TRANSIENTS THAT COULD DESTROY TRANSISTORS.

### 3. PROCEDURE.

#### A. 180R-12 Antenna Coupler.

Figure 101 states the procedure for the removal of the basic functional sections of the coupler from its case.

Refer to the figures listed below for the disassembly procedures of the various functional sections.



<u>FUNCTIONAL SECTION</u>	<u>FIGURE</u>
Discriminator disassembly	102
Case disassembly	103
Basic coupler disassembly	104
Rf load coil relay chassis removal	105
Rf load coil bulkhead plate and coil removal	106
Rf load coil support plate removal	107

B. 309A-9/9A Antenna Coupler Control.

(1) Dust Cover Removal.

Remove four screws from each side and one screw from top, and withdraw control chassis from dust cover.

(2) Module Removal. (Refer to figure 1108.)

(a) Unplug servo-amplifier modules (41, 42) after first releasing bar clamps (39).

(b) Unplug relay control (4) and servo-control (3) modules after first loosening the four redheaded captive screws on each module.

(3) Module Disassembly.

Refer to the figures listed below for the disassembly procedures of the modules.

<u>MODULE</u>	<u>FIGURE</u>
Servo amplifier	108
Relay control	109
Servo control	110

STEP	PART		HARDWARE			INSTRUCTIONS	PRECAUTIONS
	NAME	ITEM	NAME	ITEM	QTY		
1	Discriminator	5	Screw	6	10	Unfasten and unplug.	
	Gasket	12	Lockwasher	7	10		
2	Basic coupler	8	Screw	9	17	Open air valve (figure 1105, item 1).  Unfasten and slide out of case.	
	Gasket	13	Flat washer	11	17		
3	Backing strip	17	Screw	18	2	Remove.	
4	Rf load coil	14	Screw	15	10	Unfasten and slide out of case.	
			Flat washer	16	10		

Disassembly of 180R-12 Antenna Coupler  
(Refer to figure 1102.)  
Figure 101





STEP	PART		HARDWARE			INSTRUCTIONS	PRECAUTIONS
	NAME	ITEM	NAME	ITEM	QTY		
1	Housing	1	Nut	P/O 15	1	Unfasten and lift off.	
			Flat washer	3	1		
			Screw	2	3		
			Washer	P/O 2	3		
2	Connector P1	80	Screw	73	2	Remove from rf shield (82).	
			Lockwasher	74	2		
			Flat washer	75	2		
3	Connector P2 Retaining plate	9 11	Screw	13	2	Remove from rf shield (81).	
			Flat washer	14	4		
			Spacer	10	2		
			Spacer	12	2		
4	Connector J1	15	Screw	16	2	Remove from rf shield (81).	
			Lockwasher	17	2		
5	Resistor assembly	22	Screw	19	1	Remove from rf shields (81, 82).	
			Screw	18	1		
6	Terminal board	67	Screw	29	2	Remove from rf shield (81) and transformer sub-assembly (89).	
			Spacer	27	2		
			Screw	30	1		
			Lockwasher	31	1		
			Spacer	28	1		
7	Rf shield	82	Nut	83	2	Remove rf shields from transformer subassembly.	
	Rf shield	81					
8	Transformer cover	89	Screw Lockwasher	90	8	Remove screws and disassemble with extreme care.	Record color code of transformer leads and location of their feed-through holes in transformer cover.
	Transformer T2	94		91	8		
	Disc insulator	95					
	Transformer T1	96					
	Disc insulator	93					
	Transformer	92					
	Discriminator Shield plate	97 98					

Discriminator Disassembly  
(Refer to figure 1103.)  
Figure 102

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STEP	PART		HARDWARE			INSTRUCTIONS	PRECAUTIONS
	NAME	ITEM	NAME	ITEM	QTY		
1	Webbing strap	33A	Pin	33C	2	Detach.	
2	Rear cover plate	23	Screw Lockwasher	24 25	6 6	Remove hardware and break seal by lightly tapping with mallet.	
3	Contact assembly Contact	19/ 19A 20	Flat washer Lockwasher	22 21	1 1	Remove contact (20) and loosen contact assembly by lightly tapping stud with mallet.	
4	Locating pin	30	Screw Lockwasher	31 32	2 2	Remove two pins.	
5	Straight pin	26	Setscrew	27	1	Remove.	
6	Guide pin	29				Drive out two pins with pin punch.	

Case Disassembly  
(Refer to figure 1102.)  
Figure 103



STEP	PART		HARDWARE			INSTRUCTIONS	PRECAUTIONS
	NAME	ITEM	NAME	ITEM	QTY		
1	Terminal lug	118	Screw Lockwasher	119 120	1 1	Disconnect terminal lug and lead from shaft collar (121).	
2	Front housing	1	Screw Lockwasher Screw	3 4 2	8 8 1	Unfasten front housing from main gearplate (286).	
3	Connector J7	295	Nut Gasket	295B 295A	1 1	Remove connector from front housing by tapping lightly with mallet to break seal.  Disconnect harness wiring and remove front housing.	Mark all connections.
4	Tap contact housing assembly Insulator bushing	121 thru 131 291				Loosen four set-screws (122) and remove contact housing assembly with bushing (291) from between gearplates.	
5	Connector P8 Connector shield Bushing	26 27 33	Screw Flat washer Shim washer	30 31 31A	2 2	Unfasten connector, disconnect leads, and remove.  Disconnect leads to connector P9 (16).	Mark all connections.
6	Tap pinion support Ball bearing	5 112	Screw Shim washer	6 6A	2	Remove tap pinion support from rear plate (83).  Disengage tap gear lock by repositioning solenoid (256) so that toothed dog is clear of motor spline shaft.  Carefully rotate drums to transfer ribbon to ceramic drum.	
7	Ribbon	116				Disconnect ribbon from ground drum (107).	Hold spring-loaded ground drum to prevent solder splash.  Attach ribbon end to ceramic drum (167) with masking tape.

Disassembly of Basic Coupler Group (Sheet 1 of 4)

(Refer to figure 1104.)

Figure 104

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STEP	PART		HARDWARE			INSTRUCTIONS	PRECAUTIONS
	NAME	ITEM	NAME	ITEM	QTY		
8	Bearing support	12	Retaining ring Shim washer	11 11A	1	Remove bearing support and shims from protruding end of ceramic drum shaft (140) at rear plate.	
9	Rear plate	83	Screw Flat washer Screw Flat washer Shim washer Shim washer Ball bearing Ball bearing	14 14A 15 85 85A 84 13	5 5 2 2	<p>Unfasten rear plate from four posts (173), one post (358), and two hexposts (341).</p> <p>Lift rear plate away from coupler group and collect shims and bearings.</p>	<p>Flat washers are between rear plate and posts.</p> <p>Shim washers are on ground drum shaft (88). Bearings are either on drum shafts or seated in rear plate.</p> <p>If the rear plate is to be disassembled further and switch arms (58, 59) are to be removed from shaft (69), place a reference mark on the switch arms and shaft ends for use during reassembly to maintain the 22° offset angle. Do not twist arms off shaft or otherwise damage the interlocking splines.</p>
10	Ceramic drum and tap assembly	132 thru 167				Lift out of coupler group.	Use care not to damage ribbon.
11	Ground drum assembly	107 and attached parts				Lift out of coupler group.	
12	Solenoid arm	168	Roll pin Setscrew	170 169	2 4	<p>Mark and match each switch arm to its solenoid (319, 320).</p> <p>Remove arms by loosening setscrews (if any) and driving out the roll pins.</p>	

Disassembly of Basic Coupler Group (Sheet 2 of 4)  
(Refer to figure 1104.)  
Figure 104



STEP	PART		HARDWARE			INSTRUCTIONS	PRECAUTIONS
	NAME	ITEM	NAME	ITEM	QTY		
13	Solenoid K1 Solenoid K2	319 320	Nut Lockwasher Flat washer Spacer	322 323  321	4 4 4 4	Unfasten solenoids from switch mounting plate (349).  Disconnect harness wiring and remove solenoids.	Mark all connections.
14	Gasket retaining plate Cable clamp	271 261	Screw Screw Lockwasher Screw Lockwasher Screw Screw Flat washer Spacer Nut	272 272A 273 288 289 287 265 264 262 263	2 2 4 1 1 1 1 2 1 1	Disconnect harness wiring in plenum (365 and attached parts).  Unfasten and remove plenum subassembly and retaining plate from main gearplate (286).	
15	Tap pinion gear Ball bearing	113 244	Setscrew	114	2	Remove tap pinion gear from gearshaft (243) and ball bearing from main gearplate.	
16	Support cylinder and rollers subassembly	109 and attached parts	Screw Screw Screw	100 110 111	2 8 4	Remove two screws (100) securing lower roller assemblies (102, 103, 104) to main gearplate (286). Rotate gears (250, 252) to reveal hidden screw through notch in gear lightening hole (figure 513).  Remove 12 screws (110, 111) securing support cylinder to gearplates (178, 205, 286) and withdraw support cylinder.	
17	Drum support gearplate Ball bearing Ball bearing Gearshaft Gearshaft Ball bearing Ball bearing	178 182 184 183 185 182 184A	Screw Lockwasher Spacer Shim washer Shim washer	180 181 179 184B 184C	2 2 2	Unfasten and remove drum support gearplate.  Collect hardware.  Lift gearshafts away from motor mount gearplate (205) and collect two more bearings and shim washers (184C).	Two bearings may be in gearplate or on gearshafts.  Shim washers (184B) are on shaft (188) or gearshaft (185).

Disassembly of Basic Coupler Group (Sheet 3 of 4)  
(Refer to figure 1104.)  
Figure 104

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STEP	PART		HARDWARE			INSTRUCTIONS	PRECAUTIONS	
	NAME	ITEM	NAME	ITEM	QTY			
18	Torsion bar gear	189	Retaining ring	190	1	Disconnect harness wiring from motor and solenoid.  Remove retaining ring, shim washers, and gear from spline shaft of torsion bar (238).  Lift off motor mount gearplate with motor, shim, and solenoid attached.	Mark all connections.	
	Motor mount gear plate	205	Shim washer	191				
	Coil motor	203						
	Coil lock solenoid	195						
	Motor shim	203A						
19	Post	200	Stud	201	2	Remove two motor gearcase posts.	Grip posts with pin punch inserted through post tightening holes.  Studs will remain in either main gearplate (286) or post.	
20	Switch wafer	212	Screw	213	4	Disassemble and remove switch from tongue of shaft (236).		
	Switch wafer	214	Ceramic spacer	216	2			
			Ceramic washer	215	2			
21	Secondary gearplate	224	Lever spring	219	1	Detach lever spring.	Do not remove three Oilite bushings (227) from secondary gearplate.	
	Ball bearing	237	Screw	225	3	Remove secondary gearplate and collect bearings.		
	Ball bearing	249	Lockwasher	226	3			
	Ball bearing	251	Spacer	223	3			
22	Tap stop lever assembly	245				Lift out gear assemblies and collect bearings.	Do not remove three Oilite bushings (290) from main gearplate (286).	
	Tap spur gearshaft	243						
	Coil spur gear and stop assembly	230 thru 236						
	Tap stop gear assembly	246 thru 248						
	Spur gearshaft	250						
	Spur gearshaft	252						
	Ball bearing	249						
	Ball bearing	251						
	Torsion bar assembly	238						
	Ball bearing	242						

Disassembly of Basic Coupler Group (Sheet 4 of 4)

(Refer to figure 1104.)

Figure 104



STEP	PART		HARDWARE			INSTRUCTIONS	PRECAUTIONS
	NAME	ITEM	NAME	ITEM	QTY		
1						Disconnect terminal connector (P/O 10, P/O 14) from relays.	Use a no. 2 Bristol wrench.
2	Cover	1	Screw Nut	3 2	11 3	Remove chassis cover.	
3	MCN 130 and above		Screw	28D	1	Remove lugs mounted to capacitor (28A) and capacitor retainer (33A).	Grip capacitor shank with open-end wrench.
			Lockwasher	28E	1		
			Lug	28B	2		
	MCN 129 and below						
	Capacitor retainer	28	Screw	33	1	Unfasten from relay chassis and loosen capacitor mounting screw (32).	Grip capacitor shank with open-end wrench.
			Flat washer	31	2		
			Lug	27	1		
			Lockwasher	30	2		
			Nut	29	1		
			Screw	32	1		
	Capacitor	69	Lug	70	1	Remove capacitor.	
			Lockwasher	73	1		
4	Connector J8	23	Screw	26	2	Unfasten.	
			Locknut	25	2		
5	Pin bracket Spacer	35	Screw	39	2	Remove.	
		34	Locknut	37	2		
6	Relay chassis subassembly		Screw	40	2	Remove hardware and slide relay chassis out from rf load coil group.	
			Locknut	38	2		

Removal of Relay Chassis from RF Load Coil Group  
(Refer to figure 1106.)  
Figure 105



STEP	PART		HARDWARE			INSTRUCTIONS	PRECAUTIONS
	NAME	ITEM	NAME	ITEM	QTY		
1						Disconnect terminal connectors (P/O 10, P/O 14) from relays.	
2	Cover	1	Screw Nut	3 2	11 3	Remove chassis cover.	
3	MCN 130 and above  Capacitor retainer	33A	Screw Locknut Screw Lockwasher Lug	33C 33B 28D 28E 28B	1 1 1 1 2	Unfasten retainer from bulkhead plate.  Remove capacitor retainer and lugs from capacitor (28A).	Grip capacitor shank with open-end wrench.
4	Connector J8	23	Screw Locknut	26 25	2 2	Unfasten connector.	
5			Screw Locknut	40 38	2 2	Unfasten bulkhead plate from relay chassis (36).	
6			Screw Flat washer Nut Roll pin	61 60 59 56	3 3 3 3	Unfasten coil form brackets from support plate (88).  Carefully withdraw bulkhead plate and coil subassembly from rf load coil group.	Use long Phillips screwdriver through access holes of bulkhead plate.  Use pin punch to remove roll pins from support plate.

Removal of Bulkhead Plate and Coil Assembly from RF Load Coil Group  
(Refer to figure 1106.)  
Figure 106





STEP	PART		HARDWARE			INSTRUCTIONS	PRECAUTIONS
	NAME	ITEM	NAME	ITEM	QTY		
1	Cover	1	Screw Nut	3 2	11 3	Remove chassis cover.	
2	Terminal lug	78	Screw Lockwasher Nut	81 80 79	1 1 1	Remove lug from contact P6 (82).	
3	<u>MCN 130 and above</u>						
	Lug Lug	70 70A	Locknut	72A	1	Remove lugs from spark gap arm mounting screw (76).	
	<u>MCN 129 and below</u>						
	Capacitor retainer	28	Screw Flat washer Lug Lockwasher Nut Screw	33 31 27 30 29 32	1 2 1 2 1 1	Unfasten from relay chassis (36) and loosen capacitor mounting screw (32).	Grip capacitor shank with open-end wrench.
	Capacitor	69	Lug Lockwasher	70 73	1 1	Remove capacitor and lug.	
4	Pin bracket Spacer	35	Screw	39	2	Remove.	
		34	Locknut	37	2		
5			Screw	61	3	Unfasten coil forms from support plate.  Carefully withdraw support plate from rf load coil group.	Use long Phillips screwdriver through access holes of bulkhead plate.  Use pin punch to remove roll pins from support plate.
			Flat washer	60	3		
			Locknut	59	3		
			Roll pin	56	3		

Removal of Support Plate Subassembly from RF Load Coil Group  
(Refer to figure 1106.)  
Figure 107



STEP	PART		HARDWARE			INSTRUCTIONS	PRECAUTIONS
	NAME	ITEM	NAME	ITEM	QTY		
1	Cap	2				Unscrew cap from can (3).	Use strap wrench to grip can.  Use special pin spanner (special tools section) to grip tightening holes in cap.
2	Can	3				Unscrew can from base (63).	Use strap wrench and special spanner as in step 1.
3	Base Insulator Bottom wafer assembly Middle wafer assembly Top wafer assembly	63 64 61 53 18	Screw Spacer Spacer Slotted nut	5 4	3 3 6 3	Disassemble stack.	Mark all connections.  Use special slotted-nut driver (special tools section) to grip slotted nuts.

Disassembly of Servo-Amplifier Module  
(Refer to figure 1111.)  
Figure 108



STEP	PART		HARDWARE			INSTRUCTIONS	PRECAUTIONS
	NAME	ITEM	NAME	ITEM	QTY		
1	Cover	1	Screw		2	Remove cover.	
2	Terminal board subassembly	51	Screw Lockwasher		6 6	Remove.	
3	Hexpost	2	Screw Screw		1	Remove hexpost.	
	Motor-driven switch assembly	9	Screw Screw		4 1	Remove motor and switch assembly.	

Disassembly of Relay Control Module  
(Refer to figure 1110.)  
Figure 109

STEP	PART		HARDWARE			INSTRUCTIONS	PRECAUTIONS
	NAME	ITEM	NAME	ITEM	QTY		
1	Cover	1	Screw		2	Remove cover.	
2	Screw assembly	2	Screw		2	Remove two captive screws.	
	Servo-control subassembly	29	Screw Lockwasher Screw		4 4 2	Remove sub-assembly from chassis.	

Disassembly of Servo-Control Module  
(Refer to figure 1109.)  
Figure 110





## 180R -12 Antenna Coupler and 309A -9/9A Antenna Coupler Control - Cleaning

### 1. GENERAL.

This section presents instructions for cleaning parts and disassembled subassemblies of the 180R-12 Antenna Coupler and the 309A-9/9A Antenna Coupler Control.

Instructions are arranged to facilitate reference by paragraph to the procedure for cleaning. All parts requiring particular methods of cleaning are considered separately, and parts similar enough to permit identical cleaning procedures are grouped.

### 2. CLEANING MATERIALS.

The use of the word "solvent" in the following procedures means Turcosol or Stoddard solvent. The cleaning materials referred to are listed in figure 201.

In this section, "air jet" refers to a hand-operated air nozzle supplied with clean, dry, compressed air at a maximum of 28 psig.

**WARNING: USE CLEANING SOLVENT UNDER A VENTILATED HOOD. AVOID BREATHING SOLVENT VAPOR AND FUMES. WEAR A SUITABLE MASK WHEN NECESSARY. AVOID CONTINUOUS CONTACT WITH SOLVENT. USE GOGGLES, GLOVES, AND APRON TO PREVENT IRRITATION FROM PROLONGED CONTACT. CHANGE CLOTHING UPON WHICH SOLVENTS HAVE BEEN SPILLED. OBSERVE ALL FIRE PRECAUTIONS FOR FLAMMABLE MATERIALS. USE THESE MATERIALS IN A HOOD PROVIDED WITH EXPLOSION-PROOF ELECTRICAL EQUIPMENT AND AN EXHAUST FAN WITH SPARKPROOF BLADES. WARN OTHER PERSONS TO KEEP AWAY FROM HAZARDOUS AREA OR WORKING ENCLOSURE.**

**WARNING: WEAR GOGGLES WHEN USING AN AIR JET TO BLOW DUST AND DIRT FROM EQUIPMENT. WARN OTHER PERSONS TO KEEP AWAY FROM HAZARDOUS AREA OR WORK ENCLOSURE.**

MATERIAL	RECOMMENDED TYPE
Solvent	Turcosol or Stoddard solvent
Chamois skin	
Cloth, lintless cotton	
Detergent, powder	
Paper, lens tissue	
Paper, fine grade tissue	



### 3. PROCEDURES.

#### A. Bearings, Ball (Unsealed).

Bearings can be cleaned for inspection in a bearing-cleaning machine using cleaning agents and procedures recommended by the manufacturer. Otherwise, clean bearings according to the following hand-washing procedures:

- (1) Clean bearings in an air-conditioned or air-filtered area. All tools, equipment, fixtures, and the area in general must be kept very clean. For air jets used in this area, compressed air from a source outside the area should be filtered and dehydrated. All cloths used in these procedures must be clean and free of lint. Solvent must be filtered through clean chamois skin or filter paper before use and periodically thereafter.

**CAUTION: PERMANENT DAMAGE MAY RESULT FROM FORCIBLY SPINNING A BEARING BEFORE IT IS THOROUGHLY CLEAN. BEARINGS MUST NOT BE HANDLED WITH BARE HANDS DURING AND AFTER CLEANING AND PRESERVATION. OPERATORS MUST WEAR RUBBER GLOVES OR FINGERSTALLS TO AVOID CONTAMINATING BEARINGS WITH FINGERPRINTS. KEEP HANDLING TO A MINIMUM.**

- (2) Insert a bearing holder securely into bore, and immerse bearing in a bath of cleaning solvent. Move bearing up and down several times to circulate solvent.
- (3) Remove bearing from bath, and direct air jet at side of bearing opposite from holder until dry; do not permit airflow to spin bearing.
- (4) Wash and dry bearing again as directed in steps (2) and (3).
- (5) Repeat wash as prescribed in step (2), and, while washing, gently turn outer race with gloved finger to remove any foreign particles from balls, retainer, and races; then dry as directed in step (3).
- (6) Demagnetize bearing by passing bearing through throat of a suitable demagnetizer, once forward, then back, and, while doing so, turn bearing slightly to rotate balls one or two revolutions.
- (7) Using a second bath of freshly filtered solvent, repeat washing and drying as in step (5) until bearing is completely free of all foreign matter (as ascertained by following step).
- (8) Gently turn outer race with gloved finger, and see whether action is smooth all the way around, without resistance or grinding. Smooth action of dry bearing is accepted as indication that bearing is clean.
- (9) Bake bearing for approximately 1/2 hour in suitable electric or infrared ventilated oven at approximately +43 °C (+110 °F) until all remaining solvent has evaporated.



- (10) Remove bearing from oven, and place in clean, dry container for protection from dust, moisture, and handling while in transit to inspector. Attach a content identification slip to container, and forward immediately to inspection department.

**CAUTION:** SOME INSPECTION PROCEDURES REQUIRE THE CLEANED BEARING TO BE DRY, THAT IS, WITHOUT LUBRICATION. BECAUSE DRY BEARINGS ARE UNPROTECTED FROM CORROSION CAUSED BY MOISTURE, IT IS NECESSARY THAT THEY BE INSPECTED IMMEDIATELY AFTER CLEANING.

B. Bearings, Sealed and Porous Bronze (Oilite).

Normally, sealed bearings require no cleaning or lubrication, since they are lubricated by the manufacturer for lifetime operation. It is recommended that these bearings be replaced if faulty; however, under certain circumstances, lubrication may be necessary. If lubrication is necessary, bearings must be thoroughly cleaned as follows:

(1) Sealed Ball Bearings.

- (a) Sealed ball bearings must be cleaned in a suitable bearing-cleaning machine, such as a spray cleaner or an ultrasonic installation. Follow the manufacturer's instructions for proper use of these machines.
- (b) If bearings are not to be lubricated, protect bearings from dust and moisture before inspection.

**CAUTION:** PERMANENT DAMAGE MAY RESULT FROM FORCIBLY SPINNING A BEARING BEFORE IT IS THOROUGHLY CLEAN. BEARINGS MUST NOT BE HANDLED WITH BARE HANDS DURING AND AFTER CLEANING AND PRESERVATION. OPERATORS MUST WEAR RUBBER GLOVES OR FINGER-STALLS TO AVOID CONTAMINATING BEARINGS WITH FINGER-PRINTS. KEEP HANDLING TO A MINIMUM.

(2) Porous Bronze Bearings (Oilite).

It is recommended that you not lubricate porous bronze bearings. However, under certain circumstances, lubrication may be desired. If bearings are not to be lubricated, wipe dust from items that contain porous bronze bearings with a clean, dry, lintless cloth. Protect from dust and moisture pending inspection.

C. Cables, Covered.

- (1) Clean outer surfaces of flexible Vinylite conduit by wiping dirt from surfaces with a lintless cloth moistened with solvent.
- (2) Wipe dry with a clean, dry, lintless cloth.
- (3) Treat any connector terminals as directed in paragraph E. Wipe lug terminals clean with a lintless cloth moistened with solvent, and dry with a clean, dry, lintless cloth.



D. Castings.

Castings should be cleaned as follows:

- (1) Remove most of surface grease with rags.
- (2) Blow dust from surfaces, holes, and recesses using air jet.
- (3) Immerse casting in bath of solvent, and scrub until clean, working over all surfaces and into all holes and recesses with a suitable nonmetallic brush. Flat, woodbacked brushes with soft fiber bristles are recommended for surfaces; round brushes, like those used for washing bottles and test tubes, are recommended for holes and recesses.
- (4) Raise casting from bath, and permit solvent to drain into bath.
- (5) Immerse in rinsing bath of cleaning solvent, rinse, and raise from bath. Position casting to drain dry so solvent is not trapped in holes or recesses. When practical positioning will not permit complete draining, use air jet to blow out any trapped solvent.
- (6) When thoroughly dry, touch up any minor damage to finish. Extensive damage to finish may require complete refinishing.
- (7) Protect casting from dust and moisture pending inspection.

E. Chassis, Wired.

The following cleaning procedures should be used for chassis containing terminal boards, resistor and capacitor assemblies, rf coils, switches, tube sockets, inductors, transformers, and other wired parts.

- (1) Remove dust and dirt from all surfaces, including parts and wiring, using soft-bristled brushes in conjunction with air jet.

**CAUTION: AVOID AIR-BLASTING SMALL COILS, LEADS, AND OTHER DELICATE PARTS BY HOLDING AIR JET NOZZLE TOO CLOSE. USE CAUTION IN USE OF BRUSHES ON DELICATE PARTS.**

**NOTE: When necessary to disturb the dress of wiring and cables, dressing should be noted and wiring and cables restored to dress after cleaning is completed.**

- (2) Clean jacks as instructed in paragraph J.
- (3) Clean sockets as instructed in paragraph N.
- (4) With minimum disturbance of wiring, clean connectors as prescribed in paragraph F.
- (5) Clean wafer switches as directed in paragraph P.
- (6) Clean ceramic or plastic insulators by method given in paragraph I.





- (7) Finish cleaning chassis by wiping down all finished surfaces with a lintless cloth moistened with solvent.
- (8) Dry and polish these surfaces, using a clean, dry, lintless cloth.
- (9) Protect chassis from dust, moisture, and damage before inspection.

F. Connectors.

- (1) Wipe dust and dirt from bodies, shells, and cable clamps using lintless cloth moistened with solvent. Wipe dry with a clean, dry, lintless cloth.
- (2) Remove dust from inserts using a small soft-bristled brush and air jet.
- (3) Wash dirt and any traces of lubricant from inserts, insulation, and contacts using a solvent applied sparingly with a small camel-hair brush.

CAUTION: DO NOT ALLOW SOLVENT TO RUN INTO SLEEVES OR CONDUIT COVERING ANY WIRES OR CABLES CONNECTED TO CONTACT TERMINALS OF THE INSERT.

- (4) Dry insert with air jet.

G. Covers and Shields.

Clean all unfinished, finished, and partly finished sheet metal covers, such as dust covers, inspection covers, chassis covers, and housings, according to applicable steps of procedures used for cleaning castings. Refer to paragraph D.

H. Gears, Metal and Fiber.

If gear trains are disassembled for replacement or defective gears, the gears should be cleaned according to the following procedures:

- (1) Metal gears should be cleaned according to applicable steps of paragraph J.
- (2) Composition or plasticized gears and nylon friction clutches should be cleaned according to procedures given in steps (3) and (4).
- (3) Remove all surface dust and dirt by using a soft-bristled brush in conjunction with air jet.
- (4) Using a clean, lintless cloth lightly moistened with solvent, clean composition gears by wiping them clean.

CAUTION: SOLVENT SHOULD NOT BE USED TO CLEAN GEARS COMPOSED OF OR CONTAINING NYLON. CLEAN THESE GEARS USING A WASHING BATH OF 2 OUNCES OF DETERGENT POWDER TO A GALLON OF WATER AND USING SUITABLE BRUSHES TO REMOVE SURFACE DIRT OR FOREIGN MATTER. GEARS COMPOSED OF EPOXY AND SUPPORTING BASE MATERIAL ARE SUSCEPTIBLE TO SOFTENING IF SOLVENT IS APPLIED FOR TOO LONG OR IF TOO



MUCH SOLVENT IS USED. USE CARE IN CLEANING THESE GEARS WITH SOLVENT, AND DRY WITH CLEAN, LINTLESS CLOTH.

I. Insulators, Ceramic or Plastic.

Clean all ceramic insulators and plastic standoff insulators as follows:

- (1) Wipe clean with clean, lintless cloth lightly moistened with solvent.
- (2) Wipe dry, and polish using dry, clean, lintless cloth.

J. Jacks.

- (1) Remove dust from exteriors with a camel-hair brush and air jet.
- (2) Blow dust from interior of female contact with air jet.

K. Machined Metal Parts.

Detached shafts, keys, pins, collars, worms, springs, and similar machined parts should be cleaned in a suitable cleaning machine, if available; otherwise, proceed as follows:

- (1) Use procedures listed in steps (1), (3), (4), and (5) of paragraph D and steps (2) and (3) of this paragraph.

**CAUTION: TO PREVENT CORROSION, AVOID TOUCHING ANY MACHINED OR FINISHED SURFACES WITH BARE HANDS AFTER CLEANING.**

- (2) Dry in dust-free, dry area or suitable enclosure. Radiant heat used in a ventilated enclosure is recommended for drying, particularly if humidity is high.
- (3) When dry, immediately apply a light coat of MIL-L-7870 lubricating oil to any bare steel surfaces.

L. Mechanical Metal Parts.

The detached miscellaneous mechanical metal parts include ventilating grilles, mounting plates, mounting clamps and brackets, nuts, bolts, screws, washers, handles, fasteners, and hardware. These should be cleaned in a suitable cleaning machine or according to applicable steps of procedures for castings. Refer to paragraph D.

M. Molded Plastic Parts.

Plastic parts include insulating members, terminal boards, mounting blocks, etc. These should be cleaned in the following manner:

- (1) Using an air jet, blow loose dust and dirt from surfaces, holes, and crevices.
- (2) Wipe clean using a lintless cloth moistened with solvent.
- (3) Dry and polish with a clean, dry, lintless cloth.



N. Sockets.

Bakelite sockets are cleaned as follows:

- (1) Remove any resin adhering to silver-plated contacts, using a hardwood stick with a wedge point.

**CAUTION:** DO NOT USE METAL TOOLS TO REMOVE FOREIGN MATTER FROM THESE CONTACTS, AS DAMAGE TO THE CONTACT PLATING INVITES CORROSION, WHICH MAY END ULTIMATELY IN FAILURE OF THE EQUIPMENT. EXISTING CORROSION CONTACTS SHOULD NOT BE DISTURBED. CORROSION INDICATES DAMAGE TO PLATING AND NECESSITY FOR REPLACEMENT OF SOCKET.

- (2) Wash contacts with solvent applied lightly with small, soft-bristled brush.
- (3) Using a lintless cloth moistened with solvent, remove any foreign matter adhering to body of socket or wafer.
- (4) Dry all parts with air jet.

O. Switches, Concentric RF.

Clean all concentric rf switches as follows:

- (1) Carefully remove dust with air jet, gently turning switch rotor while applying air.
- (2) Carefully wash movable and stationary contacts with solvent applied lightly with a small brush.
- (3) Dry carefully with air jet; take care that solvent is not blown into switch bearings.

P. Switches, Wafer.

Clean switches of the wafer type as follows:

- (1) Remove all dust with air jet, turning switch rotor back and forth several times while blowing.
- (2) Wash all contacts and insulation with solvent lightly applied with a small, camel-hair brush.
- (3) Dry with air jet; then repeat wash using clean solvent while turning switch rotor.





## 180R - 12 Antenna Coupler and 309A - 9/9A Antenna Coupler Control - Inspection/Check

### 1. GENERAL.

This section presents instructions necessary to verify, by inspection, the condition of disassembled and cleaned assemblies of the 180R-12 Antenna Coupler and the 309A-9/9A Antenna Coupler Control. Inspection will reveal defects that result from wear, damage, deterioration, or other causes. Detailed inspection procedures are arranged alphabetically. Wear tolerances are listed in the fits and clearances section of this manual where applicable. Refer to the repair section of this manual for replacement of defective parts.

### 2. PROCEDURES.

#### A. Bearings.

##### (1) Bearings, Porous Bronze (Oilite).

Inspect bearings for pitted, scarred, or scuffed load-bearing surfaces. Inspect for burns, corrosion, and any abnormal conditions occurring on load-bearing surfaces.

##### (2) Bearings, Ball.

The following inspection procedure applies to all ball bearings of the shielded type found in this shipment. After the bearing has been cleaned, it is inspected to determine whether it is serviceable, and the bearing is cleaned again. After final cleaning, lubricate for installation. Inspect bearings as outlined below:

**CAUTION: ALL INSPECTION REQUIRES THE UTMOST CLEANLINESS. OPERATORS HANDLING BEARINGS MUST WEAR RUBBER GLOVES OR FINGERSTALLS TO PREVENT CORROSION FROM FINGERPRINTS.**

- (a) Check for blue or purple discoloration (from overheating) of any part of bearing.
- (b) Check for tarnished outer surfaces (indicated by a light discoloration of highly finished surfaces).
- (c) Check for rust.
- (d) Check for pitted, scarred, scuffed, or balled surfaces of bearings, balls, and races.
- (e) Check for flat bearing balls, broken ball separators, flaking or spalling of load-carrying surfaces, and all other abnormal conditions.

In addition to the above inspection, check for undersized od (outside diameter) caused by creepage of outer race in its housing. This applies to all ball bearings



with races that do not separate when the bearing is removed from companion parts. Also, check with a plug gauge for oversize or defective bore caused by the inner race having turned on its shaft and for excessive radial play. Use a suitable radial gauge equipped with a dial indicator calibrated in ten-thousandths of an inch when checking radial play of each bearing. A noise inspection of this type of bearing can be made by mechanical rotation. If motor-driven, the bearing should be lubricated lightly with recommended lubricant (see lubricant chart, figure 501), and rotated at 500 to 1000 r/min. A dental lathe can be used to drive the inner race while the outer race is held in gloved fingers. A used but serviceable bearing will develop a certain amount of noise. A light, uniform noise is to be expected, but loud noise, nonuniform noises such as clicks or buzzes, and vibration originating in the bearing indicate that it is unfit for service. If manually rotated, the bearing must be clean and dry (unlubricated), and the outer race should be spun with the gloved finger while the bearing is held by a bearing holder inserted in its bore. Hold the bearing in several positions while making the check, and listen for any vibration or intermittent resistance.

B. Capacitors.

Inspect capacitors for defects listed in figure 301.

DEFECT	METAL TYPE	MOLDED TYPE	CERAMIC TYPE
Leakage of electrolyte (at case seams or around terminal insulation)	X		
Cracked, broken, or charred terminal insulation	X		
Case damage (dents or holes)	X		
Case damage (cracks or breakage)		X	
Loose, broken, or corroded terminal studs, lugs, or leads	X	X	X
Loose, broken, or poorly soldered connections	X	X	X

Fixed-Capacitor Inspection  
Figure 301

C. Chassis.

Inspect chassis for deformation, dents, punctures, badly worn surfaces, damaged connectors, damaged fastener devices, or damaged handles. Inspect for corrosion and damage to finish that requires work in finishing department.



D. Connectors.

Inspect connector bodies for broken parts, deformed shells or clamps, and other irregularities. Inspect for cracked or broken insulation and for contacts that are broken, deformed, or out of alignment. Inspect for corroded or damaged plating on contacts and for loose, poorly soldered, broken, or corroded terminal connections.

E. Covers and Shields.

Inspect covers and shields for punctures, deep dents, and badly worn surfaces. Inspect for damaged fastener devices, corrosion, and damage to finish that requires work in finishing department.

F. Gaskets and Seals.

Inspect gaskets and seals for deformation and for damage such as tears, creases, rough surfaces, and imbedded foreign matter.

G. Gears, Metal and Fiber.

Inspect gears for broken, chipped, or badly worn teeth. Inspect gear bodies for cracks and deformation. Inspect surfaces for corrosion or other abnormal conditions.

H. Insulators, Ceramic or Plastic.

Inspect ceramic or plastic insulators for evidence of damage, such as broken or chipped edges, burned areas, or foreign material.

I. Jacks.

Inspect jacks for corrosion, rust, loose or broken parts, cracked insulation, bad contacts, and other irregularities.

J. Machined Metal Parts.

Inspect for physical damage to surfaces, corners, and edges. Inspect closely all machined surfaces, holes, bores, counterbores, slots, grooves, shoulder, flanges, teeth, tapped holes, and all threaded members, both male and female, for damage of any sort, including roughness of surface, corrosion, or foreign matter. Inspect plated or finished areas for damage requiring replating or refinishing beyond touchup repair.

K. Mechanical Metal Parts.

Inspect unmachined mechanical metal parts, including mounting plates, chassis, mounting clamps and brackets, nuts, bolts, screws, washers, handles, fasteners, and hardware, for damage or deformation. Inspect for corrosion and any damage that would require replating or refinishing beyond practical touchup.

L. Molded Plastic Parts.

Inspect plastic parts, such as terminal boards, mounting blocks, and insulating members, for signs of corrosion, cracked or charred insulation, and loose or missing



mounting hardware. Inspect for other abnormal indications that might be a source of later breakdown.

M. Laminated Circuit Boards.

Inspect laminated circuit boards for loose, broken, corroded, or poorly soldered terminal connections. Inspect laminated circuits for any evidence of damage, such as burned, broken, cracked, or corroded plating. Inspect for loose mounting of laminated circuit boards.

N. RF Coils.

Inspect rf coils for broken leads and loose, poorly soldered, or broken terminal connections. Inspect for crushed, scratched, cut, bruised or charred windings; corrosion on windings, leads, terminals, and connections; and for damage to forms.

O. Receptacles.

Inspect receptacles for cracked, broken, or charred insulation. Inspect for damage to all other parts, loose or bent contacts, damage to contact plating, corrosion, and other abnormal conditions.

P. Relays.

Inspect relay contacts for burned or pitted areas, welds, misalignment, and improper separation. Check contact support members for deformation causing contact misalignment or improper contact operation. With the finger, test movable contacts for sluggish action or sticking at any point of travel in either direction. Check for damage to armature. Inspect for foreign matter between end of pole piece and armature. Inspect for loose coil, corrosion, loose leads or terminals, and for cuts and damage to coil. Inspect for loose, broken, brittle, or charred insulation on coil or leads between contact-support members and between terminals on relay. Inspect for bent, loose, or broken terminals. Inspect relay mounting and mechanical parts for looseness and physical damage or corrosion.

Q. Resistors.

Inspect fixed composition resistors for cracked, broken, blistered, or charred bodies and loose, broken, poorly soldered, or corroded terminal connections.

Inspect fixed wire-wound resistors for signs of heating; cracked, broken, or charred insulation; loose, poorly soldered, broken, or corroded terminal connections; and loose mounting.

R. Semiconductors.

Inspect diodes, silicon-controlled rectifiers, and transistors for cracked, broken, blistered, or charred bodies. Inspect for loose, broken, poorly soldered, or corroded terminal connections.





S. Sockets.

Inspect sockets for loose, broken, or missing socket-mounting rings. Inspect for cracked, broken, or charred insulation. Inspect for broken, corroded, or deformed contacts and loose, poorly soldered, broken, or corroded connections.

T. Switch Wafers, Rotary.

Inspect switch wafers for bent, weak, broken, or deformed contacts. Inspect for corrosion, damage to contact plating, and cracked or broken contact insulation. Check to see that movable contacts are free to turn properly, without binding, throughout entire travel. Inspect parts mounted on switch wafers for damage.

U. Soldered Terminal Connections.

Inspect soldered terminal connections for cold-soldered or resin joints. These joints present a porous or dull, rough appearance. Check for strength of bond, using the point of a tool. Examine for excess of solder, protrusions from the joint, pieces adhering to adjacent insulation, and particles lodged between joints, conductor, or other parts. Inspect for insufficient solder and unsoldered strands of wire protruding from conductor at joint. Also, look for insulation that is stripped back too far from joint or badly frayed at joint. Inspect for corrosion (verdigris) on copper conductor at the joint.

V. Transformers and Reactors.

Inspect transformers and reactors for signs of excessive heating, damage to case, cracked or broken ceramic insulators, and other irregularities. Inspect for corroded, poorly soldered, or loose terminals and loose, broken, or missing mounting hardware.

W. Wiring.

Inspect open and laced wiring of chassis, terminal boards, and parts of equipment by checking insulation for damage and charring. Inspect wires for breakage and for improper dress in relation to adjacent wiring and chassis.





## 180R - 12 Antenna Coupler and 309A - 9/9A Antenna Coupler Control - Repair

### 1. GENERAL.

This section presents instructions for the replacement or repair of damaged or defective components of the 180R-12 Antenna Coupler and the 309A-9/9A Antenna Coupler Control. Faulty parts usually are detected through procedures in the inspection/check or testing section of this manual. If a new part is to be installed, it should first be inspected and tested.

Most of the repair or replacement instructions apply to disassembled equipment. Refer to the disassembly section for proper instructions.

### 2. PROCEDURES.

#### A. Bearings.

Shielded bearings will rarely need lubrication. If defective, replace with another bearing, new or known to be good.

#### B. Capacitors.

If defective or suspected of causing difficulties, capacitors should be replaced. Clean all connections thoroughly, and apply new solder.

#### C. Connectors.

Straighten bent pins and damaged shell areas. Replace bad connections, broken wires, or wires with split insulation. If connector insert is broken, replace connector.

#### D. Covers and Shields.

Replace damaged screws, straighten any dents or warped sections, and retouch scratched or worn painted surfaces.

#### E. Frame.

Straighten misshapen areas. Remove all corrosion with a suitable cleaner. Retouch silk screening, and refinish where needed.

#### F. Gears, Metal and Fiber.

Metal or fiber gears should be replaced if found defective in inspection or testing. Instructions are given in assembly and disassembly sections of this manual.

#### G. Relays.

Using a relay burnishing tool, burnish relay contacts in use. If inspection reveals pitting or burning of contacts and relay appears to be defective or is in danger of becoming defective, replace relay. Damaged relays are replaced as individual units.



Make a sketch of wire connections to simplify rewiring. Sealed relays cannot be repaired and must be replaced if found defective.

H. Resistors.

Replace defective resistors with components known to be good, and carefully resolder bad connections.

I. Semiconductors.

Use long-nosed pliers as a heat sink while applying heat to a lead of a semiconductor.

J. Soldered Terminal Connections.

Resolder cold-solder or resin joints. Remove all traces of corrosion.

K. Switches.

Switches are usually replaced and seldom repaired. Wafers in wafer-type switches may be replaced separately and so may defective pins in the crimped-pin type of connector. Leads should be properly identified to simplify rewiring.

L. Transformers and Reactors.

Replace or resolder as required.

M. Variable Resistors.

Add a drop or two of contact cleaner (carbon tetrachloride) to windings of a resistor with rough operation. Clean corroded terminals. Replace resistor if shaft is loose in case.

N. Wiring.

Replace damaged wiring with wire of same size and color code. Ensure that no bare wires are touching chassis, other bare wires, or metal cases of other parts.

If any wire is to be removed from a terminal or component, it should be marked with an identification tag to prevent incorrect connections.

NOTE: When necessary to disturb the dress of the wires, carefully ensure that the original wire dress is maintained when replacing wires.



## 180R - 12 Antenna Coupler and 309A - 9/9A Antenna Coupler Control - Assembly

### 1. GENERAL.

This section presents instructions for assembling, aligning, and lubricating the parts of the 180R-12 Antenna Coupler and the 309A-9/9A Antenna Coupler Control. The order of assembly starts with the lowest subassembly or component and proceeds to the completely assembled coupler or control. Required lubricants and sealants are listed in figure 501.

Refer to the fits and clearances section of this manual for particular assembly tolerances and torque values; they are referenced to the specific step of the assembly procedure where they are performed.

Refer to the special tools, fixtures, and equipment section of this manual for a listing of the items required for accurate and efficient assembly of the equipment.

### 2. PRECAUTIONS AND GENERAL TECHNIQUES.

Before soldering any parts, refer to the notes of color coding, placement of leads, and wire insulation made during disassembly.

**CAUTION:** WHEN REPLACING A SOLID-STATE DEVICE, USE A HEAT SINK ON THE LEADS TO PREVENT DAMAGE TO THE SEMICONDUCTOR.

### 3. LUBRICATION DATA.

#### A. General.

Figure 502 lists all items that can be lubricated and specifies the type of lubricant that must be used. Substitutions are not recommended.

#### B. Contamination and Compatibility.

The importance of maintaining the correct lubricant in bearings or other areas cannot be emphasized too strongly. Since failure can result from improper use of lubricants, it is imperative that the correct lubricants be used in the right place and in the right amount.

Using Versilube in equipment in which other lubricants or hydraulic fluids have been used requires caution. Compatibility tests will give an indication of difficulties that may arise. Careful cleaning eliminates most difficulties.

Major contamination problems that arise between Versilube and conventional lubricants or hydraulic fluids are a result of some additives used in these fluids (oxidation inhibitors, corrosion inhibitors, etc.). Many of these additives are not soluble in Versilube and will precipitate as gummy or crystalline sludges when the fluids are mixed. When inadequate cleaning procedures lead to this type of contamination, the result may be high torques, sticking mechanisms, lubrication failure, and ultimate failure of the equipment.



For example, when MIL-L-6085 oil, diester fluid, is mixed with MIL-L-7870 oil, petroleum fluid, a sludge forms that first causes increased torque at low temperatures, then increases it at higher temperatures, and ultimately causes failures of the equipment. The majority of the problems encountered with lubrication are due to mixed lubricants, causing failure of operation at low temperature. Another example is the addition of a drop of petroleum oil to porous bronze bearings impregnated with diester fluid, causing failure of equipment.

C. Bearings.

(1) Oilite Bushings.

This type of bearing has been impregnated with lubricant. Do not lubricate these bearings.

(2) Ball Bearings.

It is recommended that ball bearings not be lubricated; however, under certain circumstances lubrication may be necessary.

CAUTION: BE SURE THAT BALL BEARINGS ARE COMPLETELY CLEAN BEFORE LUBRICATING.

CAUTION: DO NOT OVERLUBRICATE ANY BEARING.

4. DETAILED ASSEMBLY PROCEDURES.

A. 180R-12 Antenna Coupler.

The complete assembly procedure for the 180R-12 coupler is subdivided into major subassemblies and presented in tabular form. Refer to figure 503 to determine the order of reassembly applicable to a particular situation.

B. 309A-9/9A Antenna Coupler Control.

(1) Assembly of Modules.

Refer to the applicable figure listed below for the reassembly procedure of a particular module.

<u>MODULE</u>	<u>FIGURE NO.</u>
Servo control	522
Relay control	523
Servo amplifier	524

(2) Module Replacement. (Refer to figure 1108.)

(a) Plug modules into their associated connectors on main chassis (69) of coupler control.



- (b) Secure relay (4) and servo-control (3) modules by tightening the four red-headed captive screws on each module.
  - (c) Secure servo-amplifier modules (41, 42) with bar clamps (39).
- (3) Dust Cover Replacement. (Refer to figure 1108.)

Slide dust cover (2) over coupler control chassis and module assembly and fasten with four screws on each side and one screw on top.

#### 5. ALIGNMENT PROCEDURES.

Conditions of mechanical alignment for the 180R-12 coupler are included in the sequence of the reassembly procedures. Figure 525 lists these alignment conditions and references their location in the assembly procedures.

The 309A-9/9A control requires no special mechanical alignment procedures during reassembly.

Lubricants and Sealants  
Figure 501

MANUFACTURER	DESIGNATION	*GENERAL USE	COLLINS PART NUMBER	APPLICABLE MIL. SPEC
Esso Standard Oil Co.	Beacon 325 instrument grease	Lubricating sliding electrical contacts.	005-0423-00	MIL-G-3278
The Alpha Molykote Corp.	Molykote M-88 lubricant	Antiseize lubricant for screw threads.	005-0405-00	
General Electric Co.	Versilube G-300 silicone grease	Lubricating metal-to-metal sliding surfaces.	005-0564-00	
Hooker Chemical Corp.	GR 470 Flurolube	Lubricate coated metal gasket.	005-1291-010	
Armstrong Products Co. Armstrong Products Co.	A-2 adhesive A activator	Load coil repair. (For above.)	005-0325-00 005-0328-00	Navy Spec OS-11922
Armstrong Products Co.	A-12 adhesive	Liquid sleeving.	005-0569-00	
Loctite Corp.	Blue Loctite sealant grade C	Liquid staking steel screws no. 4 and smaller in metal.	005-0548-00	MIL-S-22473 Grade C
Loctite Corp.	Brown Loctite sealant grade H	Liquid staking brass screws in metal.	005-0551-00	MIL-S-22473 Grade H
Minnesota Mining & Manufacturing Co.	EC847 cement	Liquid staking discriminator nuts.	005-9042-00	MIL-C-4003
General Electric Co.	Glyptal	Liquid staking screws in nonmetal.	005-0133-00	
Loctite Corp.	Red Loctite sealant grade A	Liquid staking steel screws no. 6 and larger in metal.	005-0547-00	MIL-S-22473 Grade A
Minnesota Mining & Manufacturing Co.	MIL-S-4383 general purpose adhesive	Liquid staking electrical parts hardware.	005-0523-00	MIL-S-4383
Dow Corning Corp.	RTV 731 sealant	Joining strip shielding braid.	005-0737-00	
Dow Corning Corp.	Silastic 140	Gasket cement and seal.	005-0701-00	
Entectic Welding Alloys Corp.	157 BN high temperature solder	Load coil repair.	005-1166-00	MIL-D-70327
Kester Solder Co.	1544 soldering flux	(For above.)	005-1001-00	MIL-D-70327

\*Uses vary. Refer to lubrication data (figure 502) or assembly procedures for specific areas of application.

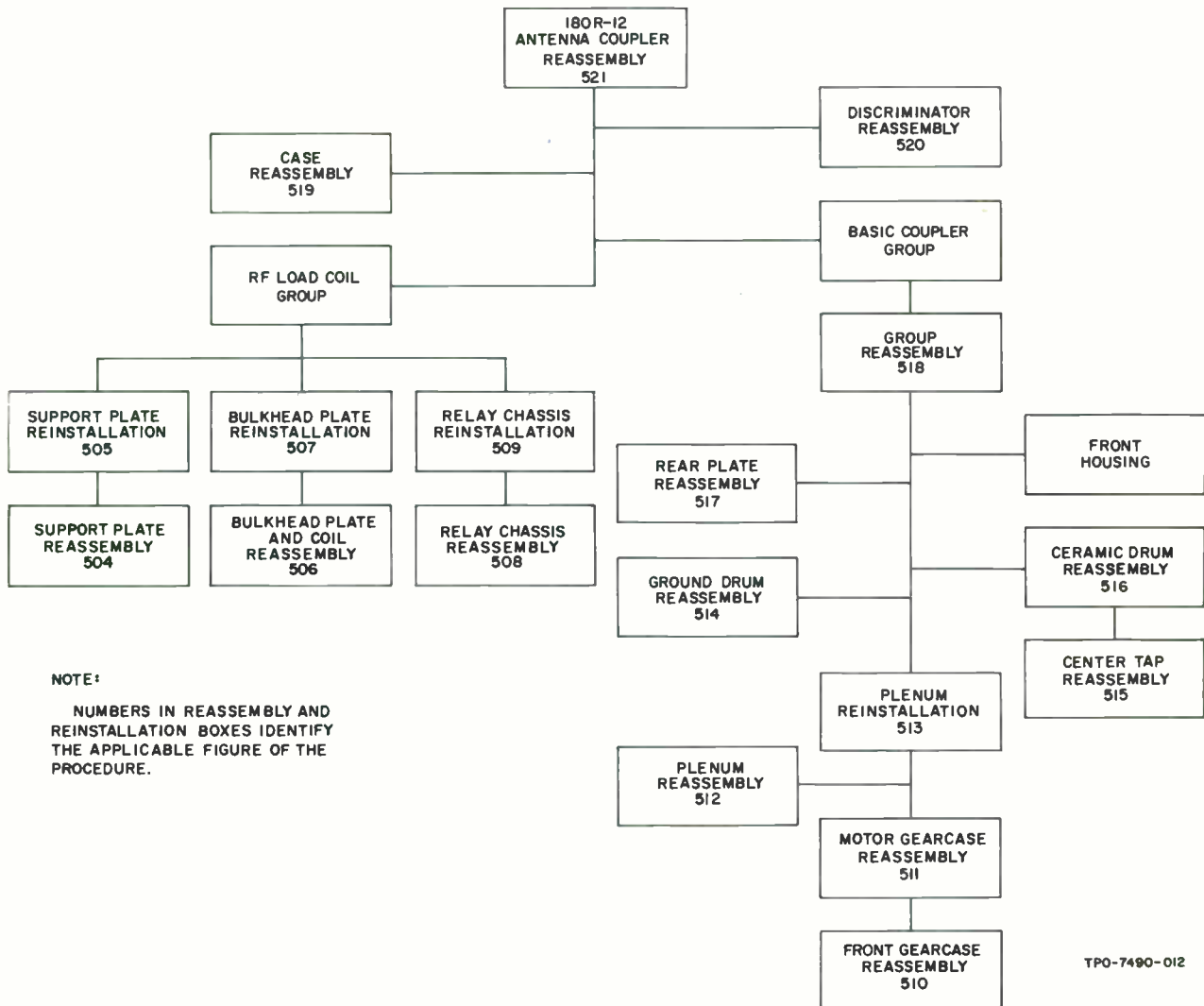






PART NAME	FIGURE-ITEM	AREA OF APPLICATION	LUBRICANT
Metal-to-metal gear trains		Gear teeth	Versilube G-300
Spring contact plate	1104-175	Contact balls	Beacon 325
Tap limit lever	1104-337	Shaft	Versilube G-300
Ground drum end plate	1104-106	Recessed area on front-side of plate	Beacon 325
Secondary switch arm	1104-59	Contact blade	Beacon 325
Tap assembly slipring	1104-148	Metal ring	Beacon 325
Gasket	1102-13	Overall	GR 470 Flurolube
Screw	1102-9	Threads	Molykote M88

Lubrication Data  
Figure 502



180R-12 Antenna Coupler Reassembly, Sequence Chart  
Figure 503

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
1	Support plate Contact assembly P6	88 82	Nut	83	1	Mount contact to plate	Blue Loctite on threads.
2	Pin bracket Spacer	84 85	Screw Locknut	87 86	2 2	Install.	
3	Spark gap arm P/O G1	71	Screw Screw Nut Nut Locknut	76 77 74 75 72	1 1 1 1 1	Secure screws to support plate with nuts.  Mount spark gap arm over screws.	Nut on screw nearest ball of gap arm.
4	Spark gap arm P/O G1	64	Screw Nut Flag washer Locknut	68 67 66 65	2 2 1 1	Secure screws to support plate with nuts.  Mount spark gap arm over screws.  Set gap clearance.	Nut on screw nearest ball of gap arm.  0.165 ±0.015 in. Use paper-base bakelite or Lucite feeler stock to prevent marring silver finish.

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Support Plate Reassembly  
 (Refer to figure 1106.)  
 Figure 504

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
<p><b>CAUTION: MAKE ALL SOLDER CONNECTIONS TO COIL L2 (49), RELAY K5 TERMINAL CONNECTORS (P/O 11), AND RELAY K9 TERMINAL CONNECTORS (P/O 14) WITH HIGH TEMPERATURE SOLDER AND SOLDERING FLUX (FIGURE 501). DETACH RELAY TERMINAL CONNECTORS FROM RELAYS BEFORE SOLDERING.</b></p>							
1	Pin bracket Spacer	35 34	Screw Locknut	39 37	2 2	Loosely install between support plate subassembly and relay chassis (36) of rf load coil group.	
2			Screw Flat washer Locknut Roll pin	61 60 59 56	3 3 3 3	Secure support plate to coil form brackets and pin coil forms.  Tighten hardware of step 1.	Use long Phillips screwdriver through access holes in bulkhead plate (62).  Ensure locator pin hole is not obstructed.
3	<u>MCN 130 and above</u>  <u>MCN 129 and below</u>  Capacitor Capacitor retainer	69 28	Lug Lug Locknut  Lug Lockwasher Screw Lockwasher Flat washer Screw Flat washer Lug Lockwasher Nut	70 70A 72A  70 73 32 30 31 33 31 27 30 29	1 1 1  1 1 1 1 1 1 1 1 1	Secure lugs to spark gap arm mounting screw (76).  Mount capacitor and lug to spark gap mounting screw (76).  Secure capacitor retainer to capacitor (69).  Fasten capacitor retainer (28) to relay chassis.	Grip capacitor shank with open end wrench.



STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
4	Terminal lug	78	Screw Lockwasher Nut	81 80 79	1 1 1	Fasten lug to contact P6 (82).	
5	Cover	1	Screw Nut	3 2	11 3	Install.	

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Support Plate Reinstallation (Sheet 2 of 2)  
(Refer to figure 1106.)  
Figure 505

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
<p><b>CAUTION: MAKE ALL SOLDER CONNECTIONS TO COIL L2 (49) WITH HIGH TEMPERATURE SOLDER AND SOLDERING FLUX (FIGURE 501).</b></p>							
1	Bulkhead plate Ground plate Connector J9	62 24 20	Screw Locknut	22 21	2 2	Fasten connector and ground plate to bulkhead plate.	Ensure all through holes of plates are aligned.
2	Contact assembly P10 Terminal lug	44 45	Flat washer Nut Lockwasher Lockwasher	48 46 47A 47	1 2 1 1	Secure connector to bulkhead plate.	
3	Rf coil L2 Coil form bracket (two required) Coil form bracket (four required)	49 57 58	Screw Nut Roll pin Screw Flat washer Locknut	55 54 56 61 60 59	6 6 3 3 3 3	Fasten brackets to forms (51, 52) of coil assembly.  Mount coil assembly to bulkhead plate and pin.	Rebond coil, if required, with A-2 adhesive and activator (figure 502).  Brackets (57) terminate coil ends.  Bulkhead plate end of coil is end where coil forms protrude the farthest.
4	<u>MCN 130 and above</u> Contact assembly J11 and P/O G2	48A	Screw Locknut	48C 48B	2 2	Mount contact to bulkhead plate.	



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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
5	<u>MCN 130 and above</u>						
	Spacer plate	48D	Screw	48J	2	Mount to bulkhead plate.  Set gap clearance.	Lug mounts to screw farthest from ball of gap arm.  0.100 ±0.005 in. Use paper-base bakelite or Lucite feeler stock so as not to mar silver finish.
	Spark gap arm	48E	Flat washer	48H	2		
	P/O G2		Lug	48F	1		
			Nut	48G	2		

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Bulkhead Plate and Coil Reassembly (Sheet 2 of 2)  
(Refer to figure 1106.)  
Figure 506

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
<p><b>CAUTION:</b> MAKE ALL SOLDER CONNECTIONS TO COIL L2 (49), RELAY K5 TERMINAL CONNECTORS (P/O 11) AND RELAY K9 TERMINAL CONNECTORS (P/O 14) WITH HIGH TEMPERATURE SOLDER AND SOLDERING FLUX (FIGURE 501). DETACH RELAY TERMINAL CONNECTORS FROM RELAYS BEFORE SOLDERING.</p>							
1	Bulkhead plate and coil subassembly		Screw Locknut	40 38	2 2	Loosely fasten bulkhead plate subassembly to relay chassis (36) of rf load coil group.	
2			Screw Flat washer Nut Roll pin	61 60 59 56	3 3 3 3	Secure coil form brackets to support plate (88) and pin coil forms.	Use long Phillips screwdriver through access holes in bulkhead plate.
3	Connector J8	23	Screw Locknut	26 25	2 2	Mount through relay chassis and grounding plate to bulkhead plate.  Secure hardware of step 1.	Ensure plate and chassis cutouts are aligned.
4	<u>MCN 130 and above</u> Capacitor retainer	33A	Screw Lockwasher Lug Screw Locknut	28D 28E 28B 33C 33B	1 1 2 1 1	Mount capacitor retainer and lugs to capacitor.  Secure capacitor retainer to bulkhead plate.	Grip capacitor shank with open end wrench.  Ensure capacitor (28A) remains securely fastened to chassis.
5	Cover	1	Screw Nut	1 2	11 3	Install.	
6						Reconnect terminal connectors to relay terminals.	Use a no. 2 Bristol wrench.





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Relay Chassis Reassembly (Sheet 1 of 2)  
(Refer to figure 1106.)  
Figure 50823-13-0  
Page 513

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
<b>CAUTION: MAKE ALL SOLDER CONNECTIONS TO RELAY TERMINAL CONNECTORS (P/O 11 AND P/O 14) WITH HIGH TEMPERATURE SOLDER AND SOLDERING FLUX (FIGURE 501).</b>							
1	Relay bracket chassis Capacitor	36 5	Screw Lockwasher Flat washer Lug	6 7 7A 5A	1 1 1 1	Install.	Flat washer and lug not used on MCN 129 and below.
2	<u>MCN 130 and above</u> Capacitor  <u>MCN 129 and below</u> Capacitor retainer	28A  28	Screw Lockwasher  Screw Flat washer Lug Lockwasher Nut	28C 28E  33 31 27 30 29	1 1  1 1 1 1 1	Mount capacitor to chassis.  Loosely attach retainer to chassis.	
3	<u>MCN 129 and below</u> Terminal lug	15	Screw Lockwasher Nut	18 17 16	1 1 1	Mount.	
4	Stud terminal	7B	Screw Lockwasher	7C 7D	1 1	Install.	

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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
5	Relay K9	14	Backing nut Lockwasher Nut	P/O 14 P/O 14 P/O 14	1 1 1	Install.	Position relay so common contact terminals are toward center and normally closed contact terminals do not extend beyond side of relay chassis.
6	Relay K5	11	Backing nut Lockwasher Nut	P/O 11 P/O 11 P/O 11	1 1 1	Install.	Position common contact terminal toward relay K9.
7	Capacitor C15	19	Nut	P/O 19	1	Mount.	Brown Loctite on threads.
8	<u>MCN 150 and above</u> Stiffener block	16	Screw Lockwasher Lug	18 17	3 3 1	Install.	Lug mounts under screwhead nearest flange of bracket chassis.





STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
<b>CAUTION: MAKE ALL SOLDER CONNECTIONS TO COIL L2 (49), RELAY K5 TERMINAL CONNECTORS (P/O 11), AND RELAY K9 TERMINAL CONNECTORS (P/O 14) WITH HIGH TEMPERATURE SOLDER AND SOLDERING FLUX (FIGURE 501). DETACH RELAY TERMINAL CONNECTORS FROM RELAYS BEFORE SOLDERING.</b>							
1	Relay chassis subassembly		Screw Locknut	40 38	2 2	Loosely attach relay chassis subassembly to bulkhead plate (62) of rf load coil group.	Ensure grounding plate (24) is mounted to bulkhead plate.
2	Pin bracket Spacer	35 34	Screw	39	2	Install between relay chassis and support plate (88).	Ensure locator pin hole is not obstructed.
			Locknut	37	2		
3	Connector J8	23	Screw Locknut	26 25	2 2	Mount through relay chassis and grounding plate to bulkhead plate (62).	Ensure plate and chassis cutouts are aligned.
4     (Cont)	<u>MCN 130 and above</u>  Capacitor retainer	33A	Screw	28D	1	Mount capacitor retainer and lugs to capacitor.  Secure capacitor retainer to bulkhead plate (62).	Grip capacitor shank with open end wrench.  Ensure capacitor (28A) remains securely fastened to retainer and chassis.
			Lockwasher	28E	1		
			Lug	28B	2		
			Screw	33C	1		
			Locknut	33B	1		

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Relay Chassis Reinstallation (Sheet 1 of 2)  
(Refer to figure 1106.)  
Figure 509

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES	
	NAME	ITEM	NAME	ITEM	QTY			
4 (Cont)	<u>MCN 129 and below</u> Capacitor	69	Lug	70	1	Mount capacitor and lug to spark gap mounting screw (76).	Grip capacitor shank with open end wrench.	
			Lockwasher	73	1			
4 (Cont)	Capacitor retainer	28	Screw	32	1	Secure capacitor re-tainer to capacitor (69).		
			Lockwasher	30	1			
			Flat washer	31	1	Fasten capacitor re-tainer to relay chassis.		
			Screw	33	1			
			Flat washer	31	1			
			Lug	27	1			
				Lockwasher	30	1		
				Nut	29	1		
5	Cover	1	Screw	3	11	Install.		
			Nut	2	3			
6						Reconnect terminal connectors to relay terminals.	Use a no. 2 Bristol wrench.	





STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
1	Main post (four required)	173	Screw	174	4	Install to rear side of main gearplate (286) at holes A (figure 526).	Red Loctite on threads. Grip posts with pin punch inserted through tightening holes.
2	Tuner core	171	Screw	172	6	Install to rear side of main gearplate at hole B (figure 526).	Red Loctite on threads.
3	Blower B3	269	Screw	270	3	Install in main gearplate at hole C (figure 526).	Red Loctite on threads. Terminal 5 toward plate center.
4	Tap motor B2	267	Screw	268	4	Install to rear side of main gearplate at hole D (figure 526).	Blue Loctite on threads. Terminal 1 toward corner of plate.
5	Tap lock solenoid Spacer sleeve (two required)	256 257	Screw Flat washer	258 260	2 1	Mount on front side of main gearplate at holes E and F (figure 526).	Spacers between solenoid and gearplate. Flat washer under head of screw fastened to hole E. Solenoid dog not engaged to motor spline shaft.

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Front Gearcase Reassembly (Sheet 1 of 6)  
(Refer to figure 1104.)  
Figure 510

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
6	Torsion bar assembly	238	Ball bearing	242	1	Seat bearing in main gearplate hole G (figure 526).  Insert torsion bar through bearing from front.	Larger face of bearing to coupler front.
7	Ball bearing Ball bearing	249 251				Seat in holes H and J (figure 526) from front.	
8	Spur gearshaft	252				Insert into bearing at hole J (figure 526).	Larger gear toward bearing.
9	Spur gearshaft	250				Insert into bearing at hole H (figure 526).	Smaller gear toward bearing. Mesh with motor spline shaft and gear installed in step 8.
10	Tap stop gear Gearshaft (shaft (247) has shorter tongue than shaft (236))	246 247	Setscrew	248	2	Fasten gear to shaft.  Insert into bushing at hole K (figure 526).	Shaft tongue on stop plate side of gear. Setscrews seat in recessed portion of shaft. Blue Loctite on threads. Use no. 4 Bristol wrench.  Flatside of gear toward bushing. Mesh with gear (253) at hole J.



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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
11	Coil spur gear Stopblock Gearshaft	232 230 236	Screw Setscrew	231 233	1 2	Fasten stopblock to hub side of gear. Fasten gear to shaft.  Insert into bushing at hole L (figure 526).  Rotate torsion bar clockwise to solid stop and counterclockwise to solid stop (figure 528).	Blue Loctite on threads. Flat-side of gear toward shaft tongue. Setscrews seat in recessed portion of shaft. Use no. 4 Bristol wrench. No Loctite on setscrews.  Gear hub toward bushing. Mesh with torsion bar gear (239).  Stopblock must clear cam except when it solidly engages cam flat. Correct by disengaging gear (232) from gear (239), rotating slightly and re-engaging.
12	Tap spur gear-shaft	243				Insert through front of main gearplate at hole M (figure 526).	Bearing is installed later.

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Front Gearcase Reassembly (Sheet 3 of 6)  
(Refer to figure 1104.)  
Figure 510

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
13	Tap stop lever assembly	245				<p>Install into bushing at hole N (figure 526).</p> <p>Gently hold stop lever away from gear (250) while rotating gear (252) clockwise, and observe engagement of stop lever pawl and stop cup of gear (250) when lever is actuated by stop plate of gear (246).</p>	<p>Side opposite shoulder pin against face of bushing and stop pawl toward center of gear-plate.</p> <p>Actuated lever pawl just begins to enter stop cup (figure 527). Correct by removing stop lever, disengaging gear (250 or 246), rotating slightly, reengaging and reinstalling lever.</p>
14	Ball bearing Ball bearing Ball bearing	237 249 251				Place on front ends of gearshafts mounted in holes G, H, and J (figure 526).	Larger faces of bearings toward gears.
15	Secondary gear-plate Lever spring Spacer (three required)	224 219 223	Screw Lockwasher	225 226	3 3	<p>Set secondary gearplate in place.</p> <p>Attach lever spring between shoulder pins on stop lever and secondary gearplate.</p>	Engage three bearings and tap stop lever pivot shaft.
(Cont)							





STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
15 (Cont)						<p>Rotate gear (252) clockwise and observe engagement of stop lever pawl and stop cup of gear (250) when lever is actuated by stop plate of gear (246).</p> <p>Secure secondary gearplate to main gearplate at holes P (figure 526).</p>	<p>Stop lever pawl is fully drawn into stop cup. Gear backs off freely when clockwise force is removed from gear (252). Correct by removing shaft (247), adjusting mesh between gears (246, 247), and re-installing shaft.</p> <p>Spacers mount between gearplates. Insulation sleeving over spacer nearest tap lock solenoid. Turn spacers to eliminate binding of gear train.</p>
16	Terminal stud	217	Stud	218	1	Install to front of secondary gearplate.	Blue Loctite on threads. Crimp threads of new stud midway between ends with cutters. Ensure threaded stud does not protrude so as to interfere with gear train.

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Front Gearcase Reassembly (Sheet 5 of 6)  
 (Refer to figure 1104.)  
 Figure 510

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
17	Switch wafer	212	Ceramic spacer	213	4	Assemble and mount to front of secondary gearplate.	Blue Loctite on threads. Contacts toward front. Red dots toward tap lock solenoid. Ensure movable contact sections are set to the same contact position when engaged to the tongue of shaft (236).
	Switch wafer	214	Ceramic washer	216	2		
			Screw	215	2		
18	Roller support	281	Screw	283	4	Assemble and install to rear side of main gearplate at four holes R (figure 526).	Roller supports fit inside tires. Larger face of bearing against rear side of main gearplate.
	Ball bearing	282	Lockwasher	285	4		
	Insulator tire	280	Flat washer	284	4		
	Roller shafts (four of each required)	279					



STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
1	Post (two required)	200	Stud	201	2	Mount to rear side of main gearplate at two holes S (figure 526).	Crimp threads of new studs midway between ends with cutters. Blue Loctite on threads. Grip post with pin punch inserted through tightening hole.
2	Coil motor B1 Motor mount gearplate  MCN 165 and <u>above</u>  Shim	203 205   203A	Screw	204	4	Install shim and motor in recess of motor mount.	Ensure that holes in shim align with holes of motor mount when shim key is engaged. Blue Loctite on threads. Position motor terminal 1 toward point of tangency formed by motor and motor mount circumferences.
3	Coil lock solenoid K4 Spacer plate	195  196	Screw Lockwasher Flatwasher	197 198 199	2 2 1	Install on flat face of motor mount.	Position toothed dog toward motor shaft but do not engage. Spacer plate between solenoid and motor mount. Flat washer on screw farthest from center of motor mount.

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Motor Gearcase Reassembly (Sheet 1 of 7)  
 (Refer to figure 1104.)  
 Figure 511

23-13-0  
 Page 523

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
4	Ball bearings	182 184A 192 193				Seat bearings into motor mount from side opposite motor.  Attach motor mount group to two posts.	Medium sized bearings seat in center hole and counterbored hole. Large bearing also seats in counterbored hole. Small bearing seats in remaining hole.  Motors are back to back and double bearings support free end of torsion bar. Fasten motor mount to posts temporarily with any two screws; screws (15) can be used.
5	Torsion bar gear	189	Shim washer Retaining ring	191 190	3 1	Install on torsion bar.	Flat face of gear toward motor mount. Splines interlock. Two shim washers between gear and bearing. One shim washer between gear hub and retaining ring.
(Cont)							





STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
5 (Cont)						<p>Set end play.</p> <p>Lubricate gear teeth.</p> <p>Remove two temporary screws used in step 4 to hold motor mount to posts.</p>	<p>Concave surface of retaining ring toward shim. Tap torsion bar shaft with plastic mallet to ensure that bearings are seated.</p> <p>Add or remove shims to provide minimum end play without binding.</p> <p>Versilube G-300.</p>
6	Gearshaft Gearshaft	183 185	Shim washer	184C	3	<p>Install gear (183) into small bearing.</p> <p>Install short shaft of gear (185) into center bearing.</p> <p>Lubricate all gear teeth.</p>	<p>Mesh larger gear with motor spline shaft.</p> <p>Three shim washers between gear and bearing. Mesh with gears (183, 189).</p> <p>Versilube G-300.</p>

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Motor Gearcase Reassembly (Sheet 3 of 7)  
(Refer to figure 1104.)  
Figure 511

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
7	Drum support gearplate Ball bearing Ball bearing Spacer sleeve (two required)	178 182 184 179	Shim washer Screw Lockwasher	184B 180 181	AR 2 2	Mount drum support gearplate.  Set end play.  Secure drum support gearplate.	Seat bearings to flat side of drum support gearplate. Place shim washer on gearshaft (188).  Add or remove shims from center gearshaft (188) to provide 0.001- to 0.004-in. end play.  If necessary, turn spacers when tightening screws to permit smooth operation of gear cluster.
8	Wire harness [including connector J7 (295) thermostat (276) cable button (220)]		Screw Lockwasher Screw Flat washer	277 278 221 222	3 3 1 1	Rotate harness.  Perform wiring of front and motor gearcases.  Install thermostat in main gearplate hole V (figure 526).	Center branch through front of main gearplate hole T (figure 526). End branch through secondary gearplate hole and main gearplate hole U (figure 526).  Silk-screened lettering toward plate edge.
(Cont)							



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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
8 (Cont)						<p>Fasten harness button to secondary gearplate.</p> <p>Set coil lock disengagement clearance.</p> <p>Check breakaway torque of output shaft (188).</p> <p>Check coil gear lock electrically.</p>	<p>Blue Loctite on all threads.</p> <p>Position solenoid so that 0.005-in. feeler stock is pinched between spline shaft of motor and toothed dog of solenoid when solenoid resembles energized condition.</p> <p>12 in-oz minimum. Adjust coil lock solenoid (195) if necessary</p> <p>Coil gear cluster can be moved freely when 28 vdc is applied to coil lock solenoid (see caution).</p>
<p><b>CAUTION:</b> DO NOT ALLOW COIL LOCK SOLENOID TO BE ENERGIZED LONGER THAN 30 SECONDS UNLESS THE APPLIED VOLTAGE IS REDUCED TO 10 VDC AFTER SOLENOID IS ENERGIZED.</p>							
9	Spring contact plate	175	Screw Lockwasher	176 177	4 4	<p>Install in recess of drum support gear plate.</p> <p>Lubricate contact balls.</p>	Beacon 325.

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Motor Gearcase Reassembly (Sheet 5 of 7)  
(Refer to figure 1104.)  
Figure 511

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
10	Support cylinder Upper roller assembly (two required) Lower roller assembly (two required)	109 97 thru 99 102 thru 104	Screw Lock washer Screw Screw Screw	95 96 111 110 100	2 2 4 8 2	<p>Attach roller assemblies to support cylinder.</p> <p>Slide support cylinder assembly over motor gearcase.</p> <p>Fasten to main gear-plate.</p> <p>Fasten to motor mount and drum support gear-plate.</p> <p>Secure lower roller assemblies to main gearplate at two holes W (figure 526).</p>	<p>Rollers to drum side of mounting flange. Upper rollers mount in two largest holes 90° apart. Fasten upper rollers with screws (95) and lockwashers (96). Lower rollers set in holes 180° away from opposing upper rollers.</p> <p>Upper roller assemblies nearest short edge of main gearplate.</p> <p>Blue Loctite on threads.</p> <p>Blue Loctite on threads.</p> <p>Blue Loctite on threads. Gently rotate gears (250, 252) to reveal hidden roller assembly through notch in gear lightening holes (figure 527).</p>





STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
11	Tap pinion gear Ball bearing	113 244	Setscrew	114	2	<p>Insert bearing into rear of main gearplate at hole M (figure 526).</p> <p>Install tap pinion gear on square gearshaft.</p>	<p>Supports square gearshaft (243).</p> <p>Gear (243) to fully mesh with gear (250) when tap pinion gear is against bearing (244). Setscrews must seat on flats of square gearshaft. Blue Loctite on threads.</p>

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Motor Gearcase Reassembly (Sheet 7 of 7)  
(Refer to figure 1104.)  
Figure 511

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Page 529

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
1	Switch block	338	Retaining ring	336	1	Lubricate lever pivot shaft.	Versilube G-300.  Burr side of ring (332) away from roller.
	Jam nut	335	Retaining ring	332	1		
	Adjusting screw	334				Assemble switch block mechanism.	
	Lever	337					
	Roller	333					
2	Switch mounting plate	349	Screw	339	2	Mount switch block mechanism to mounting plate.	
			Lockwasher	340	2		
3	Microswitch Mounting bracket	324 329	Screw	338	2	Assemble microswitch and bracket.	Glyptal on threads.
			Flat washer	326	2		
			Composition washer	327	2	Fasten assembly to switch mounting plate.	
			Nut	325	2		
			Screw	330	2		
			Lockwasher	331	2		
4	Hexpost	341	Screw	343	1	Mount to switch mounting plate.	
			Lockwasher	344			
5	Cylinder post Air plenum Hexpost	361 365 341	Stud	342	1	Fasten cylinder post to air plenum and switch mounting plate.	Crimp threads of new stud midway between ends with cutters. Blue Loctite on stud threads.
			Screw	342	3		
			Lockwasher	363	3		
			Flatwasher	364	3		
6	Switch bracket (two required)	315	Screw	316	4	Install two switch brackets to plenum.	
			Lockwasher	317	4		
			Flat washer	318	4		





STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
7	Pressure switch	311	Screw Composition washer Flat washer	212 313 314	2 2 2	Mount to switch brackets.	Common terminal toward microswitch. Glyptal on threads.
8	Terminal stud	308	Screw Lockwasher	309 310	1 1	Mount.	
9	Thermoswitch S4	305	Screw Lockwasher	307 307A	2 2	Mount.	
10			Screw Lockwasher Flat washer Screw Lockwasher Lug Flat washer	350A 351A 352A 350 351  352	2 2 2 1 1 1 1	Secure switch mounting plate (349) to air plenum (365).	
<p><b>NOTE:</b> Steps 11 through 15 apply only if shielding strip braid (357) is being replaced or reformed.</p>							
11	Gasket retaining plate Main gearplate	271 286	Screw Screw Screw	272 272A 288	2 2 1	Pinch hem of braid against gearplate with retaining plate and fasten.	Attach braid so that only 2 to 3 inches extends beyond retaining plate along short edge of gearplate and remainder of braid hangs along long edge of gearplate.
(Cont)							

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Plenum Reassembly (Sheet 2 of 3)  
(Refer to figure 1104.)  
Figure 512

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
11 (Cont)						Fasten plenum to main gearplate.  Remove blower, if installed.	Screw fastens to cylinder post (361).
12	Sleeve nut	358	Screw Lockwasher Flat washer	359 360A 360	3 3	Install, pinching hem of braid against air plenum.	
13	Support strip Backing strip	346 345	Screw Lockwasher Flat washer Flat washer	347 347A 347B 348	5 5 5	Pinch hem of braid between support and backing strips and secure to switch mounting plate (349).	Flat washer (348) between braid and switch mounting plate.
14	Backing strip	354	Screw Lug Flat washer Lockwasher Nut	356 353 355A 355	4 2 2 4 4	Install, pinching hem of braid between backing strip and air plenum.	Cut off excess braid so that ends butt. Lugs mount to middle screws. Flat washers mount to outside screw. Apply RTV 731 sealant to butt joint and allow to dry.
15	Gasket retaining plate (from step 11)	271	Screw Screw	272 272A	2 2	Remove air plenum subassembly from main gearplate.  Remount blower to main gearplate.	Figure 510, step 3.





STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
1	Plenum subassembly					Position plenum sub-assembly around wire harness branch and against rear of main gearplate (286).	
	Gasket retaining plate	271	Screw	272	2	Install gasket retaining plate to rear of main gearplate.	Gasket hem between retainer and plate. Shorter screws nearest blower.
			Screw	272A	2		
			Lockwasher	273	4		
			Screw	288	1		
			Lockwasher	289	1		
Screw	287	1					
						Secure plenum post (361) to main gearplate.	Red Loctite on threads.
						Secure plenum post (358) to main gearplate.	
2	Cable clamp	261	Screw	265	1	Secure harness cable clamp, spacer, main gearplate, gasket, and gasket retaining plate at main gearplate hole X (figure 526).	Flat washer on each side of cable clamp. Blue Loctite on threads.
			Flat washer	264	2		
			Spacer	262	1		
			Nut	263	1		
			Shield tube	32	1		
(Cont)						Dress wire harness along post (361) in plenum.	Wrap with lugs (353).

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 Plenum Reinstallation (Sheet 1 of 4)  
 (Refer to figure 1104.)  
 Figure 513  
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 Page 533

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
2 (Cont)						Perform wiring of plenum.	Feed leads for connector P8 (26) through shield tube (32) and insert through large hole. Feed tuner bypass coax through smaller hole.
3	Series C solenoid K2	320	Spacer Flat washer Lockwasher Nut	321 323 322	2 2 2 2	Electrically connect and install in plenum.	
4	Series C solenoid K1	319	Spacer Flat washer Lockwasher Nut	321 323 322	2 2 2 2	Electrically connect and install in plenum.	
5	Support strip Backing strip	346 345	Screw Lockwasher Flat washer Flat washer	347 347A 347B 348	5 5 5 1	Pinch hem of braid between support and backing strips and secure to switch mounting plate (349).	Flat washer (348) between braid and switch mounting plate at corner hole.
6	Solenoid arm (two required)	168	Roll pin	170	2	Install to shafts of solenoid K1 and solenoid K2.	Match arms to shafts (Marked at disassembly). Hammer surfaces of arms approximately face each other. Align holes in arms and shafts and pin.





STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
<b>NOTE:</b> Steps 7 through 11 apply only if solenoid arms (168) or solenoids (319, 320) are being replaced.							
7	Solenoid arm (two required)	168	Setscrew	169	4	Attach solenoid arms to shafts of solenoids.	Hammer surfaces of arms approximately face each other.
8	Rear plate subassembly (from figure 517)		Screw Flat washer Screw Flat washer	14 14A 15	5 5 2 2	Mount to four posts (173), one post (358), and two hexposts (341).	Flat washers between rear plate and posts. Striker screws (57) of primary switch arm between hammer faces of solenoid arms (168).
9						Position switch arm assembly and adjust solenoid arm (168) associated with solenoid K2 (320).	Strike screw (57) latched against hammer face of solenoid K2 arm by snap action of spring (53). Contact blade of secondary switch arm (59) to penetrate gap between balls of contacts (45) as shown in figure 533.
(Cont)							

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Plenum Reinstallation (Sheet 3 of 4)  
(Refer to figure 1104.)  
Figure 513

Plenum Reinstallation (Sheet 4 of 4)  
(Refer to figure 1104.)  
Figure 513

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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
9 (Cont)						Energize solenoid K2 (320) and adjust solenoid arm (168) associated with solenoid K1 (319).	Apply 28 vdc to solenoid (see caution). Free play of blade, measured at wipe point, should not exceed 0.010 in.
<p><b>CAUTION:</b> DO NOT ALLOW SOLENOID (K1 OR K2) TO REMAIN ENERGIZED FOR MORE THAN 30 SECONDS. SOLENOID ARM TRAVEL WHEN MOVED MANUALLY IS NOT THE SAME AS WHEN ENERGIZED.</p>							
10			Roll pin	170	2	Drill and pin solenoids arms to solenoid shafts.	0.062- to 0.065-in. diameter holes. Remove set-screws.
11			Screw Flat washer Screw Flat washer	14 14A 15	5 5 2 2	Remove rear plate subassembly.	



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Ground Drum Reassembly  
(Refer to figure 1104.)  
Figure 514

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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
1	Sleeve spacer	94	Screw	91	1	Fasten spring to shaft hub.	Spacer inside coils of spring.
	Torsion spring	90	Lockwasher	92	1		
	Output shaft hub	88	Flat washer	93	1		
2	Drum end plate	106	Screw	91	1	Fasten free end of spring to end plate.	
			Lockwasher	92	1		
			Flat washer	93	1		
3	Spur gear	87	Screw	89	1	Fasten gear to shaft hub.	Shorter screw nearest spring mounting hole. Blue Loctite on threads.
			Screw	89A	1		
4	Ground drum	107	Screw	108	4	Lubricate recess on front side of end plate.  Fasten drum to end plate.	Beacon 325.  Blue Loctite on threads.
5	Ribbon clip	105				Scrape inner surface of drum in area of clip mounting slots.  Snap clip into slots from inside of drum.	Ribbon slot in clip is clockwise as viewed from front.



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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
<p><b>CAUTION:</b> ENSURE THE CORRECTNESS OF THE AXIAL (FORE AND AFT) LOCATION OF THE INDIVIDUAL SPACERS ABOUT THE ROLLERS ON THE ROLLER SHAFTS AND THE RADIAL RELATIONSHIP OF THE FOUR SPACER PAIRS.</p> <p>DO NOT USE ANY SUBSTITUTE FOR THE LOCTITE SPECIFIED.</p>							
1	Roller (four required) Spacer (0.085 in.) (four required) Ball bearing (eight required)	156 157 155				Assemble four rollers.	Figure 530, detail E.
2	Ring gear Shaft (two required)	165 163	Screw	164	2	Fasten two shafts to ring gear.	Locate to opposing ears. Brown Loctite on threads.
3	Shoulder pin (two required)	162				Insert two shoulder pins through holes in remaining ears of ring gear.	Place assembly on bench surface so that shafts and pins point upward.
4	Spacer (0.032 in.) Spacer (0.157 in.) Slipring	159 152 148	Screw	149A	1	Temporarily mount one roller assembly from step 1 onto a shoulder pin.	Position spacers and contact mounting ear as shown in figure 530 (see caution).





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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
5	Spacer (0.157 in.)	161	Screw	150	3	Mount remaining three roller assemblies.	Position spacers axially and radially as shown in figure 530 (see caution). Flat of shoulder pin (162) should face outward (away from ceramic drum center). Brown Loctite on screw threads.
	Spacer (0.032 in.)	154					
	Spacer (0.115 in.)	160					
	Spacer (0.074 in.)	153					
	Spacer (0.074 in.)	158					
	Spacer (0.115 in.)	151					
6	Primary contact	146	Screw	149	1	Mount contacts.	Figure 530, view BB. Flat of shoulder pin (162) should face outward (away from ceramic drum center).
	Secondary contact	147	Lockwasher	150A	2		

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Center-Tap Reassembly (Sheet 2 of 2)  
(Refer to figure 1104.)  
Figure 515

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
1	Tap stop plate Helical spring	133 138				Compress and install four springs.	
2	Output shaft	140	Screw Screw Lug Flat washer Lockwasher Nut	144 145 139 143 142 141	1 3 1 1 1 1	Fasten to tap stop plate.	Lug mounting screw (longer screw) locates in hole near rim stop (figure 531). Glyptal on threads of three shorter screws.
3	Spur gear Ceramic drum	132 167	Screw Composition washer Flat washer Nut	137 136 135 134	6 6 6 6	Mount gear to tap stop plate and fasten to ceramic drum.  Check spring-loaded rim stop action.	Ribbon entrance hole of drum locates to the trailing edge side of rim stop nearest lug (139) (figure 531). Composition washers against ceramic drum. Blue Loctite on threads.  Stop rim rotary displacement is 1/4 of an in. minimum with spring return.
4  (Cont)	Ribbon	166				Insert through ribbon entrance hole and solder to wire connected to lug (139).	Dress wire connected to lug against inside wall of ceramic drum.



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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
5 (Cont)						Check tap stop action and position.	Stop pins of center-tap assembly strike rim stops of ceramic drum simultaneously and tap contact is 1/2 to 3/4 of an in. away from ribbon entrance hole.



STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
1	Rear plate Switch housing	83 70	Screw	71	1	Install housing from rear in rear plate hole A (figure 529).	Glyptal on threads.
2	Upper pilot housing	24	Screw	25	2	Install from front in hole B (figure 529).	Blue Loctite on threads.
3	Lower pilot housing	81	Screw	82	2	Install from front in hole C (figure 529).	Blue Loctite on threads.
4	Spring anchor pin	54	Screw Flat washer	55 56	1 1	Install on rear side at hole D (figure 529).	Blue Loctite on threads.
5	Support bearing	13				Seat into hole E from rear (figure 529).	
6	Switch contact (two required) Drum contact Contact block Shim block Backing shim	45 44 46 50B 47	Screw Lockwasher Nut	51 49 48	2 2 2	Mount to rear side of backplate at holes F (figure 529).	Locate screw- heads and backing shim to front side of rear plate. Drum contact (44) between switch contacts (45) and forward of spreader shim block (50B).

(Cont)

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Rear Plate Reassembly (Sheet 1 of 6)  
(Refer to figure 1104.)  
Figure 517

Rear Plate Reassembly (Sheet 2 of 6)  
(Refer to figure 1104.)  
Figure 517

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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
6 (Cont)						Insert stub shaft of special contact positioning gauge into switch housing (70) and slip elongated hole over spring anchor pin (54). Position balls of contacts (45) against side of gauge and secure.	Outer surface of contact balls to be $0.363 \pm 0.008$ in. from line connecting centers of spring anchor pin (54) and switch housing (70) (figure 533).
7	<u>MCN 129 and below</u> Switch contact (two required) Contact block Backing shim	45A 46A 47	Screw Lockwasher Nut Shim washer	51A 49A 48A 50A	2 2	Mount to rear side of rear plate at holes G (figure 529).  Set clearance between two sets of contact balls.	Locate screw-heads and backing shim to front side of rear plate.  Shim washers between contacts (45A).  $0.075 + 0.005, -0.010$ in.
8	Lower capacitor retainer/connector P11	77	Screw Lockwasher	78 79	2 2	Fasten to rear side of rear plate at holes H (figure 529).	
9	Capacitor C3	73	Screw Lockwasher	74 75	1 1	Mount to capacitor retainer (77).	





STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
10	Upper capacitor retainer	76	Screw Lockwasher Lug Screw Lockwasher Flat washer	74 75 72 78 79 80	1 1 1 2 2 2	Fasten to capacitor and rear plate.	
11	Postnut (two required)	17	Screw Flat washer	19 19B	2 4	Fasten to rear side of backplate at holes J (figure 529).	Flat washer on each side of rear plate.
12	Coax connector P9	16	Screw	18	2	Mount to postnuts (17).	Insulation sleeving over postnut nearest center of rear plate.
13	Postnut (two required)	28	Screw Flat washer	39 31	2 2	Mount to rear side of rear plate at holes K (figure 529).	Flat washer between rear plate and post. Blue Loctite on threads.
14	Primary switch arm	58	Screw	57	2	Install two flathead screws to switch arm.	Glyptal in threaded holes.
15	Switch arm Shoulder pin	59 64	Screw Flat washer	65 66	1 1	Mount shoulder pin to switch arm.	Blue Loctite on threads.

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Rear Plate Reassembly (Sheet 3 of 6)  
(Refer to figure 1104.)  
Figure 517

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
<p><b>CAUTION:</b> USE CARE IN PERFORMING STEPS 16 AND 17 SO AS NOT TO DESTROY THE INTERLOCKING SPLINES IN THE PIVOT HOLES OF SWITCH ARMS (58, 59). IF EITHER OR BOTH SWITCH ARMS ARE BEING REPLACED WITH NEW ONES, ENSURE CORRECTNESS OF 22° ±1/2° OFFSET ANGLE BEFORE PRESSING SHAFT (69) INTO SWITCH ARMS TO FORM THE INTERLOCKING SPLINES.</p>							
16	Shaft	69	Screw Flat washer Flat washer	60 61 62	1 1 1	Slide primary switch arm onto shaft and fasten.	Match and engage interlocking splines. Blue Loctite on threads.
17	Support bearing (two required) Ball bearing (two required)	67 68	Shim washer Flat washer Screw Flat washer	63 62 60 61	4 1 1 1	Assemble and install switch arms (58, 59) to rear plate maintaining 22° offset angle (figure 533) and engaging splines.  Add or remove shim washers to adjust endplay.	Larger faces of bearings toward switch arms. Ball bearings seat in switch housing (70). Blue Loctite on screw threads.  0.002 to 0.004 in. without binding.
18	Switch contact (two required) Contact block Shim block Backing shim	45A 46 50B 47	Screw Shim washer Lockwasher Nut	51 50 49 48	2 2 2 2	Mount to rear side of rear plate at holes L (figure 529).  Align contacts (45A).	Locate screw-heads and backing shim to front side of rear plate.  Two sets of contacts (45,45A) must make and break simultaneously with blade of secondary switch arm.
(Cont)							





STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
18 (Cont)						<p>Lubricate contact blade of switch arm.</p> <p>Check switching torque at switch arm pivot.</p> <p>Check pressure of contact balls on switch blade.</p>	<p>Beacon 325.</p> <p>8 in-oz maximum to make and to break.</p> <p>30 to 75 grams per individual contact. Add or remove contact shims as necessary.</p>
19	Spring	53	Retaining ring	52	2	Attach spring to secondary switch arm and rear plate anchor pins.	Position burr side of retaining rings away from spring.
20	Idler gear Ball bearing (two required) Shaft Idler support	37 36 38 35	Retaining ring	34	1	Mount idler gear to shaft.	Bearings seat in gear. Flat side of gear toward shoulder of shaft. Smaller face of idler support against bearing in gear hub. Concave surface of retaining ring toward gear.
			Screw Flat washer	39 40	1 1	Install idler gear and shaft to front side of rear plate at hole M (figure 529).	Blue Loctite on threads.

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Rear Plate Reassembly (Sheet 5 of 6)  
(Refer to figure 1104.)  
Figure 517

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
21	Electrical contact J10	41	Screw Flat washer	42 43	1 1	Mount to rear side of rear plate at hole N (figure 529).	
22	<u>MCN 129 and below</u>  Coil L3	20	Screw Flat washer	21 22	2 2	Mount to rear side of rear plate.	

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
1	Ground drum subassembly					<p>Set coil drive shaft (188) to its full counterclockwise stop (as viewed from rear).</p> <p>Install ground drum over support cylinder.</p> <p>Align.</p> <p>Slide fiber gear (87) onto output shaft (188).</p>	<p>Carefully disengage coil lock with prodding tool and reengage when stop is reached.</p> <p>Front end seats inside four rollers mounted to support cylinder.</p> <p>Ribbon anchor clip (105) is toward coupler center (figure 532).</p> <p>Splines interlock.</p>
2	<u>MCN 164 and below</u>		Retaining ring	86	1	Install.	Holds fiber gear (87) on output shaft (188).
3  (Cont)	Ceramic drum and tap assembly					Install over iron core (171).	Front end seats inside four insulated rollers mounted to main gearplate.

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Group Reassembly (Sheet 1 of 12)  
 (Refer to figure 1104.)  
 Figure 518

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
3 (Cont)						Align.	Rotate so tape anchor point is at end of imaginary line defined by both drum centers (figure 532).
4	Rear plate subassembly Ball bearing Ball bearing	84 13	Shim washer Shim washer	85 85A	1 1	Seat drum support bearings in rear plate subassembly at holes P and E (figure 529).  Place shim washers on shaft of ground drum.  Mount rear plate subassembly.	Ball bearings (84, 13) engage drum shafts. Both striker screws (57) of primary switch arm (58) are between solenoid arms (168).
(Cont)	<u>MCN 165 and above</u>		Screw Flat washer	14 14A	4 4	Fasten rear plate to four main posts (173).	Flat washer between rear plate and each post.





STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
4 (Cont)						Set ground drum end play.	Add or remove shim washers (85, 85A) to provide 0.003- to 0.009-in. end play. Ensure spacer (94) is not pinching spring (90).
						Set ground drum runout.	Adjust upper roller assemblies (95 through 99) to provide 0.002- to 0.005-in. clearance between roller and rim of drum.
5	Bearing support	12	Shim washer Retaining ring	11A 11	2 1	Place bearing support, shim washers, and retaining ring on protruding end of ceramic drum shaft (140).  Set ceramic drum end play.  Set ceramic drum runout.	Add or remove shim washers to provide 0.001- to 0.006-in. end play.  Adjust two adjacent rollers nearest edges of main gearplate for a pressure fit of a 0.004-in. shim with no binding.

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Group Reassembly (Sheet 3 of 12)  
(Refer to figure 1104.)  
Figure 518

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
6						<p>Ensure that output shaft (188) continues to be at its counterclockwise stop (see step 1).</p> <p>Wind up and align ground drum.</p> <p>Attach ribbon.</p> <p>Set rotary switch S1/S2 (212, 214).</p>	<p>Rotate ground drum approximately 2-1/4 turns counterclockwise (as viewed from the rear), and radially position ribbon anchor clip as shown in figure 532 using special degree gauge.</p> <p>Ensure that 26-1/4 turns of ribbon are on ceramic drum and that ribbon entrance hole is radially located as shown in figure 532; use special degree gauge.</p> <p>Loosen setscrews (233), rotate shaft (236), set wipers to half engage position 12 (on position 11 side), and secure setscrews with blue Loctite.</p>
(Cont)							



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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
6 (Cont)						Check that ribbon tension tangent to ground drum is 2.0 to 2.5 lb.	
7          (Cont)	Tap pinion support Ball bearing	5  112	Screw Shim washer	6 6A	2 4	<p>Lubricate slipring (148).  Preset tap assembly to maximum limit.</p> <p>Set tap pinion gear to solid counterclockwise stop and engage with ring gear of tap assembly.</p> <p>Install tap pinion support and bearing.</p>	Beacon 325.  Tap contacts are between 0° and 5° from point where ribbon leaves ceramic drum as measured with special degree gauge.

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Group Reassembly (Sheet 5 of 12)  
(Refer to figure 1104.)  
Figure 518

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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
7 (Cont)						Set end play.  Align.  Set tap limit.	<p>Add or remove shim washers on screws between rear plate and pinion support to provide 0.005- to 0.015-in. end play.</p> <p>Pinion parallel to ground drum and <math>3/16 + 1/16, -0</math> in. away from ribbon wound on drum. Glyptal on threads.</p> <p>Adjust screw (334) so that micro-switch S6 (324) clicks when center-tap assembly is <math>30^\circ</math> to <math>60^\circ</math> away from engaging rim stops on tap stop (133) of the ceramic drum as measured with special degree gauge. Lock adjustment with nut (335) and blue Loctite.</p>
(Cont)							



STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
7 (Cont)						<p>Set tap lock solenoid (256) disengagement clearance.</p> <p>Check breakaway torque of tap mechanism.</p> <p>Check tap gear lock electrically.</p>	<p>Blue Loctite on screw threads. Position solenoid so that 0.005 inch of feeler stock is pinched between spline shaft of motor and toothed dog of solenoid when solenoid resembles energized condition.</p> <p>Six ounces minimum in either direction measured tangentially to tap ring gear (165).</p> <p>Tap mechanism can be moved freely when 28 vdc is applied to tap lock solenoid (see caution).</p>
<p><b>CAUTION: DO NOT ALLOW TAP LOCK SOLENOID TO BE ENERGIZED LONGER THAN 30 SECONDS UNLESS THE APPLIED VOLTAGE IS REDUCED TO 10 VDC AFTER SOLENOID IS INITIALLY ENERGIZED.</b></p>							
						<p>Lubricate front gear-case gears.</p>	<p>Versilube G-300 on gear teeth.</p>

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Group Reassembly (Sheet 7 of 12)  
 (Refer to figure 1104.)  
 Figure 518

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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
8			Screw	14	1	<p>Secure plenum.</p> <p>Check series C switch in closed position. Adjust position of solenoid K2 (320) on mounting plate (349) if necessary.</p> <p>Energize solenoid K2 (320), check free play of switch arm (59), and adjust position of solenoid K1 (319) on mounting plate (349) if necessary.</p>	<p>Flat washers between rear plate and posts. Blue Loctite on threads.</p> <p>Striker screw (57) latched against hammer face of solenoid K2 arm by snap action of spring (53). Contact blade of secondary switch arm (59) penetrates gap between balls of contacts 45 as shown in figure 533.</p> <p>Apply 28 vdc to solenoid (see caution). Free play of blade, measured at wipe point, does not exceed 0.010 in.</p>
			Flat washer	14A	1		
			Screw	15	2		
			Flat washer		2		
<p><b>CAUTION:</b> DO NOT ALLOW SOLENOID (K1 OR K2) TO REMAIN ENERGIZED LONGER THAN 30 SECONDS. SOLENOID ARM TRAVEL WHEN MOVED MANUALLY IS NOT THE SAME AS WHEN ENERGIZED.</p>							
9 (Cont)	Straight shaft Tap housing	131 130	Springs Retaining ring	126 123	4 1	Assemble tap contact housing.	Assemble tap housing parts on shaft (131).





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Group Reassembly (Sheet 9 of 12)  
(Refer to figure 1104.)  
Figure 518

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
9 (Cont)	Washer	125	Screw	128	2	<p>Check contact pressure.</p> <p>Install tap contact housing and shaft assembly between main gearplate hole Y (figure 526) and rear plate hole R (figure 529).</p>	<p>Four springs between housing (130) and washer (125).</p> <p>40 to 70 grams.</p> <p>Tap assembly slipring (148) engages contact housing between washers (124, 125). Insulated bushing seats in main gearplate hole Y. Centralize shaft between main gearplate and rear plate and hold position with collars (121). MIL-S-4383 adhesive on setscrews of collar at main gearplate end. Blue Loctite on setscrews at rear plate end.</p>
	Shoulder washer	124	Lockwasher	129	2		
	Contact	127	Setscrew	122	4		
	Collar (two required)	121					
	Insulator bushing	291					

**NOTE:** Asterisk indicates item numbers for steps 10, 12, 13, 15, 16, 18 are found on figure 1105.

*10	Front housing	36	Gasket	3	1	Mount connector to housing.	Silastic 140 between connector and housing. Glyptal on threads.
	Connector J4	2	Nut	P/O 2	1		

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
11	Connector J1	296	Gasket Nut	296A 296B	1 1	Mount.	Silastic 140 between connector and housing. Glyptal on threads.
*12	Grommet	35				Insert.	
*13	Relay K8	24	Flat washer Nut	25 P/O 24	2 2	Install.	Glyptal on threads. Grip backing nut with 11/16 open end wrench 1/8 of an in. thick.
14	Connector J7 (wired to basic coupler build)	295	Gasket Nut	295A 295B	1 1	Install.	Silastic 140 between connector and housing. Gasket against inner surface of housing.
*15	Mounting plate Capacitor C2 Terminal stud (two required) Post	15 14 11 4	Nut Screw Lockwasher Screw Lockwasher Stud Terminal lug Lockwasher	16 12 13 17 18 6 5 7	2 2 2 3 3 2	Mount capacitor and two terminals to plate.  Install to front housing. Mount two posts on plate.	Glyptal on threads. Crimp threads of new studs midway between ends with cutters.
*16	Thermoswitch S3 Thermobacket	27 31	Screw Lockwasher Nut Screw Lockwasher	29 28A 28 34 30	3 3 3 2 2	Mount thermoswitch on bracket.  Install bracket to front housing.	
(Cont)							

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
*16 (Cont)			Flat washer Nut	33 32	2 2		
17	Extractor plate (figure 1102)	3	Screw	4	2	Fasten to front housing.	Glyptal on threads.
*18	Valve and cap	1				Install to front housing. Wire.	Red Loctite on pipe threads.
19						Coat all wire connections to three motor capacitors and two switch wafers with liquid sleeving.	A-12 adhesive.
			Screw Lockwasher Screw	3 4 2	8 8 1	Mount front housing to basic coupler build.	Route tap lead through main gearplate hole Z (figure 526).
20	Terminal lug	118	Screw Lockwasher	119 120	1 1	Fasten to shaft collar (121).	
21  (Cont)	Connector P8 Connector shield Bushing	26 27 33	Screw Flat washer Shim washer Shim washer	30 31 31A 19A	2 2 AR AR	Wire and mount connector to posts (28).	Pin 1 toward center of rear plate. Blue Loctite on threads.

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Group Reassembly (Sheet 11 of 12)  
 (Refer to figure 1104.)  
 Figure 518

STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
21 (Cont)						Mount and level basic coupler with front housing downward on a flat level surface (machinist's surface plate) and, using a height gauge, set interconnect distance.	Add or remove shim washers so that rearmost surface of connector is 8.760 ±0.008 in. from case mounting surface of front housing.
22						Mount and level basic coupler with front housing downward on a flat, level surface (machinist's surface plate) and, using a height gauge, set interconnect distance of connector P9.	Add or remove shim washers so that rearmost surface of connector is 8.730 ±0.008 in. from case mounting surface of front housing.





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Case Reassembly  
(Refer to figure 1102.)  
Figure 51923-13-0  
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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
1	Case Guide pin (two required)	28 29				Press fit inside case.	
2	Straight pin	26	Setscrew	27	1	Install.	
3	Locating pin (two required)	30	Screw Lockwasher	31 32	2 2	Install.	
4	Rear cover plate Contact  <u>MCN 129 and above</u>  Contact assembly Stud assembly  <u>MCN 128 and below</u>  Contact assembly	23 20  18A 19A  19	Flat washer Lockwasher	22 21	1 1	Mount contact assembly to rear cover plate.	Use Silastic 140 to ensure airtight seal.
5	Rear cover plate assembly (from step 4)		Screw Lockwasher	24 25	6 6	Mount to case assembly.	Use Silastic 140 to ensure airtight seal.
6	<u>MCN 109 and above</u>  Webbing strap	33A	Pins	33C	2	Attach to case-mounted brackets (33B) with pins.	

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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
1	Transformer cover	89	Screw	90	8	Carefully reassemble transformer subassembly.	Refer to figure 1103 for axial orientation of cover and transformers. Feed transformer leads through proper holes in cover. Align threaded holes in transformer bases to holes in cover and install holding hardware. Pass solid conductor wire through center holes of transformers.
	Transformer T2	94	Lockwasher	91	8		
	Disc insulator	95					
	Transformer T1	96					
	Disc insulator	93					
	Transformer T3	92					
	Disc insulator	97					
	Shield plate	98					
2	Terminal board Rf shield assembly	67	Screw	29	2	Fasten board to shield.	Glyptal on screw threads.
		81	Spacer	27	2		
3	Transformer subassembly (from step 1)	89	Retaining ring	88	1	Fasten to board and shield.	EC 847 cement on nut threads. Retaining ring seats in groove on transformer cover (89).
			Nut	83	1		
			Screw	30	1		
			Lockwasher	31	1		
			Spacer	28	1		
4	Rf shield assembly	82	Retaining ring	82	1	Mount.	EC 847 cement on nut threads. Glyptal on screw threads. Retaining ring seats in groove on transformer cover (89).
			Nut	83	1		



STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
5	Resistor assembly	22	Screw Screw	19 18	1 1	Mount.	Glyptal on threads.
6	Connector J1	15	Screw Lockwasher	16 17	2 2	Mount.	
7	Capacitor C4 Capacitor C1 Retaining plate	7 6 11	Lug Lockwasher Nut Lockwasher Nut	8 P/O 7 P/O 7 P/O 6 P/O 6	2 1 1 1 1	Mount capacitors to retaining plate.	
8	Connector P2	9	Screw Flat washer Spacer Spacer	13 14 10 12	2 4 2 2	Mount with retaining plate (11) to rf shield (81).	Glyptal on screw threads.
9	<u>MCN 616 and above</u>  Spark gap G1	  5A	  Lockwasher Nut	  5C 5B	  1 1	  Mount to rf shield (82).	
10	Connector shell Dielectric Contact Insulator bushing	80 78 77 79	Retaining ring	76	1	Assemble connector P1.	
11	Connector P1 (from step 10)	80	Screw Lockwasher Flat washer	73 74 75	2 2 2	Mount to rf shield (82).	
12	Housing	1	Screw Washer Flat washer Nut	2 P/O 2 3 P/O 15	3 3 1 1	Mount.	

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Discriminator Reassembly (Sheet 2 of 2)  
(Refer to figure 1103.)  
Figure 520

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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
1	Chassis Servo-control subassembly	59	Screw		4	Remount subassembly to four hexposts of chassis. Fasten both ends to chassis sides.	
		29	Lockwasher		4		
			Screw		2		
2	Screw assembly Screw retainer	2	Screw		2	Reinstall two captive screws.	
		3					
3	Cover	1	Screw		2	Remount cover.	

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Servo-Control Module Reassembly  
(Refer to figure 1109.)  
Figure 522

Relay Control Module Reassembly  
(Refer to figure 1110.)  
Figure 523

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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
1	Terminal board subassembly	51	Screw Lockwasher		6 6	Fasten to six posts (112, 113) mounted on chassis (122).	
2	Motor-driven switch assembly	9	Screw Screw		4 1	Fasten to base plate (121) with four screws and to chassis with one screw.	
3	Hexpost	2	Screw Screw		1 1	Install between chassis and baseplate.	
4	Cover	1	Screw		2	Install cover.	



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STEP	PART		HARDWARE			INSTRUCTIONS	NOTES
	NAME	ITEM	NAME	ITEM	QTY		
1	Printed circuit wafer assembly (top)	18	Screw		3	Orient, stack, and space wafer assemblies on screws. Fasten stack to base.	Glyptal marks aligned. Components side toward screwhead end. Top wafer nearest screwheads. Lug (17) of top wafer attaches to screw. Insulator between bottom wafer and base. Use special slotted-nut driver to grip slotted nuts.
	Printed circuit wafer assembly (middle)	53	Spacer	5	3		
	Printed circuit wafer assembly (bottom)	61	Spacer	4	6		
	Insulator	64	Slotted nut		3		
	Base	63					
2	Can	3				Screw assembly of step 1 into can.	Use strap wrench to grip can. Use special pin spanner to turn assembly (pins engage tightening holes in base). Bottom plate to be flush with end of can.
3	Cap	2				Screw cap into can.	Use special pin spanner to turn cap (pins engage tightening holes in cap). Inside surface of cap must be in contact with top of transformer (6).

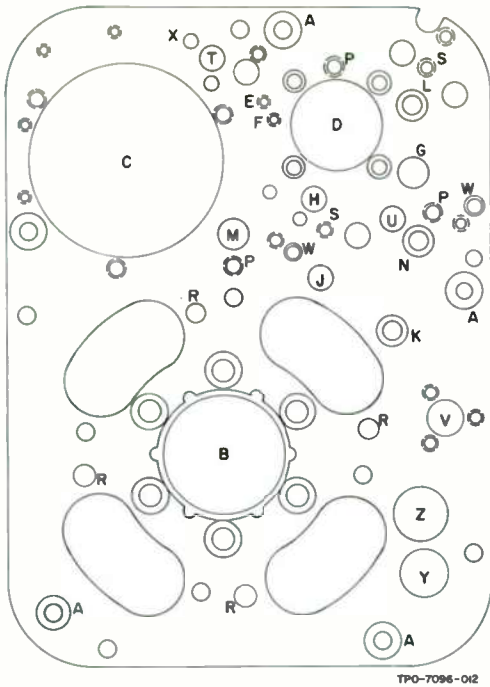
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Servo-Amplifier Module Reassembly  
(Refer to figure 1111.)  
Figure 524

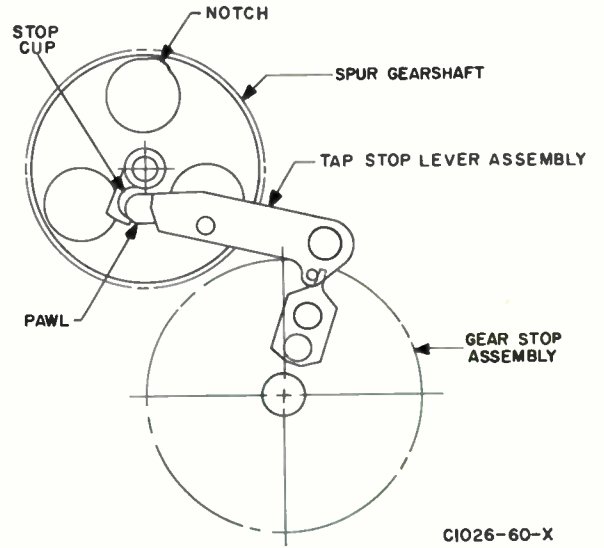
FUNCTIONAL AREA	CONDITION	PROCEDURE REFERENCE
Coil mechanism	Timing of torsion bar stop Alignment of coil drums Timing of coil limits switch	Figure 510, step 11 Figure 518, steps 1, 3, and 6 Figure 518, step 6
Tap mechanism	Timing of stop lever assembly Axial mesh of pinion gear Helical displacement of tap assembly rollers Radial alignment of tap stops to ceramic drum Timing of tap assembly Tap limit set	Figure 510, steps 13 and 15 Figure 511, step 11 Figure 515 Figure 516, step 3 Figure 518, step 7 Figure 518, step 7.
Series C switch mechanism	Alignment of solenoid arms  Alignment of contacts Alignment of switch arms	Figure 513, steps 6 through 11, and figure 518, step 8 Figure 517, steps 6 and 18 Figure 517, steps 16 and 17



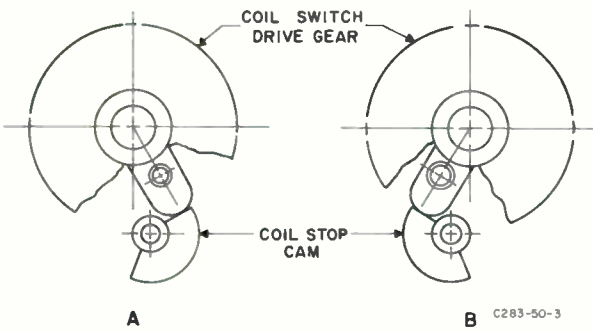




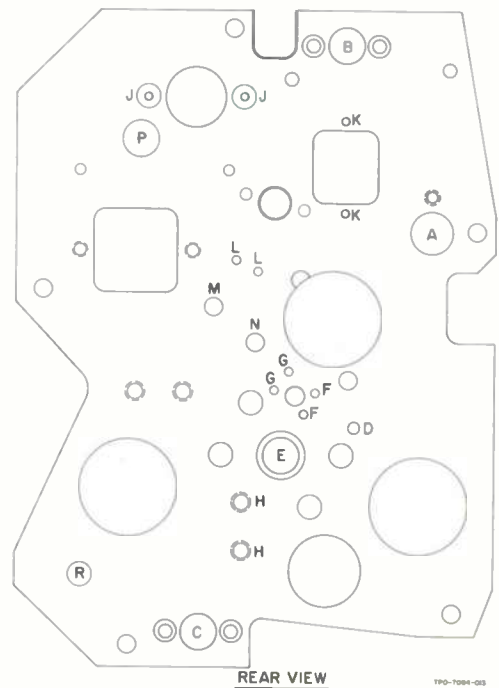
Main Gearplate, Hole  
Identification, Detail  
Figure 526



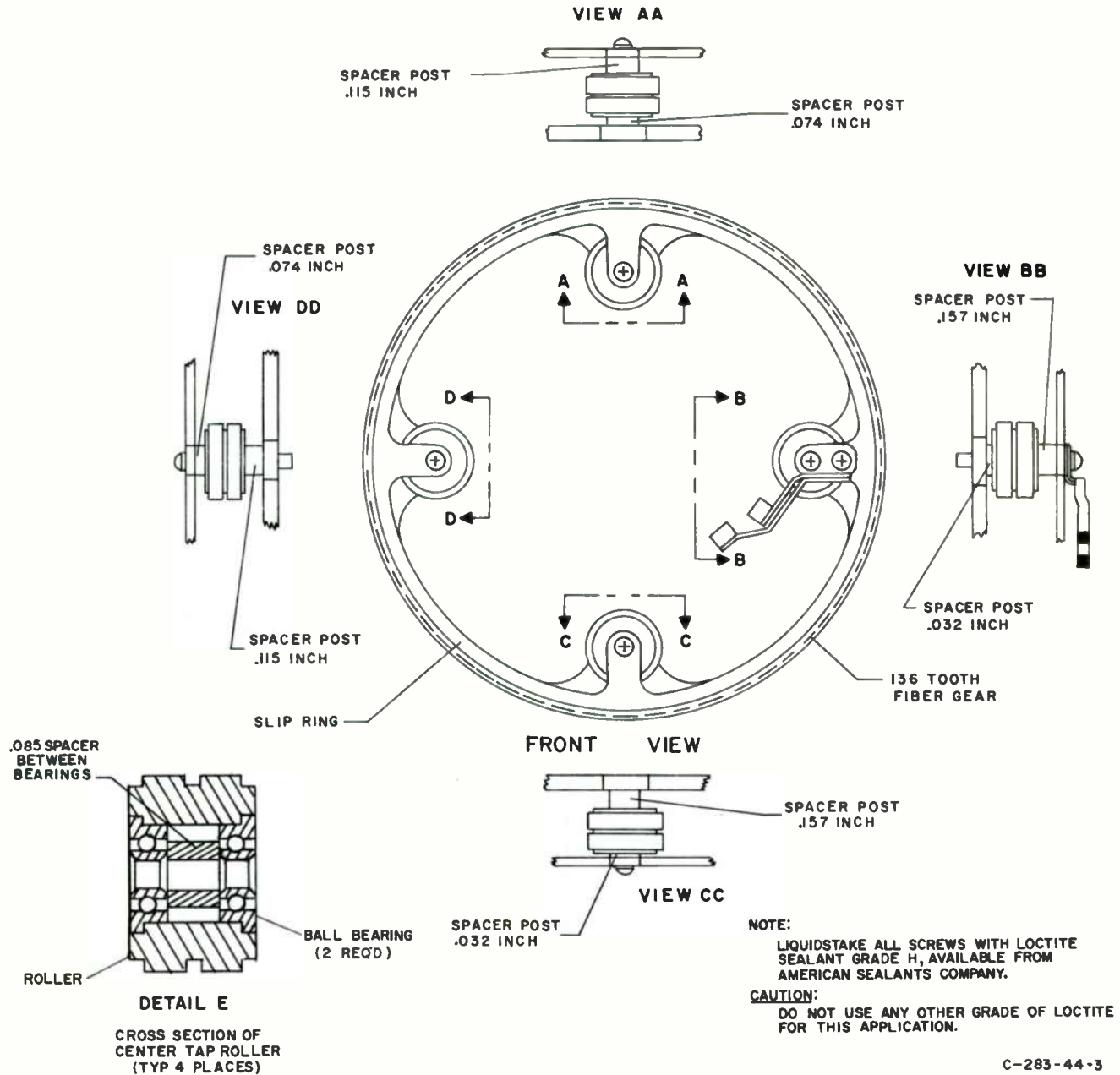
Tap Stop Mechanism, Detail  
Figure 527



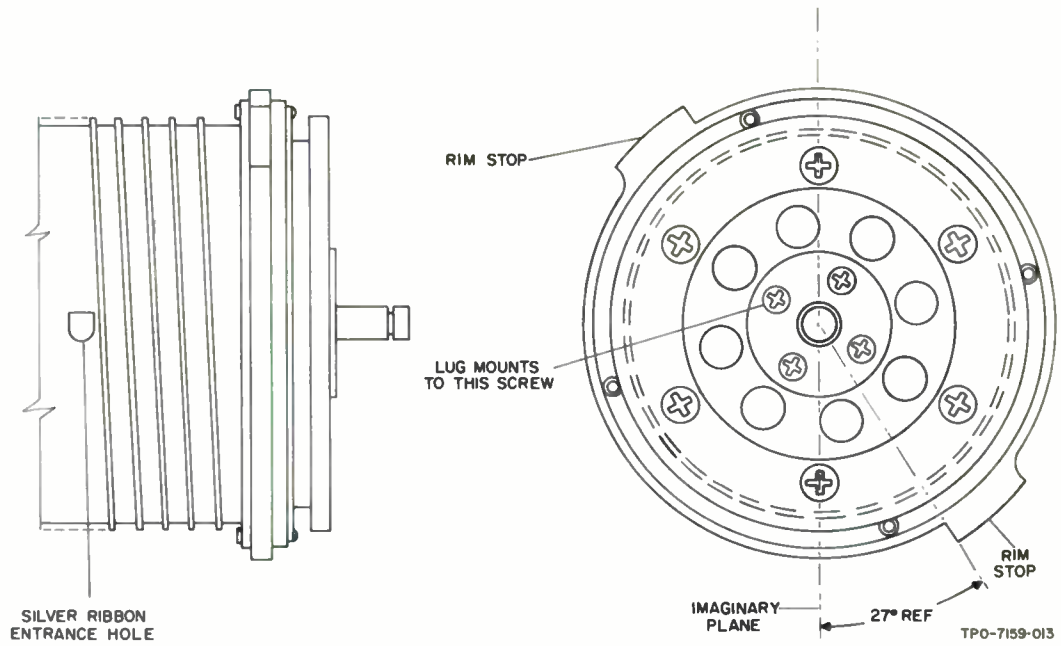
Coil Limits Stop Mechanism, Detail  
Figure 528



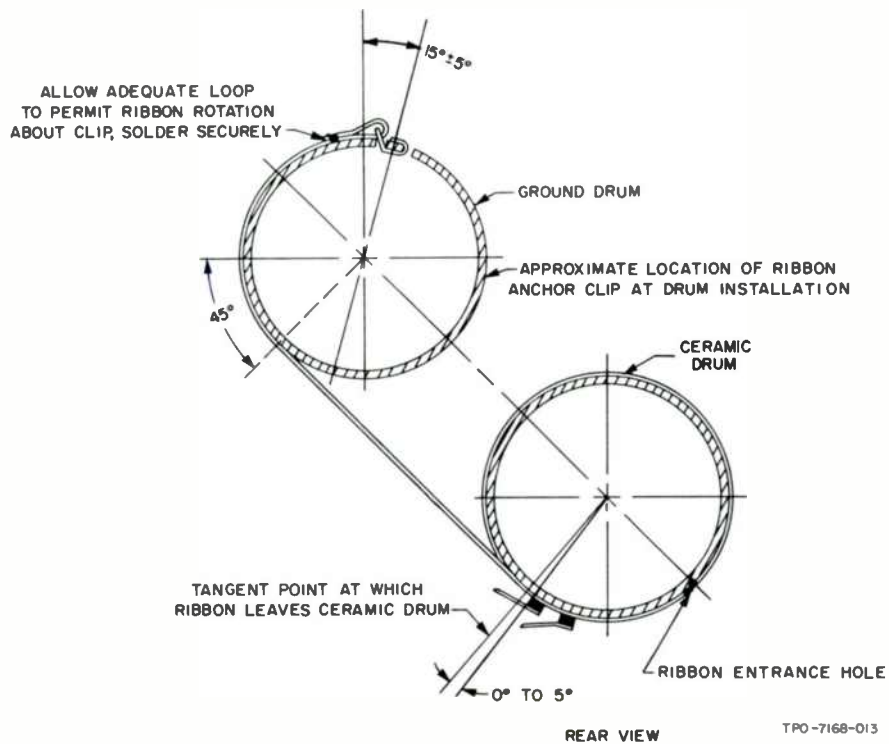
Rear Plate Hole Identification,  
Detail  
Figure 529



Center-Tap Assembly, Detail  
Figure 530

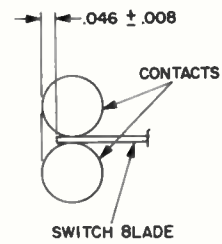
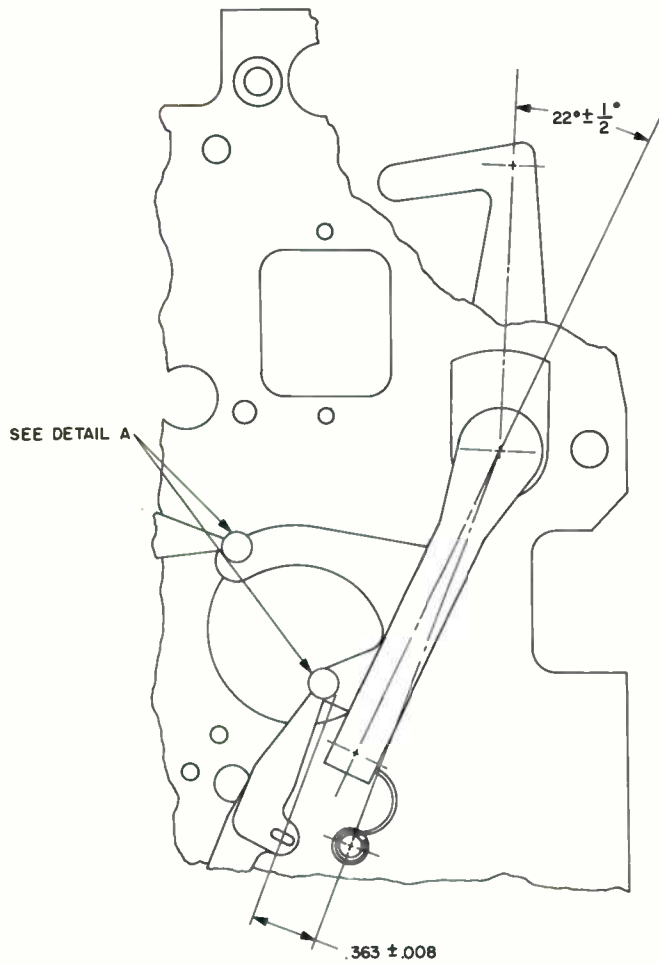


Drum and Tap Stop Orientation, Detail  
Figure 531



Drum Alignment, Detail  
Figure 532

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DETAIL A

TP0-7650-013

Series C Switch Alignments, Detail  
Figure 533



## **180R -12 Antenna Coupler and 309A -9/9A Antenna Coupler Control - Fits and Clearances**

Figure 601 presents all mechanical fits and clearances that must be observed and maintained for the 180R-12 Antenna Coupler to operate properly. Tolerances and assembly torque values are included. Reference is made to the step of the reassembly procedure where the requirement must be observed.

The 309A-9/9A Antenna Coupler Control has no special mechanical fit and clearance requirements.

Refer to the special tools, fixtures, and equipment section for descriptions of the special gauges required.

NO.	PART NAME AND FIGURE-ITEM	REQUIREMENT AND LIMITS	ADJUSTMENT	NOTES	ASSEMBLY REFERENCE
*1	Spark gap G1 (1106-64,-71)	Gap clearance 0.150 to 0.180 in.	Loosen, adjust, and re-tighten gap arm (64).	Use paper-base bakelite or lucite feeler stock so as not to mar silver finish.	Figure 504, step 4
*2	Spark gap G2 (1106-48A,-48E)	Gap clearance 0.095 to 0.150 in.	Loosen, adjust, and re-tighten gap arm (48E).	Use paper-base bakelite or lucite feeler stock so as not to mar silver finish.	Figure 506, step 5
3	Torsion bar assembly (1104-238)	Minimum end play without binding.	Add or remove shim washers (191).		Figure 511, step 5
4	Output gearshaft (1104-188)	End play 0.001 to 0.004 in.	Add or remove shim washers (184B).		Figure 511, step 7
5	Coil gear lock solenoid (1104-195)	Disengagement clearance (mechanical) 0.005 in. approximately.	Reposition solenoid with 0.005-in. feeler stock between motor spline shaft and toothed dog of solenoid when solenoid resembles energized condition.	See fit and clearance no. 6 and 7.	Figure 511, step 8
6	Output gearshaft (1104-188)	Breakaway torque 12 in-oz minimum.	Adjust coil lock solenoid (195).	Must meet fit and clearance no. 7 after adjustment.	Figure 511, step 8



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Fits and Clearances (Sheet 2 of 5)  
Figure 60123-13-0  
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NO.	PART NAME AND FIGURE-ITEM	REQUIREMENT AND LIMITS	ADJUSTMENT	NOTES	ASSEMBLY REFERENCE
7	Coil gear lock solenoid (1104-195)	Disengagement clearance (operational). Coil drive gear cluster moves freely when solenoid is energized.	See fit and clearance no. 5 and 6.	Energize solenoid with 28 vdc (see caution).	Figure 511, step 8
<b>CAUTION: DO NOT ALLOW COIL LOCK SOLENOID TO BE ENERGIZED LONGER THAN 30 SECONDS UNLESS THE APPLIED VOLTAGE IS REDUCED TO 10 VDC AFTER SOLENOID IS ENLARGED.</b>					
8	Center-tap contacts (1104-146,-147)	Bearing surface area 1/16 of an in. minimum.	Work into ceramic drum contour with fine abrasive.		Figure 516, step 5
*9	Center-tap contacts (1104-146,-147)	Contact pressure 80 to 100 grams.	Adjust contacts mounting.		Figure 516, step 5
10	<u>MCN 129 and below</u> Switch contact (1104-45A)	Clearance between contact ball pairs 0.065 to 0.080 in.	Reposition switch contacts (45A).	Do not move switch contacts (45) that were aligned in figure 517, step 6.	Figure 517, step 7
*11	Switch arm shaft (1104-69)	End play 0.002 to 0.004 in. without binding.	Add or remove shim washers (63).		Figure 517, step 17
12	Switch arm shaft (1104-69)	Switching torque 8 in-oz maximum to make and to break.	See fit and clearance no. 11 and 13.		Figure 517, step 18
*13	Switch contacts (1104-45,-45A)	Contact pressure on switch blade 30 to 75 grams per individual contact.	Add or remove shims between contacts.		Figure 517, step 18

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NO.	PART NAME AND FIGURE-ITEM	REQUIREMENT AND LIMITS	ADJUSTMENT	NOTES	ASSEMBLY REFERENCE
*14	Ground drum assembly (1104-107)	End play 0.003 to 0.009 in.	Add or remove shim washers (85, 85A).	Ensure spacer (94) is not pinching spring (90).	Figure 518, step 4
*15	Ground drum assembly (1104-107)	Runout 0.002 to 0.005 in.	Reposition upper roller assemblies (95 through 99)		Figure 518, step 4
*16	Ceramic drum and tap assembly	End play 0.001 to 0.006 in.	Add or remove shim washers (11A).		Figure 518, step 5
*17	Ceramic drum and tap assembly (1104-167)	Runout 0.004 in. maximum.	Reposition two adjustable roller assemblies (279 through 285).		Figure 518, step 5
*18	Ground drum assembly (1104-107)	Ribbon tension 2.0 to 2.5 lb measured tangent to ground drum.	Refer to figure 518, step 1.	A slight adjustment may be made by disengaging idler gear (37), rotating ceramic drum as required, and re-meshing the idler gear.	Figure 518, step 6
<p><b>CAUTION:</b> IF THE PROCEDURE FOR A SLIGHT ADJUSTMENT HAS BEEN PERFORMED, ENSURE THAT THE POSITION OF THE RIBBON ANCHOR CLIP ON THE GROUND DRUM IS AS SHOWN IN FIGURE 532 WHEN THE OUTPUT SHAFT (188) IS AT ITS FULL COUNTERCLOCKWISE STOP.</p>					
*19	Tap pinion (1104-113)	End play 0.005 to 0.015 in.	Add or remove shim washers (6A).		Figure 518, step 7





NO.	PART NAME AND FIGURE-ITEM	REQUIREMENT AND LIMITS	ADJUSTMENT	NOTES	ASSEMBLY REFERENCE
*20	Tap pinion (1104-113)	Clearance 3/16 -0, +1/16 in. between pinion and ribbon wound on ground drum for entire length of pinion.	Reposition tap pinion support (5).		Figure 518, step 7
21	Tap gear lock solenoid (1104-256).	Disengagement clearance (mechanical) 0.005 in. approximately.	Reposition solenoid with 0.005-in. feeler stock between motor spline shaft and toothed dog of solenoid when solenoid resembles energized condition.	See fit and clearance no. 22 and 23.	Figure 518, step 7
*22	Center-tap assembly (1104-165)	Breakaway torque 6 oz minimum measured tangent to ring gear (165).	Adjust tap lock solenoid (256).	Must meet fit and clearance no. 23 after adjustment.	Figure 518, step 7
23	Tap gear lock solenoid (1104-256).	Disengagement clearance. Tap assembly rotates freely when solenoid is energized.	See fit and clearance no. 21 and 22.	Energize solenoid with 28 vdc (see caution).	Figure 518, step 7
<b>CAUTION: DO NOT ALLOW TAP LOCK SOLENOID TO BE ENERGIZED LONGER THAN 30 SECONDS UNLESS THE APPLIED VOLTAGE IS REDUCED TO 10 VDC AFTER SOLENOID IS INITIALLY ENERGIZED.</b>					
*24	Secondary switch arm	Contact gap penetration as shown in figure 533.	Reposition solenoid (320) on mounting plate (349).		Figure 518, step 8



NO.	PART NAME AND FIGURE-ITEM	REQUIREMENT AND LIMITS	ADJUSTMENT	NOTES	ASSEMBLY REFERENCE
*25	Secondary switch arm (1104-59)	Free play of contact blade at wipe point when solenoid (320) is energized 0.010 in. maximum.	Reposition solenoid (319) on mounting plate (349).	Energize solenoid with 28 vdc (see caution).	Figure 518, step 8

**CAUTION: DO NOT ALLOW SOLENOID TO REMAIN ENERGIZED LONGER THAN 30 SECONDS. SOLENOID ARM TRAVEL WHEN MOVED MANUALLY IS NOT THE SAME AS WHEN ENERGIZED.**

*26	Tap housing contact (1104-127)	Contact pressure 40 to 70 grams.	Reform contact piece (127).		Figure 518, step 9
*27	Connector P8 (1104-26)	Interconnect distance 8.752 to 8.768 in.	Add or remove shim washers (31A).	Measure from rearmost surface of connector to case-mounting surface of front housing (1).	Figure 518, step 21
*28	Connector P9 (1104-16)	Interconnect distance 8.722 to 8.738 in.	Add or remove shim washers (19A).	Measure from rearmost surface of connector to case-mounting surface of front housing (1).	Figure 518, step 22
29	Front housing screws (1102-9)	Tightening torque 70 in-lb.	Tighten 17 screws (9) in progressive 10-in-lb steps beginning at 50 in-lb.		Figure 521, step 3

\* Basic coupler performance test (figure 709) requires that these fits and clearances be checked.





## 180R -12 Antenna Coupler and 309A -9/9A Antenna Coupler Control - Testing

### 1. GENERAL.

This section presents the procedures for bench testing the 180R-12 Antenna Coupler and 309A-9/9A Antenna Coupler Control. Procedures are first given for a functional check of the system equipment. Results obtained will enable the technician to determine if repair or alignment is necessary.

Module performance tests with alignment and adjustment procedures are then presented. If the equipment fails to meet the specification of a particular test, calibration or alignment procedures are given. If calibration fails or there is no provision for calibration, refer to the troubleshooting section.

### 2. TEST EQUIPMENT AND POWER REQUIREMENTS.

#### A. Test Equipment.

Refer to the special tools, fixtures, and equipment section for the descriptions of the test equipment required by the test procedures.

#### B. Power Sources.

Power requirements are included in the descriptions of the particular test procedures.

### 3. TEST PROCEDURES.

#### A. Use of Test Procedures.

Generally, the test procedures are presented in a tabular form that includes INSTRUCTIONS, RESULTS, and COMMENTS columns. The INSTRUCTIONS column provides information to initiate the test. The RESULTS column gives test limits and other end-result indications. The COMMENTS column presents alignment instructions which may be performed, and clues to the location of possible defects.

#### B. Functional System Test.

##### (1) Acceptability Requirement.

Satisfactory performance of the 180R-12 coupler and the 309A-9/9A control requires that all test steps of the procedure be performed without adjustment or repair of the coupler or control.

##### (2) Test Setup.

The top of the test bench should be covered with an unpainted aluminum grounding sheet or unpainted metal grounding straps 1 inch wide for every 6 inches of length. Place the equipment on and in contact with either method of grounding used.



Antenna impedance requirements demand that a dummy load (shown in figure 701) be constructed for each test frequency. The dummy load consists of a coaxial resistor and impedance loads (Z1 through Z4). Locate the impedance loads as close as possible to the coaxial resistor that mounts on the grounding sheet with one end at ground potential. Values of the impedance loads for each test frequency are given in figure 702.

Connect transceiver, rf wattmeter, 10-MHz dummy load, power, coupler, and control as shown in figure 701. Refer to the applicable system interconnect diagram in the 180R-12 Antenna Coupler and 309A-9/9A Antenna Coupler Control Maintenance Manual.

NOTE: Control lines may be affected by rf interference; often, such interference is undetected and may result in equipment malfunctions. Flexible, braided, and tinned copper in tubular form for easy slip-on may be used to shield from unwanted rf.

(3) Procedure.

Perform the tests described in figure 704.

C. Sealing Test of 180R-12 Antenna Coupler.

With the discriminator module removed, pressurize the unit to 15 psig with dry nitrogen and immerse it in water for approximately 5 minutes. Poorly sealed joints that leak can be located by tracing the path of the resultant bubbles. Disassemble, clean, reseal, and reassemble the parts forming these joints as described elsewhere in this manual.

After the water test is completed, reduce the internal pressure to 6 psig and dry the outside thoroughly.

D. Module Performance Tests.

(1) Loading-Phasing Discriminator Module.

(a) Special Tester Method.

1. Test Equipment.

This method uses the 878L-19 Discriminator Module Tester (Collins part number 522-4410-001).

2. Test Setup.

Remove the discriminator module from the 180R-12 coupler, and transfer the discriminator electronics from its operational housing to the special discriminator housing supplied with the tester (refer to the disassembly and assembly sections for the procedures).



Mount and secure the module to the front panel of the tester. Use the 6-foot coaxial cable supplied with the tester to connect the rf output of a 100-watt transmitter to the rf input (J1) of the module.

3. Procedure.

Perform the tests described in figure 706.

(b) Alternate Method.

1. Test Equipment.

To gain access to the discriminator adjustments under operational conditions, a discriminator test housing (refer to the special tools, fixtures, and equipment section) is required. A dc microvolt-ammeter is required for dc voltage measurements.

2. Test Setup.

Remove the discriminator module from the 180R-12 coupler, and transfer the discriminator electronics from its operational housing to the test housing (refer to the disassembly and assembly sections for the procedure). Connect the discriminator and test equipment as shown in figure 707. Connect unbalancing loads only when required by the test procedure.

3. Procedure.

Perform the tests as described in figure 708.

(2) RF Load Coil Group.

The performance of the load coil group is tested during the system functional test.

(3) Basic Coupler Group.

(a) Test Equipment.

A basic coupler test fixture (refer to the special tools, fixtures, and equipment section) is required.

(b) Test Setup.

Remove the basic coupler group from the 180R-12 coupler case (refer to the disassembly section). Connect the test fixture to connector J7 of the basic coupler group, and apply the required power to the test fixture.

(c) Procedure.

Perform the tests described in figure 709.



(4) Servo-Amplifier Module.

(a) Special Tester Method.

1. Test Equipment.

This method uses the 878L-18 Servo-Amplifier Module Tester (Collins part number 522-4409-001).

2. Test Setup.

Remove the servo-amplifier module from the 309A-9/9A control chassis (refer to the disassembly section), and plug it into the receptacle on the front panel of the tester. Connect the tester to 115  $\pm$ 10-volt, 400  $\pm$ 20-Hz, single-phase power.

3. Procedure.

Perform the tests described in figure 710.

(b) Alternate Method.

1. Test Equipment.

A servo-amplifier test fixture (special tools, fixtures, and equipment section) is required. An rms voltmeter is required for making voltage measurements.

2. Test Setup.

Remove the servo-amplifier module from the 309A-9/9A control chassis (refer to the disassembly section), and connect it to the test fixture. Apply primary power to the test fixture.

3. Procedure.

Perform the tests described in figure 711.

(5) Servo-Control Module.

(a) Test Equipment.

A servo-control module test fixture (special tools, fixtures, and equipment section) with the specified input power is required. A multimeter is required to adjust the test fixture, and an ac vtvm is required to monitor the performance of the module.

(b) Test Setup.

Plug the servo-control module into the test fixture. Connect the dc voltmeter between test point TP1 on the test fixture and ground (J4 on the module).



Connect the common lead of the ac vtvm to ground (J4 on the module). Connect the other lead of the ac vtvm to J1 on the module for test steps 1 through 5 and to J5 for test steps 6 through 10.

(c) Procedure. (Refer to figure 712.)

Apply power to the test fixture. Adjust the BAND SELECTOR, the INPUT SELECTOR, and the DC SET control as specified by the procedure, and read the ac vtvm for each step in figure 712. The ac vtvm monitor point changes from J1 to J5 (on the module) at step 6.

(6) Relay Control Module.

(a) Test Equipment.

An 878L-13 Relay Control Module Tester (Collins part number 522-3971-001) is required.

(b) Test Setup.

Remove the relay control module from the 309A-9/9A control (refer to the disassembly section), and connect it to the receptacle on the front panel of the tester, either directly or through the 5-foot extension cable supplied with the tester. Connect the tester to 115  $\pm$ 10-volt, 400  $\pm$ 20-Hz, 3-phase regulated, 4-wire wye primary power.

(c) Procedure.

1. Set the OFF/LAMP TEST/ON switch to LAMP TEST to check that all 21 front panel lamps light.
2. With the PROGRAM switch set to OFF, set the OFF/LAMP TEST/ON switch to ON.

NOTE: The lit/not-lit pattern of the green verification lamps, obtained with the PROGRAM switch set to OFF, provides information useful for troubleshooting a defective module and should be recorded if the module is suspect.

3. Set the PROGRAM switch to position 1. After a short delay, the 10 green verification lamps should display the same lit/not-lit pattern that is displayed by the 10 amber program lamps.

NOTE: A lamp that is not lit is as important as a lamp that is lit. With some lamps out and other lamps lit, a lit/not-lit pattern is displayed. This lit/not-lit pattern will be referred to as "lamp pattern" throughout the remainder of this manual.

4. Repeat step 3 for the remaining test positions (2 through 13, in sequence) of the PROGRAM switch.



NOTE: In test position 13, the tester checks the operation of the 30-second fault timer circuit in the module. Therefore, allow 25 to 35 seconds for the module to react before comparing the verification lamp pattern to the program lamp pattern.

5. Set the OFF/LAMP TEST/ON switch to OFF.

6. Disconnect module.

(7) 399V-1 Adapter.

(a) Test Equipment.

A multimeter and a 0- to 30-volt dc power supply are required to test the 399V-1 Adapter.

(b) Test Setup.

Connect the dc power supply (set for 0-volt output) to connector J3-1 and J3-2; positive lead connects to J3-2.

(c) Procedure.

Perform the tests described in figure 713.

(8) 399W-1 Adapter.

(a) Test Equipment.

A multimeter and a 0- to 30-volt dc power supply are required to test the 399W-1 Adapter.

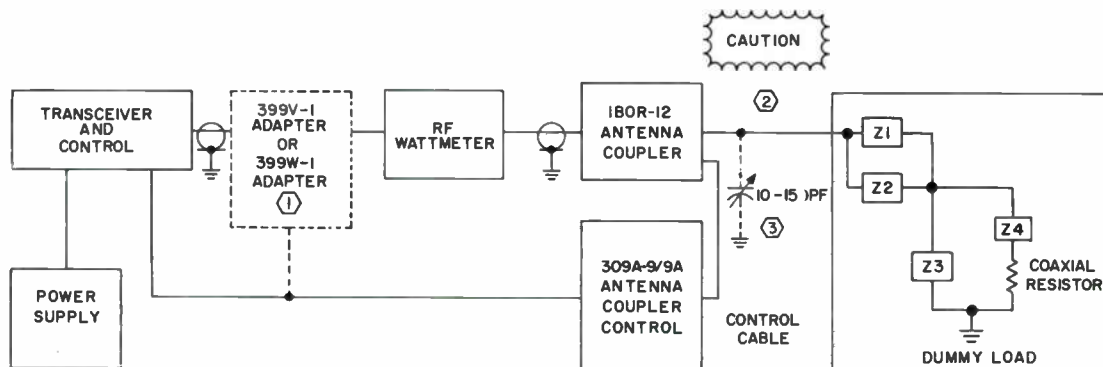
(b) Test Setup.

Connect the dc power supply (set for 0-volt output) to connector J3-1 and J3-2; positive lead connects to J3-2.

(c) Procedure.

Perform the tests described in figure 714.





**NOTES:**

- ① MAY NOT BE NEEDED. DEPENDS ON TRANSCEIVER USED. WHEN NOT NEEDED THE COAXIAL LINE CONNECTS DIRECTLY BETWEEN TRANSCEIVER AND IBOR-12.
- ② SINGLE LINE 7 IN. LONG, 3 IN. FROM GROUND PLANE. GROUND PLANE IS A GROUNDED METAL SHEET COMMON TO IBOR-12, 309A-9/9A AND DUMMY LOAD.
- ③ VARIABLE CAPACITOR USED FOR DEMAND SURVEILLANCE TEST.

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**Functional System Test, Test Setup  
Figure 701**



FREQUENCY (MHz)	ANTENNA IMPEDANCE (ohms)	180R-12 EFFICIENCY (minimum)	Z1 (pf)	Z2 (pf)	Z3 (pf)	Z4
2.0	1.7 - j842	0.20	*75	*20	**8450	Shorted
3.0	14.1 - j522	0.55	*47	*47	**1530	Shorted
5.2	1.6 - j308	0.32	*100	Not used	**2650	Shorted
8.0	5.35 - j162	0.60	*100	*25	**1000	Shorted
10.0	1.7 - j98	0.54	*67	*100	**1500	Shorted
14.0	1.3 - j23.5	0.45	**777	Not used	**1000	Shorted
17.1	40 + j32	0.80	<sup>1</sup> L1	Not used	*100	Shorted
19.5	180 - j5.5	0.85	<sup>1</sup> L2	Not used	*75	<sup>1</sup> L3
23.0	210 - j104	0.85	*47	*47	*47	<sup>1</sup> L4

\*Ceramic type, 5 kv  
 \*\*Mica type, 500 vdcw  
<sup>1</sup>Refer to figure 703.

Dummy Load Data (Boeing 727 Fin Probe Antenna)  
Figure 702

COIL	TURNS (close-wound)	WIRE TYPE	DIAMETER (in.)
L1	6	#12 enamel	0.75
L2	3-1/4	#12 enamel	0.75
L3	6-1/4	#12 enamel	0.75
L4	8	#12 enamel	0.75

Dummy Load Coil Data  
Figure 703

STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
1	Primary power test	<p>Set up equipment [ paragraph 3.B.(2) ]. Turn on transceiver.</p> <p>Set the test switch on the 309A-9/9A control successively to PHASE 1, PHASE 2, PHASE 3, and 28 VDC.</p>	Meter reads in the upper green area for all cases.	Checks control chassis and 28-vdc supply in relay control module.
<p><b>NOTE:</b> Acceptable performance requires that the following procedures be performed without the need of repair or adjustment to the coupler or coupler control. The cause of any visible corona or voltage breakdown during tests should be corrected before proceeding.</p>				
2	Forward power detector test	<p>Set rf wattmeter to the 250-watt forward power scale. Set transceiver control for 14 MHz. Momentarily press RE-CHANNEL pushbutton. Set the test switch on the 309A-9/9A to FORWARD POWER. Momentarily key transmitter and read meters.</p>	Meter reads 3 to 6 units in the upper green area. 90 to 180 watts.	Checks discriminator forward power output.
3	Reflected power detector test	<p>Set the test switch to REFLECTED POWER. Set rf wattmeter for reflected power, 10-watt scale. Momentarily press RE-CHANNEL pushbutton. Key the transmitter and read both meters.</p>	Some up-scale reading at the moment transmitter is keyed (decreases as system tunes).	Checks discriminator module reflected power output.

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Functional System Test (Sheet 1 of 9)  
Figure 704

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STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
4	Loading discriminator test	Set test switch to LOADING DISCRIMINATOR. Momentarily press RE-CHANNEL pushbutton. Momentarily key transmitter and read meter.	Some reading other than zero at the moment transmitter is keyed. (Deflections occur as the system tunes.)	Checks discriminator module loading output.
5	Phasing discriminator test	Set test switch to PHASING DISCRIMINATOR. Momentarily press RE-CHANNEL pushbutton. Key transmitter and read meter.	Some reading other than zero at the moment transmitter is keyed. (Deflections occur as the system tunes.)	Checks discriminator module phasing output.
6	Ac tuner current test	Set test switch to AC TUNER CURRENT. Momentarily press RE-CHANNEL pushbutton. Key transmitter and read meter.	Meter reads in upper green area (drops to zero when system is tuned).	Checks relay control module controlled ac.
7	Dc tuner current test	Set test switch to DC TUNER CURRENT. Momentarily press RE-CHANNEL pushbutton. Key transmitter and read meter.	Meter reads in upper green area (drops to zero when system is tuned).	Check relay control module controlled dc output.
8  (Cont)	10-MHz tune	Set rf wattmeter for forward power, 250-watt scale. Momentarily press RE-CHANNEL pushbutton.	8 seconds maximum.	Checks system operation.





STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
9 (Cont)		Key transmitter; measure reflected power and determine swr (figure 705).		
10	6-MHz tune	<p>Set dummy load for 6 MHz. Set transceiver control for 6 MHz. Momentarily key transmitter and check tune time.</p> <p>Set rf wattmeter for forward power, 250-watt scale. Key transmitter; measure and record forward power.</p> <p>Set rf wattmeter for reflected power, 10-watt scale. Key transmitter; measure reflected power and determine swr (figure 705).</p>	<p>10 seconds maximum.</p> <p>90 watts minimum.</p> <p>1.3:1 maximum.</p>	<p>Checks system operation.</p> <p>Checks discriminator calibration and system tracking.</p>
11  (Cont)	14-MHz tune	<p>Set dummy load for 14 MHz. Set transceiver control for 14 MHz. Momentarily key transmitter and check tune time.</p> <p>Set rf wattmeter for forward power, 250-watt scale.</p>	<p>12 seconds maximum.</p> <p>90 watts minimum.</p>	Checks system and series C operation.



STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
11 (Cont)		Key transmitter; measure and record forward power.  Set rf wattmeter for reflected power, 10-watt scale. Key transmitter; measure reflected power and determine swr (figure 705).	1.3:1 maximum.	Checks discriminator calibration and system tracking.
12	16-MHz tune	Set dummy load for 16 MHz. Set transceiver control for 16 MHz. Momentarily key transmitter and check tune time.  Set rf wattmeter for forward power, 10-watt scale. Key transmitter; measure and record forward power.  Set rf wattmeter for reflected power, 10-watt scale. Key transmitter; measure reflected power and determine swr (figure 705).	8 seconds maximum.  90 watts minimum.  1.3:1 maximum.	Checks system and series C operation.  Checks discriminator calibration and system tracking.
13  (Cont)	21-MHz tune	Set dummy load for 21 MHz. Set transceiver control for 21 MHz. Momentarily key transmitter and check tune time.  Set rf wattmeter for forward power, 250-watt scale.	6 seconds maximum.  90 watts minimum.	Checks series C circuits and system operation.



STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
13 (Cont)		<p>Key transmitter; measure and record forward power.</p> <p>Set rf wattmeter for reflected power, 10-watt scale.</p> <p>Key transmitter; measure reflected power and determine swr (figure 705).</p>	1.3:1 maximum.	Checks discriminator calibration and system tracking.
14	25-MHz tune	<p>Set dummy load for 25 MHz. Set transceiver control for 25 MHz. Momentarily key transmitter and check tune time.</p> <p>Set rf wattmeter for forward power, 250-watt scale. Key transmitter; measure and record forward power.</p> <p>Set rf wattmeter for reflected power, 10-watt scale. Key transmitter; measure reflected power and determine swr (figure 705).</p>	<p>6 seconds maximum.</p> <p>90 watts minimum.</p> <p>1.3:1 maximum.</p>	<p>Checks series C circuits and system operation.</p> <p>Checks discriminator calibration and system tracking.</p>
15  (Cont)	Demand surveillance test	<p>Press and release the RE-CHANNEL button on the 309A-9/9A control. Connect the variable 10- to 150-pf capacitor between the antenna terminal of the 180R-12 coupler and ground with the rotor at</p>		Checks discriminator and relay control module sensitivity.





STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
15 (Cont)		ground potential. Set the capacitance to minimum (plates unmeshed).		
	<p><b>WARNING:</b> VOLTAGE INTO DUMMY LOAD MAY BE AS HIGH AS 13.5 KV WITH RADIO SET AN/ARC-58 OR 6 KV WITH A LOWER POWER TRANSMITTER. USE CARE TO PREVENT RF BURNS. A HIGH-VOLTAGE SIGN SHOULD BE PLACED ON THE BENCH DURING THE TESTS.</p>			
		<p>Set wattmeter to forward power, 250-watt scale. Momentarily key transmitter to tune coupler. Rekey transmitter; measure and record forward power. Set wattmeter for reflected power.</p> <p>Key transmitter and hold while slowly increasing the capacitance; note the reflected power indication just before the coupler automatically retunes.</p>	15 watts maximum.	
16  (Cont)	Arc-over test	<p>Key the transmitter and, while holding key, ground the arc indicator line (309A-9, P1B-10, or 309A-9A, P1B-21).</p> <p>Change transceiver control frequency and return to 25 MHz. Momentarily key transmitter.</p>	<p>Forward power drops to zero.</p> <p>System tunes normally.</p>	Checks relay control module arc fault circuit.

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Functional System Test (Sheet 7 of 9)  
Figure 704

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STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
16 (Cont)		<p>Set the 309A-9/9A control test switch to ARC INDICATOR.</p> <p>Replace arc indicator fuse and read meter.</p>	<p>Meter reads zero.</p> <p>Meter reads in upper green area.</p>	
17	Receive only test	<p>Change and return the frequency to 25 MHz on the transceiver control. Disconnect the rf input and output leads of the 180R-12 coupler. Measure the resistance between the rf input terminal and ground.</p> <p>Measure the resistance between the rf input terminal and the rf output terminal.</p>	<p>490 to 630 ohms.</p> <p>0.6 ohm maximum.</p>	Checks relay control module in standby mode and tuner bypass switching.
18	Fault circuit test	<p>Connect the coaxial cable (that was connected to the rf input terminal of the 180R-12 coupler) directly to the 50-ohm coaxial resistor. Set the wattmeter to forward power, 250-watt scale. Momentarily key transmitter and time the presence of forward power.</p>	25 to 35 seconds.	Checks relay control module fault timer circuit.

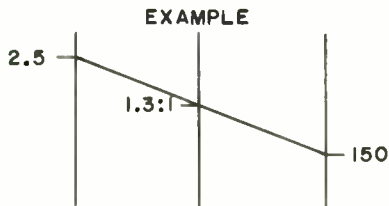
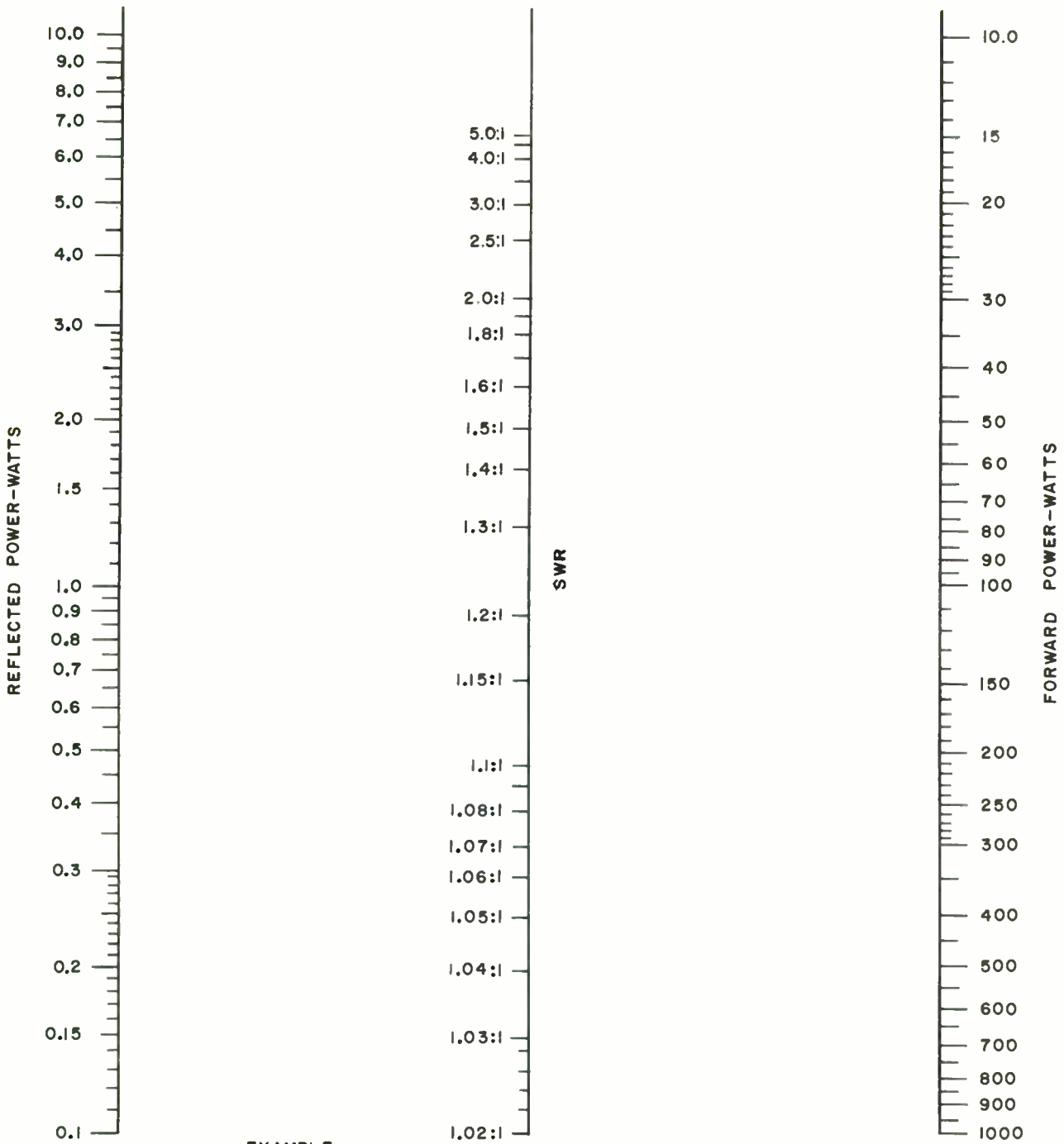


STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
19	Pressure test	Set test switch to PRESSURE.	Meter reads in upper green area.	Checks coupler pressure switch.
20		Shut off and disconnect equipment.		

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Functional System Test (Sheet 9 of 9)  
Figure 704

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REFLECTED PWR = 2.5 WATTS  
 FORWARD PWR = 150 WATTS  
 SWR = 1.3:1

C1026-17-3

SWR Nomograph  
Figure 705

STEP	TEST	CIRCUIT SELECTOR POSITION	INSTRUCTIONS	RESULTS	COMMENTS
<b>CAUTION:</b> DUTY CYCLE OF 878L-19 DISCRIMINATOR MODULE TESTER IS 5 MINUTES ON AND 5 MINUTES OFF IF BIRD LOAD RESISTOR IS NOT VENTILATED TO FREE AIR.					
1	Phasing discriminator balance	INPUT POWER  PHASE	Set up equipment [ paragraph 3.D.(1)(a) ] . Apply power to transceiver.  Set transmitter for 30 MHz, and adjust rf output for a METER indication of 7.0 ±0.5 units.  Key transmitter, and adjust R9 (PHASE ADJUST on discriminator) for center-0 indication on METER.	Center-0 indication	
2	Reflected power detector calibrate	REFL POWER	Key transmitter, and adjust C1 (REFLECTED POWER ADJ on discriminator) for a null near the center-0 on METER.	Null	
3	Loading discriminator calibrate	INPUT POWER  LOAD	Set transmitter for 14 MHz, and adjust rf output for a METER indication of 7.0 ±0.5 units.  Key transmitter, and adjust C4 (LOADING ADJUST on discriminator) for center-0 indication on METER.	Center-0 indication	

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Performance Test, Discriminator Module,  
 Special Tester Method (Sheet 1 of 6)  
 Figure 706



STEP	TEST	CIRCUIT SELECTOR POSITION	INSTRUCTIONS	RESULTS	COMMENTS
4	Tracking and sensitivity (2 MHz)	INPUT POWER	Set transmitter for 2 MHz, and adjust rf output for a METER indication of 7.0 $\pm$ 0.5 units.		
		FWD POWER	Key transmitter and read METER.	+3.0 to +6.0 units	
		PHASE	Key transmitter and record METER indication.	-2.0 to +2.0 units	
		2 MC	Key transmitter, and determine algebraic difference between this METER indication and the phase indication recorded above.	1.5 units minimum	
		LOAD	Key transmitter and record METER indication.	-3.5 to +3.5 units	
		LOAD SENS	Key transmitter, and determine algebraic difference between this METER indication and the load indication recorded above.	3.0 units minimum	
		REFL POWER	Key transmitter and record METER indication.	0.0 to +2.0 units	
		REFL SENS	Key transmitter, and determine algebraic difference between this METER indication and the reflected power indication recorded above.	1.0 unit minimum	



OVERHAUL  
MANUAL

STEP	TEST	CIRCUIT SELECTOR POSITION	INSTRUCTIONS	RESULTS	COMMENTS
5	Tracking and sensitivity (8 MHz)	INPUT POWER	Set transmitter for 8 MHz, and adjust rf output for a METER indication of 7.0 $\pm$ 0.5 units.		
		FWD POWER	Key transmitter and read METER.	+3.0 to +6.0 units	
		PHASE	Key transmitter and record METER indication.	-2.0 to +2.0 units	
		8 MC	Key transmitter, and determine algebraic difference between this METER indication and the phase indication recorded above.	2.0 units minimum	
		LOAD	Key transmitter and record METER indication.	-3.5 to +3.5 units	
		LOAD SENS	Key transmitter, and determine algebraic difference between this METER indication and the load indication recorded above.	3.0 units minimum	
		REFL POWER	Key transmitter and record METER indication.	0.0 to +2.0 units	
		REFL SENS	Key transmitter, and determine algebraic difference between this METER indication and the reflected power indication recorded above.	1.0 unit minimum	

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Performance Test, Discriminator Module,  
Special Tester Method (Sheet 3 of 6)  
Figure 706

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STEP	TEST	CIRCUIT SELECTOR POSITION	INSTRUCTIONS	RESULTS	COMMENTS
6	Tracking and sensitivity (14 MHz)	INPUT POWER	Set transmitter for 14 MHz, and adjust rf output for a METER indication of $7.0 \pm 0.5$ units.		
		FWD POWER	Key transmitter and read METER.	+3.0 to +6.0 units	
		PHASE	Key transmitter and record METER indication.	-2.0 to +2.0 units	
		14 MC	Key transmitter, and determine algebraic difference between this METER indication and the phase indication recorded above.	2.0 units minimum	
		LOAD	Key transmitter and record METER indication.	-3.5 to +3.5 units	
		LOAD SENS	Key transmitter, and determine algebraic difference between this METER indication and the load indication recorded above.	3.0 units minimum	
		REFL POWER	Key transmitter and record METER indication.	0.0 to +2.0 units	
		REFL SENS	Key transmitter, and determine algebraic difference between this METER indication and the reflected power indication recorded above.	1.0 unit minimum	





STEP	TEST	CIRCUIT SELECTOR POSITION	INSTRUCTIONS	RESULTS	COMMENTS
7	Tracking and sensitivity test (30 MHz)	INPUT POWER	Set transmitter for 30 MHz, and adjust rf output for a METER indication of 7.0 $\pm$ 0.5 units.		
		FWD POWER	Key transmitter and read METER.	+3.0 to +6.0 units	
		PHASE	Key transmitter and record METER indication.	-2.0 to +2.0 units	
		30 MC	Key transmitter, and determine algebraic difference between this METER indication and the phase indication recorded above.	2.0 units minimum	
		LOAD	Key transmitter and record METER indication.	-3.5 to +3.5 units	
		LOAD SENS	Key transmitter, and determine algebraic difference between this METER indication and the load indication recorded above.	3.0 units minimum	
		REFL POWER	Key transmitter and record METER indication.	0.0 to 2.0 units	
		REFL SENS	Key transmitter, and determine algebraic difference between this METER indication and the reflected power indication recorded above.	1.5 units minimum	
(Cont)					

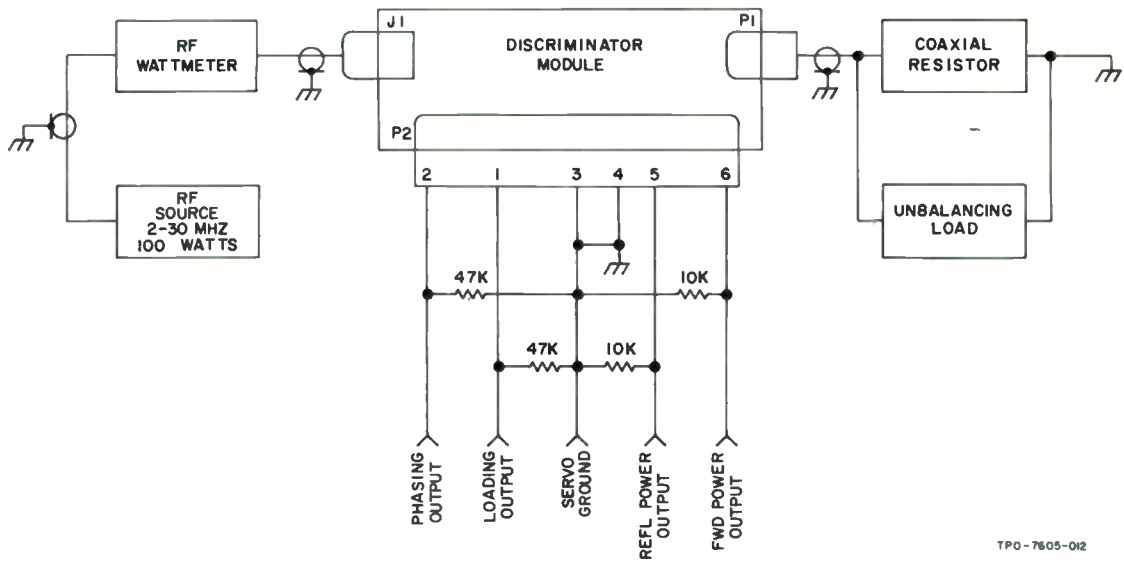
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Performance Test, Discriminator Module,  
Special Tester Method (Sheet 5 of 6)  
Figure 706

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STEP	TEST	CIRCUIT SELECTOR POSITION	INSTRUCTIONS	RESULTS	COMMENTS
7 (Cont)			<p>Shut off power and disconnect test setup.</p> <p>Transfer discriminator electronics to original housing, and remount special test housing on 878L-19 tester.</p>		



TPO-7605-012

Discriminator Performance, Alternate Method, Test Setup  
Figure 707

STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
1	Phasing discriminator	<p>Connect test setup [paragraph 3.d.(1)(6)] and apply power to transmitter.</p> <p>Set transmitter for 30 MHz at 100 watts forward power. Key transmitter, and adjust R9 in the discriminator module for 0 vdc between the phasing output and servo ground.</p>	0 vdc	
2	Reflected power detector calibrate	Key transmitter, and adjust C1 in the discriminator module for a dc voltage null (near 0 vdc) between the reflected power output and servo ground.	Null	
3	Loading discriminator calibrate	Set transmitter for 14 MHz at 100 watts forward power. Key transmitter, and adjust C4 in the discriminator module for 0 vdc between the loading output and servo ground.	0 vdc	
4	Tracking test	<p>Set transmitter for 2 MHz at 100 watts forward power. Measure the dc voltage between servo ground and the forward power output.</p> <p>Measure and record the dc voltage between servo ground and the following:</p>	2.0 to 3.0 vdc	
(Cont)				



STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
4 (Cont)		Phasing output Reflected power output Loading output  Repeat this step for frequencies of 8, 14, and 30 MHz.	-60 to +60 mvdc 0 to +150 mvdc -75 to +75 mvdc	
5	Loading sensitivity test	Connect a 500-ohm, 15-watt, nonreactive resistor in parallel with the coaxial resistor.  Measure and record the dc voltage between servo ground and the loading output for transmitter frequencies of 2, 8, 14, and 30 MHz at 100 watts forward power.  Determine the algebraic difference between these readings and the loading output reading (recorded in step 4) for the four test frequencies.	75 mvdc minimum	
6  (Cont)	Reflected power sensitivity	Measure and record the dc voltage between servo ground and the reflected power output for transmitter frequencies of 2, 8, 14, and 30 MHz at 100 watts forward power.		

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Performance Test, Discriminator Module,  
Alternate Method (Sheet 2 of 5)  
Figure 708

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STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
6 (Cont)		<p>Determine the algebraic difference between these readings and the reflected power reading (recorded in step 4) for the following test frequencies:</p> <p>2 MHz 8 MHz 14 MHz 30 MHz</p> <p>Disconnect the 500-ohm, 15-watt resistor from the test setup.</p>	<p>250 mvdc minimum 330 mvdc minimum 330 mvdc minimum 500 mvdc minimum</p>	
7	Phasing sensitivity test (2 MHz)	<p>Connect an unbalancing capacitance of 380 pf at 500 vdc in parallel with the coaxial resistor. Set transmitter for 2 MHz at 100 watts forward power.</p> <p>Measure and record the dc voltage between servo ground and the phasing output.</p> <p>Determine the algebraic difference between this reading and the phasing output reading of step 4.</p>	<p>30 mvdc minimum</p>	

STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
8	Phasing sensitivity test (8 MHz)	<p>Change unbalancing capacitance to 94 pf at 500 vdc. Set transmitter for 8 MHz at 100 watts forward power.</p> <p>Measure and record the dc voltage between servo ground and the phasing output.</p> <p>Determine the algebraic difference between this reading and the phasing output reading of step 4.</p>	50 mvdc minimum	
9	Phasing sensitivity test (14 MHz)	<p>Change unbalancing capacitance to 54 pf at 500 vdc. Set transmitter for 14 MHz at 100 watts forward power.</p> <p>Measure and record the dc voltage between servo ground and the phasing output.</p> <p>Determine the algebraic difference between this reading and the phasing output reading of step 4.</p>	50 mvdc minimum	
10 (Cont)	Phasing sensitivity test (30 MHz)	<p>Change unbalancing capacitance to 24 pf at 500 vdc. Set transmitter for 30 MHz at 100 watts forward power.</p>		

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Performance Test, Discriminator Module,  
 Alternate Method (Sheet 4 of 5)  
 Figure 708



STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
10 (Cont)		<p>Measure and record the dc voltage between servo ground and the phasing output.</p> <p>Determine the algebraic difference between this reading and the phasing output reading of step 4.</p> <p>Shut off power and disconnect test set up.</p> <p>Transfer discriminator electronics to original housing.</p>	50 mvdc minimum	





STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
1	Tap drive test (home)	<p>Connect test setup[(paragraph 3.D.(3)].</p> <p>Adjust the variable dc supply to 28 vdc. Adjust the variable ac supply to 11 vac. Set TUNE-HOME switch to HOME and COIL-TAP switch to TAP. Depress OPERATE switch.</p> <p>Release OPERATE switch when tap assembly reaches mechanical stop.</p>	Center-tap assembly moves toward front housing.	
2	Coil drive test (home)	<p>Adjust variable ac supply to 10 vac. Set COIL-TAP switch to COIL. Depress OPERATE switch.</p> <p>Release OPERATE switch when drums stop rotating (mechanical stop is reached).</p> <p>Momentarily depress CAP HOME switch.</p>	<p>Ribbon transfers to ground drum. SEQUENCE HOLD lamp lights.</p> <p>Switch arm on rear plate engages contacts to create short across capacitor C3.</p>	
3 (Cont)	Coil drive test (tune)	<p>Set TUNE-HOME switch to TUNE. Depress OPERATE switch.</p>	Ribbon transfers to ceramic drum. SEQUENCE HOLD lamp goes out.	

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Performance Test, 180R-12 Basic  
Coupler Group (Sheet 1 of 3)  
Figure 709

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STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
3 (Cont)		Release OPERATE switch when drums stop rotating (mechanical stop is reached).	COIL SELECT lamp lights momentarily just before mechanical stop is reached.	
4	Tap drive test (tune)	Adjust variable ac supply to 11 vac. Set COIL-TAP switch to TAP. Depress OPERATE switch.  Release OPERATE switch when TAP LIMIT lamp lights.	Tap assembly moves away from front housing.  Tap contacts are 30° to 60° away from tap stops on rim of ceramic drum end plate (refer to figure 521).	
5	Series C switch test	Adjust variable dc supply to 22 vdc. Momentarily depress CAP SET switch.  Momentarily depress CAP HOME switch.	Switch arm on rear plate removes short from across capacitor C3.  Switch arm creates a short across capacitor C3.	
6	Coil and tap drive test (home)	Adjust variable dc supply to 28 vdc. Set COIL-TAP switch to COIL. Depress OPERATE switch.  Release OPERATE switch when SEQUENCE HOLD lamp lights.	Ribbon transfers to metal drum and tap assembly moves toward front housing. TAP LIMIT and COIL SELECT lamps go out.	

STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
7	Mechanical fit and clearance check	<p>Check the mechanical fits and clearances marked with an asterisk in figure 601. Remove power from test fixture when not required.</p> <p>Disconnect test setup.</p>	As specified.	

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Performance Test, 180R-12 Basic  
Coupler Group (Sheet 3 of 3)  
Figure 709

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STEP	TEST	TEST SELECTOR POSITION	INSTRUCTIONS	RESULTS	COMMENTS
1	Normal amplifier gain	OFF  GAIN CHECK	Plug module into connector on front panel of 878L-18 tester.  Measure ac voltage at test point TP115 on front panel of tester.  Measure frequency at test point TP115.  Read METER.	105 to 125 vac.  380 to 420 Hz.  1.0 to 2.0 oz-in.	Adjust line voltage.  Adjust line frequency.
2	Maximum gain at saturation	MAX TORQUE  OFF	Read METER.  Disconnect module from tester.	2.0 to 3.0 oz-in.	



STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
1	Amplifier gain	<p>Connect test setup paragraph [3.D.(4)(b)]. Close S1 and S2 on test setup. Adjust R4 for 20 ±2 mvrms across R1 of test setup.</p> <p>Measure voltage across C1 of test setup.</p> <p>Measure voltage across C2 of test setup.</p> <p>Open S1 and S2 on test setup and disconnect module.</p>	<p>18 to 22 vrms.</p> <p>18 to 22 vrms.</p>	

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Performance Test, Servo-Amplifier Module,  
Alternate Method  
Figure 711

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STEP	TEST	INSTRUCTIONS				RESULTS	COMMENTS
		SET BAND	SET INPUT	MONITOR AC	SET DC VOLTS	READ AC VOLTS	
1	Coil home	A	Homing	J1	21.5 vdc	300 to 350 mvrms	
2	A coil	A	Loading	J1	23 vdc	2.80 to 3.20 vrms	
3	B coil	B	Loading	J1	23 vdc	380 to 520 mvrms	
4	C coil	C	Loading	J1	23 vdc	100 to 120 mvrms	
5	D coil	D	Loading	J1	23 vdc	280 to 320 mvrms	
6	D tap	D	Phasing	J5	23 vdc	170 to 210 mvrms	
7	C tap	C	Phasing	J5	23 vdc	120 to 140 mvrms	
8	B tap	B	Phasing	J5	23 vdc	1.85 to 2.1 vrms	
9	A tap	A	Phasing	J5	23 vdc	1.35 to 1.50 vrms	
10	Crossfeed	A	Loading	J5	23 vdc	0.90 to 1.15 vrms	





STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
1	Tune mode test	Connect test setup [paragraph 3.D.(7)]. Slowly increase dc voltage supply output.  Read ohmmeter.	Relay K1 energizes with less than 20 vdc.  20 to 30 ohms.	Checks relay circuit.  Checks series resistor.
2	Operate mode test	Decrease dc voltage supply output.  Read ohmmeter.  Remove power and disconnect test setup.	Relay K1 becomes deenergized at some voltage above 1.0 vdc.  Less than 0.1 ohm.	Checks relay operation.

STEP	TEST	INSTRUCTIONS	RESULTS	COMMENTS
1	Transmit mode test	<p>Connect test setup [paragraph 3.D.(8)] . Connect ohmmeter between center conductors of J2 and J4. Read ohmmeter.</p> <p>Slowly increase dc voltage supply output.</p> <p>Read ohmmeter.</p>	<p>Open circuit indication.</p> <p>Relay K1 energizes with less than 20 vdc.</p> <p>Less than 0.1 ohm.</p>	
2	Receive mode test	<p>Decrease dc voltage supply output.</p> <p>Read ohmmeter.</p> <p>Measure resistance between center conductors of J1 and J2.</p> <p>Remove power and disconnect test setup.</p>	<p>Relay K1 become deenergized at some voltage above 1.0 vdc.</p> <p>Open circuit indication.</p> <p>Less than 0.1 ohm.</p>	







## 180R - 12 Antenna Coupler and 309A - 9/9A Antenna Coupler Control - Troubleshooting

### 1. GENERAL.

This section presents troubleshooting information in the form of trouble-analysis tables and schematic diagrams.

After a difficulty is located and repaired, the equipment should be completely tested to verify that the repairs have not affected other portions of the circuit.

### 2. TROUBLESHOOTING PHILOSOPHY.

Troubleshooting may best be accomplished by performing the test procedures in the testing section of this manual. The COMMENTS column of the functional system performance test will normally indicate which module or group is faulty and give clues to identify the faulty area. The individual module performance tests, in like manner, further isolate the fault. Use of the applicable troubleshooting information in this section will help locate the defective part, which then can be repaired or replaced.

### 3. TEST EQUIPMENT.

The test equipment required for troubleshooting is described in the special tools, fixtures, and equipment section of this manual.

### 4. SOLDERING INSTRUCTIONS.

Use a 35-watt iron to solder or unsolder all connections except ground connections made directly to the chassis. For ground connections to a chassis, use a 100-watt iron.

CAUTION: USE HIGH-TEMPERATURE SOLDER AND FLUX WHEN REPAIRING THE SERIES L COIL IN THE RF LOAD COIL GROUP.

CAUTION: COMPONENT DRESS IS EXTREMELY CRITICAL. WHENEVER A COMPONENT OR A LENGTH OF WIRING IS BEING REPLACED, MAINTAIN THE PROPER DRESS.

CAUTION: LEAD DRESS IS EXTREMELY CRITICAL. IN ALL REPAIR THAT INCLUDES THE REPLACEMENT OF WIRING, BE ESPECIALLY CAREFUL TO DUPLICATE THE ORIGINAL TYPE, LENGTH, AND ROUTING OF WIRES TO ENSURE THE PROPER LEAD DRESS. USE ANOTHER UNIT AS A GUIDE.

### 5. TROUBLESHOOTING PROCEDURES.

#### A. Troubleshooting the System.

##### (1) Purpose.

System troubleshooting is to isolate the trouble to a module or group and to determine, from the symptoms obtained, the problem area.



(2) Procedure.

Perform the system functional test (testing section) and, when an abnormal result is obtained, refer to the corresponding step of the system trouble-analysis chart (figure 801). Use of the block diagram (description and operation section) will help to analyze the malfunction and, thereby, identify the modules or groups involved. Substitution of the modules concerned will isolate the defective module which is then tested separately. Coupler control chassis wiring should not be overlooked and use of the applicable schematic diagram (figures 811 and 812) will aid visual inspection and continuity testing of the circuits involved.

B. Troubleshooting the Discriminator Module.

Test the module using one of the two methods of performance testing provided in the testing section. When an abnormal result is obtained, refer to the corresponding step of the associated trouble-analysis chart (figures 802 and 803) for probable cause identification. The schematic diagram of the discriminator module is shown in figure 811.

C. Troubleshooting the Basic Coupler Group.

Test the basic coupler group as described in the testing section. When an abnormal result is obtained, refer to the corresponding step of the trouble-analysis chart (figure 804) for probable cause identification. The schematic diagram of the basic coupler group is shown in figure 811.

D. Troubleshooting the RF Load Coil Group. (Refer to figure 811.)

The rf load coil group is tested during the system functional test (testing section). Further checking can be accomplished visually and by use of a 28-volt dc power supply (to check operation of the two relays) and a voltohmmeter (for continuity testing).

**CAUTION:** SEE SOLDERING INSTRUCTIONS BEFORE MAKING REPAIRS.

E. Troubleshooting the Servo-Amplifier Module.

(1) General.

A servo-amplifier module should be replaced if it does not meet the requirements of the performance test (testing section).

(2) Test Equipment.

If troubleshooting is attempted, an oscilloscope, a vtvm, and an ohmmeter are required and the module must be partially disassembled (disassembly section) to permit circuit testing. The schematic diagram of the servo-amplifier module (figure 813) shows typical dc voltages present under static conditions.

**NOTE:** When using the 878L-18 tester to provide operating power and loading for the module, the static condition is obtained by patching test points 11, 12, and 13 (on the front panel of the tester) together and setting the switch to the GAIN CHECK position.



NOTE: When using the servo-amplifier test fixture (special tools, fixtures, and equipment) to provide operating power and loading, the static condition is obtained by shorting pins 11, 12, and 13 (on the module connector) together, and closing only switch S1 on the test fixture.

CAUTION: UNDER NORMAL CONDITIONS, THE CAN AND CAP OF THE SERVO-AMPLIFIER MODULE ACT AS A HEAT SINK. WHENEVER POWER IS APPLIED TO THE EXPOSED MODULE, SUBSTITUTE HEAT SINKS MUST BE ATTACHED TO THE CASES OF TRANSFORMER T1 AND POWER TRANSISTORS Q7 AND Q8.

(3) Troubleshooting Criteria.

- (a) The total voltage gain of the module is 1000 when a 9- to 20-millivolt, 400  $\pm$ 20-Hz, sinusoidal signal is applied to input number 2 (pin 11). The total phase shift between input and output signals should not exceed 15°.
- (b) Any deviation in the operating characteristics of a certain amplifier stage can affect the operation of the preceding stages.
- (c) Common-emitter amplifiers have a 180° phase shift between the input and output signal voltages. However, there will be no phase shift between the input and output signals if the base is shorted to the collector of the transistor.
- (d) The dc base voltage should be slightly more positive than the emitter voltage during normal operation of a common-emitter, npn-type transistor amplifier. However, an open circuit between the base and the emitter of the transistor will result in an emitter voltage of approximately ground potential and a base voltage considerably greater than normal.
- (e) An unusually high dc collector voltage can be caused by an open emitter circuit, an open collector circuit, or a short between the base and the emitter of the transistor. An open circuit either between the base and the emitter or in the output load of the stage under consideration will also cause an unusually high dc collector voltage.
- (f) An unusually low dc collector voltage indicates a short circuit between the collector and ground, the collector and the emitter, the collector and the base, or across the output load.
- (g) When checking the directional junction resistance of the npn-type of transistor, the resistance to electron flow from the emitter to the base and the collector to the base is several thousand times greater than the resistance from the base to the emitter and from the base to the collector. Check the ohmmeter against a diode to determine which prod is connected to the negative side of the meter's internal battery to ascertain the direction of electron flow for these checks.

CAUTION: USE EXTREME CARE WHEN SOLDERING THE LEADS OF SEMICONDUCTOR DEVICES SO AS NOT TO CHANGE THEIR CHARACTERISTICS. WHENEVER PRACTICABLE, USE A HEAT SINK ON THE LEAD BETWEEN THE POINT OF HEAT APPLICATION AND THE SEMICONDUCTOR DEVICE.



F. Troubleshooting the Servo-Control Module.

Completely test the servo-control module as described in the testing section. Record all abnormal results (symptoms). Search the trouble-analysis chart (figure 805) for a symptom match to identify the probable cause. Figure 814 is the schematic diagram of the servo-control module.

G. Troubleshooting the Relay Control Module.

Test the relay control module as described in the testing section until a verification lamp pattern deviation is obtained. In the trouble-analysis chart (figure 806) locate the corresponding PROGRAM switch position and the lamp pattern deviation for interpretation and probable defect identification.

NOTE: An erroneous lamp pattern deviation may occur if the PROGRAM switch is not advanced sequentially or sufficient time for verification is not provided.

NOTE: If the three fuses of the 878L-13 tester blow, this indicates that the 28-volt supply of the module is being shorted by the defect in the module.

NOTE: A trouble-analysis chart (figure 807), covering the OFF position of the 878L-13 tester PROGRAM switch, gives information regarding the mode and the 28-volt power supply of the module.

Figure 815 is the schematic diagram of the relay control module.

H. Troubleshooting the 399V-1 and 399W-1 Adapters.

Test the adapters as described in the testing section. When an abnormal result is obtained, refer to the corresponding step of the trouble-analysis chart for probable cause identification. The applicable figure numbers are shown below.

<u>ADAPTER</u>	<u>TROUBLE ANALYSIS</u>	<u>SCHEMATIC DIAGRAM</u>
399V-1	Figure 808	Figure 816
399W-1	Figure 809	Figure 817

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System Trouble-Analysis Chart (Sheet 1 of 6)  
Figure 801

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Page 805

STEP	TEST	SYMPTOM	PROBABLE CAUSE
1	Primary power test	<p>PHASE 1, 2, 3 and 28 VDC not in upper green area.</p> <p>PHASE 1, 2, and 3 OK. 28 VDC not in upper green area.</p> <p>28 VDC OK. PHASE 1, 2, or 3 not in upper green area.</p>	<p>Primary power relay not energized. Check K1, CR1, CR2, 3-phase input power, primary power control, and external 28 vdc in coupler control chassis.</p> <p>Defective 28-vdc power supply. Check T1 in coupler control chassis and CR1 through CR6 in relay control module.</p> <p>Defective meter circuit in coupler control chassis.</p>
2	Forward power detector	<p>Zero indication on both meters.</p> <p>Rf wattmeter indication normal. Test meter indication low or zero.</p>	<p>Check interconnect wiring, standby circuit in coupler control chassis, relay control module, and antenna/interlock relay in rf load coil group.</p> <p>Defective test meter circuit in coupler control chassis. Defective forward power detector in discriminator module.</p>
3	Reflected power detector	<p>Rf wattmeter indication normal. Steady zero or low indication on test meter.</p> <p>As system tunes, rf wattmeter indication decreases toward zero but test meter indication remains up scale.</p> <p>Both meter indications remain up scale for approximately 30 seconds before dropping to zero.</p>	<p>Defective test meter circuit in coupler control chassis. Defective reflected power detector in discriminator module.</p> <p>Same as above.</p> <p>System not tuning. Perform test 4.</p>



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STEP	TEST	SYMPTOM	PROBABLE CAUSE
4	Loading discriminator test	<p>Test meter indication is approximately zero or full scale and steady (no deflections) during system tune time. Reflected power indication on rf wattmeter decreases toward zero.</p> <p>Same as above except reflected power indication on rf wattmeter remains up scale for approximately 30 seconds.</p> <p>Test meter indication appears normal but meter deflections do not occur.</p>	<p>Defective test meter circuit in coupler control chassis.</p> <p>Defective loading discriminator in discriminator module.</p> <p>System not tuning. Perform test 5.</p>
5	Phasing discriminator test	<p>Test meter indication is approximately zero or full scale and steady (no deflections) during system tune time. Reflected power indication on rf wattmeter decreases toward zero.</p> <p>Same as above except reflected power indication on rf wattmeter remains up scale for approximately 30 seconds.</p> <p>Test meter indication appears normal but meter deflections do not occur.</p>	<p>Defective test meter circuit in coupler control chassis</p> <p>Defective phasing discriminator in discriminator module.</p> <p>System not tuning. Perform test 6.</p>
6	Ac tuner current test	<p>Test meter indication not in upper green area as system tunes. Reflected power indication of rf wattmeter decreases toward zero.</p> <p>Test meter indication is zero when transmitter is keyed. Rf wattmeter indicates presence of reflected power.</p>	<p>Defective test meter circuit in coupler control chassis.</p> <p>Loss of controlled ac power. Check relay control module, phase 2 ac and 10-vac circuits in coupler control chassis.</p>



STEP	TEST	SYMPTOM	PROBABLE CAUSE
7	Dc tuner current test	<p>Test meter indication not in upper green area as system tunes. Reflected power indication on rf wattmeter meter decreases toward zero.</p> <p>Test meter indication is zero when transmitter is keyed. Rf wattmeter indicates presence of reflected power.</p>	<p>Defective test meter circuit in coupler control chassis.</p> <p>Loss of controlled dc power. Check relay control module.</p>
8	10-MHz tune	<p>Tune time exceeds 8 seconds.</p> <p>Forward power less than 90 watts.</p> <p>Swr exceeds 1.3:1.</p>	<p>Check servo-amplifier modules, servo-control module, relay control module, and basic coupler group.</p> <p>Adjust rf output of transmitter.</p> <p>Recalibrate discriminator. Check compensation network in servo-control module.</p>
9	2-MHz tune	<p>Tune time exceeds 14 seconds.</p> <p>Forward power less than 90 watts.</p> <p>Swr exceeds 1.3:1.</p>	<p>Check coil select and series L circuits throughout system, servo-amplifier modules, servo-control module, relay control module, rf load coil group, and basic coupler group.</p> <p>Adjust rf output of transmitter.</p> <p>Recalibrate discriminator. Check compensation network in servo-control module.</p>
10 (Cont)	6-MHz tune	<p>Tune time exceeds 10 seconds but is normal after RECHANNEL pushbutton is momentarily depressed.</p>	<p>Check rechannel interconnect circuit in coupler control chassis.</p>



STEP	TEST	SYMPTOM	PROBABLE CAUSE
10 (Cont)		Tune time exceeds 10 seconds.  Forward power less than 90 watts.  Swr exceeds 1.3:1.	Check servo-amplifier modules, servo-control module, relay control module, and basic coupler group.  Adjust rf output of transmitter.  Recalibrate discriminator. Check compensation network in servo-control module.
11	14-MHz tune	Duration of forward power presence (tune time) exceeds 12 seconds.  Forward power less than 90 watts.  Swr exceeds 1.3:1.	Check series C, high-set, and band information circuits in basic coupler group, servo-amplifier modules, servo-control module, basic coupler group, and relay control module.  Adjust transmitter rf output.  Recalibrate discriminator. Check compensation network in servo-control module.
12	16-MHz tune	Tune time exceeds 8 seconds.  Forward power less than 90 watts.  Swr exceeds 1.3:1.	Check series C, high-set, and band information circuits in basic coupler group, servo-amplifier modules, servo-control module, and relay control module.  Adjust rf output of transmitter.  Recalibrate discriminator. Check compensation network in servo-control module.
13 (Cont)	21-MHz tune	Tune time exceeds 6 seconds.	Check series C, high-set, and band D information circuits in basic coupler group, servo-amplifier modules, servo-control module, and relay control module.





STEP	TEST	SYMPTOM	PROBABLE CAUSE
13 (Cont)		Forward power less than 90 watts. Swr exceeds 1.3:1.	Adjust rf output of transmitter. Recalibrate discriminator. Check compensation network in servo-control module.
14	25-MHz tune	Tune time exceeds 6 seconds.  Forward power less than 90 watts.  Swr exceeds 1.3:1.	Check series C, high-set, and band information circuits in basic coupler group, servo-amplifier modules, servo-control module, and relay control module.  Adjust rf output of transmitter.  Recalibrate discriminator. Check compensation network in servo-control module.
15	Demand surveillance test	Reflected power exceeds 15 watts.	Check reflected power detector in discriminator module and reflected power trigger in relay control module.
16	Arc-over test	Forward power does not drop to zero.  System does not tune normally after frequency waggle.  Test meter indication is not zero before fuse replacement or is zero after fuse replacement.	Check relay control module and antenna/interlock circuit of rf load coil group.  Check relay control module.  Check meter circuit, arc indicator circuit, and 28-vdc circuit in coupler control chassis.
17	Receive only test	Resistance reading is not 490 to 630 ohms.  Resistance reading exceeds 0.6 ohm.	Check receiver load and bypass relay in basic coupler group and bypass tuner circuit in relay control module.  Check antenna/interlock relay in rf load coil group.



STEP	TEST	SYMPTOM	PROBABLE CAUSE
18	Fault circuit test	Duration of forward power presence is other than 25 to 35 seconds.	Check relay control module.
19	Pressure test	Test meter does not read in upper green area.  Test meter does not read in upper green area after pressure gauge check reveals that pressure is normal.	Check coupler pressure with pressure gauge and repressurize to 6 ±1 psig if necessary. Repeat pressure test step 19.  Check pressure switch in basic coupler group.





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STEP	TEST	RESULT	PROBABLE CAUSE
1	Phasing discriminator balance	METER indication to left of center 0. Adjustment of R9 does not correct or R9 must be set to limit.	Open circuit in CR6 leg of phasing discriminator.
		METER indication to right of center 0. Adjustment of R9 does not correct or R9 must be set to limit.	Open circuit in CR5 leg of phasing discriminator.
		METER indication oscillates.	Leaky diode, defective filter choke, or defective filter capacitor in phasing discriminator circuit.
2	Reflected power detector calibrate	METER indication exceeds 1.5 units. Adjustment of C1 does not change indication.	Open circuit in capacitive leg of reflected power detector.
		Adjustment of C1 does not null METER indication below 1.5 units.	Open circuit in inductive leg of reflected power detector.
		METER indication oscillates.	Leaky diode or defective choke in reflected power detector.
3	Loading discriminator calibrate	METER indication to left of center 0. Adjustment of C4 has no effect.	Open circuit in capacitive leg of loading discriminator.
		METER indication to right of center 0. Adjustment of C4 cannot bring indication to left of center 0.	Open circuit in inductive leg of loading discriminator.
		METER indication oscillates.	Defective diode or filter network in loading discriminator.
4 (Cont)	Tracking and sensitivity (2 MHz)	FWD POWER indication is zero.	Open circuit in forward power detector.

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Trouble Analysis, Discriminator Module,  
Special Tester Method (Sheet 1 of 4)  
Figure 802

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Page 811

STEP	TEST	RESULT	PROBABLE CAUSE
<p>4 (Cont)</p>		<p>FWD POWER indication oscillates.</p> <p>FWD POWER indication not between +3.0 and +6.0 units.</p> <p>PHASE indication not between -2.0 and +2.0 units.</p> <p>or</p> <p>Algebraic difference of 2 MC sensitivity less than 1.5 units.</p> <p>LOAD indication not between -3.5 and +3.5 units.</p> <p>or</p> <p>Algebraic difference of LOAD SENS less than 3.0 units.</p> <p>REFL POWER indication not between 0.0 and +2.0 units.</p> <p>or</p> <p>Algebraic difference of REFL SENS less than 1.0 unit.</p>	<p>Leaky diode CR2 or defective filter network in forward power detector.</p> <p>Defective capacitor C8 or coupling of loading discriminator to rf line.</p> <p>Defective coupling of phasing discriminator to rf line.</p> <p>Defective coupling of loading discriminator to rf line.</p> <p>Defective coupling of reflected power detector to rf line.</p>
<p>5 (Cont)</p>	<p>Tracking and sensitivity (8 MHz)</p>	<p>FWD POWER indication not between +3.0 and +6.0 units.</p>	<p>Defective capacitor C8 or coupling of loading discriminator to rf line.</p>



STEP	TEST	SYMPTOM	PROBABLE CAUSE
6 (Cont)		Algebraic difference of LOAD SENS less than 3.0 units.  REFL POWER indication not between 0.0 and 2.0 units.  or  Algebraic difference of REFL SENS less than 1.0 unit.	Defective coupling of load discriminator to rf line.  Defective coupling of reflected power detector to rf line.
7	Tracking and sensitivity (30 MHz)	FWD POWER indication not between +3.0 and 6.0 units.  PHASE indication not between -2.0 and +2.0 units.  Algebraic difference of 30 MC sensitivity less than 2.0 units.  LOAD indication not between -3.5 and +3.5 units.  or  Algebraic difference of LOAD SENS less than 3.0 units.  REFL POWER indication not between 0.0 and +2.0 units.  Algebraic difference of REFL SENS less than 1.5 units.	Defective capacitor C8 or coupling of loading discriminator to rf line.  Recalibrate (step 1).  Defective coupling of phase discriminators to rf line.  Defective coupling of loading discriminator to rf line.   Recalibrate (step 2).  Defective coupling of reflected power detector to rf line.





STEP	TEST	SYMPTOM	PROBABLE CAUSE
1	Phasing discriminator balance	Negative voltage output. Adjustment of R9 does not correct or R9 must be set to limit.  Positive voltage output. Adjustment of R9 does not correct or R9 must be set to limit.  Voltage indication not steady or oscillates.	Open circuit in CR6 leg of phasing discriminator.  Open circuit in CR5 leg of phasing discriminator.  Leaky diode, defective filter choke, or defective filter in phasing discriminator circuit.
2	Reflected power detector calibrate	Reflected power output signal exceeds 120 mvdc. Adjustment of C1 does not change output.  Reflected power output signal cannot be nulled below 120 mvdc when adjusting C1.  Reflected power output signal not steady or oscillates.	Open circuit in capacitive leg of reflected power detector.  Open circuit in inductive leg of reflected power detector.  Leaky diode or defective choke in reflected power detector.
3	Loading discriminator calibrate	Loading output signal is negative. Adjustment of C4 has no effect.  Loading output signal is positive. Adjustment of C4 cannot cause output signal to be negative.  Loading output signal not steady or oscillates.	Open circuit in capacitive leg of loading discriminator.  Open circuit in inductive leg of loading discriminator.  Defective diode or filter network in loading discriminator.
4	Tracking test	Forward power output signal is 0 vdc.  Forward power output signal not steady or oscillates.	Open circuit in forward power detector.  Leaky diode CR2 or defective filter network in forward power detector.

(Cont)

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Trouble Analysis, Discriminator Module,  
Alternate Method (Sheet 1 of 2)  
Figure 803

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STEP	TEST	SYMPTOM	PROBABLE CAUSE
4 (Cont)		Forward power output signal not between 2.0 and 3.0 vdc.	Defective capacitor C8 or coupling of loading discriminator to rf line.
		Phasing output signal not between -60 and +60 mvdc.	Defective coupling of phasing discriminator to rf line or poor calibration.
		Reflected power output signal not between 0 and +150 mvdc.	Defective coupling of reflected power detector to rf line or poor calibration.
		Loading output signal not between -75 and +75 mvdc.	Defective coupling of loading discriminator to rf line or poor calibration.
5	Loading sensitivity test	Algebraic difference of loading sensitivity less than 75 mvdc.	Defective coupling of loading discriminator to rf line.
6	Reflected power sensitivity test	Algebraic difference of reflected power sensitivity below minimum specified.	Defective coupling of reflected power detector to rf line.
7	Phasing sensitivity test (2 MHz)	Algebraic difference of phasing sensitivity less than 30 mvdc.	Defective coupling of phasing discriminator to rf line.
8	Phasing sensitivity test (8 MHz)	Algebraic difference of phasing sensitivity less than 50 mvdc.	Defective coupling of phasing discriminator to rf line.
9	Phasing sensitivity test (14 MHz)	Algebraic difference of phasing sensitivity less than 50 mvdc.	Defective coupling of phasing discriminator to rf line.
10	Phasing sensitivity test (30 MHz)	Algebraic difference of phasing sensitivity less than 50 mvdc.	Defective coupling of phasing discriminator to rf line.





STEP	TEST	SYMPTOM	PROBABLE CAUSE
1	Tap drive test (home)	<p>Tap mechanism does not start.</p> <p>Tap mechanism does not start but operates after given a push manually.</p> <p>Tap mechanism does not start or ratcheting sound is heard as tap mechanism operates.</p>	<p>Tap mechanism already home (home position is when tap mechanism is nearest to front housing and contacts are within 10° of the point where the ribbon leaves the ceramic drum). Proceed to next test step.</p> <p>Tap drive mechanism binding mechanically. Inspect, clean, lubricate, and realign gear clusters and tap mechanism.</p> <p>Tap lock solenoid inoperative or tap lock solenoid disengagement clearance incorrect.</p>
2	Coil drive test (home)	<p>Drums do not rotate.</p> <p>Drums do not start to rotate but do rotate after given a push manually.</p> <p>Drums do not start to rotate or ratcheting sound is heard as drums rotate.</p> <p>SEQUENCE HOLD lamp does not light.</p> <p>Switch arm not in shorting position.</p>	<p>Coil already at home (home position is when 1/4 to 1/2 of a turn of ribbon remains on ceramic drum). Proceed to next test step.</p> <p>Coil drive mechanism binding. Inspect, clean, lubricate, and realign gear clusters and coil drive mechanism.</p> <p>Coil lock solenoid inoperative or coil lock solenoid disengagement clearance incorrect.</p> <p>Motor-driven switch S2 defective or not aligned.</p> <p>Defective solenoid K1.</p>
3	Coil drive test (tune)	<p>Drums do not rotate.</p> <p>COIL SELECT lamp does not light momentarily.</p>	<p>See symptoms in step 2.</p> <p>Motor-driven switch S2 defective or not aligned.</p>

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Trouble Analysis, Basic Coupler Group (Sheet 1 of 2)  
Figure 804

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STEP	TEST	SYMPTOM	PROBABLE CAUSE
4	Tap drive test (tune)	Tap assembly does not move. TAP LIMIT lamp does not light before mechanical stop is reached. Tap contacts are not 30° to 60° away from rim stops when TAP LIMIT lamp lights.	See symptoms in step 1. Tap limit switch S6 out of adjustment or defective. Tap limit switch S6 out of adjustment.
5	Series C switch test	Switch arm remains in shorting position when CAP SET switch is depressed. Switch arm does not short capacitor C3 when CAP HOME switch is depressed.	Defective solenoid K2, switch arm binding at pivot, or contact pressure too great (see fits and clearances section). Defective solenoid K1 or switch arm is binding (see above).
6	Coil and tap drive test (home)	Coil and tap mechanism fail to start.	Repeat steps 1 and 2.
7	Mechanical fit and clearance check	As determined from fit and clearance section.	As indicated by applicable assembly procedure reference.



SYMPTOM		PROBABLE CAUSE
PERFORMANCE TEST STEP	AC VOLTAGE READING	
All test steps	0 vrms	R1 or L1 open.
1	0 vrms	R3 open or C1 shorted.
1	Exceeds 350 mvrms	R2 open.
2 thru 5 and 10	0 vrms	L2 or R22 open.
2 thru 5	0 vrms	R4 open.
6 thru 9	0 vrms	L3, R23, or R5 open.
10	0 vrms	R6 open.
3 8	2.80 to 3.20 vrms 1.35 to 1.50 vrms	K2 not energizing.
4 7	2.80 to 3.20 vrms 1.35 to 1.50 vrms	K3 not energizing.
5 6	2.80 to 3.20 vrms 1.35 to 1.50 vrms	K4 not energizing.
2	Exceeds 3.2 vrms	R13 open.
3	Exceeds 3.2 vrms	R10 open.
4	Exceeds 3.2 vrms	R11 open.
5	Exceeds 3.2 vrms	R12 open.
6	Exceeds 3.2 vrms	R16 open.
7	Exceeds 3.2 vrms	R15 open.

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 Trouble Analysis, Servo-Control Module (Sheet 1 of 2)  
 Figure 805  
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SYMPTOM		PROBABLE CAUSE
PERFORMANCE TEST STEP	AC VOLTAGE READING	
8	Exceeds 3.2 vrms	R14 open.
9	Exceeds 3.2 vrms	R17 open.
10	Exceeds 3.2 vrms	R21 open.



PROGRAM SWITCH POSITION	TESTER FUNCTION	VERIFICATION LAMP PATTERN (X INDICATES DEVIATION FROM NORMAL LAMP PATTERN)										INTERPRETATION	PROBABLE DEFECTS	
		1	2	3	4	5	6	7	8	9	10			
1	Ground rechannel, standby, and fault disable inputs. Verify module advance to and operation in home mode.	Lit	Out	Out	Lit	Out	Out	Lit	Out	Lit	Lit	Normal.	None.	
		X			X		X	X	X			Stuck in standby mode.	K5-2/-8, CR35, S1E(F), K8, CR43, or B1.	
		X							X		X	Stuck in rf-on mode.	CR25, S1D(R), K8, CR43, or B1.	
			X								X	Stuck in tune mode.	As above.	
		X			X		X	X			X	Stuck in operate mode.	As above.	
		X			X						X	Stuck in fault mode.	As above.	
		X			X		X	X			X	X	Faulty 28-vdc supply.	CR1 thru CR6.
		X			X						X	X	As above.	As above.
		X									X		Delay circuit not inhibited or K9 energized.	S1C(F), CR42, CR34, or R15 open. CR52 or C25 shorted.
		X											K2 not energized.	CR47, K2, or CR16 open.
(Cont)		X									Faulty blower control.	S1B(F) shorting.		

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Trouble Analysis, Relay Control Module (Sheet 1 of 15)  
Figure 806

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PROGRAM SWITCH POSITION	TESTER FUNCTION	VERIFICATION LAMP PATTERN (X INDICATES DEVIATION FROM NORMAL LAMP PATTERN)										INTERPRETATION	PROBABLE DEFECTS
		1	2	3	4	5	6	7	8	9	10		
1 (Cont)		Lit	Out	Out	Lit	Out	Out	Lit	Out	Lit	Lit	Normal.	None.
				X								Negative coil homing voltage.	CR23 shorted.
				X								Loss of controlled dc.	S1A(F) open.
					X							Faulty keying interlock.	K4-3/-8 shorted.
						X						Faulty tune indicator.	S1B(R).
							X					As above.	As above.
								X				Faulty special ground circuit.	S1C(F).
									X			Faulty AM control circuit.	CR37, CR56, or K9-2/-8 open.
										X		Faulty bypass control.	S1C(R).

PROGRAM SWITCH POSITION	TESTER FUNCTION	VERIFICATION LAMP PATTERN (X INDICATES DEVIATION FROM NORMAL LAMP PATTERN)										INTERPRETATION	PROBABLE DEFECTS	
		1	2	3	4	5	6	7	8	9	10			
2	Ground sequence hold and fault disable inputs. Verify module advance to and operation in standby mode.	Out	Out	Lit	Out	Out	Lit	Out	Lit	Out	Lit	Normal.	None.	
		X			X		X	X	X	X		Stuck in home mode.	S1E(F) or sequence hold line open.	
				X	X		X	X		X		Skipped to rf-on mode.	S1E(F) or standby line grounded.	
		X			X							K1 energized.	CR27 shorted.	
		X			X					X		K1 energized.	S1D(F) shorted.	
		X										K2 energized.	K2-3/-8 or S1C(F) shorted.	
			X										Faulty blower control.	S1B(F).
				X									Faulty bypass tuner control.	S1C(R).
					X								Faulty controlled dc circuit.	S1A(F), K1-3/-8, or CR18 shorted.
								X					Faulty tune indicator.	S1B(R).
									X				As above.	As above.
(Cont)								X			Faulty special ground circuit.	S1C(F).		

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Trouble Analysis, Relay Control Module (Sheet 3 of 15)  
Figure 806

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PROGRAM SWITCH POSITION	TESTER FUNCTION	VERIFICATION LAMP PATTERN (X INDICATES DEVIATION FROM NORMAL LAMP PATTERN)										INTERPRETATION	PROBABLE DEFECTS	
		1	2	3	4	5	6	7	8	9	10			
2 (Cont)		Out	Out	Lit	Out	Out	Lit	Out	Lit	Out	Lit	Normal.	None.	
										X		K9 not energized or faulty delay circuit.	R16 thru R19, C13, C14, CR39, CR52, or K9 open. CR51, C24, C13, or C21 shorted.	
												X	Faulty coil A filter.	C1 open.
3  (Cont)	Ground standby and fault disable inputs. Verify module advance to and operation in rf-on mode.	Out	Out	Lit	Lit	Out	Out	Lit	Lit	Lit	Lit	Normal.	None.	
				X	X		X	X		X		Stuck in standby mode.	CR35 or K5-2/-8 open.	
		X	X						X			Skipped to tune mode.	S1E(F)-3 shorted to ground.	
		X										Faulty controlled ac circuit.	C15 shorted.	





PROGRAM SWITCH POSITION	TESTER FUNCTION	VERIFICATION LAMP PATTERN (X INDICATES DEVIATION FROM NORMAL LAMP PATTERN)										INTERPRETATION	PROBABLE DEFECTS
		1	2	3	4	5	6	7	8	9	10		
3 (Cont)		Out	Out	Lit	Lit	Out	Out	Lit	Lit	Lit	Lit	Normal.	None.
			X									Faulty blower control.	S1B(F).
				X								Faulty ac control.	K2-4/-7 or CR18 open.
					X							Faulty dc control.	K1 open.
				X	X							Faulty power control.	CR26 open.
				X	X						X	Faulty mode support.	S1D(F)-6 open.
							X					Faulty tune indicator.	S1B(R).
								X				As above.	As above.
									X			Faulty special ground circuit.	S1C(F).
										X		Faulty AM control circuit.	CR27 open.
(Cont)										X	Faulty coil B filter.	C2 open.	

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 Trouble Analysis, Relay Control Module (Sheet 5 of 15)  
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PROGRAM SWITCH POSITION	TESTER FUNCTION	VERIFICATION LAMP PATTERN (X INDICATES DEVIATION FROM NORMAL LAMP PATTERN)										INTERPRETATION	PROBABLE DEFECTS	
		1	2	3	4	5	6	7	8	9	10			
4 (Cont)		Out	Out	Out	Lit	Out	Out	Lit	Lit	Out	Lit	Normal.	None.	
5       (Cont)	Ground fault disable input. Apply dc voltage to reflected power and forward power inputs. Verify module advance to and operation in tune mode.	Lit	Lit	Out	Lit	Out	Out	Lit	Out	Lit	Lit	Normal.	None.	
		X	X						X			Stuck in rf-on mode (faulty forward power trigger).	R8 thru R11, K10, CR32, CR53, CR55, or C10 open. C22 shorted.	
		X	X						X	X		Stuck in rf-on mode (faulty reflected power trigger).	CR51, R26, or R27 open. C18 or C20 shorted.	
			X									Faulty blower control.	S1B(F).	
				X								Faulty coil add relay.	K3-3/-8 shorted.	
								X					Faulty tune indicator.	S1B(R).
									X				As above.	As above.

PROGRAM SWITCH POSITION	TESTER FUNCTION	VERIFICATION LAMP PATTERN (X INDICATES DEVIATION FROM NORMAL LAMP PATTERN)										INTERPRETATION	PROBABLE DEFECTS
		1	2	3	4	5	6	7	8	9	10		
5 (Cont)		Lit	Lit	Out	Lit	Out	Out	Lit	Out	Lit	Lit	Normal.	None
									X			Faulty special ground circuit.	S1C(F)-4.
											X	Faulty tap B filter.	C4 open.
		X	X		X						X	Defective fault circuit.	R24 open.
		NOTE: Deviation may occur after slight delay.											
6   (Cont)	Ground fault disable, tap limit, and coil select inputs. Apply dc voltage to reflected power and forward power inputs. Verify continued operation in tune mode.	Lit	Lit	Lit	Lit	Out	Out	Lit	Out	Lit	Lit	Normal.	None.
				X								Faulty coil override circuit.	CR15, K3, or S1A(R) open.
									X			Faulty complete tune circuit.	S1C(F)-5 shorted.
											X	Faulty gear locks circuit.	CR38 open.



PROGRAM SWITCH POSITION	TESTER FUNCTION	VERIFICATION LAMP PATTERN (X INDICATES DEVIATION FROM NORMAL LAMP PATTERN)										INTERPRETATION	PROBABLE DEFECTS	
		1	2	3	4	5	6	7	8	9	10			
6 (Cont)		Lit	Lit	Lit	Lit	Out	Out	Lit	Out	Lit	Lit	Normal.	None.	
											X	Faulty low-set circuit.	K7 open.	
		X	X	X	X								Defective fault circuit.	R24 open.
		NOTE: Deviation may be delayed.												
7   (Cont)	Ground gear locks and tap limit inputs. Apply dc voltage to forward power input and no voltage to reflected power input. Verify module advance to and operation in operate mode.	Out	Out	Out	Out	Out	Lit	Out	Lit	Out	Lit	Normal.	None.	
		NOTE: Allow 1 second for module to react.												
		X	X	X	X		X	X	X	X			Stuck in tune mode.	K9-3/-8, K10-4/-7, or S1E(F)-4 open.
							X	X	X	X			As above after 30-second fault delay.	As above.
		X		X							Faulty ac control circuit.	S1E(R)-10 or S1D(F)-6 shorted.		

PROGRAM SWITCH POSITION	TESTER FUNCTION	VERIFICATION LAMP PATTERN (X INDICATES DEVIATION FROM NORMAL LAMP PATTERN)										INTERPRETATION	PROBABLE DEFECTS
		1	2	3	4	5	6	7	8	9	10		
7 (Cont)		Out	Out	Out	Out	Out	Lit	Out	Lit	Out	Lit	Normal.	None.
							X					Faulty tune indicator.	S1B(R).
								X				As above.	As above.
									X			Faulty complete tune circuit.	CR28 or S1C(F)-5 open.
										X		Faulty gear locks isolation.	CR38 shorted.
											X	Faulty low-set relay hold circuit.	K7-3/-8 or S1E(R)-6 open.
8  (Cont)	Ground key, key interlock 1, and AM control inputs. Apply dc voltage to forward power input. Verify continued	Out	Lit	Lit	Lit	Lit	Lit	Out	Out	Out	Out	Normal.	None.
			X	X	X							Key line open.	CR19 open.
						X			X			Faulty interlock circuit.	K4, CR7, or P1-25 open.





PROGRAM SWITCH POSITION	TESTER FUNCTION	VERIFICATION LAMP PATTERN (X INDICATES DEVIATION FROM NORMAL LAMP PATTERN)										INTERPRETATION	PROBABLE DEFECTS	
		1	2	3	4	5	6	7	8	9	10			
8 (Cont)	operation in operate mode.	Out	Lit	Lit	Lit	Lit	Lit	Out	Out	Out	Out	Normal.	None.	
										X		Faulty gear locks isolation.	CR37 shorted.	
												X	Faulty tuner bypass control.	S1C(R).
9   (Cont)	Ground key interlock 2 input. Apply dc voltage to forward power and reflected power inputs. Verify continued operation in operate mode.	Out	Out	Out	Out	Lit	Lit	Out	Out	Lit	Out	Normal.	None.	
		X	X	X	X							Faulty key hold circuit.	S1E(R)-10 shorted.	
						X							Faulty key interlock input.	P1-49 open.
												X	Faulty coil A filter.	C1 shorted.

PROGRAM SWITCH POSITION	TESTER FUNCTION	VERIFICATION LAMP PATTERN (X INDICATES DEVIATION FROM NORMAL LAMP PATTERN)										INTERPRETATION	PROBABLE DEFECTS	
		1	2	3	4	5	6	7	8	9	10			
9 (Cont)		Out	Out	Out	Out	Lit	Lit	Out	Out	Lit	Out	Normal.	None.	
10       (Cont)	Remove key interlock input. Ground key input. Apply dc voltage to reflected power input. Pulse arc indicator input. Verify module advance to and operation in fault mode.	Out	Out	Lit	Lit	Out	Out	Lit	Out	Lit	Out	Normal.	None.	
		X	X	X			X	X	X	X		Faulty arc indicator control (stuck in operate mode).	K6, CR12, R12, or S1D(R)-5 open.	
						X							Faulty interlock control.	K4 not releasing.
											X		Faulty coil B filter.	C2 shorted.
		X											Faulty override circuit.	S1C(F)-6 open.
				X									Faulty tuner bypass control.	S1C(R).
										X			Faulty mode status control.	S1C(F)-5 shorted.





PROGRAM SWITCH POSITION	TESTER FUNCTION	VERIFICATION LAMP PATTERN (X INDICATES DEVIATION FROM NORMAL LAMP PATTERN)										INTERPRETATION	PROBABLE DEFECTS	
		1	2	3	4	5	6	7	8	9	10			
10 (Cont)		Out	Out	Lit	Lit	Out	Out	Lit	Out	Lit	Out	Normal.	None.	
11	Ground fault disable and standby inputs. Pulse rechannel input. Verify module advance to and operation in home mode.	Lit	Out	Lit	Lit	Out	Out	Lit	Lit	Lit	Out	Normal.	None.	
		X		X					X	X		Stuck in fault mode.	K5, CR21, CR25, S1D(R)-12, or K8-3/-8 open.	
				X									Faulty coil homing circuit.	CR23 open.
										X			Faulty mode support control.	S1D(F)-3.
											X		Faulty transmitter hold circuit.	P1-4.
												X	Faulty tap A filter.	C3 shorted.

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Trouble Analysis, Relay Control Module (Sheet 13 of 15)  
 Figure 806

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PROGRAM SWITCH POSITION	TESTER FUNCTION	VERIFICATION LAMP PATTERN (X INDICATES DEVIATION FROM NORMAL LAMP PATTERN)										INTERPRETATION	PROBABLE DEFECTS
		1	2	3	4	5	6	7	8	9	10		
12	Ground fault disable and sequence hold inputs. Pulse key input. Verify module advance to and operation in standby mode.	Out	Out	Out	Lit	Out	Lit	Out	Out	Out	Out	Normal.	None.
					X							Faulty key hold circuit.	CR36 or S1E(R)-10 open.
									X			Faulty mode support control.	S1D(F)-3.
										X		Faulty isolation circuit.	CR47 shorted.
											X	Faulty tap B filter.	C4 shorted.
13	Ground standby input advancing module to rf-on mode. Apply no forward power input. Allow module fault timer to control and advance module to fault mode after 30 seconds.	Out	Out	Out	Out	Out	Out	Lit	Out	Out	Out	Normal.	None.
		NOTE: Allow 30 seconds for module to react.											
				X	X				X			Stuck in rf-on mode (faulty fault timer circuit).	CR54, R21, R22, R23, R25, C16, or C17 open. C16, C17, C5, S1D(F)-2/-8, or K6-4/-7 shorted.
(Cont)													





PROGRAM SWITCH POSITION	TESTER FUNCTION	VERIFICATION LAMP PATTERN (X INDICATES DEVIATION FROM NORMAL LAMP PATTERN)										INTERPRETATION	PROBABLE DEFECTS
		1	2	3	4	5	6	7	8	9	10		
13 (Cont)		Out	Out	Out	Out	Out	Out	Lit	Out	Out	Out	Normal.	None.
										X	Faulty isolation circuit.	CR42 shorted.	
											X	Faulty low-set hold/reset circuit.	S1E(R)-6 or K7-3/-8 shorted.

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Trouble Analysis, Relay Control Module (Sheet 15 of 15)  
Figure 806

PROGRAM SWITCH IN OFF POSITION											
LAMP PATTERN (LAMPS ARE NOT LIT UNLESS SO INDICATED)										INTERPRETATION	
1	2	3	4	5	6	7	8	9	10		
											Module in resets mode.
Lit			Lit			Lit					Module in home mode and 28-vdc supply is OK.
Lit			Lit								Module in resets mode (S1 positions 9 through 12) and 28-vdc supply OK.
	Lit		Lit			Lit					Module in tune mode and 28-vdc supply is OK.
			Lit		Lit						Module in standby mode and 28-vdc supply is OK.
			Lit			Lit					Module in rf-on mode and 28-vdc supply is OK.
					Lit						Module in operate mode or, when 28-vdc supply is defective, in standby mode.
						Lit					Module in fault mode or, when 28-vdc supply is defective, in home, rf-on, or tune mode.



OVERHAUL  
MANUAL

STEP	TEST	SYMPTOM	PROBABLE CAUSE
1	Tune mode test	Relay does not energize as specified.  Ohmmeter indicates less than 0.1 ohm.  Ohmmeter indication is not between 20 and 30 ohms.	Defective relay circuit.  Defective relay circuit.  Defective series resistor R1.
2	Operate mode test	Relay does not deenergize as specified.  Ohmmeter indication in excess of 0.1 ohm.	Defective relay circuit.  Defective relay contacts.

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Trouble Analysis, 399V-1 Adapter  
Figure 808

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STEP	TEST	SYMPTOM	PROBABLE CAUSE
1	Transmit mode test	Ohmmeter indicates closed circuit or or resistive short.  Relay does not energize as specified.  Ohmmeter indication in excess of 0.1 ohm when relay is energized.	Defective relay.  Defective relay circuit.  Defective relay contacts.
2	Receive mode test	Relay does not deenergize as specified.  Resistance between J1 and J2 not less than 0.1 ohm when relay is deenergized.	Defective relay circuit.  Defective relay contacts.





SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
841/842	A1	Added spark gap G1.	1	MCN 616
841/842	B1	In discriminator module, moved L1 from between C1 and the junction of CR1, R2, and C2 to between the junctions of C1-C2 and CR1-R2. Changed L1 from 0.33 to 1.5 uh. Added L2 to the circuit from C2 to the junction of L1 and C1. Reduces tracking error.		MCN 770

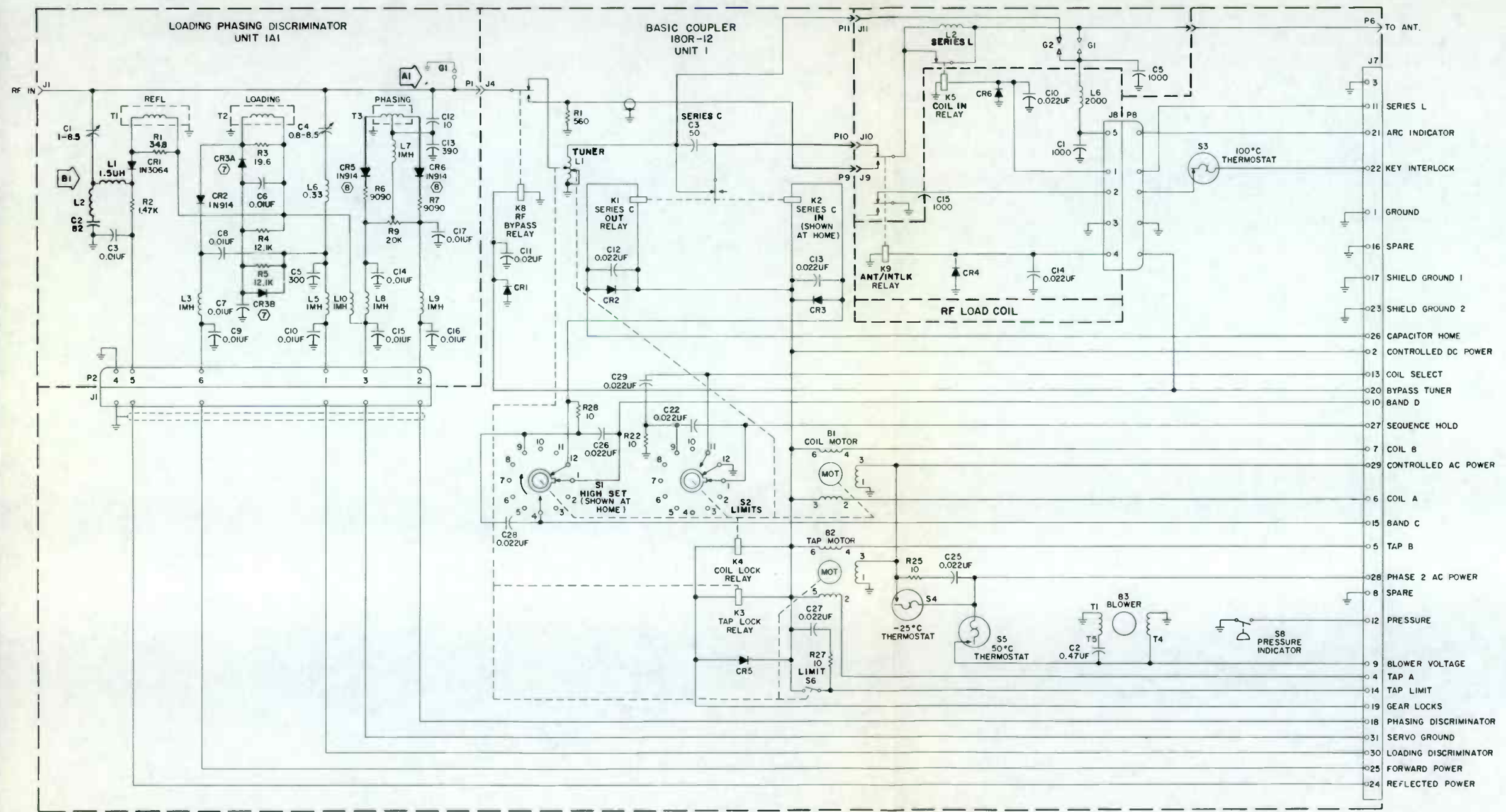
180R-12 Antenna Coupler, Schematic Diagram (Sheet A)  
Figure 810

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Pages 839/840







NOTES:

- ① UNLESS OTHERWISE INDICATED, ALL DIODES ARE 1N645.
- ② 50 OHM LINE FUNCTIONS AS PRIMARY FOR 1A1T1, 1A1T2 AND 1A1T3.
- ③ ALL SWITCHES VIEWED FROM SIDE OPPOSITE DRIVEN END.
- ④ UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN PICOFARADS, AND ALL INDUCTANCE VALUES ARE IN MICROHENRYS.
- ⑤ REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX DESIGNATIONS WITH UNIT NUMBER OR SUBASSEMBLY DESIGNATIONS OR BOTH.
- ⑥ DO NOT MOVE L1 TAP MECHANISM EXCESSIVELY UNLESS K3 IS ENERGIZED. DO NOT MOVE L1 COIL MECHANISM EXCESSIVELY UNLESS K4 IS ENERGIZED.
- ⑦ DIODES CR3A AND CR3B ARE MATCHED-TYPE AD1259, PACKAGED AS A SINGLE UNIT.
- ⑧ DIODES CR5 AND CR6 ARE MATCHED.

180R-12 Antenna Coupler, Schematic Diagram  
Figure 810



Fig. 10  
180R-12 Antenna Coupler, Schematic Diagram

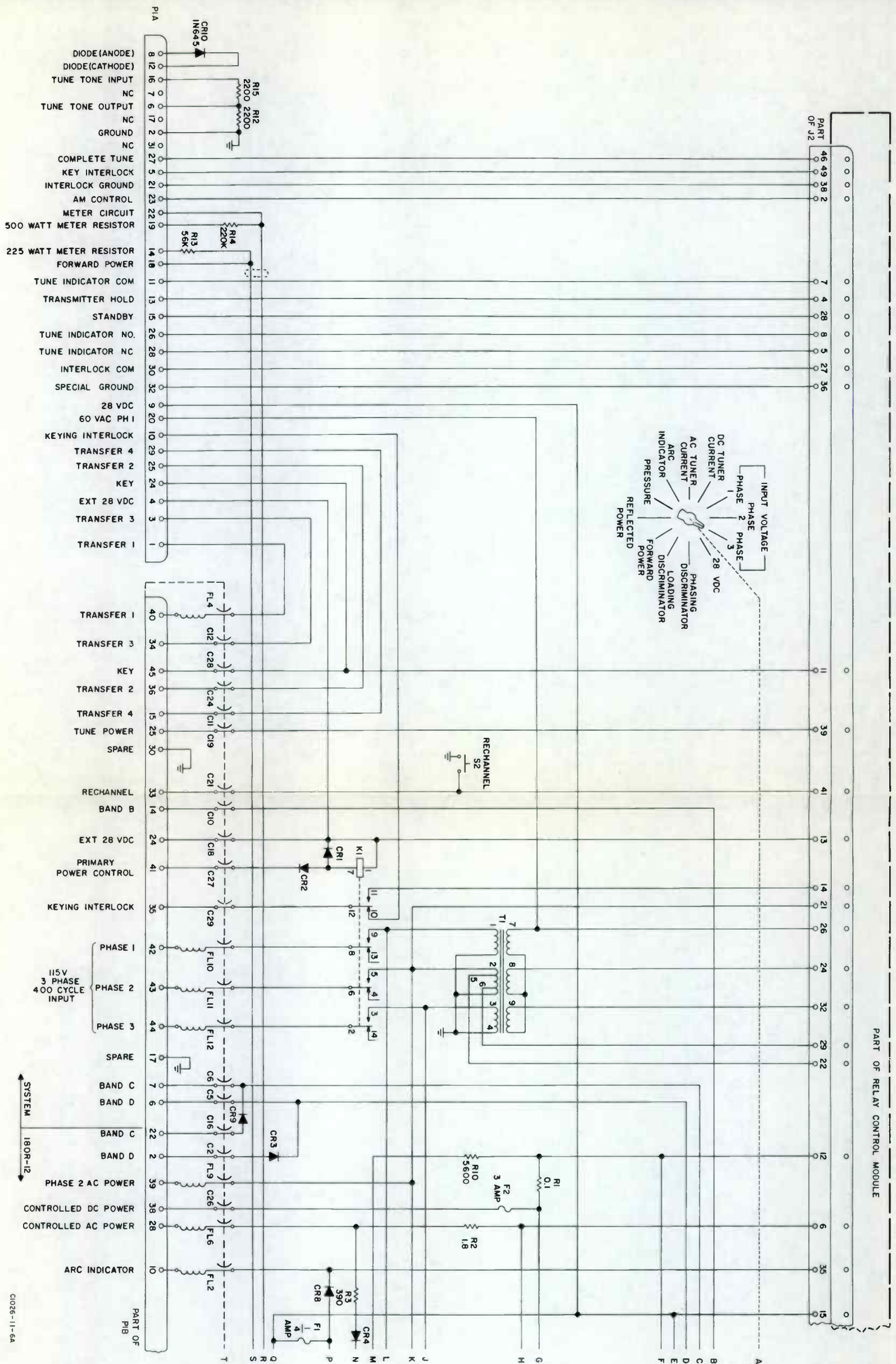


SCHEMATIC CHANGES

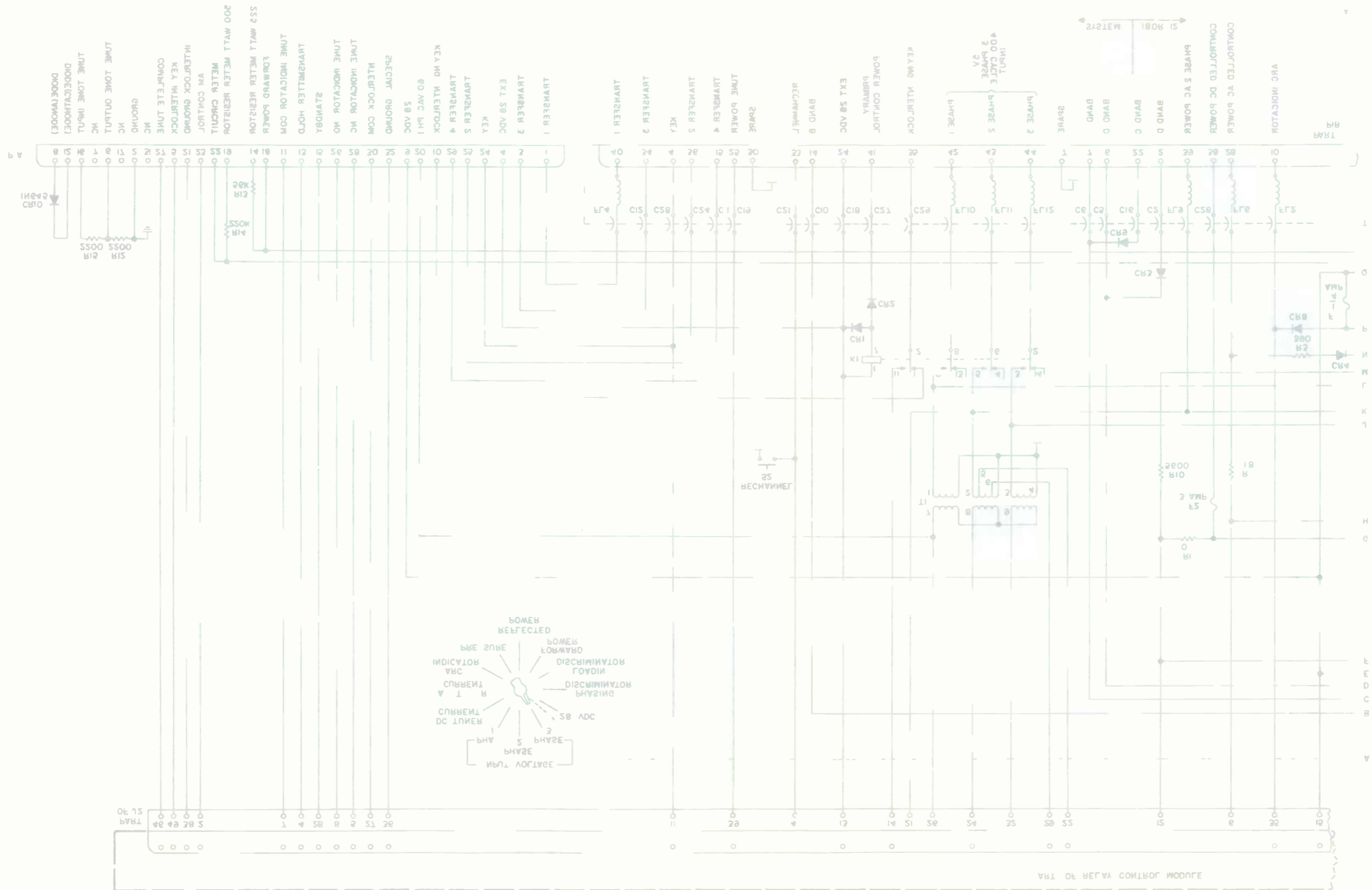
PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
<p>This page will contain schematic revision information.</p>				

309A-9 Antenna Coupler Control Chassis, Schematic Diagram (Sheet A)  
Figure 811

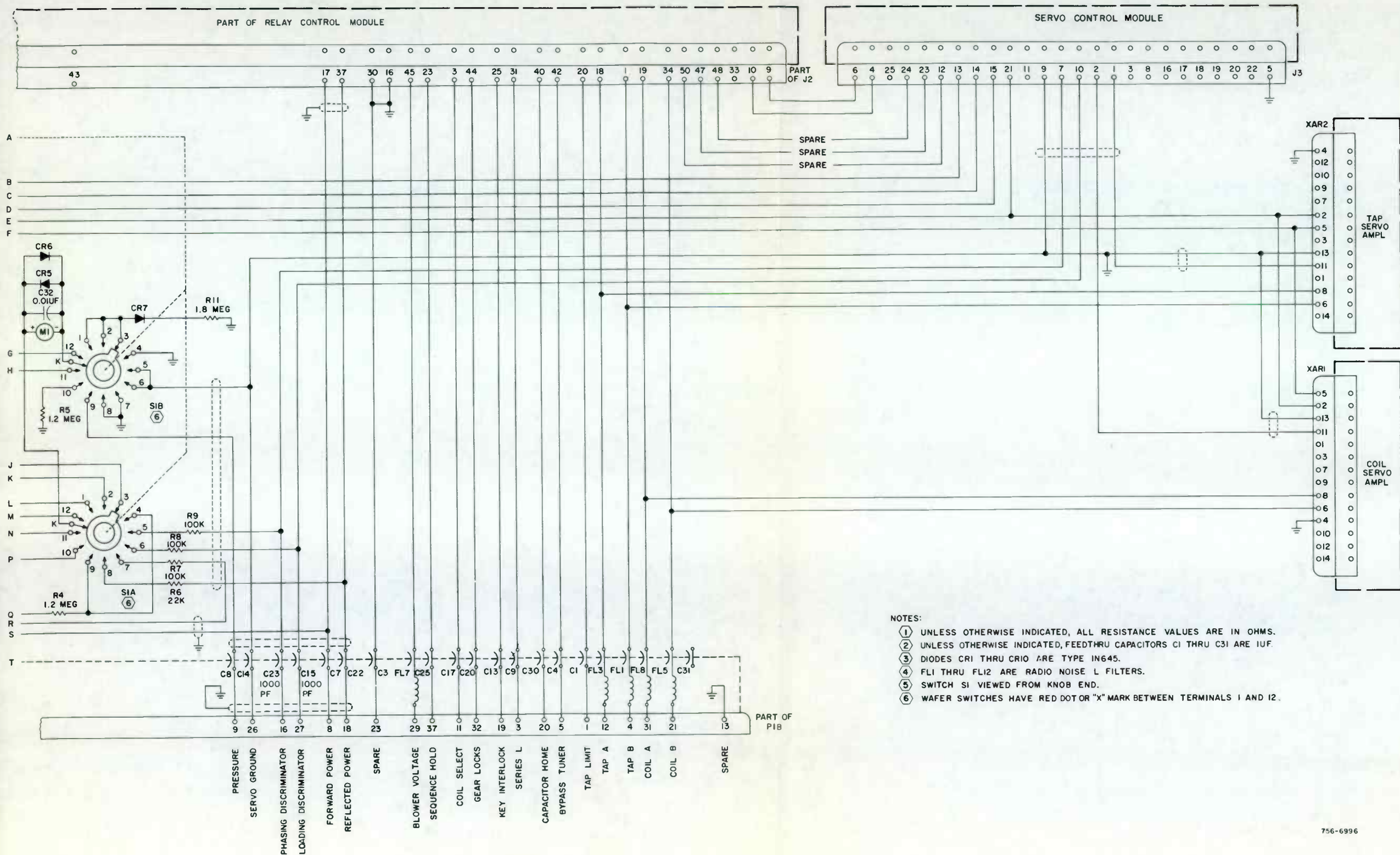




C1026-11-6A

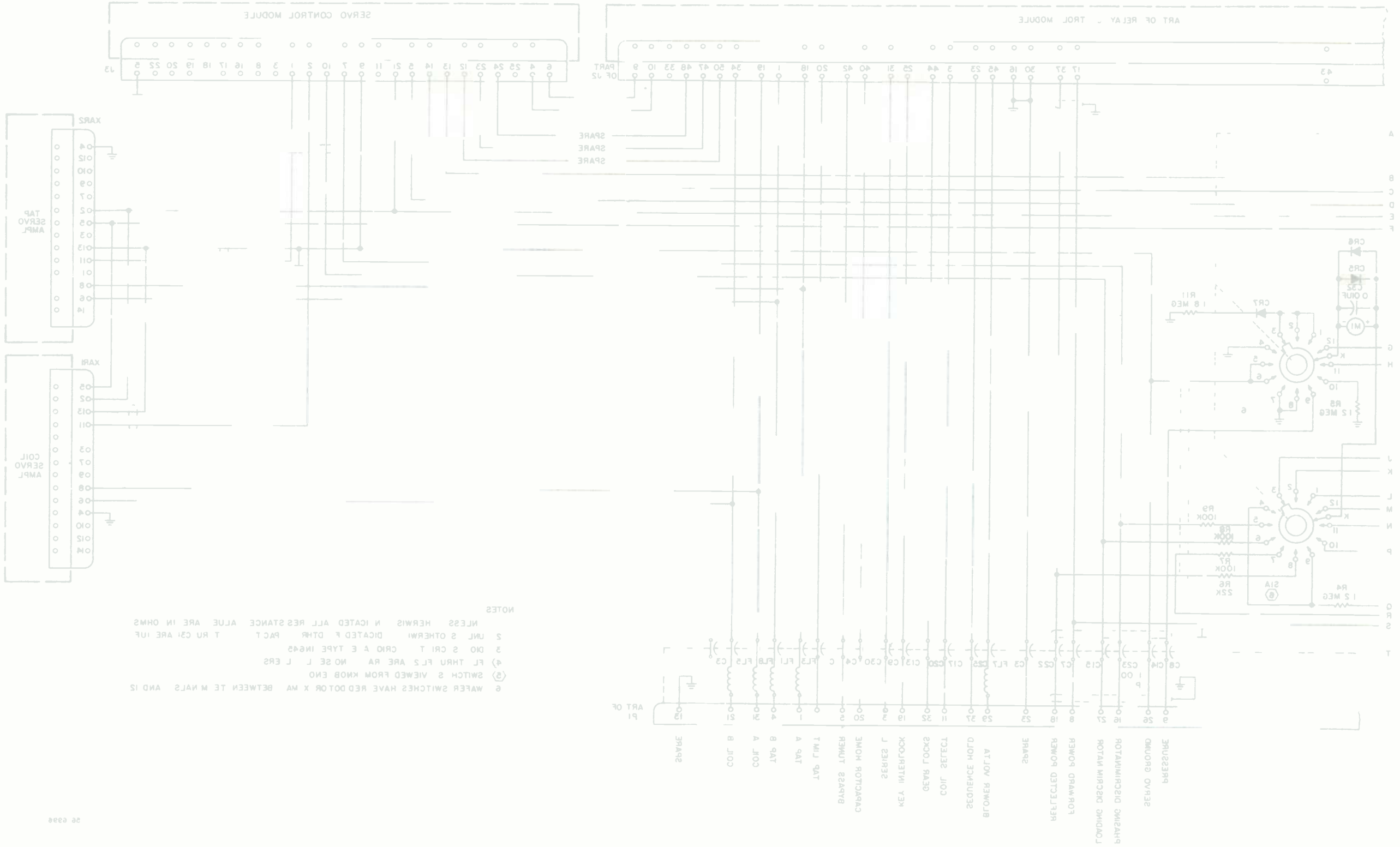


НАЦІОНАЛЬНИЙ  
УНІВЕРСИТЕТ



- NOTES:
- ① UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS.
  - ② UNLESS OTHERWISE INDICATED, FEEDTHRU CAPACITORS C1 THRU C31 ARE 1UF.
  - ③ DIODES CR1 THRU CR7 ARE TYPE 1N645.
  - ④ FL1 THRU FL5 ARE RADIO NOISE L FILTERS.
  - ⑤ SWITCH S1 VIEWED FROM KNOB END.
  - ⑥ WAFER SWITCHES HAVE RED DOT OR "X" MARK BETWEEN TERMINALS 1 AND 12.

756-6996



NOTES  
e WAFER SWITCHES HAVE RED DOT OR X MARK BETWEEN TERMINALS AND IS  
(a) SWITCH IS VIEWED FROM KNOB END  
d) FL THRU FL'S ARE RA NO SE L LERS  
3 DO 2 CRIT CRINO E TYPE INKING  
2 UNL 2 OTHERW DICTATED F DTHR PACT T RU CBI ARE IUF  
UNLESS OTHERWISE INDICATED ALL RESISTANCE VALUES ARE IN OHMS



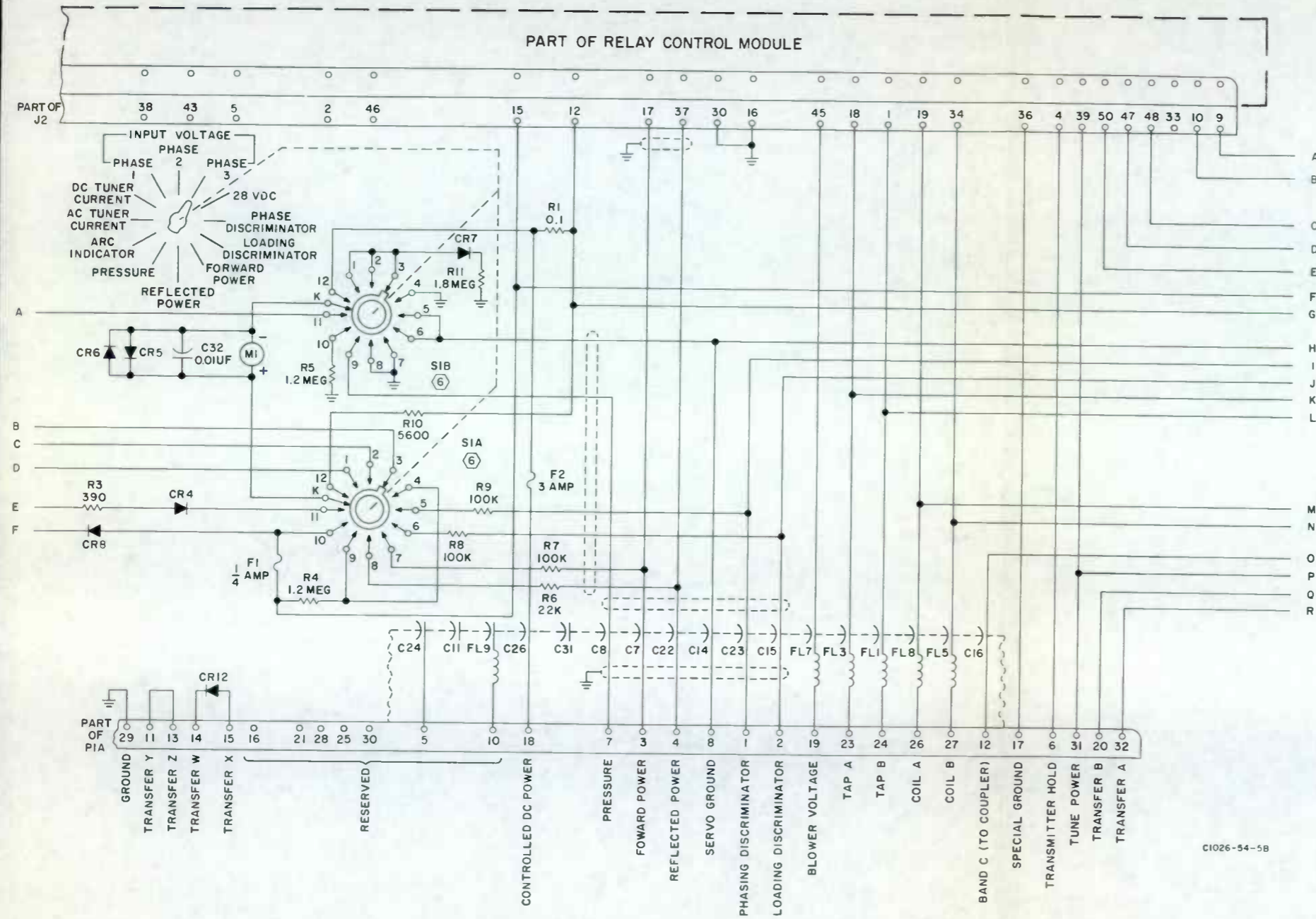


SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
<p>This page will contain schematic revision information.</p>				

309A-9A Antenna Coupler Control Chassis, Schematic Diagram (Sheet A)  
Figure 812

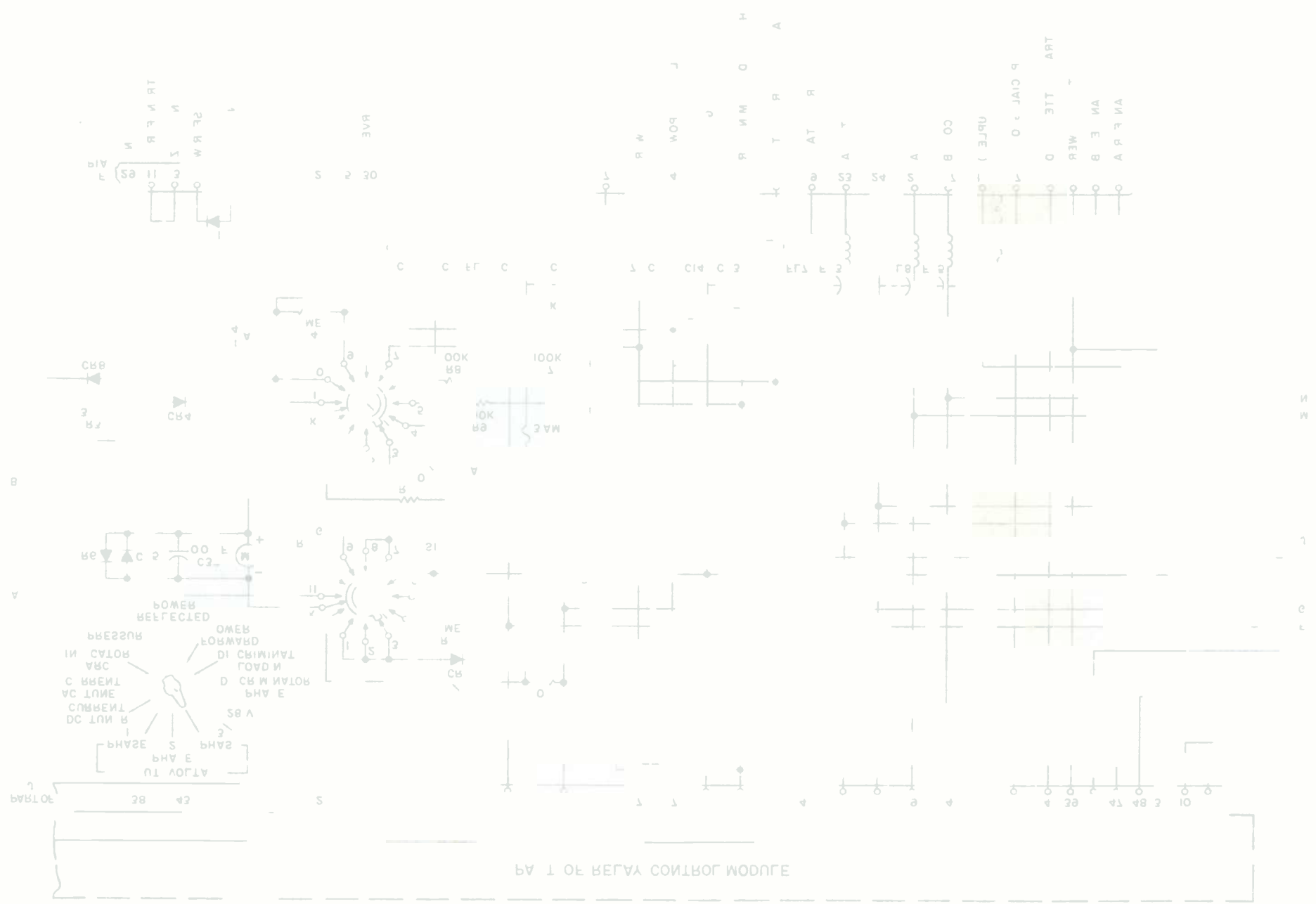


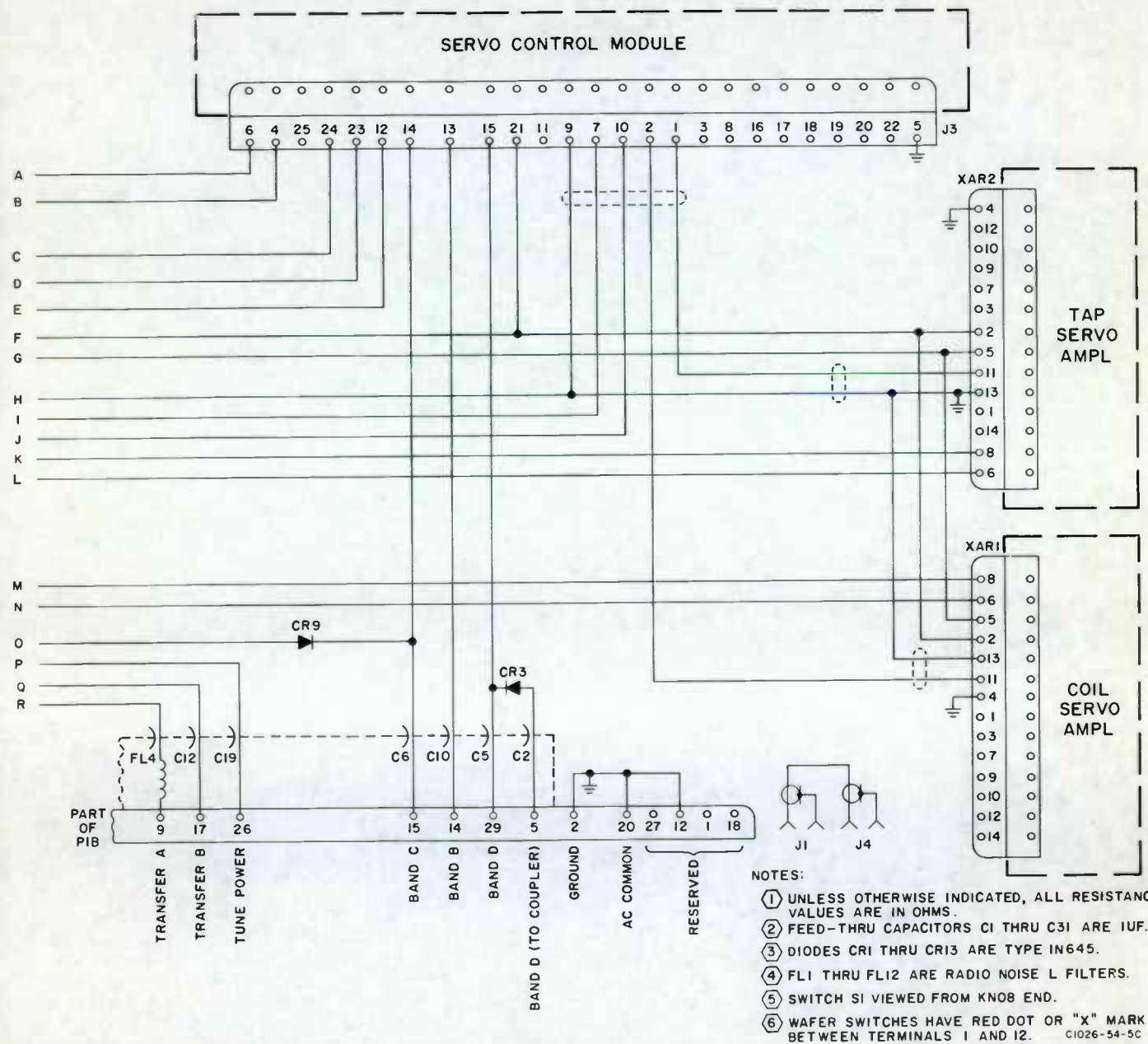


C1026-54-5B

309A-9A Antenna Coupler Control Chassis, Schematic Diagram (Sheet 2 of 3)  
Figure 812

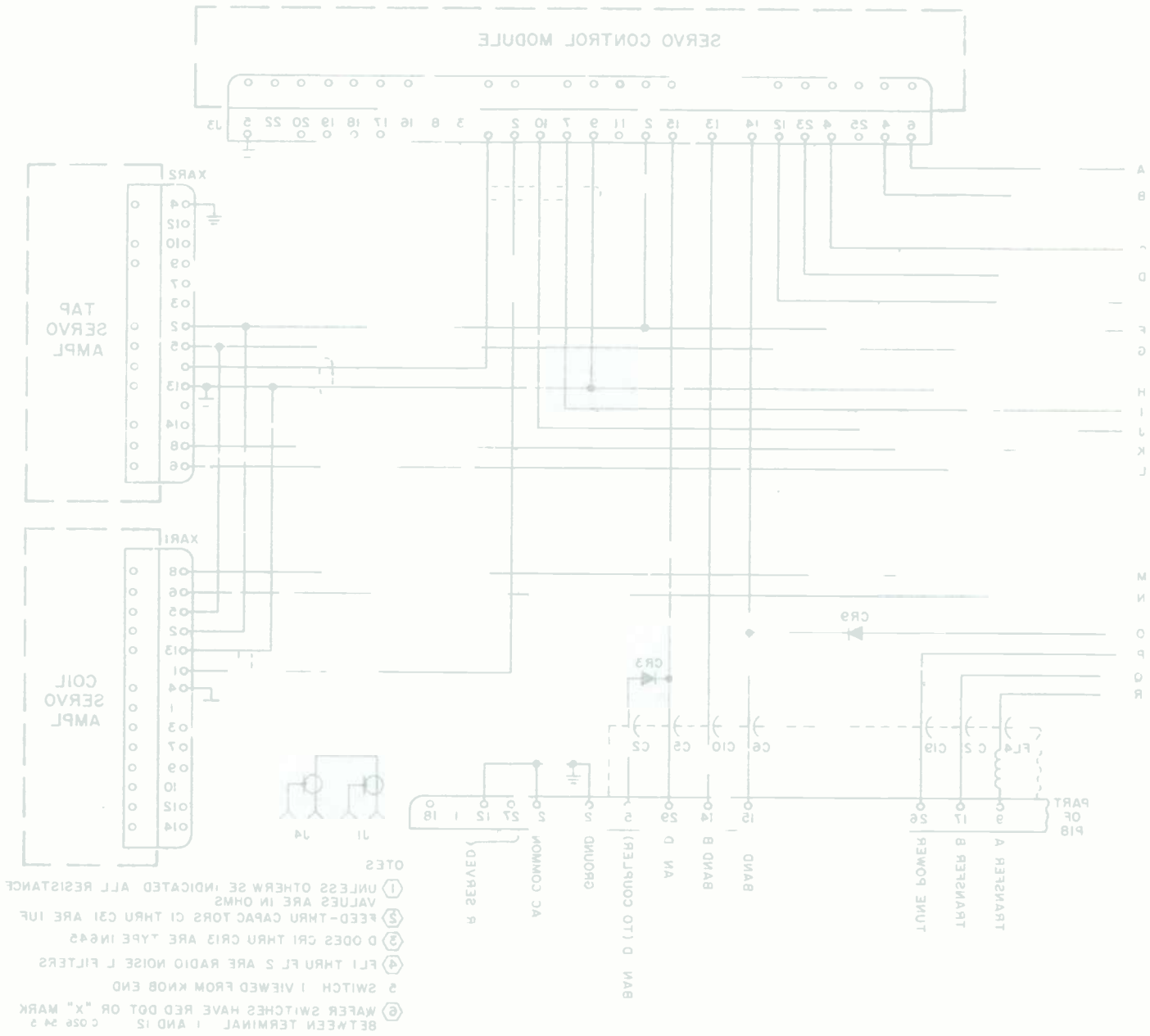
17-4 Ant. m. C. R. CP (13)





309A-9A Antenna Coupler Control Chassis, Schematic Diagram (Sheet 3 of 3)  
Figure 812

Figure 812  
309 1-9 / Antenna Coupler Control Chassis, Schematic Diagram (Sheet 3 of 3)



- NOTES
- ① UNLESS OTHERWISE INDICATED ALL RESISTANCE VALUES ARE IN OHMS
  - ② FEED-THRU CAPACITORS C1 THRU C31 ARE IUF
  - ③ D ODES CR1 THRU CR3 ARE TYPE INE43
  - ④ FL1 THRU FL2 ARE RADIO NOISE L FILTERS
  - ⑤ SWITCH 1 VIEWED FROM KNOB END
  - ⑥ WAFER SWITCHES HAVE RED DOT OR "X" MARK BETWEEN TERMINAL 1 AND 15. CODE 24 2



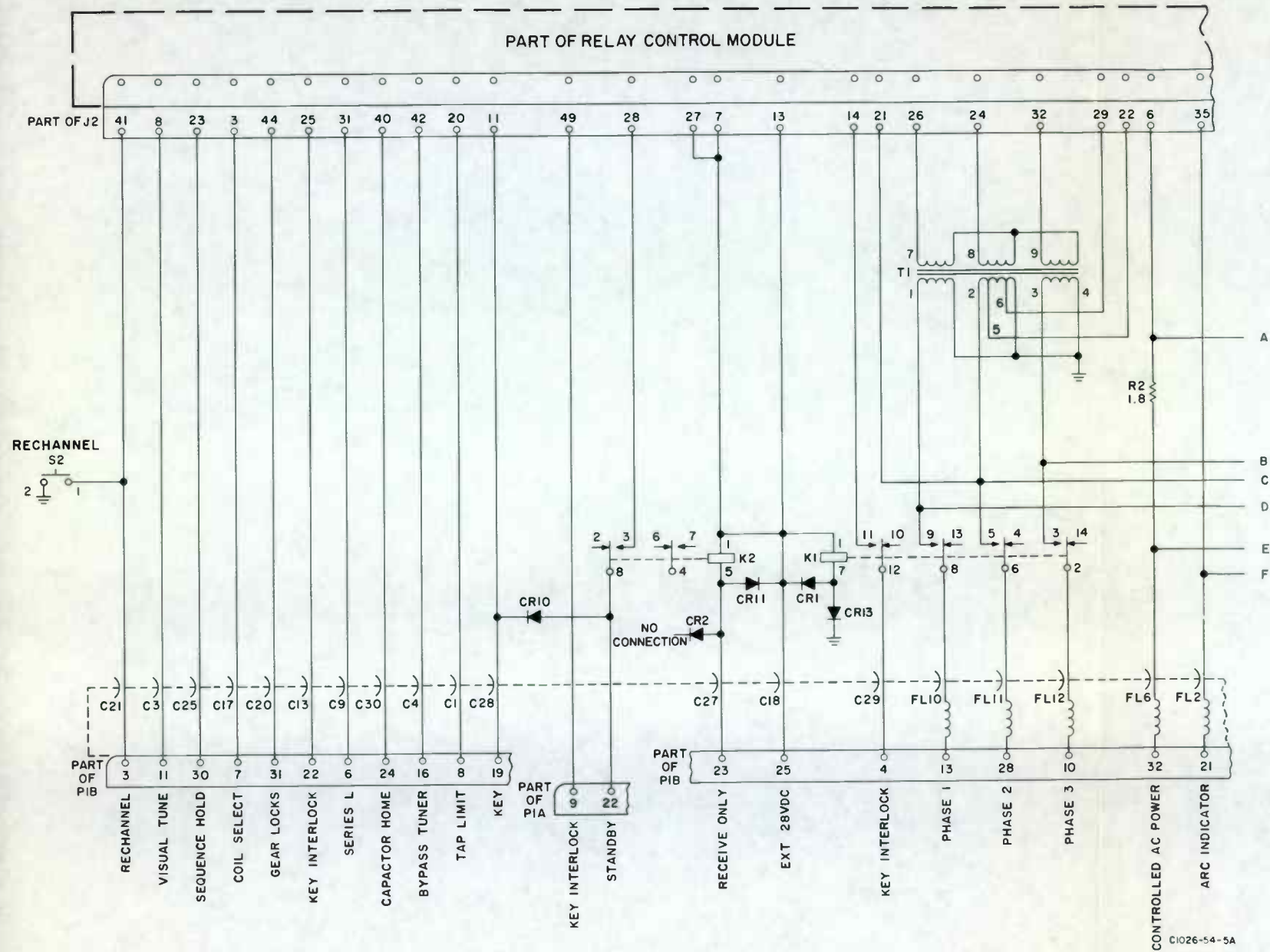
SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
<p>This page will contain schematic revision information.</p>				

Servo-Amplifier Module, Schematic Diagram (Sheet A)  
Figure 813

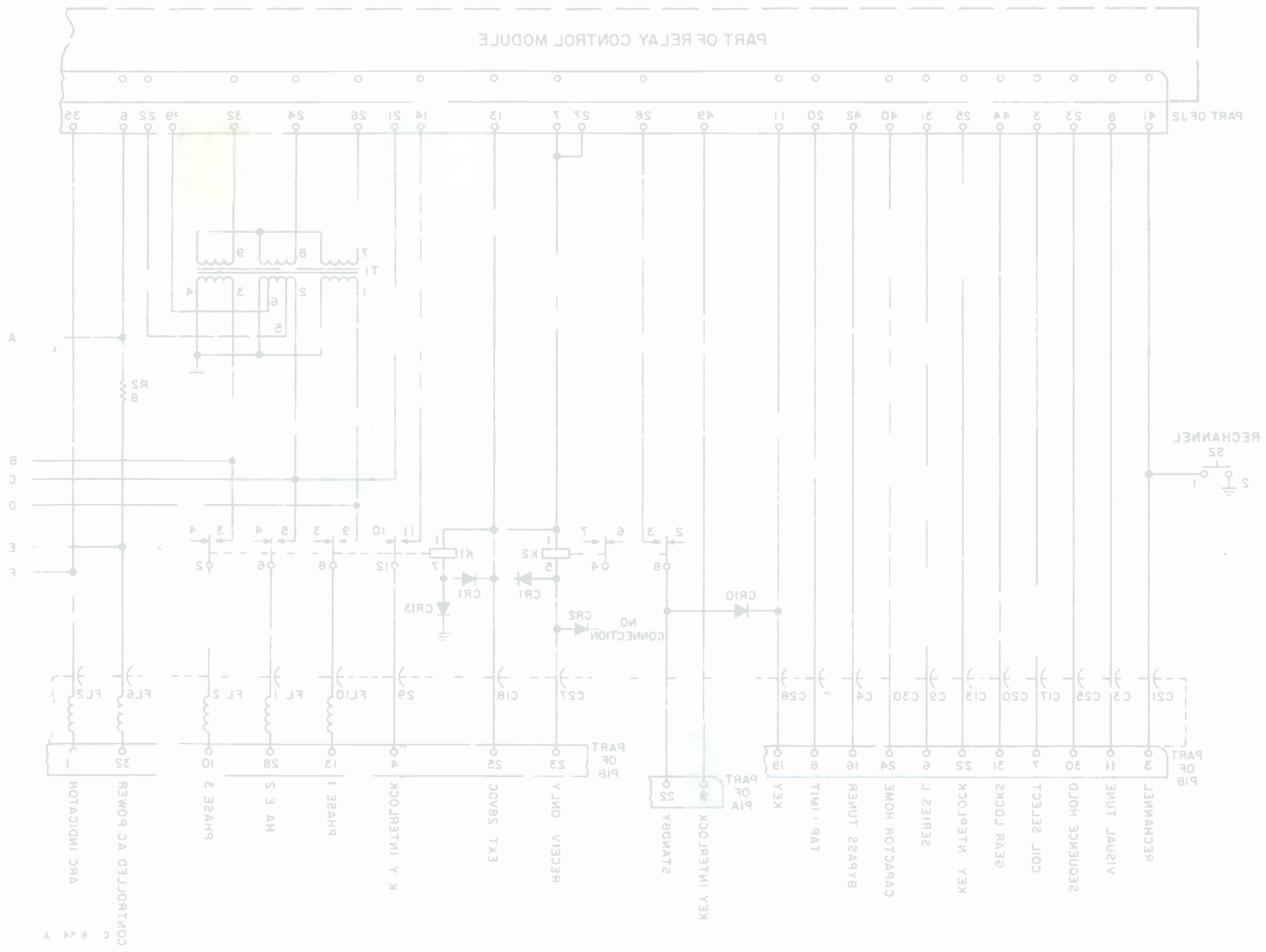


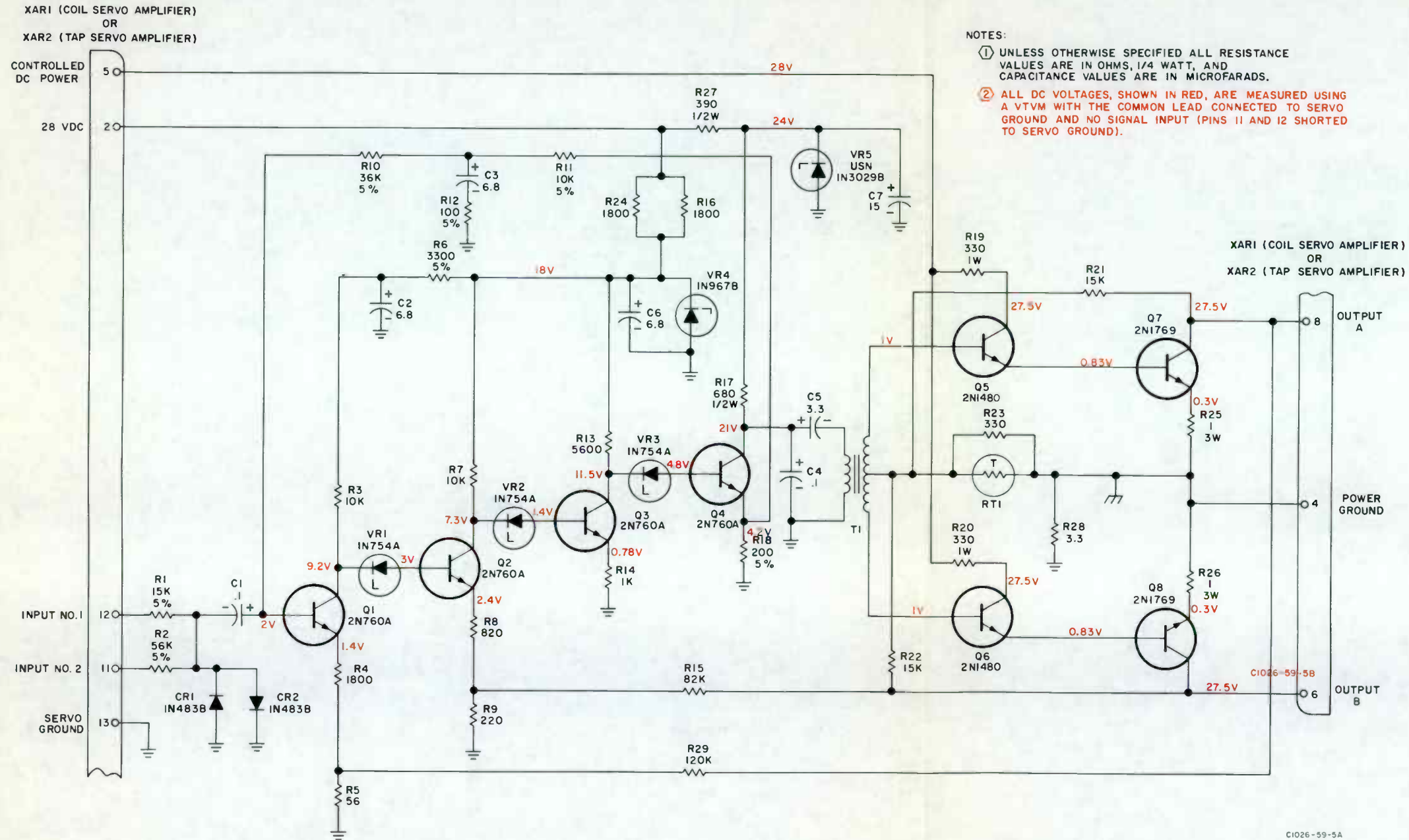




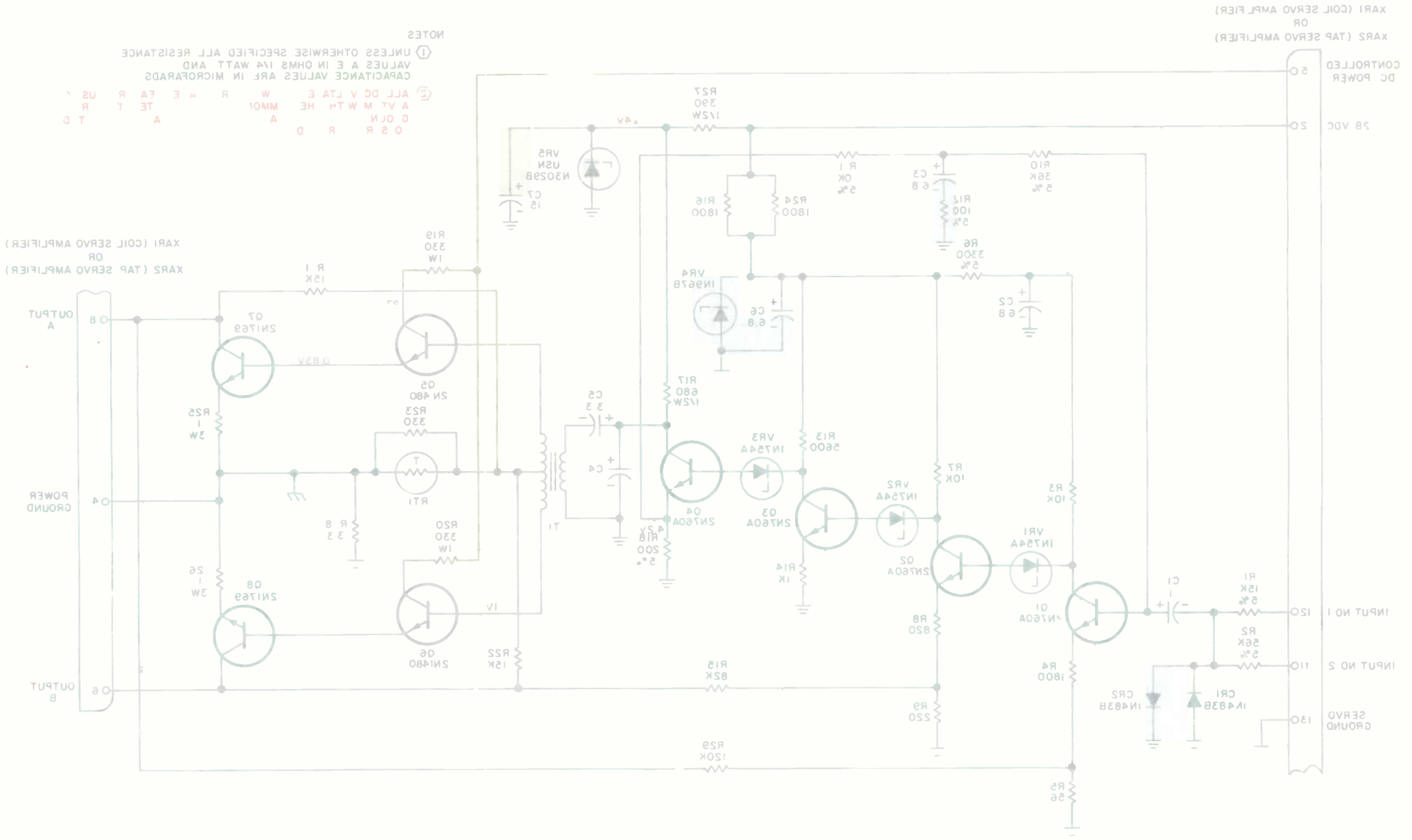
309A-9A Antenna Coupler Control Chassis, Schematic Diagram (Sheet 1 of 3)  
Figure 812

Figure 812  
309 /-9A Antenna Coupler Control Chassis, Schematic Diagram (Sheet 1 of 3)





Servo-Amplifier Module, Schematic Diagram  
Figure 813



NOTES  
 ① UNLESS OTHERWISE SPECIFIED ALL RESISTANCE VALUES ARE IN OHMS 1/4 WATT AND CAPACITANCE VALUES ARE IN MICROFARADS  
 ② ALL DC VOLTAGE VALUES ARE IN VOLTS  
 ③ ALL RESISTANCE VALUES ARE IN OHMS 1/4 WATT AND CAPACITANCE VALUES ARE IN MICROFARADS  
 ④ UNLESS OTHERWISE SPECIFIED ALL RESISTANCE VALUES ARE IN OHMS 1/4 WATT AND CAPACITANCE VALUES ARE IN MICROFARADS

Servo-Amplifier Module, Schematic Diagram  
 Figure 813

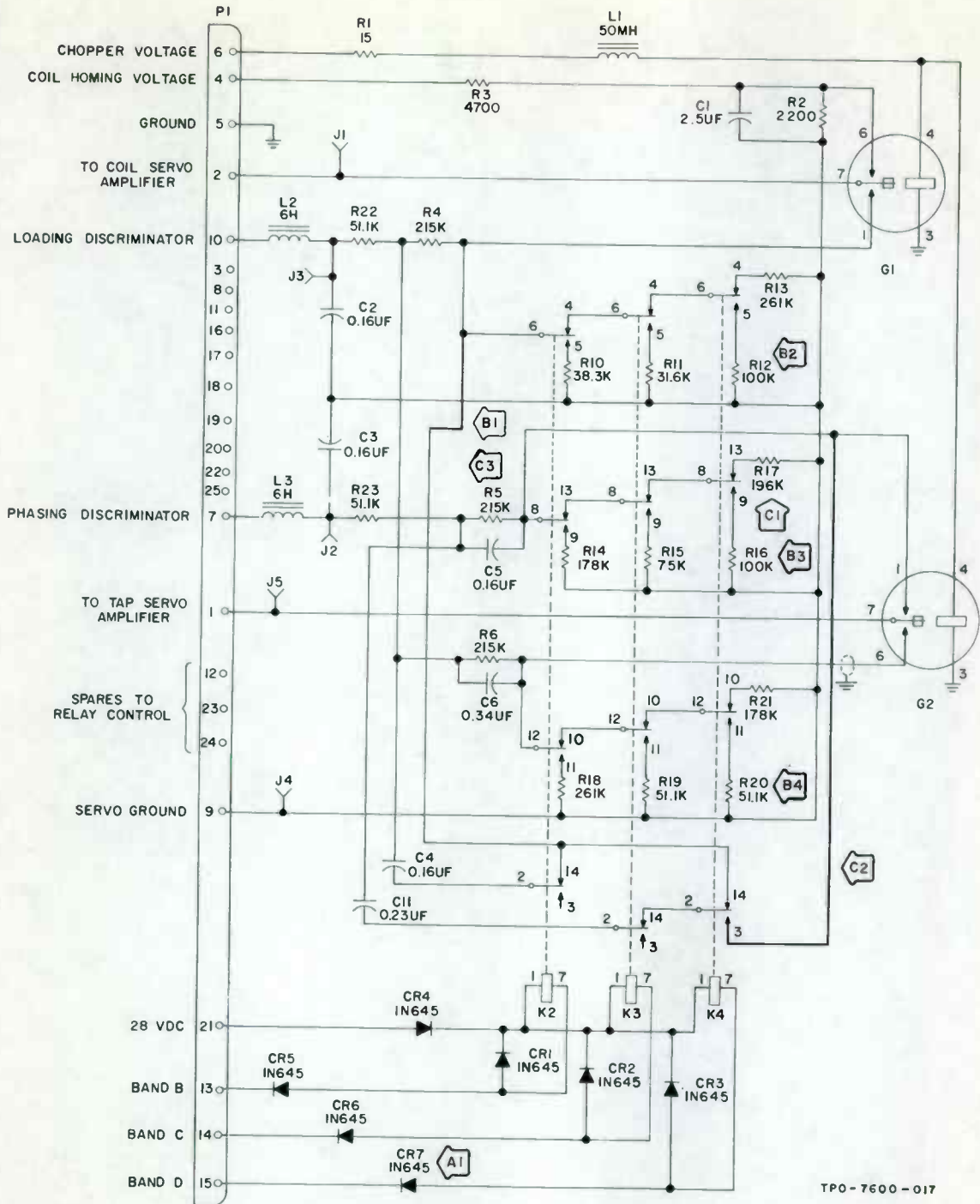


SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
859/860	A1	Added CR5, CR6, and CR7 to the band input circuits. Ensures compatibility with 618S Transceiver.	15	MCN 201
	B1	Deleted C7 (0.068 uf).	18	MCN 632
	B2	Changed R12 from 261K to 100K.		
	B3	Changed R16 from 261K to 100K.		
	B4	Changed R20 from 261K to 51.1 K. Corrects tuning loop instabilities.		
	C1	Changed R17 from 100K to 196K.		MCN 512
	C2	Added connection between K3-3 and G2-1.		
	C3	Removed connection between the junction of R4, G1-1, K2-6, K2-14, and K4-14 and the junction of R23, R5, C5, and C11. Increases pull-in accuracy at 2 MHz.		
	C4	Added capacitor C5.		MCN 114, 117 and above.

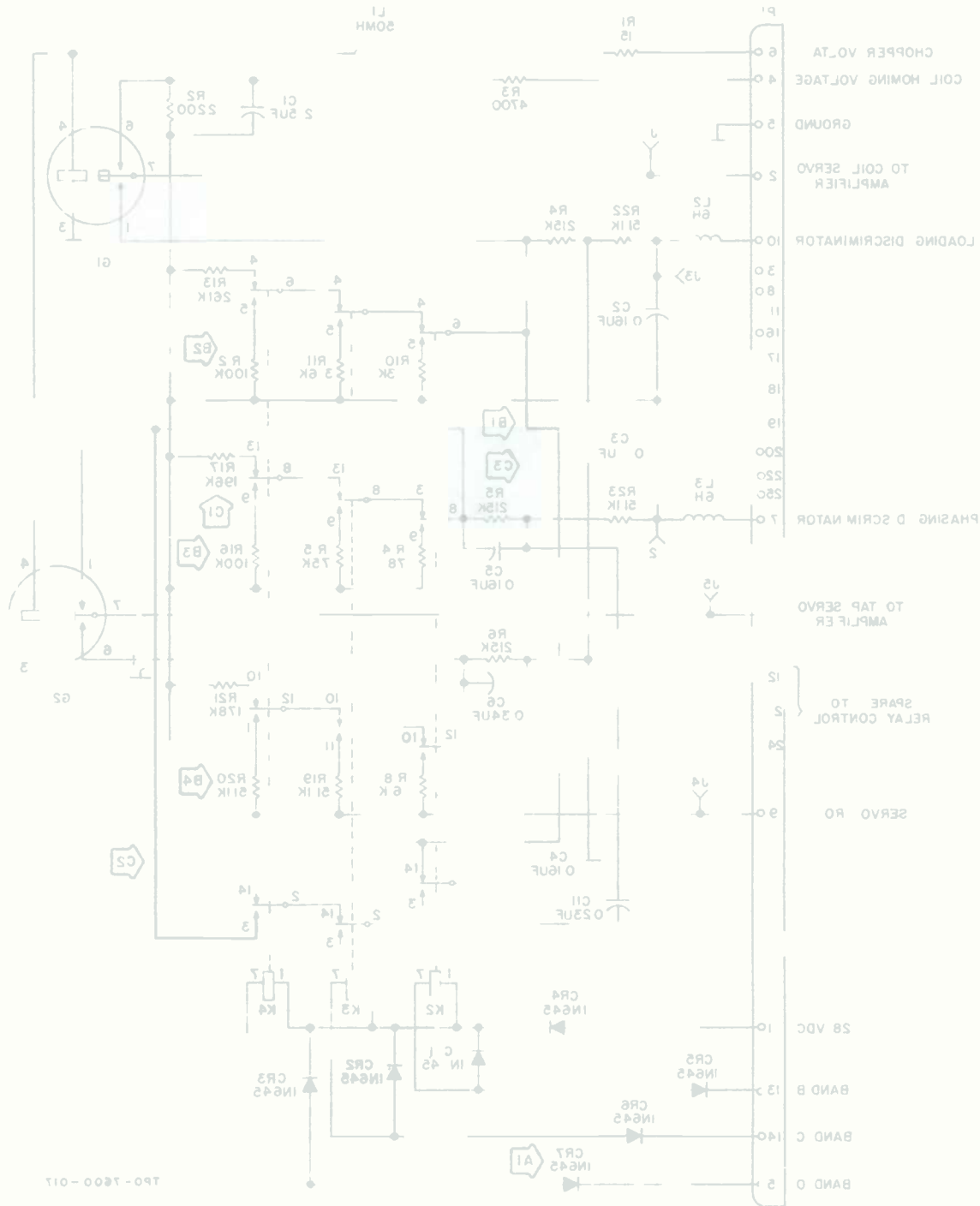
Servo-Control Module, Schematic Diagram (Sheet A)  
Figure 814





Servo-Control Module, Schematic Diagram  
Figure 814

Figure 814 Servo-Control Module, Schematic Diagram







SCHEMATIC CHANGES

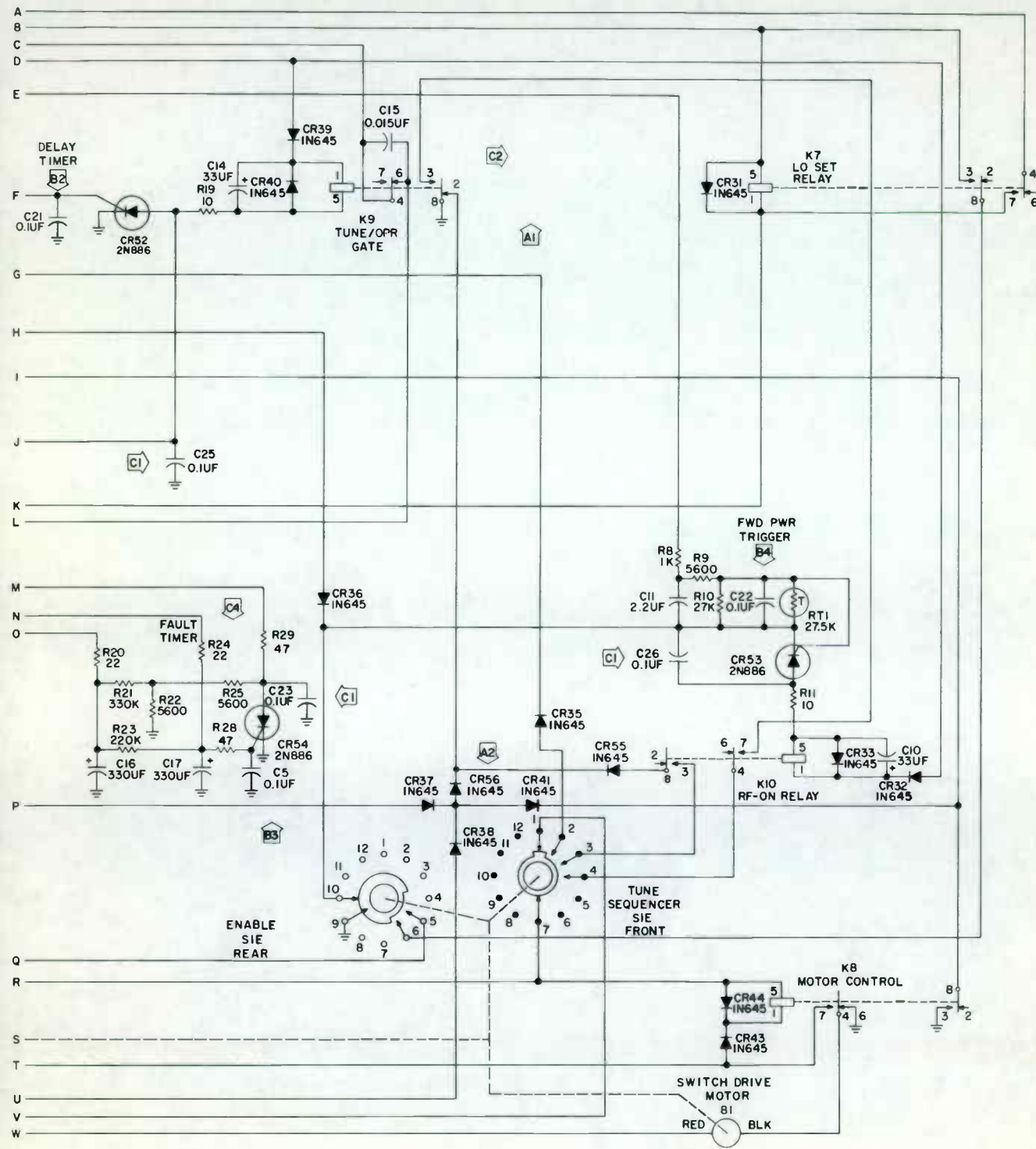
PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
869/870	A1	Deleted leads from terminals 4 and 7 of 1 second time delay slave relay K11 (including CR29).	17	MCN 235
869/870	A2	Added CR55 and CR56.		
867/868	A3	Added C18 (22 uf) and changed value of R26 from 22K to 68K.		
867/868	A4	Added C19 (0.68 uf). Ensures proper command surveillance operation.		
867/868	B1	Added C20 (0.1 uf).	18	MCN 360
869/870	B2	Added C21 (0.1 uf).		
869/870	B3	Changed C5 from .01 uf to 0.1 uf.		
869/870	B4	Added C22 (0.1 uf). Corrects tuning loop instabilities.		
867/868	C1	Shunted scr's (CR51 through CR54) with 0.1 uf capacitors (C23 through C26) to increase reliability by suppressing transients.	19	MCN 391
869/870	C2	Removed 1-second time delay slave relay K11 and transferred the controlled ac power circuit from K11-4/-7 to K9-4/-6 contacts that formerly energized K11. Eliminates extra relay.		MCN 605
867/868	C3	Changed R18 from 4700 to 3900 ohms and R26 from 68K to 33K. Improves demand surveillance response and 1-second delay timer operation.		MCN 668

Relay Control Module, Schematic Diagram (Sheet A)  
Figure 815



PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
869/870	C4	Added R28 (47 ohms) to circuit between C5 and C17. Added R29(47 ohms) to circuit between K6-7 and CR54 anode. Prevents CR54 from firing on transients.		MCN 851

Relay Control Module, Schematic Diagram (Sheet B)  
Figure 815



NOTES:

① UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN PICO-FARADS, AND ALL INDUCTANCE VALUES ARE IN MICROHENRYS.

② ALL SWITCHES ARE VIEWED FROM OPPOSITE THE MOTOR OR DRIVEN END.

LEGEND:

- REAR
- ◐ FRONT
- BOTH SIDES

③ CR1 THRU CR6 ARE TYPE IN1200R.

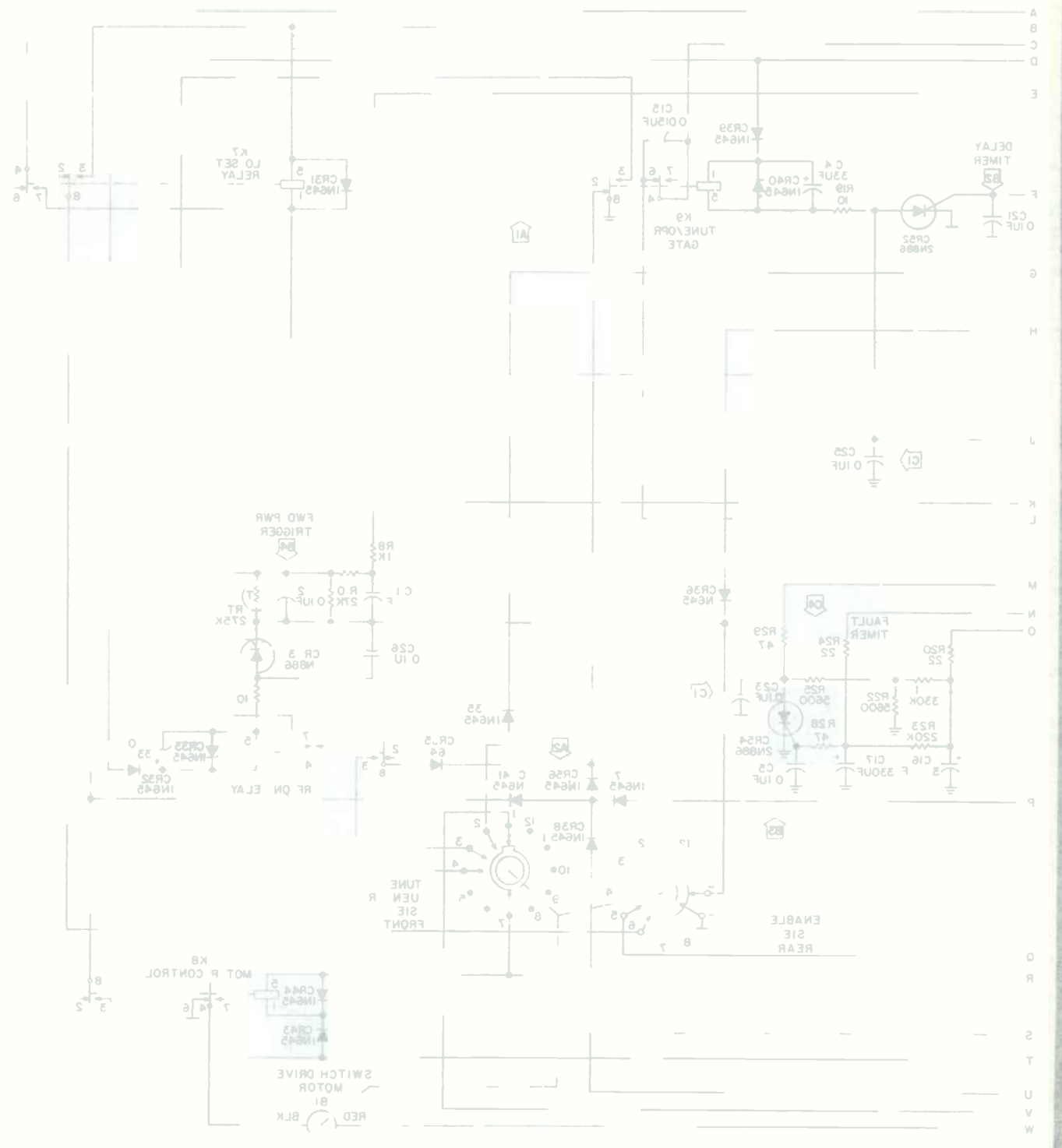
④

SWITCH POSITION	MODE
1	HOME
2	STANDBY
3	RF-ON
4	TUNE
5	OPERATE
6	FAULT
7 - 12	RESETS

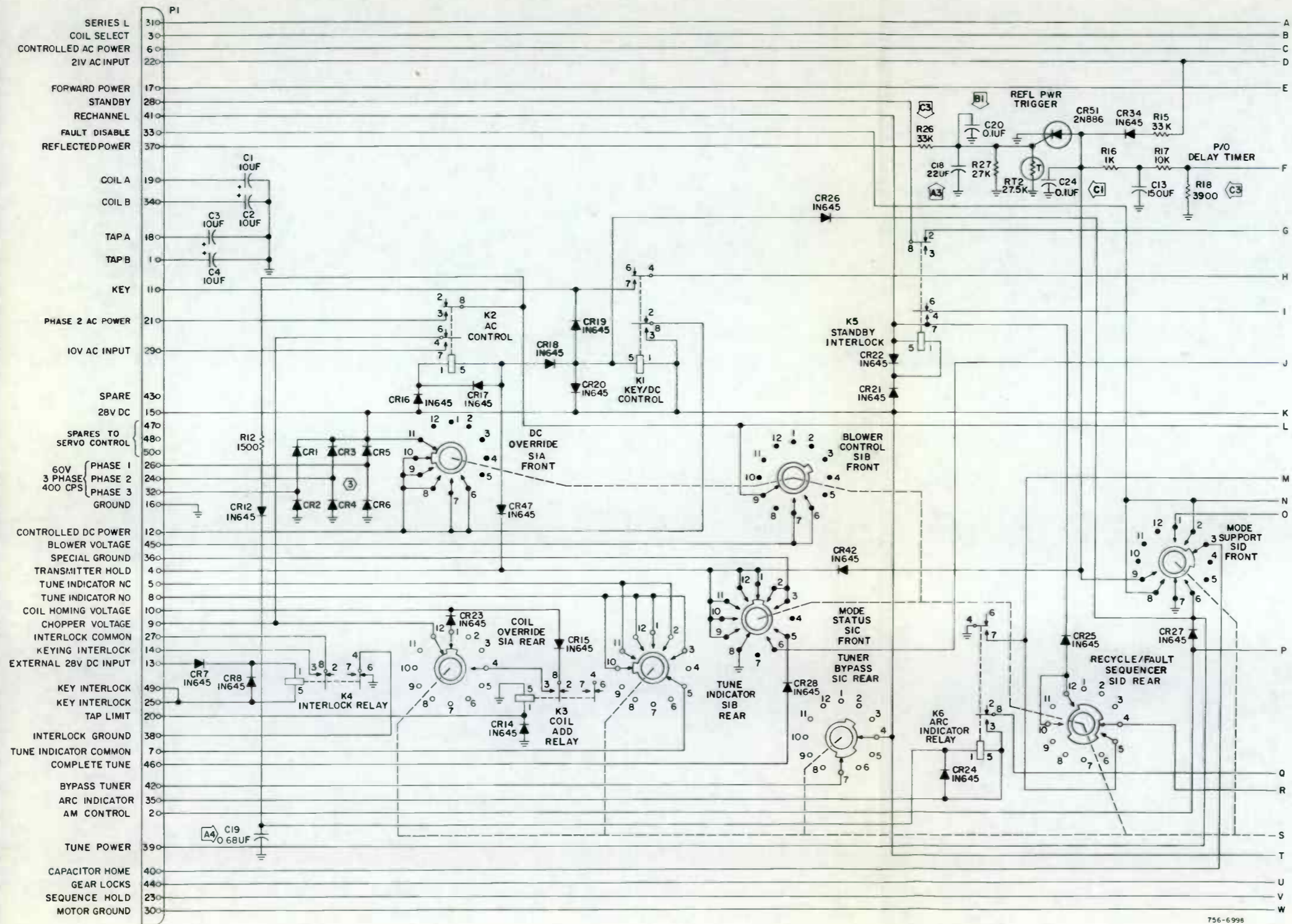
SHOWN  
IN HOME  
POSITION

Relay Control Module, Schematic Diagram (Sheet 2 of 2)  
Figure 815

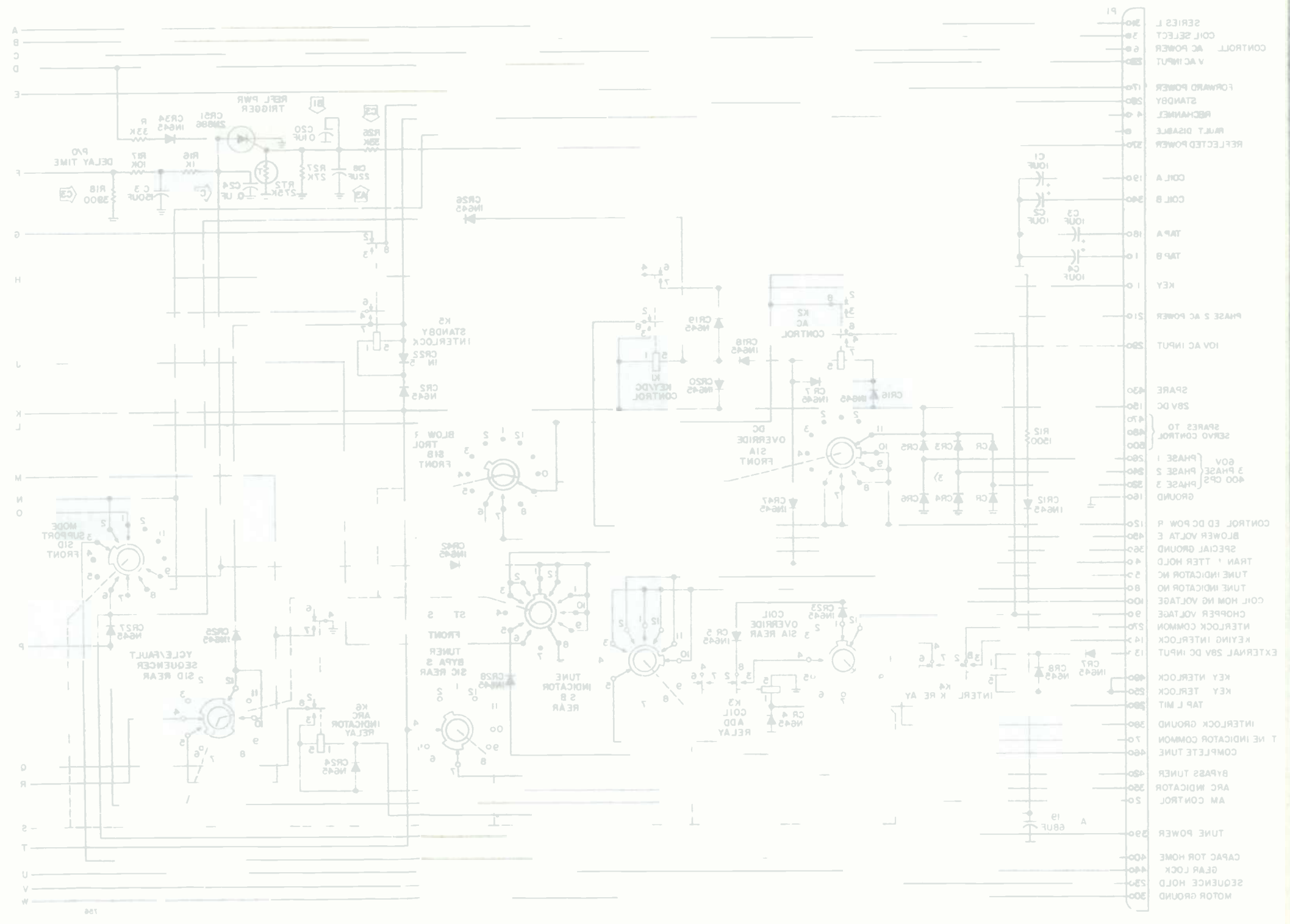
Figure 817  
Relay Control Module, Schematic Diagram (Sheet 2 of 2)



① UNLESS OTHERWISE INDICATED ALL RESISTANCE VALUES ARE IN OHMS  
 ALL CAPACITANCE VALUES ARE IN PICOFARADS UNLESS OTHERWISE INDICATED  
 ALL INDUCTANCE VALUES ARE IN MICROHENRYS  
 ALL SWITCHES ARE V WED F M POSITIVE THE MOTOR OR DRIVEN END  
 LEGEND  
 ○ REAR  
 □ FRONT  
 △ TH DES  
 THRU CORE TYPE S  
 SW TCH POSITION MODE  
 1 HOME  
 2 S ANDBY  
 3 R ON  
 4 T NE  
 5 OPERATE  
 6 FAULT  
 7 RESETS



Relay Control Module, Schematic Diagram (Sheet 1 of 2)  
Figure 815



Relay Control Module Schematic Diagram (Sheet 1 of 2)  
11 11 817



SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
<p>This page will contain schematic revision information.</p>				

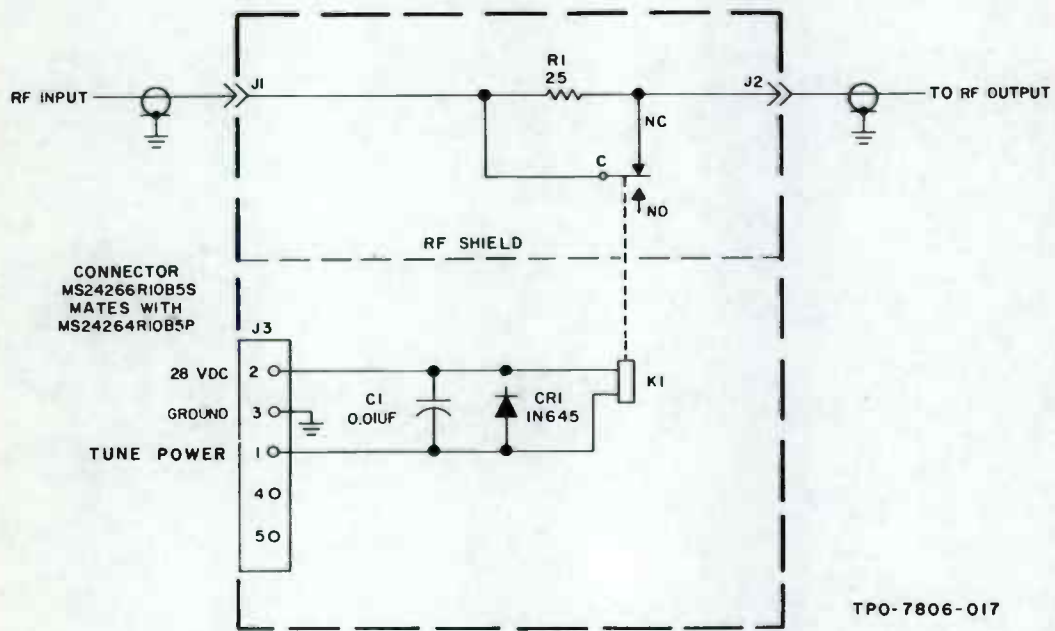
399V-1 Adapter, Schematic Diagram (Sheet A)  
Figure 816

Oct 1/67

23-13-0  
Pages 871/872



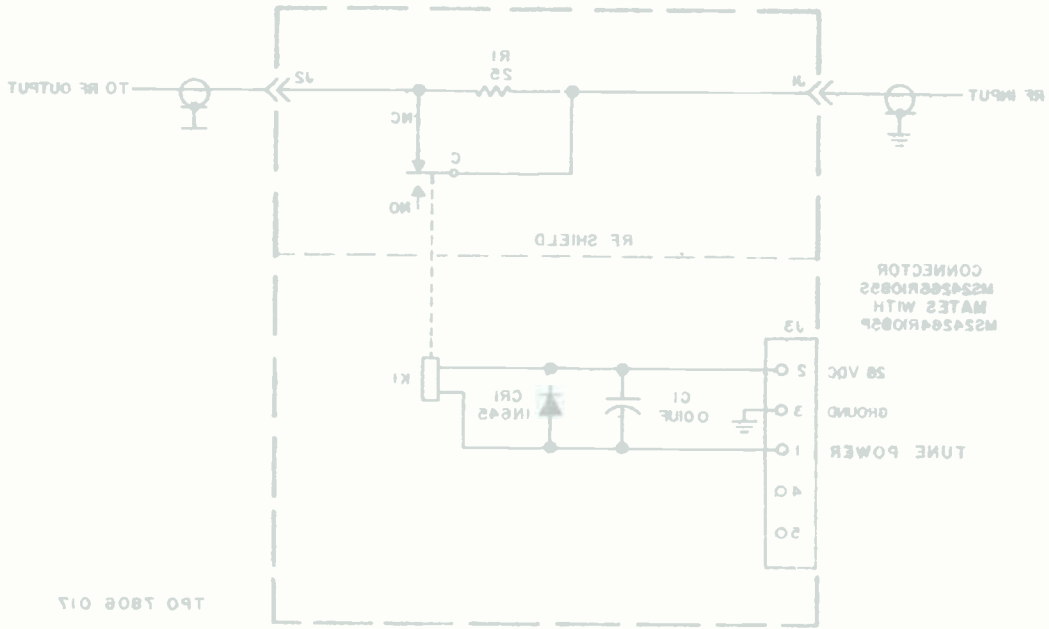




399 V-1 Adapter, Schematic Diagram  
Figure 816



COLLINS  
MANUAL



TP0 7808 017

Figure 810  
300V-1 Adapter, Schematic Diagram



SCHEMATIC CHANGES

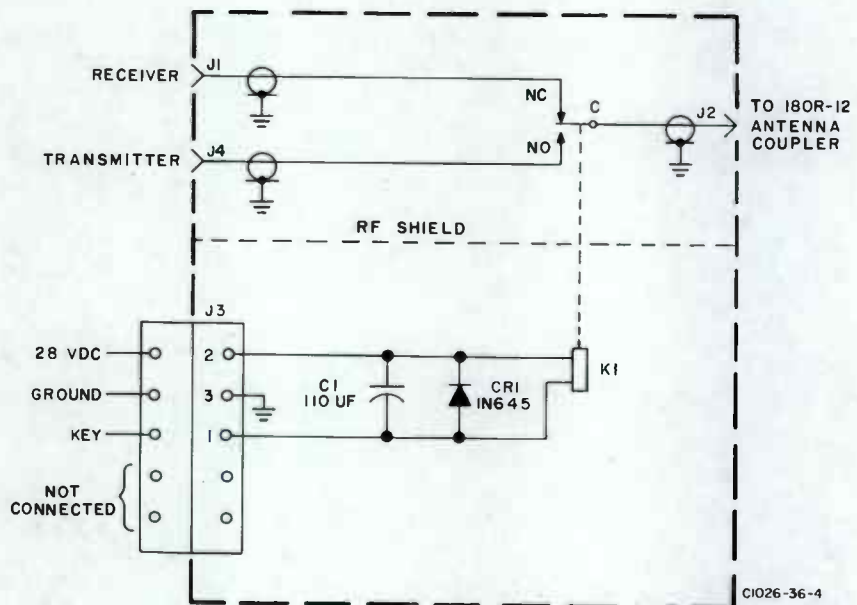
PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
<p>This page will contain schematic revision information.</p>				

399W-1 Adapter, Schematic Diagram (Sheet A)  
Figure 817

Oct 1/67

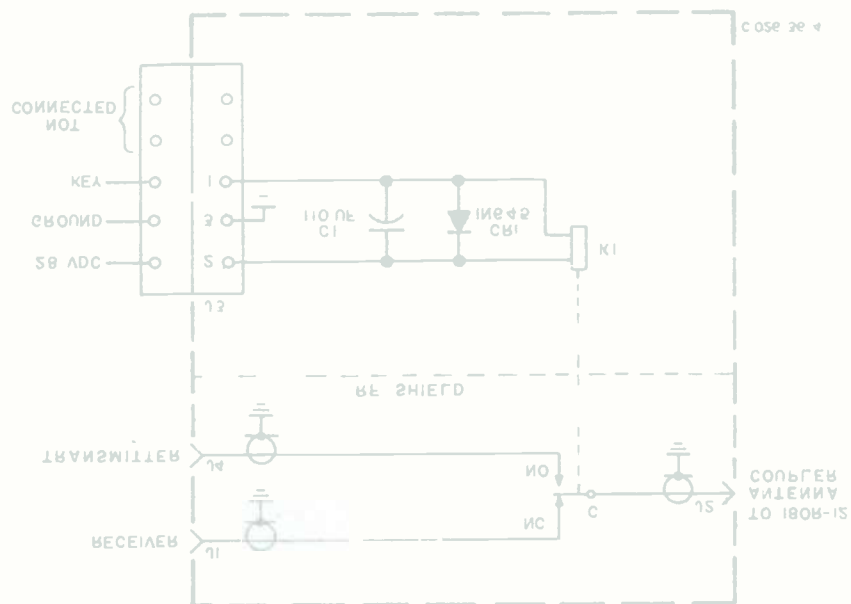
23-13-0  
Pages 875/876





399W-1 Adapter, Schematic Diagram  
Figure 817

Figure 811  
38811-1 Adapter, Schematic Diagram





## **180R - 12 Antenna Coupler and 309A - 9/9A Antenna Coupler Control - Storage Instructions**

The components that comprise the 180R-12 Antenna Coupler and the 309A-9/9A Antenna Coupler Control should be stored in their original shipping containers in a relatively dry, dust-free area.

The 180R-12 should remain pressurized during storage.

When stored, the 180R-12 pressure should be checked every 6 months. Be careful not to depressurize the unit when checking pressure.







## 180R - 12 Antenna Coupler and 309A - 9/9A Antenna Coupler Control - Special Tools, Fixtures, and Test Equipment

### 1. GENERAL.

This section describes the special tools, fixtures, and equipment required to test and repair the antenna coupler and the coupler control.

### 2. TEST EQUIPMENT, GAUGES, AND FIXTURES.

Figure 1101 lists and describes the equipment required to test and troubleshoot the coupler and control. If the equipment is to be locally fabricated, a figure providing fabrication details is referenced.

### 3. SPECIAL TOOLS.

Figure 1102 is a list with applications of tools required but not commonly found in the shop. Figures showing construction details of these tools are referenced in the list.

EQUIPMENT	RECOMMENDED TYPE OR MODEL	FUNCTION
Transceiver (rf source)	Collins 618T-( ).	Provides 2- to 30-MHz, 100-watt rf energy.
Transmitter control	Collins 714E-( ).	To operate transceiver.
Rf wattmeter	Bird Model 4141S.  <u>NOTE:</u> A toggle switch may be used to conveniently switch the meter to either reflected or forward power as desired.	Forward and reflected power measurements.
Rf coaxial resistor	Bird Model 82C.	Resistive dummy load.
Reactive dummy loads	See figures 701 through 703.	Simulate antenna impedances.
Stopwatch	Meylan 202A.	Measure system tune time.
Pressure gauge	Marshalltown, 0 to 15 psi.	Test gas pressure of coupler case.
Voltohmmeter	Triplet 630A.	General electrical measurements.



EQUIPMENT	RECOMMENDED TYPE OR MODEL	FUNCTION
Discriminator model tester	Collins 878L-19.	Module performance testing and troubleshooting.
Dc microvolt-ammeter	Hewlett-Packard Model 425A - <u>NOTE:</u> Not required if 878L-19 is used.	Discriminator testing.
Discriminator test housing	See figure 1103. <u>NOTE:</u> Not required when 878L-19, which provides a special housing, is used.	Discriminator alignment.
Basic coupler test fixture	See figure 1104.	Coupler performance testing and troubleshooting.
Variable dc power supply, 0 to 140 v, 400 Hz	General Radio Variac Type M2.	Ac power for testing.
Variable dc power supply, 0 to 30 v	Sorensen Model QRC-15.	Dc power for testing.
Servo-amplifier module tester	Collins 878L-18.	Module performance testing.
Servo-amplifier test fixture	See figure 1105.	Alternate for above.
Rms voltmeter	Ballantine Model 320.	Servo-amplifier testing and troubleshooting.
Oscilloscope	Tektronix 541.	Servo-amplifier troubleshooting.
Servo-control module test fixture	See figure 1106.	Module performance testing and troubleshooting.
Ac vtvm	Hewlett-Packard Model 400D.	Servo-control module testing.
Relay control module tester	Collins 878L-13.	Module performance testing and troubleshooting.



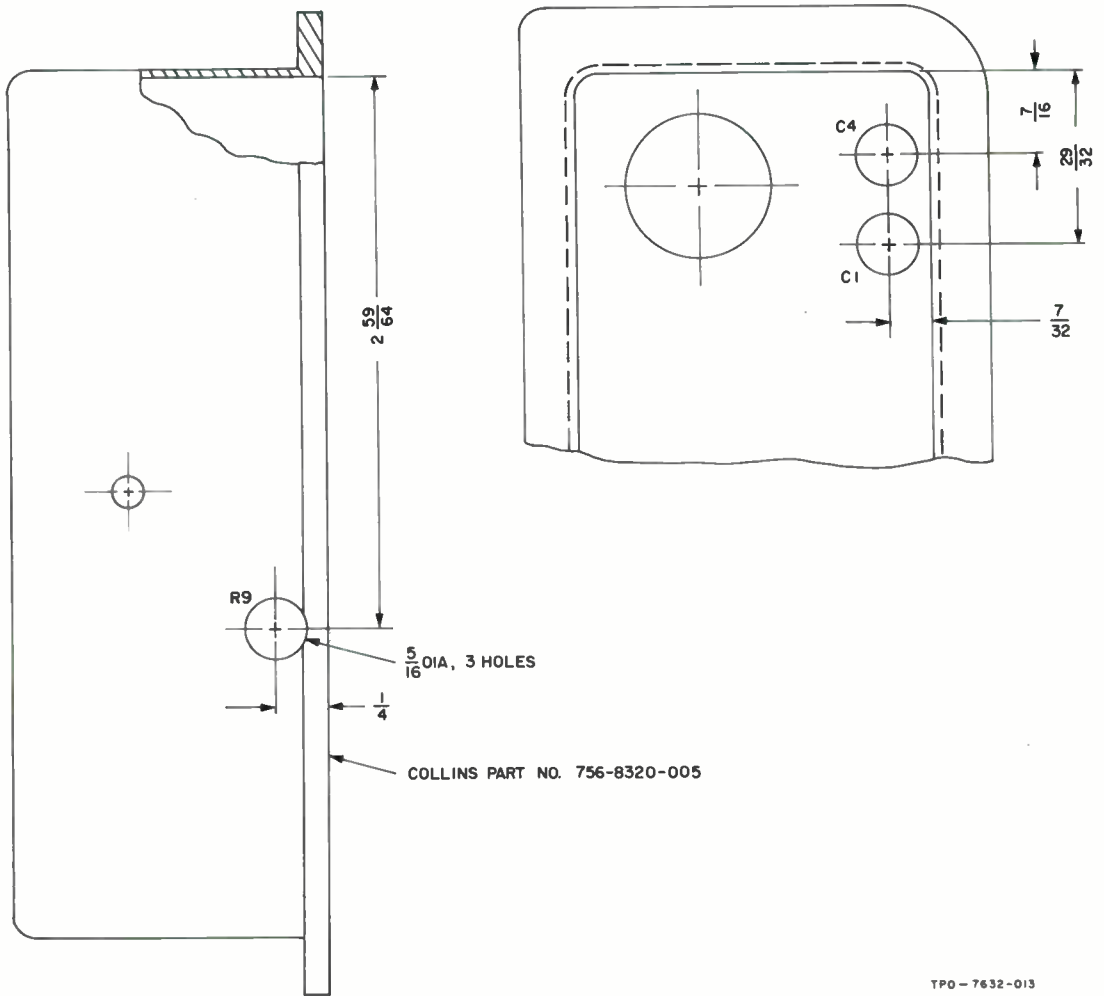
EQUIPMENT	RECOMMENDED TYPE OR MODEL	FUNCTION
Gram gauge	Scherr Tumico, 20- to 100-gram range.	Measure electrical contact pressure in coupler.
Feeler gauge		Mechanical end play and clearance measurements.
Degree gauge	See figure 1107.	Radial alignment measurements of basic coupler.
Height gauge		Coupler connectors interconnect distance measurement.
Machinist's surface plate		Coupler connectors interconnect distance measurement.
Torque wrench	75 in-lb capacity minimum.	Installation of coupler in coupler case.

Test Equipment, Gauge, and Fixture List (Sheet 3 of 3)  
Figure 1001



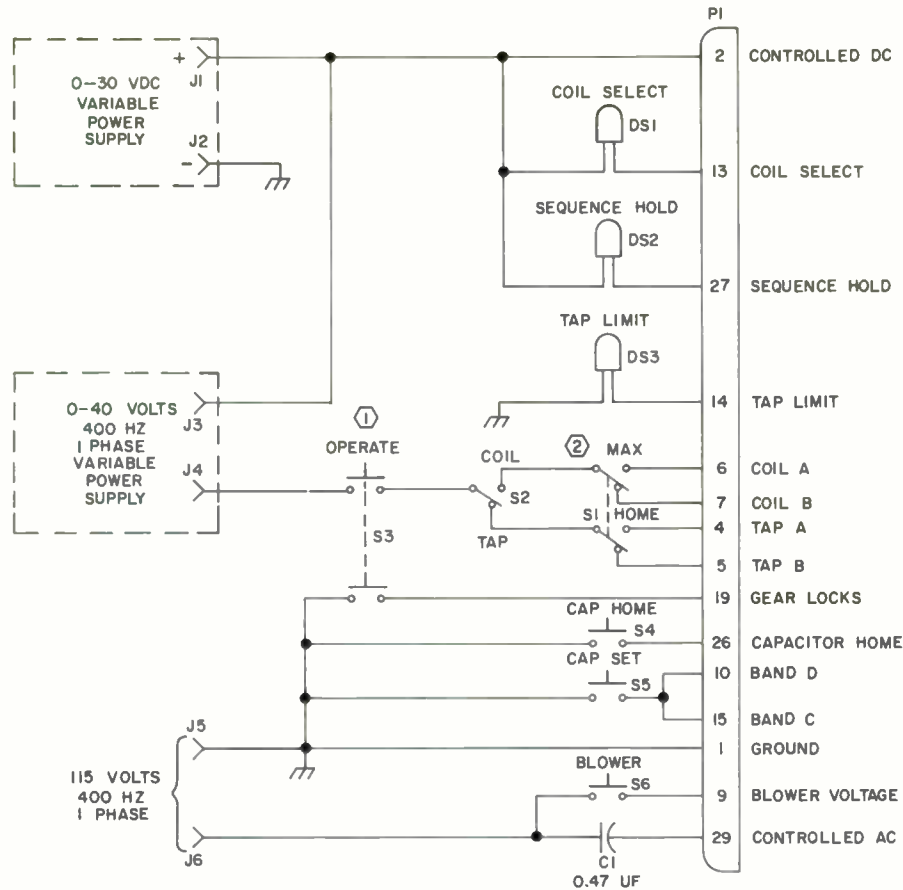
NAME	APPLICATION	DETAILS
Contact positioning tool	Alignment of series C switch contacts on rear plate of basic coupler	Figure 1008
Pin spanner	Disassembly and reassembly of servo-amplifier module can.	Figure 1009
Slotted-nut driver	Disassembly and reassembly of servo-amplifier electronics stack.	Figure 1010
Drum roller shaft wrench	Detaching, reattaching, and adjusting the coupler ground drum and ceramic drum roller assemblies.	Figure 1011
Rf feedthrough spanner		Figure 1012

Special Tool List  
Figure 1002



TPO-7632-013

Discriminator Test Housing, Drilling Detail  
Figure 1003



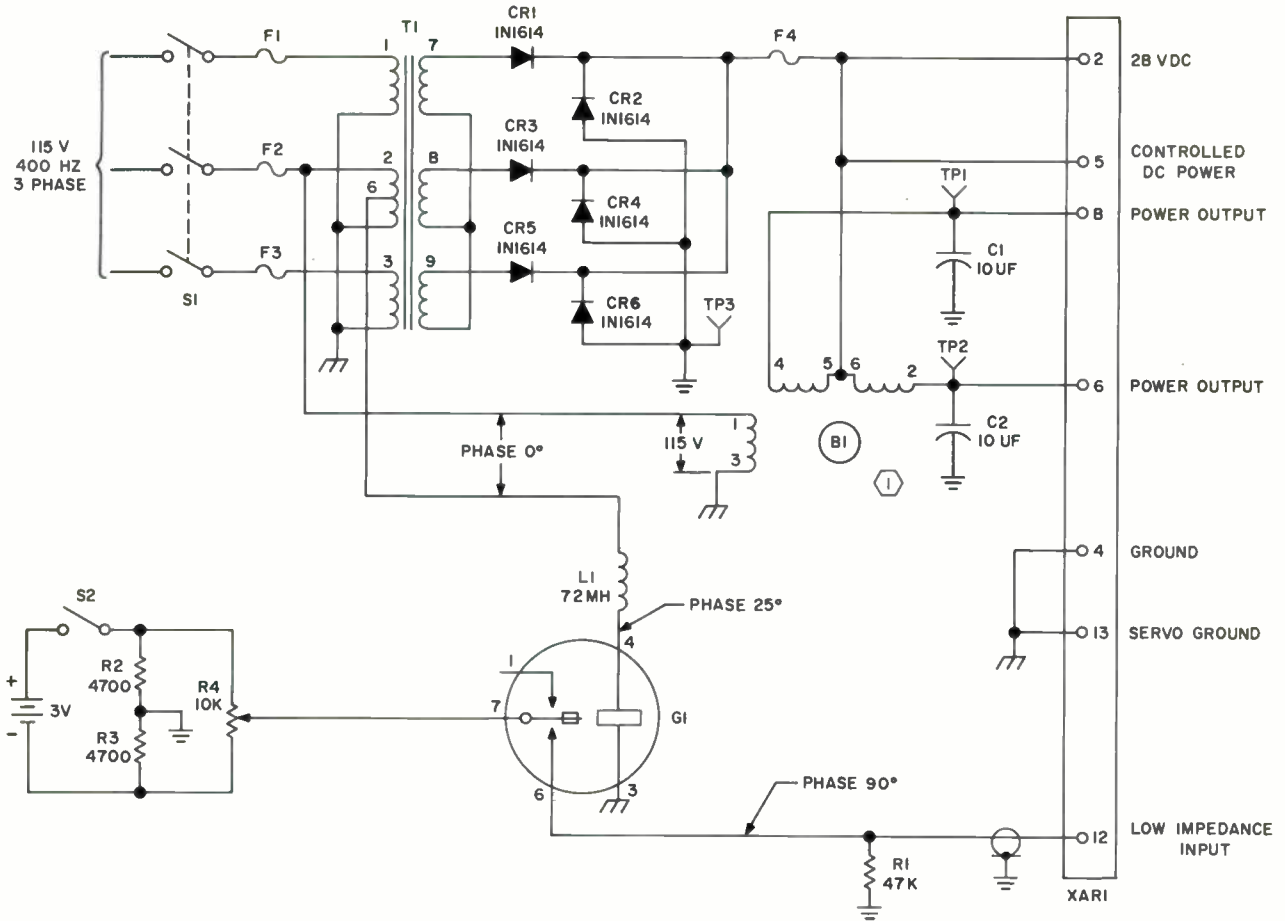
NOTES:

- ① DO NOT HOLD OPERATE SWITCH S3 DEPRESSED FOR MORE THAN 30 SECONDS.
- ② IF MAX/HOME SWITCH S1 PERFORMS THE OPPOSITE OPERATION, REVERSE 115 VAC PRIMARY POWER LEADS AT INPUT TO TESTER OR INPUT TO VARIABLE AC VOLTAGE POWER SUPPLY.
- ③ PUSHBUTTONS S3 THROUGH S6 ARE NORMALLY OPEN, MOMENTARY CLOSE TYPES.

TPO-7679-013

LIST OF SPECIFIC PARTS REQUIRED

REF DES	DESCRIPTION	COLLINS PART NUMBER
C1	Capacitor, 0.47 uf x 200 vac	931-7111-000
DS1 thru DS3	Indicator lamp, 28 vdc	262-0179-000
P1	Connector, MS24266R-18-B-31S	359-4050-000

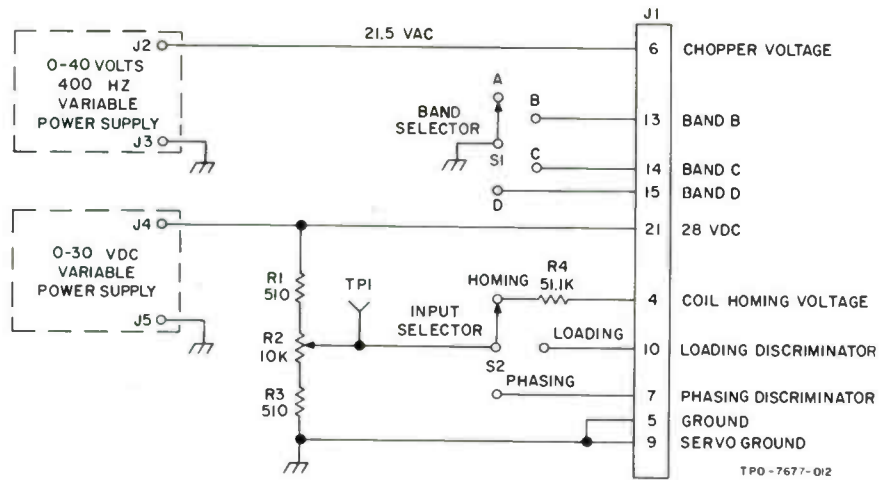


COMPONENT	COLLINS PART NUMBER
MOTOR BI	229-0296-00
CAPACITORS C1, C2	184-8068-00
CHOPPER, G1	354-1022-00
CHOKE, L1	240-0272-00
DIODES, CR1 THRU CR6	353-1837-00
TRANSFORMER, T1	674-0069-00
SOCKET, XARI	220-1546-00

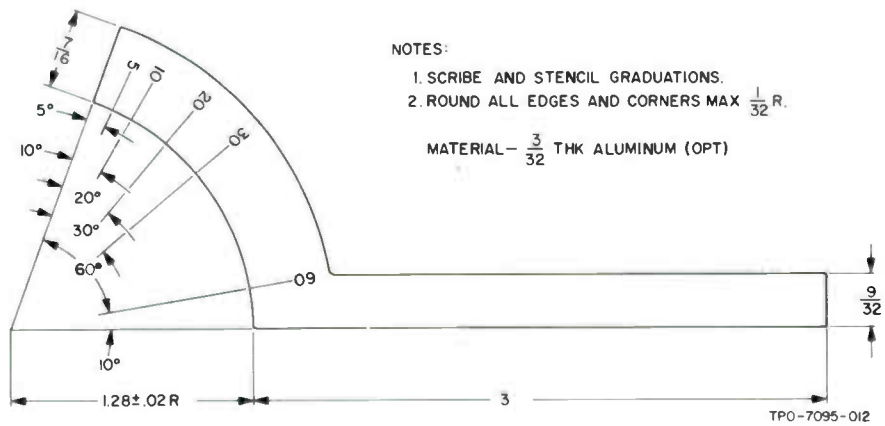
NOTE:  
 SHAFT OF MOTOR BI IS TO BE IMMOBILIZED OR LINKED TO A TORQUE INDICATOR CALIBRATED IN INCH OUNCES.

C1026-46-4

Servo-Amplifier Module Test Fixture, Schematic Diagram  
Figure 1005

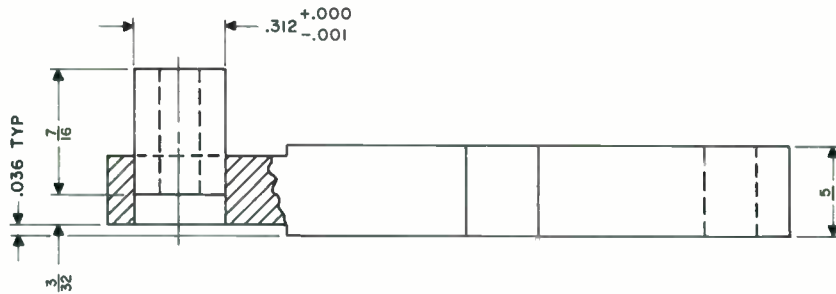
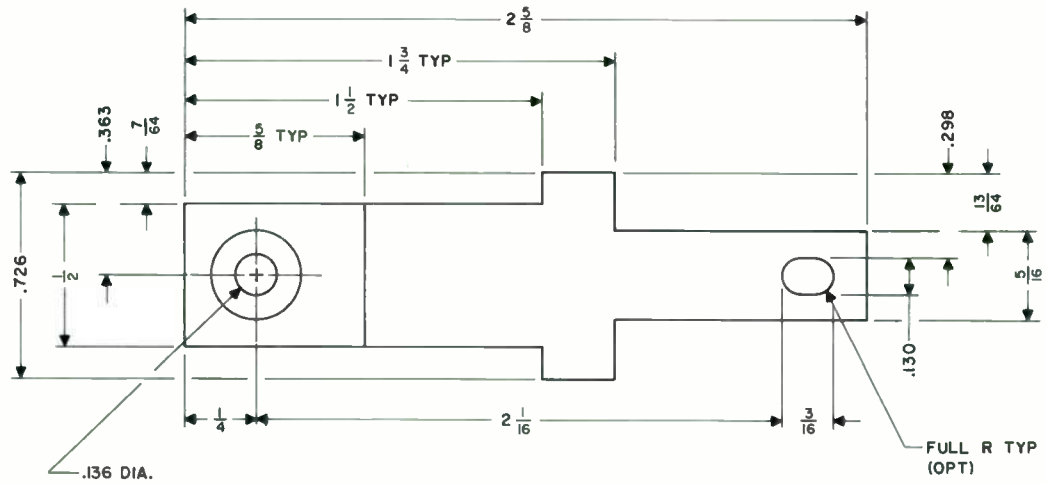


Servo-Control Module Test Fixture, Schematic Diagram  
Figure 1006



Degree Gauge, Fabrication Detail  
Figure 1007

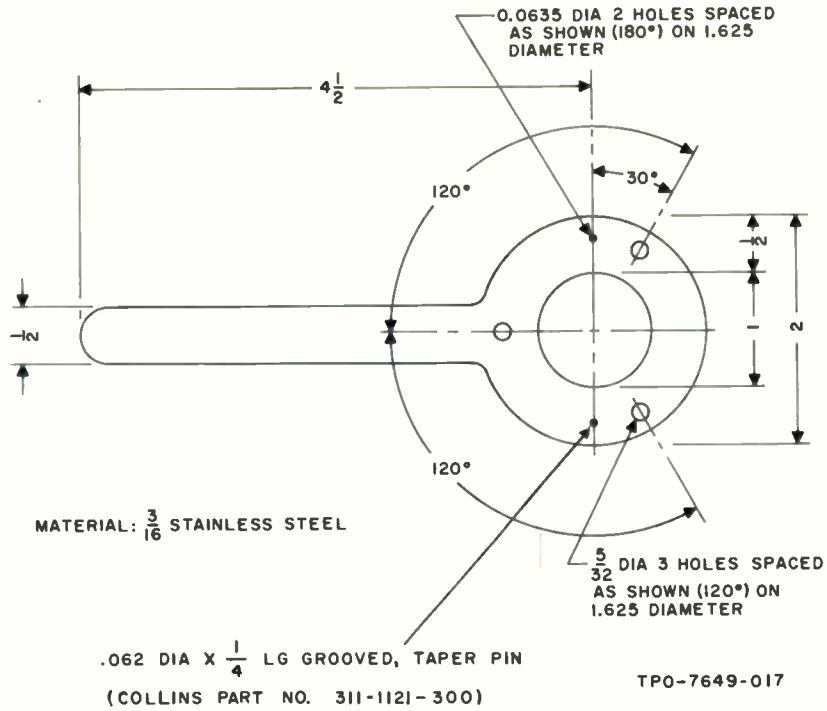




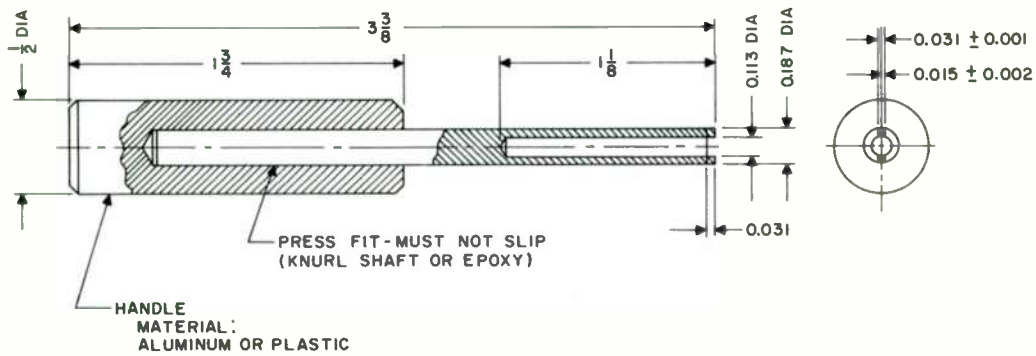
NOTE:  
UNLESS OTHERWISE SPECIFIED;  
DECIMAL DIMENSIONS ARE  $\pm .001$   
FRACTIONAL DIMENSIONS ARE  $\pm \frac{1}{64}$

C283-99-3

Contact Positioning Tool, Fabrication Detail  
Figure 1008



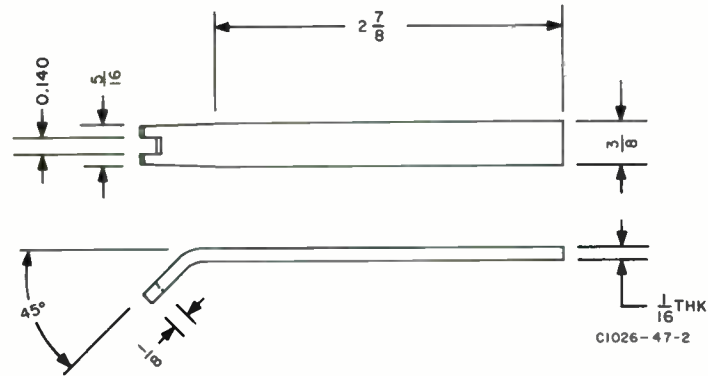
Pin Spanner, Fabrication Detail  
Figure 1009



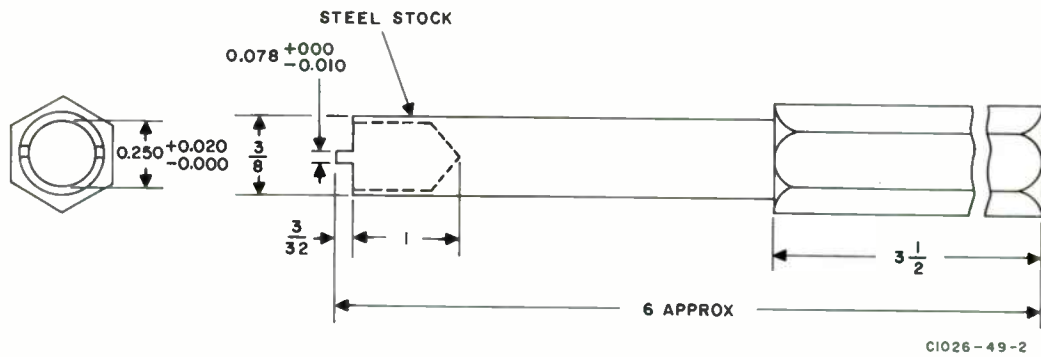
DIEHL PART NO. 6-780901-01

C1026-42-3

Slotted-Nut Driver, Fabrication Detail  
Figure 1010



Roller-Shaft Wrench, Fabrication Detail  
Figure 1011



RF Feedthrough Spanner, Fabrication Detail  
Figure 1012





# 180R - 12 Antenna Coupler and 309A - 9/9A Antenna Coupler Control - Illustrated Parts List

## INTRODUCTION

### 1. GENERAL.

This Illustrated Parts List is a complete list of parts for the above equipment manufactured by Collins Radio Company (see figure 1101).

Collins Radio Company part numbering system is comprised of a three-digit family number, a four-digit serial number, and two- or three-digit dash number:

FAMILY NO.	SERIAL NO.	DASH NO.
XXX	XXXX	XX or XXX

If a part is purchased by Collins Radio Company from a vendor, the Federal Manufacturer's Code Number is listed in the nomenclature column. If this column does not include a Federal Manufacturer's Code Number, the item is either a MIL approved item, commercial item or manufactured by Collins. Where COML appears in this column, the part may be obtained commercially from various vendors. Part numbers appearing in this column are Collins assigned part numbers for that item. Serial numbers or MCN (manufacturing control number) effectivities, where applicable, are listed in this column. Serial number effectivities are designated on the nameplate. The MCN is stamped on each module and/or chassis. Changes made from service bulletins are so indicated by SB1, SB2, etc.

### 2. MANUFACTURER'S CODE AND NAME INDEX.

CODE	MANUFACTURER'S NAME AND ADDRESS	CODE	MANUFACTURER'S NAME AND ADDRESS
01526	General Electric Co. Specialty Control Dept. P.O. Box 812 Waynesboro, Va. 22980	08289	Blinn Delbert Co., Inc., The 1678 E. 5th Ave. Pomona, Calif. 91769
02660	Amphenol Corp. 2801 S. 25th Ave. Broadview, Ill. 60153	08664	Bristol Co., The Bristol Plts Mls Waterbury, Conn. 06720
02697	Parker Seal Co. Cleveland, Ohio 44100	09922	Burndy Corp. Richards Ave. Norwalk, Conn. 06852
04812	United Metallic O Ring Corp. Dayton, Ohio 45400	10646	Carborundum Co. Buffalo Ave. Niagara Falls, N.Y. 14302
07700	Technical Wire Products, Inc. 129 Dermody St. Cranford, N.J. 07016	12615	U.S. Terminals, Inc. 7504 Camargo Cincinnati, Ohio 45243



**OVERHAUL  
MANUAL**

CODE	MANUFACTURER'S NAME AND ADDRESS	CODE	MANUFACTURER'S NAME AND ADDRESS
14101	Sprague Electric Co. 300 W. National Vandalia, Ohio 45377	70674	ADC Products, Inc. 6405 Cambridge St. Minneapolis, Minn. 55426
16952	American Micro Devices, Inc. 10888 N. 19th Ave. Phoenix, Ariz. 85020	71400	Bussman Mfg. Div. of McGraw- Edison Co. 2538 W. University St. St. Louis, Mo. 63107
17771	Singer Co., The Diehl Div. FINDERNE Plant FINDERNE Ave. Somerville, N.J. 08876	71468	ITT Cannon Electric, Inc. 3208 Humbolt St. Los Angeles, Calif. 90031
17875	Eaton Yale and Towne, Inc. Dill Div. 700 E. 82nd St. Cleveland, Ohio 44103	71590	Centralab Div. of Globe- Union, Inc. 932 E. Keefe Ave. Milwaukee, Wis. 53212
19070	Eastern Air Devices, Inc. 385 Central Ave. Dover, N.H. 03820	71785	Cinch Mfg. Co. and Howard B. Jones Div. 1026 S. Homan Ave. Chicago, Ill. 60624
21242	American Electronics Components Corp. P.O. Box 27087 Cincinnati, Ohio 45200	72568	G.M. Laboratories, Inc. 4300 North Knox Ave. Chicago, Ill. 60641
23663	Joslyn Electronic Systems Div. Joslyn Mfg and Supply Co. 6868 Cortona Dr. P.O. Box 817 Goleta, Calif. 93017	72962	Elastic Stop Nut Corp. of America 2330 Vauxhall Road Union, N.J. 07083
24036	Clemens Canvas and Mfg. 823 Tenth St. S.W. Cedar Rapids, Ia. 52404	72982	Erie Technological Products, Inc. 644 W. 12th St. Erie, Pa. 16512
40920	Miniature Precision Bearings, Inc. Precision Park Keene, N.H. 03431	73168	Fenwal, Inc. 400 Main St. Ashland, Mass. 01721
56289	Sprague Electric Co. 479 Marshall St. North Adams, Mass. 01247	73899	J.F.D. Electronics Corp. 15th at 62nd St. Brooklyn, N.Y. 11270
57771	Stimpson, Edwin B., Co., Inc. 70 Franklin Ave. Brooklyn, N.Y. 11205	73905	Jennings Radio Mfg. Corp. 970 McLaughlin Ave. San Jose, Calif. 95108



CODE	MANUFACTURER'S NAME AND ADDRESS	CODE	MANUFACTURER'S NAME AND ADDRESS
74868	Amphenol Corp. Amphenol RF Div. 33 E. Franklin St. Danbury, Conn. 06810	80586	Gorn Electric Co., Inc. Stamford, Conn. 06900
75915	Littlefuse, Inc. 800 E. Northwest Hwy Des Plaines, Ill. 60016	81073	Grayhill, Inc. 531 Hillgrove La Grange Ill. 60525
76854	Oak Mfg. Co. S. Main Crystal Lake, Ill. 60014	81541	Airpax Electronics, Inc. Cambridge, Md. 21613
77147	Patton MacGuyer Co. Edgewood Station Providence, R.I. 02905	81840	Ledex, Inc. 123 Webster St. Dayton, Ohio 45402
77250	Pheoll Mfg. Co. 5700 Roosevelt Rd. Chicago, Ill. 60650	82142	Jeffers Electronics Div. of Speer Carbon Co. Du Bois, Pa. 15801
78189	Shakeproof Div. of Illinois Tool Works, Inc. St. Charles Road Elgin, Ill. 60120	82647	Metals and Controls, Inc. Control Products Group 34 Forest St. Attleboro, Mass. 02703
79136	Waldes Kohinoor, Inc. 47-16 Austel Place Long Island City, N.Y. 11101	82877	Rotron Mfg. Co., Inc. 7-9 Hasbrouck Lane Woodstock, N.Y. 12498
79807	Wrought Washer Mfg. Co. 2252 S. Bay St. Milwaukee, Wis. 53207	83086	New Hampshire Ball Bearings, Inc. Peterborough, N.H. 03458
79963	Zierick Mfg. Corp. 83 Rockdale Ave. New Rochelle, N.Y. 10801	83616	Polymer Corp., The Reading, Pa. 19600
80223	United Transformer Co. 150 Varick St. New York, N.Y. 10013	86335	Glenco Corp. 212 Durham Ave. Metuchen, N.J. 08841
80294	Bourns, Inc. 6135 Magnolia Ave. Riverside, Calif. 92506	86577	Precision Metal Products of Malden, Inc. 41 Elm Street Stoneham Mass. 02180
80411	Acro Div. of Robertshaw Controls Co. 2040 E. Main St. Columbus, Ohio 43216	88818	Kearfott Div. of General Precision Inc. 1150 McBride Little Falls, N.J. 07424
		90484	ITT Wire and Cable Div. 172 Sterling Street Clinton, Mass. 01510



INTRODUCTION

CODE	MANUFACTURER'S NAME AND ADDRESS	CODE	MANUFACTURER'S NAME AND ADDRESS
91314	Lewis Spring and Mfg. Co. 2652 W. North Ave. Chicago, Ill. 60647	94916	Wac Line, Inc. 35 S. St. Clair St. Dayton, Ohio 45402
91500	Asheville - Schoonmaker Mica Co. 910 Jefferson Ave. Newport News, Va. 23600	95105	Collins Radio Co. Information Science Center 19700 Jamboree Rd. P.O. Box C Newport Beach, Calif. 92660
91506	Augat, Inc. 33 Perry Ave. Attleboro, Mass. 02703	95275	Vitramon Inc. Box 544 Bridgeport, Conn. 06600
91637	Dale Electronics, Inc. P.O. Box 609 Columbus, Nebr. 68601	97539	Apm-Hexseal Corp. 41 Honeck Street Englewood, N.J. 07631
91663	Armel Electronics, Inc. 1601 75th St. North Bergen, N.J. 07047	97968	D.S.D. Mfg. Co. 2970 Whitney Ave. Hamden, Conn. 06518
93108	Duralith Corp. 1025 Race Philadelphia, Pa. 19107	98291	Seaelectro Corp. 225 Hoyt Mamaroneck, N.Y. 10544
93332	Sylvania Electric Products, Inc. Semiconductor Products Div. 100 Sylvan Rd. Woburn, Mass. 01801	99378	Atlee Corp. 2 Lowell Ave. Winchester, Mass. 01890
94084	Handy and Harman 1900 Estes Elk Grove Village, Ill. 60007	99800	Delevan Electronics Corp. 270 Quaker Rd. East Aurora, N.Y. 14052
94375	Automatic Metal Products Co. 315 Berry Brooklyn, N.Y. 11211		





INTRODUCTION

3. TABLE I.

A. Usage Code

The following codes have been assigned in this manual:

USAGE CODE	UNIT	FIGURE
A	309A-9	1108
B	309A-9A	1108
C	399V-1	1107
D	399W-1	1107



INTRODUCTION

How to Use This Illustrated Parts List

1-FIND PAGE NO. IN LIST OF ILLUSTRATIONS

6-FIND PART NO. IN NUMERICAL INDEX

3-FIND PART AND ITS INDEX NO.

8-LOCATE PART ON ILLUSTRATION

The diagram illustrates the process of finding a part number using three interconnected documents:

- Symbol Index:** A table with columns for SYMBOL, FIG. - ITEM, PART NUMBER, and SYMBOL. It lists various symbols and their corresponding part numbers.
- Numerical Index:** A table with columns for PART NUMBER, AIRLINE PART NO., FIG. - ITEM, and PART #. It lists part numbers and their corresponding figure and item numbers.
- Group Assembly Parts List:** A table with columns for FIG. - ITEM, PART NO., and NOMENCLATURE. It provides detailed descriptions of parts, including their figure and item numbers, part numbers, and nomenclature.

Arrows indicate the flow of information: from the Symbol Index to the Numerical Index, from the Numerical Index to the Group Assembly Parts List, and from the Group Assembly Parts List to the illustration. The illustration shows a mechanical assembly with numbered callouts (1-10) corresponding to the parts listed in the parts list.

5-LOCATE SYMBOL

7-TURN TO FIGURE AND INDEX NO.

4-LOCATE INDEX NO. ON GROUP ASSEMBLY PARTS LIST

2-TURN TO PAGE

HOW TO FIND THE PART NUMBER IF THE SECTION OR SYSTEM OF THE EQUIPMENT IN WHICH THE PART IS USED IS KNOWN:

- Turn to the List of Illustrations and find the page number for the Major Assembly or System in which the part is used.
- Turn to the page determined in step (1).
- Locate the part and its index number on the illustration.
- Find the index number on the Group Assembly Parts List page to determine complete description.
- If the reference designation symbol is known, refer to the Symbol Index to find the part number.

HOW TO FIND 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.
- On the face of the illustration, find the index number determined in step (7).



NUMERICAL INDEX

PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.	PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
AD1586	1103	61A	1	DEMF9S	1103	9	1
A0-15497-2	1104	269	1	DE9PC33	1106	23	1
A14657	1108	35	1	DPA32-34P	1108	65C	1
A1750CTEFLON	1104	295A	1	DPA32-34P	1108	66A	1
A39097-001	1104	319	1	DPX2MA57P40P34B0201	1108	66	1
A39097-001	1104	320	1	DP439-433WHT	1109	51	9
A937CTEFLON	1104	296A	1	DP439-433WHT	1110	95	5
BCD2N1094	1108	7	1	DP439-433WHT	1110	95	4
BH855	1109	42	1	F02A250V1-4AS	1108	8	1
BH855	1109	44	1	F02A250V3AS	1108	37A	1
BP-1742-1	1103	51	1	F02A250V3AS	1108	37A	1
BP-1742-1	1103	66	1	F12NCFMA1-62	1109	62	2
BP-1742-3	1103	37	1	F22NCFMA1-26	1109	53	2
BP-1742-3	1103	38	1	F22NCFMA1-40	1103	25	1
BP-1742-3	1103	43	1	F22NCFMA1-40	1103	86	2
BP-1742-3	1103	47	1	F22NCFMA1-40	1106	42	7
BP-1742-3	1103	49	1	GB300-148-1A	1104	311	1
BP-1742-3	1103	59	1	G2522	1106	41	1
CK14AX103M	1110	80A	1	HKPEHLQRWZ	1108	9	1
CK14AX103M	1110	80A	1	HP4N	1105	14B	1
CK15AX223M	1104	206	1	HP4N	1108	12A	1
CK15AX223M	1104	209	1	HP4N	1108	62	1
CK15AX223M	1104	210	1	HP4N	1110	49	2
CK15AX223M	1104	211	1	HP5N	1104	261	1
CK15AX223M	1104	298	1	HP5N	1105	14A	1
CK15AX223M	1104	300	1	HP5N	1108	51	1
CK15AX223M	1104	301	1	HP5N	1108	51A	2
CK15AX223M	1104	304	1	HP6N	1108	38B	1
CK15AX223M	1105	22	1	JAN1N914	1103	48	1
CK15AX223M	1106	9	1	JAN1N914	1103	60	1
CK15AX223M	1106	13	1	JAN1N914	1103	61	1
CK16M104M	1110	52A	1	MP206-14B	1109	21	1
CK16M104M	1110	52B	1	MS124696	1102	33	17
CK16M104M	1110	52C	1	MS16535-75	1103	24	2
CK16M104M	1110	52D	1	MS16535-76	1109	54	3
CK16M104M	1110	52E	1	MS16535-76	1109	54	2
CK16M104M	1110	52F	1	MS16562-190	1110	19	1
CK16M104M	1110	52G	1	MS16562-191	1104	170	2
CK16M104M	1110	80A	1	MS16562-191	1104	187	1
CK63AW103M	1108	6	1	MS16562-193	1104	116	1
CL25BH111UP3	1107	13A	1	MS16562-202	1102	33C	2
CL35BN100MP3	1110	99	1	MS16624-1075	1103	88	2
CL35BN100MP3	1110	101	1	MS16633-1018	1104	11	1
CL35BN100MP3	1110	102	1	MS16998-44	1102	9	17
CL35BN100MP3	1110	103	1	MS16998-44	1102	9	17
CL35BXU10LP3	1110	65B	1	MS18130-10	1103	65	1
CL37BE2R5MN3	1109	39	1	MS18130-10	1103	66	1
CS13BB685M	1111	42	1	MS18130-3	1103	51	1
CS13BF335M	1111	12	1	MS18130-3	1103	66	1
CS13BF685M	1111	23	1	MS20470AD3-3	1110	124	3
CS13BF685M	1111	46	1	MS231-19-6-1PCT	1103	21	1
CS13BG156M	1111	17A	1	MS231-34-8-1PCT	1103	20	1
CV50112650	1104	203	1	MS24264R10B5PX	1107	2	1
CV50112650	1104	267	1	MS35214-23	1107	1	10
C511	1104	31B	AR	MS35338-134	1103	17	2
DAL1C1S	1106	20	1	MS35338-134	1103	74	2
DA858-003	1106	28A	1	MS35338-134	1104	96	2
DA858-003	1106	69	1	MS35338-134	1104	273	4
DBMF25S	1108	48	1	MS35338-134	1104	307A	2
DBM25P	1109	23	1	MS35338-134	1104	331	2
DDMF50S	1108	45	1	MS35338-134	1104	340	2
DDM50P	1110	22	1	MS35338-134	1104	347A	5
DEF9SC33	1104	26	1	MS35338-134	1104	351A	2



NUMERICAL INDEX

PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.	PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
MS35338-134	1104	355A	4	MS51957-13	1106	3	10
MS35338-134	1104	360A	3	MS51957-13	1108	2	9
MS35338-134	1104	364	1	MS51957-13	1108	2	1
MS35338-134	1108	65	8	MS51957-13	1108	2	1
MS35338-135	1102	7	10	MS51957-13	1108	52	2
MS35338-135	1103	31	1	MS51957-13	1108	63	4
MS35338-135	1104	92	2	MS51957-13	1108	65	4
MS35338-135	1104	181	2	MS51957-13	1110	9	1
MS35338-135	1104	284	4	MS51957-14	1102	6	10
MS35338-135	1104	289	1	MS51957-14	1103	29	3
MS35338-135	1104	310	1	MS51957-14	1104	288	1
MS35338-135	1104	317	4	MS51957-14	1104	314	2
MS35338-135	1104	344	1	MS51957-14	1104	343	1
MS35338-135	1108	37	2	MS51957-14	1108	2	2
MS35338-135	1108	52	4	MS51957-14	1108	33	2
MS35338-135	1108	63	4	MS51957-14	1108	34	4
MS35338-135	1108	65	4	MS51957-14	1108	35	3
MS35338-135	1109	17	2	MS51957-14	1108	52	4
MS35338-135	1109	22	2	MS51957-14	1108	65	4
MS35338-135	1109	29	4	MS51957-14	1109	17	4
MS35338-135	1110	51	6	MS51957-14	1110	1	2
MS35338-136	1104	226	3	MS51957-14	1110	20	4
MS35338-136	1104	278	3	MS51957-14	1110	49	2
MS35338-136	1105	7	1	MS51957-14	1110	51	6
MS35338-136	1105	13	2	MS51957-15	1105	10	1
MS35338-136	1105	18	1	MS51957-15	1105	29	3
MS35338-136	1106	47	2	MS51957-15	1106	55A	3
MS35338-136	1107	1	10	MS51957-15	1108	37B	1
MS35338-137	1102	25	6	MS51957-16	1104	6	2
MS35338-137	1102	32	2	MS51957-16	1106	55	3
MS35338-137	1107	9	2	MS51957-17	1104	15	2
MS35338-138	1110	105	1	MS51957-17	1106	61	6
MS35338-138	1110	108	1	MS51957-19	1103	30	1
MS35338-138	1110	111	1	MS51957-19	1108	44	4
MS35489-33	1105	35	1	MS51957-2	1104	65	1
MS35489-33	1108	61	1	MS51957-2	1104	272A	2
MS35489-6	1108	38	1	MS51957-2	1104	330	2
MS35489-9	1108	38A	2	MS51957-2	1104	350	3
MS35649-24	1104	325	2	MS51957-2	1104	356	4
MS35649-24	1104	335	1	MS51957-2	1107	11	2
MS35649-24	1104	355	4	MS51957-20	1104	265	1
MS35649-24	1107	2	4	MS51957-21	1104	180	2
MS35649-24	1107	11	2	MS51957-26	1104	218	1
MS35649-24	1107	13B	2	MS51957-26	1104	277	3
MS35649-44	1104	263	1	MS51957-26	1105	12	2
MS35649-64	1105	16	2	MS51957-26	1109	1	2
MS35649-64	1108	12A	1	MS51957-27	1104	3	8
MS51957-1	1102	2	2	MS51957-27	1107	3	1
MS51957-1	1104	60	2	MS51957-28	1105	17A	1
MS51957-1	1104	95	2	MS51957-29	1104	270	3
MS51957-1	1108	1A	2	MS51957-3	1103	16	2
MS51957-10	1108	65	8	MS51957-3	1103	73	2
MS51957-12	1103	18	1	MS51957-3	1104	39	1
MS51957-12	1103	19	1	MS51957-3	1104	55	1
MS51957-12	1104	307	2	MS51957-3	1104	197	2
MS51957-12	1104	309	1	MS51957-3	1104	231	1
MS51957-12	1104	316	4	MS51957-3	1104	347	5
MS51957-12	1108	37	2	MS51957-3	1104	362	3
MS51957-12	1108	58	1	MS51957-3	1107	2	4
MS51957-12	1109	22	2	MS51957-3	1107	11	2
MS51957-12	1109	29	4	MS51957-3	1108	66A	4
MS51957-13	1104	91	2	MS51957-30	1102	4	2
MS51957-13	1104	283	4	MS51957-30	1102	15	10



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PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.	PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
MS51957-30	1106	40	2	MS90540-07	1106	4	1
MS51957-30	1108	11	4	M9762	1103	53	1
MS51957-4	1104	221	1	NFR2-5PPC17K28	1104	155	8
MS51957-4	1104	339	2	NS5W0206	1107	9	1
MS51957-4	1104	359	3	N6632FCHHP28LY15	1104	13	2
MS51957-44	1102	31	2	O1061A	1105	2	1
MS51957-45	1102	24	6	O11-0116-000	1102	33A	1
MS51957-45	1104	14	5	O13-3130-000	1105	1	1
MS51957-6	1104	21	2	O2363	1103	15	1
MS51957-6	1104	258	2	P31034-1	1110	91	4
MS51957-7	1104	19	2	P312-0007-000	1104	201	2
MS51957-7	1104	215	2	P312-0025-000	1110	18	2
MS51957-7	1104	328	2	P312-0064-000	1104	342	1
MS51957-80	1106	18A	1	P312-0077-000	1105	6	1
MS51957-9	1103	13	2	P312-3060-000	1104	10	1
MS51959-1	1104	100	2	P312-3450-000	1104	23	2
MS51959-1	1109	3	4	P313-0050-000	1104	48	4
MS51959-12	1104	268	4	P313-0050-000	1104	48A	2
MS51959-12	1109	58	4	P313-0050-000	1110	92	1
MS51959-12	1110	18	2	P313-0051-000	1105	32	2
MS51959-12	1110	113	6	P313-0051-000	1106	67	2
MS51959-13	1104	204	4	P313-0051-000	1106	74	1
MS51959-13	1108	68	6	P313-0051-000	1106	75	1
MS51959-13	1110	2	1	P313-0053-000	1103	5B	1
MS51959-14	1104	25	2	P313-0053-000	1107	3	1
MS51959-14	1104	71	1	P313-0054-000	1104	8	2
MS51959-14	1104	82	2	P313-0132-000	1104	134	6
MS51959-14	1106	22	2	P313-0132-000	1104	141	1
MS51959-14	1108	2	8	P313-0140-000	1105	28	3
MS51959-14	1108	2	8	P313-0140-000	1106	46	2
MS51959-14	1108	66B	5	P313-0140-000	1106	74	1
MS51959-14	1109	57	6	P313-0140-000	1106	79	1
MS51959-14	1110	2	1	P313-0163-000	1104	322	4
MS51959-14	1110	9	4	P313-9001-000	1103	33	1
MS51959-14	1110	116	7	P334-0273-000	1110	105	1
MS51959-15	1108	110	6	P334-0273-000	1110	108	1
MS51959-15	1108	51A	1	P334-0273-000	1110	111	1
MS51959-15	1108	51A	2	P334-4120-000	1108	28	1
MS51959-15	1108	66	6	P342-0054-000	1110	4	2
MS51959-18	1104	137	6	P342-0142-000	1104	164	2
MS51959-2	1104	89A	1	P342-0143-000	1110	22	2
MS51959-2	1104	110	8	P342-0146-000	1108	46	2
MS51959-2	1107	6	4	P342-0146-000	1108	49	2
MS51959-2	1107	13B	2	P342-0153-000	1108	44	4
MS51959-2	1107	14B	2	P342-0156-000	1104	145	3
MS51959-2	1109	29	2	P342-0157-000	1104	144	1
MS51959-27	1104	2	1	P342-0158-000	1104	144	1
MS51959-28	1109	21	1	P342-0168-000	1106	81	1
MS51959-3	1104	89	1	P343-0044-000	1104	352A	2
MS51959-3	1108	65C	4	P343-0108-000	1104	149	1
MS51959-3	1109	23	2	P343-0284-000	1104	42	1
MS51959-4	1106	26	2	P343-0284-000	1108	62	2
MS51959-44	1107	1	10	P343-0285-000	1106	7C	1
MS51959-44	1107	9	2	P343-0286-000	1106	18	3
MS51959-45	1104	174	4	P343-0286-000	1108	35	1
MS51959-45	1104	287	1	P343-0287-000	1105	34	2
MS51959-45	1108	32	2	P343-0287-000	1106	33C	1
MS51959-46	1106	87	2	P343-0289-000	1106	48C	2
MS51959-47	1106	39	2	P343-0289-000	1106	48J	2
MS51959-5	1104	29	2	P343-0289-000	1106	68	2
MS51959-67	1104	172	6	P343-0289-000	1106	76	1
MS51959-8	1108	12A	1	P343-0289-000	1106	77	1
MS51981-27	1102	27	1	P343-0297-000	1104	128	2



NUMERICAL INDEX

PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.	PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
P343-0297-000	1104	176	4	RC07GF332J	1111	43	1
P343-0298-000	1103	90	8	RC07GF333K	1110	66	1
P343-0298-000	1104	150	3	RC07GF333K	1110	72	1
P343-0298-000	1104	350A	1	RC07GF334K	1110	77	1
P343-0298-000	1110	92	1	RC07GF363J	1111	47	1
P343-0299-000	1104	149A	1	RC07GF391K	1108	18	1
P343-0299-000	1104	272	4	RC07GF392K	1110	64	1
P343-0301-000	1104	18	2	RC07GF472K	1109	38	1
P343-0301-000	1104	30	2	RC07GF472K	1109	38	1
P343-0308-000	1104	74	2	RC07GF560J	1111	24	1
P343-0309-000	1104	78	4	RC07GF562K	1108	21	1
P343-0310-000	1107	9	2	RC07GF562K	1110	57	1
P343-0328-000	1106	28C	1	RC07GF562K	1110	60	1
P343-0328-000	1106	33	1	RC07GF562K	1110	76	1
P343-0329-000	1106	28D	1	RC07GF562K	1111	38	1
P343-0329-000	1106	32	1	RC07GF563J	1111	49	1
P343-0329-000	1107	3	1	RC07GF563K	1108	65G	1
P343-0332-000	1106	76	1	RC07GF821K	1111	26	1
P343-0361-000	1104	51	4	RC07GF823J	1111	27	1
P343-0361-000	1104	51A	2	RC20GF100K	1104	207	1
P343-0384-000	1106	6	1	RC20GF100K	1104	208	1
P347-0006-000	1104	111	4	RC20GF100K	1104	297	1
P347-0035-000	1105	17	3	RC20GF100K	1104	303	1
P347-0167-000	1104	119	1	RC20GF101K	1107	10A	1
RB3-26D737	1106	14	1	RC20GF222K	1108	65E	1
RC07GF100K	1110	62	1	RC20GF222K	1108	65F	1
RC07GF100K	1110	63	1	RC20GF391K	1111	17D	1
RC07GF101J	1111	39	1	RC20GF561K	1105	21	1
RC07GF102K	1110	70	1	RC20GF681K	1111	17B	1
RC07GF102K	1110	75	1	RC32GF152K	1110	71A	1
RC07GF102K	1111	30	1	RC32GF152K	1110	71A	1
RC07GF103J	1111	41	1	RC32GF331K	1111	7	1
RC07GF103J	1111	44	1	RC32GF331K	1111	16	1
RC07GF103J	1111	45	1	RD6B26N359	1106	11	1
RC07GF103K	1110	65	1	RJ1A26N323	1105	24	1
RC07GF104K	1108	23	1	RJ1A26N323	1107	12	1
RC07GF104K	1108	24	1	RN60C1003F	1109	10	1
RC07GF104K	1108	25	1	RN60C1003F	1109	13	1
RC07GF123K	1109	38	1	RN60C1003F	1109	13	1
RC07GF124J	1111	22A	1	RN60C1003F	1109	15	1
RC07GF125K	1108	19	1	RN60C1212F	1103	54	1
RC07GF125K	1108	22	1	RN60C1212F	1103	58	1
RC07GF150K	1109	20	1	RN60C1471F	1103	63	1
RC07GF153J	1111	48	1	RN60C1783F	1109	6	1
RC07GF153K	1111	8	1	RN60C1783F	1109	6	1
RC07GF153K	1111	15	1	RN60C1783F	1109	11	1
RC07GF182J	1111	21	1	RN60C1783F	1109	11	1
RC07GF182J	1111	36	1	RN60C2153F	1109	32	1
RC07GF182J	1111	37	1	RN60C2153F	1109	36	1
RC07GF185K	1108	16	1	RN60C2153F	1109	41	1
RC07GF201J	1111	32	1	RN60C2613F	1109	4	1
RC07GF220K	1110	78	1	RN60C2613F	1109	10	1
RC07GF220K	1110	80	1	RN60C2613F	1109	12	1
RC07GF221J	1111	28	1	RN60C2613F	1109	14	1
RC07GF222K	1109	30	1	RN60C2613F	1109	15	1
RC07GF223K	1108	26	1	RN60C5112F	1109	7	1
RC07GF223K	1110	66	1	RN60C5112F	1109	7	1
RC07GF224K	1108	65H	1	RN60C5112F	1109	12	1
RC07GF224K	1110	79	1	RN60C5112F	1109	33	1
RC07GF273K	1110	59	1	RN60C5112F	1109	35	1
RC07GF273K	1110	68	1	RN60C7502F	1109	8	1
RC07GF3R3J	1111	33	1	RN60C7502F	1109	9	1
RC07GF331K	1111	10	1	RN60D1003F	1109	7	1



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PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.	PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
RN60D1003F	1109	13	1	SPL4040-2HOTTINNED	1109	23	1
RN60D1783F	1109	5	1	SPL4040-2HOTTINNED	1110	22	2
RN60D1783F	1109	6	1	SPL4040-2HOTTINNED	1110	92	2
RN60D1783F	1109	11	1	SPL4040-4HOTTINNED	1104	202	6
RN60D1963F	1109	13	1	SPL4040-4HOTTINNED	1104	266	6
RN60D2613F	1109	4	1	SPL4040-4HOTTINNED	1108	35	1
RN60D2613F	1109	14	1	SPL4040-4HOTTINNED	1108	44	2
RN60D3162F	1109	9	1	SPL4040-4HOTTINNED	1108	61A	2
RN60D3162F	1109	9	1	S187-375HHP15L02	1104	184A	1
RN60D3832F	1109	5	1	S3CHH3P28LY15	1104	98	2
RN60D3832F	1109	5	1	S3CHH3P28LY15	1104	103	2
RN60D9091F	1103	40	1	S6316FRHH3P15L02	1104	84	1
RN60D9091F	1103	42	1	S6316FRHH3P15L02	1104	184	1
RN65D9091F	1103	40	1	S6316FRHH3P15L02	1104	193	1
RN65D9091F	1103	42	1	S6632CHHP28LY15	1104	282	4
RN70D1212F	1103	54	1	S6632FCHHP28LY15	1104	13	2
RN70D1212F	1103	58	1	S6632FCHHP28LY15	1104	193	1
RSKR5000F	1108	36	1	S92212A	1105	14	1
RTMT12-2M	1107	14B	2	TA018-UA145C	1108	41	1
RTMT12-6M	1105	11	2	TA018-UA145C	1108	42	1
RTMT12M	1104	217	1	TA018-UA145C	1111	0	REF
RTMT12M	1104	308	1	TF300	1108	62C	1
RTMT12M	1106	7B	1	UG496U	1108	11A	1
RTMT12M	1108	37	2	UG569AU	1107	4	1
RTMT12M	1108	58	1	UG569AU	1107	5	1
RTMT12M	1109	22	2	UG625BU	1107	5A	1
RW59V1R0	1111	59	1	USN1N3064	1103	65	1
RW59V1R0	1111	60	1	USN1N3064	1103	66	1
RW69V1R8	1108	20	1	UY0282UG	1103	64	1
R4-40UNC2A1-4	1103	2	3	UY03100J	1103	4	1
SB375-4	1109	28	2	UY03301J	1103	52	1
SFR144PPK28	1104	36	2	UY03391J	1103	5	1
SFR144PPK28	1104	182	2	U2210-00938NPD	1105	3	1
SFR144PPK28	1104	237	1	U523662	1102	13	1
SFR144PPK28	1104	249	2	VCJ1849	1103	6	1
SFR144PPK28	1104	251	2	VCJ1849	1103	7	1
SFR156PPK28	1104	68	2	VCJ1971	1103	6	1
SFR156PPK28	1104	84	1	VCJ1971	1103	7	1
SFR156PPK28	1104	112	1	VC20GY	1103	6	1
SFR156PPK28	1104	184	1	VC20GY	1103	7	1
SFR156PPK28	1104	184A	1	VK37BW103M	1103	39	1
SFR156PPK28	1104	192	1	VK37BW103M	1103	41	1
SFR156PPK28	1104	242	1	VK37BW103M	1103	44	1
SFR156PPK28	1104	244	1	VK37BW103M	1103	45	1
SKT41ORN	1109	49	1	VK37BW103M	1103	46	1
SKT41GRN	1109	60	1	VK37BW103M	1103	50	1
SKT41GRN	1109	61	1	VK37BW103M	1103	55	1
SKT41RED	1109	50	1	VK37BW103M	1103	56	1
SKT41YEL	1109	48	1	VK37BW103M	1103	57	1
SL157-197	1110	125	16	VK37BW103M	1103	62	1
SL179-230	1103	68	18	V1HJG8-3C	1104	269	1
SL179-230	1103	68A	2	WTE18A	1103	99	AR
SL180-231	1103	71	6	X5131-18C	1104	11	1
SL276-198DWHT	1105	19	1	X5131-18C	1104	190	1
SL283-230	1103	68	18	YE1620F32	1108	44A	2
SL283-230	1103	68	17	Z103-02	1108	67	1
SL283-230	1103	85	1	1-768782-08	1111	4	6
SL286-301DWHT	1110	94	55	1-768782-09	1111	5	3
SPL4040-2HOTTINNED	1104	194	1	1-774785-01	1111	52	4
SPL4040-2HOTTINNED	1108	30	1	1-776400-00	1111	5	3
SPL4040-2HOTTINNED	1108	46	1	1-778275-01	1111	62	1
SPL4040-2HOTTINNED	1108	49	1	1N1200R	1110	104	1
SPL4040-2HOTTINNED	1108	65	1	1N1200R	1110	105	1



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PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.	PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
1N1200R	1110	107	1	1N645	1110	54A	1
1N1200R	1110	108	1	1N645	1110	55	1
1N1200R	1110	110	1	1N645	1110	56	1
1N1200R	1110	111	1	1N645	1110	65A	1
1N3029B	1111	17C	1	1N645	1110	65A	1
1N483B	1111	50	1	1N645	1110	69	1
1N483B	1111	51	1	1N645	1110	71	1
1N645	1104	255	1	1N645	1110	73	1
1N645	1104	299	1	1N645	1110	74	1
1N645	1104	302	1	1N645	1110	81	1
1N645	1105	23	1	1N645	1110	81A	1
1N645	1106	8	1	1N645	1110	82	1
1N645	1106	12	1	1N645	1110	84	1
1N645	1107	14	1	1N645	1110	85	1
1N645	1107	14A	1	1N645	1110	86	1
1N645	1108	13	1	1N754A	1111	22	1
1N645	1108	14	1	1N754A	1111	29	1
1N645	1108	15	1	1N754A	1111	31	1
1N645	1108	17	1	1N967B	1111	40	1
1N645	1108	27	1	1P4-26A	1103	69	5
1N645	1108	29	1	1P4-26A	1103	84	1
1N645	1108	29A	1	100-200-14-7	1103	23	2
1N645	1108	53	1	100-200-5A0	1110	124	3
1N645	1108	55	1	100-200-6A2	1110	123	8
1N645	1108	55A	1	100-200-7-0	1107	138	1
1N645	1108	62A	1	10178-19	1103	37	1
1N645	1108	62B	1	10178-19	1103	38	1
1N645	1108	65D	1	10178-19	1103	43	1
1N645	1108	65J	1	10178-19	1103	47	1
1N645	1109	18	1	10178-19	1103	49	1
1N645	1109	24	1	10178-19	1103	59	1
1N645	1109	26	1	1024-6HOTTINNED	1104	7	1
1N645	1109	26A	1	1024-6HOTTINNED	1104	118	1
1N645	1109	26A	1	1024-6HOTTINNED	1106	28B	2
1N645	1109	26B	1	1024-6HOTTINNED	1106	48F	1
1N645	1109	26B	1	1024-6HOTTINNED	1106	63	1
1N645	1109	26C	1	1024-6HOTTINNED	1106	70	1
1N645	1109	26C	1	107H187	1104	72	1
1N645	1109	26D	1	107H187	1105	5	1
1N645	1109	26D	1	107H187	1106	45	1
1N645	1110	5	1	107H187	1106	78	1
1N645	1110	6	1	109D336X0075F2	1110	98	1
1N645	1110	7	1	109D336X0075F2	1110	106	1
1N645	1110	8	1	11041-101-9	1104	305	1
1N645	1110	23	1	118P15306S4	1110	83	1
1N645	1110	24	1	118P68302S4	1109	46	1
1N645	1110	25	1	1214-05	1108	10A	1
1N645	1110	26	1	134	1104	16	1
1N645	1110	27	1	13535	1104	357	AR
1N645	1110	28	1	150D104X0035A2	1111	13	1
1N645	1110	28A	1	150D104X0035A2	1111	19	1
1N645	1110	29	1	150D157X0006R2	1110	109	1
1N645	1110	30	1	150D225X0035B2	1110	61	1
1N645	1110	31	1	150D226X0015B2	1110	67A	1
1N645	1110	32	1	150D336X0020R2	1110	98	1
1N645	1110	33	1	150D336X0020R2	1110	106	1
1N645	1110	34	1	150D337X0006S2	1110	97	1
1N645	1110	35	1	150D337X0006S2	1110	100	1
1N645	1110	36	1	151D164X0035W2	1109	31	1
1N645	1110	37	1	151D164X0035W2	1109	37	1
1N645	1110	52	1	151D164X0035W2	1109	43	1
1N645	1110	53	1	151D164X0035W2	1109	45	1
1N645	1110	54	1	151D234X0035W2	1109	34	1





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PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.	PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
151D344X0035W2	1109	40	1	302-0347-000	1107	9	4
15517-002	1104	216	2	302-22	1109	56	1
15523 1-8	1104	213	4	302-22	1109	57	1
1720-02	1108	28	1	305-0043-000	1109	63	4
180D105X0050R1	1108	54	29	306-1351-000	1109	52	14
2-44B278-7	1102	12	1	310-0044-000	1104	19B	AR
2JX49	1108	59	12	310-0044-000	1104	22	2
2N1480	1111	9	1	310-0044-000	1104	31	2
2N1480	1111	14	1	310-0044-000	1104	40	1
2N1769	1111	54	1	310-0044-000	1104	56	1
2N1769	1111	55	1	310-0044-000	1104	61	2
2N760A	1111	20	1	310-0044-000	1104	66	1
2N760A	1111	25	1	310-0044-000	1104	326	2
2N760A	1111	34	1	310-0044-000	1104	348	1
2N760A	1111	35	1	310-0044-000	1104	360	3
2N886	1110	87	1	310-0045-000	1104	93	2
2N886	1110	88	1	310-0045-000	1104	135	6
2N886	1110	89	1	310-0045-000	1104	143	1
2N886	1110	90	1	310-0045-000	1104	222	1
2001-33	1103	5A	1	310-0045-000	1104	264	1
203-6214-017	1108	47	1	310-0045-000	1104	285	4
203-6214-017	1108	50	1	310-0045-000	1104	318	4
2052-6H0TTINNEED	1104	139	1	310-0045-000	1105	33	2
2104-04-01-2520N	1105	8	1	310-0045-000	1106	60	6
2104-04-01-2520N	1106	5A	1	310-0045-000	1108	35	3
2104-06-02-2520N	1106	27	1	310-0045-000	1108	44	1
2185P3	1107	10	1	310-0045-000	1108	51A	1
238974A	1104	214	1	310-0045-000	1108	51A	2
238975A	1104	212	1	310-0045-000	1108	52	2
239498K2	1108	28	1	310-0045-000	1110	49	2
239579F	1110	15	1	310-0046-000	1102	16	10
239580F	1110	17	1	310-0046-000	1104	62	2
239581F	1110	16	1	310-0046-000	1105	18A	1
239582F	1110	12	1	310-0053-000	1104	347B	1
23978F	1110	13	1	310-0053-000	1104	352	1
2522-06-00-20	1108	44	2	310-0053-000	1108	65	7
260-0024-00	1104	324	1	310-0054-000	1104	43	1
267-0216-000	1105	27	1	310-0054-000	1106	7A	1
270-2047-090	1111	5	3	310-0056-000	1106	31	2
270-2047-220	1111	17	1	310-0056-000	1106	48	1
280-3778-010	1109	1A	1	310-0057-000	1102	22	1
3-992276-02	1111	1	1	310-0057-000	1104	80	2
3PP4-66A	1103	70	1	310-0071-000	1104	4	8
3SAF1131	1108	62D	1	310-0071-000	1107	3	1
3SAF1131	1110	38	1	310-0074-000	1104	49A	2
3SAF1131	1110	39	1	310-0074-000	1104	351	1
3SAF1131	1110	40	1	310-0074-000	1104	363	3
3SAF1131	1110	41	1	310-0075-000	1103	91	8
3SAF1131	1110	42	1	310-0075-000	1104	49	4
3SAF1131	1110	43	1	310-0075-000	1104	129	2
3SAF1131	1110	44	1	310-0075-000	1104	150A	2
3SAF1131	1110	45	1	310-0075-000	1104	177	4
3SAF1131	1110	46	1	310-0075-000	1104	198	2
3SAF1131	1110	47	1	310-0075-000	1110	92	1
3SAF1131	1110	48	1	310-0076-000	1106	17	3
3SAH1003	1109	19	1	310-0076-000	1108	62	1
3SAH1003	1109	25	1	310-0077-000	1103	5C	1
3SAH1003	1109	27	1	310-0077-000	1104	120	1
3SAH1022	1108	30	1	310-0077-000	1105	28A	3
30-1	1108	10	1	310-0077-000	1106	28E	2
302-0023-000	1104	327	2	310-0077-000	1106	30	2
302-0024-000	1104	136	6	310-0077-000	1106	47A	1
302-0024-000	1104	313	2	310-0077-000	1106	73	1



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PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.	PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
310-0077-000	1106	80	1	522-3159-000	1102	6	REF
310-0078-000	1107	3	1	522-3375-004	1101	3	1
310-0079-000	1102	21	1	522-3375-004	1108	6	REF
310-0079-000	1104	9	1	522-3559-004	1101	2	1
310-0079-000	1104	75	2	522-3559-004	1107	6	REF
310-0079-000	1104	79	4	522-3560-000	1101	5	1
310-0131-000	1106	48H	2	522-3560-000	1107	6	REF
310-0131-000	1106	66	2	522-4159-001	1101	4	1
310-0134-000	1104	312	2	522-4159-001	1108	6	REF
310-0274-000	1103	34	1	528-0478-005	1108	4	1
310-0277-000	1104	323	4	528-0478-005	1110	6	REF
310-0394-000	1106	7	1	528-0479-005	1108	3	1
310-0396-000	1104	142	1	528-0479-005	1109	6	REF
310-0396-000	1105	30	2	528-0494-004	1102	5	1
310-0396-000	1106	7D	1	528-0494-004	1103	6	REF
310-0550-000	1103	35	1	540-7769-002	1110	120	2
310-6320-000	1103	14	4	540-9049-003	1109	58	4
310-6320-000	1103	75	2	540-9064-003	1108	63	4
310-6320-000	1104	199	1	540-9225-003	1105	4	1
310-6320-000	1104	260	2	541-1234-003	1104	11A	3
310-6340-000	1108	37B	1	541-1234-003	1104	63	AR
321-0306-000	1103	36	1	541-5177-002	1104	220	1
323-0254-000	1104	108	4	541-5949-002	1103	12	2
327-029X5T0102Z	1106	19	1	541-5952-002	1103	10	2
327-029X5T0102Z	1108	56	1	541-5955-002	1104	257	2
327-029X5T0102Z	1108	57	1	541-5972-002	1103	28	1
328-0013-000	1108	12	1	541-5983-002	1104	262	1
328-0018-000	1104	114	2	541-6557-002	1109	64	2
3281L1-203	1103	32	1	541-7455-002	1108	32	2
331-2002-000	1104	19A	AR	543-5586-003	1104	50	AR
340-0642-000	1110	114	4	543-5586-003	1104	50A	AR
340-0644-000	1108	40	4	543-5624-003	1104	6A	4
350-231	1108	37B	1	543-5644-003	1104	125	1
350-231	1108	37B	1	543-5652-003	1104	191	AR
4-48X1-8 6SPLINEOVP	1104	122	4	543-5951-002	1110	119	4
T18-8SST				543-5967-003	1110	115	4
4-48X1-8 6SPLINEOVP	1104	169	4	543-6223-002	1108	31	1
T18-8SST				543-9929-002	1104	127	1
4-48X1-8 6SPLINEOVP	1104	233	2	543-9930-002	1104		1
T18-8SST				544-0028-002	1104	130	1
4-48X1-8 6SPLINEOVP	1104	248	2	544-0049-002	1104	124	1
T18-8SST				544-0054-002	1104	126	4
4007-6HOTTINNED	1106	70A	1	544-0090-002	1106	10	2
4007-6HOTTINNED	1107	3	1	544-0112-003	1104	167	1
4019-4HOTTINNED	1108	44	1	544-0574-002	1104	104	2
4021	1110	105	1	544-0575-002	1104	99	2
4021	1110	108	1	544-0576-002	1104	281	4
4021	1110	111	1	544-0577-002	1104	279	4
4041 7-32HOTTINNED	1103	8	2	544-0578-002	1104	280	4
43A159	1110	21	1	544-0579-002	1104	223	3
491-32-11-080-933	1106	9A	2	544-0580-002	1104	173	4
491-32-11-080-933	1106	13A	2	544-0582-002	1104	241	1
50-101CR3	1104	171	1	544-0584-002	1104	361	1
500-1126-003	1104	14A	5	544-0587-002	1104	200	2
502-6045-002	1109	63	4	544-0588-002	1104	179	2
503-4970-001	1108	11	2	544-0589-002	1104	183	1
5100-37C	1104	123	1	544-0590-002	1104	186	1
5131-12C	1104	34	1	544-0591-002	1104	240	1
5133-12C	1103	76	1	544-0592-002	1104	239	1
5133-12C	1104	52	2	544-0593-002	1104	235	1
5133-12C	1104	332	1	544-0594-002	1104	234	1
5133-9C	1104	336	1	544-0595-002	1104	236	1
522-3159-000	1101	1	1	544-0596-002	1104	230	1
				544-0598-002	1104	243	1



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PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.	PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
544-0600-002	1104	254	1	544-0695-002	1104	147	1
544-0601-002	1104	253	1	544-0698-002	1104	341	2
544-0602-002	1104	247	1	544-0699-002	1104	358	1
544-0604-002	1104	227	3	544-0703-002	1104		1
544-0604-002	1104	290	3	544-0704-002	1104	338	1
544-0609-002	1104	35	1	544-0706-002	1104	329	1
544-0610-002	1104	228	1	544-0707-002	1104	334	1
544-0611-002	1104	219	1	544-0708-002	1104	337	1
544-0614-003	1104	188	1	544-0710-002	1104	346	1
544-0617-002	1104	94	1	544-0711-002	1104	225	3
544-0618-002	1104	88	1	544-0718-003	1104	229	1
544-0619-002	1104	90	1	544-0721-003	1104	205	1
544-0620-002	1104	87	1	544-0722-003	1104	178	1
544-0621-002	1104	37	1	544-0723-003	1104	189	1
544-0622-002	1104	38	1	544-0724-003	1104	107	1
544-0623-002	1104	132	1	544-0728-003	1104	113	1
544-0625-002	1104	12	1	544-0729-003	1104	117	1
544-0625-002	1104	67	2	544-0730-003	1104	115	1
544-0626-002	1104	5	1	544-0735-003	1104		1
544-0629-002	1104	354	1	544-0736-003	1104		1
544-0630-002	1104	345	1	544-0739-004	1104	109	1
544-0632-002	1104	58	1	544-0779-004	1108	12	1
544-0636-002	1104	57	2	544-2688-002	1104	133	1
544-0638-002	1104	321	4	544-3797-003	1104		1
544-0639-002	1104	53	1	544-3875-003	1110	20	1
544-0640-002	1104	54	1	544-5111-003	1108	1	1
544-0640-002	1104	64	1	544-7050-002	1108	46	2
544-0645-002	1104	291	1	544-7050-002	1108	49	2
544-0647-002	1104	232	1	544-8773-003	1104	85A	AR
544-0648-002	1104	250	1	544-8773-003	1104	184B	AR
544-0649-002	1104	252	1	544-8776-003	1104	85	AR
544-0650-002	1104	246	1	544-8776-003	1104	184C	1
544-0654-002	1104	168	2	545-2956-002	1104	333	1
544-0655-002	1104	138	4	545-5960-002	1104	24	1
544-0657-002	1104	97	2	545-5961-002	1104	81	1
544-0657-002	1104	102	2	545-7531-003	1109	2	4
544-0658-002	1104		2	545-7669-002	1104	44	1
544-0659-002	1104		2	545-7670-002	1104	46	2
544-0661-002	1104	238	1	545-7670-002	1104	46A	1
544-0663-002	1104	185	1	545-7671-002	1104	47	2
544-0664-002	1104		1	545-7671-002	1104	47A	1
544-0665-002	1104	121	2	545-7674-002	1104	45	2
544-0666-002	1104	131	1	545-7674-002	1104	45A	2
544-0667-002	1104	148	1	545-7674-002	1104	45B	2
544-0669-002	1104	156	4	545-7761-002	1104	69	1
544-0672-002	1104	245	1	545-7764-002	1104	70	1
544-0673-002	1104	165	1	545-7779-002	1104	353	2
544-0675-002	1104	154	1	545-7782-002	1108	33	1
544-0675-002	1104	159	1	546-0327-002	1104	315	2
544-0676-002	1104	152	1	546-3029-003	1104	31A	AR
544-0676-002	1104	161	1	546-6128-002	1109	63	2
544-0677-002	1104	153	1	546-7830-002	1104	105	1
544-0677-002	1104	158	1	549-0932-003	1107	7	1
544-0678-002	1104	151	1	549-0932-003	1109	2	4
544-0678-002	1104	160	1	549-0945-003	1107	6	4
544-0679-002	1104	157	4	549-0945-003	1109	3	4
544-0680-002	1104	163	2	553-4382-002	1104	196	1
544-0681-002	1104	224	1	553-4383-003	1104	195	1
544-0682-002	1104	140	1	553-4383-003	1104	256	1
544-0686-002	1104	162	2	553-5119-003	1103	27	3
544-0688-002	1104	175	1	554-3764-002	1104	140	1
544-0689-002	1104	106	1	554-3782-003	1104	271	1
544-0694-002	1104	146	1	554-3859-002	1110	118	8



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PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.	PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
554-3860-002	1110	117	4	68-1660-40	1109	57	6
554-3861-002	1110	3	1	68-1660-40	1110	18	2
554-3862-002	1110	4	1	68-1660-40	1110	20	4
554-3863-002	1110	113	3	68-1660-40	1110	48	22
554-3864-002	1110	112	3	68-1660-40	1110	48	20
554-3865-002	1110	2	1	68NM26	1107	11	2
554-3866-002	1110	18	2	68NM40	1106	21	2
554-3871-003	1110	19	1	68NM40	1106	54	6
554-3873-003	1110	14	1	68NM40	1106	59	6
554-3896-002	1108	39	2	68NM40	1106	72	1
554-3897-002	1108	43	2	68NM62	1106	38	2
554-3904-003	1108	44	2	68NM62	1108	12A	1
554-3933-002	1104		1	68NM82	1106	37	2
554-5112-003	1102	1	1	68NM82	1106	86	2
554-5117-003	1107	11	1	756-6376-001	1102	33B	2
5555-18MD	1104	86	1	756-6419-002	1103	61A	1
6-780934-01	1111	11	1	756-6523-001	1107	15	1
6-780935-01	1111	6	1	756-6593-002	1104	28	2
6-780951-02	1111	63	1	756-6594-002	1104	32	1
6-780984-01	1111	63	4	756-6596-002	1102	3	1
6-781574-01	1111	18	1	756-6597-002	1102	30	2
6-781575-01	1111	53	1	756-6598-002	1102	26	1
6-781579-01	1111	56	2	756-6600-002	1104	295B	1
6-781580-01	1111	58	2	756-6603-002	1106	34	1
6-781581-01	1111	57	2	756-6603-002	1106	85	1
6-781586-01	1111	61	1	756-6604-002	1106	35	1
6-781657-02	1111	3	1	756-6605-002	1106	84	1
6-781658-01	1111	2	1	756-6606-002	1106	83	1
6-781659-01	1111	64	1	756-6607-002	1102	20	1
6009-8A	1109	54	3	756-6608-002	1104	41	1
6009-8A	1109	54	2	756-6611-002	1106	58	4
66200301B3102M	1106	5	1	756-6612-002	1106	28	1
665-53-214-1	1104	203	1	756-6616-002	1102	29	2
665-53-214-1	1104	267	1	756-6617-002	1104	17	2
67321-0-122	1104	276	1	756-6620-002	1106	49	1
68-1660-26	1106	25	2	756-6622-003	1104	27	1
68-1660-26	1108	46	2	756-6623-003	1104	76	1
68-1660-26	1108	49	2	756-6624-003	1104	77	1
68-1660-26	1108	62C	1	756-6625-003	1106	1	1
68-1660-26	1108	62D	1	756-6629-003	1106	24	1
68-1660-26	1109	23	2	756-6633-003	1106	50	3
68-1660-26	1110	22	2	756-6634-003	1106	51	1
68-1660-40	1104	306	2	756-6635-003	1106	52	1
68-1660-40	1106	2	3	756-6636-003	1106	53	1
68-1660-40	1106	33B	1	756-6639-003	1104	349	1
68-1660-40	1106	48B	2	756-6640-003	1102	17	1
68-1660-40	1106	48G	2	756-6644-004	1106	43	1
68-1660-40	1106	65	2	756-6645-004	1106	36	1
68-1660-40	1106	72	1	756-6646-004	1106	88	1
68-1660-40	1106	72A	1	756-6652-004	1104	365	1
68-1660-40	1108	7	4	756-6654-005	1104	83	1
68-1660-40	1108	30	3	756-6655-005	1106	62	1
68-1660-40	1108	37B	1	756-6657-005	1102	34	1
68-1660-40	1108	44	12	756-6658-005	1102	28	1
68-1660-40	1108	51A	1	756-6665-005	1105	36	1
68-1660-40	1108	51A	2	756-6740-003	1107	8	1
68-1660-40	1108	62D	2	756-6742-003	1107	1	1
68-1660-40	1108	66	6	756-6745-004	1107	15	1
68-1660-40	1108	66B	5	756-6746-000	1104		1
68-1660-40	1109	19	3	756-6747-000	1104		1
68-1660-40	1109	25	3	756-6748-000	1104	1	1
68-1660-40	1109	27	3	756-6748-000	1105	6	REF



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PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.	PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
756-6749-000	1104	1		756-8288-003	1103	80	1
756-6750-000	1102	14	1	756-8289-003	1103	96	1
756-6750-000	1106	6	REF	756-8290-003	1103	94	1
756-6751-002	1104	295	1	756-8291-003	1103	87	1
756-6752-002	1104	33	1	756-8293-003	1103	15	1
756-6753-002	1106	82	1	756-8294-003	1103		1
756-6754-002	1106	44	1	756-8295-003	1103	81	1
756-6755-002	1106	71	1	756-8296-003	1103	82	1
756-6756-002	1106	48E	1	756-8299-003	1103	26	1
756-6756-002	1106	64	1	756-8300-003	1103	22	1
756-6760-002	1104	20	1	756-8301-003	1103	72	1
756-6761-002	1102	18	2	756-8302-003	1103	67	1
756-6763-003	1102	18A	1	756-8303-003	1103	92	1
756-6763-003	1102	19	1	756-8304-004	1103		1
756-6766-003	1102	23	1	756-8305-004	1103		1
756-6767-003	1106	57	2	756-8307-005	1103		1
756-6768-003	1104	59	1	756-8316-002	1107	4	1
756-6773-005	1104	286	1	756-8316-002	1107	5	1
756-6775-004	1102		1	756-8320-005	1103	1	1
756-6778-000	1102	8	1	756-8321-002	1105	31	1
756-6778-000	1104	6	REF	756-8322-003	1105	20	1
756-6779-000	1109		1	756-8323-003	1105	15	1
756-6784-003	1109	16	1	756-8354-000	1104		1
756-6786-004	1109	1	1	756-8372-003	1104	296	1
756-6787-004	1109	29	1	756-8378-002	1104	296B	1
756-6789-005	1109	65	1	756-9965-002	1105	25	2
756-6790-005	1109	59	1	756-9966-002	1102	11	17
756-6791-005	1109	55	1	757-1575-001	1107	11	1
756-6792-005	1109	47	1	757-3770-001	1106	33A	1
756-6807-000	1108	5	1	757-3771-001	1106	48D	1
756-6808-000	1108		1	757-3775-001	1106	48A	1
756-6810-003	1108	65	1	757-3788-001	1104	45A	2
756-6811-003	1108	64	1	757-3789-001	1104	59	1
756-6815-004	1108	34	1	757-3791-001	1104	77	1
756-6817-004	1108	60	1	757-3872-001	1106	16	1
756-6820-004	1108	52	1	757-4528-001	1104	203A	1
756-6821-005	1108	2	1	757-4598-001	1108	1A	1
756-6823-005	1108	69	1	757-5740-001	1108	5	1
756-6825-005	1108	68	1	757-5742-001	1108	64	1
756-6883-000	1110	21	1	757-5743-001	1108	65B	4
756-6888-003	1110	9	1	757-5744-001	1108	11C	1
756-6889-004	1110	121	1	757-5745-001	1108	65A	1
756-6890-004	1110	116	1	757-5746-001	1108	66B	1
756-6892-004	1110	51	1	757-5747-001	1108	66C	1
756-6894-005	1110	1	1	757-5748-001	1108	11E	1
756-6895-005	1110	96	1	757-5749-001	1108	11D	1
756-6896-005	1110	93	1	757-5750-001	1108	110	1
756-6898-005	1110	122	1	757-5751-001	1108	66B	1
756-6947-002	1109	17	2	757-5752-001	1108	34	1
756-8256-002	1103		1	757-5755-001	1108		1
756-8259-002	1103		1	761-0469-001	1102	19A	1
756-8261-002	1103	79	1	763-3993-001	1104	50B	2
756-8263-002	1103	3	1	763F95	1110	58	1
756-8265-002	1103	11	1	763F95	1110	67	1
756-8267-002	1103	77	1	772-5727-001	1103	66A	1
756-8268-002	1103	83	2	805-014X5V0103Z	1107	13	1
756-8269-002	1103	78	1	85725	1108	11B	1
756-8271-002	1103	98	1	8980-2 1-4	1110	11	8
756-8276-002	1103	93	1	8980-2 1-8	1110	10	6
756-8276-002	1103	95	1	919-0181-000	1104	73	1
756-8276-002	1103	97	1	99-012-062-0250	1106	56	6
756-8284-003	1103	89	1	998-0026-000	1104	166	1



SYMBOL INDEX

SYMBOL	FIG. - ITEM	PART NUMBER	SYMBOL	FIG. - ITEM	PART NUMBER
LOADING-PHASING DISCRIMINATOR					
CR1	1103 65	USN1N3064	R5	1103 54	RN70D1212F
CR1	1103 66	USN1N3064	R6	1103 40	RN60D9091F
CR2	1103 48	JAN1N914	R6	1103 40	RN65D9091F
CR3A,CR3B	1103 53	M9762	R7	1103 42	RN60D9091F
CR5	1103 60	JAN1N914	R7	1103 42	RN65D9091F
CR5,CR6	1103 61A	AD1586	R9	1103 32	3281L1-203
CR5,CR6	1103 61A	756-6419-002	TB1	1103 72	756-8301-003
CR6	1103 61	JAN1N914	T1	1103 96	756-8289-003
C1	1103 6	VCJ1849	T2	1103 94	756-8290-003
C1	1103 6	VCJ1971	T3	1103 92	756-8303-003
C1	1103 6	VC20GY	ANTENNA COUPLER SUBASSEMBLY		
C2	1103 64	UY02820G	B1	1104 203	CV50112650
C3	1103 62	VK37BW103M	B1	1104 203	665-53-214-1
C4	1103 7	VCJ1849	B2	1104 267	CV50112650
C4	1103 7	VCJ1971	B2	1104 267	665-53-214-1
C4	1103 7	VC20GY	B3	1104 269	AO-15497-2
C5	1103 52	UY03301J	B3	1104 269	V1HJG8-3C
C6	1103 57	VK37BW103M	CR2	1104 302	1N645
C7	1103 56	VK37BW103M	CR3	1104 299	1N645
C8	1103 50	VK37BW103M	CR5	1104 255	1N645
C9	1103 45	VK37BW103M	C3	1104 73	919-0181-000
C10	1103 46	VK37BW103M	C12	1104 301	CK15AX223M
C12	1103 4	UY03100J	C13	1104 300	CK15AX223M
C13	1103 5	UY03391J	C22	1104 206	CK15AX223M
C14	1103 55	VK37BW103M	C25	1104 304	CK15AX223M
C15	1103 41	VK37BW103M	C26	1104 211	CK15AX223M
C16	1103 39	VK37BW103M	C27	1104 298	CK15AX223M
C17	1103 44	VK37BW103M	C28	1104 210	CK15AX223M
E6	1103 84	1P4-26A	C29	1104 209	CK15AX223M
G1	1103 5A	2001-33	J7	1104 295	756-6751-002
J1	1103 15	02363	J10	1104 41	756-6608-002
J1	1103 15	756-8293-003	K1	1104 319	A39097-001
L1	1103 65	MS18130-10	K2	1104 320	A39097-001
L1	1103 66	BP-1742-1	K3	1104 256	553-4383-003
L1	1103 66	MS18130-10	K4	1104 195	553-4383-003
L1	1103 66	MS18130-3	L1	1104 166	998-0026-000
L2	1103 66A	772-5727-001	L3	1104 20	756-6760-002
L3	1103 47	BP-1742-3	P8	1104 26	DEF9SC33
L3	1103 47	10178-19	P9	1104 16	134
L5	1103 49	BP-1742-3	R22	1104 207	RC20GF100K
L5	1103 49	10178-19	R25	1104 303	RC20GF100K
L6	1103 51	BP-1742-1	R27	1104 297	RC20GF100K
L6	1103 51	MS18130-3	R28	1104 208	RC20GF100K
L7	1103 59	BP-1742-3	S1	1104 214	238974A
L7	1103 59	10178-19	S2	1104 212	238975A
L8	1103 38	BP-1742-3	S4	1104 305	11041-101-9
L8	1103 38	10178-19	S5	1104 276	67321-0-122
L9	1103 43	BP-1742-3	S6	1104 324	260-0024-00
L9	1103 43	10178-19	S8	1104 311	GB300-148-1A
L10	1103 37	BP-1742-3	FRONT HOUSING ASSY		
L10	1103 37	10178-19	CR1	1105 23	1N645
P1	1103	756-8259-002	C2	1105 14	S92212A
P2	1103 9	DEMF9S	C11	1105 22	CK15AX223M
R1	1103 20	MS231-34-8-1PCT	J4	1105 2	01061A
R2	1103 63	RN60C1471F			
R3	1103 21	MS231-19-6-1PCT			
R4	1103 58	RN60C1212F			
R4	1103 58	RN70D1212F			
R5	1103 54	RN60C1212F			



SYMBOL INDEX

SYMBOL	FIG. - ITEM	PART NUMBER	SYMBOL	FIG. - ITEM	PART NUMBER
K8	1105 24	RJ1A26N323	CR12	1108 65J	1N645
R1	1105 21	RC20GF561K	C1 THRU	1108 54	180D105X0050R1
S3	1105 27	267-0216-000	C14		
RE LOAD COIL					
CR4	1106 12	1N645	C15	1108 56	327-029X5T0102Z
CR6	1106 8	1N645	C16 THRU	1108 54	180D105X0050R1
C1	1106 5	662U0301B3102M	C22		
C5	1106 28A	DA858-003	C23	1108 57	327-029X5T0102Z
C5	1106 69	DA858-003	C24 THRU	1108 54	180D105X0050R1
C10	1106 9	CK15AX223M	C31		
C14	1106 13	CK15AX223M	C32	1108 6	CK63AW103M
C15	1106 19	327-029X5T0102Z	FL1 THRU	1108 59	2JX49
G1	1106 64	756-6756-002	FL12		
G2	1106 71	756-6755-002	F1	1108 8	F02A250V1-4AS
J8	1106 23	DE9PC33	F2	1108 37A	F02A250V3AS
J9	1106 20	DA11C1S	F2	1108 37A	F02A250V3AS
K5	1106 11	RD6B26N359	J1	1108 11A	UG496U
K9	1106 14	RB3-26D737	J2	1108 45	DMF50S
L2	1106 49	756-6620-002	J3	1108 48	DBMF25S
L6	1106 4	MS9U540-07	J4	1108 11B	85725
P6	1106 82	756-6753-002	K1	1108 30	3SAH102Z
P10	1106 44	756-6754-002	K2	1108 62D	3SAF1131
399V-1 TRANSMITTER ADAPTER					
CR1	1107 14	1N645	M1	1108 7	BCD2N1094
CR1	1107 14A	1N645	P1	1108 66	DPX2MA57P40P34B0201
C1	1107 13	805-014X5V0103Z	P1A	1108 65C	DPA32-34P
C1	1107 13A	CL25BH111UP3	P1B	1108 66A	DPA32-34P
J1	1107 5	UG569AU	R1	1108 36	RSKR5000F
J2	1107 4	UG569AU	R2	1108 20	RW69V1R8
J3	1107 2	MS24264k10b5PX	R3	1108 18	RC07GF391K
J4	1107 5A	UG625BU	R4	1108 22	RC07GF125K
K1	1107 12	RJ1A26N323	R5	1108 19	RC07GF125K
R1	1107 10	218SP3	R6	1108 26	RC07GF223K
R1	1107 10A	RC20GF101K	R7	1108 25	RC07GF104K
309A-9/9A ANTENNA COUPLER CONTROL					
AR1	1108 41	TA018-0A145C	R8	1108 24	RC07GF104K
AR2	1108 42	TA018-0A145C	R9	1108 23	RC07GF104K
CR1	1108 29	1N645	R10	1108 21	RC07GF562K
CR2	1108 29A	1N645	R11	1108 16	RC07GF185K
CR2	1108 53	1N645	R12	1108 65F	RC20GF222K
CR3	1108 55	1N645	R13	1108 65G	RC07GF563K
CR4	1108 17	1N645	R14	1108 65H	RC07GF224K
CR5	1108 13	1N645	R15	1108 65E	RC20GF222K
CR6	1108 14	1N645	S1	1108 28	239498K2
CR7	1108 15	1N645	S2	1108 10	30-1
CR8	1108 27	1N645	T1	1108 35	A14657
CR9	1108 55A	1N645	XAR1	1108 47	203-6214-017
CR10	1108 62A	1N645	XAR2	1108 50	203-6214-017
CR10	1108 65D	1N645	XF1	1108 9	HKPEHLQRWZ
CR11	1108 62B	1N645	XF2	1108 37B	350-231
			XF2	1108 37B	350-231
SERVO CONTROL ASSY					
			CR1	1109 26	1N645
			CR2	1109 24	1N645
			CR3	1109 18	1N645
			CR4	1109 26A	1N645
			CR4	1109 26A	1N645
			CR5	1109 26D	1N645
			CR5	1109 26D	1N645
			CR6	1109 26C	1N645
			CR6	1109 26C	1N645





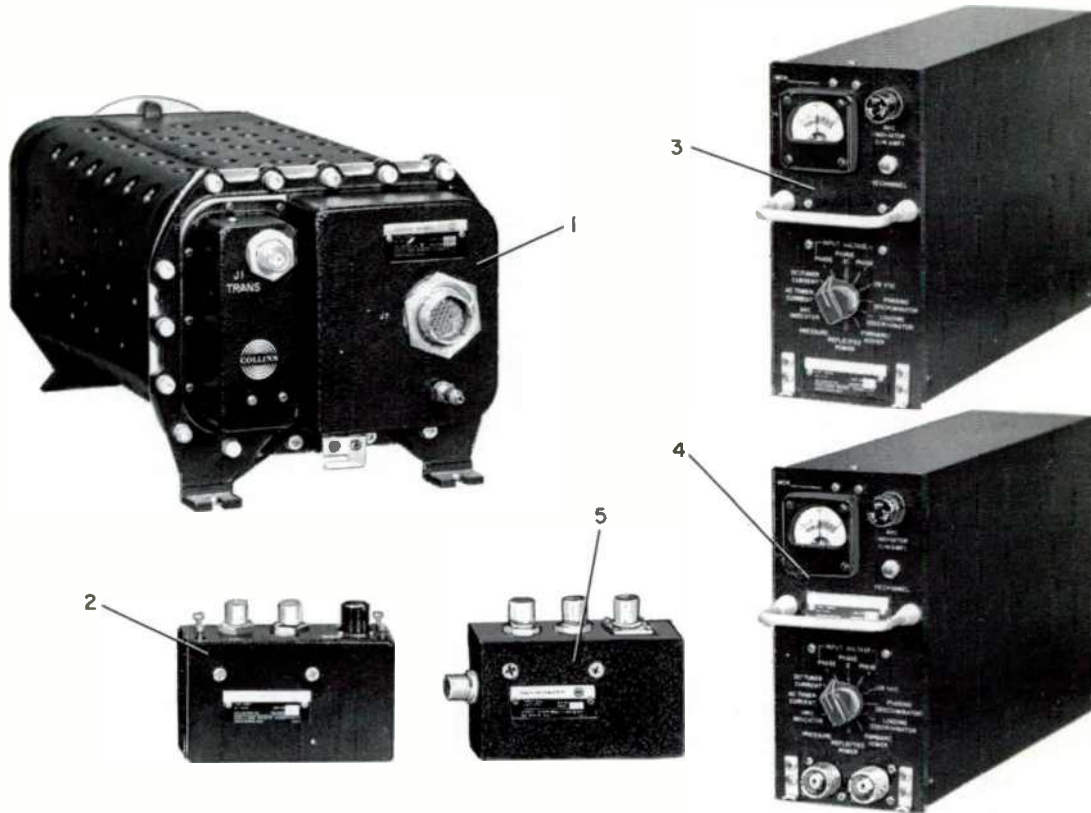


SYMBOL INDEX

SYMBOL	FIG. - ITEM	PART NUMBER	SYMBOL	FIG. - ITEM	PART NUMBER
C5	1110 80A	CK14Ax103M	ELECTRONIC CONTROL AMPLIFIER		
C5	1110 80A	CK16M104M			
C10	1110 98	109D336X0075F2			
C10	1110 98	150D336X0020R2			
C11	1110 61	150D225X0035B2			
C13	1110 109	150D157X0006R2			
C14	1110 106	109D336X0075F2			
C14	1110 106	150D336X0020R2			
C15	1110 83	118P15306S4			
C16	1110 97	150D337X0006S2			
C17	1110 100	150D337X0006S2			
C18	1110 67A	150D226X0015B2			
C19	1110 65B	CL35BX010LP3			
C20	1110 52A	CK16M104M			
C21	1110 52D	CK16M104M			
C22	1110 52F	CK16M104M			
C23	1110 52G	CK16M104M			
C24	1110 52B	CK16M104M			
C25	1110 52C	CK16M104M			
C26	1110 52E	CK16M104M			
K1	1110 38	3SAF1131			
K2	1110 43	3SAF1131			
K3	1110 39	3SAF1131			
K4	1110 44	3SAF1131			
K5	1110 40	3SAF1131			
K6	1110 45	3SAF1131			
K7	1110 41	3SAF1131			
K8	1110 46	3SAF1131			
K9	1110 42	3SAF1131			
K10	1110 47	3SAF1131			
K11	1110 48	3SAF1131			
RT1	1110 58	763F95			
RT2	1110 67	763F95			
R8	1110 75	RC07GF102K			
R9	1110 60	RC07GF562K			
R10	1110 59	RC07GF273K			
R11	1110 62	RC07GF100K			
R12	1110 71A	RC32GF152K			
R12	1110 71A	RC32GF152K			
R15	1110 72	RC07GF333K			
R16	1110 70	RC07GF102K			
R17	1110 65	RC07GF103K			
R18	1110 64	RC07GF392K			
R19	1110 63	RC07GF100K			
R20	1110 78	RC07GF220K			
R21	1110 77	RC07GF334K			
R22	1110 76	RC07GF562K			
R23	1110 79	RC07GF224K			
R24	1110 80	RC07GF220K			
R25	1110 57	RC07GF562K			
R26	1110 66	RC07GF223K			
R26	1110 66	RC07GF333K			
R27	1110 68	RC07GF273K			
S1A	1110 17	239580F			
S1B	1110 16	239581F			
S1C	1110 15	239579F			
S1D	1110 13	23978F			
S1E	1110 12	239582F			
TB1	1110 93	756-6896-005			
CR1	1111 51	1N483B			
CR2	1111 50	1N483B			
C1	1111 19	150D104X0035A2			
C2	1111 46	CS13BF685M			
C3	1111 42	CS13BB685M			
C4	1111 13	150D104X0035A2			
C5	1111 12	CS13BF335M			
C6	1111 23	CS13BF685M			
C7	1111 17A	CS13BG156M			
Q1	1111 20	2N760A			
Q2	1111 25	2N760A			
Q3	1111 35	2N760A			
Q4	1111 34	2N760A			
Q5	1111 14	2N1480			
Q6	1111 9	2N1480			
Q7	1111 54	2N1769			
Q8	1111 55	2N1769			
RT1	1111 11	6-780934-01			
R1	1111 48	RC07GF153J			
R2	1111 49	RC07GF563J			
R3	1111 45	RC07GF103J			
R4	1111 21	RC07GF182J			
R5	1111 24	RC07GF560J			
R6	1111 43	RC07GF332J			
R7	1111 41	RC07GF103J			
R8	1111 26	RC07GF821K			
R9	1111 28	RC07GF221J			
R10	1111 47	RC07GF363J			
R11	1111 44	RC07GF103J			
R12	1111 39	RC07GF101J			
R13	1111 38	RC07GF562K			
R14	1111 30	RC07GF102K			
R15	1111 27	RC07GF823J			
R16	1111 37	RC07GF182J			
R17	1111 17B	RC20GF681K			
R18	1111 32	RC07GF201J			
R19	1111 16	RC32GF331K			
R20	1111 7	RC32GF331K			
R21	1111 15	RC07GF153K			
R22	1111 8	RC07GF153K			
R23	1111 10	RC07GF331K			
R24	1111 36	RC07GF182J			
R25	1111 60	RW59V1R0			
R26	1111 59	RW59V1R0			
R27	1111 17D	RC20GF391K			
R28	1111 33	RC07GF3R3J			
R29	1111 22A	RC07GF124J			
T1	1111 6	6-780935-01			
VR1	1111 22	1N754A			
VR2	1111 29	1N754A			
VR3	1111 31	1N754A			
VR4	1111 40	1N967B			
VR5	1111 17C	1N3029B			



GROUP ASSEMBLY PARTS LIST



180R-12 Antenna Coupler and 309A-9/9A Antenna Coupler Control  
Figure 1101

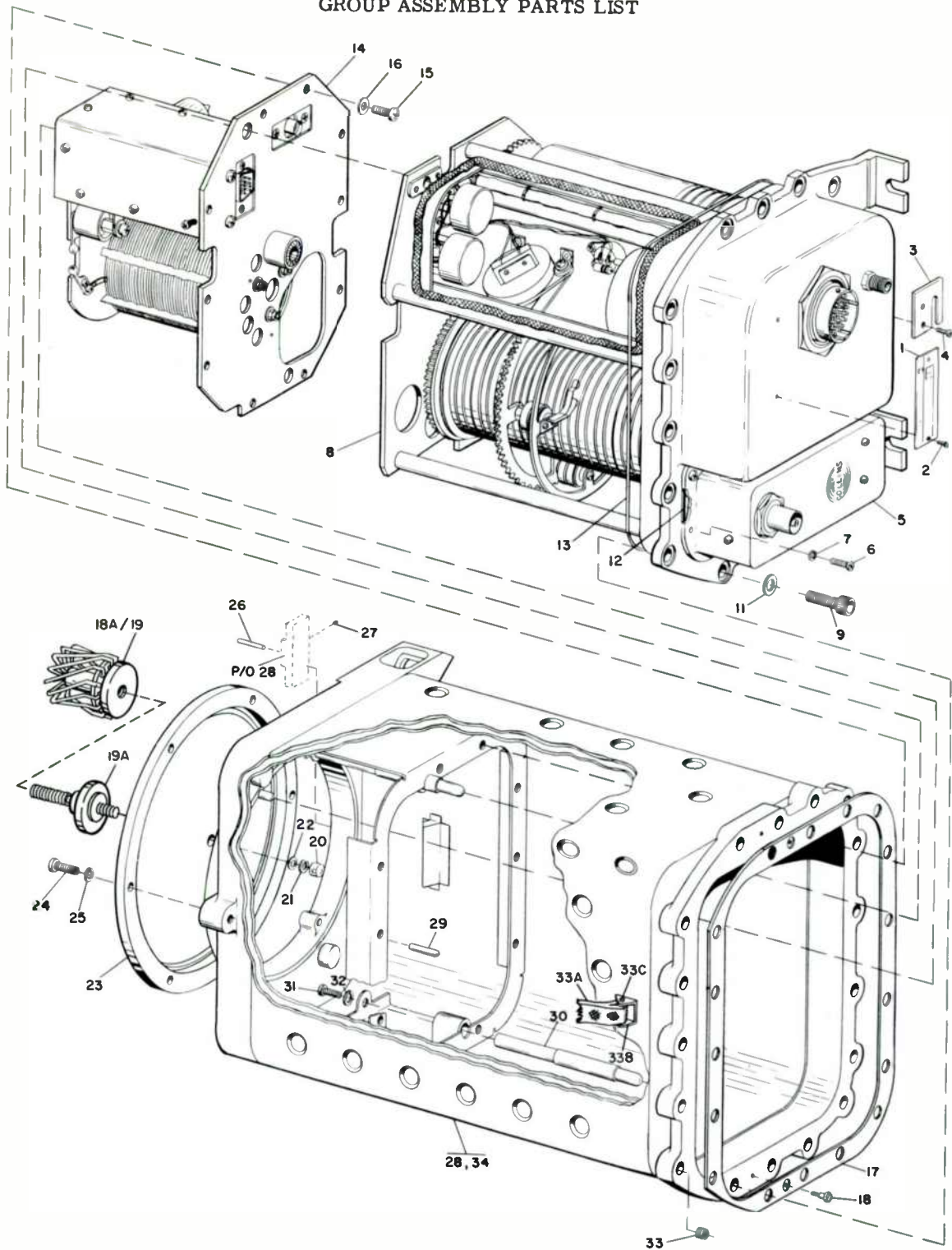
FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1101 - 0	NO NUMBER	1	180R-12 ANTENNA COUPLER AND 309A-9/9A ANTENNA COUPLER CONTROL	1	
- 1	522-3159-000	2	180R-12 ANTENNA COUPLER SEE FIG. 1102	1	
R * 2	522-3559-004	2	399V-/W-1 ADAPTER SEE FIG. 1107	1	C
- 3	522-3375-004	2	309A-9 ANTENNA COUPLER CONTROL SEE FIG. 1108	1	A
- 4	522-4159-001	2	309A-9A ANTENNA COUPLER CONTROL P SEE FIG. 1108	1	B
R ** 5	522-3560-000	2	399W-1/V-1 ADAPTER SEE FIG. 1107	1	D

\* ADAPTER USED WITH 618S TRANSCEIVER.

\*\* ADAPTER USED WITH AN/ARC-58 RADIO SET.



GROUP ASSEMBLY PARTS LIST



180R-12 Antenna Coupler  
Figure 1102



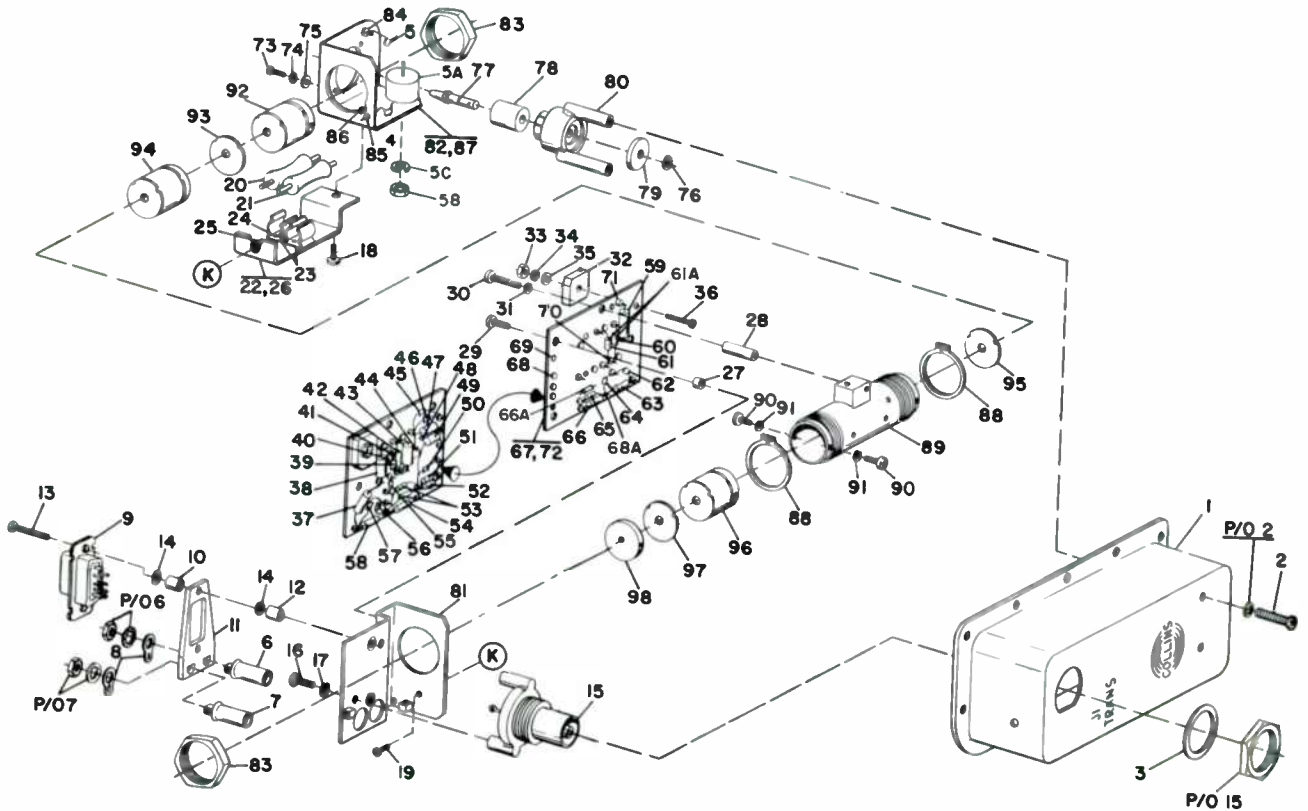
GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1102 - 0	522-3159-000	1	180R-12 ANTENNA COUPLER SEE FIG. 1101-1 FOR NHA	REF	
- 1	554-5112-003	2	PLATE, IDENT	1	
- 2	MS51957-1	2	SCREW, MACH., SST, PAN HD, 2-56 X 1/8 343-0122-000 AP	2	
- 3	756-6596-002	2	PLATE, EXTRACTOR	1	
- 4	MS51957-30	2	SCREW, MACH., SST, PAN HD, 6-32 X 1/2 343-0171-000 AP	2	
- 5	528-0494-004	2	LOADING-PHASING DISCRIMINATOR MODULE SEE FIG. 1103	1	
- 6	MS51957-14	2	SCREW, MACH., SST, PAN HD, 4-40 X 5/16 343-0134-000 AP	10	
- 7	MS35338-135	2	WASHER, LOCK, SST, 0.115 ID, 0.212 OD 310-0279-000 AP	10	
- 8	756-6778-000	2	ANTENNA COUPLER SUBASSEMBLY SEE FIG. 1104	1	
- 9	MS16998-44	2	SCREW, CAP, SCH, CAD. PL STL, 1/4-28 X 7/8 324-1506-000 AP OR	17	
- 9	MS16998-44	2	SCREW, CAP, SCH, CAD. PL STL, 1/4-28 X 7/8 324-0786-000 AP	17	
- 10		1	DELETED		
- 11	756-9966-002	2	WASHER AP	17	
- 12	2-44b278-7	2	GASKET 02697 200-2263-000	1	
- 13	U523662	2	GASKET 04812 200-1508-000	1	
- 14	756-6750-000	2	LOAD COIL, RF SEE FIG. 1106	1	
R - 15	MS51957-30	2	SCREW, MACH., SST, PAN HD, 6-32 X 1/2 343-0171-000 AP	10	
- 16	310-0046-000	2	WASHER, FLAT, SST, 0.147 ID, 0.312 OD COML AP	10	
- 17	756-6640-003	2	STRIP, BACKING	1	
- 18	756-6761-002	2	SCREW, SHOULDERED AP	2	
- 18A	756-6763-003	2	CONTACT ASSY EFF MCN 129	1	
	756-6775-004	2	HOUSING, ANT. COUPLER	1	
- 19	756-6763-003	3	CONTACT ASSY EFF THRU MCN 128	1	
- 19A	761-0469-001	3	STUD ASSY EFF MCN 129	1	
- 20	756-6607-002	3	CONTACT, ELECTRICAL	1	
- 21	310-0079-000	3	WASHER, LOCK, BRZ, 0.168 ID, 0.296 OD COML AP FOR 19, 19A AND 20	1	
- 22	310-0057-000	3	WASHER, FLAT, NI PL BRS, 0.172 ID, 0.375 OD COML AP FOR 19, 19A AND 20	1	
- 23	756-6766-003	3	PLATE, REAR	1	
- 24	MS51957-45	3	SCREW, MACH., SST, PAN HD, 8-32 X 1/2 343-0189-000 AP	6	
- 25	MS35338-137	3	WASHER, LOCK, SST, 0.168 ID, 0.296 OD 310-0072-000 AP	6	
- 26	756-6598-002	3	PIN, STR, HDLS	1	
- 27	MS51981-27	3	SETScrew, STL, 8-32 X 1/4 335-0012-000 AP	1	
- 28	756-6658-005	3	HOUSING, ANT. COUPLER	1	
- 29	756-6616-002	4	PIN, STR, HDLS	2	
- 30	756-6597-002	4	PIN, LOCATING	2	
- 31	MS51957-44	4	SCREW, MACH., SST, PAN HD, 8-32 X 7/16 343-0188-000 AP	2	
- 32	MS35338-137	4	WASHER, LOCK, SST, 0.168 ID, 0.296 OD 310-0072-000 AP	2	
- 33	MS124696	4	INSERT 012-1591-000	17	



GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1102 - 33A	011-0116-000	4	STRAP, WEBBING 24036 EFF MCN 109	1	
- 33B	756-6376-001	4	PIN, BRACKET STRAP AP	2	
- 33C	MS16562-202	4	PIN, SPG, SST, 0.078 DIA X 0.437 LG 311-0358-000 AP	2	
- 34	756-6657-005	4	HOUSING, ANT. COUPLER	1	
1103 - 0	528-0494-004	1	LOADING-PHASING DISCRIMINATOR MODULE SEE FIG. 1102-5 FOR NHA	REF	
- 1	756-8320-005	2	HOUSING, DISCK	1	
- 2	R4-40UNC2A1-4	2	SCREW, SEAL, SST, 4-40 X 1/4	3	
- 3	756-8304-004	2	DISCRIMINATOR SUBASSEMBLY P	1	
- 3	756-8263-002	2	WASHER, FLAT AP	1	
- 4	UY03100J	3	CAPACITOR, FXD, 10 PF 5%, 1000 VDCW 73899 914-3080-000	1	C12



Loading-Phasing Discriminator Module  
Figure 1103



GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1103 - 5	UY03391J	3	CAPACITOR, FXD, 390 PF 5%, 300 VDCW 73899 914-3081-000 C13	1	
R - 5A	2001-33	3	SPARK-GAP 23663 013-1318-030 G1	1	
R - 5B	P313-0053-00	3	NUT, PLAIN, HEX., NI PL BRS, 6-32 77250 313-0053-000 SB1 AP	1	
R - 5C	310-0077-000	3	WASHER, LOCK, BRZ, 0.141 ID, 0.253 OD COML SB1 AP	1	
- 6	756-8307-005	3	ELECTRONIC COMPONENTS ASSY P	1	
- 6	VC20GY	4	CAPACITOR, VAR, 0.8 TO 8.5 PF, 1000 VDCW 73899 922-0414-000 EFF THRU MCN 130 C1	1	
- 6	VCJ1971	4	CAPACITOR, VAR, 0.8 TO 8.5 PF, 750 VDCW 73899 922-3031-010 EFF MCN 131 THRU 275 C1	1	
- 6	VCJ1849	4	CAPACITOR, VAR, 1 TO 8.5 PF, 750 VDCW 73899 922-3031-020 EFF MCN 276 C1	1	
- 7	VC20GY	4	CAPACITOR, VAR, 0.8 TO 8.5 PF, 1000 VDCW 73899 922-0414-000 EFF THRU MCN 130 C4	1	
- 7	VCJ1971	4	CAPACITOR, VAR, 0.8 TO 8.5 PF, 750 VDCW 73899 922-3031-010 EFF MCN 131 THRU 275 C4	1	
- 7	VCJ1849	4	CAPACITOR, VAR, 1 TO 8.5 PF, 750 VDCW 73899 922-3031-020 EFF MCN 276 C4	1	
R - 8	4041 7-32HOT TINNED	4	TERMINAL 77147 304-0196-000	2	
- 9	DEMF9S	4	CONNECTOR 71468 371-0957-000 P2	1	
- 10	541-5952-002	4	SPACER, SLV	2	
- 11	756-8265-002	4	PLATE, RETAINING ELECTRICAL CONN P	1	
- 12	541-5949-002	4	SPACER, SLV	2	
- 13	MS51957-9	4	SCREW, MACH., SST, PAN HD, 2-56 X 3/4 343-0129-000 AP FOR 9 THRU 12	2	
- 14	310-6320-000	4	WASHER, FLAT, SST, 0.092 ID, 0.218 OD COML AP FOR 9 THRU 12	4	
- 15	756-8293-003	4	CONNECTOR, RECP EFF THRU MCN 171 J1	1	
- 15	02363	4	CONNECTOR 94375 357-7119-010 EFF MCN 172 J1	1	
- 16	MS51957-3	4	SCREW, MACH., SST, PAN HD, 2-56 X 1/4 343-0124-000 AP	2	
- 17	MS35338-134	4	WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP	2	
- 18	756-8256-002	4	RESISTOR ASSY	1	
- 18	MS51957-12	4	SCREW, MACH., SST, PAN HD, 4-40 X 3/16 343-0132-000 AP	1	
R - 19	MS51957-12	4	SCREW, MACH., SST, PAN HD, 4-40 X 3/16 343-0132-000 AP	1	
- 20	MS231-34-8-1 PCT	5	RESISTOR, FXD, 34.8 OHMS 1%, 8 W 714-3187-000 R1	1	
- 21	MS231-19-6-1 PCT	5	RESISTOR, FXD, 19.6 OHMS 1%, 8 W 714-3186-000 R3	1	
- 22	756-8300-003	5	HOLDER ASSY	1	
- 23	100-200-14-7	6	CLIP 99378 139-2231-000	2	
- 24	MS16535-75	6	RIVET, TUBULAR, AL, 0V HD, 0.089 DIA X 0.094 LG SHK 305-1754-000 AP	2	



GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1103 - 25	F22NCFMA1-40	6	NUT, SELF-LKG, CLINCH, CAD. PL STL, 4-40 72962 333-0839-000	1	
- 26	756-8299-003	6	HOLDER, RESISTOR P	1	
- 27	553-5119-003	4	SPACER, SLV	3	
- 28	541-5972-002	4	SPACER, SLV	1	
- 29	MS51957-14	4	SCREW, MACH., SST, PAN HD, 4-40 X 5/16 343-0134-000 AP FOR 27 AND 28	3	
- 30	MS51957-19	4	SCREW, MACH., SST, PAN HD, 4-40 X 3/4 343-0139-000 AP FOR 27 AND 28	1	
- 31	MS35338-135	4	WASHER, LOCK, SST, 0.115 ID, 0.212 OD 310-0279-000 AP FOR 27 AND 28	1	
- 32	756-8305-004 3281L1-203	4 5	DISCRIMINATOR SUBASSEMBLY RESISTOR, VAR, 20,000 OHMS 20%, 1/2 W 80294 380-4041-000	1 1	R9
R - 33	P313-9001-00 O	5	NUT, PLAIN, HEX., NI PL BRS, 1-72 77250 313-9001-000 AP	1	
- 34	310-0274-000	5	WASHER, LOCK, NI PL BRS, 0.073 ID 0.117 OD COML AP	1	
- 35	310-0550-000	5	WASHER, FLAT, SST, 0.062 ID, 0.156 OD COML AP	1	
R - 36	321-0306-000	5	SCREW, MACH., NI PL BRS, UV HD, 1-72 X 5/16 COML AP	1	
- 37	10178-19	5	COIL, RF, 1000 MH 82142 240-2182-000 EFF THRU MCN 139	1	L10
- 37	BP-1742-3	5	COIL, RF, 1000 UH 99800 240-2803-000 EFF MCN 140	1	L10
- 38	10178-19	5	COIL, RF, 1000 MH 82142 240-2182-000 EFF THRU MCN 139	1	L8
- 38	BP-1742-3	5	COIL, RF, 1000 UH 99800 240-2803-000 EFF MCN 140	1	L8
- 39	VK37BW103M	5	CAPACITOR, FXD, 10,000 PF 20%, 200 VDCW 95275 913-5010-010	1	C16
- 40	RN65D9091F	5	RESISTOR, FXD, 9090 OHMS 1%, 1/2 W 705-7142-000 EFF THRU MCN 108	1	R6
- 40	RN60D9091F	5	RESISTOR, FXD, 9090 OHMS 1%, 1/4 W 705-6642-000 EFF MCN 109	1	R6
- 41	VK37BW103M	5	CAPACITOR, FXD, 10,000 PF 20%, 200 VDCW 95275 913-5010-010	1	C15
- 42	RN65D9091F	5	RESISTOR, FXD, 9090 OHMS 1%, 1/2 W 705-7142-000 EFF THRU MCN 108	1	R7
- 42	RN60D9091F	5	RESISTOR, FXD, 9090 OHMS 1%, 1/4 W 705-6642-000 EFF MCN 109	1	R7
- 43	10178-19	5	COIL, RF, 1000 MH 82142 240-2182-000 EFF THRU MCN 139	1	L9
- 43	BP-1742-3	5	COIL, RF, 1000 UH 99800 240-2803-000 EFF MCN 140	1	L9
- 44	VK37BW103M	5	CAPACITOR, FXD, 10,000 PF 20%, 200 VDCW 95275 913-5010-010	1	C17
- 45	VK37BW103M	5	CAPACITOR, FXD, 10,000 PF 20%, 200 VDCW 95275 913-5010-010	1	C9
- 46	VK37BW103M	5	CAPACITOR, FXD, 10,000 PF 20%, 200 VDCW 95275 913-5010-010	1	C10
- 47	10178-19	5	COIL, RF, 1000 MH 82142 240-2182-000 EFF THRU MCN 139	1	L3
- 47	BP-1742-3	5	COIL, RF, 1000 UH 99800 240-2803-000 EFF MCN 140	1	L3
- 48	JAN1N914	5	SEMICOND DEVICE 353-3338-000	1	CR2



GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE	
1103 - 49	10178-19	5	COIL, RF, 1000 MH 82142 240-2182-000 EFF THRU MCN 139	L5	1	
- 49	BP-1742-3	5	COIL, RF, 1000 UH 99800 240-2803-000 EFF MCN 140	L5	1	
- 50	VK37BW103M	5	CAPACITOR, FXD, 10,000 PF 20%, 200 VDCW 95275 913-5010-010	C8	1	
- 51	MS18130-3	5	COIL, RF, 0.33 UH 240-1564-000 EFF THRU MCN 139	L6	1	
- 51	BP-1742-1	5	COIL, RF, 0.33 UH 99800 240-2801-000 EFF MCN 140	L6	1	
- 52	UY03301J	5	CAPACITOR, FXD, 300 PF 5%, 300 VDCW 73899 914-3079-000	C5	1	
- 53	M9762	5	SEMICONV DEVICE 93332 353-3534-000	CR3A,CR3B	1	
- 54	RN70D1212F	5	RESISTOR, FXD, 12,100 OHMS 1%, 3/4 W 705-7648-000 EFF THRU MCN 108	R5	1	
- 54	RN60C1212F	5	RESISTOR, FXD, 12,100 OHMS 1%, 1/8 W 705-6299-000 EFF MCN 109	R5	1	
- 55	VK37BW103M	5	CAPACITOR, FXD, 10,000 PF 20%, 200 VDCW 95275 913-5010-010	C14	1	
- 56	VK37BW103M	5	CAPACITOR, FXD, 10,000 PF 20%, 200 VDCW 95275 913-5010-010	C7	1	
- 57	VK37BW103M	5	CAPACITOR, FXD, 10,000 PF 20%, 200 VDCW 95275 913-5010-010	C6	1	
- 58	RN70D1212F	5	RESISTOR, FXD, 12,100 OHMS 1%, 3/4 W 705-7648-000 EFF THRU MCN 108	R4	1	
- 58	RN60C1212F	5	RESISTOR, FXD, 12,100 OHMS 1%, 1/8 W 705-6299-000 EFF MCN 109	R4	1	
- 59	10178-19	5	COIL, RF, 1000 MH 82142 240-2182-000 EFF THRU MCN 139	L7	1	
- 59	BP-1742-3	5	COIL, RF, 1000 UH 99800 240-2803-000 EFF MCN 140	L7	1	
- 60	JAN1N914	5	SEMICONV DEVICE 353-3338-000 EFF THRU MCN 130	CR5	1	
- 61	JAN1N914	5	SEMICONV DEVICE 353-3338-000 EFF THRU MCN 130	CR6	1	
- 61A	756-6419-002	5	SEMICONV DEVICE SET P EFF MCN 131 THRU 199	CR5,CR6	1	
- 61A	AD1586	5	SEMICONV DEVICE 16952 353-3589-010 EFF MCN 200	CR5,CR6	1	
- 62	VK37BW103M	5	CAPACITOR, FXD, 10,000 PF 20%, 200 VDCW 95275 913-5010-010	C3	1	
- 63	RN60C1471F	5	RESISTOR, FXD, 1470 OHMS 1%, 1/8 W 705-6277-000	R2	1	
- 64	UY0282UG	5	CAPACITOR, FXD, 82 PF 2%, 300 VDCW 73899 914-3078-000	C2	1	
R	- 65	USN1N3064	5	SEMICONV DEVICE 353-3289-000 EFF THRU MCN 769	CR1	1
R	- 65	MS18130-10	5	COIL, RF, 1.50 UH 240-1570-000 EFF MCN 770	L1	1
- 66	MS18130-3	5	COIL, RF, 0.33 UH 240-1564-000 EFF THRU MCN 139	L1	1	
R	- 66	BP-1742-1	5	COIL, RF, 0.33 UH 99800 240-2801-000 EFF MCN 140 THRU 616	L1	1
R	- 66	MS18130-10	5	COIL, RF, 1.50 UH 240-1570-000 EFF MCN 617 THRU 769	L1	1
R	- 66	USN1N3064	5	SEMICONV DEVICE 353-3289-000 EFF MCN 770	CR1	1
R	- 66A	772-5727-001	5	COIL, RF EFF MCN 617	L2	1





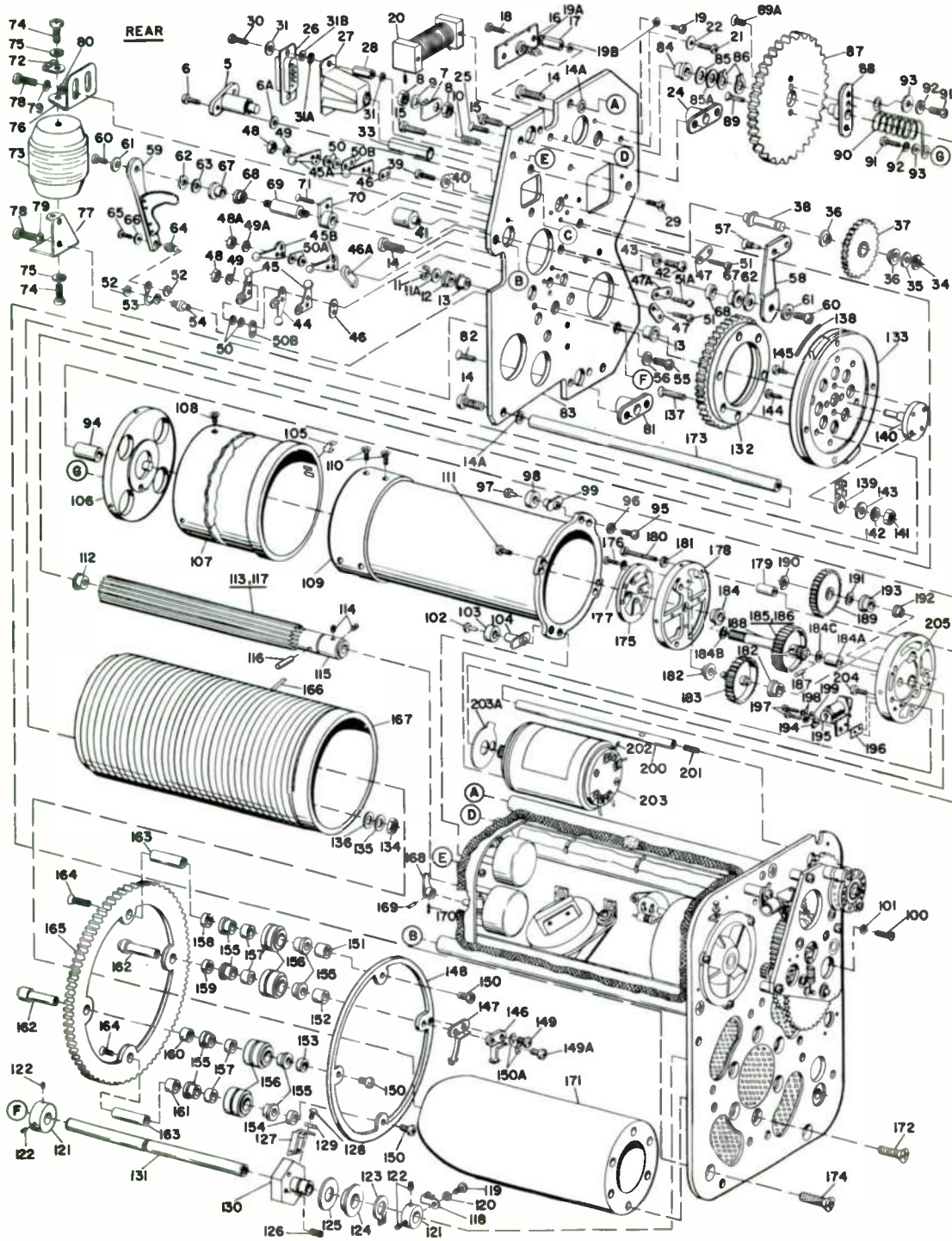
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GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1103 - 67	756-8302-003	5	TERMINAL BOARD	1	
- 68	SL179-230	6	TERMINAL 12615 306-1262-000 EFF THRU MCN 164	18	
- 68	SL283-230	6	TERMINAL 12615 306-1265-000 EFF MCN 165 THRU 184	18	
- 68	SL283-230	6	TERMINAL 12615 306-1265-000 EFF MCN 185	17	
- 68A	SL179-230	6	TERMINAL 12615 306-1262-000 EFF MCN 185	2	
- 69	1P4-26A	6	TERMINAL 86577 306-0972-000	5	
- 70	3PP4-66A	6	TERMINAL 86577 306-0953-000	1	
- 71	SL180-231	6	TERMINAL 12615 306-1272-000	6	
- 72	756-8301-003	6	TERMINAL BOARD P	1	TB1
	756-8259-002	4	CONNECTOR, RECP, ELECTRICAL	1	P1
- 73	MS51957-3	4	SCREW, MACH., SST, PAN HD, 2-56 X 1/4 343-0124-000 AP	2	
- 74	MS35338-134	4	WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP	2	
- 75	310-6320-000	4	WASHER, FLAT, SST, 0.092 ID, 0.218 OD COML AP	2	
- 76	5133-12C	5	RING 79136 340-0250-000	1	
- 77	756-8267-002	5	CONTACT, ELECTRICAL	1	
- 78	756-8269-002	5	DIELECTRIC, CONN	1	
- 79	756-8261-002	5	INSULATOR, BUSH.	1	
- 80	756-8288-003	5	SHELL, ELECTRICAL CONN	1	
- 81	756-8295-003	4	SHIELD ASSY	1	
- 82	756-8296-003	4	SHIELD ASSY	1	
- 83	756-8268-002	4	NUT, PLAIN, HEX. AP FOR 81 AND 82	2	
- 84	1P4-26A	5	TERMINAL 86577 306-0972-000	1	E6
- 85	SL283-230	5	TERMINAL 12615 306-1265-000	1	
- 86	F22NCFMA1-40	5	NUT, SELF-LKG, CLINCH, CAD. PL STL, 4-40 72962 333-0839-000	2	
- 87	756-8291-003	5	PLATE, ELECTRICAL	1	
- 88	MS16624-1075	4	RING 340-0132-000	2	
	756-8294-003	4	TRANSFORMER, DISCR	1	
- 89	756-8284-003	5	COVER, XMFR	1	
- 90	P343-0298-000	5	SCREW, MACH., NI PL BRS, PAN HD, 2-56 X 3/16 77250 343-0298-000 AP	8	
- 91	310-0075-000	5	WASHER, LOCK, BRZ, 0.088 ID, 0.165 OD COML AP	8	
R - 92	756-8303-003	5	TRANSFORMER, DISCR	1	T3
- 93	756-8276-002	5	INSULATOR, DISK	1	
R - 94	756-8290-003	5	TRANSFORMER, DISCR	1	T2
- 95	756-8276-002	5	INSULATOR, DISK	1	
R - 96	756-8289-003	5	TRANSFORMER, DISCR	1	T1
- 97	756-8276-002	5	INSULATOR, DISK	1	
- 98	756-8271-002	5	PLATE, SHIELD	1	
- 99	WTE18A	5	WIRE, 0.4 FT 90484 428-4826-000	AR	



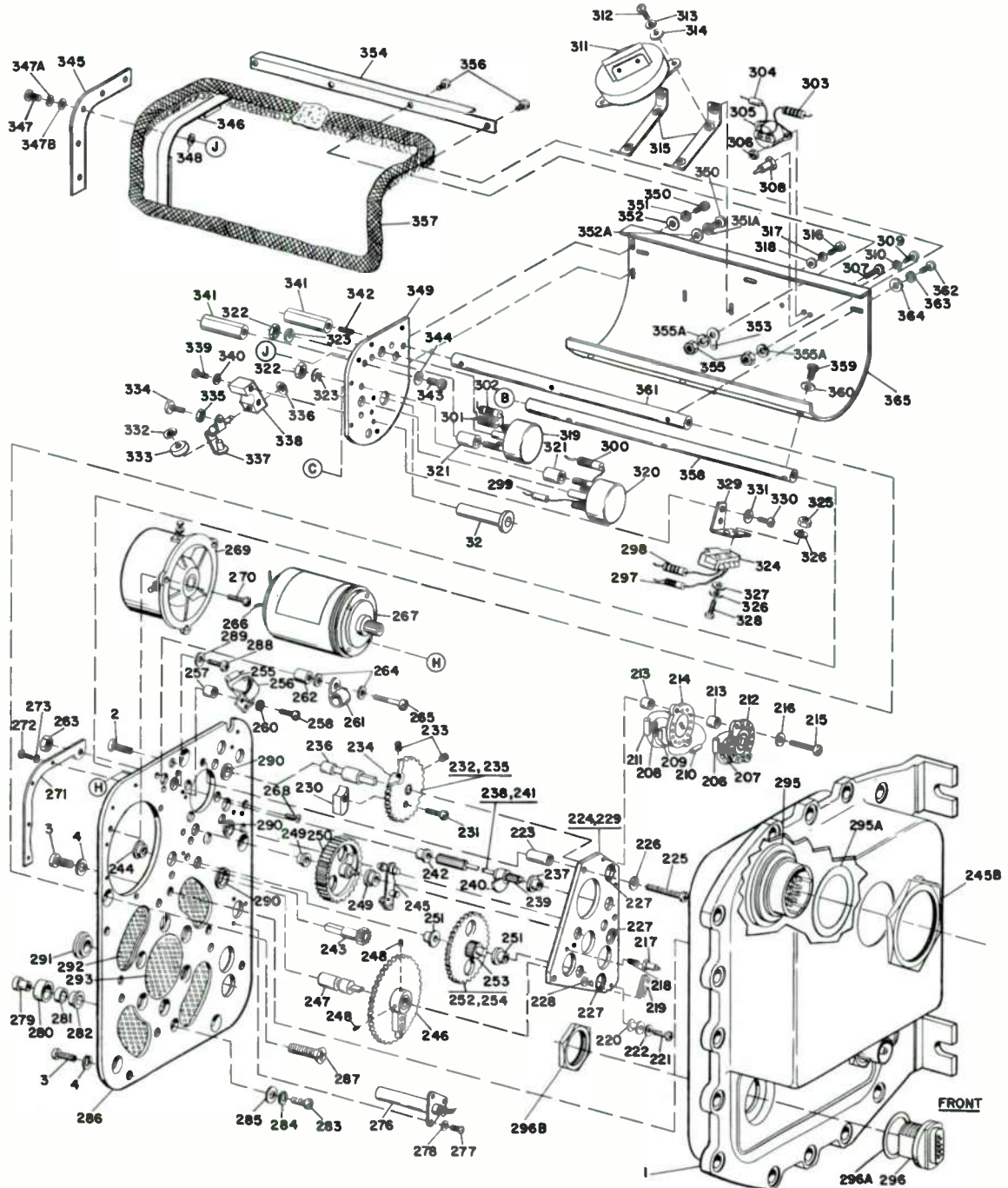
GROUP ASSEMBLY PARTS LIST



Antenna Coupler Subassembly (Sheet 1 of 2)  
Figure 1104



GROUP ASSEMBLY PARTS LIST



Antenna Coupler Subassembly (Sheet 2 of 2)  
Figure 1104



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GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDET.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1104 - 0	756-6778-000	1	ANTENNA COUPLER SUBASSEMBLY SEE FIG. 1102-8 FOR NHA	REF	
- 1	756-6748-000	2	FRONT HOUSING ASSY SEE FIG. 1105	1	
- 2	MS51959-27	2	SCREW, MACH., SST, FH, 6-32 X 5/16 342-0061-000 AP	1	
R - 3	MS51957-27	2	SCREW, MACH., SST, PAN HD, 6-32 X 5/16 343-0168-000 AP	8	
- 4	310-0071-000	2	WASHER, LOCK, SST, 0.151 ID, 0.239 OD COML AP	8	
- 5	544-0626-002	2	SUPPORT, PINION P	1	
R - 6	MS51957-16	2	SCREW, MACH., SST, PAN HD, 4-40 X 7/16 343-0136-000 AP	2	
- 6A	543-5654-003	2	WASHER	4	
- 7	1024-6HOTTIN NED	2	TERMINAL 77147 304-0140-000	1	
- 8	P313-0054-00 O	2	NUT, PLAIN, HEX., NI PL BRS, 8-32 77250 313-0054-000 AP	2	
- 9	310-0079-000	2	WASHER, LOCK, BRZ, 0.168 ID, 0.296 OD COML AP	1	
- 10	P312-3060-00 O	2	STUD, CONTINUOUS THD, CAD. PL BRS, 8-32 X 7/8 77250 312-3060-000 AP	1	
- 11	X5131-18C	2	RING 79136 340-0485-000 EFF THRU MCN 159	1	
- 11	MS16633-1018	2	RING 340-0090-000 EFF MCN 160	1	
- 11A	541-1234-003	2	WASHER	3	
- 12	544-0625-002	2	WASHER, SHOULDERED	1	
- 13	S6632FCHHP28 LY15	2	BEARING 40920 309-0753-000 EFF THRU MCN 159	2	
- 13	N6632FCHHP28 LY15	2	BEARING 40920 309-1976-010 EFF MCN 160	2	
- 14	756-6747-000 MS51957-45	2	ANTENNA COUPLER SUBASSEMBLY SCREW, MACH., SST, PAN HD, 8-32 X 1/2 343-0189-000 AP	5	
R - 14A	500-1126-003	2	WASHER AP	5	
- 15	MS51957-17	2	SCREW, MACH., SST, PAN HD, 4-40 X 1/2 343-0137-000 AP	2	
- 16	134	3	CONNECTOR 12615 371-0240-000	1	P9
- 17	756-6617-002	3	NUT, SLV	2	
- 18	P343-0301-00 O	3	SCREW, MACH., NI PL BRS, PAN HD, 2-56 X 3/8 77250 343-0301-000 AP FOR 16 AND 17	2	
R - 19	MS51957-7	3	SCREW, MACH., SST, PAN HD, 2-56 X 1/2 343-0128-000 AP FOR 16 AND 17	2	
- 19A	331-2002-000	3	SHIM, SST, 0.005 THK 79807 EFF MCN 109 AP FOR 16 AND 17	AK	
- 19B	310-0044-000	3	WASHER, FLAT, SST, 0.093 ID, 0.250 OD COML AP FOR 16 AND 17	AK	
- 20	756-6760-002	3	COIL, RF EFF THRU MCN 129 ONLY	1	L3
- 21	MS51957-6	3	SCREW, MACH., SST, PAN HD, 2-56 X 7/16 343-0127-000 AP	2	
- 22	310-0044-000	3	WASHER, FLAT, SST, 0.093 ID, 0.250 OD COML AP	2	
- 23	P312-3450-00 O	4	STUD, CONTINUOUS THD, CAD. PL BRS, 2-56 X 3/8 77250 312-3450-000	2	
- 24	545-5960-002	3	HOUSING, PILOT	1	
- 25	MS51959-14	3	SCREW, MACH., SST, FH, 4-40 X 5/16 342-0045-000 AP	2	
- 26	DEF9SC33	3	CONNECTOR 71468 371-0164-000	1	P8



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GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1104 - 27	756-6622-003	3	SHIELD, ELECTRICAL CONN	1	
- 28	756-6593-002	3	NUT, SLV	2	
R - 29	MS51959-5	3	SCREW, MACH., SST, FH, 2-56 X 3/8 342-0135-000 AP	2	
- 30	P343-0301-000	3	SCREW, MACH., NI PL BRS, PAN HD, 2-56 X 3/8 77250 343-0301-000 AP	2	
- 31	310-0044-000	3	WASHER, FLAT, SST, 0.093 ID, 0.250 OD COML AP	2	
- 31A	546-3029-003	3	WASHER AP EFF MCN 109	AR	
R - 31B	C511	3	WASHER, FINISHING, BRS, 0.138 ID, 0.360 OD 57771 310-0610-000 AP	AK	
- 32	756-6594-002	3	TUBE, SHIELD	1	
- 33	756-6752-002	3	BUSHING, ELECTRICAL COND	1	
- 34	5131-12C	3	RING 79136 340-0480-000	1	
- 35	544-0609-002	3	WASHER	1	
- 36	SFR144PPK28	3	BEARING 83086 309-0751-000	2	
- 37	544-0621-002	3	GEAR, SPUR, 20 TEETH P	1	
- 38	544-0622-002	3	SHAFT, SHOULDERED P	1	
- 39	MS51957-3	3	SCREW, MACH., SST, PAN HD, 2-56 X 1/4 343-0124-000 AP	1	
- 40	310-0044-000	3	WASHER, FLAT, SST, 0.093 ID, 0.250 OD COML AP	1	
- 41	756-6608-002	3	CONTACT, ELECTRICAL	J10	1
- 42	P343-0284-000	3	SCREW, MACH., NI PL BRS, PAN HD, 4-40 X 3/16 77250 343-0284-000 AP	1	
- 43	310-0054-000	3	WASHER, FLAT, NI PL BRS, 0.125 ID, 0.312 OD COML AP	1	
- 44	545-7669-002	3	CONTACT, ELECTRICAL P	2	
- 45	545-7674-002	3	CONTACT, ELECTRICAL P	2	
- 45A	545-7674-002	3	CONTACT, ELECTRICAL P EFF THRU MCN 129	2	
- 45A	757-3788-001	3	CONTACT, ELECTRICAL EFF MCN 130	2	
- 45B	545-7674-002	3	CONTACT, ELECTRICAL P EFF THRU MCN 129 ONLY	2	
- 46	545-7670-002	3	BLOCK, CONTACT	2	
- 46A	545-7670-002	3	BLOCK, CONTACT EFF THRU MCN 129 ONLY	1	
- 47	545-7671-002	3	SHIM, BRS, 0.032 THK	2	
- 47A	545-7671-002	3	SHIM, BRS, 0.032 THK EFF THRU MCN 129 ONLY	1	
- 48	P313-0050-000	3	NUT, PLAIN, HEX., NI PL BRS, 2-56 77250 313-0050-000 AP FOR 44 THRU 47A	4	
- 48A	P313-0050-000	3	NUT, PLAIN, HEX., NI PL BRS, 2-56 77250 313-0050-000 EFF THRU MCN 129 ONLY AP FOR 44 THRU 47A	2	
- 49	310-0075-000	3	WASHER, LOCK, BRZ, 0.088 ID, 0.165 OD COML AP FOR 44 THRU 47A	4	
- 49A	310-0074-000	3	WASHER, LOCK, BRZ, 0.088 ID, 0.175 OD COML EFF THRU MCN 129 ONLY AP FOR 44 THRU 47A	2	
- 50	543-5586-003	3	WASHER AP FOR 44 THRU 47A	AR	
- 50A	543-5586-003	3	WASHER EFF THRU MCN 129 ONLY AP FOR 44 THRU 47A	AR	
R - 50B	763-3993-001	3	SHIM, BRS, 0.171 THK AP FOR 44 THRU 47A	2	



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GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1104 - 51	P343-0361-00 0	3	SCREW, MACH., NI PL BRS, PAN HD, 2-56 X 5/8 77250 343-0361-000 AP FOR 44 THRU 47A	4	
- 51A	P343-0361-00 0	3	SCREW, MACH., NI PL BRS, PAN HD, 2-56 X 5/8 77250 343-0361-000 EFF THRU MCN 129 ONLY AP FOR 44 THRU 47A	2	
- 52	5133-12C	3	RING 79136 340-U250-000	2	
- 53	544-0639-002	3	SPRING, SWITCH P	1	
- 54	544-0640-002	3	PIN, SHOULDERED P	1	
- 55	MS51957-3	3	SCREW, MACH., SST, PAN HD, 2-56 X 1/4 343-0124-000 AP	1	
- 56	310-0044-000	3	WASHER, FLAT, SST, 0.093 ID, 0.250 OD COML AP	1	
- 57	544-0636-002	3	SCREW, EXTERNALLY RELIEVED BODY	2	
- 58	544-0632-002	3	ARM, SWITCH P	1	
- 59	756-6768-003	3	ARM, SWITCH EFF THRU MCN 129	1	
- 59	757-3789-001	3	ARM, SWITCH EFF MCN 130	1	
- 60	MS51957-1	3	SCREW, MACH., SST, PAN HD, 2-56 X 1/8 343-0122-000 AP	2	
- 61	310-0044-000	3	WASHER, FLAT, SST, 0.093 ID, 0.250 OD COML AP	2	
- 62	310-0046-000	3	WASHER, FLAT, SST, 0.147 ID, 0.312 OD COML AP	2	
- 63	541-1234-003	3	WASHER AP	AK	
- 64	544-0640-002	4	PIN, SHOULDERED P	1	
- 65	MS51957-2	4	SCREW, MACH., SST, PAN HD, 2-56 X 3/16 343-0123-000 AP	1	
- 66	310-0044-000	4	WASHER, FLAT, SST, 0.093 ID, 0.250 OD COML AP	1	
R - 67	544-0625-002	3	WASHER, SHOULDERED	2	
- 68	SFR156PPK28	3	BEARING 83086 309-0752-000	2	
- 69	545-7761-002	3	SHAFT, STR	1	
- 70	545-7764-002	3	HOUSING, SWITCH	1	
- 71	MS51959-14	3	SCREW, MACH., SST, FH, 4-40 X 5/16 342-0045-000 AP	1	
R - 72	107H187	3	TERMINAL 79963 304-6000-000	1	
- 73	919-0181-000	3	CAPACITOR, FXD, 50 PF 5%, 15 VDCW 73905	1	C3
- 74	P343-0308-00 0	3	SCREW, MACH., NI PL BRS, PAN HD, 8-32 X 5/16 77250 343-0308-000 AP FOR 72 AND 73	2	
- 75	310-0079-000	3	WASHER, LOCK, BRZ, 0.168 ID, 0.296 OD COML AP FOR 72 AND 73	2	
- 76	756-6623-003	3	RETAINER, CAPACITOR	1	
- 77	756-6624-003	3	RETAINER, CAPACITOR EFF THRU MCN 129	1	
- 77	757-3791-001	3	RETAINER, CAPACITOR EFF MCN 130	1	
- 78	P343-0309-00 0	3	SCREW, MACH., NI PL BRS, PAN HD, 8-32 X 3/8 77250 343-0309-000 AP FOR 76 AND 77	4	
- 79	310-0079-000	3	WASHER, LOCK, BRZ, 0.168 ID, 0.296 OD COML AP FOR 76 AND 77	4	
- 80	310-0057-000	3	WASHER, FLAT, NI PL BRS, 0.172 ID, 0.375 OD COML AP FOR 76 AND 77	2	
- 81	545-5961-002	3	HOUSING, PILOT	1	
- 82	MS51959-14	3	SCREW, MACH., SST, FH, 4-40 X 5/16 342-0045-000 AP	2	
- 83	756-6654-005	3	PLATE, GEAR	1	



GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1104 - 84	SFR156PPK28	2	BEARING 83086 309-0752-000 EFF THRU MCN 164	1	
- 84	S6316FRHH3P1 5L02	2	BEARING 40920 309-1521-000 EFF MCN 165	1	
- 85	544-8776-003	2	WASHER	AK	
- 85A	544-8773-003	2	WASHER EFF MCN 165	AK	
- 86	5555-18MD	2	RING 79136 340-0269-000 EFF THRU MCN 164 ONLY	1	
	544-0664-002	2	GEAR CLUSTER, SPUR P EFF THRU MCN 164, 167 THRU 169	1	
	554-3933-002	2	GEAR CLUSTER, SPUR EFF MCN 165, 166, 170 AND UP	1	
- 87	544-0620-002	3	GEAR, SPUR, 80 TEETH P	1	
- 88	544-0618-002	3	HUB, OUTPUT SHAFT P	1	
- 89	MS51959-3	3	SCREW, MACH., SST, FH, 2-56 X 1/4 342-0133-000 AP	1	
- 89A	MS51959-2	3	SCREW, MACH., SST, FH, 2-56 X 3/16 342-0132-000 AP	1	
- 90	544-0619-002	2	SPRING, HELICAL, TORSION P	1	
- 91	MS51957-13	2	SCREW, MACH., SST, PAN HD, 4-40 X 1/4 343-0133-000 AP	2	
- 92	MS35338-135	2	WASHER, LOCK, SST, 0.115 ID, 0.212 OD 310-0279-000 AP	2	
- 93	310-0045-000	2	WASHER, FLAT, SST, 0.125 ID, 0.312 OD COML AP	2	
- 94	544-0617-002	2	SPACER, SLV	1	
-	544-0659-002	2	ROLLER ASSY P	2	
- 95	MS51957-1	2	SCREW, MACH., SST, PAN HD, 2-56 X 1/8 343-0122-000 AP	2	
- 96	MS35338-134	2	WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP	2	
- 97	544-0657-002	3	PIN, STR, HDLS P	2	
R - 98	S3CHH3P28LY1 5	3	BEARING 40920 309-1162-010	2	
- 99	544-0575-002	3	SHAFT, SHOULDERED P	2	
	544-0658-002	2	ROLLER ASSY P	2	
-100	MS51959-1	2	SCREW, MACH., SST, FH, 2-56 X 1/8 342-0131-000 AP	2	
-101		1	DELETED		
-102	544-0657-002	3	PIN, STR, HDLS P	2	
R -103	S3CHH3P28LY1 5	3	BEARING 40920 309-1162-010	2	
-104	544-0574-002	3	SHAFT, SHOULDERED P	2	
-105	546-7830-002	2	CLIP, ELECTRICAL	1	
	544-0703-002	2	DRUM ASSY P	1	
-106	544-0689-002	3	END PLATE, DRUM P	1	
-107	544-0724-003	3	DRUM, GROUND P	1	
-108	323-0254-000	3	SCREW, MACH., SST, SLOT, BIND. HD, 0-80 X 1/8 COML AP FOR 106 AND 107	4	
-109	544-0739-004	2	CYLINDER, SUPPORT P	1	
-110	MS51959-2	2	SCREW, MACH., SST, FH, 2-56 X 3/16 342-0132-000 AP	8	
-111	P347-0006-00 0	2	SCREW, MACH., SST, FIL H, 4-40 X 1/4 77250 347-0006-000 AP	4	
-112	SFR156PPK28	2	BEARING 83086 309-0752-000	1	
-113	544-0728-003	2	GEARSHAFT, SPUR P	1	
-114	328-0018-000	2	SETSCREW, SST, 6-32 X 1/8 COML AP	2	



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GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1104 -115	544-0730-003	3	GEARSHAFT, SPUR DRILL ON INSTALLATION P	1	
-116	MS16562-193	3	PIN, SPG, SST, 0.062 DIA X 7/16 LG 311-0420-000 AP	1	
-117	544-0729-003	3	GEARSHAFT, SPUR DR&LL ON INSTALLATION P	1	
-118	1024-6HOTTIN NED	2	TERMINAL 77147 304-0140-000	1	
-119	P347-0167-00 0	2	SCREW, MACH., NI PL BRS, FIL H, 6-32 X 1/8 77250 347-0167-000 AP	1	
-120	310-0077-000	2	WASHER, LOCK, BRZ, 0.141 ID, 0.253 OD COML AP	1	
-121	544-0665-002	2	COLLAR, SHAFT	2	
-122	4-48X1-8 6SP LINEOVPT18-8 SST	2	SETSCREW, SST, 4-48 X 1/8 08664 335-0019-000 AP	4	
-123	543-9930-002 5100-37C	2	HOUSING ASSY	1	
-124	5100-37C	3	RING 79136 340-0043-000	1	
-124	544-0049-002	3	WASHER, SHOULDERED	1	
-125	543-5644-003	3	WASHER	1	
-126	544-0054-002	3	SPRING, HELICAL, COMPRESSION	4	
-127	543-9929-002	3	CONTACT, ELECTRICAL	1	
-128	P343-0297-00 0	3	SCREW, MACH., NI PL BRS, PAN HD, 2-56 X 1/8 77250 343-0297-000 AP	2	
-129	310-0075-000	3	WASHER, LOCK, BRZ, 0.088 ID, 0.165 OD COML AP	2	
-130	544-0028-002	3	HOUSING, TAP	1	
-131	544-0666-002	2	SHAFT, STR	1	
	544-0735-003	2	TRANSFORMER P EFF THRU MCN 169	1	
	544-3797-003	2	INDICATOR EFF MCN 170	1	
-132	544-0623-002	3	GEAR, SPUR, 20 TEETH P	1	
-133	544-2688-002	3	STOP, TAP	1	
-134	P313-0132-00 0	3	NUT, PLAIN, HEX., SST, 4-40 77250 313-0132-000 AP FOR 132 AND 133	6	
-135	310-0045-000	3	WASHER, FLAT, SST, 0.125 ID, 0.312 OD COML AP FOR 132 AND 133	6	
-136	302-0024-000	3	WASHER, NM, CORPRENE, 0.125 ID, 0.312 OD COML AP FOR 132 AND 133	6	
-137	MS51959-18	3	SCREW, MACH., SST, FH, 4-40 X 5/8 342-0049-000 AP FOR 132 AND 133	6	
-138	544-0655-002	3	SPRING, HELICAL, COMPRESSION	4	
-139	2052-6HOTTIN NED	3	TERMINAL 77147 304-0141-000	1	
-140	544-0682-002	3	SHAFT, OUTPUT P EFF THRU MCN 169	1	
-140	554-3764-002	3	SHAFT, SHOULDERED EFF MCN 170	1	
-141	P313-0132-00 0	3	NUT, PLAIN, HEX., SST, 4-40 77250 313-0132-000 AP FOR 139 AND 140	1	
-142	310-0396-000	3	WASHER, LOCK, BRZ, 0.115 ID, 0.202 OD COML AP FOR 139 AND 140	1	
-143	310-0045-000	3	WASHER, FLAT, SST, 0.125 ID, 0.312 OD COML AP FOR 139 AND 140	1	
-144	P342-0158-00 0	3	SCREW, MACH., NI PL BRS, FH, 4-40 X 3/4 77250 342-0158-000 EFF THRU MCN 169 AP FOR 139 AND 140	1	
-144	P342-0157-00 0	3	SCREW, MACH., NI PL BRS, FH, 4-40 X 5/8 77250 342-0157-000 EFF MCN 170 AP FOR 139 AND 140	1	





GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE	
1104 -145	P342-0156-00 0	3	SCREW, MACH., NI PL BRS, FH, 4-40 X 1/2 77250 342-0156-000 AP FOR 139 AND 140	3		
	544-0736-003	3	CENTER TAP ASSY P	1		
-146	544-0694-002	4	CONTACT ASSY	1		
-147	544-0695-002	4	CONTACT, ELECTRICAL	1		
-148	544-0667-002	4	RING, ELECTRICAL CONTACT	1		
-149	P343-0108-00 0	4	SCREW, MACH., CAD. PL BRS, PAN HD, 2-56 X 1/8 77250 343-0108-000 AP FOR 146 THRU 148	1		
-149A	P343-0299-00 0	4	SCREW, MACH., NI PL BRS, PAN HD, 2-56 X 1/4 77250 343-0299-000 AP FOR 146 THRU 148	1		
-150	P343-0298-00 0	4	SCREW, MACH., NI PL BRS, PAN HD, 2-56 X 3/16 77250 343-0298-000 AP FOR 146 THRU 148	3		
-150A	310-0075-000	4	WASHER, LOCK, BRZ, 0.088 ID, 0.165 OD COML AP FOR 146 THRU 148	2		
-151	544-0678-002	4	SPACER, SLV P	1		
-152	544-0676-002	4	SPACER, SLV P	1		
-153	544-0677-002	4	SPACER, SLV P	1		
-154	544-0675-002	4	SPACER, SLV P	1		
-155	NFR2-5PPC17K 28	4	BEARING 83086 309-0878-000	8		
-156	544-0669-002	4	ROLLER, CENTER P	4		
-157	544-0679-002	4	SPACER, SLV P	4		
-158	544-0677-002	4	SPACER, SLV P	1		
-159	544-0675-002	4	SPACER, SLV P	1		
-160	544-0678-002	4	SPACER, SLV P	1		
-161	544-0676-002	4	SPACER, SLV P	1		
-162	544-0686-002	4	PIN, SHOULDERED P	2		
-163	544-0680-002	4	SHAFT, STR P	2		
-164	P342-0142-00 0	4	SCREW, MACH., NI PL BRS, FH, 2-56 X 3/16 77250 342-0142-000 AP	2		
-165	544-0673-002	4	GEAR, SPUR, 136 TEETH P	1		
-166	998-0026-000	3	RIBBON, SIL 94084	1	L1	
-167	544-0112-003	3	FORM, COIL	1		
-168	544-0654-002	2	ARM, SOL. DRILL ON INSTALLATION P	2		
-169	4-48X1-8 6SP LINEOVPT18-8 SST	2	SETSCREW, SST, 4-48 X 1/8 08664 335-0019-000 AP	4		
-170	MS16562-191	2	PIN, SPG, SST, 0.062 DIA X 5/16 LG 311-0418-000 AP	2		
	756-6749-000	2	GEARCASE, MOTOR	1		
-171	50-101CR3	3	CORE 83616 288-2504-000	1		
-172	MS51959-67	3	SCREW, MACH., SST, FH, 10-24 X 1 342-0103-000 AP	6		
R	-173	544-0580-002	3	POST, ELECTRICAL-MECHANICAL EQUIP.	4	
R	-174	MS51959-45	3	SCREW, MACH., SST, FH, 8-32 X 1/2 342-0080-000 AP	4	
	-175	544-0688-002	3	CONTACT ASSY P	1	
R	-176	P343-0297-00 0	3	SCREW, MACH., NI PL BRS, PAN HD, 2-56 X 1/8 77250 343-0297-000 AP	4	
R	-177	310-0075-000	3	WASHER, LOCK, BRZ, 0.088 ID, 0.165 OD COML AP	4	
	-178	544-0722-003	3	PLATE, GEAR P	1	
	-179	544-0588-002	3	SPACER, SLV	2	



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GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
R 1104	-180	MS51957-21	3 SCREW, MACH., SST, PAN HD, 4-40 X 1 343-0141-000 AP FOR 178 AND 179	2	
	-181	MS35338-135	3 WASHER, LOCK, SST, 0.115 ID, 0.212 OD 310-0279-000 AP FOR 178 AND 179	2	
	-182	SFR144PPK28	3 BEARING 83086 309-0751-000	2	
	-183	544-0589-002	3 GEAR, SPUR, 89 TEETH P	1	
	-184	SFR156PPK28	3 BEARING 83086 309-0752-000 EFF THRU MCN 164	1	
	-184	S6316FRHH3P1 5L02	3 BEARING 40920 309-1521-000 EFF MCN 165	1	
	-184A	SFR156PPK28	3 BEARING 83086 309-0752-000 EFF THRU MCN 164	1	
	-184A	S187-375HHP1 5L02	3 BEARING 40920 309-1926-000 EFF MCN 165	1	
	-184B	544-8773-003	3 WASHER	AR	
	-184C	544-8776-003	3 WASHER	1	
	-185	544-0663-002	3 GEARSHAFT, SPUR P	1	
	-186	544-0590-002	4 GEAR CLUSTER, SPUR DRILL ON INSTALLATION P	1	
	-187	MS16562-191	4 PIN, SPG, SST, 0.062 DIA X 5/16 LG 311-0418-000 AP	1	
	-188	544-0614-003	4 SHAFT, STR DRILL ON INSTALLATION P	1	
	-189	544-0723-003	3 GEAR, SPUR, 63 TEETH P	1	
	-190	X5131-18C	3 RING 79136 340-0485-000 AP	1	
	-191	543-5652-003	3 WASHER AP	AR	
	-192	SFR156PPK28	3 BEARING 83086 309-0752-000	1	
	-193	S6632FCHHP28 LY15	3 BEARING 40920 309-0753-000 EFF THRU MCN 164	1	
	-193	S6316FRHH3P1 5L02	3 BEARING 40920 309-1521-000 EFF MCN 165	1	
	-194	SPL4040-2HOT TINNED	3 TERMINAL 77147 304-0331-000	1	
	-195	553-4383-003	3 DUCT, AIR	K4	
	-196	553-4382-002	3 DUCT, AIR	1	
	-197	MS51957-3	3 SCREW, MACH., SST, PAN HD, 2-56 X 1/4 343-0124-000 AP FOR 194 THRU 196	2	
	-198	310-0075-000	3 WASHER, LOCK, BRZ, 0.088 ID, 0.165 OD COML AP FOR 194 THRU 196	2	
	-199	310-6320-000	3 WASHER, FLAT, SST, 0.092 ID, 0.218 OD COML AP FOR 194 THRU 196	1	
	-200	544-0587-002	3 POST, ELECTRICAL-MECHANICAL EQUIP.	2	
	-201	P312-0007-00 O	3 STUD, CONTINUOUS THD, SST, 4-40 X 3/8 77250 312-0007-000 AP	2	
	-202	SPL4040-4HOT TINNED	3 TERMINAL 77147 304-0332-000	6	
	-203	665-53-214-1	3 MOTOR 72568 229-0296-000 OR	B1	
	-203	CV50112650	3 MOTOR 88818 229-0295-000	B1	
	-203A	757-4528-001	3 SHIM, AL, 0.001 THK EFF MCN 165 AP	1	
	-204	MS51959-13	3 SCREW, MACH., SST, FH, 4-40 X 1/4 342-0044-000 AP	4	
	-205	544-0721-003	3 PLATE, GEAR	1	
	-206	CK15AX223M	3 CAPACITOR, FXD, 22,000 PF 20%, 100 VDCW 913-3022-000	C22	



GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1104 -207	RC20GF100K	3	RESISTOR, FXD, 10 OHMS 10%, 1/2 W 745-1268-000	R22	1
-208	RC20GF100K	3	RESISTOR, FXD, 10 OHMS 10%, 1/2 W 745-1268-000	R28	1
-209	CK15AX223M	3	CAPACITOR, FXD, 22,000 PF 20%, 100 VDCW 913-3022-000	C29	1
-210	CK15AX223M	3	CAPACITOR, FXD, 22,000 PF 20%, 100 VDCW 913-3022-000	C28	1
-211	CK15AX223M	3	CAPACITOR, FXD, 22,000 PF 20%, 100 VDCW 913-3022-000	C26	1
-212	238975A	3	SWITCH SECTION 76854 269-2571-000	S2	1
-213	15523 1-8	3	INSULATOR 76854 269-8021-000		4
-214	238974A	3	SWITCH SECTION 76854 269-2570-000	S1	1
-215	MS51957-7	3	SCREW, MACH., SST, PAN HD, 2-56 X 1/2 343-0128-000 AP FOR 212 THRU 214		2
-216	15517-002	3	WASHER, NM, PLSTC, 0.088 ID, 0.150 OD 76854 269-8031-000 AP FOR 212 THRU 214		2
-217	RTMT12M	3	TERMINAL 91663 306-0976-000		1
-218	MS51957-26	3	SCREW, MACH., SST, PAN HD, 6-32 X 5/16 343-0167-000 AP		1
-219	544-0611-002	3	SPRING, HELICAL, EXTENSION P		1
-220	541-5177-002	3	BUTTON, CABLE		1
-221	MS51957-4	3	SCREW, MACH., SST, PAN HD, 2-56 X 5/16 343-0125-000 AP		1
-222	310-0045-000	3	WASHER, FLAT, SST, 0.125 ID, 0.312 OD COML AP		1
-223	544-0579-002	3	SPACER, SLV		3
-224	544-0681-002	3	PLATE, GEAR P		1
-225	544-0711-002	3	SCREW, MACH. P AP FOR 223 AND 224		3
-226	MS35338-136	3	WASHER, LOCK, SST, 0.141 ID, 0.253 OD 310-0282-000 AP FOR 223 AND 224		3
-227	544-0604-002	4	BEARING, SLV P		3
-228	544-0610-002	4	PIN, SHOULDERED P		1
-229	544-0718-003	4	PLATE, GEAR		1
-230	544-0596-002	3	BLOCK, STOP		1
-231	MS51957-3	3	SCREW, MACH., SST, PAN HD, 2-56 X 1/4 343-0124-000 AP		1
-232	544-0647-002	3	GEAR, SPUR, 120 TEETH P		1
-233	4-48X1-8 6SP LINEOVPT18-8 SST	3	SETSCREW, SST, 4-48 X 1/8 08664 335-0019-000 AP		2
-234	544-0594-002	4	HUB, GEAR, DRUM P		1
-235	544-0593-002	4	GEAR, SPUR, 120 TEETH P		1
-236	544-0595-002	4	SHAFT, SHOULDERED		1
-237	SFR144PPK28	3	BEARING 83086 309-0751-000		1
-238	544-0661-002	3	BAR ASSY P		1
-239	544-0592-002	4	GEARSHAFT, SPUR P		1
-240	544-0591-002	4	STOP, CAM P		1
-241	544-0582-002	4	TORSION BAR P		1
-242	SFR156PPK28	3	BEARING 83086 309-0752-000		1
-243	544-0598-002	3	GEARSHAFT, SPUR P		1
-244	SFR156PPK28	3	BEARING 83086 309-0752-000		1
-245	544-0672-002	3	STOP, ASSY P		1
-246	544-0650-002	3	GEAR, STOP ASSY		1



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GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1104	-247	544-0602-002	3 SHAFT, SHOULDERS	1	
	-248	4-48X1-8 6SP LINEOVPT18-8 SST	3 SETSCREW, SST, 4-48 X 1/8 08664 335-0019-000 AP FOR 246 AND 247	2	
	-249	SFR144PPK28	3 BEARING 83086 309-0751-000	2	
	-250	544-0648-002	3 GEARSHAFT, SPUR P	1	
	-251	SFR144PPK28	3 BEARING 83086 309-0751-000	2	
	-252	544-0649-002	3 GEARSHAFT, SPUR P	1	
	-253	544-0601-002	4 GEARSHAFT, SPUR P	1	
	-254	544-0600-002	4 GEAR, SPUR, 145 TEETH P	1	
	-255	1N645	3 SEMICOND DEVICE 353-2607-000	1	CR5
R	-256	553-4383-003	3 DUCT, AIR	1	K3
	-257	541-5955-002	3 SPACER, SLV	2	
	-258	MS51957-6	3 SCREW, MACH., SST, PAN HD, 2-56 X 7/16 343-0127-000 AP FOR 256 AND 257	2	
	-259		1 DELETED		
	-260	310-6320-000	3 WASHER, FLAT, SST, 0.092 ID, 0.218 OD COML AP FOR 256 AND 257	2	
	-261	HP5N	3 CLAMP 09922 150-1542-000	1	
	-262	541-5983-002	3 SPACER, SLV	1	
	-263	MS35649-44	3 NUT, PLAIN, HEX., SST, 4-40 313-0043-000 AP FOR 261 AND 262	1	
	-264	310-0045-000	3 WASHER, FLAT, SST, 0.125 ID, 0.312 OD COML AP FOR 261 AND 262	1	
	-265	MS51957-20	3 SCREW, MACH., SST, PAN HD, 4-40 X 7/8 343-0140-000 AP FOR 261 AND 262	1	
R	-266	SPL4040-4HUT TINNED	3 TERMINAL 77147 304-0332-000	6	
	-267	665-53-214-1	3 MOTOR 72568 229-0296-000 OR	1	B2
	-267	CV50112650	3 MOTOR 88818 229-0295-000	1	B2
	-268	MS51959-12	3 SCREW, MACH., SST, FH, 4-40 X 3/16 342-0043-000 AP	4	
	-269	A0-15497-2	3 FAN 82877 009-1376-000 OR	1	B3
	-269	V1HJG8-3C	3 FAN 19070 009-1498-000	1	B3
	-270	MS51957-29	3 SCREW, MACH., SST, PAN HD, 6-32 X 7/16 343-0170-000 AP	3	
	-271	554-3782-003	3 PLATE, RETAINING	1	
	-272	P343-0299-00 O	3 SCREW, MACH., NI PL BRS, PAN HD, 2-56 X 1/4 77250 343-0299-000 AP	4	
	-272A	MS51957-2	3 SCREW, MACH., SST, PAN HD, 2-56 X 3/16 343-0123-000 AP	2	
	-273	MS35338-134	3 WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP	4	
R	-274		1 DELETED		
R	-275		1 DELETED		
	-276	67321-0-122	3 SWITCH 73168 267-0071-000	1	S5
	-277	MS51957-26	3 SCREW, MACH., SST, PAN HD, 6-32 X 5/16 343-0167-000 AP	3	
	-278	MS35338-136	3 WASHER, LOCK, SST, 0.141 ID, 0.253 OD 310-0282-000 AP	3	
	-279	544-0577-002	3 PIN, ROLLER, COIL P	4	
	-280	544-0578-002	3 INSULATOR, ROLLER P	4	
	-281	544-0576-002	3 SUPPORT, ROLLER, COIL P	4	
	-282	S6632CHHP28L Y15	3 BEARING 40920 309-0755-000	4	



GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1104 -283	MS51957-13	3	SCREW, MACH., SST, PAN HD, 4-40 X 1/4 343-0133-000 AP FOR 279 THRU 282	4	
-284	MS35338-135	3	WASHER, LOCK, SST, 0.115 ID, 0.212 OD 310-0279-000 AP FOR 279 THRU 282	4	
-285	310-0045-000	3	WASHER, FLAT, SST, 0.125 ID, 0.312 OD COML AP FOR 279 THRU 282	4	
-286	756-6773-005	3	PLATE, GEAR	1	
-287	MS51959-45	3	SCREW, MACH., SST, FH, 8-32 X 1/2 342-0080-000 AP	1	
-288	MS51957-14	3	SCREW, MACH., SST, PAN HD, 4-40 X 5/16 343-0134-000 AP	1	
-289	MS35338-135	3	WASHER, LOCK, SST, 0.115 ID, 0.212 OD 310-0279-000 AP	1	
-290	544-0604-002	4	BEARING, SLV P	3	
-291	544-0645-002	4	INSULATOR, BUSHING	1	
-292		1	DELETED		
-293		1	DELETED		
-294		1	DELETED		
	756-8354-000	3	WIRING HARNESS	1	
-295	756-6751-002	4	CONNECTOR, RECP, ELECTRICAL	1	J7
-295A	A1750CTEFLON	4	GASKET 97968 200-2243-000	1	
-295B	756-6600-002	4	NUT, PLAIN, HEX. AP FOR 295 AND 295A	1	
-296	756-8372-003	4	ADAPTER, CONN	1	
-296A	A937CTEFLON	4	GASKET 97968 200-2223-000	1	
-296B	756-8378-002	4	NUT, PLAIN, HEX. AP FOR 296 AND 296A	1	
-297	RC2UGF100K	3	RESISTOR, FXD, 10 OHMS 10%, 1/2 W 745-1268-000	1	R27
-298	CK15AX223M	3	CAPACITOR, FXD, 22,000 PF 20%, 100 VDCW 913-3022-000	1	C27
-299	1N645	3	SEMICONV DEVICE 353-2607-000	1	CR3
-300	CK15AX223M	3	CAPACITOR, FXD, 22,000 PF 20%, 100 VDCW 913-3022-000	1	C13
-301	CK15AX223M	3	CAPACITOR, FXD, 22,000 PF 20%, 100 VDCW 913-3022-000	1	C12
-302	1N645	3	SEMICONV DEVICE 353-2607-000	1	CR2
-303	RC2UGF100K	3	RESISTOR, FXD, 10 OHMS 10%, 1/2 W 745-1268-000	1	R25
-304	CK15AX223M	3	CAPACITOR, FXD, 22,000 PF 20%, 100 VDCW 913-3022-000	1	C25
	756-6746-000	3	ANTENNA COUPLER SUBASSEMBLY	1	
-305	11041-101-9	4	SWITCH 82647 267-0206-000	1	S4
-306	68-1660-40	4	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP	2	
R -307	MS51957-12	4	SCREW, MACH., SST, PAN HD, 4-40 X 3/16 343-0132-000 AP	2	
-307A	MS35338-134	4	WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP	2	
-308	RTMT12M	4	TERMINAL 91663 306-0976-000	1	
-309	MS51957-12	4	SCREW, MACH., SST, PAN HD, 4-40 X 3/16 343-0132-000 AP	1	
-310	MS35338-135	4	WASHER, LOCK, SST, 0.115 ID, 0.212 OD 310-0279-000 AP	1	
-311	GB300-148-1A	4	SWITCH 80586 266-8335-000	1	S8
-312	310-0134-000	4	WASHER, FLAT, STL, 0.116 ID, 0.312 OD COML AP	2	



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GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1104	-313	302-0024-000	4 WASHER, NM, CORPRENE, 0.125 ID, 0.312 OD COML AP	2	
R	-314	MS51957-14	4 SCREW, MACH., SST, PAN HD, 4-40 X 5/16 343-0134-000 AP	2	
	-315	546-0327-002	4 BRACKET, ELECTRICAL	2	
	-316	MS51957-12	4 SCREW, MACH., SST, PAN HD, 4-40 X 3/16 343-0132-000 AP	4	
	-317	MS35338-135	4 WASHER, LOCK, SST, 0.115 ID, 0.212 OD 310-0279-000 AP	4	
	-318	310-0045-000	4 WASHER, FLAT, SST, 0.125 ID, 0.312 OD COML AP	4	
	-319	A39097-001	4 SOLENOID 81840 411-0017-000	1	K1
	-320	A39097-001	4 SOLENOID 81840 411-0017-000	1	K2
	-321	544-0638-002	4 SPACER, SLV	4	
	-322	P313-0163-00 0	4 NUT, PLAIN, HEX., NI PL BRS, 3-48 77250 313-0163-000 AP FOR 319 THRU 321	4	
	-323	310-0277-000	4 WASHER, LOCK, SST, 0.102 ID, 0.198 OD COML AP FOR 319 THRU 321	4	
	-324	260-0024-00	4 SWITCH 80411 266-3118-000	1	S6
	-325	MS35649-24	4 NUT, PLAIN, HEX., SST, 2-56 313-0037-000 AP	2	
R	-326	310-0044-000	4 WASHER, FLAT, SST, 0.093 ID, 0.250 OD COML AP	2	
	-327	302-0023-000	4 WASHER, NM, CORPRENE, 0.093 ID, 0.250 OD COML AP	2	
	-328	MS51957-7	4 SCREW, MACH., SST, PAN HD, 2-56 X 1/2 343-0128-000 AP	2	
	-329	544-0706-002	4 PLATE, MTG P	1	
	-330	MS51957-2	4 SCREW, MACH., SST, PAN HD, 2-56 X 3/16 343-0123-000 AP	2	
	-331	MS35338-134	4 WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP	2	
	-332	5133-12C	4 RING 79136 340-0250-000	1	
	-333	545-2956-002	4 ROLLER, SWITCH P	1	
	-334	544-0707-002	4 SCREW, MACH. P	1	
	-335	MS35649-24	4 NUT, PLAIN, HEX., SST, 2-56 313-0037-000 AP	1	
	-336	5133-9C	4 RING 79136 340-0249-000	1	
	-337	544-0708-002	4 LEVER, SWITCH P	1	
	-338	544-0704-002	4 BLOCK, SWITCH	1	
	-339	MS51957-4	4 SCREW, MACH., SST, PAN HD, 2-56 X 5/16 343-0125-000 AP	2	
	-340	MS35338-134	4 WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP	2	
	-341	544-0698-002	4 POST, ELECTRICAL-MECHANICAL EQUIP.	2	
	-342	P312-0064-00 0	4 STUD, CONTINUOUS THD, CAD, PL BRS, 4-40 X 1/2 77250 312-0064-000 AP	1	
	-343	MS51957-14	4 SCREW, MACH., SST, PAN HD, 4-40 X 5/16 343-0134-000 AP	1	
	-344	MS35338-135	4 WASHER, LOCK, SST, 0.115 ID, 0.212 OD 310-0279-000 AP	1	
	-345	544-0630-002	4 STRIP, BACKING	1	
	-346	544-0710-002	4 STRIP, SUPPORT	1	
	-347	MS51957-3	4 SCREW, MACH., SST, PAN HD, 2-56 X 1/4 343-0124-000 AP FOR 345 AND 346	5	

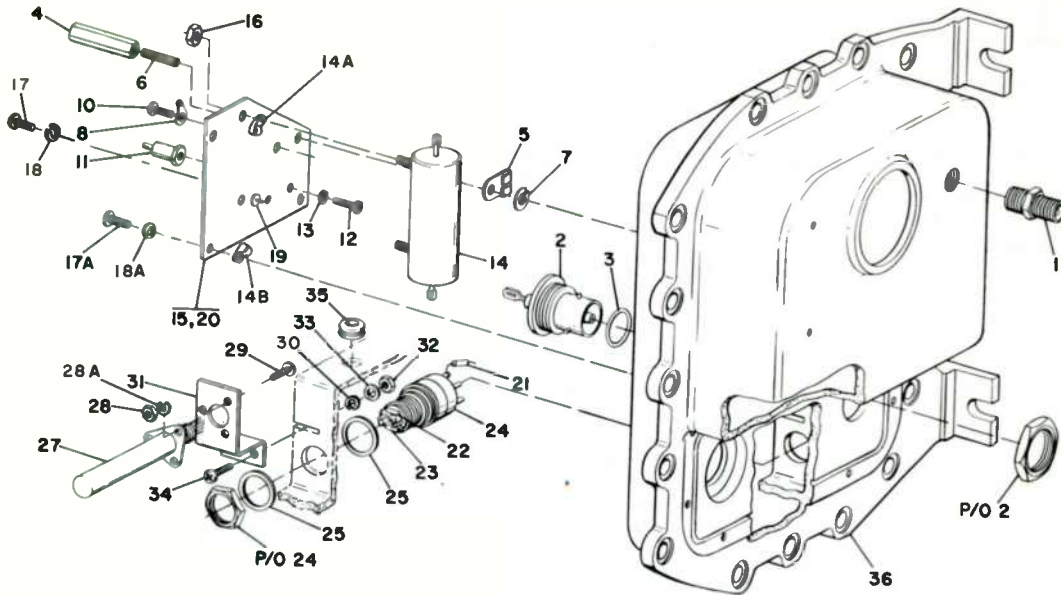


GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
R 1104	-347A MS35338-134	4	WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP FOR 345 AND 346	5	
	-347B 310-0053-000	4	WASHER, FLAT, NI PL BRS, 0.093 ID, 0.250 OD COML AP FOR 345 AND 346	1	
	-348 310-0044-000	4	WASHER, FLAT, SST, 0.093 ID, 0.250 OD COML AP FOR 345 AND 346	1	
	-349 756-6639-003	4	PLATE, MTG	1	
	-350 MS51957-2	4	SCREW, MACH., SST, PAN HD, 2-56 X 3/16 343-0123-000 AP	3	
	-350A P343-0298-00 0	4	SCREW, MACH., NI PL BRS, PAN HD, 2-56 X 3/16 77250 343-0298-000 AP	1	
	-351 310-0074-000	4	WASHER, LOCK, BRZ, 0.088 ID, 0.175 OD COML AP	1	
	-351A MS35338-134	4	WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP	2	
	-352 310-0053-000	4	WASHER, FLAT, NI PL BRS, 0.093 ID, 0.250 OD COML AP	1	
	-352A P343-0044-00 0	4	SCREW, MACH., SST, PAN HD, 6-32 X 2 77250 343-0044-000 AP	2	
	-353 545-7779-002	4	TERMINAL, LUG	2	
	-354 544-0629-002	4	STRIP, BACKING	1	
	-355 MS35649-24	4	NUT, PLAIN, HEX., SST, 2-56 313-0037-000 AP FOR 353 AND 354	4	
	-355A MS35338-134	4	WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP FOR 353 AND 354	4	
	-356 MS51957-2	4	SCREW, MACH., SST, PAN HD, 2-56 X 3/16 343-0123-000 AP FOR 353 AND 354	4	
	-357 13535	4	SHIELDING GASKET 07700 018-1347-000	AK	
	-358 544-0699-002	4	POST, ELECTRICAL-MECHANICAL EQUIP.	1	
	-359 MS51957-4	4	SCREW, MACH., SST, PAN HD, 2-56 X 5/16 343-0125-000 AP	3	
	-360 310-0044-000	4	WASHER, FLAT, SST, 0.093 ID, 0.250 OD COML AP	3	
	-360A MS35338-134	4	WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP	3	
	-361 544-0584-002	4	POST, ELECTRICAL-MECHANICAL EQUIP.	1	
	-362 MS51957-3	4	SCREW, MACH., SST, PAN HD, 2-56 X 1/4 343-0124-000 AP	3	
	-363 310-0074-000	4	WASHER, LOCK, BRZ, 0.088 ID, 0.175 OD COML AP	3	
	-364 MS35338-134	4	WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP	1	
	-365 756-6652-004	4	PLENUM, AIR	1	



GROUP ASSEMBLY PARTS LIST



Front Housing Assembly  
Figure 1105

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1105 - 0	756-6748-000	1	FRONT HOUSING ASSY SEE FIG. 1104-1 FOR NHA	REF	
- 1	013-3130-000	2	VALVE PNEUMATIC TANK 17875	1	
- 2	01061A	2	CONNECTOR 94375 357-9506-000	1	J4
- 3	U2210-00938N PD	2	GASKET 04812 200-1511-000	1	
- 4	540-9225-003	2	POST, ELECTRICAL-MECHANICAL EQUIP.	1	
- 5	107H187	2	TERMINAL 79963 304-6000-000	1	
- 6	P312-0077-000	2	STUD, CONTINUOUS THD, SST, 6-32 X 5/8 77250 312-0077-000 AP FOR 4 AND 5	1	
- 7	MS35338-136	2	WASHER, LOCK, SST, 0.141 ID, 0.253 OD 310-0282-000 AP FOR 4 AND 5	1	
- 8	2104-04-01-2 520N	2	TERMINAL 78189 304-0317-000	1	
- 9		1	DELETED		
- 10	MS51957-15	2	SCREW, MACH., SST, PAN HD, 4-40 X 3/8 343-0135-000 AP	1	
- 11	RTMT12-6M	2	TERMINAL 91663 306-0978-000	2	
- 12	MS51957-26	2	SCREW, MACH., SST, PAN HD, 6-32 X 5/16 343-0167-000 AP	2	



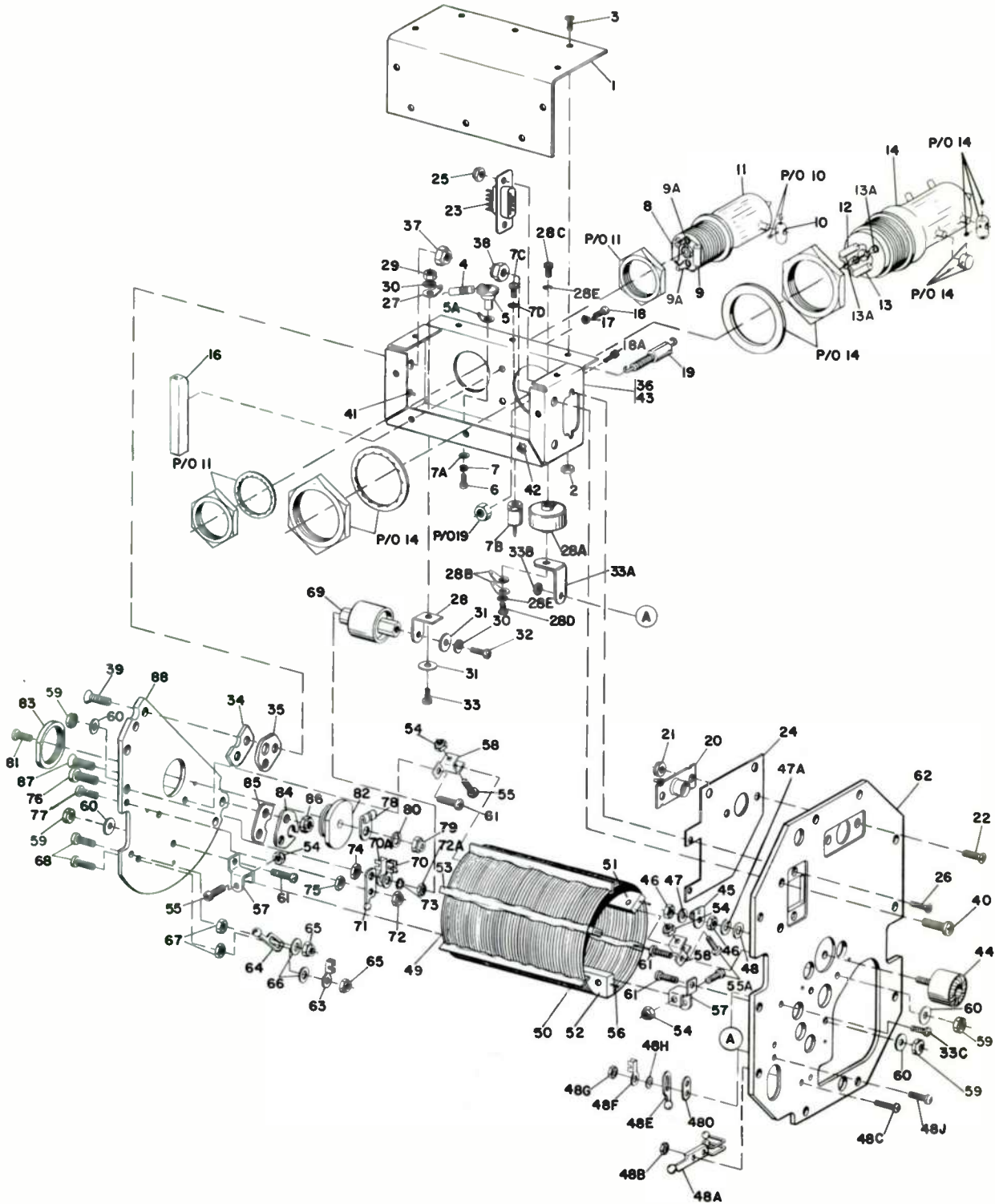


GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1105 - 13	MS35338-136	2	WASHER, LOCK, SST, 0.141 ID, 0.253 OD 310-0282-000 AP	2	
- 14	S92212A	2	CAPACITOR, FXD, 0.47 UF 10%, 220 VDCW 56289 931-7111-000	1	C2
- 14A	HP5N	2	CLAMP 09922 150-1542-000	1	
- 14B	HP4N	2	CLAMP 09922 150-1541-000	1	
- 15	756-8323-003	2	PLATE, MTG	1	
- 16	MS35649-64	2	NUT, PLAIN, HEX., SST, 6-32 313-0002-000 AP FOR 14, 14A, 14B AND 15	2	
- 17	P347-0035-00 0	2	SCREW, MACH., SST, FIL H, 6-32 X 3/8 77250 347-0035-000 AP FOR 14, 14A, 14B AND 15	3	
- 17A	MS51957-28	2	SCREW, MACH., SST, PAN HD, 6-32 X 3/8 343-0169-000 AP FOR 14, 14A, 14B AND 15	1	
- 18	MS35338-136	2	WASHER, LOCK, SST, 0.141 ID, 0.253 OD 310-0282-000 AP FOR 14, 14A, 14B AND 15	1	
- 18A	310-0046-000	2	WASHER, FLAT, SST, 0.147 ID, 0.312 OD COML AP FOR 14, 14A, 14B AND 15	1	
- 19	SL276-198DWH T	3	TERMINAL 12615 306-1321-000	1	
- 20	756-8322-003	3	PLATE, MTG	1	
- 21	RC2UGF561K	2	RESISTOR, FXD, 560 OHMS 10%, 1/2 W 745-1342-000	1	R1
- 22	CK15AX223M	2	CAPACITOR, FXD, 22,000 PF 20%, 100 VDCW 913-3022-000	1	C11
- 23	1N645	2	SEMICONV DEVICE 353-2607-000	1	CR1
- 24	RJ1A26N323	2	RELAY 73905 410-0346-000	1	K8
- 25	756-9965-002	2	WASHER AP	2	
- 26		1	DELETED		
- 27	267-0216-000	2	SWITCH, THERMO 73168	1	S3
- 28	P313-0140-00 0	2	NUT, PLAIN, HEX., NI PL BRS, 6-32 77250 313-0140-000 AP FOR 26 AND 27	3	
- 28A	310-0077-000	2	WASHER, LOCK, BRZ, 0.141 ID, 0.253 OD COML AP FOR 26 AND 27	3	
- 29	MS51957-15	2	SCREW, MACH., SST, PAN HD, 4-40 X 3/8 343-0135-000 AP FOR 26 AND 27	3	
- 30	310-0396-000	2	WASHER, LOCK, BRZ, 0.115 ID, 0.202 OD COML	2	
- 31	756-8321-002	2	BRACKET, THERMO	1	
- 32	P313-0051-00 0	2	NUT, PLAIN, HEX., NI PL BRS, 4-40 77250 313-0051-000 AP FOR 30 AND 31	2	
- 33	310-0045-000	2	WASHER, FLAT, SST, 0.125 ID, 0.312 OD COML AP FOR 30 AND 31	2	
- 34	P343-0287-00 0	2	SCREW, MACH., NI PL BRS, PAN HD, 4-40 X 3/8 77250 343-0287-000 AP FOR 30 AND 31	2	
- 35	MS35489-33	2	GROMMET 201-0019-000	1	
- 36	756-6665-005	2	HOUSING, FRONT	1	



GROUP ASSEMBLY PARTS LIST



RF Load Coil  
Figure 1106



GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1106 - 0	756-6750-000	1	RF LOAD COIL SEE FIG. 1102-14 FOR NHA		REF
- 1	756-6625-003	2	COVER, CHASSIS		1
- 2	68-1660-40	2	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP		3
- 3	MS51957-13	2	SCREW, MACH., SST, PAN HD, 4-40 X 1/4 343-0133-000 AP		10
- 4	MS90540-07	2	COIL, RF, 2000 UH 240-2547-000	L6	1
- 5	66200301B310 2M	2	CAPACITOR, FXD, 1000 PF 20%, 500 VDCW 72982 912-0720-000	C1	1
- 5A	2104-04-01-2 520N	2	TERMINAL 78189 304-0317-000 EFF MCN 130		1
- 6	P343-0384-00 0	2	SCREW, MACH., NI PL BRS, PAN HD, 3-48 X 1/4 77250 343-0384-000 AP FOR 5 AND 5A		1
- 7	310-0394-000	2	WASHER, LOCK, BRZ, 0.102 ID, 0.188 OD COML AP FOR 5 AND 5A		1
- 7A	310-0054-000	2	WASHER, FLAT, NI PL BRS, 0.125 ID, 0.312 OD COML EFF MCN 130 AP FOR 5 AND 5A		1
- 7B	RTMT12M	2	TERMINAL 91663 306-0976-000 AP FOR 5 AND 5A		1
- 7C	P343-0285-00 0	2	SCREW, MACH., NI PL BRS, PAN HD, 4-40 X 1/4 77250 343-0285-000 AP FOR 5 AND 5A		1
- 7D	310-0396-000	2	WASHER, LOCK, BRZ, 0.115 ID, 0.202 OD COML AP FOR 5 AND 5A		1
- 8	1N645	2	SEMICOND DEVICE 353-2607-000	CR6	1
- 9	CK15AX223M	2	CAPACITOR, FXD, 22,000 PF 20%, 100 VDCW 913-3022-000	C10	1
R - 9A	491-32-11-08 0-933	2	TERMINAL 71785 304-0011-000		2
- 10	544-0090-002	2	CONNECTOR EFF THRU MCN 129 ONLY		2
- 11	RD6B26N359	2	RELAY 73905 410-0389-000	K5	1
- 12	1N645	2	SEMICOND DEVICE 353-2607-000	CR4	1
- 13	CK15AX223M	2	CAPACITOR, FXD, 22,000 PF 20%, 100 VDCW 913-3022-000	C14	1
R - 13A	491-32-11-08 0-933	2	TERMINAL 71785 304-0011-000		2
- 14	RB3-26D737	2	RELAY 73905 410-0168-000	K9	1
- 15		1	DELETED		
- 16	757-3872-001	2	BLOCK, STIFF. EFF MCN 150		1
- 17	310-0076-000	2	WASHER, LOCK, BRZ, 0.115 ID, 0.212 OD COML AP FOR 15 AND 16		3
- 18	P343-0286-00 0	2	SCREW, MACH., NI PL BRS, PAN HD, 4-40 X 5/16 77250 343-0286-000 AP FOR 15 AND 16		3
- 18A	MS51957-80	2	SCREW, MACH., SST, PAN HD, 1/4-20 X 5/8 343-0266-000 AP FOR 15 AND 16		1
- 19	327-029X5T01 02Z	2	CAPACITOR, FXD, 1000 PF P80M20%, 500 VDCW 72982 913-1292-000	C15	1
- 20	DA11C15	2	CONNECTOR 71468 371-0239-000	J9	1
- 21	68NM40	2	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0347-000 AP		2
- 22	MS51959-14	2	SCREW, MACH., SST, FH, 4-40 X 5/16 342-0045-000 AP		2
- 23	DE9PC33	2	CONNECTOR 71468 371-0168-000	J8	1
- 24	756-6629-003	2	PLATE, ELECTRICAL GROUNDING		1



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GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1106 - 25	68-1660-26	2	NUT, SELF-LKG, HEX., AL, 2-56 72962 333-0604-000 AP FOR 23 AND 24	2	
- 26	MS51959-4	2	SCREW, MACH., SST, FH, 2-56 X 5/16 342-0134-000 AP FOR 23 AND 24	2	
- 27	2104-06-02-2	2	TERMINAL 78189 304-0318-000	1	
	520N		EFF THRU MCN 129 ONLY		
- 28	756-6612-002	2	RETAINER, CAPACITOR EFF THRU MCN 129	1	
- 28A	DA858-003	2	CAPACITOR, FXD, 1000 PF 20%, 5000 VDCW 71590 913-0101-000 EFF MCN 130	1	C5
- 28B	1024-6HOTTIN NED	2	TERMINAL 77147 304-0140-000 EFF MCN 130	2	
- 28C	P343-0328-00 0	2	SCREW, MACH., NI PL BRS, PAN HD, 6-32 X 1/4 77250 343-0328-000 EFF MCN 130 AP FOR 27 THRU 28B	1	
- 28D	P343-0329-00 0	2	SCREW, MACH., NI PL BRS, PAN HD, 6-32 X 5/16 77250 343-0329-000 EFF MCN 130 AP FOR 27 THRU 28B	1	
- 28E	310-0077-000	2	WASHER, LOCK, BRZ, 0.141 ID, 0.253 OD COML EFF MCN 130 AP FOR 27 THRU 28B	2	
- 30	310-0077-000	2	WASHER, LOCK, BRZ, 0.141 ID, 0.253 OD COML EFF THRU MCN 129 AP FOR 27 THRU 28B	2	
- 31	310-0056-000	2	WASHER, FLAT, NI PL BRS, 0.147 ID, 0.375 OD COML EFF THRU MCN 129 AP FOR 27 THRU 28B	2	
- 32	P343-0329-00 0	2	SCREW, MACH., NI PL BRS, PAN HD, 6-32 X 5/16 77250 343-0329-000 EFF THRU MCN 129 AP FOR 27 THRU 28B	1	
- 33	P343-0328-00 0	2	SCREW, MACH., NI PL BRS, PAN HD, 6-32 X 1/4 77250 343-0328-000 EFF THRU MCN 129 AP FOR 27 THRU 28B	1	
- 33A	757-3770-001	2	RETAINER, CAPACITOR EFF MCN 130	1	
- 33B	68-1660-40	2	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP	1	
- 33C	P343-0287-00 0	2	SCREW, MACH., NI PL BRS, PAN HD, 4-40 X 3/8 77250 343-0287-000 AP	1	
- 34	756-6603-002	2	SPACER, PIN BRACKET	1	
- 35	756-6604-002	2	BRACKET, PIN	1	
- 36	756-6645-004	2	BRACKET, RELAY	1	
- 37	68NM82	2	NUT, SELF-LKG, HEX., AL, 8-32 72962 333-0381-000 AP FOR 34 THRU 36	2	
- 38	68NM62	2	NUT, SELF-LKG, HEX., AL, 6-32 72962 333-0368-000 AP FOR 34 THRU 36	2	
- 39	MS51959-47	2	SCREW, MACH., SST, FH, 8-32 X 3/4 342-0082-000 AP FOR 34 THRU 36	2	
- 40	MS51957-30	2	SCREW, MACH., SST, PAN HD, 6-32 X 1/2 343-0171-000 AP FOR 34 THRU 36	2	
- 41	G2522	3	TERMINAL 12615 306-0323-000	1	
- 42	F22NCFMA1-40	3	NUT, SELF-LKG, CLINCH, CAD. PL STL, 4-40 72962 333-0839-000	7	



GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1106 - 43	756-6644-004	3	BRACKET, RELAY	1	
- 44	756-6754-002	2	CONTACT ASSY, ELECTRICAL	1	P10
- 45	107H187	2	TERMINAL 79963 304-6000-000	1	
- 46	P313-0140-000	2	NUT, PLAIN, HEX., NI PL BRS, 6-32	2	
	0		77250 313-0140-000 AP FOR 44 AND 45		
- 47	MS35338-136	2	WASHER, LOCK, SST, 0.141 ID, 0.253 OD 310-0282-000 AP FOR 44 AND 45	2	
- 47A	310-0077-000	2	WASHER, LOCK, BRZ, 0.141 ID, 0.253 OD COML AP FOR 44 AND 45	1	
- 48	310-0056-000	2	WASHER, FLAT, NI PL BRS, 0.147 ID, 0.375 OD COML AP FOR 44 AND 45	1	
- 48A	757-3775-001	2	CONTACT ASSY EFF MCN 130	1	
- 48B	68-1660-40	2	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP	2	
- 48C	P343-0289-000	2	SCREW, MACH., NI PL BRS, PAN HD, 4-40 X 1/2 77250 343-0289-000 AP	2	
- 48D	757-3771-001	2	SPACER, PLATE EFF MCN 130	1	
- 48E	756-6756-002	2	SPARK GAP ARM NO. 1 EFF MCN 130	1	
- 48F	1024-6H0TTIN NED	2	TERMINAL 77147 304-0140-000 EFF MCN 130	1	
- 48G	68-1660-40	2	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP FOR 48D THRU 48F	2	
R - 48H	310-0131-000	2	WASHER, FLAT, NI PL BRS, 0.125 ID, 0.250 OD COML AP FOR 48D THRU 48F	2	
- 48J	P343-0289-000	2	SCREW, MACH., NI PL BRS, PAN HD, 4-40 X 1/2 77250 343-0289-000 AP FOR 48D THRU 48F	2	
- 49	756-6620-002	2	COIL, KF	1	L2
- 50	756-6633-003	2	BAR, COIL SPACING	3	
- 51	756-6634-003	2	FORM, COIL	1	
- 52	756-6635-003	2	FORM, COIL	1	
- 53	756-6636-003	2	FORM, COIL	1	
- 54	68NM40	2	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0347-000 AP FOR 51 THRU 53	6	
- 55	MS51957-16	2	SCREW, MACH., SST, PAN HD, 4-40 X 7/16 343-0136-000 AP FOR 51 THRU 53	3	
- 55A	MS51957-15	2	SCREW, MACH., SST, PAN HD, 4-40 X 3/8 343-0135-000 AP FOR 51 THRU 53	3	
- 56	99-012-062-0250	2	PIN, SPG, BE. COP, 0.062 DIA X 0.250 LG 72962 311-0591-000	6	
- 57	756-6767-003	2	BRACKET, COIL	2	
- 58	756-6611-002	2	BRACKET, COIL FORM	4	
R - 59	68NM40	2	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0347-000 AP FOR 57 AND 58	6	
- 60	310-0045-000	2	WASHER, FLAT, SST, 0.125 ID, 0.312 OD COML AP FOR 57 AND 58	6	
- 61	MS51957-17	2	SCREW, MACH., SST, PAN HD, 4-40 X 1/2 343-0137-000 AP FOR 57 AND 58	6	
- 62	756-6655-005	2	PLATE, BULKHEAD	1	
- 63	1024-6H0TTIN NED	2	TERMINAL 77147 304-0140-000	1	



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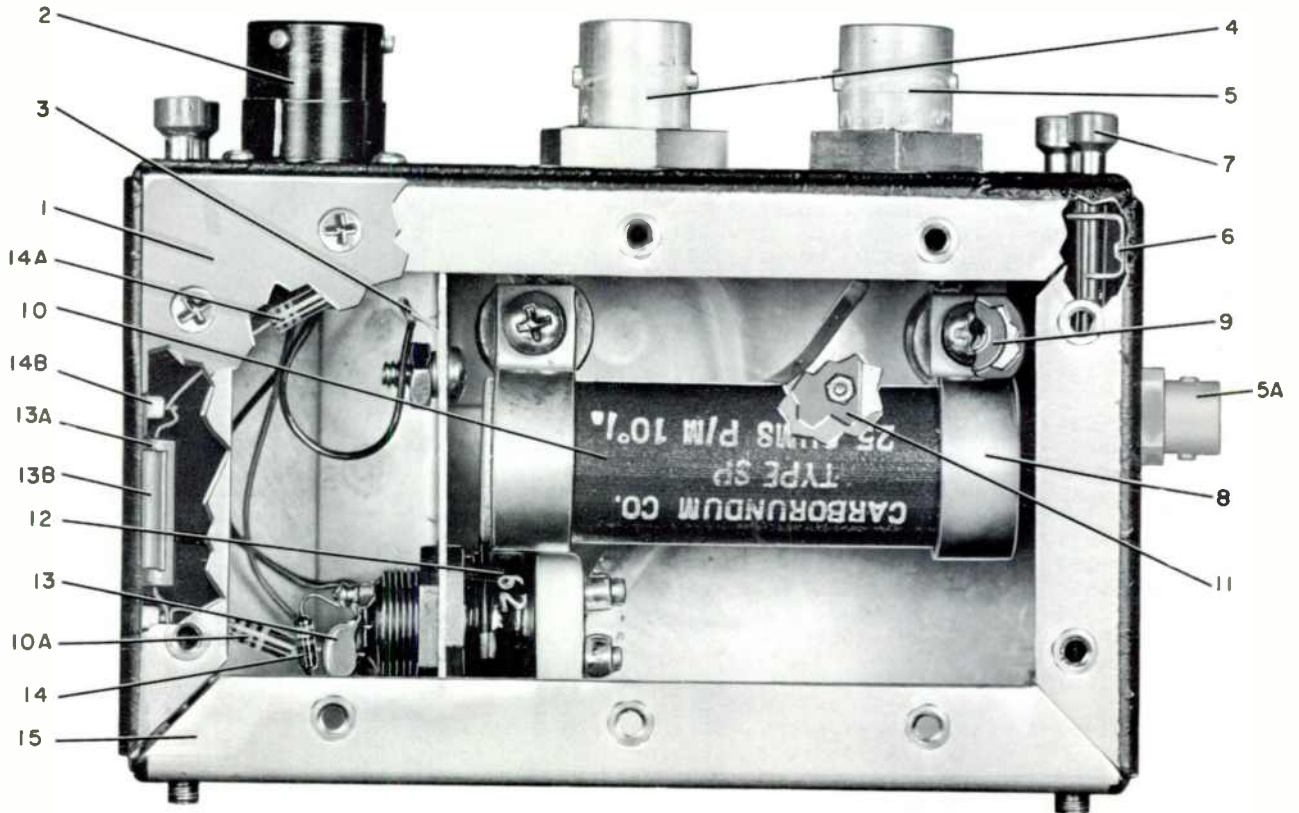
GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1106 - 64	756-6756-002	2	ELECTRODE	G1	1
- 65	68-1660-40	2	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP FOR 63 AND 64		2
R - 66	310-0131-000	2	WASHER, FLAT, NI PL BRS, 0.125 ID, 0.250 OD COML AP FOR 63 AND 64		2
- 67	P313-0051-00 O	2	NUT, PLAIN, HEX., NI PL BRS, 4-40 77250 313-0051-000 AP FOR 63 AND 64		2
- 68	P343-0289-00 O	2	SCREW, MACH., NI PL BRS, PAN HD, 4-40 X 1/2 77250 343-0289-000 AP FOR 63 AND 64		2
- 69	DA858-003	2	CAPACITOR, FXD, 1000 PF 20%, 5000 VDCW 71590 913-0101-000 EFF THRU MCN 129	C5	1
R - 70	1024-6HOTTIN NED	2	TERMINAL 77147 304-0140-000		1
- 70A	4007-6HOTTIN NED	2	TERMINAL 77147 304-0016-000 EFF MCN 130		1
- 71	756-6755-002	2	ELECTRODE	G2	1
- 72	68NM40	2	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0347-000 EFF THRU MCN 129 AP FOR 69 AND 71		1
- 72	68-1660-40	2	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 EFF MCN 130 AP FOR 69 THRU 71		1
- 72A	68-1660-40	2	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 EFF MCN 130 AP FOR 69 THRU 71		1
- 73	310-0077-000	2	WASHER, LOCK, BRZ, 0.141 ID, 0.253 OD COML EFF THRU MCN 129 ONLY AP FOR 69 THRU 71		1
- 74	P313-0140-00 O	2	NUT, PLAIN, HEX., NI PL BRS, 6-32 77250 313-0140-000 EFF THRU MCN 129 AP FOR 69 THRU 71		1
- 74	P313-0051-00 O	2	NUT, PLAIN, HEX., NI PL BRS, 4-40 77250 313-0051-000 EFF MCN 130 AP FOR 69 THRU 71		1
- 75	P313-0051-00 O	2	NUT, PLAIN, HEX., NI PL BRS, 4-40 77250 313-0051-000 AP FOR 69 THRU 71		1
- 76	P 43-0332-00 O	2	SCREW, MACH., NI PL BRS, PAN HD, 6-32 X 1/2 77250 343-0332-000 EFF THRU MCN 129 AP FOR 69 THRU		1
- 76	P343-0289-00 O	2	SCREW, MACH., NI PL BRS, PAN HD, 4-40 X 1/2 77250 343-0289-000 EFF MCN 130 AP FOR 69 THRU 71		1
- 77	P343-0289-00 O	2	SCREW, MACH., NI PL BRS, PAN HD, 4-40 X 1/2 77250 343-0289-000 AP FOR 69 THRU 71		1
- 78	107H187	2	TERMINAL 79963 304-6000-000		1
- 79	P313-0140-00 O	2	NUT, PLAIN, HEX., NI PL BRS, 6-32 77250 313-0140-000 AP		1
- 80	310-0077-000	2	WASHER, LOCK, BRZ, 0.141 ID, 0.253 OD COML AP		1
- 81	P342-0168-00 O	2	SCREW, MACH., NI PL BRS, FH, 6-32 X 3/8 77250 342-0168-000 AP		1
- 82	756-6753-002	2	CONTACT ASSY, ELECTRICAL	P6	1
- 83	756-6606-002	2	NUT, PLAIN, RD AP		1
- 84	756-6605-002	2	BRACKET, PIN		1



GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1106 - 85	756-6603-002	2	SPACER, PIN BRACKET	1	
- 86	68NM82	2	NUT, SELF-LKG, HEX., AL, 8-32 72962 333-0381-000 AP FOR 84 AND 85	2	
- 87	MS51959-46	2	SCREW, MACH., SST, FH, 8-32 X 5/8 342-0081-000 AP FOR 84 AND 85	2	
- 88	756-6646-004	2	PLATE, SUPPORT	1	
1107 - O	522-3559-004	1	399V-1/W-1 ADAPTER SEE	REF	C
R 1107 - O	522-3560-000	1	399W-1/V-1 ADAPTER SEE	REF	D
- 1	756-6742-003	2	COVER, CHASSIS	1	
R	MS51959-44	2	SCREW, MACH., SST, FH, 6-32 X 1 342-0079-000 AP	10	C



399V-1/W-1 Adapter  
Figure 1107



GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
R 1107	MS35214-23	2	SCREW, MACH., BRS, PAN HD, 6-32 X 1/4 343-1770-000 AP	10	D
R	MS35338-136	2	WASHER, LOCK, SST, 0.141 ID, 0.253 OD 310-0282-000 AP	10	C
- 2	MS24264R10b5 PX	2	CONNECTOR 359-4055-000	1	J3
	MS35649-24	2	NUT, PLAIN, HEX., SST, 2-56 313-0037-000 AP	4	
	MS51957-3	2	SCREW, MACH., SST, PAN HD, 2-56 X 1/4 343-0124-000 AP	4	
- 3	4007-6HOTTIN NED	2	TERMINAL 77147 304-0016-000	1	
	P313-0053-00 O	2	NUT, PLAIN, HEX., NI PL BRS, 6-32 77250 313-0053-000 AP	1	
R	310-0078-000	2	WASHER, LOCK, BRZ, 0.141 ID, 0.239 OD COML AP	1	C
R	310-0071-000	2	WASHER, LOCK, SST, 0.151 ID, 0.239 OD COML AP	1	D
R	P343-0329-00 O	2	SCREW, MACH., NI PL BRS, PAN HD, 6-32 X 5/16 77250 343-0329-000 AP	1	C
R	MS51957-27	2	SCREW, MACH., SST, PAN HD, 6-32 X 5/16 343-0168-000 AP	1	D
- 4	UG569AU	2	CONNECTOR 357-9130-000	1	J2
	756-8316-002	2	NUT, PLAIN, HEX. AP	1	
- 5	UG569AU	2	CONNECTOR 357-9130-000	1	J1
	756-8316-002	2	NUT, PLAIN, HEX. AP	1	
R	- 5A UG625BU	2	CONNECTOR 357-9670-000	1	J4
- 6	549-0945-003	2	RETAINER, SCR	4	
	MS51959-2	2	SCREW, MACH., SST, FH, 2-56 X 3/16 342-0132-000 AP	4	
- 7	549-0932-003	2	SCREW, ASSEMBLED WASH.	1	
R	- 8 756-6740-003	2	CLAMP, LOOP	1	C
R	- 9 NS5W0206	2	INSULATOR 190-0017-000	1	C
R	MS51959-44	2	SCREW, MACH., SST, FH, 6-32 X 1 342-0079-000 AP	2	C
R	P343-0310-00 O	2	SCREW, MACH., NI PL BRS, PAN HD, 8-32 X 7/16 77250 343-0310-000 AP	2	C
R	MS35338-137	2	WASHER, LOCK, SST, 0.168 ID, 0.280 OD 310-0283-000 AP	2	C
R	302-0347-000	2	INSULATOR, WASH. 91500 AP	4	C
R	- 10 218SP3	2	RESISTOR, FXD, 25 OHMS 10%, 30 W 10646 712-0082-000	1	C
R	- 10A RC20GF101K	2	RESISTOR, FXD, 10W OHMS 10%, 1/2 W 745-1310-000	1	D
R	- 11 554-5117-003	2	PLATE, IDENT	1	C
R	- 11 757-1575-001	2	PLATE, IDENT	1	D
R	MS35649-24	2	NUT, PLAIN, HEX., SST, 2-56 313-0037-000 AP	2	C
R	68NM26	2	NUT, SELF-LKG, HEX., AL, 2-56 72962 333-0327-000 AP	2	D
R	MS51957-2	2	SCREW, MACH., SST, PAN HD, 2-56 X 3/16 343-0123-000 AP	2	C
R	MS51957-3	2	SCREW, MACH., SST, PAN HD, 2-56 X 1/4 343-0124-000 AP	2	D
- 12	RJ1A26N323	2	RELAY 73905 410-0346-000	1	K1
R	- 13 805-014X5VU1 03Z	2	CAPACITOR, FXD, 0.01 UF P80M20%, 100 VDCW 72982 913-3680-000	1	C1





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GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
R 1107 - 13A	CL25BH111UP3	2	CAPACITOR, FXD, 110 UF P30M15%, 30 VDCW 184-8012-000	1	D
R - 13B	100-200-7-0	2	CLIP 99378 139-0747-000	1	D
R	MS35649-24	2	NUT, PLAIN, HEX., SST, 2-56 313-0037-000 AP	2	D
R	MS51959-2	2	SCREW, MACH., SST, FH, 2-56 X 3/16 342-0132-000 AP	2	D
R - 14	1N645	2	SEMICONV DEVICE 353-2607-000	1	C
R - 14A	1N645	2	SEMICONV DEVICE 353-2607-000	1	D
R - 14B	RTMT12-2M	2	TERMINAL 91663 306-0980-000	2	D
R	MS51959-2	2	SCREW, MACH., SST, FH, 2-56 X 3/16 342-0132-000 AP	2	D
R - 15	756-6745-004	2	CHASSIS, ELECTRICAL EQUIP.	1	C
R - 15	756-6523-001	2	CHASSIS, ELECTRICAL EQUIP.	1	D
1108 - 0	522-3375-004	1	309A-9 ANTENNA COUPLER CONTROL SEE FIG. 1101-3 FOR NHA	REF	A
1108 - 0	522-4159-001	1	309A-9A ANTENNA COUPLER CONTROL SEE FIG. 1101-4 FOR NHA	REF	B
- 1	544-5111-003	2	PLATE, IDENT	1	A
- 1A	757-4598-001	2	PLATE, IDENT	1	B
	MS51957-1	2	SCREW, MACH., SST, PAN HD, 2-56 X 1/8 343-0122-000 AP FOR 1 AND 1A	2	
- 2	756-6821-005	2	COVER, CONTROL	1	
	MS51957-14	2	SCREW, MACH., SST, PAN HD, 4-40 X 5/16 343-0134-000 AP	2	
	MS51957-13	2	SCREW, MACH., SST, PAN HD, 4-40 X 1/4 343-0133-000 EFF THRU MCN 108 AP	9	A
	MS51957-13	2	SCREW, MACH., SST, PAN HD, 4-40 X 1/4 343-0133-000 EFF MCN 109 AP	1	A
	MS51959-14	2	SCREW, MACH., SST, FH, 4-40 X 5/16 342-0045-000 EFF MCN 109 AP	8	A
	MS51957-13	2	SCREW, MACH., SST, PAN HD, 4-40 X 1/4 343-0133-000 AP	1	B
	MS51959-14	2	SCREW, MACH., SST, FH, 4-40 X 5/16 342-0045-000 AP	8	B
R - 3	528-0479-005	2	SERVO CONTROL MODULE SEE FIG. 1109	1	
- 4	528-0478-005	2	RELAY CONTROL MODULE SEE FIG. 1110	1	
- 5	756-6807-000	2	CONTROL SUBASSEMBLY	1	A
- 5	757-5740-001	2	CONTROL SUBASSEMBLY	1	B
- 6	CK63AW103M	3	CAPACITOR, FXD, 10,000 PF 20%, 500 VDCW 913-1188-000	1	
- 7	BCD2N1094	3	AMMETER 94916 476-0385-000	1	
	68-1660-40	3	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP	4	
- 8	F02A250V1-4A	3	FUSE 264-4020-000	1	
	S				
- 9	HKPEHLQRWZ	3	FUSEHOLDER 71400 265-1086-000	1	
- 10	30-1	3	SWITCH 81073 260-2709-000	1	
R - 10A	1214-05	3	WASHER, LOCK, CAD. PL STL, 0.267 ID, 0.408 OD 78189 373-0087-000	1	
- 11	503-4970-001	3	BRACKET, ANGLE	2	
	MS51957-30	3	SCREW, MACH., SST, PAN HD, 6-32 X 1/2 343-0171-000 AP	4	





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FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1108	- 11A UG496U	3	CONNECTOR 357-9037-000	J1	1	B
	- 11B 85725	3	CONNECTOR 74868 357-9419-000	J4	1	B
	- 11C 757-5744-001	3	GASKET		1	B
	- 11D 757-5750-001	3	BLOCK, MTG		1	B
			OR			
	- 11D 757-5749-001	3	BLOCK, MTG		1	B
	MS51959-15	3	SCREW, MACH., SST, FH, 4-40 X 3/8 342-0046-000 AP FOR 11A THRU 11D		6	B
	- 11E 757-5748-001	4	BLOCK, MTG		1	B
	- 12 544-0779-004	3	KNOB, POINTER		1	
	328-0013-000	3	SETSCREW, CAD. PL STL, 8-32 X 1/4 COML AP		1	
	- 12A HP4N	3	CLAMP 09922 150-1541-000		1	A
	68NM62	3	NUT, SELF-LKG, HEX., AL, 6-32 77250 333-0368-000 AP		1	A
	MS35649-64	3	NUT, PLAIN, HEX., SST, 6-32 313-0002-000 AP		1	A
	MS51959-8	3	SCREW, MACH., SST, FH, 2-56 X 5/8 342-0041-000 AP		1	A
	- 13 1N645	3	SEMICONV DEVICE 353-2607-000	CR5	1	
	- 14 1N645	3	SEMICONV DEVICE 353-2607-000	CR6	1	
	- 15 1N645	3	SEMICONV DEVICE 353-2607-000	CR7	1	
	- 16 RC07GF185K	3	RESISTOR, FXD, 1.8 MEG 10%, 1/4 W 745-0866-000	R11	1	
	- 17 1N645	3	SEMICONV DEVICE 353-2607-000	CR4	1	
	- 18 RC07GF391K	3	RESISTOR, FXD, 390 OHMS 10%, 1/4 W 745-0734-000	R3	1	
	- 19 RC07GF125K	3	RESISTOR, FXD, 1.2 MEG 10%, 1/4 W 745-0860-000	R5	1	
	- 20 RW69V1R8	3	RESISTOR, FXD, 1.8 OHMS 5%, 3 W 747-5305-000	R2	1	
	- 21 RC07GF562K	3	RESISTOR, FXD, 5600 OHMS 10%, 1/4 W 745-0776-000	R10	1	
	- 22 RC07GF125K	3	RESISTOR, FXD, 1.2 MEG 10%, 1/4 W 745-0860-000	R4	1	
	- 23 RC07GF104K	3	RESISTOR, FXD, 0.10 MEG 10%, 1/4 W 745-0821-000	R9	1	
	- 24 RC07GF104K	3	RESISTOR, FXD, 0.10 MEG 10%, 1/4 W 745-0821-000	R8	1	
	- 25 RC07GF104K	3	RESISTOR, FXD, 0.10 MEG 10%, 1/4 W 745-0821-000	R7	1	
	- 26 RC07GF223K	3	RESISTOR, FXD, 22,000 OHMS 10%, 1/4 W 745-0797-000	R6	1	
	- 27 1N645	3	SEMICONV DEVICE 353-2607-000	CR8	1	
	- 28 239498K2	3	SWITCH 76854 259-2219-000	S1	1	
	P334-4120-00	3	NUT, PLAIN, HEX., SST, 3/8-32 77250 334-4120-000 AP		1	
	0					
	1720-02	3	WASHER, LOCK, CAD. PL STL, 0.391 ID, 0.507 OD 78189 373-0085-000 AP		1	
	- 29 1N645	3	SEMICONV DEVICE 353-2607-000	CR1	1	
	- 29A 1N645	3	SEMICONV DEVICE 353-2607-000	CR2	1	B
	- 30 3SAH1022	3	RELAY 01526 974-0786-000	K1	1	
	68-1660-40	3	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP		3	
	SPL4040-2HOT TINNED	3	TERMINAL 77147 304-0331-000 AP		1	
	- 31 543-6223-002	3	HANDLE		1	
	- 32 541-7455-002	3	STOP, HANDLE		2	
	MS51959-45	3	SCREW, MACH., SST, FH, 8-32 X 1/2 342-0080-000 AP FOR 31 AND 32		2	



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## GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1108 - 33	545-7782-002	3	BRACKET, COVER	1	
	MS51957-14	3	SCREW, MACH., SST, PAN HD, 4-40 X 5/16 343-0134-000 AP	2	
- 34	756-6815-004	3	PANEL, FRONT	1	A
- 34	757-5752-001	3	PANEL, FRONT	1	B
	MS51957-14	3	SCREW, MACH., SST, PAN HD, 4-40 X 5/16 343-0134-000 AP	4	
- 35	A14657	3	TRANSFORMER 70674 674-0069-000	1	T1
	MS51957-14	3	SCREW, MACH., SST, PAN HD, 4-40 X 5/16 343-0134-000 AP	3	
	P343-0286-000	3	SCREW, MACH., NI PL BRS, PAN HD, 4-40 X 5/16 77250 343-0286-000 AP	1	
	O				
	SPL4040-4HOT TINNED	3	TERMINAL 77147 304-0332-000 AP	1	
	310-0045-000	3	WASHER, FLAT, SST, 0.125 ID, 0.312 OD COML AP	3	
- 36	RSKR500UF	3	RESISTOR, FXD, 0.1 OHMS 1%, 5 W	1	R1
			91637 747-9441-000		
R - 37	RTMT12M	3	TERMINAL 91663 306-0976-000	2	
	MS51957-12	3	SCREW, MACH., SST, PAN HD, 4-40 X 3/16 343-0132-000 AP	2	
	MS35338-135	3	WASHER, LOCK, SST, 0.115 ID, 0.212 OD 310-0279-000 AP	2	
- 37A	F02A250V3AS	3	FUSE 264-4080-000 EFF MCN 109	1	A
- 37A	F02A250V3AS	3	FUSE 264-4080-000	1	B
- 37B	350-231	3	FUSEHOLDER 75915 265-1114-000 EFF MCN 109	1	A
- 37B	350-231	3	FUSEHOLDER 75915 265-1114-000	1	B
	68-1660-40	3	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP FOR 37A AND 37B	1	
	310-6340-000	3	WASHER, FLAT, SST, 0.125 ID, 0.281 OD COML AP FOR 37A AND 37B	1	
	MS51957-15	3	SCREW, MACH., SST, PAN HD, 4-40 X 3/8 343-0135-000 AP FOR 37A AND 37B	1	
- 38	MS35489-6	3	GROMMET 201-0002-000	1	
- 38A	MS35489-9	3	GROMMET 201-0003-000	2	
- 38B	HP6N	3	CLAMP 09922 150-1543-000	1	
- 39	554-3896-002	3	CLAMP, AMPL	2	
- 40	340-0644-000	3	SLEEVE, SPG 91314	4	
- 41	TA018-0A145C	3	SERVO-AMPLIFIER MODULE 17771 270-2047-020 SEE FIG. 1111	1	AR1
- 42	TA018-0A145C	3	SERVO-AMPLIFIER MODULE 17771 270-2047-020	1	AR2
- 43	554-3897-002	3	SPACER, SOCKET	2	
- 44	554-3904-003	3	SHROUD, AIR	2	
	68-1660-40	3	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP FOR 38B THRU 44	12	
	310-0045-000	3	WASHER, FLAT, SST, 0.125 ID, 0.312 OD COML AP FOR 38B THRU 44	1	
	4019-4HOTTIN NED	3	TERMINAL 77147 304-0085-000 AP FOR 38B THRU 44	1	
	2522-06-00-2 O	3	TERMINAL 78189 304-4200-000 AP FOR 38B THRU 44	2	
	SPL4040-4HOT TINNED	3	TERMINAL 77147 304-0332-000 AP FOR 38B THRU 44	2	



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FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1108	MS51957-19	3	SCREW, MACH., SST, PAN HD, 4-40 X 3/4 343-0139-000 AP FOR 38B THRU 44	4	
	P342-0153-00 O	3	SCREW, MACH., NI PL BRS, FH, 4-40 X 5/16 77250 342-0153-000 AP FOR 38B THRU 44	4	
	756-6808-000	3	WIRING HARNESS	1	A
	757-5755-001	3	WIRING HARNESS	1	B
- 44A	YE1620F32	3	ADAPTER 09922 372-8015-000	2	
- 45	DDMF50S	4	CONNECTOR 71468 371-0961-000	1	J2
- 46	544-7050-002	4	SPACER, SLV	2	
	68-1660-26	4	NUT, SELF-LKG, HEX., AL, 2-56 72962 333-0604-000 AP FOR 45 AND 46	2	
	SPL4040-2HOT TINNED	4	TERMINAL 77147 304-0331-000 AP FOR 45 AND 46	1	
	P342-0146-00 O	4	SCREW, MACH., NI PL BRS, FH, 2-56 X 7/16 77250 342-0146-000 AP FOR 45 AND 46	2	
- 47	203-6214-017	4	SOCKET 71785 220-1546-000	1	XAR1
- 48	DBMF25S	4	CONNECTOR 71468 371-0959-000	1	J3
- 49	544-7050-002	4	SPACER, SLV	2	
	68-1660-26	4	NUT, SELF-LKG, HEX., AL, 2-56 72962 333-0604-000 AP	2	
	SPL4040-2HOT TINNED	4	TERMINAL 77147 304-0331-000 AP	1	
	P342-0146-00 O	4	SCREW, MACH., NI PL BRS, FH, 2-56 X 7/16 77250 342-0146-000 AP	2	
- 50	203-6214-017	4	SOCKET 71785 220-1546-000	1	XAR2
- 51	HP5N	3	CLAMP 09922 150-1542-000	1	A
- 51A	HP5N	3	CLAMP 09922 150-1542-000	2	B
	68-1660-40	3	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP FOR 51 AND 51A	1	A
	68-1660-40	3	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP FOR 51 AND 51A	2	B
	310-0045-000	3	WASHER, FLAT, SST, 0.125 ID, 0.312 OD COML AP FOR 51 AND 51A	1	A
	310-0045-000	3	WASHER, FLAT, SST, 0.125 ID, 0.312 OD COML AP FOR 51 AND 51A	2	B
	MS51959-15	3	SCREW, MACH., SST, FH, 4-40 X 3/8 342-0046-000 AP FOR 51 AND 51A	1	A
	MS51959-15	3	SCREW, MACH., SST, FH, 4-40 X 3/8 342-0046-000 AP FOR 51 AND 51A	2	B
- 52	756-6820-004	3	FILTER ASSY	1	
	MS51957-13	3	SCREW, MACH., SST, PAN HD, 4-40 X 1/4 343-0133-000 AP	2	
	MS51957-14	3	SCREW, MACH., SST, PAN HD, 4-40 X 5/16 343-0134-000 AP	4	
	MS35338-135	3	WASHER, LOCK, SST, 0.115 ID, 0.212 OD 310-0279-000 AP	4	
R	310-0045-000	3	WASHER, FLAT, SST, 0.125 ID, 0.312 OD COML AP	2	
- 53	1N645	4	SEMICONV DEVICE 353-2607-000	1	CR2
- 54	180D105X0050 R1	4	CAPACITOR, FXD, 1 UF 20%, 50 VDCW 56289 241-6001-000	29	C1 THRU C14 C16 THRU C22 C24 THRU C31



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FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1108 - 55	1N645	4	SEMICOND DEVICE 353-2607-000	CR3	1
- 55A	1N645	4	SEMICOND DEVICE 353-2607-000	CR9	1
- 56	327-029X5T01 O2Z	4	CAPACITOR, FXD, 1000 PF P80M20%, 500 VDCW 72982 913-1292-000	C15	1
- 57	327-029X5T01 O2Z	4	CAPACITOR, FXD, 1000 PF P80M20%, 500 VDCW 72982 913-1292-000	C23	1
- 58	RTMT12M	4	TERMINAL 91663 306-0976-000		1
	MS51957-12	4	SCREW, MACH., SST, PAN HD, 4-40 X 3/16 343-0132-000 AP		1
- 59	2JX49	4	FILTER 14101 241-0330-000	FL1 THRU FL12	12
- 60	756-6817-004	4	COVER, FILTER		1
- 61	MS35489-33	3	GROMMET 201-0019-000		1 A
- 61A	SPL4040-4HOT TINNED	3	TERMINAL 77147 304-0332-000		2 A
- 62	HP4N	3	CLAMP 09922 150-1541-000		1 A
	P343-0284-00 O	3	SCREW, MACH., NI PL BRS, PAN HD, 4-40 X 3/16 77250 343-0284-000 AP FOR 61A AND 62		2 A
	310-0076-000	3	WASHER, LOCK, BRZ, 0.115 ID, 0.212 OD COML AP FOR 61A AND 62		1 A
- 62A	1N645	3	SEMICOND DEVICE 353-2607-000	CR10	1 B
- 62B	1N645	3	SEMICOND DEVICE 353-2607-000	CR11	1 B
- 62C	TF300	3	TERMINAL 98291 306-1018-000		1 B
	68-1660-26	3	NUT, SELF-LKG, HEX., AL, 2-56 72962 333-0604-000 AP		1 B
- 62D	3SAF1131	3	RELAY 01526 974-0722-000	K2	1 B
	68-1660-26	3	NUT, SELF-LKG, HEX., AL, 2-56 72962 333-0604-000 AP		1 B
	68-1660-40	3	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP		2 B
- 63	540-9064-003	3	POST, ELECTRICAL-MECHANICAL EQUIP.		4
	MS51957-13	3	SCREW, MACH., SST, PAN HD, 4-40 X 1/4 343-0133-000 AP		4
	MS35338-135	3	WASHER, LOCK, SST, 0.115 ID, 0.212 OD 310-0279-000 AP		4
- 64	756-6811-003	3	PLATE, MTG		1 A
- 64	757-5742-001	3	PLATE, MTG		1 B
- 65	756-6810-003	3	SPACER, SHLD		1 A
	MS51957-13	3	SCREW, MACH., SST, PAN HD, 4-40 X 1/4 343-0133-000 AP FOR 64 AND 65		4 A
	MS51957-10	3	SCREW, MACH., SST, PAN HD, 2-56 X 7/8 343-0130-000 AP FOR 64 AND 65		8 A
	SPL4040-2HOT TINNED	3	TERMINAL 77147 304-0331-000 AP FOR 64 AND 65		1 A
	MS51957-14	3	SCREW, MACH., SST, PAN HD, 4-40 X 5/16 343-0134-000 AP FOR 64 AND 65		4 B
	MS35338-134	3	WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP FOR 64 AND 65		8 A
	MS35338-135	3	WASHER, LOCK, SST, 0.115 ID, 0.212 OD 310-0279-000 AP FOR 64 AND 65		4 B
	310-0053-000	3	WASHER, FLAT, NI PL BRS, 0.093 ID, 0.250 OD COML AP FOR 64 AND 65		7 A
- 65A	757-5745-001	3	PLATE, RETAINING		1 B
- 65B	757-5743-001	3	SPACER, SLV		4 B
- 65C	DPA32-34P	3	CONNECTOR 71468 370-2138-000	P1A	1 B

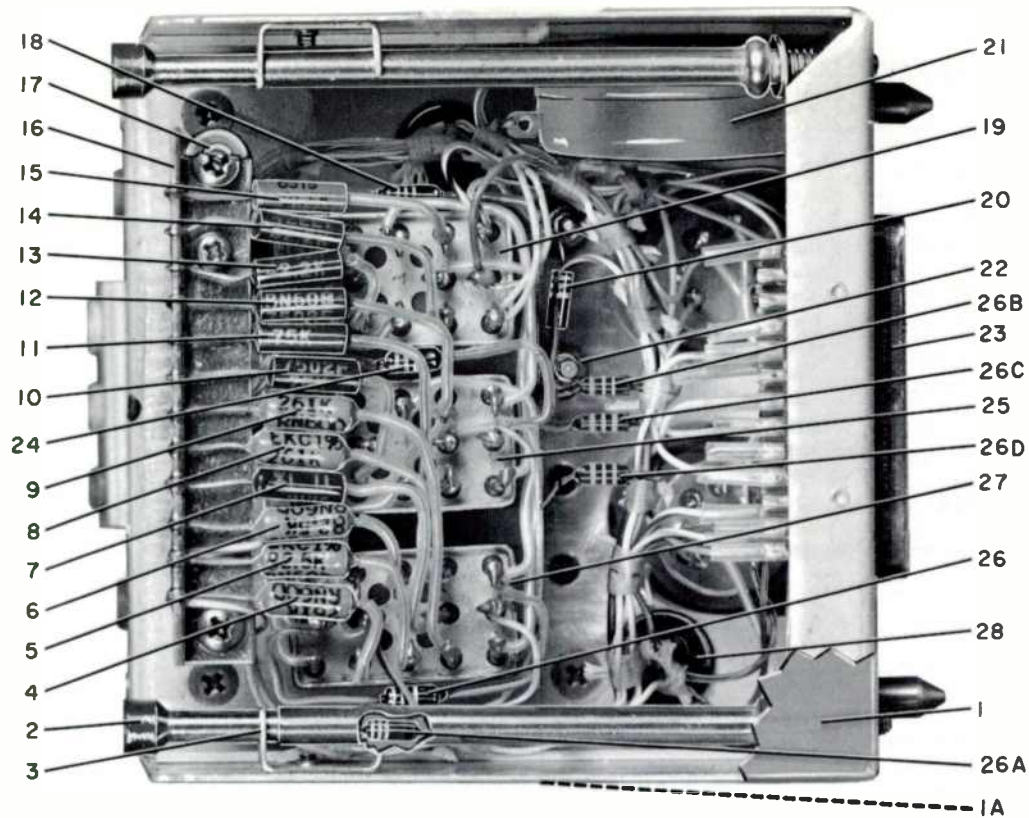


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FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1108	MS51959-3	3	SCREW, MACH., SST, FH, 2-56 X 1/4 342-0133-000 AP FOR 65A THRU 65C	4	B
- 65D	1N645	3	SEMICOND DEVICE 353-2607-000	1	A
- 65E	RC20GF222K	3	RESISTOR, FXD, 2200 OHMS 10%, 1/2 W 745-1366-000	1	A
- 65F	RC20GF222K	3	RESISTOR, FXD, 2200 OHMS 10%, 1/2 W 745-1366-000	1	A
- 65G	RC07GF563K	3	RESISTOR, FXD, 56,000 OHMS 10%, 1/4 W 745-0812-000	1	A
- 65H	RC07GF224K	3	RESISTOR, FXD, 0.22 MEG 10%, 1/4 W 745-0833-000	1	A
- 65J	1N645	3	SEMICOND DEVICE 353-2607-000	1	B
- 66	DPX2MA57P4UP 34B0201 68-1660-40	3	CONNECTOR 71468 370-5268-000	1	A
	MS51959-15	3	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP	6	A
- 66A	DPA32-34P MS51957-3	3	SCREW, MACH., SST, FH, 4-40 X 3/8 342-0046-000 AP	1	B
		3	CONNECTOR 71468 370-2138-000	1	B
		3	SCREW, MACH., SST, PAN HD, 2-56 X 1/4 343-0124-000 AP	4	B
- 66B	757-5751-001	3	BLOCK, MTG OR	1	B
- 66B	757-5746-001 68-1660-40	3	BLOCK, MTG	1	B
		3	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP	5	B
	MS51959-14	3	SCREW, MACH., SST, FH, 4-40 X 5/16 342-0045-000 AP	5	B
- 66C	757-5747-001	4	BLOCK, MTG	1	B
- 67	Z103-02	3	RETAINER 02660 201-1060-000	1	
- 68	756-6825-005 MS51959-13	3	CHASSIS, LOWER	1	
		3	SCREW, MACH., SST, FH, 4-40 X 1/4 342-0044-000 AP	6	
- 69	756-6823-005	3	CHASSIS, ELECTRICAL EQUIP.	1	



GROUP ASSEMBLY PARTS LIST



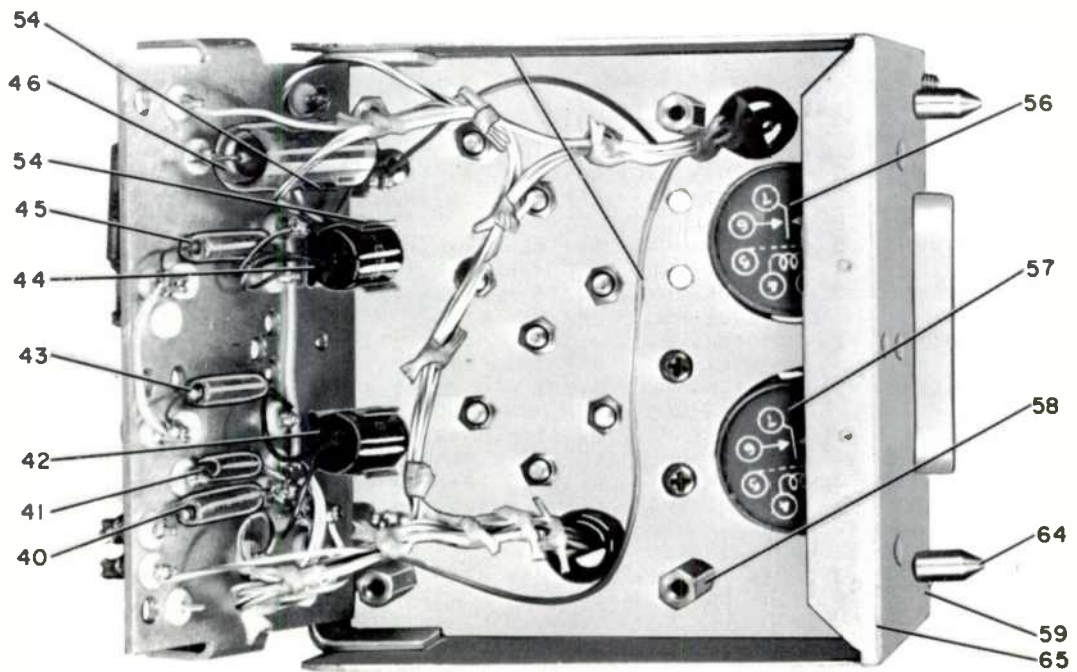
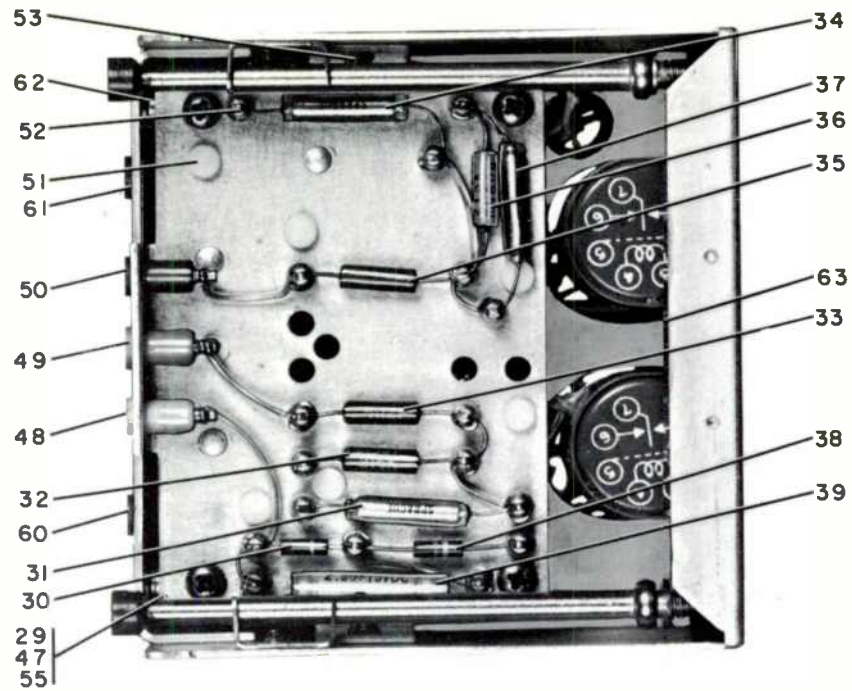
Servo Control Module (Sheet 1 of 2)  
Figure 1109

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1109 - 0	528-0479-005	1	SERVO CONTROL MODULE SEE FIG. 1108-3 FOR NHA	REF	
- 1	756-6786-004	2	COVER, SERVO CONTROL	1	
	MS51957-26	2	SCREW, MACH., SST, PAN HD, 6-32 X 5/16 343-0167-000 AP	2	
- 1A	280-3778-010	2	CHART, INFORMATION 93108 SB15	1	
- 2	549-0932-003	2	SCREW, ASSEMBLED WASH.	4	
	545-7531-003	2	WASHER AP	4	
- 3	549-0945-003	2	RETAINER, SCR	4	
	MS51959-1	2	SCREW, MACH., SST, FH, 2-56 X 1/8 342-0131-000 AP	4	
- 4	RN60D2613F	2	RESISTOR, FXD, 0.261 MEG 1%, 1/4 W R18	1	
			705-6712-000 EFF THRU MCN 154		
- 4	RN60C2613F	2	RESISTOR, FXD, 0.261 MEG 1%, 1/8 W R18	1	
			705-6332-000 EFF MCN 155		
- 5	RN60D1783F	2	RESISTOR, FXD, 0.178 MEG 1%, 1/4 W R10	1	A
			705-6704-000 EFF THRU MCN 108		
- 5	RN60D3832F	2	RESISTOR, FXD, 38,300 OHMS 1%, 1/4 W R10	1	A
			705-6672-000 EFF MCN 109		
- 5	RN60D3832F	2	RESISTOR, FXD, 38,300 OHMS 1%, 1/4 W R10	1	B
			705-6672-000		





GROUP ASSEMBLY PARTS LIST



Servo Control Module (Sheet 2 of 2)  
Figure 1109



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GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1109 - 6	RN60D1783F	2	RESISTOR, FXD, 0.178 MEG 1%, 1/4 W 705-6704-000 EFF THRU MCN 108	R14	1 A
- 6	RN60C1783F	2	RESISTOR, FXD, 0.178 MEG 1%, 1/8 W 705-6328-000 EFF MCN 109	R14	1 A
- 6	RN60C1783F	2	RESISTOR, FXD, 0.178 MEG 1%, 1/8 W 705-6328-000	R14	1 B
- 7	RN60D1003F	2	RESISTOR, FXD, 0.1 MEG 1%, 1/4 W 705-6692-000 EFF THRU MCN 108	R19	1 A
- 7	RN60C5112F	2	RESISTOR, FXD, 51,100 OHMS 1%, 1/8 W 705-6314-000 EFF MCN 109	R19	1 A
- 7	RN60C5112F	2	RESISTOR, FXD, 51,100 OHMS 1%, 1/8 W 705-6314-000	R19	1 B
- 8	RN60C7502F	2	RESISTOR, FXD, 75,000 OHMS 1%, 1/8 W 705-6318-000	R15	1
- 9	RN60C7502F	2	RESISTOR, FXD, 75,000 OHMS 1%, 1/8 W 705-6318-000 EFF THRU MCN 108	R11	1 A
- 9	RN60D3162F	2	RESISTOR, FXD, 31,600 OHMS 1%, 1/4 W 705-6668-000 EFF MCN 109	R11	1 A
- 9	RN60D3162F	2	RESISTOR, FXD, 31,600 OHMS 1%, 1/4 W 705-6668-000	R11	1 B
- 10	RN60C2613F	2	RESISTOR, FXD, 0.261 MEG 1%, 1/8 W 705-6332-000 EFF THRU MCN 334	R16	1
R - 10	RN60C1003F	2	RESISTOR, FXD, 0.1 MEG 1%, 1/8 W 705-6321-000 EFF MCN 335 SB18	R16	1
- 11	RN60D1783F	2	RESISTOR, FXD, 0.178 MEG 1%, 1/4 W 705-6704-000 EFF THRU MCN 108	R21	1 A
- 11	RN60C1783F	2	RESISTOR, FXD, 0.178 MEG 1%, 1/8 W 705-6328-000 EFF MCN 109	K21	1 A
- 11	RN60C1783F	2	RESISTOR, FXD, 0.178 MEG 1%, 1/8 W 705-6328-000	R21	1 B
- 12	RN60C2613F	2	RESISTOR, FXD, 0.261 MEG 1%, 1/8 W 705-6332-000 EFF THRU MCN 334	R20	1
R - 12	RN60C5112F	2	RESISTOR, FXD, 51,100 OHMS 1%, 1/8 W 705-6314-000 EFF MCN 335 SB18	R20	1
- 13	RN60D1003F	2	RESISTOR, FXD, 0.1 MEG 1%, 1/4 W 705-6692-000 EFF THRU MCN 108	R17	1 A
R - 13	RN60C1003F	2	RESISTOR, FXD, 0.1 MEG 1%, 1/8 W 705-6321-000 EFF MCN 109 THRU 511	R17	1 A
R - 13	RN60C1003F	2	RESISTOR, FXD, 0.1 MEG 1%, 1/8 W 705-6321-000 EFF THRU MCN 511	R17	1 B
R - 13	RN60D1963F	2	RESISTOR, FXD, 0.196 MEG 1%, 1/4 W 705-6706-000 EFF MCN 512	R17	1
- 14	RN60D2613F	2	RESISTOR, FXD, 0.261 MEG 1%, 1/4 W 705-6712-000 EFF THRU MCN 154	R13	1
- 14	RN60C2613F	2	RESISTOR, FXD, 0.261 MEG 1%, 1/8 W 705-6332-000 EFF MCN 155	R13	1
- 15	RN60C2613F	2	RESISTOR, FXD, 0.261 MEG 1%, 1/8 W 705-6332-000 EFF THRU MCN 334	R12	1
R - 15	RN60C1003F	2	RESISTOR, FXD, 0.1 MEG 1%, 1/8 W 705-6321-000 EFF MCN 335 SB18	R12	1
- 16	756-6784-003	2	BRACKET, RIGHT ANGLE		1
- 17	756-6947-002	2	POST, SPACING		2
	MS51957-14	2	SCREW, MACH., SST, PAN HD, 4-40 X 5/16 343-0134-000 AP FOR 16 AND 17		4
	MS35338-135	2	WASHER, LOCK, SST, 0.115 ID, 0.212 OD 310-0279-000 AP FOR 16 AND 17		2
- 18	1N645	2	SEMICONV DEVICE 353-2607-000	CR3	1



GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1109 - 19	3SAH1003 68-1660-40	2	RELAY 01526 974-0756-000	K4	1
		2	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP		3
- 20	RC07GF150K	2	RESISTOR, FXD, 15 OHMS 10%, 1/4 W 745-0683-000	R1	1
- 21	MP206-14B	2	COIL, RF, 50 MH 95105 240-0270-000	L1	1
	MS51959-28	2	SCREW, MACH., SST, FH, 6-32 X 3/8 342-0062-000 AP		1
- 22	RTMT12M	2	TERMINAL 91663 306-0976-000		2
	MS51957-12	2	SCREW, MACH., SST, PAN HD, 4-40 X 3/16 343-0132-000 AP		2
	MS35338-135	2	WASHER, LOCK, SST, 0.115 ID, 0.212 OD 310-0279-000 AP		2
	756-6779-000	2	WIRING HARNESS		1
- 23	DBM25P	3	CONNECTOR 71468 371-0969-000	P1	1
	68-1660-26	3	NUT, SELF-LKG, HEX., AL, 2-56 72962 333-0604-000 AP		2
	SPL4040-2HOT TINNED	3	TERMINAL 77147 304-0331-000 AP		1
	MS51959-3	3	SCREW, MACH., SST, FH, 2-56 X 1/4 342-0133-000 AP		2
- 24	1N645	2	SEMICONV DEVICE 353-2607-000	CR2	1
- 25	3SAH1003 68-1660-40	2	RELAY 01526 974-0756-000	K3	1
		2	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP		3
- 26	1N645	2	SEMICONV DEVICE 353-2607-000	CR1	1
- 26A	1N645	2	SEMICONV DEVICE 353-2607-000 EFF MCN 109	CR4	1
- 26A	1N645	2	SEMICONV DEVICE 353-2607-000	CR4	1
- 26B	1N645	2	SEMICONV DEVICE 353-2607-000 SB15	CR7	1
- 26B	1N645	2	SEMICONV DEVICE 353-2607-000 EFF MCN 201 SB15	CR7	1
- 26C	1N645	2	SEMICONV DEVICE 353-2607-000 SB15	CR6	1
- 26C	1N645	2	SEMICONV DEVICE 353-2607-000 EFF MCN 201 SB15	CR6	1
- 26D	1N645	2	SEMICONV DEVICE 353-2607-000 SB15	CR5	1
- 26D	1N645	2	SEMICONV DEVICE 353-2607-000 EFF MCN 201 SB15	CR5	1
- 27	3SAH1003 68-1660-40	2	RELAY 01526 974-0756-000	K2	1
		2	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP		3
- 28	SB375-4	2	GROMMET CAMPBELL D.J. CO. 150-0459-000		2
- 29	756-6787-004 MS51959-2	2	SEVRO CONTROL SUBASSEMBLY		1
		2	SCREW, MACH., SST, FH, 2-56 X 3/16 342-0132-000 AP		2
	MS51957-12	2	SCREW, MACH., SST, PAN HD, 4-40 X 3/16 343-0132-000 AP		4
	MS35338-135	2	WASHER, LOCK, SST, 0.115 ID, 0.212 OD 310-0279-000 AP		4
- 30	RC07GF222K	3	RESISTOR, FXD, 2200 OHMS 10%, 1/4 W 745-0761-000	R2	1
- 31	1510164X0035 W2	3	CAPACITOR, FXD, 0.16 UF 20%, 35 VDCW 56289 184-8261-000	C4	1
- 32	RN60C2153F	3	RESISTOR, FXD, 0.215 MEG 1%, 1/8 W 705-6330-000	R4	1



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GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1109 - 33	RN60C5112F	3	RESISTOR, FXD, 51,100 OHMS 1%, 1/8 W 705-6314-000	R22	1
- 34	151D234X0035 W2	3	CAPACITOR, FXD, 0.23 UF 20%, 35 VDCW 56289 184-8262-000	C11	1
- 35	RN60C5112F	3	RESISTOR, FXD, 51,100 OHMS 1%, 1/8 W 705-6314-000	R23	1
- 36	RN60C2153F	3	RESISTOR, FXD, 0.215 MEG 1%, 1/8 W 705-6330-000	R5	1
- 37	151D164X0035 W2	3	CAPACITOR, FXD, 0.16 UF 20%, 35 VDCW 56289 184-8261-000	C5	1
- 38	RC07GF123K	3	RESISTOR, FXD, 12,000 OHMS 10%, 1/4 W 745-0788-000 EFF THRU MCN 129	R3	1 A
- 38	RC07GF472K	3	RESISTOR, FXD, 4700 OHMS 10%, 1/4 W 745-0773-000 EFF MCN 130	R3	1 A
- 38	RC07GF472K	3	RESISTOR, FXD, 4700 OHMS 10%, 1/4 W 745-0773-000	R3	1 B
- 39	CL37BE2R5MN3	3	CAPACITOR, FXD, 2.5 UF 20%, 15 VDCW 184-7940-000	C1	1
- 40	151D344X0035 W2	3	CAPACITOR, FXD, 0.34 UF 20%, 35 VDCW 56289 184-8263-000	C6	1
- 41	RN60C2153F	3	RESISTOR, FXD, 0.215 MEG 1%, 1/8 W 705-6330-000	R6	1
- 42	BH855	3	REACTOR, 12 HENRIES 80223 678-0060-000	L2	1
- 43	151D164X0035 W2	3	CAPACITOR, FXD, 0.16 UF 20%, 35 VDCW 56289 184-8261-000	C2	1
- 44	BH855	3	REACTOR, 12 HENRIES 80223 678-0060-000	L3	1
- 45	151D164X0035 W2	3	CAPACITOR, FXD, 0.16 UF 20%, 35 VDCW 56289 184-8261-000	C3	1
- 46	118P68302S4	3	CAPACITOR, FXD, 0.068 UF 10%, 200 VDCW 56289 951-2501-000 EFF THRU MCN 334 ONLY	C7	1
- 47	756-6792-005	3	TERMINAL BOARD	TB1	1
- 48	SKT41YEL	4	JACK 98291 360-0261-000	J4	1
- 49	SKT410KN	4	JACK 98291 360-0260-000	J3	1
- 50	SKT41RED	4	JACK 98291 360-0259-000	J2	1
- 51	DP439-433WHT	4	TERMINAL 21242 306-1521-000		9
- 52	306-1351-000	4	TERMINAL, FEEDTHRU 98291		14
- 53	F22NCFMA1-26	4	NUT, SELF-LKG, CLINCH, CAD. PL STL, 2-56 72962 333-0837-000		2
- 54	6009-8A	4	CLIP 91506 139-2336-000 EFF THRU MCN 359		3
- 54	6009-8A	4	CLIP 91506 139-2336-000 EFF MCN 360		2
	MS16535-76	4	RIVET, TUBULAR, AL, OV HD, 0.152 DIA X 0.125 LG SHK 305-1755-000 EFF THRU MCN 359 AP		3
	MS16535-76	4	RIVET, TUBULAR, AL, OV HD, 0.152 DIA X 0.125 LG SHK 305-1755-000 EFF MCN 360 AP		2
- 55	756-6791-005	4	TERMINAL BOARD		1
- 56	302-22	2	CHOPPER 81541 354-1022-000	G1	1
- 57	302-22	2	CHOPPER 81541 354-1022-000	G2	1
	68-1660-40	2	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP FOR 56 AND 57		6
	MS51959-14	2	SCREW, MACH., SST, FH, 4-40 X 5/16 342-0045-000 AP FOR 56 AND 57		6

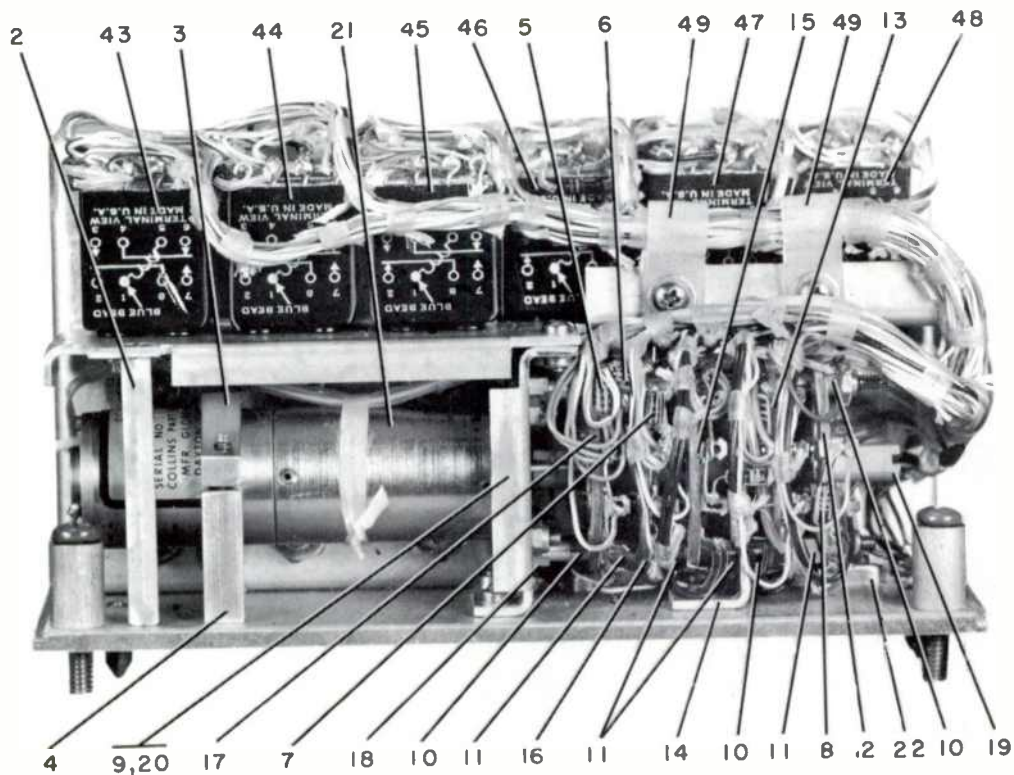
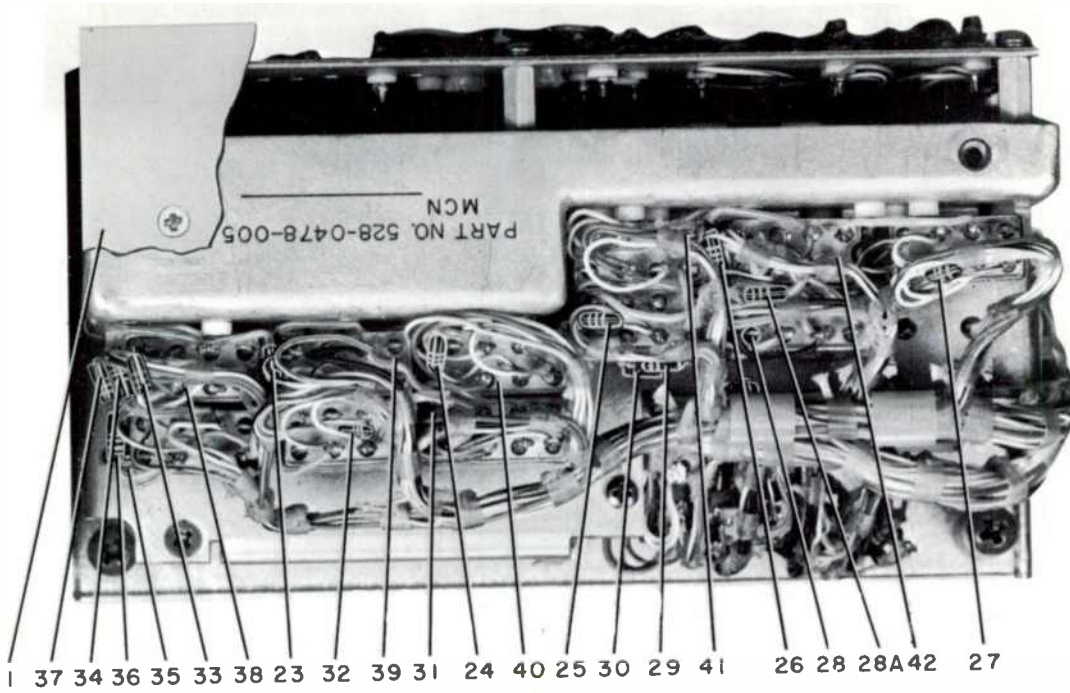


GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1109 - 58	540-9049-003	2	POST, ELECTRICAL-MECHANICAL EQUIP.	4	
	MS51959-12	2	SCREW, MACH., SST, FH, 4-40 X 3/16 342-0043-000 AP	4	
- 59	756-6790-005	2	CHASSIS, ELECTRICAL EQUIP.	1	
- 60	SKT41GRN	3	JACK 98291 360-0262-000	1	J5
- 61	SKT41GRN	3	JACK 98291 360-0262-000	1	J1
- 62	F12NCFMA1-62	3	NUT, SELF-LKG, CLINCH, CAD. PL STL, 6-32 72962 333-0841-000	2	
- 63	546-6128-002	3	CLIP, SPG, TENS	2	
	305-0043-000	3	RIVET, TUBULAR, SIL PL BRS, FH, 0.060 DIA X 3/32 LG SHK COML AP	4	
	502-6045-002	3	WASHER AP	4	
- 64	541-6557-002	3	PIN, LOCATING	2	
- 65	756-6789-005	3	CHASSIS, ELECTRICAL EQUIP.	1	
R 1110 - 0	528-0478-005	1	RELAY CONTROL MODULE SEE FIG. 1108-4 FOR NHA	REF	
- 1	756-6894-005	2	COVER, RELAY ASSY GROUP	1	
	MS51957-14	2	SCREW, MACH., SST, PAN HD, 4-40 X 5/16 343-0134-000 AP	2	
- 2	554-3865-002	2	POST, ELECTRICAL-MECHANICAL EQUIP.	1	
	MS51959-14	2	SCREW, MACH., SST, FH, 4-40 X 5/16 342-0045-000 AP	1	
	MS51959-13	2	SCREW, MACH., SST, FH, 4-40 X 1/4 342-0044-000 AP	1	
- 3	554-3861-002	2	CLAMP, MOTOR	1	
- 4	554-3862-002	2	CLAMP, MOTOR	1	
	P342-0054-000	2	SCREW, MACH., SST, FH, 4-40 X 1-1/4 77250 342-0054-000 AP FOR 3 AND 4	2	
- 5	1N645	2	SEMICOND DEVICE 353-2607-000	1	CR35
- 6	1N645	2	SEMICOND DEVICE 353-2607-000	1	CR36
- 7	1N645	2	SEMICOND DEVICE 353-2607-000	1	CR25
- 8	1N645	2	SEMICOND DEVICE 353-2607-000	1	CR23
- 9	756-6888-003	2	SWITCH, MOTOR DRIVEN	1	
	MS51957-13	2	SCREW, MACH., SST, PAN HD, 4-40 X 1/4 343-0133-000 AP	1	
	MS51959-14	2	SCREW, MACH., SST, FH, 4-40 X 5/16 342-0045-000 AP	4	
- 10	8980-2 1-8	3	SPACER 76854 269-1401-000	6	
- 11	8980-2 1-4	3	SPACER 76854 269-1403-000	8	
- 12	239582F	3	SWITCH SECTION 76854	1	S1E
			269-2567-000		
- 13	23978F	3	SWITCH SECTION 76854	1	S1D
			269-2566-000		
- 14	554-3873-003	3	BRACKET, ANGLE	1	
- 15	239579F	3	SWITCH SECTION 76854	1	S1C
			269-2565-000		
- 16	239581F	3	SWITCH SECTION 76854	1	S1B
			269-2569-000		
- 17	239580F	3	SWITCH SECTION 76854	1	S1A
			269-2568-000		
- 18	554-3866-002	3	NUT, SLV	2	
	68-1660-40	3	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP FOR 10 THRU 18	2	



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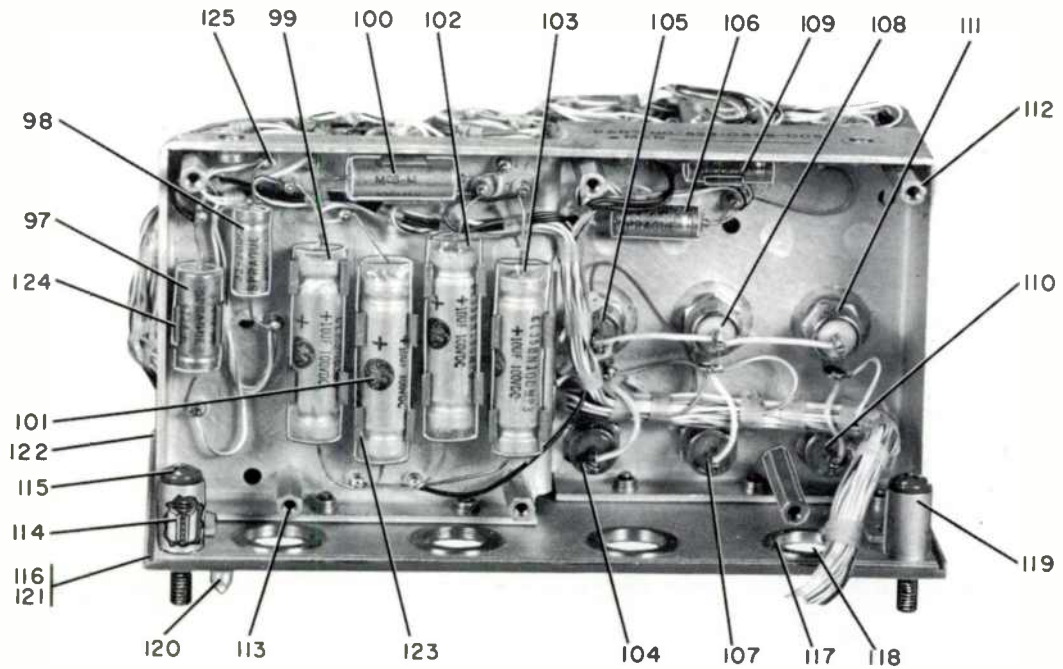
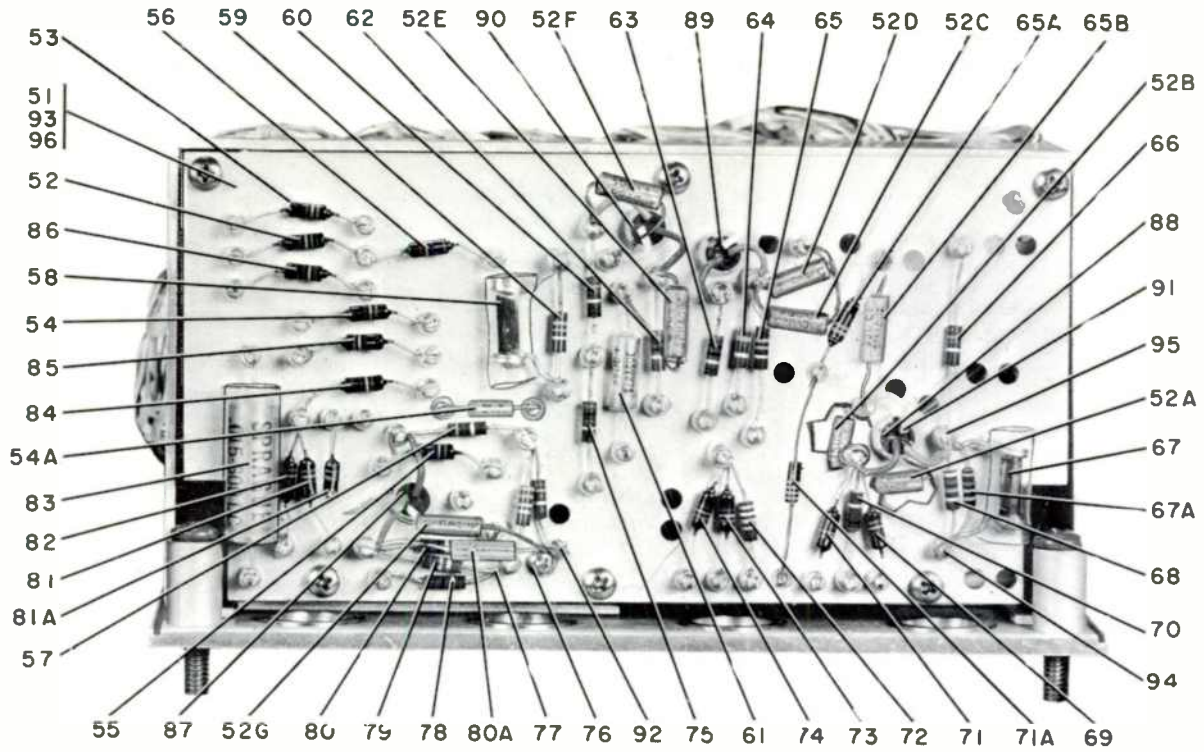


Relay Control Module (Sheet 1 of 2)  
Figure 1110

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Relay Control Module (Sheet 2 of 2)  
Figure 1110



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FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1110	P312-0025-00 0	3	STUD, CONTINUOUS THD, SST, 4-40 X 2 77250 312-0025-000 AP FOR 10 THRU 18	2	
	MS51959-12	3	SCREW, MACH., SST, FH, 4-40 X 3/16 342-0043-000 AP FOR 10 THRU 18	2	
- 19	554-3871-003 MS16562-190	3	SHAFT, STR 3 PIN, SPG, SST, 0.062 DIA X 1/4 LG 311-0417-000 AP	1 1	
- 20	544-3875-003 68-1660-40	3	CHASSIS ASSY 3 NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 AP	1 4	
	MS51957-14	3	SCREW, MACH., SST, PAN HD, 4-40 X 5/16 343-0134-000 AP	4	
- 21	43A159 756-6883-000	3	MOTOR 25140 230-0284-000	1	B1
- 22	DDM50P 68-1660-26	2	WIRING HARNESS, BRANCHED	1	
		3	CONNECTOR 71468 371-0971-000	1	
		3	NUT, SELF-LKG, HEX., AL, 2-56 72962 333-0604-000 AP	2	
	SPL4040-2HUT TINNED P342-0143-00 0	3	TERMINAL 77147 304-0331-000 AP	2	
		3	SCREW, MACH., NI PL BRS, FH, 2-56 X 1/4 77250 342-0143-000 AP	2	
- 23	1N645	2	SEMICONV DEVICE 353-2607-000	1	CR14
- 24	1N645	2	SEMICONV DEVICE 353-2607-000	1	CR22
- 25	1N645	2	SEMICONV DEVICE 353-2607-000	1	CR31
- 26	1N645	2	SEMICONV DEVICE 353-2607-000	1	CR40
R - 27	1N645	2	SEMICONV DEVICE 353-2607-000 EFF THRU MCN 604	1	CR50
		2	SEMICONV DEVICE 353-2607-000	1	CR33
R - 28A	1N645	2	SEMICONV DEVICE 353-2607-000 EFF MCN 235 SB7	1	CR55
- 29	1N645	2	SEMICONV DEVICE 353-2607-000	1	CR43
- 30	1N645	2	SEMICONV DEVICE 353-2607-000	1	CR44
- 31	1N645	2	SEMICONV DEVICE 353-2607-000	1	CR24
- 32	1N645	2	SEMICONV DEVICE 353-2607-000	1	CR8
- 33	1N645	2	SEMICONV DEVICE 353-2607-000	1	CR20
- 34	1N645	2	SEMICONV DEVICE 353-2607-000	1	CR18
- 35	1N645	2	SEMICONV DEVICE 353-2607-000	1	CR17
- 36	1N645	2	SEMICONV DEVICE 353-2607-000	1	CR16
- 37	1N645	2	SEMICONV DEVICE 353-2607-000	1	CR19
- 38	3SAF1131	2	RELAY 01526 974-0722-000	1	K1
- 39	3SAF1131	2	RELAY 01526 974-0722-000	1	K3
- 40	3SAF1131	2	RELAY 01526 974-0722-000	1	K5
- 41	3SAF1131	2	RELAY 01526 974-0722-000	1	K7
- 42	3SAF1131	2	RELAY 01526 974-0722-000	1	K9
- 43	3SAF1131	2	RELAY 01526 974-0722-000	1	K2
- 44	3SAF1131	2	RELAY 01526 974-0722-000	1	K4
- 45	3SAF1131	2	RELAY 01526 974-0722-000	1	K6
- 46	3SAF1131	2	RELAY 01526 974-0722-000	1	K8
- 47	3SAF1131	2	RELAY 01526 974-0722-000	1	K10
R - 48	3SAF1131	2	RELAY 01526 974-0722-000 EFF THRU MCN 604	1	K11
R	68-1660-40	2	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 EFF THRU MCN 604 AP FOR 38 THRU 48	22	
R	68-1660-40	2	NUT, SELF-LKG, HEX., AL, 4-40 72962 333-0605-000 EFF MCN 605 AP FOR 38 THRU 48	20	





GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1110 - 49	HP4N	2	CLAMP 09922 150-1541-000	2	
	MS51957-14	2	SCREW, MACH., SST, PAN HD, 4-40 X 5/16 343-0134-000 AP	2	
	310-0045-000	2	WASHER, FLAT, SST, 0.125 ID, 0.312 OD COML AP	2	
- 50		1	DELETED		
- 51	756-6892-004	2	RELAY ASSY GROUP SUBASSEMBLY	1	
	MS51957-14	2	SCREW, MACH., SST, PAN HD, 4-40 X 5/16 343-0134-000 AP	6	
	MS35338-135	2	WASHER, LOCK, SST, 0.115 ID, 0.212 OD 310-0279-000 AP	6	
R - 52	1N645	3	SEMICONV DEVICE 353-2607-000	1	CR28
- 52A	CK16M104M	3	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010 EFF MCN 360 SB18	1	C20
R - 52B	CK16M104M	3	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010 EFF MCN 391 SB19	1	C24
R - 52C	CK16M104M	3	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010 EFF MCN 391 SB19	1	C25
R - 52D	CK16M104M	3	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010 EFF MCN 360 SB18	1	C21
- 52E	CK16M104M	3	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010 EFF MCN 391 SB19	1	C26
R - 52F	CK16M104M	3	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010 EFF MCN 360 SB18	1	C22
R - 52G	CK16M104M	3	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010 EFF MCN 391 SB19	1	C23
- 53	1N645	3	SEMICONV DEVICE 353-2607-000	1	CR21
- 54	1N645	3	SEMICONV DEVICE 353-2607-000	1	CR47
- 54A	1N645	3	SEMICONV DEVICE 353-2607-000	1	CR26
- 55	1N645	3	SEMICONV DEVICE 353-2607-000	1	CR27
- 56	1N645	3	SEMICONV DEVICE 353-2607-000 EFF THRU MCN 228 ONLY	1	CR29
- 57	RCU7GF562K	3	RESISTOR, FXD, 5600 OHMS 10%, 1/4 W 745-0776-000	1	R25
- 58	763F95	3	RESISTOR, THRM, 27,500 OHMS 10%, 1 W 10646 714-0181-000	1	RT1
- 59	RCU7GF273K	3	RESISTOR, FXD, 27,000 OHMS 10%, 1/4 W 745-0800-000	1	R10
- 60	RCU7GF562K	3	RESISTOR, FXD, 5600 OHMS 10%, 1/4 W 745-0776-000	1	R9
- 61	150D225X0035 B2	3	CAPACITOR, FXD, 2.2 UF 20%, 35 VDCW 56289 184-7397-000	1	C11
- 62	RCU7GF100K	3	RESISTOR, FXD, 10 OHMS 10%, 1/4 W 745-0677-000	1	R11
- 63	RCU7GF100K	3	RESISTOR, FXD, 10 OHMS 10%, 1/4 W 745-0677-000	1	R19
R - 64	RCU7GF392K	3	RESISTOR, FXD, 3900 OHMS 10%, 1/4 W 745-0770-000	1	R18
- 65	RCU7GF103K	3	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	1	R17
- 65A	1N645	3	SEMICONV DEVICE 353-2607-000 EFF MCN 134	1	CR12
R - 65A	1N645	3	SEMICONV DEVICE 353-2607-000	1	CR12
- 65B	CL35BX010LP3	3	CAPACITOR, FXD, 1 UF 15%, 300 VDCW 184-8207-000 EFF MCN 235 SB17	1	C19



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GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
R 1110 - 66	RC07GF223K	3	RESISTOR, FXD, 22,000 OHMS 10%, 1/4 W 745-0797-000 EFF THRU MCN 234	R26	1
- 66	RC07GF333K	3	RESISTOR, FXD, 33,000 OHMS 10%, 1/4 W 745-0803-000 EFF MCN 235 SB17	R26	1
- 67	763F95	3	RESISTOR, THRM, 27,500 OHMS 10%, 1 W 10646 714-0181-000	RT2	1
R - 67A	150D226X0015 B2	3	CAPACITOR, FXD, 22 UF 20%, 15 VDCW 56289 184-7373-000 EFF MCN 235 SB17	C18	1
- 68	RC07GF273K	3	RESISTOR, FXD, 27,000 OHMS 10%, 1/4 W 745-0800-000	R27	1
- 69	1N645	3	SEMICONV DEVICE 353-2607-000	CR34	1
- 70	RC07GF102K	3	RESISTOR, FXD, 1000 OHMS 10%, 1/4 W 745-0749-000	R16	1
- 71	1N645	3	SEMICONV DEVICE 353-2607-000	CR42	1
- 71A	RC32GF152K	3	RESISTOR, FXD, 1500 OHMS 10%, 1 W 745-3359-000 EFF MCN 134	R12	1 A
- 71A	RC32GF152K	3	RESISTOR, FXD, 1500 OHMS 10%, 1 W 745-3359-000	R12	1 B
- 72	RC07GF333K	3	RESISTOR, FXD, 33,000 OHMS 10%, 1/4 W 745-0803-000	R15	1
- 73	1N645	3	SEMICONV DEVICE 353-2607-000	CR32	1
- 74	1N645	3	SEMICONV DEVICE 353-2607-000	CR39	1
- 75	RC07GF102K	3	RESISTOR, FXD, 1000 OHMS 10%, 1/4 W 745-0749-000	R8	1
- 76	RC07GF562K	3	RESISTOR, FXD, 5600 OHMS 10%, 1/4 W 745-0776-000	R22	1
- 77	RC07GF334K	3	RESISTOR, FXD, 0.33 MEG 10%, 1/4 W 745-0839-000	R21	1
- 78	RC07GF220K	3	RESISTOR, FXD, 22 OHMS 10%, 1/4 W 745-0689-000	R20	1
- 79	RC07GF224K	3	RESISTOR, FXD, 0.22 MEG 10%, 1/4 W 745-0833-000	R23	1
- 80	RC07GF220K	3	RESISTOR, FXD, 22 OHMS 10%, 1/4 W 745-0689-000	R24	1
- 80A	CK14AX103M	3	CAPACITOR, FXD, 10,000 PF 20%, 100 VDCW 913-3021-000 EFF MCN 116 THRU 334	C5	1 A
- 80A	CK16M104M	3	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010 EFF MCN 335 SB18	C5	1 A
- 80A	CK14AX103M	3	CAPACITOR, FXD, 10,000 PF 20%, 100 VDCW 913-3021-000	C5	1 B
- 81	1N645	3	SEMICONV DEVICE 353-2607-000	CR37	1
R - 81A	1N645	3	SEMICONV DEVICE 353-2607-000 EFF MCN 235 SB17	CR56	1
- 82	1N645	3	SEMICONV DEVICE 353-2607-000	CR38	1
- 83	118P15306S4	3	CAPACITOR, FXD, 0.015 UF 20%, 600 VDCW 56289 951-1058-000	C15	1
- 84	1N645	3	SEMICONV DEVICE 353-2607-000	CR41	1
- 85	1N645	3	SEMICONV DEVICE 353-2607-000	CR15	1
- 86	1N645	3	SEMICONV DEVICE 353-2607-000	CR7	1
- 87	2N886	3	SEMICONV DEVICE 353-3369-000	CR54	1
- 88	2N886	3	SEMICONV DEVICE 353-3369-000	CR51	1
- 89	2N886	3	SEMICONV DEVICE 353-3369-000	CR52	1
- 90	2N886	3	SEMICONV DEVICE 353-3369-000	CR53	1
- 91	P31034-1	3	HOLDER 08289 352-9 89-000		4



GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1110 - 92	SPL4040-2HOT TINNED	3	TERMINAL 77147 304-0331-000	2	
	P313-0050-00 O	3	NUT, PLAIN, HEX., NI PL BRS, 2-56 77250 313-0050-000 AP	1	
	310-0075-000	3	WASHER, LOCK, BRZ, 0.088 ID, 0.165 OD COML AP	1	
	P343-0298-00 O	3	SCREW, MACH., NI PL BRS, PAN HD, 2-56 X 3/16 77250 343-0298-000 AP	1	
- 93	756-6896-005	3	TERMINAL BOARD	1	TB1
- 94	SL286-301DWH T	4	TERMINAL 12615 306-1331-000	55	
- 95	DP439-433WHT	4	TERMINAL 21242 306-1521-000 EFF THRU MCN 334	5	
- 95	DP439-433WHT	4	TERMINAL 21242 306-1521-000 EFF MCN 335	4	
- 96	756-6895-005	4	TERMINAL BOARD	1	
- 97	150D337X0006 S2	2	CAPACITOR, FXD, 330 UF 20%, 6 VDCW 56289 184-7647-000	1	C16
R - 98	150D336X0020 R2	2	CAPACITOR, FXD, 33 UF 20%, 20 VDCW 56289 184-7663-000 EFF THRU MCN 604	1	C10
- 98	109D336X0075 F2	2	CAPACITOR, FXD, 33 UF 20%, 75 VDCW 56289 184-7774-000 EFF MCN 605	1	C10
- 99	CL358N100MP3	2	CAPACITOR, FXD, 10 UF 20%, 100 VDCW 184-8068-000	1	C1
-100	150D337X0006 S2	2	CAPACITOR, FXD, 330 UF 20%, 6 VDCW 56289 184-7647-000	1	C17
-101	CL358N100MP3	2	CAPACITOR, FXD, 10 UF 20%, 100 VDCW 184-8068-000	1	C2
-102	CL358N100MP3	2	CAPACITOR, FXD, 10 UF 20%, 100 VDCW 184-8068-000	1	C3
-103	CL358N100MP3	2	CAPACITOR, FXD, 10 UF 20%, 100 VDCW 184-8068-000	1	C4
-104	1N1200R	2	SEMICONV DEVICE 353-6213-000	1	CR2
-105	1N1200R	2	SEMICONV DEVICE 353-6213-000	1	CR1
	P334-0273-00 O	2	NUT, PLAIN, HEX., NI PL BRS, 10-32 77250 334-0273-000 AP	1	
	MS35338-138	2	WASHER, LOCK, SST, 0.194 ID, 0.337 OD 310-0284-000 AP	1	
	4021	2	TERMINAL 77147 304-8000-000 AP	1	
R -106	150D336X0020 R2	2	CAPACITOR, FXD, 33 UF 20%, 20 VDCW 56289 184-7663-000 EFF THRU MCN 604	1	C14
R -106	109D336X0075 F2	2	CAPACITOR, FXD, 33 UF 20%, 75 VDCW 56289 184-7774-000 EFF MCN 605	1	C14
-107	1N1200R	2	SEMICONV DEVICE 353-6213-000	1	CR4
-108	1N1200R	2	SEMICONV DEVICE 353-6213-000	1	CR3
	P334-0273-00 O	2	NUT, PLAIN, HEX., NI PL BRS, 10-32 77250 334-0273-000 AP	1	
	MS35338-138	2	WASHER, LOCK, SST, 0.194 ID, 0.337 OD 310-0284-000 AP	1	
	4021	2	TERMINAL 77147 304-8000-000 AP	1	
-109	150D157X0006 R2	2	CAPACITOR, FXD, 150 UF 20%, 6 VDCW 56289 184-7645-000	1	C13
-110	1N1200R	2	SEMICONV DEVICE 353-6213-000	1	CR6
-111	1N1200R	2	SEMICONV DEVICE 353-6213-000	1	CR5
	P334-0273-00 O	2	NUT, PLAIN, HEX., NI PL BRS, 10-32 77250 334-0273-000 AP	1	
	MS35338-138	2	WASHER, LOCK, SST, 0.194 ID, 0.337 OD 310-0284-000 AP	1	
	4021	2	TERMINAL 77147 304-8000-000 AP	1	

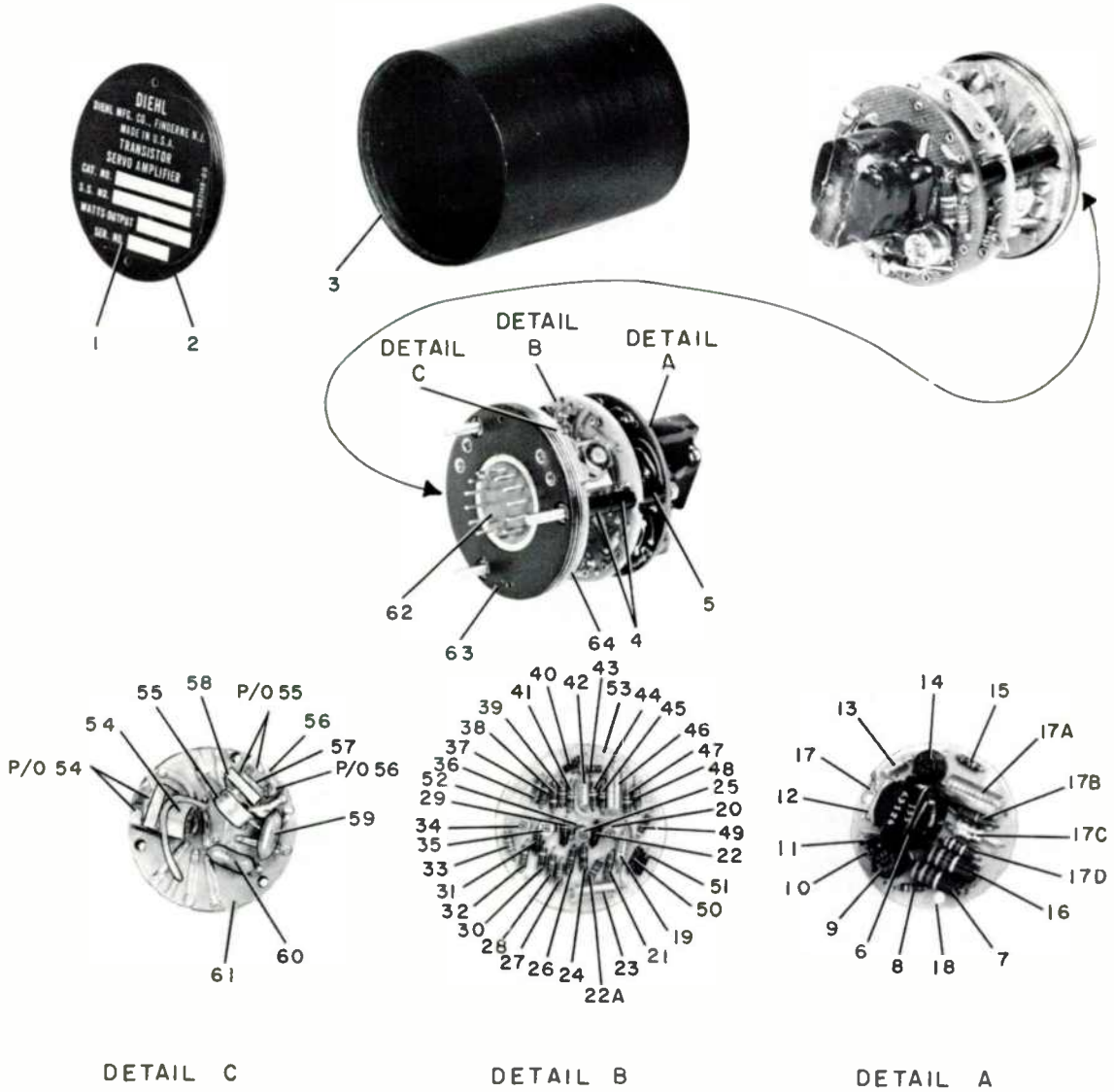


GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1110	-112	554-3864-002	2 POST, ELECTRICAL-MECHANICAL EQUIP.	3	
R	-113	554-3863-002	2 POST, ELECTRICAL-MECHANICAL EQUIP.	3	
		MS51959-12	2 SCREW, MACH., SST, FH, 4-40 X 3/16 342-0043-000 AP FOR 112 AND 113	6	
	-114	340-0642-000	2 SLEEVE, SPG 91314	4	
	-115	543-5967-003	2 SCREW, SPL	4	
	-116	756-6890-004	2 PLATE, BASE	1	
		MS51959-14	2 SCREW, MACH., SST, FH, 4-40 X 5/16 342-0045-000 AP	7	
	-117	554-3860-002	3 RETAINER, SCRNR	4	
	-118	554-3859-002	3 SCREW, AIR INTAKE	8	
	-119	543-5951-002	3 BUSHING	4	
	-120	540-7769-002	3 PIN, LOCATING	2	
	-121	756-6889-004	3 PLATE, BASE	1	
	-122	756-6898-005	2 CHASSIS, ELECTRICAL EQUIP.	1	
	-123	100-200-6A2	3 CLIP 99378 139-2216-000	8	
	-124	100-200-5A0	3 CLIP 99378 139-2726-000	3	
		MS2047UAD3-3	3 RIVET, SOLID, AL, 0.094 DIA X 0.187 LG SHK 305-1154-000 AP FOR 123 AND 124	3	
	-125	SL157-197	3 TERMINAL 12615 306-1260-000	16	
1111	- 0	TA018-UA145C	1 SERVO AMPLIFIER MODULE 17771 270-2047-020 SEE FIG. 1108-41 FOR NHA	REF	
	- 1	3-992276-02	2 NAMEPLATE 17771 270-2047-080	1	
	- 2	6-781658-01	2 CAP 17771 270-2047-130	1	
	- 3	6-781657-02	2 CAN 17771 270-2047-120	1	
	- 4	1-768782-08	2 SPACER 17771 270-2047-070	6	
	- 5	1-768782-09	2 SPACER 17771 270-2047-060	3	
		1-776400-00	2 NUT, SST 17771 270-2047-10G AP	3	
		270-2047-090	2 SCREW, MACH., SST, SLOT, FIL H, 4-40 X 1-11/16 17771 AP	3	
	- 6	6-780935-01	2 TRANSFORMER 17771 270-2047-150	T1	
	- 7	RC32GF331K	2 RESISTOR, FXD, 330 OHMS 10%, 1 W 745-3331-000	R20	
	- 8	RC07GF153K	2 RESISTOR, FXD, 15,000 OHMS 10%, 1/4 W 745-0791-000	R22	
	- 9	2N1480	2 TRANSISTOR 352-0578-010	Q6	
	- 10	RC07GF331K	2 RESISTOR, FXD, 330 OHMS 10%, 1/4 W 745-0731-000	R23	
	- 11	6-780934-01	2 RESISTOR, IHRR, 535 OHMS 10%, 3/4 W 17771 270-2047-050	RT1	
	- 12	CS138F335M	2 CAPACITOR, FXD, 3.3 UF 20%, 35 VDCW 184-6210-000	C5	
	- 13	150D104X0035 A2	2 CAPACITOR, FXD, 0.10 UF 20%, 35 VDCW 56289 184-7408-000	C4	
	- 14	2N1480	2 TRANSISTOR 352-0578-010	Q5	
	- 15	RC07GF153K	2 RESISTOR, FXD, 15,000 OHMS 10%, 1/4 W 745-0791-000	R21	
	- 16	RC32GF331K	2 RESISTOR, FXD, 330 OHMS 10%, 1 W 745-3331-000	R19	
	- 17	270-2047-220	2 LUG 17771	1	
	- 17A	CS138G156M	2 CAPACITOR, FXD, 15 UF 20%, 50 VDCW 184-6254-000	C7	



GROUP ASSEMBLY PARTS LIST





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FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1111 - 17B	RC2UGF681K	2	RESISTOR, FXD, 680 OHMS 10%, 1/2 W 745-1345-000	R17	1
- 17C	1N3029B	2	SEMICONV DEVICE, ZENER DIO, 24 V 5% 353-3059-000	VR5	1
- 17D	RC2UGF391K	2	RESISTOR, FXD, 390 OHMS 10%, 1/2 W 745-1335-000	R27	1
- 18	6-781574-01	2	PRINTED CIRCUIT BOARD 17771 270-2047-160		1
- 19	150D104X0035 A2	2	CAPACITOR, FXD, 0.10 UF 20%, 35 VDCW 56289 184-7408-000	C1	1
- 20	2N760A	2	TRANSISTOR 17771 270-2047-240	Q1	1
- 21	RC07GF182J	2	RESISTOR, FXD, 1800 OHMS 5%, 1/4 W 745-0757-000	R4	1
- 22	1N754A	2	SEMICONV DEVICE, ZENER DIO, 6.8 V 5% 353-2716-000	VR1	1
- 22A	RC07GF124J	2	RESISTOR, FXD, 0.12 MEG 5%, 1/4 W 745-0823-000	R29	1
- 23	CS138F685M	2	CAPACITOR, FXD, 6.8 UF 20%, 35 VDCW 184-6216-000	C6	1
- 24	RC07GF560J	2	RESISTOR, FXD, 56 OHMS 5%, 1/4 W 745-0703-000	R5	1
- 25	2N760A	2	TRANSISTOR 17771 270-2047-240	Q2	1
- 26	RC07GF821K	2	RESISTOR, FXD, 820 OHMS 10%, 1/4 W 745-0746-000	R8	1
- 27	RC07GF823J	2	RESISTOR, FXD, 82,000 OHMS 5%, 1/4 W 745-0817-000	R15	1
- 28	RC07GF221J	2	RESISTOR, FXD, 220 OHMS 5%, 1/4 W 745-0724-000	R9	1
- 29	1N754A	2	SEMICONV DEVICE, ZENER DIO, 6.8 V 5% 353-2716-000	VR2	1
- 30	RC07GF102K	2	RESISTOR, FXD, 1000 OHMS 10%, 1/4 W 745-0749-000	R14	1
- 31	1N754A	2	SEMICONV DEVICE, ZENER DIO, 6.8 V 5% 353-2716-000	VR3	1
- 32	RC07GF201J	2	RESISTOR, FXD, 200 OHMS 5%, 1/4 W 745-0723-000	R18	1
- 33	RC07GF3R3J	2	RESISTOR, FXD, 3.3 OHMS 5%, 1/4 W 745-4376-000	R28	1
- 34	2N760A	2	TRANSISTOR 17771 270-2047-240	Q4	1
- 35	2N760A	2	TRANSISTOR 17771 270-2047-240	Q3	1
- 36	RC07GF182J	2	RESISTOR, FXD, 1800 OHMS 5%, 1/4 W 745-0757-000	R24	1
- 37	RC07GF182J	2	RESISTOR, FXD, 1800 OHMS 5%, 1/4 W 745-0757-000	R16	1
- 38	RC07GF562K	2	RESISTOR, FXD, 5600 OHMS 10%, 1/4 W 745-0776-000	R13	1
- 39	RC07GF101J	2	RESISTOR, FXD, 100 OHMS 5%, 1/4 W 745-0712-000	R12	1
- 40	1N967B	2	SEMICONV DEVICE, ZENER DIO, 18 V 5% 353-3178-000	VR4	1
- 41	RC07GF103J	2	RESISTOR, FXD, 10,000 OHMS 5%, 1/4 W 745-0784-000	R7	1
- 42	CS138B685M	2	CAPACITOR, FXD, 6.8 UF 20%, 6 VDCW 184-6131-000	C3	1
- 43	RC07GF332J	2	RESISTOR, FXD, 3300 OHMS 5%, 1/4 W 745-0766-000	R6	1
- 44	RC07GF103J	2	RESISTOR, FXD, 10,000 OHMS 5%, 1/4 W 745-0784-000	R11	1
- 45	RC07GF103J	2	RESISTOR, FXD, 10,000 OHMS 5%, 1/4 W 745-0784-000	R3	1



GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE	UNITS PER ASSY.	USAGE CODE
1111 - 46	CS13BF685M	2	CAPACITOR, FXD, 6.8 UF 20%, 35 VDCW 184-6216-000	C2	1
- 47	RC07GF363J	2	RESISTOR, FXD, 36,000 OHMS 5%, 1/4 W 745-0804-000	R10	1
- 48	RC07GF153J	2	RESISTOR, FXD, 15,000 OHMS 5%, 1/4 W 745-0790-000	R1	1
- 49	RC07GF563J	2	RESISTOR, FXD, 56,000 OHMS 5%, 1/4 W 745-0811-000	R2	1
- 50	1N483B	2	SEMICOND DEVICE 353-2652-000	CR2	1
- 51	1N483B	2	SEMICOND DEVICE 353-2652-000	CK1	1
- 52	1-774785-01	2	TRANSISTOR MOUNTING PAD 17771 270-2047-040		4
- 53	6-781575-01	2	PRINTED CIRCUIT BOARD 17771 270-2047-170		1
- 54	2N1769	2	TRANSISTOR 352-0541-000	Q7	1
- 55	2N1769	2	TRANSISTOR 352-0541-000	Q8	1
- 56	6-781579-01	2	BRACKET 17771 270-2047-190		2
- 57	6-781581-01	2	SPACER 17771 270-2047-210		2
- 58	6-781580-01	2	INSULATOR 17771 270-2047-200		2
- 59	RW59V1R0	2	RESISTOR, FXD, 1 OHM 5%, 3 W 747-5105-000	R26	1
- 60	RW59V1K0	2	RESISTOR, FXD, 1 OHM 5%, 3 W 747-5105-000	R25	1
- 61	6-781586-01	2	PRINTED CIRCUIT BOARD 17771 270-2047-180		1
- 62	1-778275-01	2	CONNECTOR 17771 270-2047-030		1
- 63	6-780951-02	2	BASE 17771 270-2047-140		1
	6-780984-01	2	EYELET, BR5 17771 270-2047-110 AP		4
- 64	6-781659-01	2	INSULATOR 17771 270-2047-230		1





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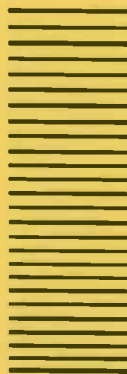


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