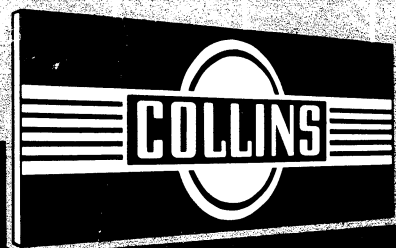


Collins

I N S T R U C T I O N B O O K

SC-101 STATION CONTROL



COLLINS RADIO COMPANY
CEDAR RAPIDS, IOWA

Instruction Book

SC-101

STATION CONTROL

COLLINS RADIO COMPANY

Cedar Rapids, Iowa

NEW YORK

BURBANK

DALLAS

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- (C) Item or symbol number obtained from parts list or schematic
- (D) Collins' type number, name, and serial number of principal equipment
- (E) Unit sub-assembly number (where applicable)

TABLE OF CONTENTS

Section		Page
I	GENERAL DESCRIPTION.	1-1
	1.1 General	1-1
	1.2 Major Units.	1-1
	1.3 System Components	1-1
	1.4 System Application	1-1
	1.5 Description of Units	1-2
	1.5.1 312A-2 Control/Speaker Unit	1-2
	1.5.2 68Y-1 Antenna Selector Unit	1-2
	1.5.3 534A-1 Cable Harness and Wiring Duct	1-3
	1.6 302C-2 Directional Wattmeter Specifications	1-4
	1.7 Items Required But Not Supplied	1-4
	1.7.1 General	1-4
	1.7.2 Additional Items Required, General	1-5
	1.7.3 Additional Items Required When More Than Three Antennas are Used.	1-6
II	INSTALLATION	2-1
	2.1 General	2-1
	2.1.1 Unpacking	2-1
	2.1.2 Layout	2-1
	2.2 Installation and Wiring	2-1
	2.2.1 General	2-1
	2.2.2 Installation and Wiring Procedure, General.	2-1
	2.2.3 Installation and Wiring Procedure, Four, Five, or Six Antenna Systems	2-2
	2.2.4 312A-2 Modification	2-2
	2.2.5 75A-4 Modification	2-2
III	OPERATION, INITIAL TEST, AND ADJUSTMENT.	3-1
	3.1 Controls	3-1
	3.2 Operation of KWS-1 Transmitter and 75A-4 Receiver	3-1
	3.3 Initial Tests and Adjustments.	3-1
	3.3.1 Initial Tests	3-1
	3.3.2 Initial Adjustments	3-2
	3.3.2.1 Phone Patch	3-2
	3.3.2.2 Synchro System	3-3
	3.4 SWR and Transmitter Power Output	3-3
	3.5 Monitoring R-F Output.	3-3
IV	PRINCIPLES OF OPERATION	4-1
	4.1 Controls and Functions.	4-1
	4.2 Block Diagram	4-2
	4.2.1 Primary Power Distribution	4-2
	4.2.2 Antenna Switching	4-2
	4.2.3 Phone Patch	4-2
	4.2.4 302C-2 Directional Wattmeter	4-2
	4.2.5 Rotator/Synchro.	4-4
	4.3 Circuit Theory	4-4
	4.3.1 Antenna Selector Relay Circuit	4-4
	4.3.2 Phone-Patch Circuit.	4-5
	4.3.3 302C-2 Directional Wattmeter Circuit	4-6
	4.3.4 Rotator/Synchro Circuits.	4-7

TABLE OF CONTENTS (Cont)

Section		Page
V	MAINTENANCE	5-1
5.1	General	5-1
5.2	Trouble Shooting and Repair	5-1
5.2.1	General	5-1
5.2.2	Trouble Shooting and Repair of the Primary Power Distribution Circuit	5-1
5.2.3	Trouble Shooting and Repair of the Antenna Switching Circuit.	5-1
5.2.4	Trouble Shooting and Repair of the 302C-2 Directional Wattmeter.	5-1
5.2.5	Trouble Shooting and Repair of the Phone Patch.	5-2
5.2.6	Trouble Shooting and Repair of the Rotator Control and Synchro Circuit	5-2
5.3	Preventive Maintenance	5-2
VI	PARTS LIST	
6.1	534A-1 Cable Harness and Wiring Duct	6-1
6.2	312A-2 Control/Speaker	6-2
6.3	68Y-1 Antenna Selector Unit	6-5
VII	ILLUSTRATIONS	
VIII	INSTALLATION AND WIRING FOR 4, 5, and 6 ANTENNA SYSTEMS	
8.1	Installation and Wiring Instructions	8-1

LIST OF ILLUSTRATIONS

Figure		Page
1-1	SC-101 Station Control Installed with KWS-1 Transmitter and 75A-4 Receiver	1-0
1-2	312A-2 Control/Speaker Unit	1-2
1-3	68Y-1 Antenna Selector Unit.	1-3
1-4	534A-1 Cable Harness and Wiring Duct.	1-4
2-1	SC-101 Station Control, Installation Diagram	2-3/2-4
2-2	SC-101 Station Control, Wiring Diagram	2-5/2-6
2-3	68Y-1 Antenna Selector Unit, Front Cover Closed, Showing Method of Connecting Transmission Lines to Patch Panel.	2-7
2-4	68Y-1 Antenna Selector Unit, Front Cover Open, Showing Method of Dressing Cables and Transmission Lines Inside Unit.	2-8
2-5	Installation of Type N Male Connector on RG-8/U Transmission Line	2-9
2-6	Installation of Type BNC Male Connector on RG-58/U Transmission Line	2-10
2-7	SC-101 Station Control, Typical Rotary Beam Antenna Tower Components, Schematic Diagram	2-11
2-8	312A-2 Control/Speaker Unit, Rotator/Synchro Circuits, Simplified Schematic Diagram . .	2-12
3-1	312A-2 Control/Speaker Unit, Location of Controls	3-1
3-2	Graph: SWR Corresponding to Various Values of Forward and Reflected Power.	3-4
4-1	SC-101 Station Control, Block Diagram.	4-3
4-2	SC-101 Station Control, Antenna Selector Relay Circuit, Simplified Schematic Diagram . .	4-4
4-3	SC-101 Station Control, Phone-Patch Circuit, Simplified Schematic Diagram	4-5
4-4	302C-2 Directional Wattmeter, Simplified Schematic Diagram.	4-6
4-5	SC-101 Station Control, Synchro Circuit, Simplified Schematic Diagram	4-7
7-1	312A-2 Control/Speaker Unit, Front View, Front Panel Opened	7-1
7-2	312A-2 Control/Speaker Unit, Front Panel, Rear View	7-1
7-3	312A-2 Control/Speaker Unit, Rear View	7-2
7-4	312A-2 Control/Speaker Unit, Relay Power Supply Chassis, Top View	7-2
7-5	312A-2 Control/Speaker Unit, Relay Power Supply Chassis, Bottom View.	7-3
7-6	312A-2 Control/Speaker Unit, Phone-Patch Chassis, Top View	7-3
7-7	312A-2 Control/Speaker Unit, Phone-Patch Chassis, Bottom View.	7-4
7-8	534A-1 Cable Harness and Wiring Duct, Duct Back Plate Removed.	7-4
7-9	68Y-1 Antenna Selector Unit, Front Cover, Rear View	7-5
7-10	302C-2 Coupler, Shield Removed.	7-5
7-11	SC-101 Station Control, Complete Schematic Diagram	7-7/7-8
8-1	Installation and Wiring of Additional Relays in 68Y-1 Antenna Selector Unit.	8-3/8-4

LIST OF TABLES

Table		Page
1-1	Items Required But Not Supplied, General.	1-5
1-2	Additional Items Required When More Than Three Antennas are Used	1-6
2-1	Connections to K902 and K903 With Three-Antenna Systems.	2-5/2-6
4-1	Controls and Functions	4-1

SECTION I
General Description

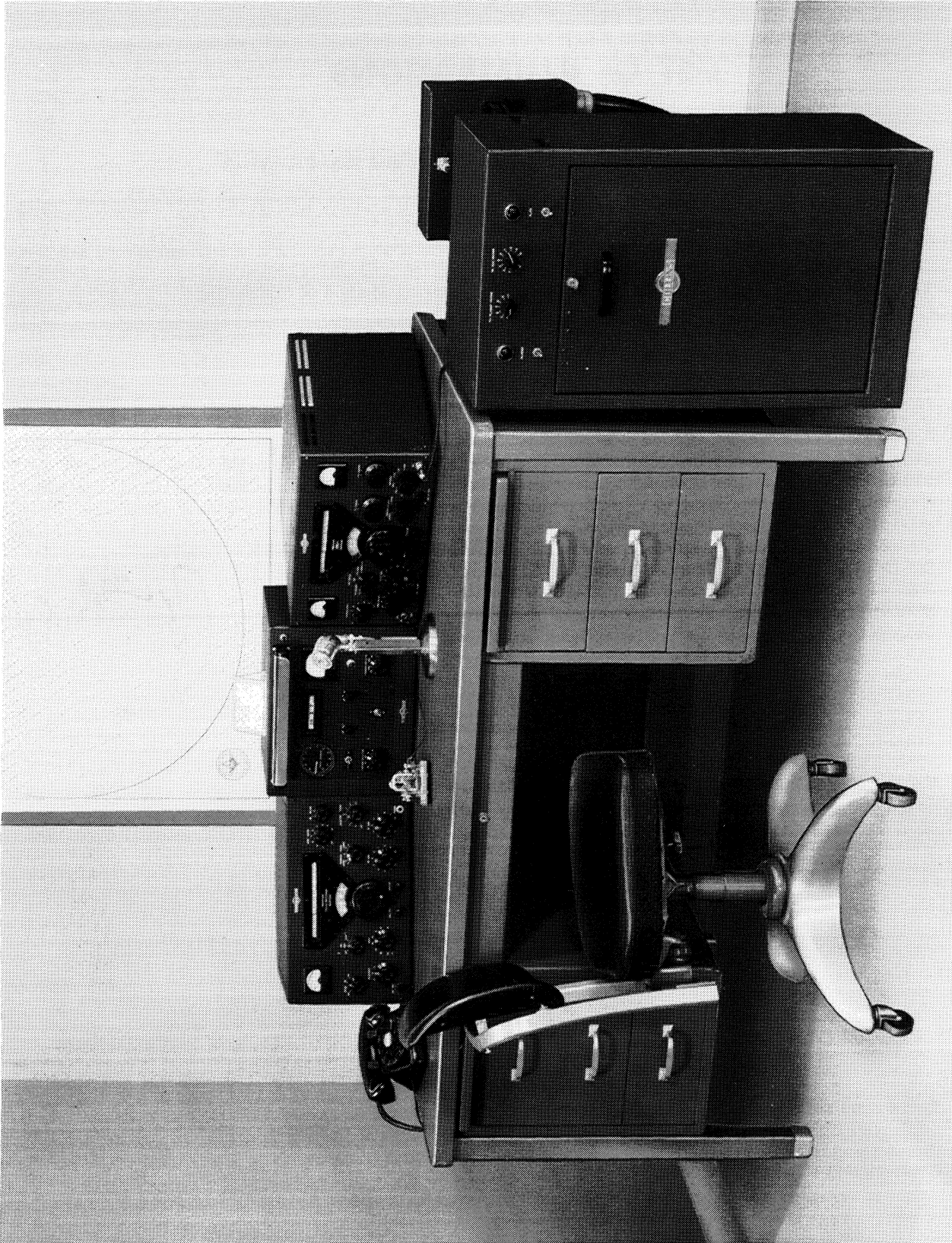


Figure 1-1. SC-101 Station Control Installed with KWS-1 Transmitter and 75A-4 Receiver

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SECTION I GENERAL DESCRIPTION

1.1 GENERAL.

The Collins SC-101 Station Control is a multipurpose accessory designed for use with the Collins KWS-1 Transmitter and Collins 75A-4 Receiver. The three equipments, together with antenna installations, comprise a complete amateur station system installation.

The SC-101 Station Control performs the following functions:

- a. Selection of any one of three transmission lines to antennas on any three of the five high-frequency amateur bands (80-40-20-15-10). The equipment can be modified to select up to six transmission lines to six separate antennas.
- b. Selection of either one of two separate rotary beam antenna tower installations. This selection is made simultaneously with the transmission line selection. Normally, one tower installation is selected with the 20-meter antenna selection and the other with both the 15- and 10-meter antenna selection. The arrangement can be modified as required.
- c. Indication of the forward and reflected power on the transmission line in use. These values are used in determining swr and transmitter power output.
- d. Automatic transmit-receive switching.

In addition to performing the above functions, the SC-101 Station Control provides the following auxiliary conveniences:

- Voice-operated phone patch
- Station clock
- Station light
- Speaker for the 75A-4 Receiver

1.2 MAJOR UNITS.

The SC-101 Station Control consists of the following major units:

- 312A-2 Control/Speaker unit
- 68Y-1 Antenna Selector
- 534A-1 Cable Harness and Wiring Duct

The 312A-2 Control/Speaker unit is housed in a modified version of the 75A-4 speaker cabinet. The components are mounted in the unused space surrounding the speaker. All control knobs and indicators are on the front of the cabinet. The front panel is hinged at the base and may be opened for access to the components inside. Cabinet dimensions are: 15 in. wide,

11-1/8 in. high, and 9-1/8 in. deep. The unit normally is placed on the operating desk between the KWS-1 Transmitter and 75A-4 Receiver.

The 68Y-1 Antenna Selector unit is housed in a hinged-front steel box designed for wall mounting. Box dimensions are: 12 in. wide, 12 in. high, and 5-5/8 in. deep. At least 12 in. clearance must be left in front of the box to provide room for opening the front of the box. The major components in the box are mounted on the front cover.

The 534A-1 Cable Harness and Wiring Duct is used to interconnect the 312A-2, 68Y-1, 75A-4, KWS-1, KWS-1 Power Supply, and various external system components. The wiring duct normally is mounted along the rear edge of the operating desk, and the wiring harness subcables are brought out through cable connectors and holes in the duct. Leads to the KWS-1 Power Supply, the 68Y-1 and other external locations are fed through plastic-covered flexible steel conduits (not supplied). The wiring duct dimensions are 53 in. long, 4 in. high, and 3 in. deep.

Figure 1-1 shows a typical station installation of the SC-101, KWS-1, and 75A-4.

1.3 SYSTEM COMPONENTS.

In addition to the three major units, the SC-101 includes the following component parts of a complete system installation:

- a. One synchro transmitter for use with a rotary beam antenna installation.
- b. All necessary coaxial connectors.
- c. Conduit connectors for terminating the various conduits used in the system.

1.4 SYSTEM APPLICATION.

The SC-101 Station Control forms the link between the KWS-1, 75A-4, existing antennas, towers, and other station facilities to make up a complete custom-type system installation. Each antenna used in the system must be fed with a 52-ohm coaxial transmission line, terminated in a type N connector, and must match the KWS-1 Transmitter with swr less than 2.5:1 on all operating frequencies. The rotator/synchro circuitry, as supplied, is designed to handle one stacked 10-over-15 tower installation and/or one 20-meter tower installation. The circuit can be modified if desired.

SECTION I
General Description

1.5 DESCRIPTION OF UNITS.

1.5.1 312A-2 CONTROL/SPEAKER UNIT (figure 1-2).

The 312A-2 Control/Speaker unit contains the following items:

- a. A ten-inch speaker for the 75A-4 Receiver.
- b. An antenna selector switch with positions for each of the five high-frequency amateur bands and one spare position. This switch actuates the antenna selector relays and connects power and control leads to each of two rotary beam antenna installations.
- c. A synchro azimuth indicator coupled to a radio-compass dial. The synchro system operates on 110 v a-c.
- d. A clockwise/off/counterclockwise switch that controls the direction of the rotator(s) and applies power to the rotator and synchro circuits.
- e. A voice-operated phone-patch subassembly, with OFF-ON and VOX BAL controls.
- f. An indicating meter and selector switch for the Collins 302C-2 Directional **Wattmeter**.

g. A power supply that provides d-c voltage for operation of the antenna selector relays.

- h. A station clock.
- i. A station light.
- j. A power switch and pilot light.
- k. Two line fuses.

External connections to all of the above items are made through a terminal board mounted on the rear of the cabinet. The telephone line to the phone patch is connected directly to a terminal board mounted on the phone-patch subassembly.

1.5.2 68Y-1 ANTENNA SELECTOR UNIT (figure 1-3).

The 68Y-1 Antenna Selector unit, as supplied, contains the following items:

- a. Two 52-ohm coaxial relays that work in conjunction with the antenna selector switch in the 312A-2 to select any one of three different antenna transmission lines.
- b. Three type N female coaxial connectors grouped as a patch panel for termination of the transmission lines.



Figure 1-2. 312A-2 Control/Speaker Unit

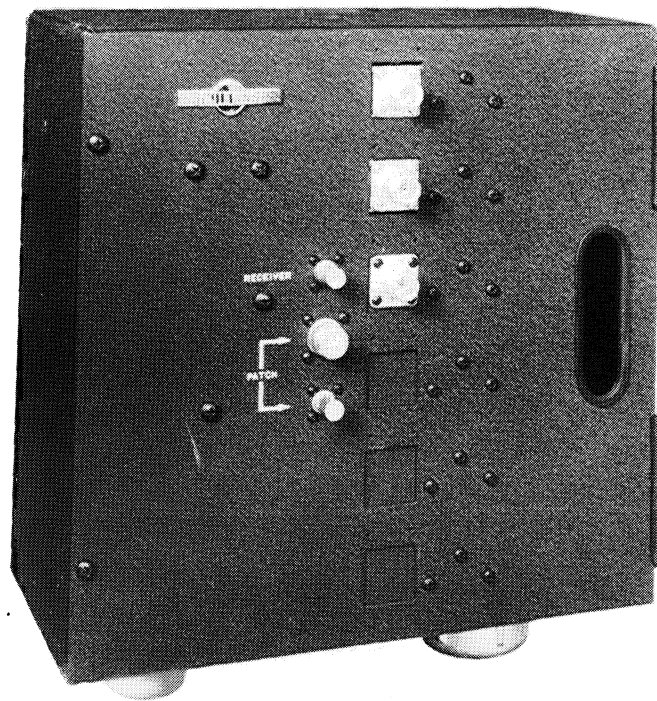


Figure 1-3. 68Y-1 Antenna Selector Unit

C183-15-P

c. A transmit-receive relay interconnected with the KWS-1 and 75A-4 Antenna and operate/standby circuits.

d. The 302C-2 coupler unit used with the indicating meter for measuring transmission line forward and reflected power. The readings are converted to swr by reference to a graph.

e. An auxiliary patch panel with an RCVR type BNC coaxial connector, and a type N coaxial connector connected to a type BNC coaxial connector to permit use of a second receiver with any unused antenna. This patch panel is also mounted on the front of the unit.

Transmission lines from the various antennas are brought into the box through one and one-half inch conduit at the bottom, and then brought out through a hole in the front for connection to the patch panels. All other external leads are part of the 534A-1 Cable Harness and enter the box through a second one-inch conduit in the bottom. Wiring harness connections to

the relays are made directly to the soldering lugs on the relay assemblies. Leads from the 302C-2 indicating meter and switch in the 312A-2 are connected to solder lugs on the coupler unit.

1.5.3 534A-1 CABLE HARNESS AND WIRING DUCT (figure 1-4).

The 534A-1 Cable Harness and Wiring Duct consists of the following items:

a. A wiring duct with removable back cover. The duct has cable connectors and grommeted access holes at various locations. These locations correspond to the positions of the various units and cables in a normal installation. Across the top of the duct are six 115 v a-c utility outlets.

b. A cabled wiring harness and RG-58/U coaxial cable installed within the duct. Subcables branch off the wiring harness and out of the duct to various terminations.

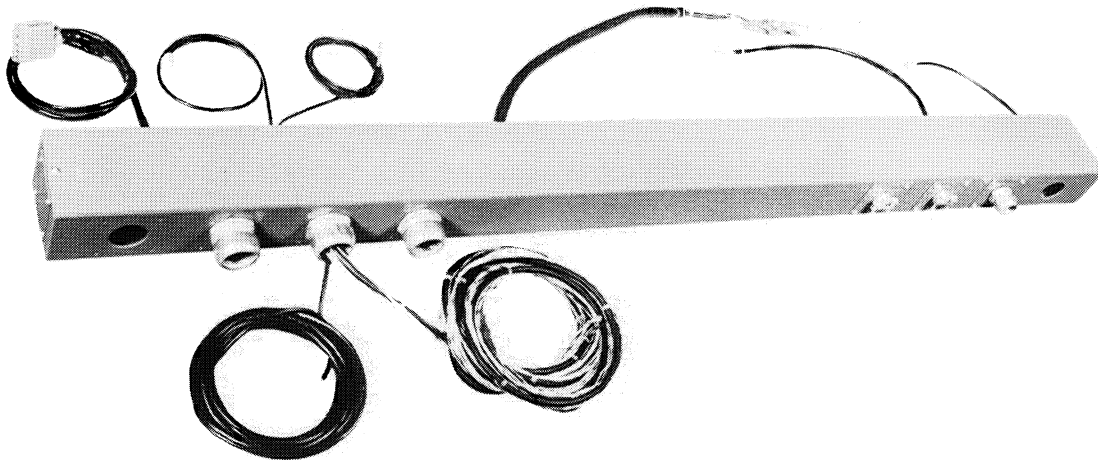


Figure 1-4. 534A-1 Cable Harness and Wiring Duct

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1.6 302C-2 DIRECTIONAL WATTMETER SPECIFICATIONS.

The 302C-2 Directional Wattmeter has the following specifications:

Maximum power handling capability*	2000 watts forward power
Power loss through coupler	Less than 0.1%, or 1 watt with 1000 watts r-f output
Swr introduced by coupler	Less than 1.05:1
Frequency range	2 to 30 mc
Impedance	52 ohm unbalanced
Wattmeter scales	100 watts forward 1000 watts forward 100 watts reflected 1000 watts reflected

*The amount of actual transmitter output power that can be handled safely by the wattmeter depends on the swr on the line.

1.7 ITEMS REQUIRED BUT NOT SUPPLIED.

1.7.1 GENERAL.

The SC-101 Station Control is designed to interconnect existing antennas, rotary beam antenna tower installations, the telephone line, and a primary power source with the KWS-1 Transmitter and 75A-4 Receiver. It is assumed that the station is equipped with the major items associated with these equipments, i.e., tower(s), rotator(s), fuse or breaker box, etc. The SC-101 rotator switching circuitry is best used with relay control of the rotators. A typical circuit is given as part of the installation procedure, section II. The synchro transmitter used on the tower(s) must be the type proper for mating with the synchro azimuth indicator installed in the 312A-2. One synchro transmitter is supplied with the equipment. If two towers are used, a second synchro transmitter must be obtained; it can be ordered from Collins Radio Company, part number CPN 230 0142 00. The synchro transmitters have a 0.125 in. OD shaft for coupling to the antenna drive pole(s).

Other additional items are required in every installation but are not supplied, because the specifications (length of conduits, cables, etc.) vary with individual requirements. These items are listed in paragraph 1.7.2. If more than three antennas are used, additional parts are required in the 68Y-1 Antenna Selector unit. These parts are listed in paragraph 1.7.3.

1.7.2 ADDITIONAL ITEMS REQUIRED, GENERAL.

Table 1-1 below lists the additional parts required in every installation. These items can be obtained from

local suppliers or from Collins Radio Company by part number, as listed.

TABLE 1-1. ITEMS REQUIRED BUT NOT SUPPLIED, GENERAL

ITEM	DESCRIPTION	COLLINS PART NUMBER	USE, NOTES
LIQUID-TITE MACHINE TOOL CONDUIT AND FITTINGS (All fittings for normal installation supplied. Fittings listed for reference only, as when additional extra fittings are required.)	Conduit, 1 in. OD, 4 ft maximum length	018 0068 00	Contains leads from KWS-1 Power Supply to 534A-1 Wiring Duct
	1 in. ID conduit fittings	019 0284 00	Terminates 1 in. OD conduit
	Conduit, 1/2 in. OD, length as required	018 0067 00	Contains primary power leads from distribution box to 534A-1 Wiring Duct
	1/2 in. ID conduit fittings	019 1283 00	Terminates 1/2 in. OD conduit
	Conduit, 1 in. OD, 10 ft maximum length	018 0068 00	Contains leads from 68Y-1 Antenna Selector unit to 534A-1 Wiring Duct
	Conduit, 1-1/2 in. OD, length as required	018 0069 00	Contains RG-8/U transmission lines to 68Y-1 Antenna Selector unit
	1-1/2 in. ID conduit fittings	019 0285 00	Terminates 1-1/2 in. OD conduit
	Conduit, 1 in. OD, length as required	018 0068 00	Contains rotator/synchro cable(s)
TRANSMISSION LINES	RG-8/U coaxial cables, length as required		Connect antennas to 68Y-1 Antenna Selector unit patch-panel jacks
	RG-8/U coaxial cable, 17 ft max length		Connects KWS-1 r-f output to 68Y-1 Antenna Selector unit
PRIMARY POWER LEADS	2 or 3-wire, no. 12 copper, length as required		Primary power leads from distribution box to KWS-1 Power Supply
	2-wire, no. 12 or no. 14 copper, length as required		Primary power leads from distribution box to utility outlet string on 534A-1 Wiring Duct
ROTATOR/ SYNCHRO POWER/ CONTROL CABLE(S)	8-wire (min) cable(s), 6-no. 16 copper, 2- no. 10 copper, one cable for each rotary beam antenna tower, length as required		Power/control cables to tower components. Specifications adequate for cable lengths up to 100 feet. With longer runs, increase wire sizes
PHONE-PATCH LINE	2-wire no. 22, length as required		Telephone connection line from telephone terminal box or block to phone-patch terminal board

SECTION I
General Description

1.7.3 ADDITIONAL ITEMS REQUIRED WHEN MORE
THAN THREE ANTENNAS ARE USED.

Table 1-2 lists the additional items required in the
68Y-1 Antenna Selector unit when more than three

antennas (or transmission lines) are used. Refer to
section VIII for installation instructions.

TABLE 1-2. ADDITIONAL ITEMS REQUIRED WHEN MORE THAN THREE ANTENNAS ARE USED

ITEM	COLLINS PART NUMBER	USE, NOTES
ANTENNA SELECTOR RELAY(S)	410 0136 00	One required for each additional antenna. Symbols: K904, K905, K906.
COAXIAL JUMPER(S)	542 0985 003	One required with each additional relay. Symbols: E903, E904, E905.
TYPE N MALE CONNECTOR(S)	357 9040 00	One required for each additional trans- mission line. Symbols: P908, P909, P910. (Spares supplied may be used.)

SECTION II INSTALLATION

2.1 GENERAL.

2.1.1 UNPACKING.

The SC-101 Station Control units are packed in one wooden case and two cardboard cases. The wooden case contains the 534A-1 Cable Harness and Wiring Duct. The larger cardboard case contains the 68Y-1 Antenna Selector unit and the various accessory cables and components. The smaller cardboard case contains the 312A-2 Control/Speaker unit. Remove the nails from the wooden case carefully to avoid damaging the unit inside. Remove the other units and accessories carefully, and check the items contained in each case against the packing list. If damage to the units is evident, retain the packing cases and material, and notify the transportation company immediately.

Make a thorough visual inspection of the outside and inside of each unit. Do not make adjustments or connections at this time, but look for broken connections, damaged parts, or any other evidence of shipping damage. Reference to figures in section VII will be helpful while making this visual check. If the units appear to be in satisfactory condition, proceed with the installation.

2.1.2 LAYOUT.

Layout of the units in a given station is subject to the option of the operator. The following points must be considered in planning the layout to facilitate cable installation:

- a. The KWS-1 Power Supply must be no more than three feet from one of the rear top corners of the operating desk.
- b. The 68Y-1 Antenna Selector unit must be no more than eight feet from one of the rear top corners of the operating desk.
- c. The operating desk should be at least 53 in. long to accommodate the wiring channel.
- d. A second receiver may be positioned on the operating table in place of the KWS-1 Exciter/Power Amplifier which in turn is placed on top of the KWS-1 Power Supply. In all arrangements, the 312A-2 must be placed between the KWS-1 Exciter/Power Amplifier and the main 75A-4 Receiver.
- e. Either a right-hand layout or a left-hand layout may be used. In the right-hand layout, the KWS-1 is to the right of the operator and the 75A-4 is to his left. In the left-hand layout, the reverse is true, and

the position of the 68Y-1 Antenna Selector unit is similarly interchanged. The 534A-1 Cable Harness is shipped installed in the duct for a right-hand layout. The entrance and exit holes in the top of the duct are symmetrically placed. If a left-hand layout is planned, simply reverse the harness in the duct, bringing out all leads in corresponding positions at the opposite end of the duct. Installation drawings show a typical right-hand layout. Cabling positions, etc., are opposite to those used in left-hand installations, but wire coding and other details apply in both cases.

2.2 INSTALLATION AND WIRING.

2.2.1 GENERAL.

The installation and wiring of much of the equipment and circuitry associated with the SC-101 units will vary with the requirements of the individual station. The drawings and text indicate the options necessary to adapt the equipment to most circumstances. Details may vary in a particular installation from those shown, but the general method should be followed as closely as possible to assure neat and accurate results.

2.2.2 INSTALLATION AND WIRING PROCEDURE, GENERAL.

Figures 2-1, 2-2, 2-3, and 2-4 show the major installation and wiring details. The following steps outline a systematic approach to installation and wiring:

- a. Fasten the 68Y-1 Antenna Selector box to the wall. Mounting holes for the box are on the back, visible by opening the cover. Fasten the 534A-1 Wiring Duct to the back of the operating desk. Mounting holes for the duct are on the back edge, visible by removing the cover plate from the duct. Remove the plate by sliding the cover up until free of the bottom duct lip.
- b. Set the remaining units in position (the KWS-1, 75A-4, and 312A-2) on and around the operating table (figure 2-1). Install band-indicator plates in the 68Y-1 front cover (figure 2-3).
- c. Secure the conduits to the bottom edge of the wiring duct in the proper positions using the conduit connectors provided.
- d. Remove leads to the KWS-1 Power Supply as noted. Thread the various cables through the conduits. A fish-wire taped to the composite cables will help pull them through (figure 2-1).
- e. Install the external end of each conduit in a conduit connector at the desired location. The connector

SECTION II
Installation

on the KWS-1 Power Supply is left free until the back is put on the cabinet, as noted (figure 2-1).

f. Cut all unterminated leads to length, leaving appropriate slack where noted. Install type N and type BNC connectors on the transmission lines. Refer to figures 2-5 and 2-6 for connector installation. Refer to figures 2-3 and 2-4 for lead dress in the 68Y-1 Antenna Selector unit.

g. Connect all wires to their proper terminals, as shown on figure 2-2.

h. Connect the components on the tower(s) to the rotator/synchro cable(s). Figure 2-7 shows a typical schematic with connections to the 312A-2 unit in various applications.

This completes the general installation.

2.2.3 INSTALLATION AND WIRING PROCEDURE,
FOUR, FIVE, OR SIX ANTENNA SYSTEMS.

If a four, five, or six antenna system is used, refer to section VIII for instructions.

2.2.4 312A-2 MODIFICATION.

If existing tower components or the rotary beam antenna distribution is different from those shown, the rotator/synchro switching circuit in the 312A-2 may have to be modified to suit these special circumstances. Figure 2-8 is a simplified schematic of this circuitry. For example, if one tower was used for a 10-meter antenna, and the other for a 15- and 20-meter antenna, the circuitry would be modified as follows:

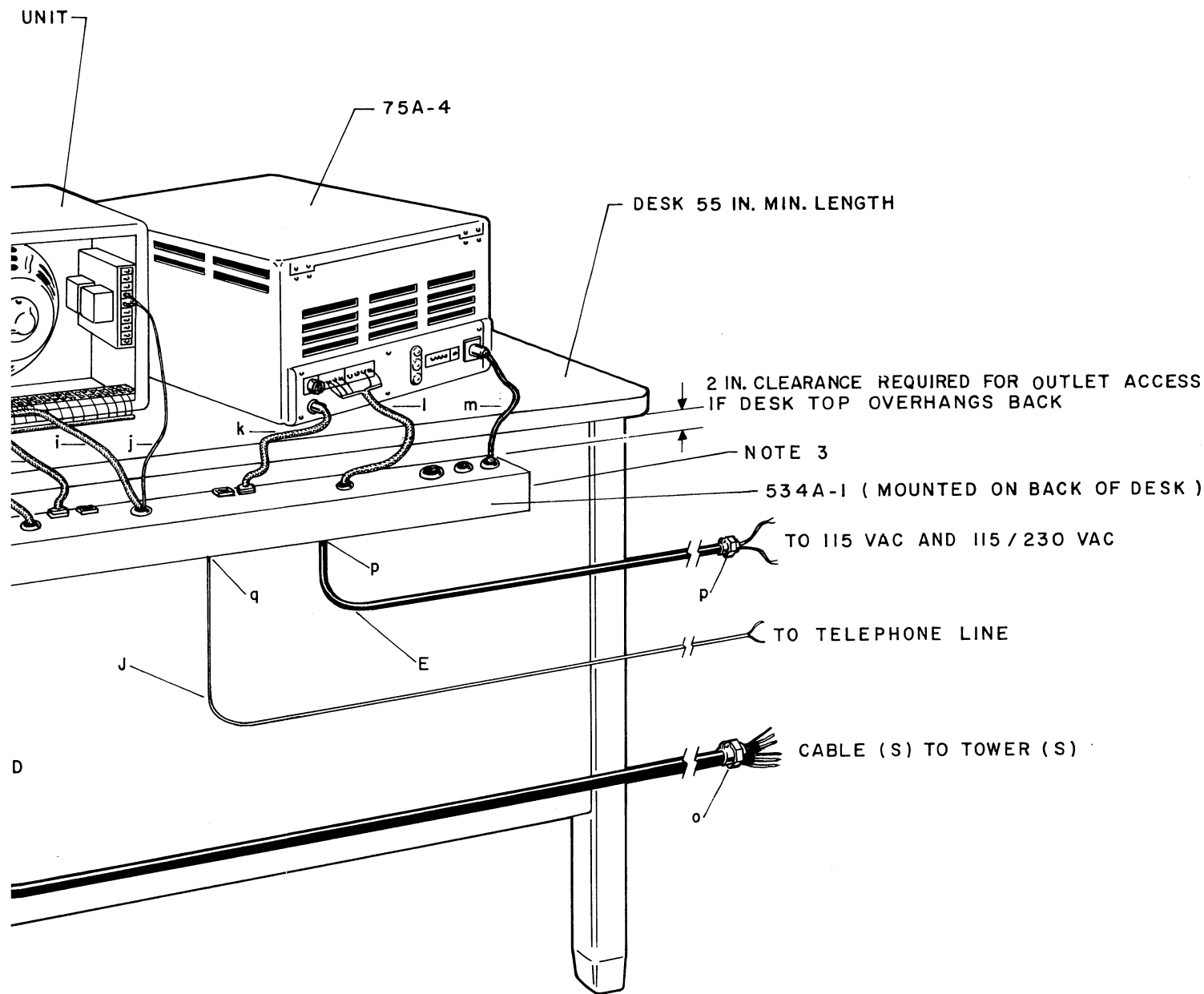
a. On S801 sections A, B, C, and D, remove the jumper between the 10- and 15-meter contacts.

b. Connect a jumper between the 15- and 20-meter contacts on these switch sections.

Modify the circuitry as required.

2.2.5 75A-4 MODIFICATION.

If the 75A-4 Receiver to be used has a serial number below 2382, replace C102 (0.1 uf) with a 1-uf, 200-volt tubular capacitor. Capacitor C102 is located next to the chassis in the position indicated in figure 5-3 in the 75A-4 instruction book. The 1-uf capacitor assures proper operation of the phone patch.



DOWN. FOR LEFT-HAND LAYOUT, LATERALLY REVERSE POSITIONS OF ALL UNITS AND CONDUITS. REMOVE ALL CABLES AND CONDUITS IN CORRESPONDING REVERSED POSITIONS. TO REMOVE MAIN WIRING HARNESS, FEED OUT THROUGH HOLE ADJACENT TO PI02. REPLACE BY FEEDING THROUGH CORRESPONDING HOLE (THIRD FROM END) IN LEFT-HAND END OF DUCT. POSITION IDENTICAL FOR EITHER LAYOUT.

TO PREPARE RECEIVER, PLACE KWS-1 EXCITER / PA ON TOP OF POWER SUPPLY. REMOVE PLATE FROM END OF DUCT AND END-HOLE. REMOVE MAIN WIRING HARNESS BY PULLING OUT LEADS THROUGH DUCT HOLE ADJACENT TO PI02. FEED DUCT THROUGH END-HOLE. PASS ALL LEADS TO KWS-1 EXCITER / PA (SYMBOLS a THROUGH f) THROUGH END-HOLE. REPLACE HARNESS LEADS IN FORMER POSITIONS.

FOR LEFT-HAND LAYOUT, NOTE 2 REFERS TO LEFT-HAND END OF DUCT.

UNIT IS TO BE POSITIONED IN SLOT WHEN POWER SUPPLY BACK COVER IS REPLACED.

Figure 2-1. SC-101 Station Control, Installation Diagram

312A-2 CONTROL / SPEAKER UNIT

KWS-1 EXCITER / PA

NOTE 2

KWS-1 POWER SUPPLY

12 IN.
CLEARANCE
REQUIRED

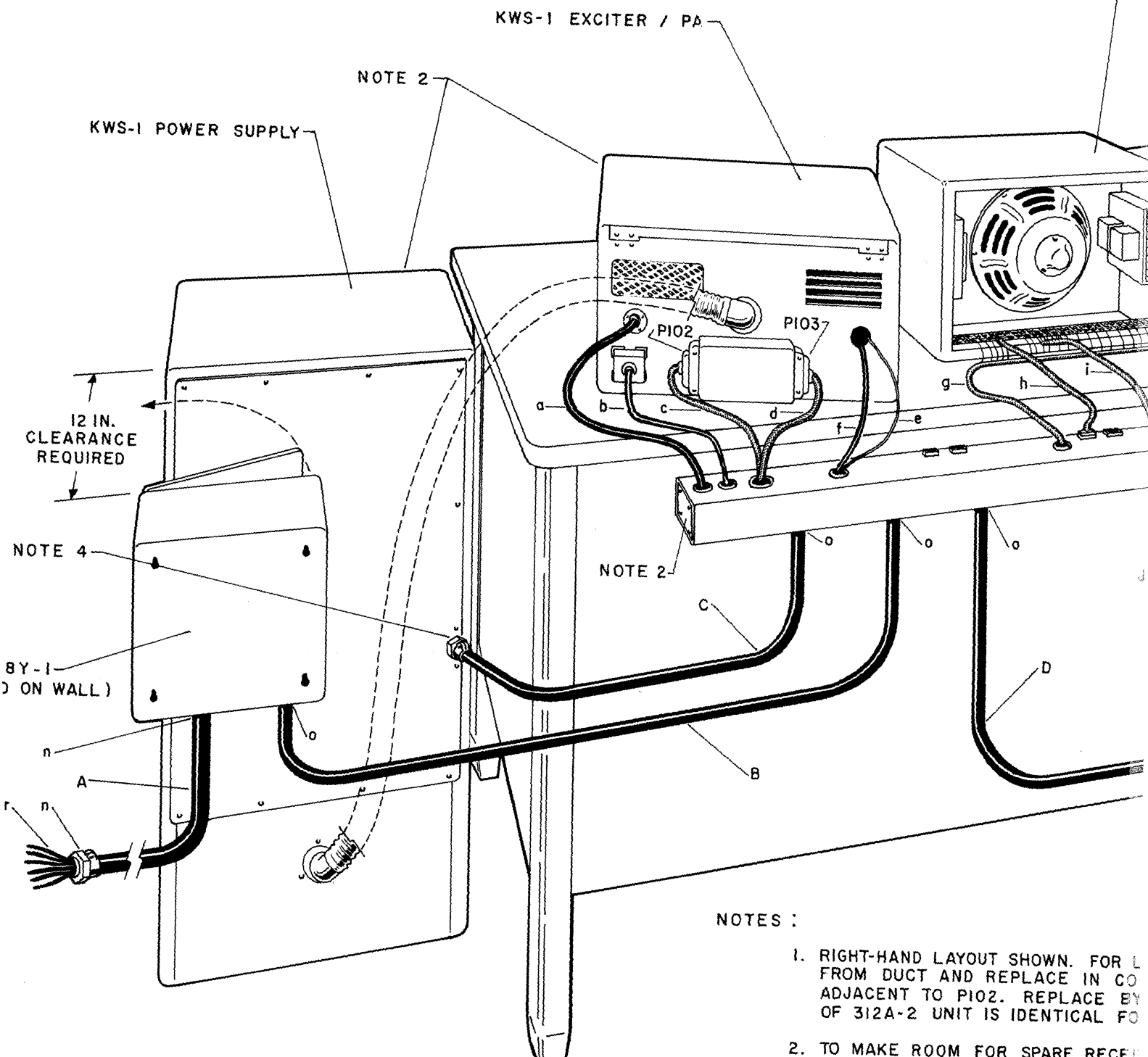
NOTE 4

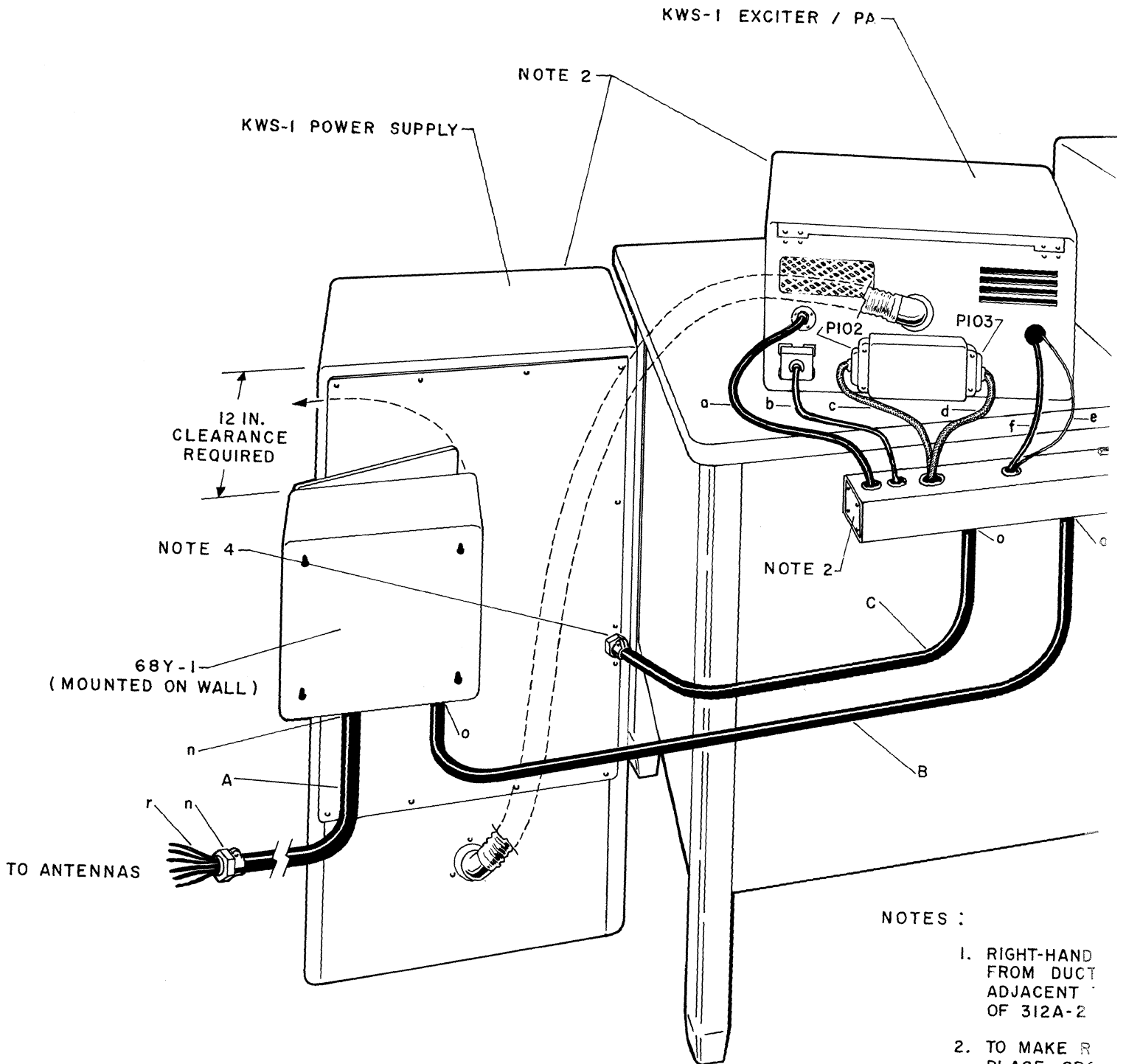
8Y-1
(ON WALL)

NOTE 2

NOTES :

1. RIGHT-HAND LAYOUT SHOWN. FOR LEFT-HAND LAYOUT, REMOVE CONDUIT FROM DUCT AND REPLACE IN CONDUIT ADJACENT TO PI02. REPLACE BY CONDUIT OF 312A-2 UNIT IS IDENTICAL FOR LEFT-HAND LAYOUT.
2. TO MAKE ROOM FOR SPARE RECEPTACLE, PLACE GROMMET IN END-HOLE. REPLACE WIRING HARNESS BACK INTO DUCT THROUGH GROMMET. REPLACE OTHER WIRING HARNESS AS NECESSARY.
3. FOR LEFT-HAND LAYOUTS, NOTE 1.
4. CONDUIT CONNECTOR POSITIONED AS SHOWN.





NOTES :

1. RIGHT-HAND FROM DUCT ADJACENT OF 312A-2
2. TO MAKE R PLACE GRO HARNESS E REPLACE O
3. FOR LEFT-
4. CONDUIT CO

LEGEND

DESCRIPTION

KWS-1 r-f output, RG-8/U, to 68Y-1 via conduit B

KWS-1 +2000 volt lead, RG-58/U, to KWS-1 P.S. via conduit C

Main wiring harness connections to P-102 on KWS-1 Exciter/PA

Main KWS-1 interunit cable, from P-103 on exciter/PA to P.S. via conduit C

Phone-patch input cable to exciter/PA from main wiring harness (P-703 to J-104)

Calibrate lead, RG-58/U, from KWS-1 calibrate connector to 75A-4 antenna lead, connected to coaxial "tee" in duct.

Main wiring harness leads to TB801 on 312A-2 unit

312A-2 primary power cord and plug to utility outlet

Rotation/synchro power/control cable(s) to tower(s) via conduit D

2-wire telephone line from phone-patch chassis terminal board in 312A-2 to telephone terminal box

75A-4 primary power cord and plug to utility outlet

Main wiring harness leads to 75A-4 terminal boards

75A-4 antenna lead, RG-58/U, from 68Y-1 unit via conduit B

1 in. ID conduit connectors

1/2 in. ID conduit connections

Cable connector mounted on adapter plate over conduit entrance hole

1-1/2 in. ID conduit connectors

Antenna transmission lines, RG-8/U, from 68Y-1 patch panel to antennas, via conduit A

1-1/2 in. OD liquid-tite conduit containing transmission lines

1 in. OD liquid-tite conduit containing leads from duct to 68Y-1 unit

1 in. OD liquid-tite conduit containing leads from duct to KWS-1 P.S.

1 in. OD liquid-tite conduit containing multiwire cable(s) to tower(s)

1/2 in. OD liquid-tite conduit containing primary power leads

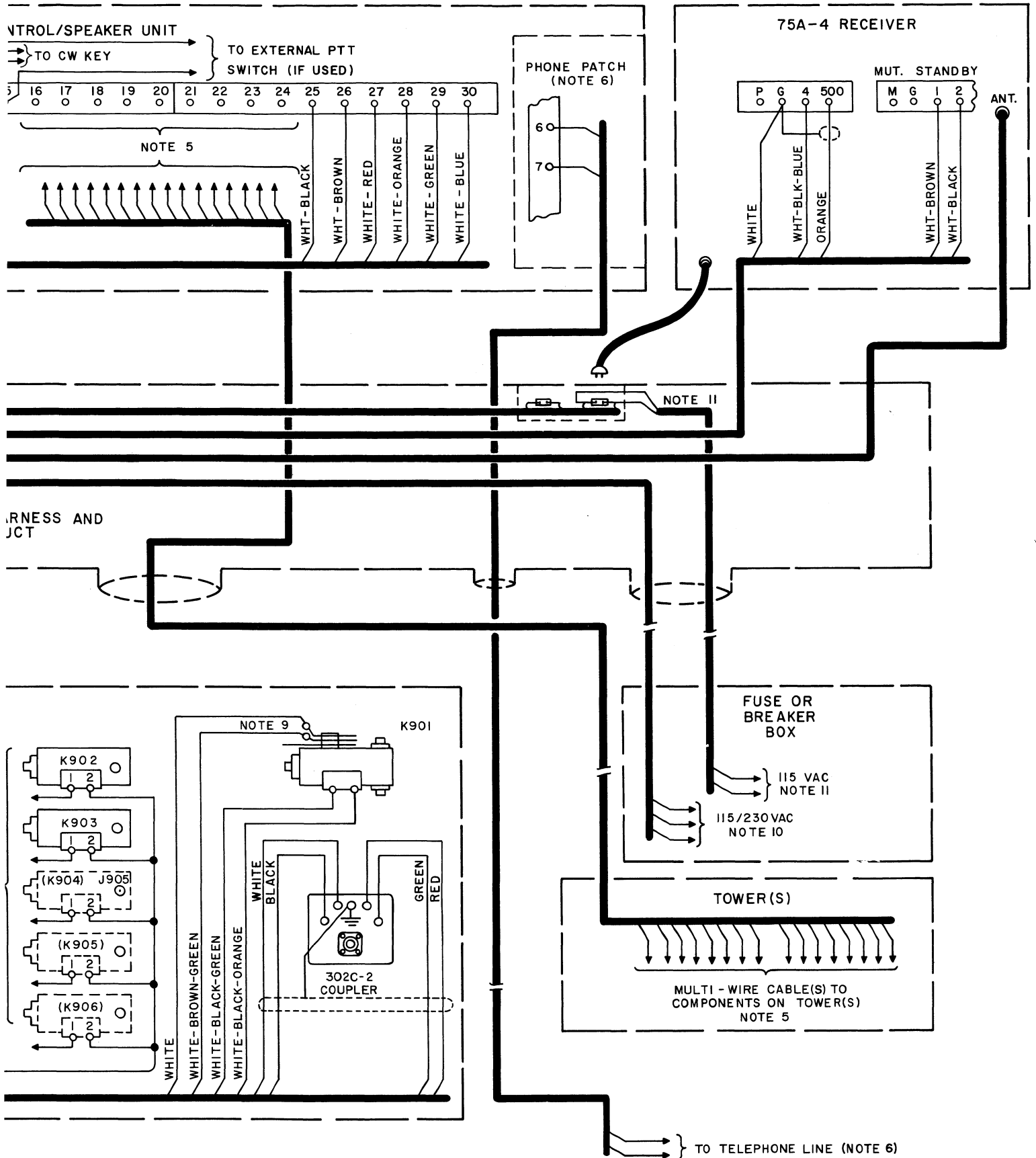
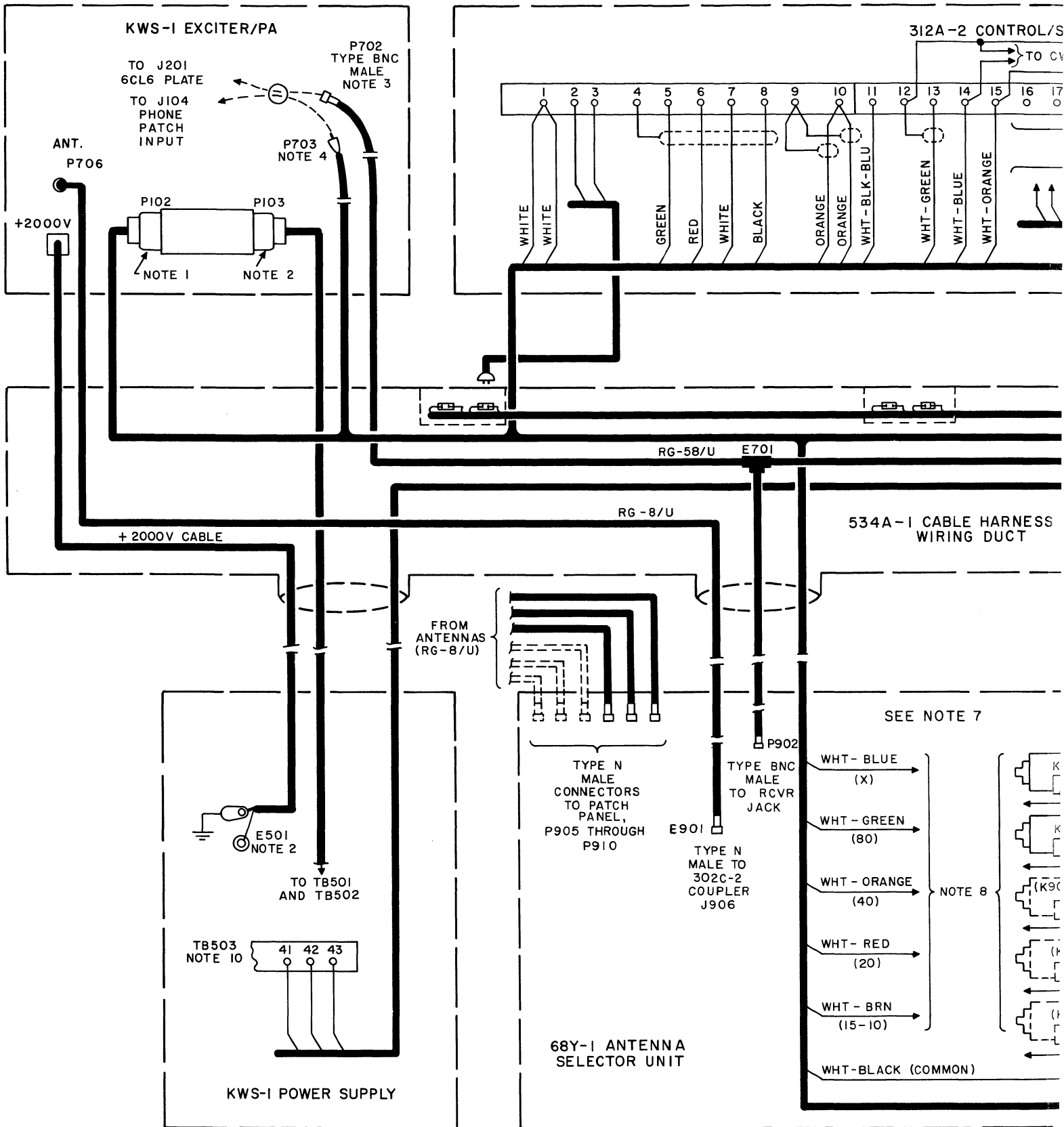


Figure 2-2. SC-101 Station Control, Wiring Diagram



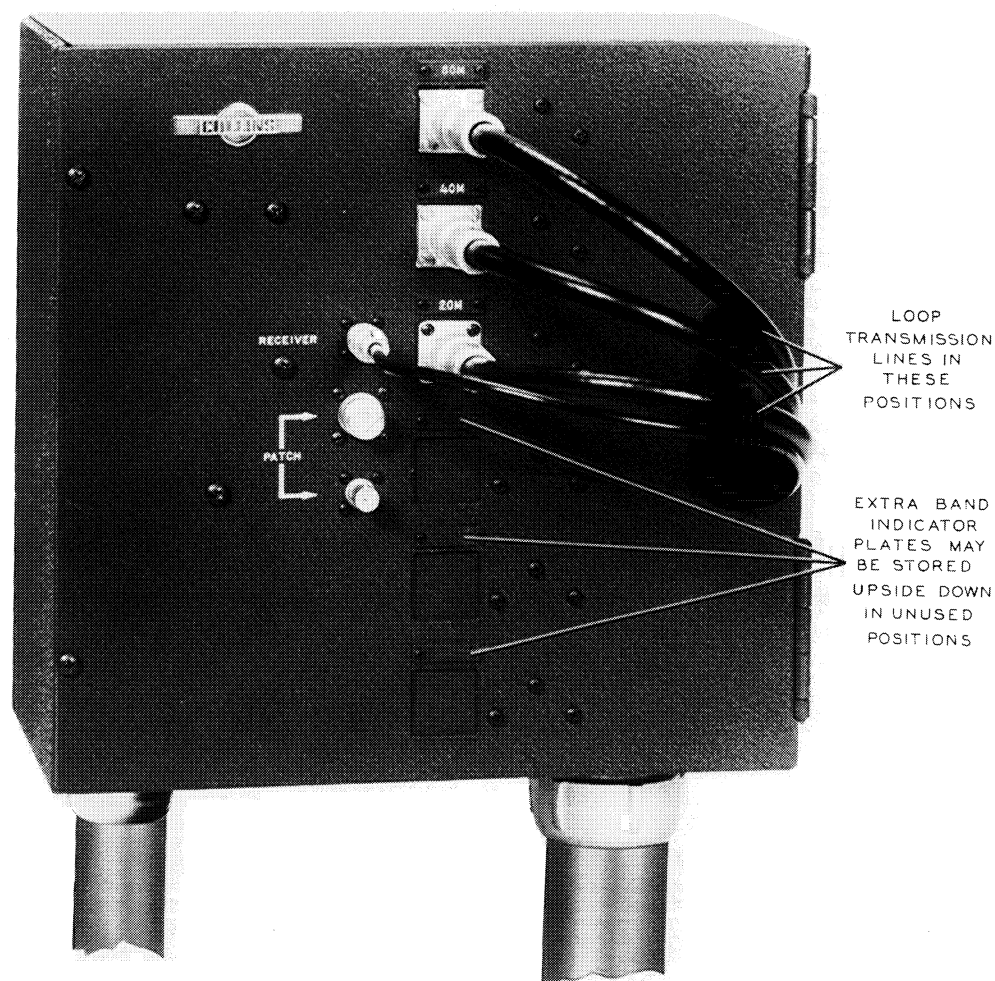
NOTES

1. P102 preconnected to wiring harness. Remove P102 supplied with KWS-1 and substitute P102 from wiring harness in its place.
2. P103 and +2000-volt cable supplied with KWS-1. To install in conduit, tag and remove all leads to TB501, TB502, and E501. Pull cables through duct and conduit, and reconnect. Check connections by reference to KWS-1 instruction book to avoid errors.
3. Connect to J201 as explained in KWS-1 instruction book.
4. Connect to J104 PHONE-PATCH input jack.
5. Rotator/synchro cable connections to terminals 16-24 vary with type of tower circuitry used. Refer to figure 2-7 for various options.
6. Connect 2 wires from telephone line to terminals 6 and 7 on phone-patch terminal board. Telephone line terminals are usually labeled L1-L2 (red-green wires) on telephone connection block.
7. Cut all wires and cables entering 68Y-1 unit to length, dressing leads as shown on figure 2-4. Install type N and type BNC connectors on coaxial leads as shown on figures 2-5 and 2-6. RG-8/U transmission lines and RG-58/U line (to 75A-4 Receiver) passed through slot in front cover and looped to patch panels (see figure 2-3).
8. Number of wires used and connections to K902 through K906 vary with the number and bands of the antennas used. For three antenna systems, refer to table 2-1 below. For four, five, and six antenna systems, refer to section VIII. Connections to relays are made by soldering leads directly to relay terminals.
9. Connect leads to normally open contacts on external terminals.
10. Number of wires used and connections to TB503 and primary fuse and breaker box vary with type of primary power (115 v a-c or 115/230 v a-c) used. Refer to figure 7-3, KWS-1 instruction book, for options. Three-wire 115/230 v a-c connections shown.
11. Connect 115 v a-c utility cable to either end of utility outlet string, as convenient. Outlet string prewired. Remove shield for access to terminals. Far end of cable connected across any 115 v a-c terminals in primary fuse or breaker box.

TABLE 2-1. CONNECTIONS TO K902 AND K903 WITH THREE-ANTENNA SYSTEMS

ANTENNAS USED*	ON K902, CONNECT TERMINAL TO:	ON K903, CONNECT TERMINAL TO:	K902 INDICATOR PLATE:	K903 INDICATOR PLATE:	J905 INDICATOR PLATE:
80-40-20	WH-GRN	WH-OR	80M	40M	20M
80-40-15	WH-GRN	WH-OR	80M	40M	15M
80-40-10	WH-GRN	WH-OR	80M	40M	10M
80-20-15	WH-GRN	WH-RED	80M	20M	15M
80-20-10	WH-GRN	WH-RED	80M	20M	10M
80-15-10	WH-GRN	WH-BRN	80M	15M	10M
40-20-15	WH-OR	WH-RED	40M	20M	15M
40-20-10	WH-OR	WH-RED	40M	20M	10M
40-15-10	WH-OR	WH-BRN	40M	15M	10M
20-15-10	WH-RED	WH-BRN	20M	15M	10M

*If extra antenna is used on any band, connect WHT-BLU lead in place of eliminated lead. Mount X indicator plate in place of eliminated plate.



C183-17-P

Figure 2-3. 68Y-1 Antenna Selector Unit, Front Cover Closed, Showing Method of Connecting Transmission Lines to Patch Panel

SECTION II
Installation

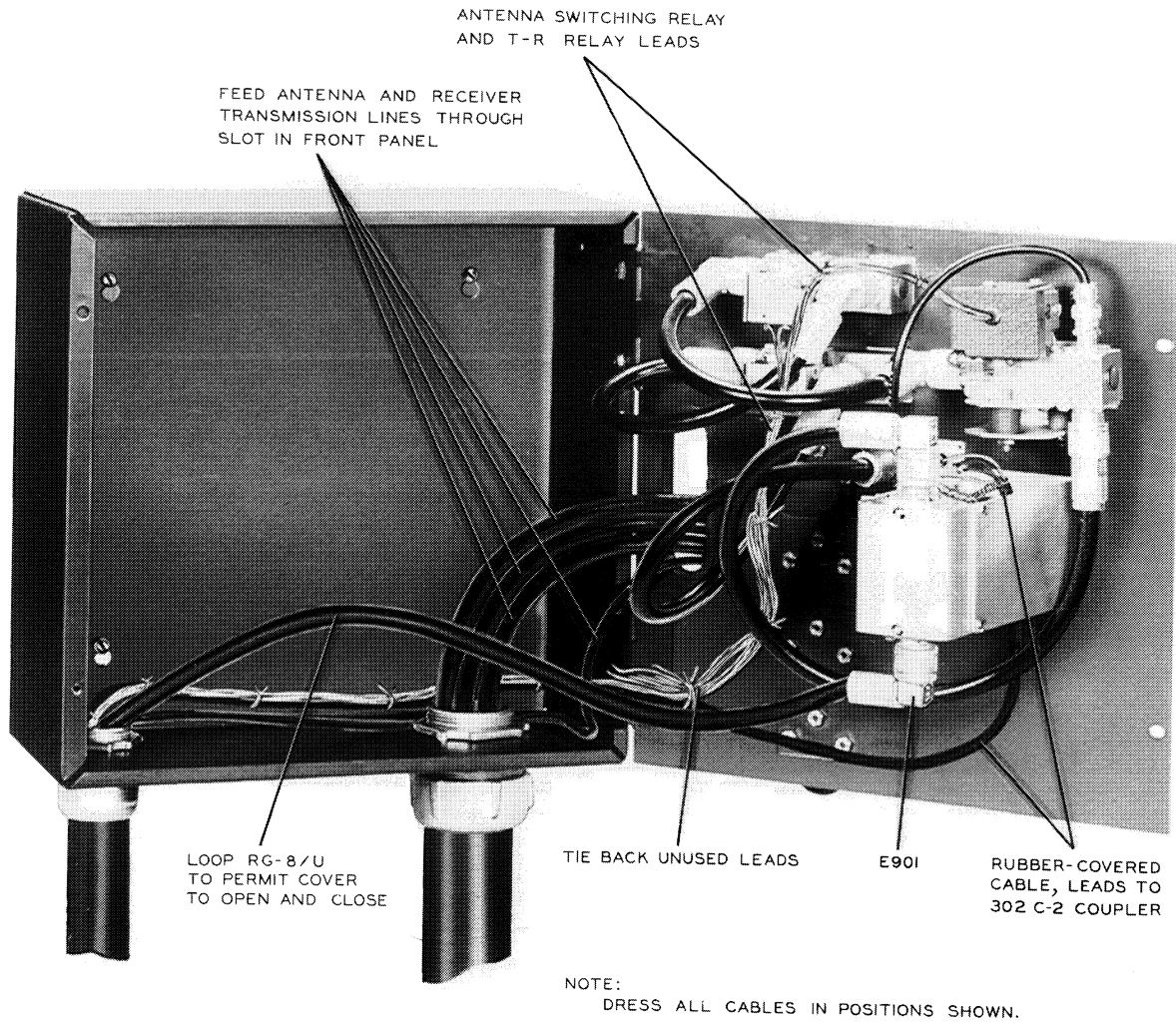
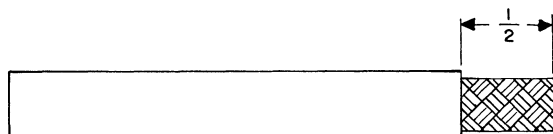


Figure 2-4. 68Y-1 Antenna Selector Unit, Front Cover Open, Showing Method of Dressing Cables and Transmission Lines Inside Unit

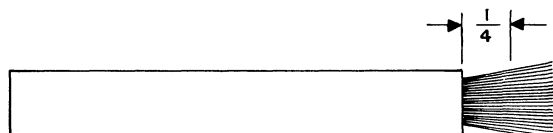
C183-18-P



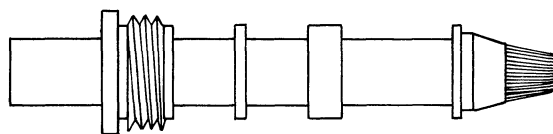
CUT END OF CABLE EVEN.



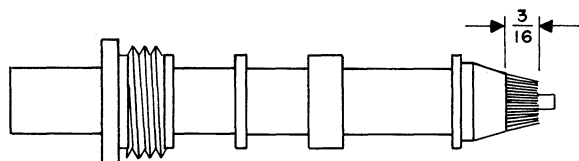
REMOVE VINYL JACKET $\frac{1}{2}$ INCH -
DON'T NICK BRAID.



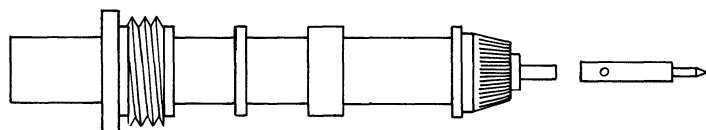
COMB OUT COPPER BRAID AS SHOWN.
BARE $\frac{1}{4}$ INCH OF CENTER CONDUCTOR -
DON'T NICK CONDUCTOR.



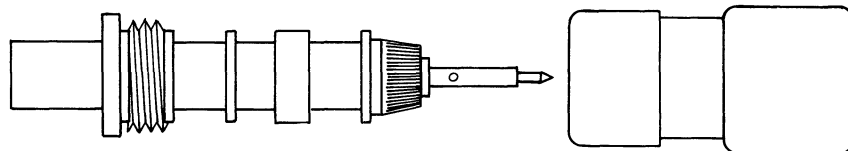
TAPER BRAID AS SHOWN. SLIDE NUT,
WASHER AND GASKET ON VINYL JACKET.
SLIDE CLAMP ON BRAID.



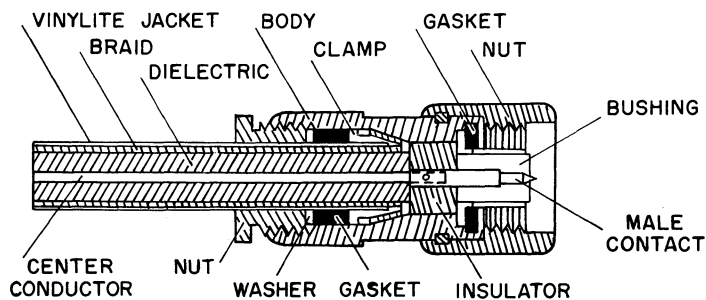
WITH CLAMP IN PLACE, TRIM BRAID
AS SHOWN.



FOLD COPPER BRAID BACK ON CLAMP.
TIN CENTER CONDUCTOR,
USING MINIMUM AMOUNT OF
HEAT.



HOLDING CONTACT WITH PLIERS,
SOFT SOLDER CONTACT TO
CENTER CONDUCTOR. IT IS
IMPERATIVE THAT BACK END
OF CONTACT BE FLUSH WITH
POLYETHYLENE DIELECTRIC.
DO NOT USE EXCESS SOLDER.
WIPE CLEAN - SEE THAT END OF
CABLE INSULATOR IS CLEAN
AND FREE OF SOLDER, ROSIN
AND FOREIGN MATERIAL.



SLIDE BODY INTO PLACE CAREFULLY SO
THAT CENTER CONDUCTOR ENTERS HOLE
IN INSULATOR. FACE OF CABLE DIELECTRIC
MUST FIT FLUSH AGAINST INSULATOR.
PROPERLY TIGHTEN BODY AND NUT
WITH WRENCHES.

Figure 2-5. Installation of Type N Male Connector on RG-8/U Transmission Line

SECTION II
Installation

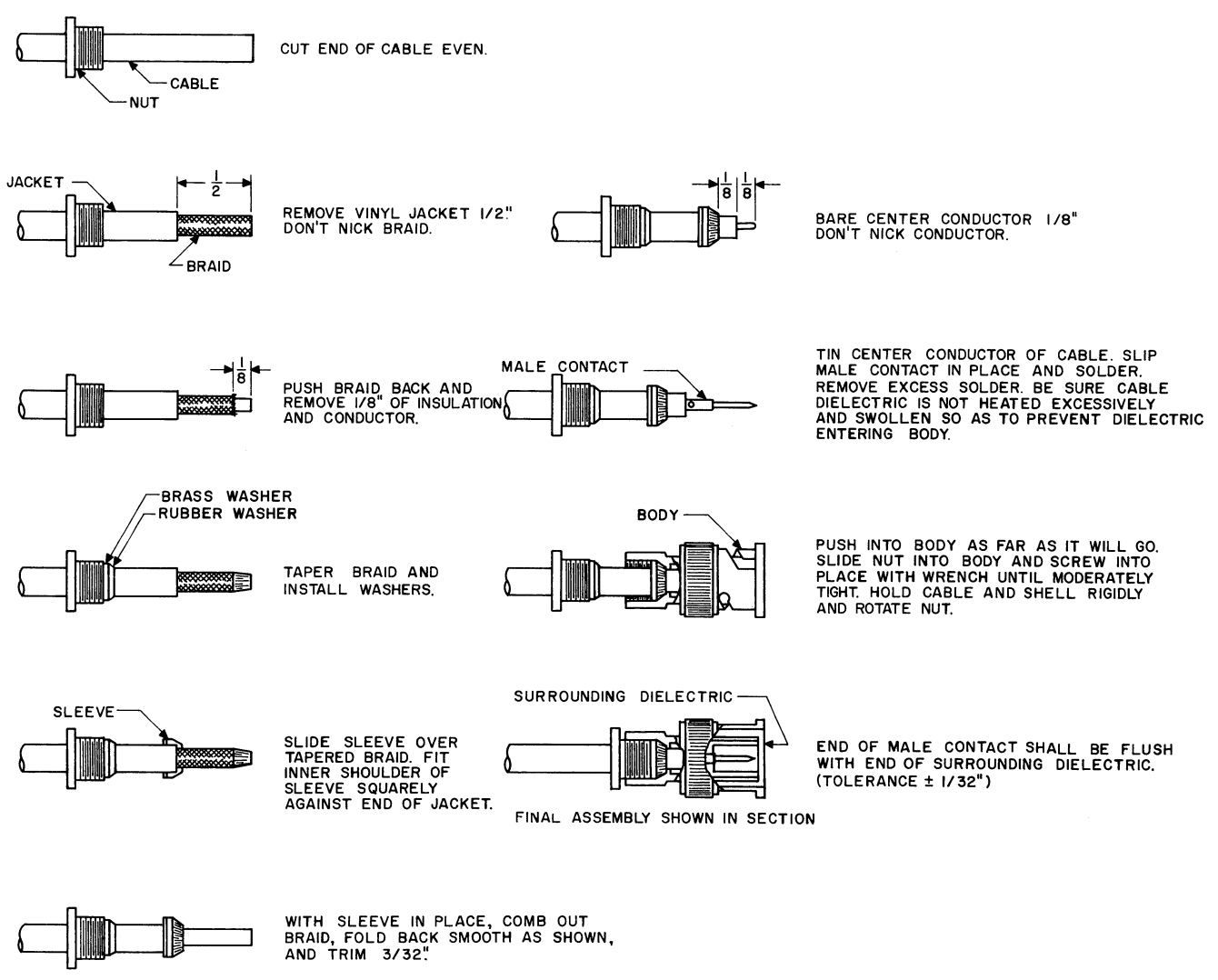
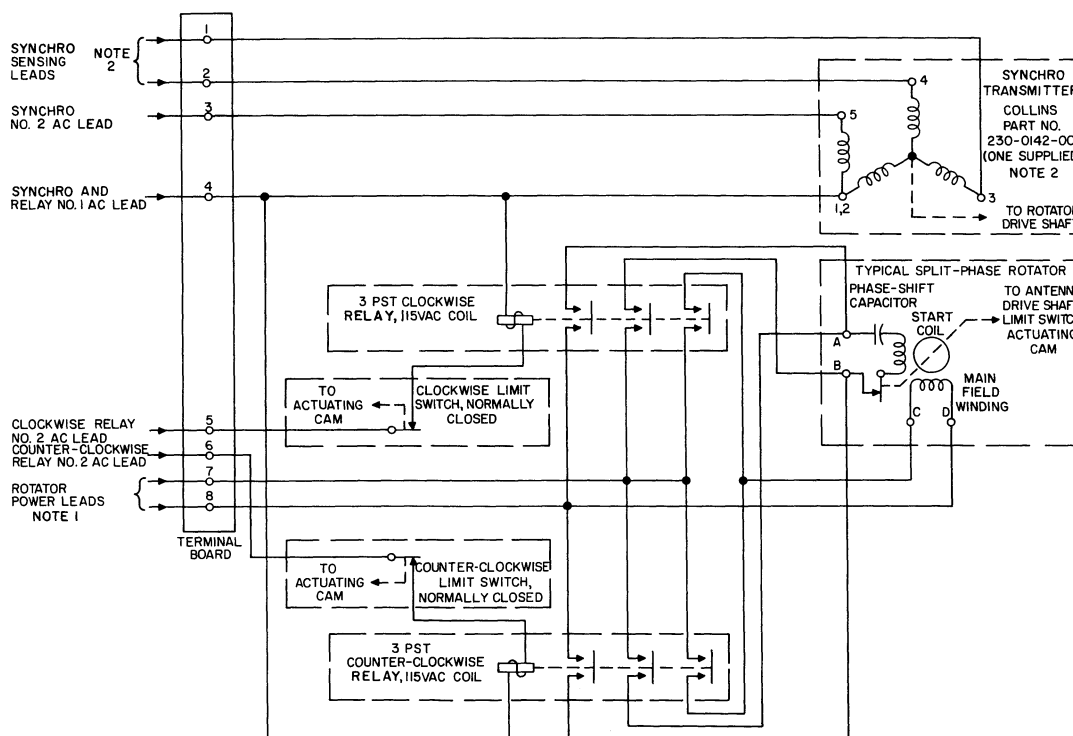


Figure 2-6. Installation of Type BNC Male Connector on RG-58/U Transmission Line

C64-01-3



CONNECTIONS TO 312A-2 TERMINAL BOARD, TERMINALS 16-24									
		SYNCHRO SENSING LEADS NOTE 2		SYNCHRO NO. 2 AC LEAD	SYNCHRO AND RELAY NO. 1 AC LEAD	CLOCKWISE RELAY NO. 2 AC LEAD	COUNTER- CLOCKWISE RELAY NO. 2 AC LEAD	ROTATOR POWER LEADS NOTE 1	
		1	2	3	4	5	6	7	8
TYPE OF INSTALLATION	10 AND/OR 15 METER ROTARY BEAM ANTENNA(S)	17	16	21	18	20	19	18	21
	20 METER ROTARY BEAM ANTENNA	23	24	21	22	20	19	22	21
	10-15-20 STACKED ANTENNAS	17,23	16,24	21	18,22	20	19	18,22	21
	10 AND 20 OR 15 AND 20 METER STACKED ANTENNAS	17,23	16,24	21	18,22	20	19	18,22	21

NOTES:

1. ROTATOR POWER MAY BE SUPPLIED FROM A SOURCE OTHER THAN 312A-2 IF POWER IS AVAILABLE AT OR NEAR THE TOWER LOCATION. THIS SOURCE SHOULD HAVE PROPER FUSE OR CIRCUIT BREAKER PROTECTION FOR TYPE OF ROTATOR USED.
2. IF SYNCHRO TRANSMITTER IS MOUNTED IN AN INVERTED POSITION (SHAFT DOWN) WHEN DIRECT COUPLED, OR IS GEAR-COUPLED TO ANTENNA DRIVE SHAFT, SENSING LEADS (TERMINALS 3 AND 4) SHOULD BE REVERSED AT THE TOWER, OR ON THE 312A-2 TERMINAL BOARD (TERMINALS 16-17 OR 23-24).

Figure 2-7. SC-101 Station Control, Typical Rotary Beam Antenna Tower Components, Schematic Diagram

SECTION II
Installation

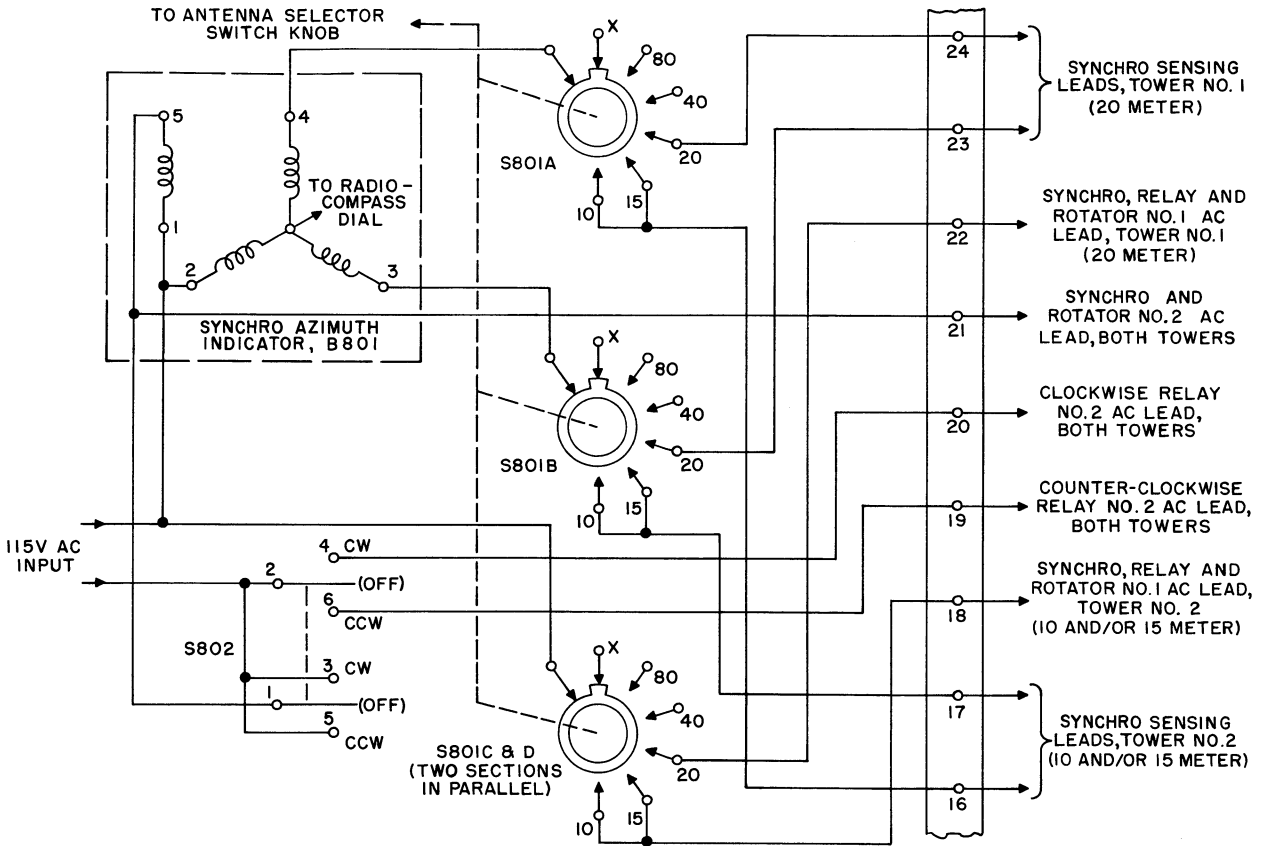


Figure 2-8. 312A-2 Control/Speaker Unit, Rotator/Synchro Circuits, Simplified Schematic Diagram

C183-11-3

SECTION III

OPERATION, INITIAL TEST, AND ADJUSTMENT

3.1 CONTROLS.

Figure 3-1 shows the location of the SC-101 controls on the 312A-2 Control/Speaker unit. Detailed information regarding the function of these controls is given in paragraph 4.1.

3.2 OPERATION OF KWS-1 TRANSMITTER AND 75A-4 RECEIVER.

Operation of the KWS-1 Transmitter and 75A-4 Receiver is explained in the instruction book accompanying the equipments.

3.3 INITIAL TESTS AND ADJUSTMENTS.

3.3.1 INITIAL TESTS.

Before performing the initial adjustments, the SC-101 installation should be tested as follows:

a. Apply power to the installation. Check the clock, light, 75A-4, and KWS-1 to make sure the primary power circuit is wired correctly (the speaker is connected to the 75A-4 Receiver only when the phone-patch (PH) OFF-ON switch is off). Turn the primary OFF-ON switch to ON. The pilot light should light.

b. Check the ANTENNA SELECTOR switch positions against the actuating sequence of the antenna selector relays in the 68Y-1 unit to make sure the relay actuating leads are wired correctly. Check the transmit-receive relay connections. In transmit position, the 75A-4 Receiver should be silenced, and the antenna should be connected to the KWS-1 Transmitter.

c. Check the tower rotator(s) action in both CW and CCW operation.

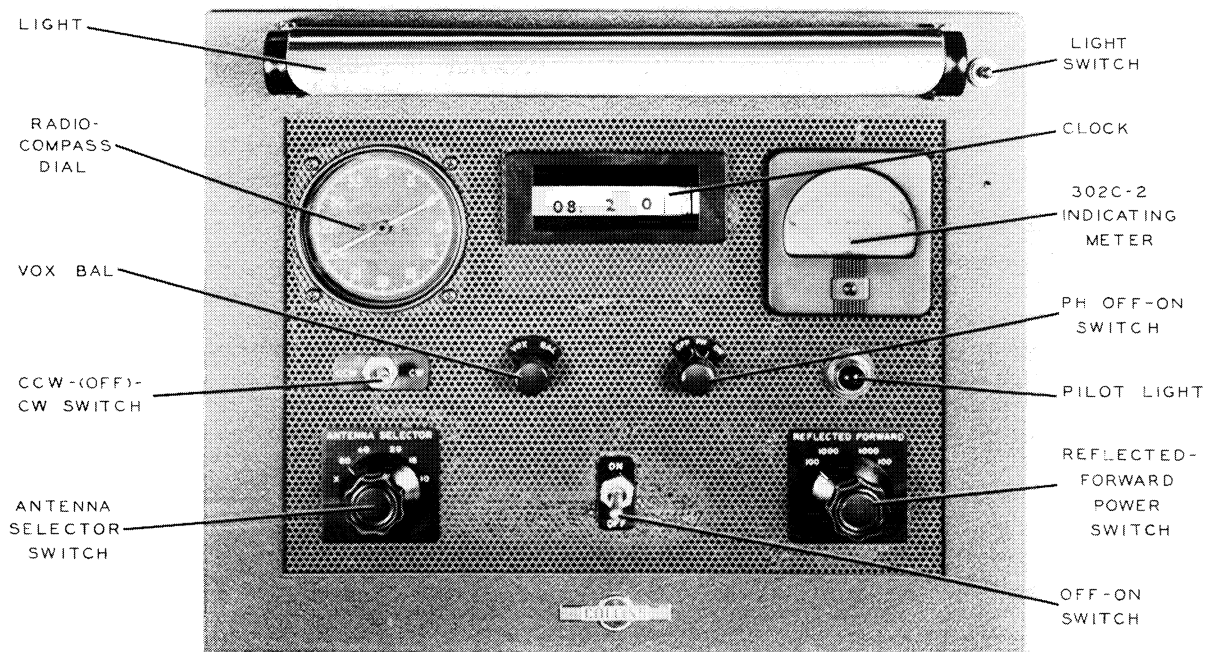


Figure 3-1. 312A-2 Control/Speaker Unit, Location of Controls

SECTION III
Operation, Initial Test, and Adjustment

NOTE

Some rotators of the heavy-duty type normally may draw enough starting current to blow fuse F802 in the 312A-2 unit. If this occurs, replace fuse with next larger size. If rotator draws more than 5 amperes normal current, feed rotator power from a source other than the 312A-2 circuitry (see figure 2-7).

Check operation of the synchro circuit. Bearing changes should be indicated with rotation.

d. Check the antenna transmission lines and operation of the 302C-2 Directional Wattmeter as follows:

(1) Set the REFLECTED-FORWARD power switch to FORWARD 1000 scale.

(2) Tune and load the KWS-1 Transmitter into any antenna using either AM or CW emission. The 302C-2 meter should indicate a forward power reading.

(3) Switch the REFLECTED - FORWARD power switch to REFLECTED 1000 scale. Unless the antenna is perfectly matched to the line, the meter will indicate a reflected power reading. If the reading is less than 100 watts, switch to REFLECTED 100 scale.

(4) Using the readings obtained, determine the swr as outlined in paragraph 3.4. Repeat steps (1) through (4) for all antennas and transmission lines in use. The KWS-1 Transmitter cannot load properly into 52-ohm transmission line when the swr is greater than 2.5:1.

NOTE

If extremely high reflected power readings are obtained with any transmission line, check to make sure the proper antenna is in use. Check all coaxial connectors, jumpers, etc, for possible poor connections. If the reflected power reading is higher than the forward power reading, check to make sure the coupler is wired correctly.

This completes the initial tests. If the equipment is operating properly, proceed to the Initial Adjustments in the following paragraph.

3.3.2 INITIAL ADJUSTMENTS.

Make the following initial adjustments before placing the SC-101 installation into service:

3.3.2.1 PHONE PATCH. Adjust the phone-patch equipment as follows:

NOTE

If the 75A-4 Receiver has a serial number below 2382, it should be modified as outlined in paragraph 2.2.5 before making the following adjustments.

a. Turn on the 75A-4 Receiver and KWS-1 Transmitter. Make sure the transmitter PLATE switch is in the OFF position. All the adjustments are made using the transmitter exciter only.

b. Turn on the 75A-4 crystal calibrator. Tune the receiver to the vicinity of a 100-kc dial mark to establish a beat note of approximately 500 cps (0.5 kc from zero-beat).

c. Turn to ON position the phone-patch (PH) OFF-ON switch. Lift the telephone receiver and dial any digit to remove the dial tone. Check that the 500 cps note is heard in the telephone receiver.

d. Set the speaker quieting control in the KWS-1 Exciter/Power Amplifier to full counterclockwise position. The control is located inside the cabinet above the PA PLATE meter.

e. Set the KWS-1 EMISSION switch to AM or SSB position. Set the multimeter to PA GRID position.

f. Set the VOX BAL control on the 312A-2 to full clockwise position. Advance the VOX SPEECH control on the KWS-1 until the 500-cps tone from the receiver actuates the KWS-1 carrier control relay, causing the meter to indicate PA grid current.

g. Adjust the AUDIO GAIN control until the multimeter reads 95% of full scale.

h. Slowly rotate the VOX BAL control on the 312A-2 in a counterclockwise direction. At about the midpoint of the control rotation, the grid current will show a decided dip, or null. If grid current disappears entirely as the null is approached, advance the VOX SPEECH control until a reading is again obtained.

i. Set the VOX BAL control at the null point determined in h. above (minimum grid current). Reduce the VOX SPEECH control setting until the PA grid current drops to zero.

j. Return speaker quieting control to normal setting.

NOTE

The VOX BAL control probably will have to be reset slightly on different telephone calls to keep the receiver output from triggering the voice-operate circuitry.

k. This completes the initial balancing of the phone-patch circuitry. When using the phone patch during actual conversations, the VOX SPEECH and AUDIO GAIN controls on the KWS-1 should be adjusted so that the party on the other end of the telephone line operates the transmitter normally. Do not advance the VOX SPEECH control farther than necessary, as this will cause sluggish operation of the voice-control circuitry. The 75A-4 AF GAIN control should be adjusted to comfortable level for the other party when receiving. Do not raise receiver audio output farther than is necessary for a comfortable telephone listening level. If audio output is too large, it is likely to feed through to the transmitter, tripping the voice-operate circuit. Control the audio level on the station end of the line by maintaining an appropriate distance from the telephone mouth piece.

3.3.2.2 SYNCHRO SYSTEM. Adjust the synchro transmitter(s) as follows:

a. Apply power to the rotator with the actuating switch in CCW position until the limit switch is actuated, stopping rotation.

b. At the top of the tower, adjust the rotary beam antenna(s) to an exact direction (due north, for example) with a magnetic compass or by reference to a local map.

c. Decouple the synchro transmitter from the antenna drive shaft. Apply power in the CCW (limited) position so that the synchro circuit is actuated. This can be done by a second person in the operating location.

d. Turn the synchro transmitter shaft manually until the radio-compass dial (on the 312A-2 panel) indicates the exact direction set in step b. Sound-powered telephones or other temporary communication with the operating location is desirable when making this adjustment.

e. Repeat steps a. through d. at the second tower in two-tower installations. This completes the initial tests and adjustments. The system installation is now ready for service.

3.4 SWR AND TRANSMITTER POWER OUTPUT.

To determine transmission line swr, refer to figure 3-2. Locate the point on the graph corresponding to the indicated values of forward and reflected power. If the point falls on one of the swr lines, transmission line swr is the value labeled on the line. For example, if forward power is 100 watts and reflected

power is 4 watts, the point is on the 1.5 line, and swr is 1.5:1. If the point falls between two lines, transmission line swr is between the values labeled on the lines. Interpolate as necessary. For example, if the forward power is 500 watts and the reflected power is 6 watts, the corresponding point falls midway between the 1.2 and 1.3 lines so the swr is 1.25:1. Transmitter power output (sometimes called real or net power) is determined by subtracting the reflected power reading from the forward power reading:

$$\text{TRANSMITTER POWER OUTPUT} = \text{FORWARD POWER} - \text{REFLECTED POWER}$$

Under good antenna match conditions, reflected power is quite small in comparison to forward power (with a correspondingly low swr), and the forward power reading is approximately equal to transmitter power output. For example, if forward power is 500 watts and reflected power is 4 watts, transmitter power output is 496 watts, which is only slightly less than the forward power reading. The swr (from figure 3-2) is about 1.2:1. Under poor antenna match conditions, reflected power is large in comparison to forward power, and transmitter power output may be quite small in comparison to either reading. The swr is correspondingly high. For example, if forward power is 700 watts and reflected power is 650 watts, transmitter power output is only 50 watts, which is considerably less than either recorded value. The swr (from figure 3-2) is 50:1.

3.5 MONITORING R-F OUTPUT.

During operating periods, the directional wattmeter forward power scale readings provide a convenient monitor of KWS-1 performance in various types of emission. For example, during SSB transmissions, the upward kick in forward power is an indication of signal level, while the rest level (which should be too small to read) is an indication of the degree of carrier suppression. With a two-tone test signal, a peak envelope power of one kw causes an average power output (as determined from the wattmeter) of about 450 watts. In a similar manner, output indications during CW, AM., and other types of emission give valuable information on KWS-1 performance.

The reflected power scale readings provide an indication of antenna match during operating periods. When the approximate reflected power level is known, any sudden or gradual changes in antenna impedance (such as those caused by faulty connections, icing, etc.,) are quickly evident as changes in the normal reflected power reading.

SECTION III
 Operation, Initial Test, and Adjustment

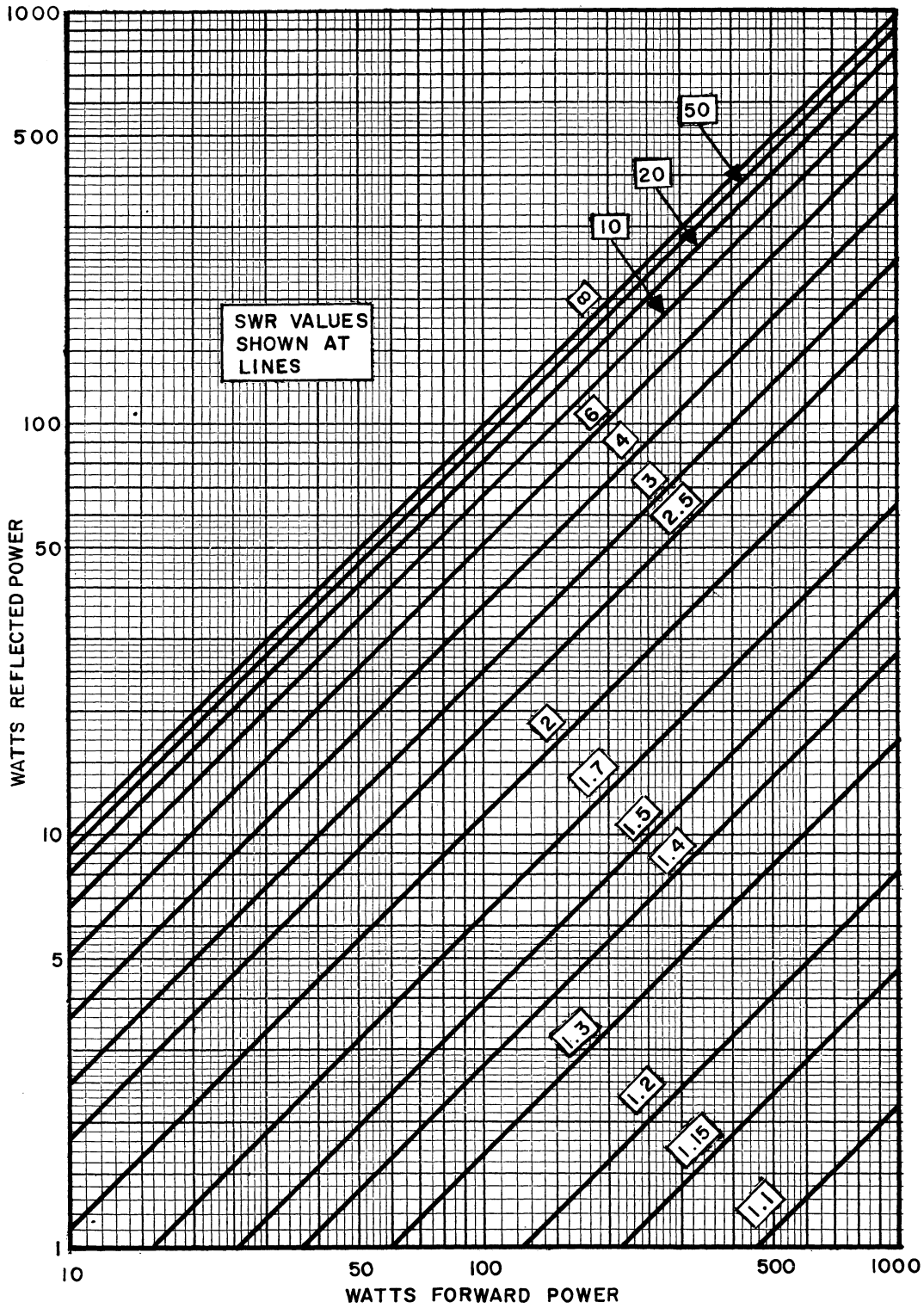


Figure 3-2. Graph: SWR Corresponding to Various Values of Forward and Reflected Power

SECTION IV PRINCIPLES OF OPERATION

4.1 CONTROLS AND FUNCTIONS.

The following table gives a detailed description of the SC-101 controls and meter and their functions:

TABLE 4-1. CONTROLS AND FUNCTIONS

CONTROL	FUNCTION
OFF-ON switch	Controls application of a-c primary power to all circuits of the 312A-2 units except the station clock and light. Power is applied continuously to the clock, and the light is controlled by a switch mounted on the light bracket.
ANTENNA SELECTOR switch	<p>This switch has six positions as follows: X (EXTRA), 80 METER, 40 METER, 20 METER, 15 METER, and 10 METER.</p> <p>The switch has two functions, as follows:</p> <p>(1) Controls application of energizing voltage to two coaxial relays in the 68Y-1 Antenna Selector unit. The relay contacts are series connected so that any one of three different antenna transmission lines may be selected corresponding to any three of the six switch positions. Up to three relays may be added, so that all six positions connect lines to the equipment. When the switch is set to any unused position, the highest frequency antenna is connected to the equipment.</p> <p>(2) Controls application of rotator power, rotator control, and synchro power and control voltages to either of two rotary beam antenna tower installations. One rotator/synchro installation is selected in the 20 METER position, the other in both the 15 METER and 10 METER position. In other positions (80 METER, 40 METER, and EXTRA), rotator/synchro voltage is not applied. The connections can be modified if desired.</p>
CCW-(off)-CW switch	Applies power to the rotator(s) and synchro circuit(s), and controls direction of rotation, counterclockwise or clockwise, of selected tower rotator.
RADIO COMPASS	Indicates position of synchro transmitter on either of two-tower installations. The RADIO COMPASS dial is part of the synchro azimuth indicator unit. The synchro system is synchronized as explained in paragraph 3.3.2.2. When properly synchronized, the dial indicates the horizontal direction bearing of the rotary beam antennas mounted on the tower(s).
PH OFF-ON switch	Places the phone-patch unit in operation. When the switch is actuated, the 75A-4 Receiver output is disconnected from the speaker and applied to the telephone. The telephone line is also connected to the KWS-1 PHONE PATCH input jack.
VOX BAL	Balances the telephone line in a hybrid transformer so that the receiver output does not actuate the transmitter. Isolation resulting from the balance assures proper operation of the voice-operate circuits in the

TABLE 4-1. CONTROLS AND FUNCTIONS (Cont)

CONTROL	FUNCTION		
VOX BAL (Cont)	KWS-1 Transmitter during phone-patch conversations. Instructions for adjusting the control are given in paragraph 3.3.2.1.		
REFLECTED - FORWARD power switch	This switch determines the scale and direction of the reading on the 302C-2 indicating meter. The switch has four positions as follows:		
	POSITION and SCALE		FUNCTION
	REFLECTED	1000	Connects indicating meter to read reflected power on the transmission line, using the 1000 watt (1K) scale.
		100	Connects indicating meter to read reflected power on the transmission line, using the 100 watt scale.
	FORWARD	1000	Connects indicating meter to read forward power on the transmission line, using the 1000 watt (1K) scale
100		Connects indicating meter to read forward power on the transmission line, using the 100 watt scale.	
METER 302C-2 indicating meter	Reads forward or reflected power in watts as selected by the REFLECTED-FORWARD power switch.		

4.2 BLOCK DIAGRAM.

The SC-101 Station Control is shown in block form on figure 4-1.

4.2.1. PRIMARY POWER DISTRIBUTION.

A 115 v a-c primary power lead connects the primary power source to the utility outlets on the 534A-1 cable duct. One utility outlet is used for the power plug from the 75A-4 Receiver, and another is used for the power plug from the 312A-2 Control/Speaker unit. Four spare outlets are available for auxiliary equipment.

In the 312A-2 Control/Speaker unit, primary power is fed directly to the station clock and light and through the main OFF-ON toggle switch to the 115 v d-c relay power supply and the rotator/synchro switching components.

4.2.2 ANTENNA SWITCHING.

The 115 v d-c output of the relay power supply is fed through section E of the ANTENNA SELECTOR switch to any one of the antenna selector relays in 68Y-1 Antenna Selector unit. The selected relay is energized by this voltage, connecting one of the antenna RG-8/U transmission lines to the main relay feed from the transmit-receive (T-R) relay. When

de-energized, the T-R relay connects the main feed and the selected transmission line to the 75A-4 Receiver ANTENNA INPUT through RG-58/U coaxial cable. A coaxial tee connector, located in the RG-58/U cable, connects to the CALIBRATE lead from the KWS-1 Transmitter. When the T-R relay is energized by the KWS-1 circuitry, the main relay feed and the selected transmission line are lifted from the RG-58/U lead and connected to the RG-8/U r-f output lead from the KWS-1 Transmitter. This RG-8/U coaxial cable feeds the T-R relay via the 302C-2 coupler. In addition, when the T-R relay is energized, a second set of contacts on the relay close the key-line interlock leads from the KWS-1 Transmitter. The interlock circuit in turn silences the 75A-4 Receiver through the standby leads.

4.2.3 PHONE PATCH.

The phone-patch subassembly is interconnected with the speaker, the audio output from the 75A-4 Receiver (both 4 ohm and 500 ohm), the KWS-1 phone-patch input, the telephone line, and the phone-patch controls mounted on the front panel of the 312A-2 unit.

4.2.4 302C-2 DIRECTIONAL WATTMETER.

The 302C-2 coupler, mounted in the 68Y-1 unit, develops d-c sensing voltages that are fed to the

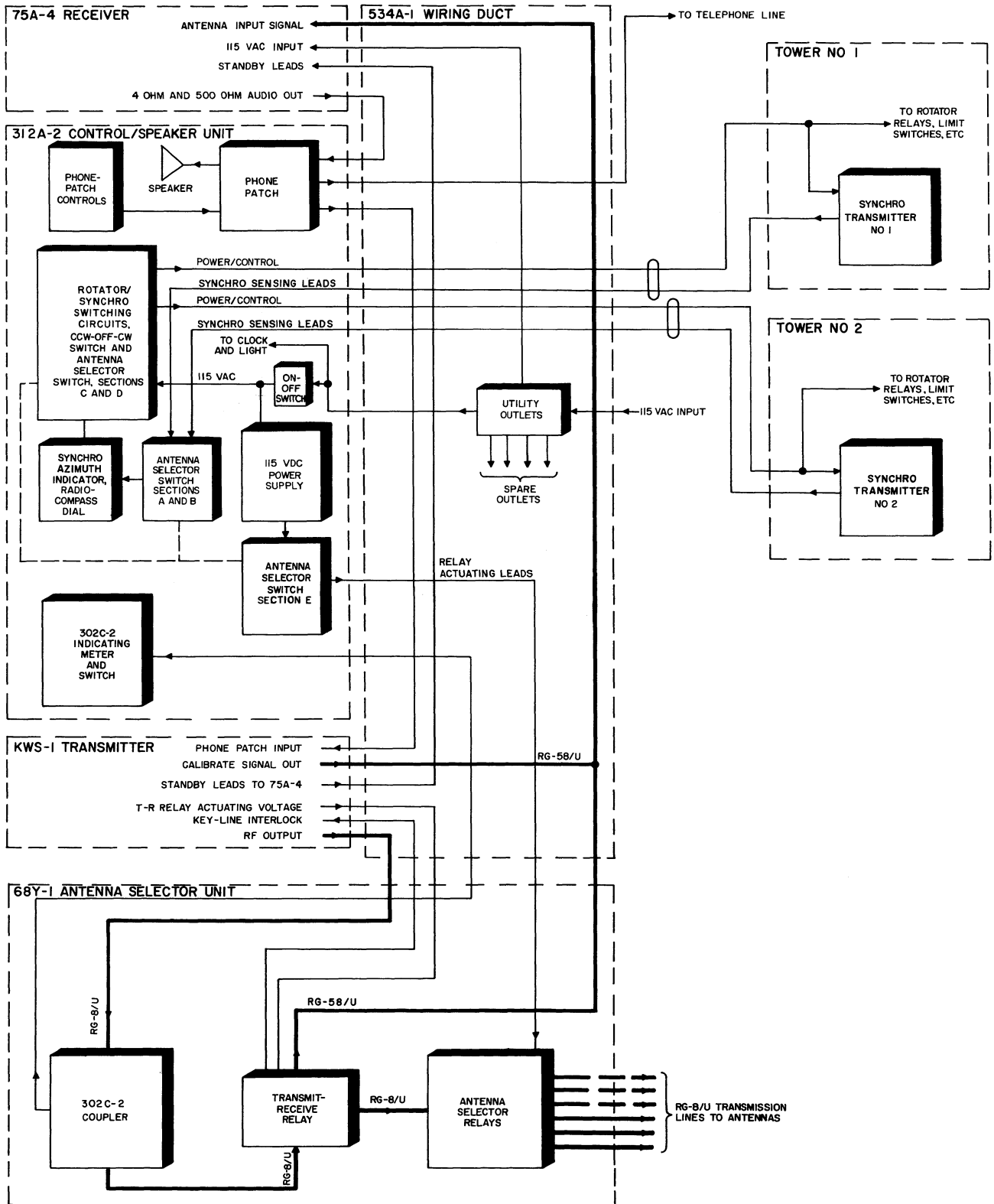


Figure 4-1. SC-101 Station Control, Block Diagram

SECTION IV

Principles of Operation

indicating meter and selector switch mounted in the 312A-2 unit.

4.2.5 ROTATOR/SYNCHRO.

The 115 v a-c rotator/synchro voltages are routed to the tower installations and to the synchro azimuth indicator through the CCW-(off)-CW switch and the ANTENNA SELECTOR switch, sections C and D. Sensing leads from the synchro transmitters are connected to the synchro azimuth indicator through the ANTENNA SELECTOR switch, sections A and B. The power/control and sensing leads are connected to the towers through common multiwire cables.

4.3 CIRCUIT THEORY.

Special circuits used in SC-101 Station Control are described in the following paragraphs. Other circuitry can be understood by reference to the over-all schematic diagram in section VII, the supplementary diagrams in section II, or the block diagram. Internal circuitry of the KWS-1 Transmitter and 75A-4 Receiver is explained in the instruction books supplied with these equipments.

4.3.1 ANTENNA SELECTOR RELAY CIRCUIT.

A typical antenna selector relay circuit is shown schematically in figure 4-2. The circuit uses 6 antennas and 5 selector relays. The extra antenna is assumed to be a second antenna on the 80-meter band.

The relays are arranged with the highest frequency antenna connected to the bottom relay, and the other antennas are connected in descending order with the lowest frequency antenna connected to the first relay in line. Transmitter r-f output is thus present in all relays above the one actuated but not below it. This arrangement reduces harmonic transfer to unused antennas through stray coupling in the relays, because all antennas resonant at harmonic multiples of the antenna in use are connected to a relay that is out of the series circuit. For example, if the 40-meter relay (K904) on figure 4-2 were actuated through S801E, 40-meter r-f output from the transmitter would pass through the X relay (K902) 80-meter relay K903 but not through the 20 and 15-10 meter relay contacts. Second, third, and fourth harmonic energy (on 20, 15, and 10 meters) would thus be

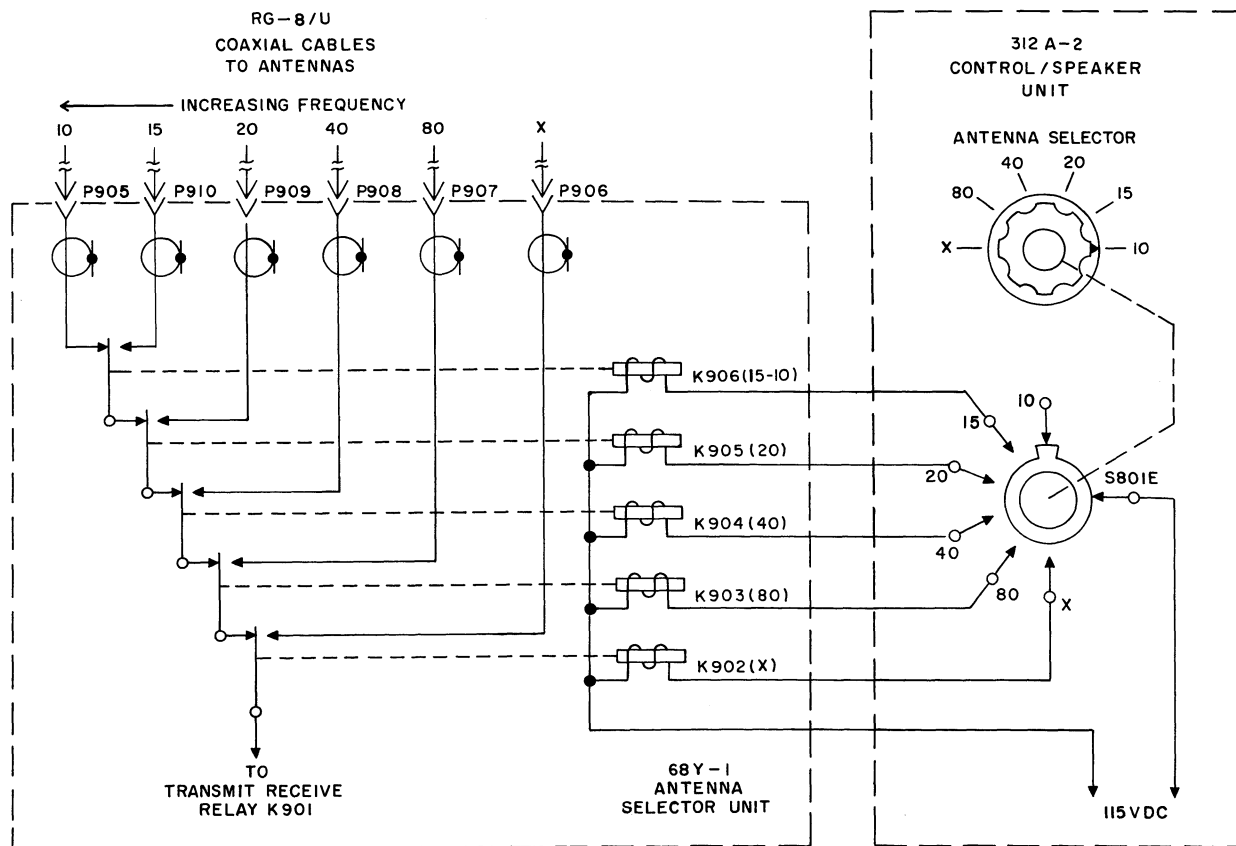


Figure 4-2. SC-101 Station Control, Antenna Selector Relay Circuit, Simplified Schematic Diagram

C183-08-3

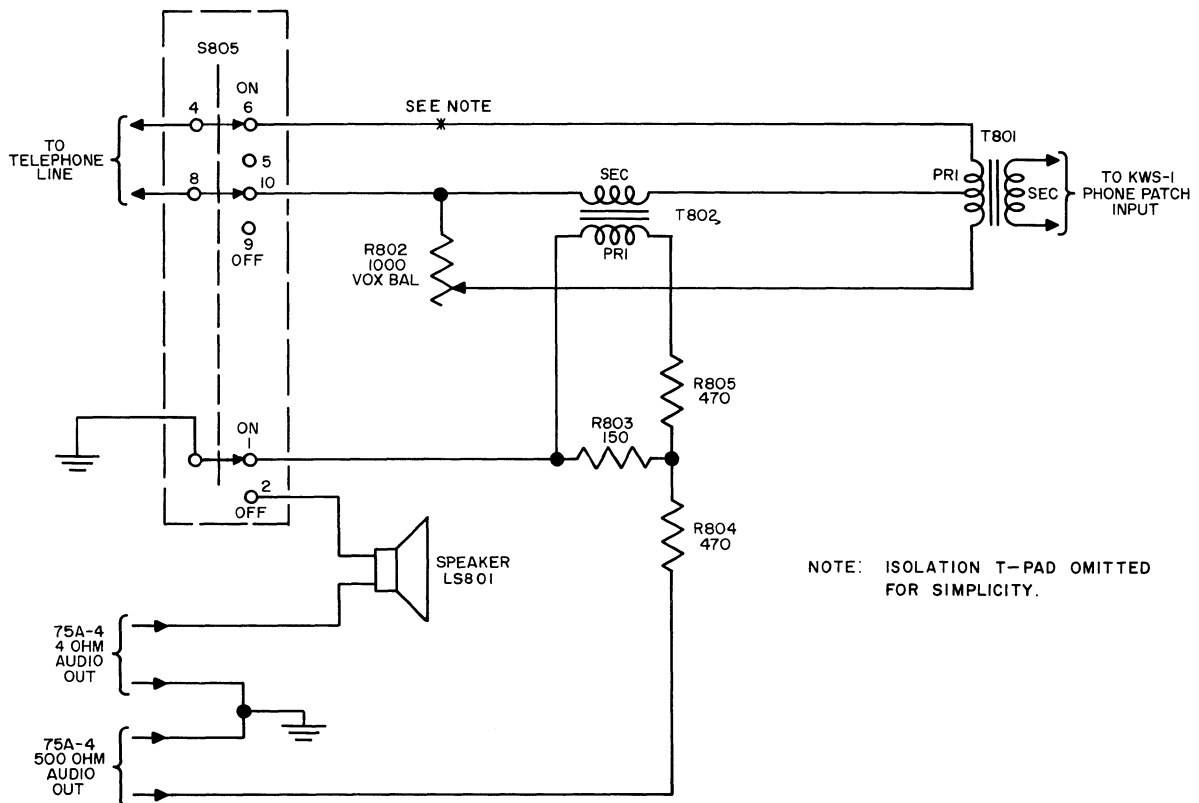


Figure 4-3. SC-101 Station Control, Phone-patch Circuit, Simplified Schematic Diagram

C183-03-3

effectively isolated from the corresponding transmission lines. When S802 E is in the 10-meter position (as shown), none of the relays are energized, and the series connection is complete to the 10-meter transmission line. In systems using fewer than five selector relays, the highest frequency antenna is always connected to the circuit when S801 is in an unused position.

4.3.2 PHONE-PATCH CIRCUIT.

Figure 4-3 shows the phone-patch circuit schematically. The operation is clarified by tracing the audio signal voltages from the receiver to the line and from the line to the transmitter as follows: When phone-patch switch S805 is set to ON as shown, 500-ohm audio output voltage from the 75A-4 Receiver passes through an attenuating pad (R803, R804, and R805) and appears across the primary winding of T802. Corresponding audio voltage appearing across the secondary of T802 also appears across terminals 6-10 of S802, although one leg of this path passes through 1/2 of the secondary of T801. When S805 is set to ON, this audio voltage appears across the telephone line. Incoming audio voltage from the telephone line similarly

appears across terminals 6-10 on S805. This audio voltage also appears across 1/2 the primary of T801 although one leg of the path passes through the secondary of T802. Corresponding incoming audio voltage appears across the secondary of T801 and is fed to the KWS-1 Transmitter phone-patch input.

The arrangement of T801, T802, and the VOX BAL control R802 prevents audio output voltage from the 75A-4 Receiver from appearing at the phone-patch input to the KWS-1 Transmitter, where it would operate the voice-operate circuit. This isolation is accomplished as follows: R802 is adjusted so that its resistance is exactly equal to the impedance of the telephone line (approximately 600 ohms). Receiver output audio voltage appears across the secondary of T802. Since R802 equals the telephone line impedance, this voltage is equally divided across the primary of T801. The equal voltages are opposite in phase, however, so the net receiver output voltage across the primary of T801 is zero, and no voltage is induced across its secondary to appear at the KWS-1 phone-patch input terminals. The VOX BAL control and the arrangement of the transformers thus effectively isolate the 75A-4 output from the KWS-1 input.

SECTION IV
Principles of Operation

When S805 is set to OFF, the following circuit conditions occur: The telephone line is disconnected from the transformers; the 500-ohm 75A-4 output is disconnected from the primary of T802 when terminal 1 is lifted above ground; the speaker is energized when the 4-ohm speaker lead is grounded through terminals 2-12.

The audio pad (R803, R804, and R805) attenuates the 75A-4 output audio so that a comfortable speaker level corresponds with a comfortable telephone level. Thus, the audio gain of the receiver is approximately correct when the phone patch is placed in operation.

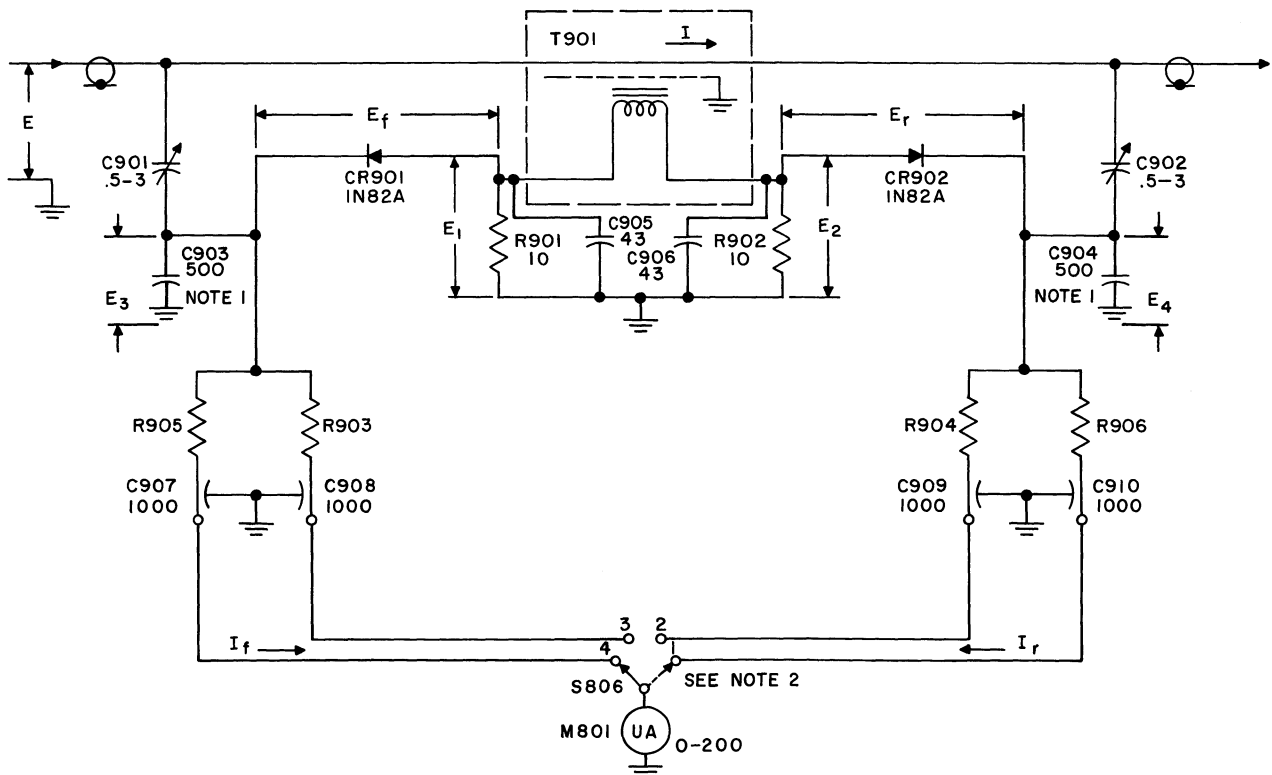
4.3.3. 302C-2 DIRECTIONAL WATTMETER CIRCUIT.

Refer to figure 4-4. Transmission line current, I , flows through the line center conductor and through the center of a toroid coil. The conductor forms the primary, and the coil the secondary, of a toroidal transformer, T901. Induced toroid current produces a voltage that divides equally across series resistors R901 and R902. This results in two equal voltages, E_1 and E_2 , across the resistors. Since the junction

of the R901 and R902 is grounded, E_1 and E_2 are opposite in phase and proportional to line current, I . Line voltage, E , is applied across two capacity dividers, C901-C903 and C902-C904, resulting in two equal voltages of the same phase, E_3 and E_4 , across capacitors C903 and C904.

When the transmission line is mismatched (terminated in an impedance other than to 52 ohms), E_1 and E_2 represent the vector sum of two components, one proportional to the current of the forward wave and the other proportional to the current of the reflected wave. Similarly, E_3 and E_4 represent the vector sum of forward and reflected wave voltage components. Capacitors C901 and C902 are factory adjusted so that the magnitude of the forward voltage and current components are identical; the reflected components are then equal. The settings of C901 and C902 are correct for 52-ohm transmission line only.

The phase relationship between the various components is such that the r-f voltage across rectifier CR901 (E_f) is equal to the arithmetic sum of the two equal forward components, while the r-f voltage



- NOTES: 1. C903 AND C904 FEED-THROUGH TYPE CAPACITORS.
2. DOTTED LINE INDICATES REFLECTED 100 POSITION.
3. R903 THROUGH R906 SELECTED VALUES, $\pm 1\%$

Figure 4-4. 302C-2 Directional Wattmeter, Simplified Schematic Diagram

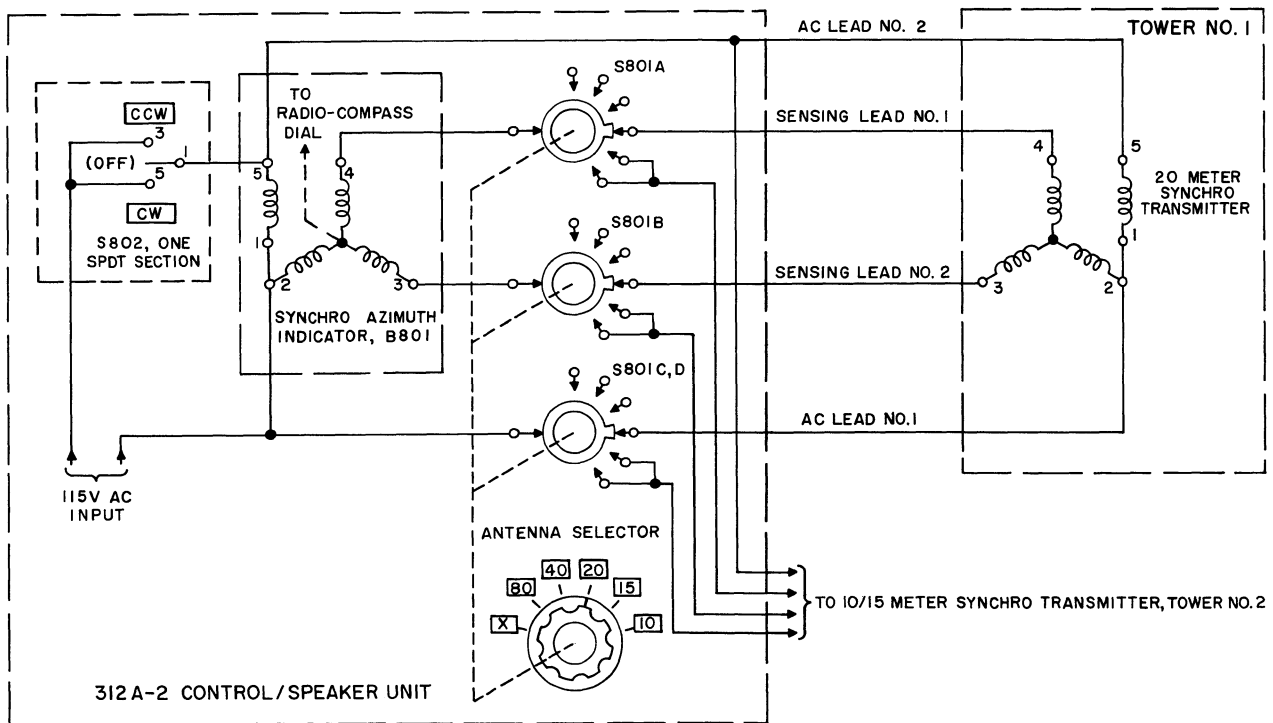


Figure 4-5. SC-101 Station Control, Synchro Circuit, Simplified Schematic Diagram

C183-01-3

across rectifier CR902 (E_R) is equal to the arithmetic sum of the two equal reflected components.

When the transmission line is perfectly matched (terminated in a resistive load of 52 ohms), E_1 is equal in magnitude to E_3 and opposite in phase, E_f is the sum of E_1 and E_3 or twice the value of either. Also, E_2 and E_4 are equal in magnitude and of the same phase, and E_r is zero volts. These relationships are used for adjusting C901 and C902 under laboratory conditions.

Derived r-f voltages E_f and E_r are rectified and filtered by CR901, CR902, C903, and C904 to produce d-c currents, I_f and I_r , through meter M801. The meter scale is calibrated in such a way that I_f produces a scale reading proportional to forward power, while I_r produces a scale reading proportional to reflected power.

Calibrating resistors R903, R904 (1000 watt scales), R905 and R906 (100 watt scales) are selected so that I_f and I_r give accurate indications of the two power levels.

Accuracy of the r-f wattmeter is maintained over a frequency range of 2 to 30 mc in both the inductively

coupled (T901) and the capacitively coupled (C901-C903, C902-C904) elements. In T901, the increase with frequency of the induced voltage is canceled by the voltage drop in the toroidal coil due to the increase with frequency of the inductive reactance when the coil is loaded with R901 and R902. In the directly coupled capacitive element, the ratio of the capacitive reactances in the voltage divider remains constant even though the reactance varies with frequency. Capacitors C905 and C906 compensate for the residual series inductance of resistors R901 and R902.

4.3.4 ROTATOR/SYNCHRO CIRCUITS.

The synchro circuit used with the SC-101 is shown in figure 4-5. One side of the 115 v a-c line connects to terminals 1 and 2 of synchro azimuth indicator B801, and also passes through sections C and D of ANTENNA SELECTOR switch S801 where it is connected to terminals 1 and 2 of one synchro transmitter, as selected. The other side of the 115 v a-c line passes through the CW-(off)-CCW switch and connects to terminal 5 of B801 and to terminal 5 of both synchro transmitters. Primary a-c power is thus applied to the synchro circuit only when the CW-(off)-CCW switch is actuated, i.e., when the rotator is running. Sections A and B of S801 connect the sensing leads from terminals 3 and 4

SECTION IV

Principles of Operation

on B801 to the corresponding terminals on one transmitter synchro, as selected.

Rotator circuitry varies with the type of rotator used. Relay control is recommended for rotators used with SC-101 installations. Limit switches may be inserted

in the relay coils to stop rotation in a given direction at some predetermined limit of travel.

Figure 2-7 in section II shows a typical complete rotator and synchro circuit at the tower.

SECTION V MAINTENANCE

5.1 GENERAL.

The SC-101 Station Control consists mainly of inter-unit wiring circuits with only a few components that require maintenance after the installation of the equipments. The following paragraphs describe the few electrical and mechanical maintenance procedures necessary with this equipment. Many apparent troubles in the SC-101 circuitry may actually be traced to trouble in the KWS-1 Transmitter or 75A-4 Receiver circuitry. Check operation as outlined in the instruction books supplied with the equipment.

5.2 TROUBLE SHOOTING AND REPAIR.

5.2.1 GENERAL.

If trouble is experienced with the SC-101 circuitry, proceed with the initial test and adjustment procedure outlined in section III until the circuit or unit causing trouble is isolated.

5.2.2 TROUBLE SHOOTING AND REPAIR OF THE PRIMARY POWER DISTRIBUTION CIRCUIT.

Trouble in the primary power distribution circuit is usually the result of faulty a-c plugs, fuses, utility outlets, switches, or solder lug connections. If isolated to the above components, replace the faulty component or resolder the faulty joint. Refer to figure 7-11 as necessary. If F801 or F802 are blown, replace with the same value fuse after the trouble is repaired.

5.2.3 TROUBLE SHOOTING AND REPAIR OF THE ANTENNA SWITCHING CIRCUIT.

Trouble in the antenna switching circuitry can usually be traced to faulty transmission line connector joints, dirty or pitted relay contacts, open relay coils, or faulty parts in the antenna switching relay power supply. To clean relay contacts in the coaxial relays in the 68Y-1 Antenna Selector unit, proceed as follows:

- a. Remove the snap button in the end of the coaxial relay.
- b. Clean the four relay contacts (two on the actuating arm and one on each of the opposed jacks) with crocus cloth.



Do not use sandpaper or emery cloth on relay contacts. The abrasive will remove the contact plating.

- c. Replace the snap button.

If trouble is traced to faulty coaxial joints, remake the joint as detailed in figure 2-5 (type N) or figure 2-6 (type BNC), section II.

If trouble is traced to the power supply, remove the faulty component and replace with an identical type.

If trouble is traced to an open relay coil, replace the entire relay with a new one.

Components can be ordered from Collins Radio Company by part number, as listed in the Parts List, section VI.

5.2.4 TROUBLE SHOOTING AND REPAIR OF THE 302C-2 DIRECTIONAL WATTMETER.

Unusual readings for forward and reflected power do not necessarily indicate a faulty instrument. The wattmeter may be reading the true conditions resulting from a faulty transmission line, antenna, or transmitter. If a fault in the instrument is suspected, switch the coupler into a transmission line that feeds a known good antenna, excite the antenna with the KWS-1 on the proper band, and compare with previous results. Check the main RG-8/U line from the KWS-1 to the coupler. If these checks prove the instrument faulty, the trouble is probably within the instrument circuitry.

Wattmeter performance can be checked further by connecting a 52-ohm nonreactive load to the patch panel in place of the antenna in use. The load must be capable of dissipating approximately 500 watts. When r-f output is fed into the load via the coupler, the forward power reading should be consistent with the KWS-1 power output (in the type of service used), and the reflected power reading should be quite small or zero, depending on the tolerance of the load. If the load is somewhat reactive, test the instrument on the 75-80 meter band.

Wattmeter calibration and accuracy can be checked by reversing the coupler in the line and comparing the power readings on corresponding scales. The coupler is reversed by removing the transmission line connectors from the coupler and replacing them on opposite ends; i.e., the antenna is connected to the input and the line from the KWS-1 to the output side of the coupler. Under these conditions, forward power will be read when the switch is set to the REFLECTED positions, and vice versa. Corresponding readings in the normal and reversed positions should be within $\pm 10\%$ of each other.

SECTION V Maintenance

The value and placement of most of the parts in the coupler are critical. Replacement components must have the same tolerance, be of the same type, and be in exactly the same position as the original parts. Accuracy and calibration will be impaired if improper parts and placement are used. The types of parts and their tolerances are specified in the Parts List, section VII. Figure 7-10 can be used as a guide to parts placement. If any one of the selected resistors (R903 through R906) must be replaced, use the exact value ($\pm 1\%$) of the original resistor.

Faulty instruments can be returned to the factory for service, calibration, and adjustment at any time. If the indicating meter is not faulty, only the coupler unit need be returned.



When packing the indicating meter for shipment, pad the shipping container with abundant packing material to avoid shipping damage.

5.2.5 TROUBLE SHOOTING AND REPAIR OF THE PHONE PATCH.

If the phone-patch unit is not functioning properly, carefully check all adjustments as outlined in section III. Check all connections, plugs, etc. for open or shorted conditions. If the VOX BAL control does not yield sufficient isolation, check to make sure the telephone line is properly connected. If all connections are satisfactory, isolate and replace the faulty component. Replacement components can be ordered from the factory by part number, as listed in the Parts List, section VI.

5.2.6 TROUBLE SHOOTING AND REPAIR OF THE ROTATOR CONTROL AND SYNCHRO CIRCUIT.

Trouble in the rotator control and synchro circuit can usually be traced to improper circuit wiring, poor or

broken solder connections, or frayed or shorted cables. Check and repair or replace faulty wiring as necessary using the wiring information in sections II, III, and VII as a guide. If the synchro azimuth indicator, B801, or the synchro transmitter(s) are faulty, remove them and return to the factory for repair or replacement.



Do not attempt to repair the synchros. They are precision units that can be properly repaired only at the factory.

5.3 PREVENTIVE MAINTENANCE.

Trouble in the SC-101 units can often be anticipated and avoided by a regular checking procedure. The installation should be checked periodically as follows:

- a. Inspect the rotator/synchro cables for signs of wear or deterioration.
- b. Check the operation of all antenna switching relays, especially those that are used infrequently.
- c. Check the operation and alignment of the synchro circuits, especially those connected to a tower installation that is used infrequently.
- d. Check all coaxial connectors for signs of mechanical strain. Apply power to the line in question, and move the connector and/or the line to several positions, observing the wattmeter indicator for erratic movement.
- e. Inspect all solder lugs and terminals for signs of strain, wear, or breaking.
- f. Check all conduit connectors to make sure they are tight. Any trouble discovered while performing these checks usually can be quickly repaired, resulting in efficient operation of the system with a minimum of maintenance time.

SECTION VI

PARTS LIST

6.1 534A-1 CABLE HARNESS AND WIRING DUCT.

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
E701	Coaxial "T" connector, type BNC, KWS-1 Cal. Signal pickup	CONNECTOR: adapter; 2 female contacts and 1 male contact; rd; angle type; receiver antenna cable; tee shape, bayonet locking	357 9026 00
J701	Utility outlet	CONNECTOR, RECEPTACLE, ELECTRICAL: 2U hollow female contacts; 10 amp, 250 v a-c rms; plastic dielectric; straight shape; 29/32 in. by 1-3/32 in. by 2-7/32 in.; plastic shell, resistant to corrosion and rust; polarized; jettison-type locking	368 4500 00
J702	Utility outlet	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J701	368 4500 00
J703	Utility outlet	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J701	368 4500 00
J704	Utility outlet	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J701	368 4500 00
J705	Utility outlet	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J701	368 4500 00
J706	Utility outlet	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J701	368 4500 00
J707	Receptacle-type BNC female (mates w/ E701)	CONNECTOR, PLUG: 1 rd female contact; straight; 0.500 in. OD by 1-1/16 in. lg over-all; cylindrical brass body, bayonet locking; cable opening 0.212 in. dia; weatherproofed	357 9050 00
P102	Receptacle, control cable plug	CONNECTOR, RECEPTACLE, ELECTRICAL: 15 polarized female contacts; straight, 500 v a-c rms, 12 contacts at 5 amp, 3 contacts at 15 amp	372 1081 00
	Cover for receptacle	COVER, ELECTRICAL CONNECTOR: metallic material; 0.83 in. by 1.58 in. by 2-1/16 in.; two tapped 6-32 NC-2 mtg holes on tabs located 1 on ea side inside of cover, 0.329 in. from bottom and 1.188 in. c to c	372 1083 00
P701	Plug BNC male (mates w/ 75A-4 ANT. jack)	CONNECTOR, PLUG ELECTRICAL: 1 mating end; 1 rd male contact; 50 ohm; low loss plastic dielectric; straight shape; 0.563 in. OD, 1-1/32 in. lg; bayonet-type locking; 0.206 in. dia cable opening; w/ cable clamp and conduit nut; weatherproofed	357 9018 00
P702	Plug BNC male, KWS-1 Cal. signal output	CONNECTOR, PLUG ELECTRICAL: same as P701	357 9018 00

SECTION VI
Parts List

6.1 534A-1 CABLE HARNESS AND WIRING DUCT (Cont)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
P703	Phonotype plug, KWS-1 phone-patch input	CONNECTOR, PLUG ELECTRICAL: phonotype plug for use with shielded audio cable; brass cadmium pl; 13/16 in. lg by 1/8 in. ID	361 0045 00
P704	Plug BNC male (mates w/ E701)	CONNECTOR, PLUG ELECTRICAL: same as P701	357 9018 00
P705	Plug BNC male (mates w/ E701)	CONNECTOR, PLUG ELECTRICAL: same as P701	357 9018 00
P706	Plug type N male (mates w/ KWS-1 ANT. jack)	CONNECTOR, PLUG ELECTRICAL: 1 mating end; 1 rd male contact, 50 ohm, low loss plastic dielectric; straight shape; 25/32 in. OD, 1-13/16 in. lg; 5/8-24 NEF-2 thd for coupling nut; 0.437 in. dia cable opening w/ cable clamp and conduit nut	357 9040 00

6.2 312A-2 CONTROL/SPEAKER.

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
B801	Radio-compass dial	INDICATOR: azimuth; antenna azimuth; 115 v \pm 10 v, 50/60 cycles per sec; panel mtg, arrow indicator, dial marked 0, 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 2°, 10°, 30° graduations; 3-1/8 in. dia by 3-1/32 in. lg over-all	482 0027 00
	Synchro receiver	MOTOR: self-synchronous; 115 v, 50/60 cycles per sec; single phase; 2-1/2 in. dia by 2-7/8 in. lg over-all; closed frame, type no. 1339-0160; shaft 0.1245 in. dia by 1/4 in. lg from housing; three no. 6-32 mtg holes spaced equally on 2.125 in. dia circle for mtg flange, six screw term	482 0027 00
B802	Synchro transmitter	MOTOR: same as motor, B801	230 0142 00
C801	R-f bypass, phone patch	CAPACITOR: mica; 470 uuf \pm 10%, 500 vdcw	935 0134 00
C802	R-f bypass, phone patch	CAPACITOR: same as C801	935 0134 00
C803	R-f bypass, phone patch	CAPACITOR: same as C801	935 0134 00
C804	R-f bypass, phone patch	CAPACITOR: same as C801	935 0134 00
C805	D-c isolation, phone patch	CAPACITOR: electrolytic, tantalum, 4 uf \pm 20%, 100 vdcw	184 7019 00
C806	D-c isolation, phone patch	CAPACITOR: electrolytic, tantalum, 1 uf \pm 20%, 150 vdcw	184 7011 00
C807	Relay supply filter	CAPACITOR: dry electrolytic, 10 uf, -10%, +100%, 150 vdcw	183 1040 00

6.2 312A-2 CONTROL/SPEAKER (Cont)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
CR801	Relay supply rectifier	RECTIFIER, METALLIC: type 1N158, selenium, half-wave circuit, single-phase half-wave rectification; 130 v rms, input voltage; 52 v output, resistive load, solder lug terminals	353 0186 00
E802	Station clock	CLOCK: model 1P-244, 1/4 numechron clock movement 1/4 in. black numerals on hour and minute wheels, second wheel w/ printed red numerals 5 to 60 at 5 second intervals, 110 v, 60 cycles, a-c; 3 in. h, 4-1/4 in. w, 2-1/2 in. depth	015 0588 00
F801	E802, I801 line fuse	FUSE, CARTRIDGE: 250 v; 20 amp current; normal instantaneous operating; ferrule terminals, 0.250 in. dia; glass body 1-1/4 in. lg by 0.250 in. dia	264 4070 00
F802	312A-2 line fuse	FUSE, CARTRIDGE: same as F801	264 4070 00
I801	Station light	LAMP, FLOURESCENT: 40 w, white light, 11-3/4 in. lg, 1-5/32 in. dia	262 0170 00
I802	Pilot light	LAMP, INCANDESCENT: 6.3 v, 0.15 amp; miniature bayonet base; T-3-1/4 bulb, clear, tungsten filament; 1-1/8 in. lg	262 3240 00
J801	Phone-patch control cable jack	CONNECTOR, PLUG ELECTRICAL: 11 rd male contacts, 1 connector mating end; 50 v a-c rms, 2 large contacts 15 amp, 9 small contacts 5 amp, phenolic dielectric; straight nonlocking	372 1074 00
L801	R-f filter, phone-patch	CHOKE, RADIO FREQUENCY: 4 pi windings, universal wound, 139 turns, ± 2 turns each section, no. 36 AWG, SNE copper wire; 2.0 uh at 350 kc inductance, 20,000 ohms to 50,000 ohms impedance, powdered iron coil form	240 0134 00
L802	R-f filter, phone-patch	CHOKE, RADIO FREQUENCY: same as L801	240 0134 00
LS801	75A-4 loudspeaker	LOUDSPEAKER, PERMANENT MAGNET: 10 in. core; input 8 w normal; voice coil impedance 6-8 ohm; 10-1/8 in. OD by 9-1/8 in. ID by 3-13/16 in. d; speaker mts in cabinet by eight oblong holes, spaced 45° apart on 4.851 in. radius	271 0197 00
M801	302C-2 indicating meter	METER: d-c micrometer scale 0-100 and 0-1000 w, black markings on white background 0-100, 0-1000 (1 k) watts, $\pm 2\%$ full-scale deflection, 1000 ohm $\pm 2\%$ resistance, 3 in. by 3 in. case, four 4-36 NS-2 mtg studs; 1/4-28 NF-2, two studs	458 0388 00
P801	Phone-patch control cable plug	CONNECTOR, PLUG ELECTRICAL: 11 rd female contacts, 2 large and 9 small contacts, 15 amp and 5 amp, 500 v a-c rms, respectively; plastic dielectric; straight shape, 0.415 in. by 0.750 in. by 1.171 in.; accommodates 11 conductor cable, 1 mating end	372 1076 00
R801	Relay supply filter	RESISTOR: comp; 100 ohm $\pm 10\%$, 1 w	745 3310 00

SECTION VI
Parts List

6.2 312A-2 CONTROL/SPEAKER (Cont)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R802	VOX BAL control	RESISTOR: variable comp; 1000 ohm $\pm 20\%$, 1 w	380 1258 00
R803	Part of phone-patch rcvr, audio atten. pad	RESISTOR: comp; 150 ohm $\pm 10\%$, 1/2 w	745 1317 00
R804	Part of phone-patch rcvr, audio atten. pad	RESISTOR: comp; 470 ohm $\pm 10\%$, 1/2 w	745 1338 00
R805	Part of phone-patch rcvr. audio atten. pad	RESISTOR: same as R804	745 1338 00
R806	Part of phone-patch tel. line. iso. pad	RESISTOR: comp; 220 ohm $\pm 10\%$, 1/2 w	745 1324 00
R807	Part of phone-patch tel. line iso. pad	RESISTOR: same as R806	745 1324 00
R808	Part of phone-patch tel. line. iso. pad	RESISTOR: comp; 820 ohm $\pm 10\%$, 1/2 w	745 1349 00
S801	Antenna selector switch	SWITCH, ROTARY: 5 circuits, 5 pole, 6 positions; 1-7/8 in. h by 3-1/2 in. lg by 1-5/8 in. w	259 0786 00
S802	Rotator control switch	SWITCH, TOGGLE: dpdt; 2 positions, 49/64 in. lg by 1/16 in. by 1-21/64 in. overall excluding handle and bushing; 11/16 in. lg bat-type handle	266 3061 00
S803	Primary power switch	SWITCH, TOGGLE: dpst; 2 positions; 30 amp; 49/64 in. by 1/16 in. by 1-21/64 in. overall excluding handle and bushing, 11/16 in. lg bat-type handle	266 3057 00
S804	I801 primary power switch	SWITCH, ROTARY: single pole, 6 leads, 6 amp 125 v, 3 amp 250 v, 3/8 in. thd shaft, one lock nut supplied	260 1289 00
S805	Phone-patch control switch	SWITCH, ROTARY: 1 section; 2 positions; 3 moving and 9 fixed contacts, 3 pole, 1 throw	259 0791 00
S806	302C-2 indicating meter selector switch	SWITCH, ROTARY: 1 section; 4 positions; 2 moving and 10 fixed contacts, 2 poles, 3 throws a-c, d-c, 230 v, 0.25 amp	259 0758 00
T801	Phone-patch balancing transformer	TRANSFORMER, AUDIO FREQUENCY: primary, 600 ohm p/m 10% at 200 cps; secondary 1200 ohm, primary current rating zero, secondary current rating zero, 2 mtg studs, solder lug terminals 1-5/16 in. by 1-5/16 in. by 2-1/16 in.	667 0233 00
T802	Phone-patch line-to-line transformer	TRANSFORMER, AUDIO FREQUENCY: line type, primary 600 ohm p/m 10%, secondary 600 ohm; zero primary and secondary current rating, compound-filled steel case, solder lug terminals, 2 mtg studs, 1-5/16 in. by 1-5/16 in. by 2-1/16 in. h	667 0234 00

6.2 312A-2 CONTROL/SPEAKER (Cont)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
T803	Relay power supply transformer	TRANSFORMER, POWER STEP-DOWN, STEP-UP: 60 cps plate and filament type; primary 117 v, secondary no. one 125 v, secondary no. 2 6.3 v, 2.0 amp; exposed core and coil; wire-lead terminals	662 0231 00
TB801	312A-2 main terminal board	TERMINAL BOARD: bakelite, 3/8 in. thk, 7/8 in. w by 4-3/8 in. lg overall, 10 terminals w/ 5-40 by 3/16 in. lg screws, four 1/8 in. dia mtg holes	367 3100 00
TB802	Relay power supply terminal board	TERMINAL BOARD: phenolic; 31/32 in. thk, 1-1/8 in. w by 3-3/8 in. lg, 6 terminals, 6-32 B, hd, sc, four 0.175 in. dia mtg holes	367 0104 00
TB803	Phone-patch	TERMINAL BOARD: phenolic, 13/32 in. thk, 7/8 in. w by 4-1/8 in. lg; 10 terminals w/ 5-40 NC-2 by 3/16 in. lg screws	367 0018 00

6.3 68Y-1 ANTENNA SELECTOR UNIT.

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C901	Divider capacitor	CAPACITOR: variable; 0.5 min to 3.0 max uuf, 500 vdcw	922 0149 00
C902	Divider capacitor	CAPACITOR: same as C901	922 0149 00
C903	Divider capacitor	CAPACITOR: mica, 500 uuf, $\pm 20\%$, 500 vdcw	912 0667 00
C904	Divider capacitor	CAPACITOR: same as C903	912 0667 00
C905	Phase corrector	CAPACITOR: ceramic; 43 uuf $\pm 1\%$, 500 vdcw	916 4675 00
C906	Phase corrector	CAPACITOR: same as C905	916 4675 00
C907	D-c line filter	CAPACITOR: ceramic; 1000 uuf $+80\%$ -20% , 500 vdcw	913 1292 00
C908	D-c line filter	CAPACITOR: same as C907	913 1292 00
C909	D-c line filter	CAPACITOR: same as C907	913 1292 00
C910	D-c line filter	CAPACITOR: same as C907	913 1292 00
CR901	Crystal diode 1N82A	SEMICONDUCTOR, DEVICE DIODE: silicon crystal diode for use as r-f mixer at freq to 1000 mc; avg. rectified cur., 50 ma; peak rectified cur., 150 ma; surge cur. (1 sec.), 500 ma; peak inverse voltage, 5 v; conversion loss, 8 db max; noise figure 14 db max; i-f impedance 450 ohms; injection cur. range, 0.5 to 4.5 ma	353 2542 00
CR902	Crystal diode 1N82A	SEMICONDUCTOR, DEVICE DIODE: same as CR901	353 2542 00
E901	Coaxial elbow type N (mates with J906)	CONNECTOR, PLUG, ELECTRICAL: 1 mating end, 1 coaxial, plain female contact, 50 ohm, low loss plastic; 90° angle; 13/16 in. by 1.468 in. by 1.968 in.; w/ 5/8-24 thd coupling nut; 0.562 in. dia cable accommodated	357 9113 00

SECTION VI
Parts List

6.3 68Y-1 ANTENNA SELECTOR UNIT (Cont)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
E902	Coaxial jumper, K902 - K903	CABLE ASSEMBLY: consists of 1 connector plug, single rd male contact, straight; 1-13/16 in. lg by 25/32 in. dia; 1 connector plug; 1 female contact one end, angle type, 1.968 in. lg by 1.468 in. w by 13/16 in. thk overall; cable r-f, RG-8/U; coaxial; 52 ohm impedance, 10-3/4 in. lg	542 0985 003
J902	Receptacle - coaxial BNC RCVR Jack	CONNECTOR, RECEPTACLE, ELECTRICAL: single rd female contact; straight shape	357 9027 00
J903	Receptacle - coaxial type N patch - jack	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 mating end; 1 rd female contact, 50 ohm; low loss plastic dielectric; straight shape; 0.731 in. by 1 in. by 1 in.; w/ silver-plated brass enclosing shell; resistant to corrosion; 5/8-24 NEF-2 thd for locking	357 9003 00
J904	Receptacle - coaxial BNC patch - jack	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 mating end, 1 rd female contact, 50 ohm; low loss plastic dielectric; straight; brass shell; bayonet latch locking	357 9054 00
J905	Receptacle - coaxial type N Trans. Line Jack	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd female contact; straight; 2 in. lg by 0.718 in. OD; cylindrical brass silver plated body; four 1/8 in. dia mtg holes spaced on 0.718 in. by 0.718 in. mtg center in flange	357 9061 00
J906	Trans end of 302C-2 coupler	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J903	357 9003 00
J907	Load end of 302C-2 coupler	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J903	357 9003 00
K901	Relay - coaxial Transmit - Receive	RELAY, ARMATURE: 1A contact arrangement; 125.0 v max d-c; coil resistance 4000 ohm $\pm 10\%$; r-f contact rating 600 w into a 52-ohm line; 3 amp at 115 v a-c or 27.5 v d-c auxiliary contact; continuous duty	410 0134 00
K902	Relay - coaxial Antenna Switching	RELAY, ARMATURE: coaxial, contact rating, 600 w into a 52-ohm line; standing wave ratio 1:1.1 max., 3 mc to 30 mc; max operate voltage 125.0 v d-c; coil resistance; 4000 ohm $\pm 10\%$, continuous duty cycle	410 0136 00
K903	Relay - coaxial Antenna Switching	RELAY, ARMATURE: same as K902	410 0136 00
K904	Relay - coaxial Antenna Switching (not supplied)	RELAY, ARMATURE: same as K902	410 0136 00
K905	Relay - coaxial Antenna Switching (not supplied)	RELAY, ARMATURE: same as K902	410 0136 00
K906	Relay - coaxial Antenna Switching (not supplied)	RELAY, ARMATURE: same as K902	410 0136 00

6.3 68Y-1 ANTENNA SELECTOR UNIT (Cont)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
L901	R-f choke	COIL, RADIO FREQUENCY: universal wound, 3 pi; 225 total turns no. 36 AWG, enamel insulation; 220 uh inductance, 0.02 amp cur. rating	240 0037 00
L902	R-f choke	COIL, RADIO FREQUENCY: same as L901	240 0037 00
P901	Plug, coaxial type N, male (spare, three supplied)	CONNECTOR, PLUG, ELECTRICAL: 1 mating end; 1 rd male contact, 50 ohm; low loss plastic dielectric; straight shape; 25/32 in. OD, 1-13/16 in. lg; 5/8-24 NEF-2 thd for coupling nut; 0.437 in. dia cable opening; w/ cable clamp and conduit nut; weatherproofed	357 9040 00
P902	Plug, coaxial type BNC, male (mates with J902)	CONNECTOR, PLUG, ELECTRICAL: 1 mating end; 1 rd male contact; 50 ohm; low loss plastic dielectric; straight shape; 0.563 in. OD, 1-1/32 in. lg; bayonet type locking; 0.206 in. dia cable opening; w/ cable clamp and conduit nut; weatherproofed	357 9018 00
P903		NOT USED	
P904	Plug, coaxial type BNC, spare rcvr. ant. plug (not supplied)	CONNECTOR, PLUG, ELECTRICAL: same as P902	357 9018 00
P905	Transmission line plug, coaxial, type N, (mates with J905)	CONNECTOR, PLUG, ELECTRICAL: same as P901	357 9040 00
P906	Transmission line plug, coaxial type N, (mates with type N female on K902 patch-panel jack)	CONNECTOR, PLUG, ELECTRICAL: same as P901	357 9040 00
P907	Transmission line plug, coaxial type N (mates with type N female on K903 patch-panel jack)	CONNECTOR, PLUG, ELECTRICAL: same as P901	357 9040 00
P908	Transmission line plug, type N male (spare, see P901)	CONNECTOR, PLUG, ELECTRICAL: same as P901	357 9040 00
P909	Transmission line plug, type N male (spare, see P901)	CONNECTOR, PLUG, ELECTRICAL: same as P901	359 9040 00
P910	Transmission line plug, type N male (spare, see P901)	CONNECTOR, PLUG, ELECTRICAL: same as P901	357 9040 00
R901	Toroid trans load res.	RESISTOR: film, 10 ohm $\pm 1\%$, 1/2 w	705 2356 00

SECTION VI
Parts List

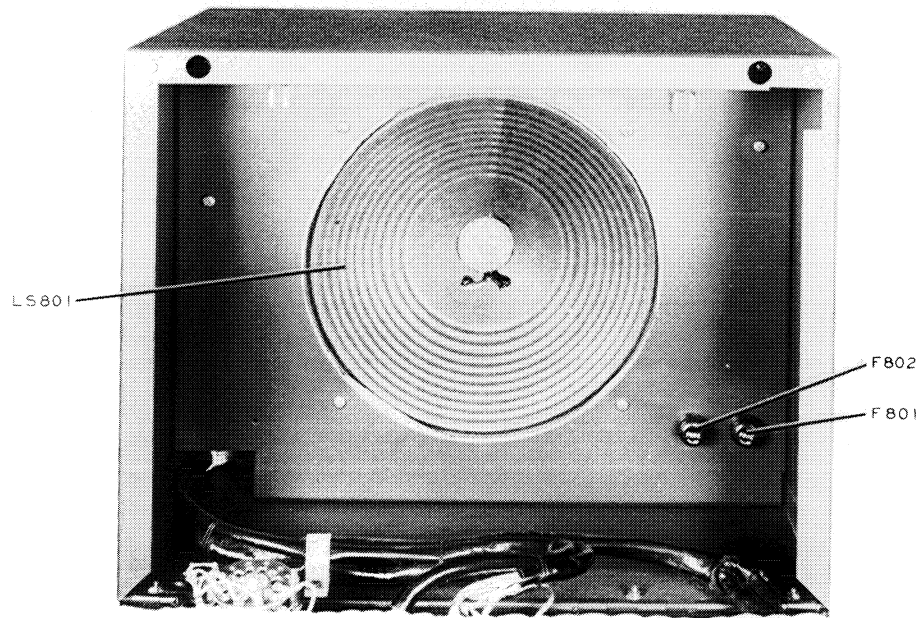
6.3 68Y-1 ANTENNA SELECTOR UNIT (Cont)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R902	Toroid trans load res.	RESISTOR: same as R901	705 2356 00
R903 and R904	Selected per operational requirement	RESISTOR: film; 4750 ohms $\pm 1\%$, 1/4 w	705 7255 00
		RESISTOR: film; 4870 ohm $\pm 1\%$, 1/4 w	705 7129 00
		RESISTOR: film; 4990 ohm $\pm 1\%$, 1/4 w	705 7256 00
		RESISTOR: film; 5110 ohm $\pm 1\%$, 1/4 w	705 7130 00
		RESISTOR: film; 5230 ohm $\pm 1\%$, 1/4 w	705 7257 00
		RESISTOR: film; 5360 ohm $\pm 1\%$, 1/4 w	705 7131 00
		RESISTOR: film; 5490 ohm $\pm 1\%$, 1/4 w	705 7258 00
		RESISTOR: film; 5620 ohm $\pm 1\%$, 1/4 w	705 7132 00
		RESISTOR: film; 5760 ohm $\pm 1\%$, 1/4 w	705 7259 00
		RESISTOR: film; 5900 ohm $\pm 1\%$, 1/4 w	705 7133 00
		RESISTOR: film; 6040 ohm $\pm 1\%$, 1/4 w	705 7260 00
		RESISTOR: film; 6190 ohm $\pm 1\%$, 1/4 w	705 7134 00
		RESISTOR: film; 6340 ohm $\pm 1\%$, 1/4 w	705 7261 00
		RESISTOR: film; 6490 ohm $\pm 1\%$, 1/4 w	705 7135 00
		RESISTOR: film; 6650 ohm $\pm 1\%$, 1/4 w	705 7262 00
		RESISTOR: film; 6810 ohm $\pm 1\%$, 1/4 w	705 7136 00
		RESISTOR: film; 6980 ohm $\pm 1\%$, 1/4 w	705 7263 00
R905 and R906	Selected per operational requirement	RESISTOR: film; 51.1 ohm $\pm 1\%$, 1/4 w	705 7034 00
		RESISTOR: film; 100 ohm $\pm 1\%$, 1/4 w	705 7048 00
		RESISTOR: film; 147 ohm $\pm 1\%$, 1/4 w	705 7056 00
		RESISTOR: film; 196 ohm $\pm 1\%$, 1/4 w	705 7062 00
		RESISTOR: film; 249 ohm $\pm 1\%$, 1/4 w	705 7067 00
		RESISTOR: film; 301 ohm $\pm 1\%$, 1/4 w	705 7071 00
		RESISTOR: film; 348 ohm $\pm 1\%$, 1/4 w	705 7074 00
		RESISTOR: film; 402 ohm $\pm 1\%$, 1/4 w	705 7077 00
		RESISTOR: film; 464 ohm $\pm 1\%$, 1/4 w	705 7080 00
		RESISTOR: film; 511 ohm $\pm 1\%$, 1/4 w	705 7082 00

6.3 68Y-1 ANTENNA SELECTOR UNIT (Cont)

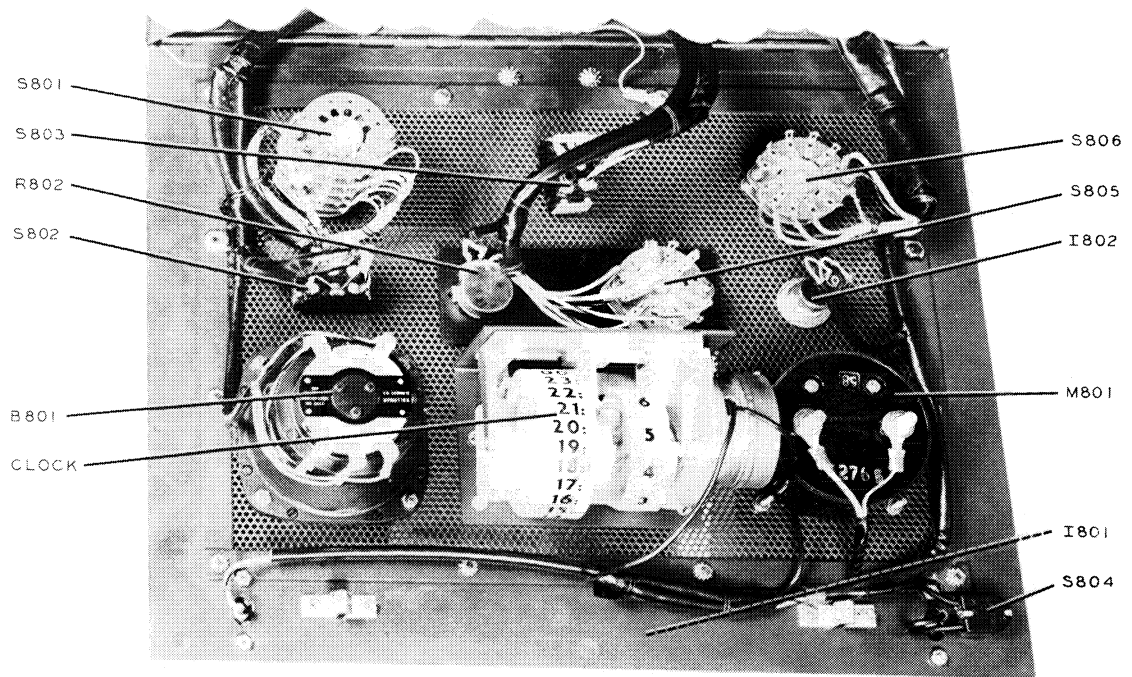
ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
T901	R-f transformer Toroidal	RESISTOR: film; 562 ohm $\pm 1\%$, 1/4 w	705 7084 00
		RESISTOR: film; 619 ohm $\pm 1\%$, 1/4 w	705 7086 00
		RESISTOR: film; 681 ohm $\pm 1\%$, 1/4 w	705 7088 00
		RESISTOR: film; 750 ohm $\pm 1\%$, 1/4 w	705 7090 00
		RESISTOR: film; 835 ohm $\pm 1\%$, 1/4 w	705 7092 00
		RESISTOR: film; 909 ohm $\pm 1\%$, 1/4 w	705 7094 00
		RESISTOR: film; 953 ohm $\pm 1\%$, 1/4 w	705 7095 00
		RESISTOR: film; 1000 ohm $\pm 1\%$, 1/4 w	705 7096 00
			542 0916 002

SECTION VII ILLUSTRATIONS



C183-20-P

Figure 7-1. 312A-2 Control/Speaker Unit, Front View, Front Panel Opened



C183-21-P

Figure 7-2. 312A-2 Control/Speaker Unit, Front Panel, Rear View

SECTION VII
Illustrations

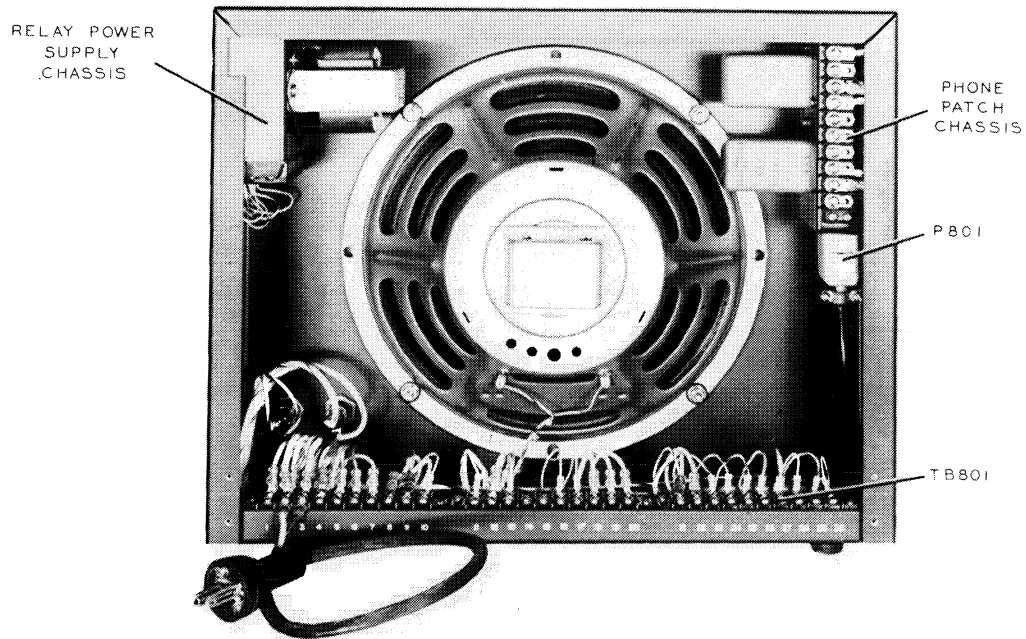


Figure 7-3. 312A-2 Control/Speaker Unit, Rear View

C183-22-P

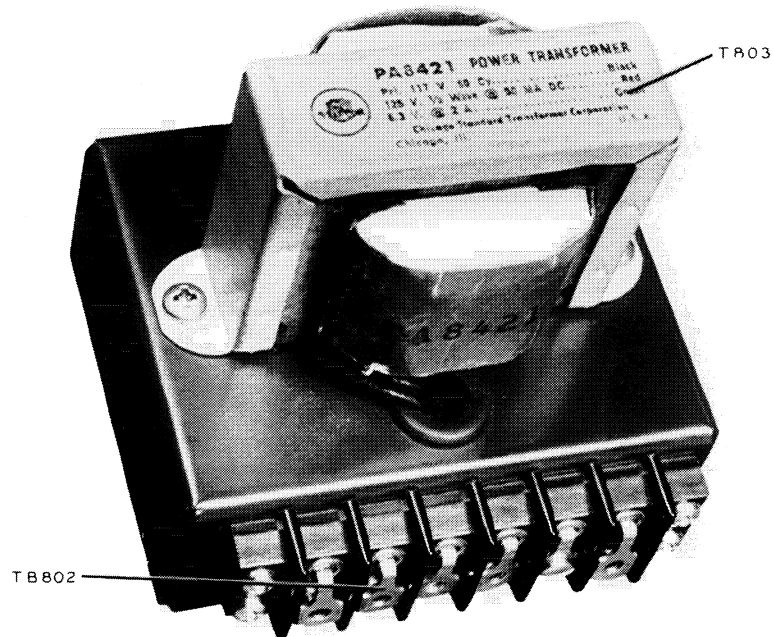
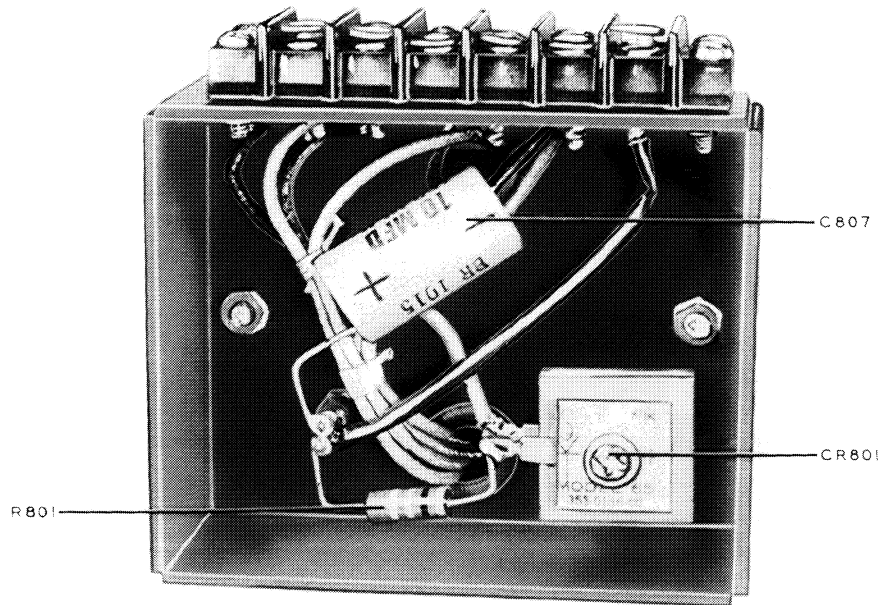


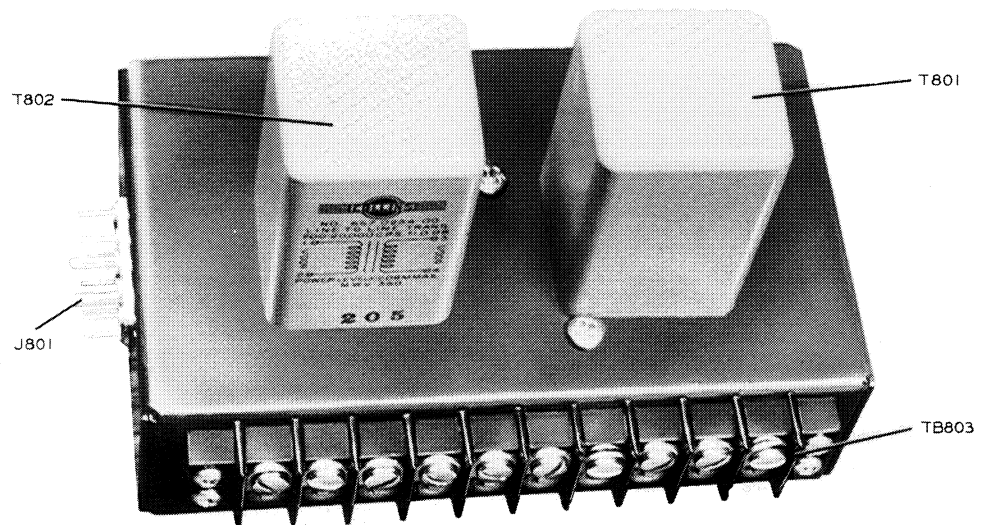
Figure 7-4. 312A-2 Control/Speaker Unit, Relay Power Supply Chassis, Top View

C183-23-P



C183-24-P

Figure 7-5. 312A-2 Control/Speaker Unit, Relay Power Supply Chassis, Bottom View



C183-25-P

Figure 7-6. 312A-2 Control/Speaker Unit, Phone-Patch Chassis, Top View

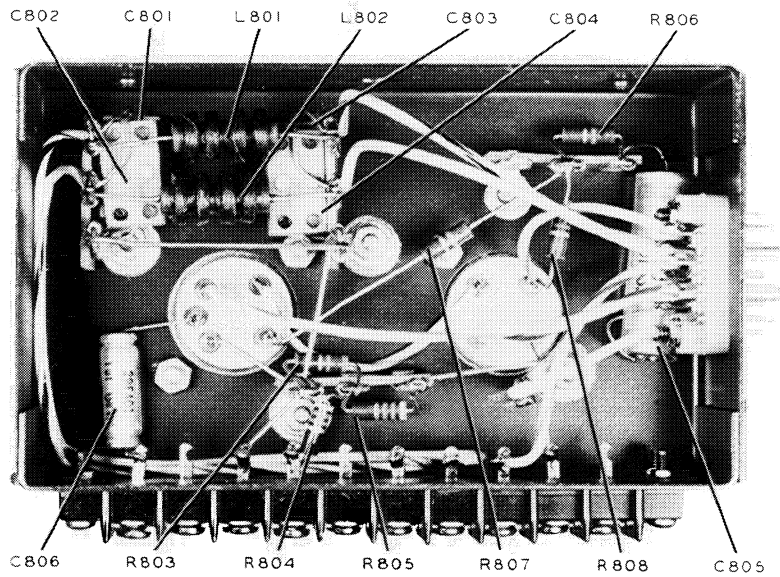


Figure 7-7. 312A-2 Control/Speaker Unit, Phone-Patch Chassis, Bottom View

C183-26-P

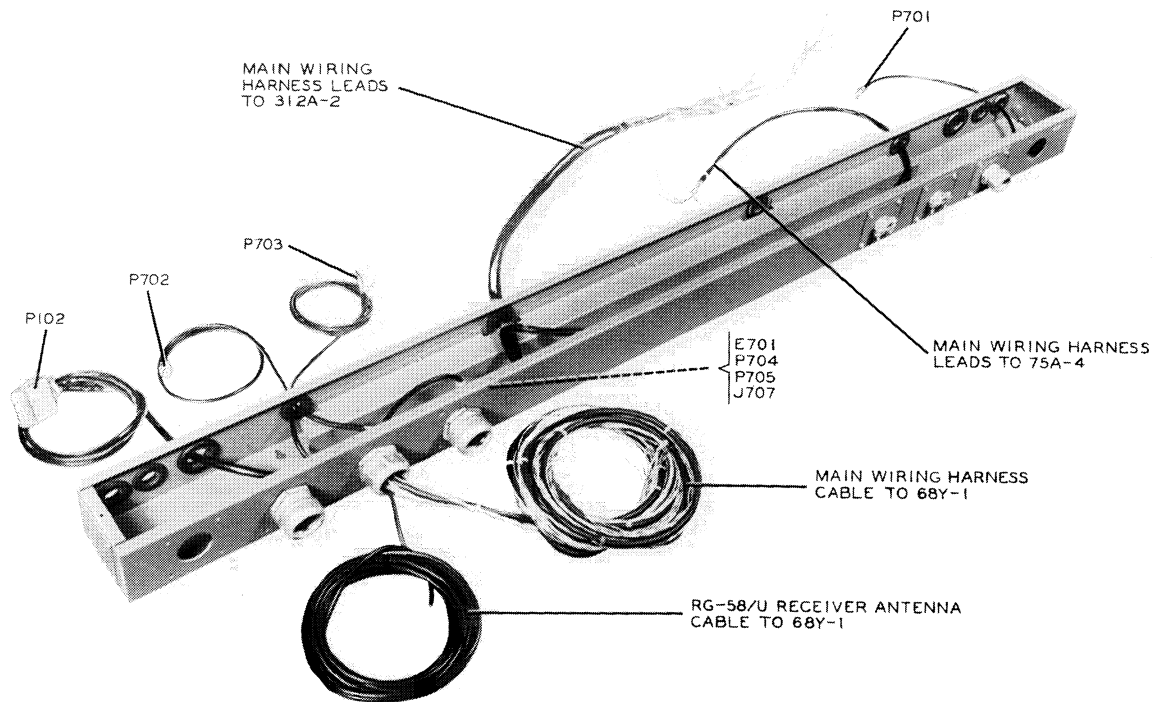
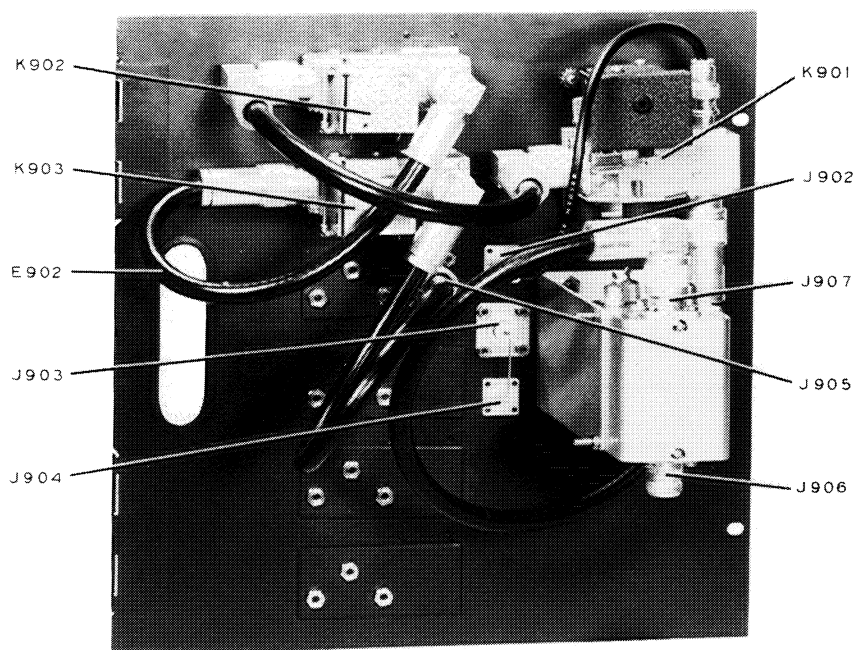


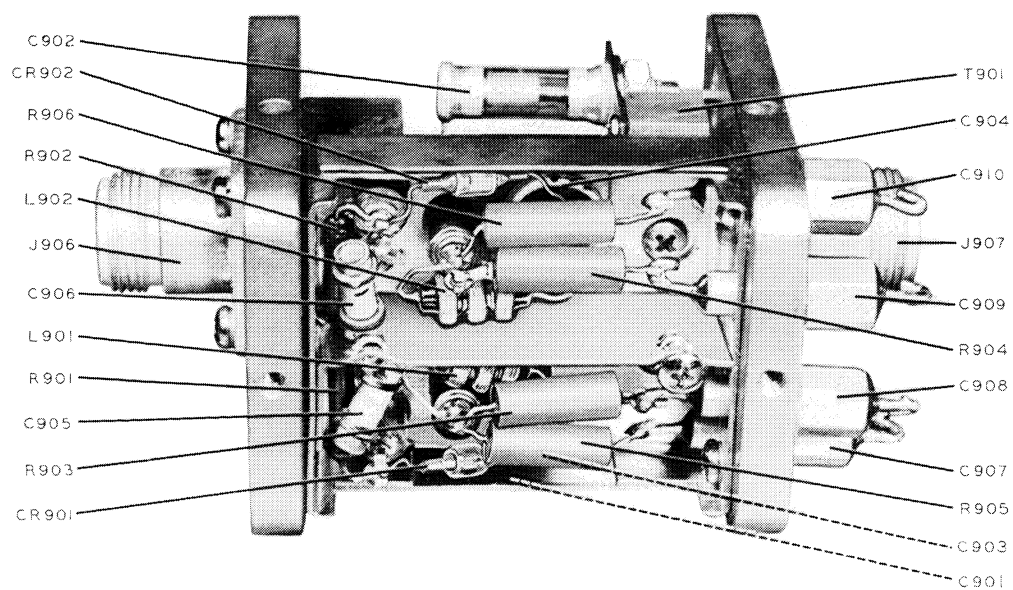
Figure 7-8. 534A-1 Cable Harness and Wiring Duct, Duct Back Plate Removed

C183-27-P



C183-28-P

Figure 7-9. 68Y-1 Antenna Selector Unit, Front Cover, Rear View



C183-29-P

Figure 7-10. 302C-2 Coupler, Shield Removed

NOTES:

1. SKETCH OPTIONAL EQUIPMENT (SPARE RECEIVER, ETC.) CONNECTIONS IN SPACES PROVIDED. ADD WIRING AS NECESSARY.
2. SKETCH ANY ADDITIONAL RELAYS IN SPACES PROVIDED. CHANGE POSITION OF J905 AS NECESSARY.
3. SKETCH ROTATOR, RELAY, AND OTHER TOWER COMPONENTS IN SPACE(S) PROVIDED. ADD WIRING BETWEEN 3/2A-2 TERMINALS 16-24 AND TOWER COMPONENTS TO SUIT INSTALLATION.
4. R903 THROUGH R906 SELECTED INDIVIDUALLY FOR CALIBRATION ACCURACY. R903 AND R904 SELECTED FROM RANGE OF 4750-6980 OHMS. R905 AND R906 SELECTED FROM RANGE OF 51.1-1000 OHMS. ALL FOUR RESISTORS $\pm 1\%$.
5. R901 AND R902 ARE A MATCHED PAIR, $\pm 1\%$.

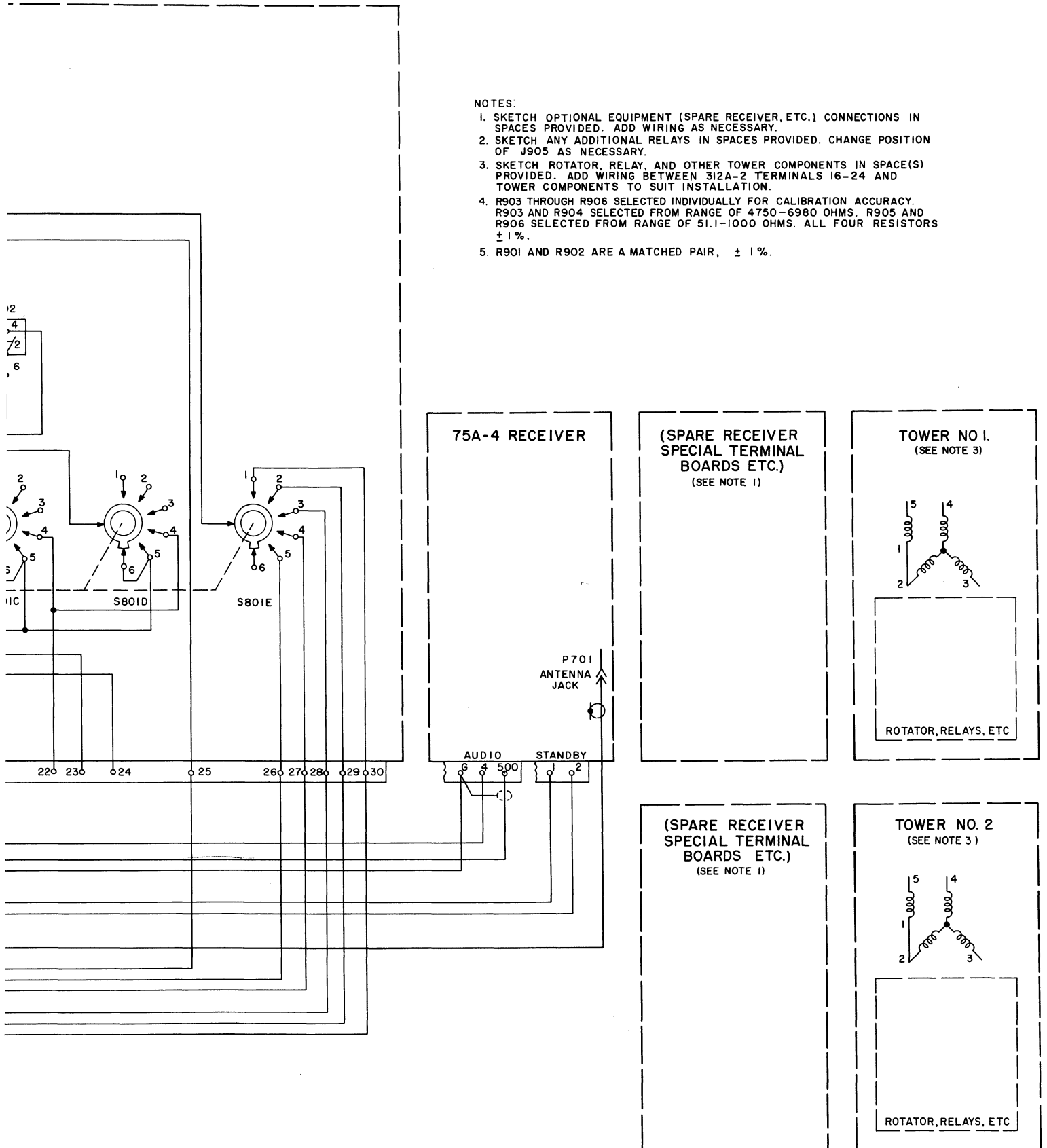
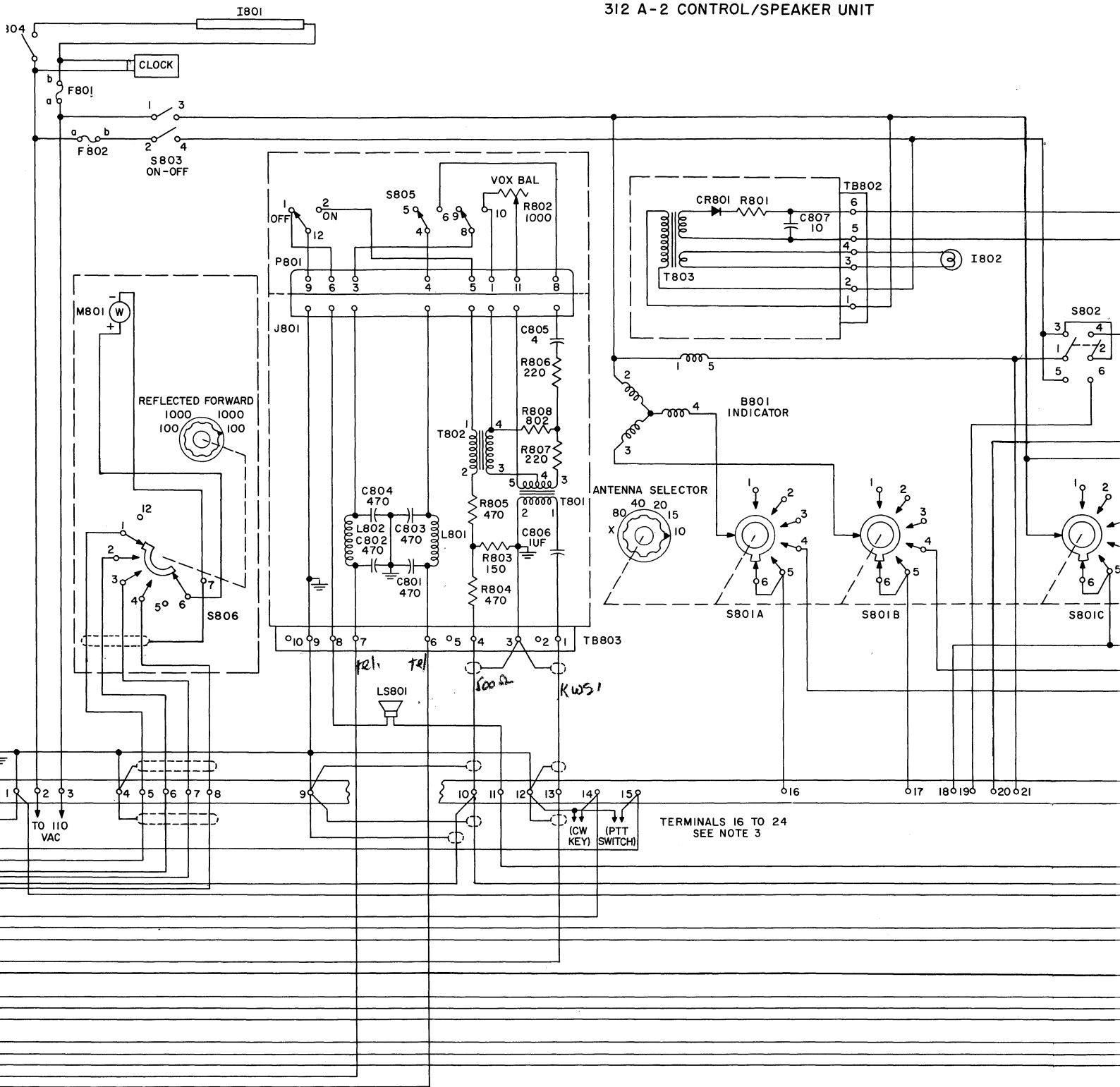
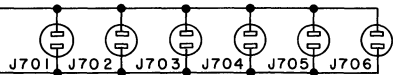


Figure 7-11. SC-101 Station Control, Complete Schematic Diagram

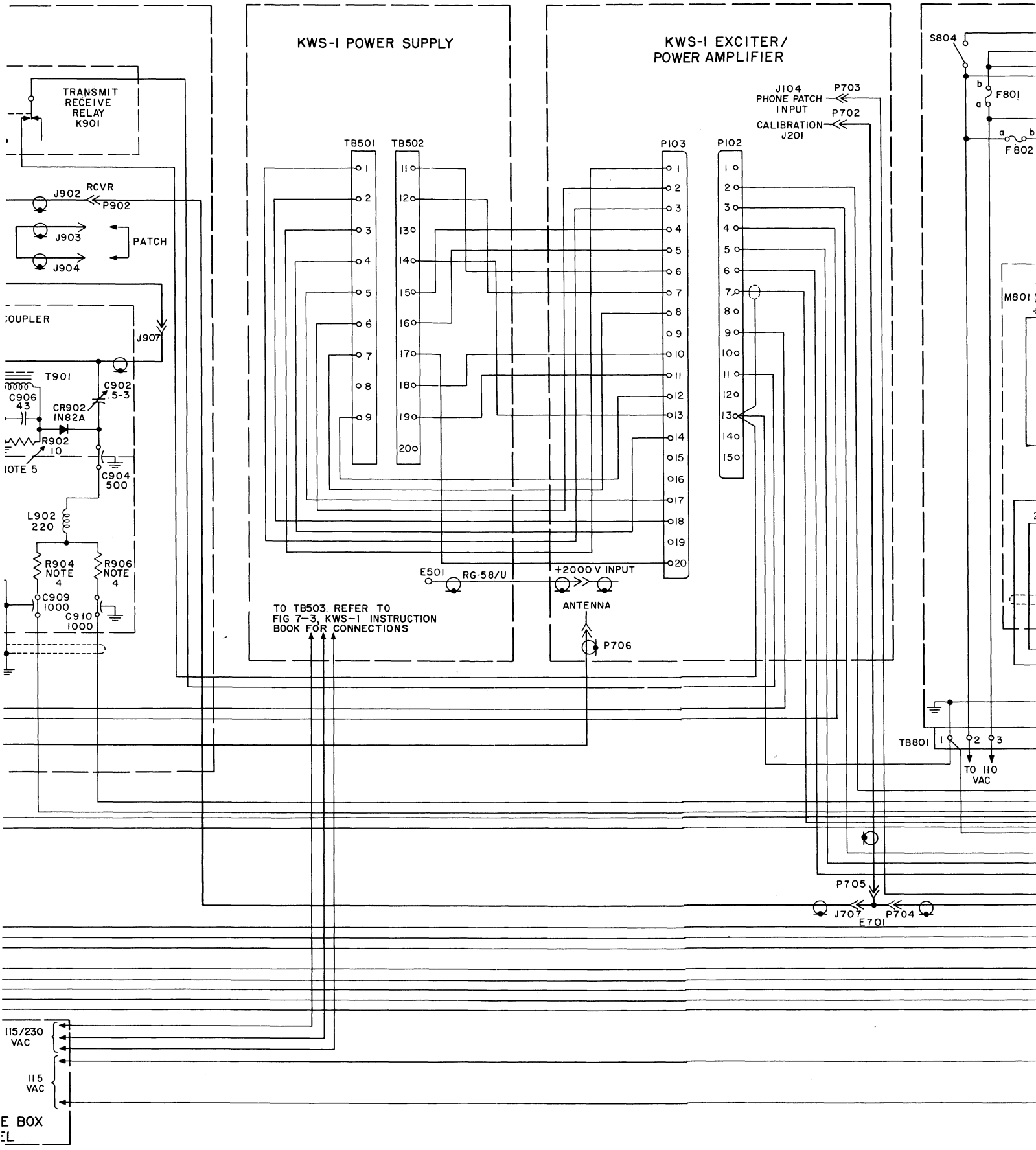
312 A-2 CONTROL/SPEAKER UNIT



534 A-1 WIRING CHANNEL

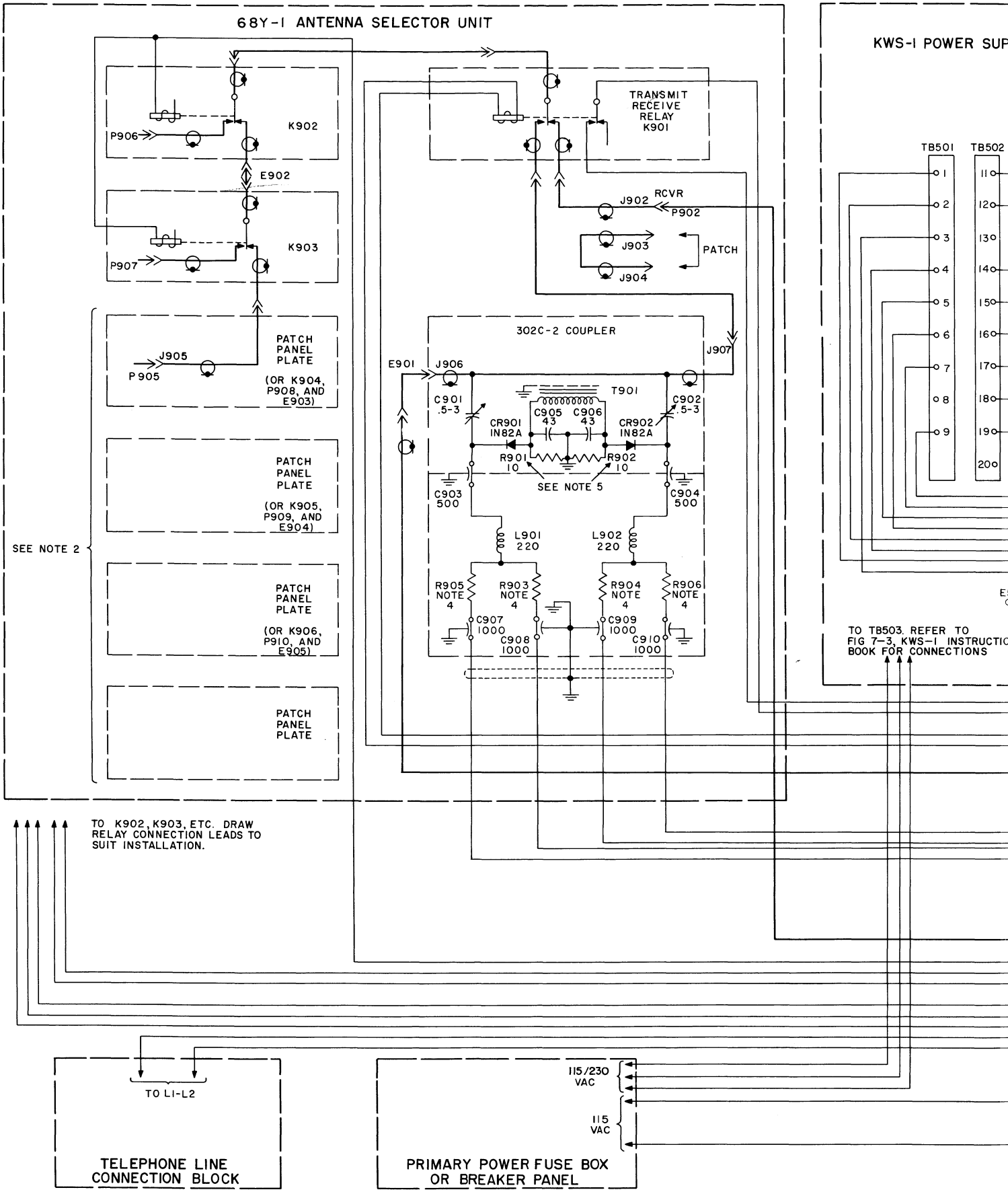


UTILITY OUTLETS
(AC FEMALE PLUG)



68Y-1 ANTENNA SELECTOR UNIT

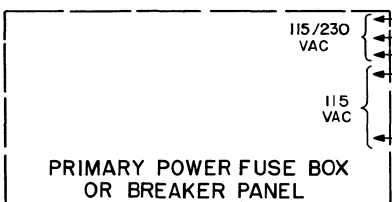
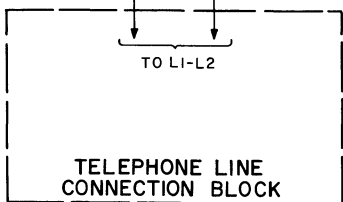
KWS-1 POWER SUP



SEE NOTE 2

TO K902, K903, ETC. DRAW RELAY CONNECTION LEADS TO SUIT INSTALLATION.

TO TB503, REFER TO FIG 7-3, KWS-1 INSTRUCTION BOOK FOR CONNECTIONS



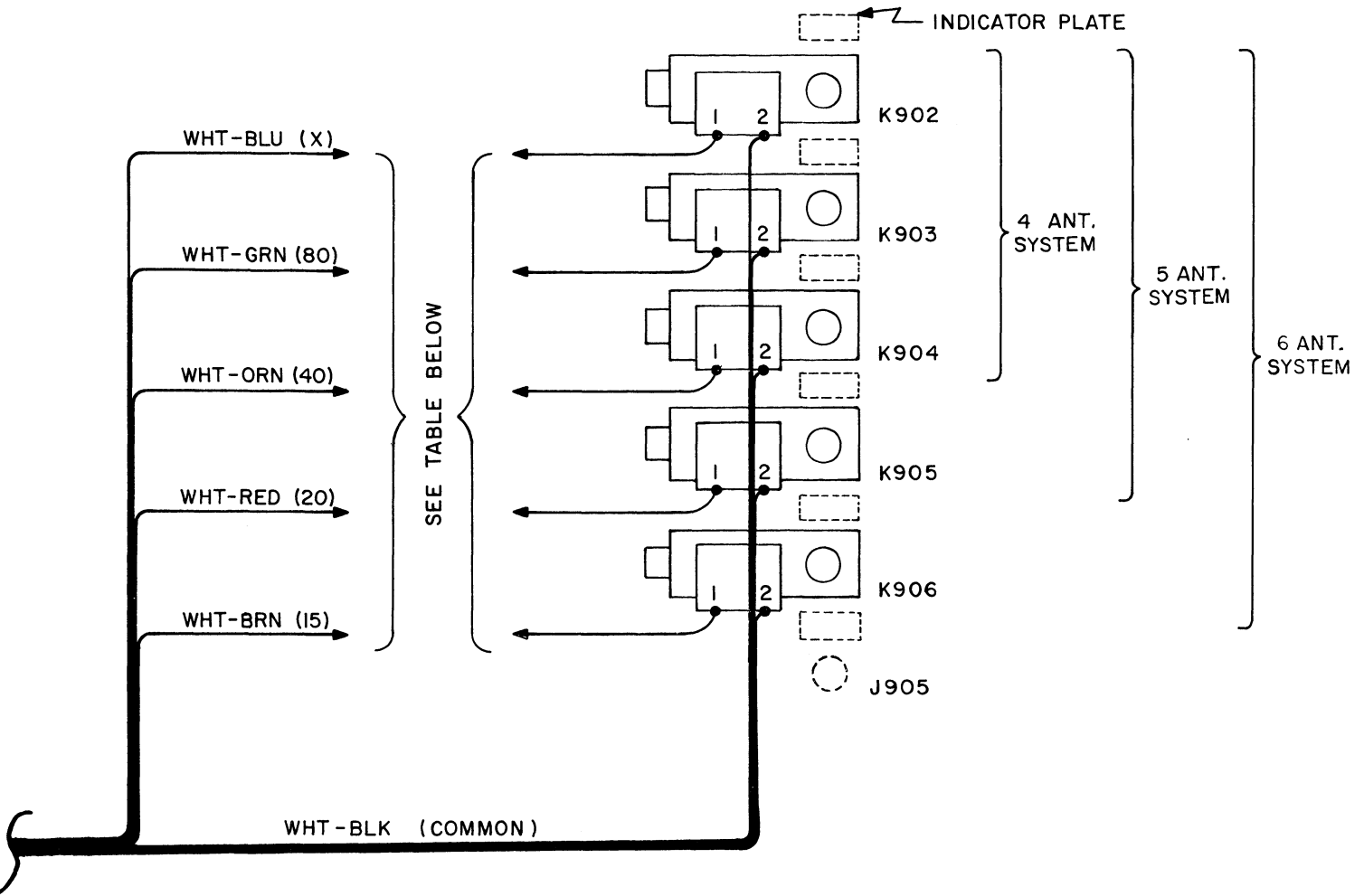
SECTION VIII

INSTALLATION AND WIRING FOR 4, 5, AND 6 ANTENNA SYSTEMS

8.1 INSTALLATION AND WIRING INSTRUCTIONS.

If a four, five, or six antenna system is used, refer to figure 8-1. Install additional relays and jumpers as required. Mount band indicator plates in appropriate positions on the patch panel. Wire the relays as

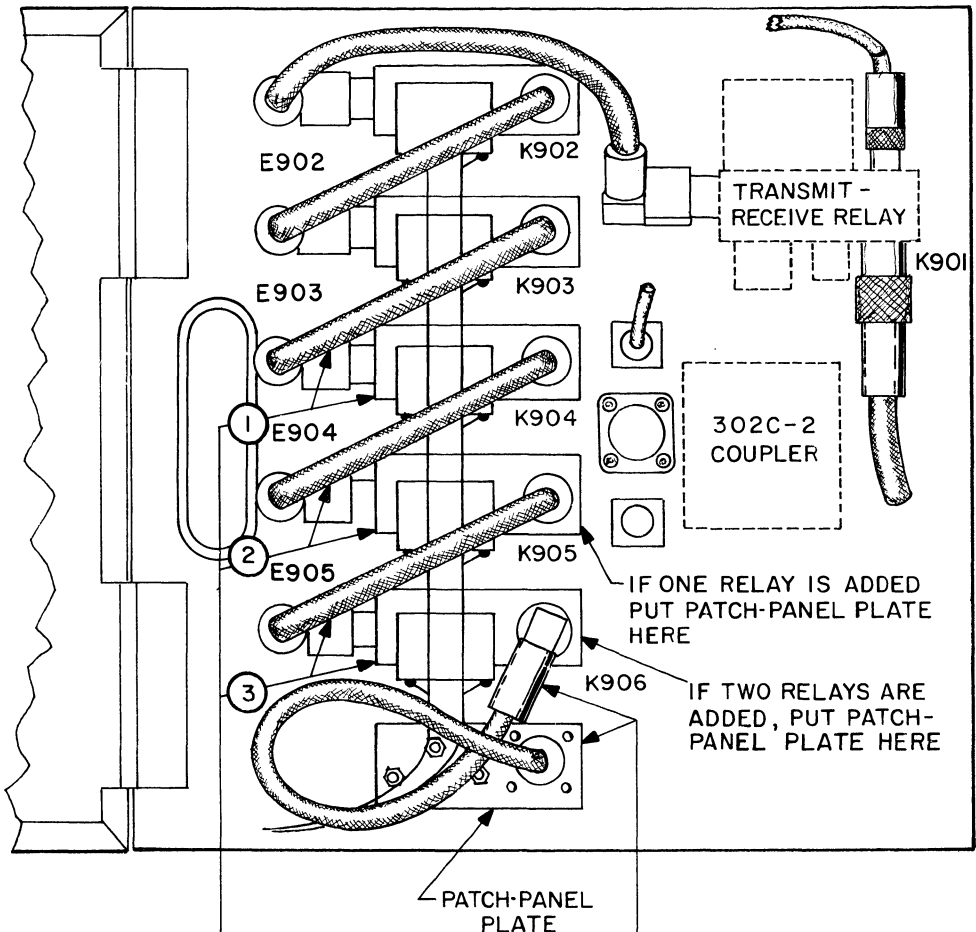
required. Determine the proper coding from the table. Feed additional RG-8/U cables through the one and one-half-inch conduit and the slot in the front cover of the 68Y-1 unit. Install additional type N male connectors, referring to figure 2-5 for instructions. Connect plugs to proper jacks on the patch panel.



AS	RELAY TERMINAL NO.1 CONNECTIONS					INDICATOR PLATE POSITIONS						NOTES
	K902	K903	K904	K905	K906	K902	K903	K904	K905	K906	J905	
0,15	WHT-GRN	WHT-ORN	WHT-RED	—	—	80M	40M	20M	—	—	15M	IF EXTRA ANTENNA IS USED ON ANY BAND, CONNECT WHT-BLU LEAD TO ELIMINATED LEAD. PUT X PLATE IN APPROPRIATE POSITION.
0,10	WHT-GRN	WHT-ORN	WHT-RED	—	—	80M	40M	20M	—	—	10M	
5,10	WHT-GRN	WHT-ORN	WHT-BRN	—	—	80M	40M	15M	—	—	10M	
5,10	WHT-GRN	WHT-RED	WHT-BRN	—	—	80M	20M	15M	—	—	10M	
5,10	WHT-ORN	WHT-RED	WHT-BRN	—	—	40M	20M	15M	—	—	10M	
20	WHT-GRN	WHT-ORN	WHT-RED	WHT-BRN	—	80M	40M	20M	15M	—	10M	
0,10	WHT-BLU	WHT-GRN	WHT-ORN	WHT-RED	WHT-BRN	X	80M	40M	20M	15M	10M	EXTRA ANTENNA POSITION WILL VARY WITH SYSTEM USED.

Figure 8-1. Installation and Wiring of Additional Relays in 68Y-1 Antenna Selector Unit

C183-07-4

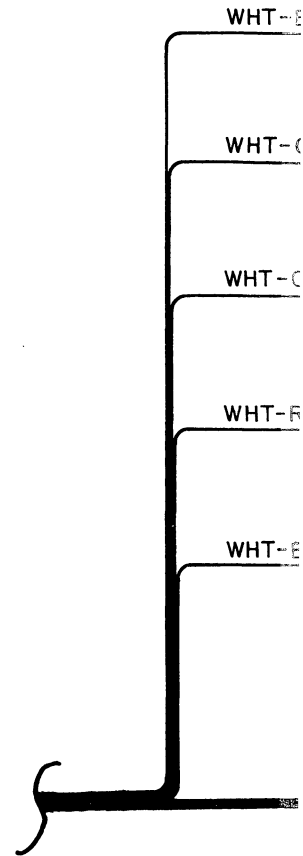


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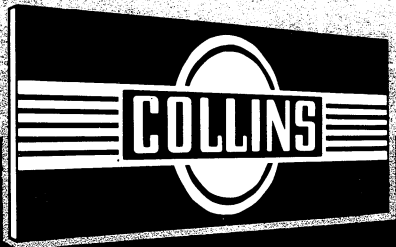
REMOVE COVER PLATES AND INSTALL ONE, TWO, OR THREE ADDITIONAL RELAYS AS REQUIRED. INSTALL JUMPERS BETWEEN RELAYS.

B

INSTALL PATCH-PANEL PLATE AND JUMPER IN LAST UNCOVERED HOLE DOWN THE PANEL. CONNECT JUMPER TO BOTTOM RELAY.



SYSTEM	ANTENNAS	RELAY TERMINALS	
		K902	K903
4 ANTENNAS	80,40,20,15	WHT-GRN	WHT-ORN
	80,40,20,10	WHT-GRN	WHT-ORN
	80,40,15,10	WHT-GRN	WHT-ORN
	80,20,15,10	WHT-GRN	WHT-RED
5 ANTENNAS	40,20,15,10	WHT-ORN	WHT-RED
	80,40,20 15,10	WHT-GRN	WHT-ORN
6 ANTENNAS	X, 80, 40,20,15,10	WHT-BLU	WHT-GRN



COLLINS RADIO COMPANY
CEDAR RAPIDS, IOWA