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Collins Government Telecommunications Group

30S-1 RF Linear Amplifier

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**30S-1
RF Linear Amplifier**

**Collins Government
Telecommunications Group
Rockwell International
Cedar Rapids, Iowa 52406**

Printed in the United States of America

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SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
1	To increase operating life of pa tube	11th Ed	15 Jun 73
2	Prevent intermittent dropout of plate overload relay	11th Ed	15 Jun 73
3	Reduce excessive ALC control	11th Ed	15 Jun 73

section 1

installation

1.1 UNPACKING

Carefully remove the amplifier and associated items (table 1-1) from the packing material. Examine for visible damage. If the amplifier

has been damaged in shipment, save box and packing material, and notify the transportation company. Fill out and mail the equipment registration card.

Table 1-1. Equipment Furnished With 30S-1.

QUANTITY	DESCRIPTION	FUNCTION	COLLINS PART NUMBER
1	Ac power cable, four #12 wires, 10 feet long, with lugs on one end.	Ac power	609-0682-001
2	Shielded cables, 10 feet long, with phono plug (part number 361-0062-00) on each end.	ALC and antenna relay cables	426-2029-000
1	RG-58/U cable, 20.5 feet long, with phono plug (part number 361-0062-00) on each end.	Rf input cable	426-5079-000
1	RG-213/U cable, 10 feet long, with type N connector (part number 357-9261-00) on each end.	Rf output cable	545-3122-000
1	Instruction book.	Instructions	520-5879000
1	Polyethylene spiral wrapping, 6 feet long.	Lacing the inter-connecting cables	152-3375-000
2	Cable marker card.	Cable callout	280-2946-000
2	Fuses, 1-ampere.	Spare	264-4280-000
2	Fuses, 3.2-ampere.	Spare	264-0216-000
2	Fuses, 8-ampere.	Spare	264-0395-000
4	Fuses, 15-ampere.	Spare	264-0912-340
1	Key sch screw #8.	Knob removal	024-0019-000
1	Key sch screw #6 (4-spline).	Tool	024-9730-000
1	Key sch screw #6 (6-spline).	Tool	024-0167-000
1	Bag containing hardware.	Mounting 516F-2 Power Supply	
1	Bag containing hardware.	Mounting power transformer	

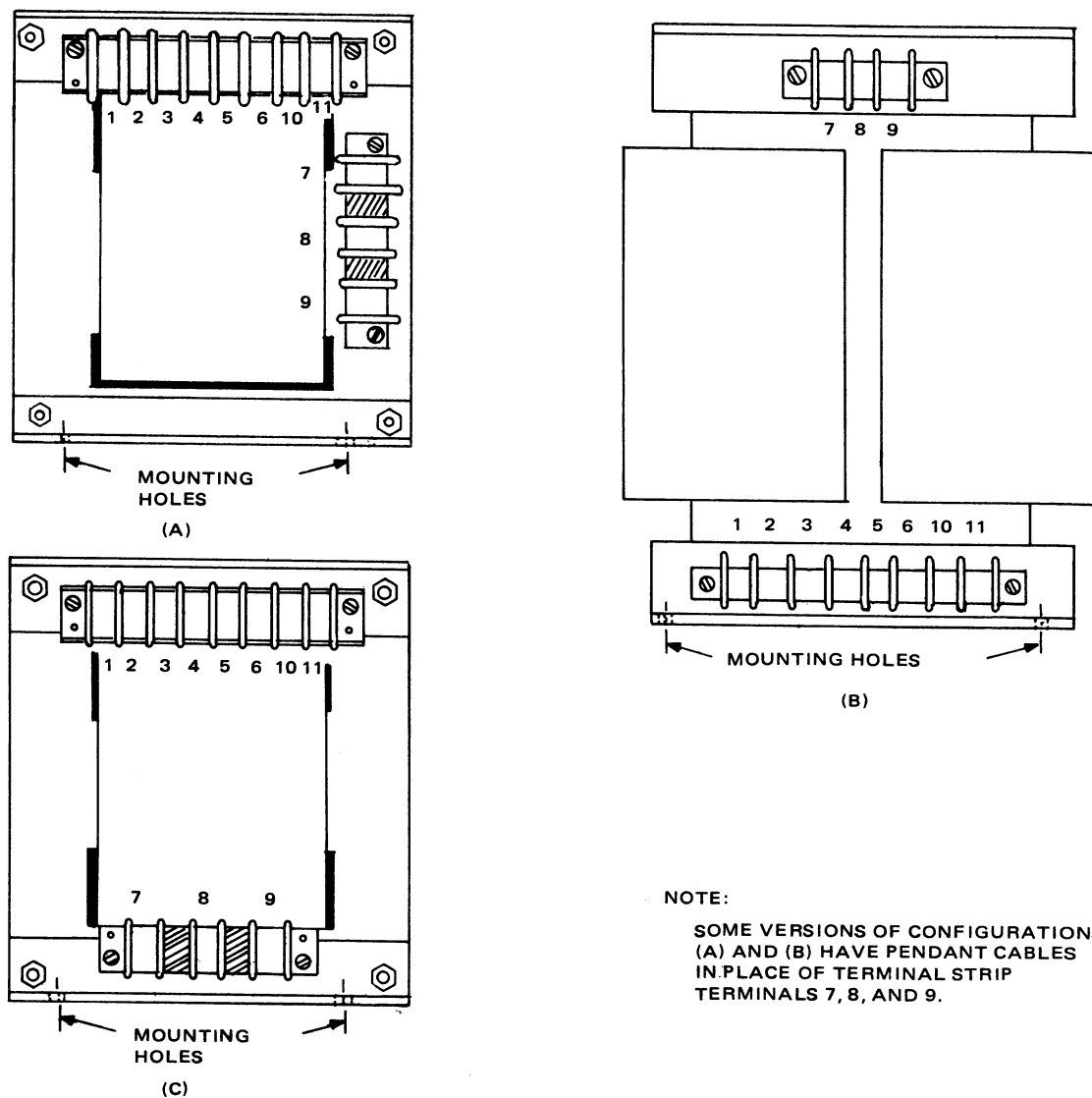
1.2 MOUNTING, CABLING, AND ADJUSTMENTS

Warning

Do not block interlock switches. Lethal voltages are present in this equipment. The high voltage is interlocked with the amplifier covers. Make no attempt to put the amplifier into service until all compartment covers are in place. Disconnect primary power before attempting any repairs.

1.2.1 Mounting and Cabling

- a. Set the 30S-1 on the floor beside the operating desk.
 - b. Unlock the power supply compartment door with the key furnished, pull out the door, and remove it. The key is packed in a small cloth bag that is tied to one of the knobs on the front panel. Uncrate the high-voltage transformer from its separate shipping container.
 - c. Loosen the exciter power supply shelf, shown in figure 1-5, and tip it back out of the way. This shelf provides space for mounting the exciter power supply inside the 30S-1 power compartment, if desired. The shelf may be loosened by removing three flathead machine screws along the left side and two sheet-metal screws along the back edge. The screwheads on the left side are on the inside of the cabinet, and the screwheads along the rear are on the outside of the cabinet.
 - d. Mount the high-voltage power supply transformer over the mounting holes in the bottom plate of the compartment. Be sure to position the transformer with terminals 1, 2, 3, 4, 5, 6, 10, and 11 positioned as shown in figure 1-1. Secure the transformer to the cabinet floor with the four screws supplied.
- Note**
- In order to insert the rear screws in the mounting holes, it may be necessary to use beeswax or some other type of adhesive on the screwdriver head.
- e. Connect the lead from the ceramic post insulator to the center tap (terminal 8) of the transformer (figure 1-1). This insulator is shown in figure 1-5 in front of the 3B28 filament transformer, T202.
 - f. Connect the two leads from the lower terminals of the two surge suppressing resistors, R222 and R223, to terminals 7 and 9 of the transformer (figure 1-1). These resistors are mounted behind the rectifier tube sockets.
 - g. Connect the wires of the cable to the terminal strip across the top edge of the transformer frame according to the wire code information of figure 1-5.
 - h. Replace the exciter power supply shelf. Secure the front edge of the shelf to the back edge of the transformer with spacer and screw provided. Replace the two sheet-metal screws along the rear, and replace the three flathead machine screws along the left side.
 - i. If the exciter power supply is preferred on the operating desk, disregard note 2 of figure 1-2 and note 1 of figures 1-3 and 1-4.
 - j. If the exciter power supply is preferred in the lower compartment of the 30S-1, remove the 516F-2 from its case before mounting on the shelf in the 30S-1. Plug the 32S-() (or KWM-2) into the 516F-2. Plug the 516F-2 into J204. This jack is located inside the 30S-1 on the flange of the power supply shelf. See figure 1-5.
 - k. Secure the 516F-2 chassis with the sheet-metal screws provided. Insert two of the screws from the outside rear of the cabinet, and two from the front of the shelf inside the cabinet.
 - l. Connect the 30S-1 power supply input terminals to the ac line according to the information given in figures 1-2 through 1-4, and figure 7-1. Run the ac power supply leads through the entry conduit from the rear of the cabinet. Connect the white wire to the neutral. The ac input terminals are shown in figure 1-5.
 - m. Install the rectifier tubes. Install plate caps on the rectifier tubes. Make sure the plug-in time-delay relay is installed on the shelf in the power supply. The delay relay looks like an octal-base tube. Refer to figure 6-6. Open the top cover of the rf compartment. Check that thermal relay K102 is properly positioned as shown in figure 6-2. Check the entire rf compartment to see that no short circuits exist.
 - n. Connect a 32S-(), KWM-2, or KWM-1 exciter as shown in figures 1-2, 1-3, or 1-4. A length

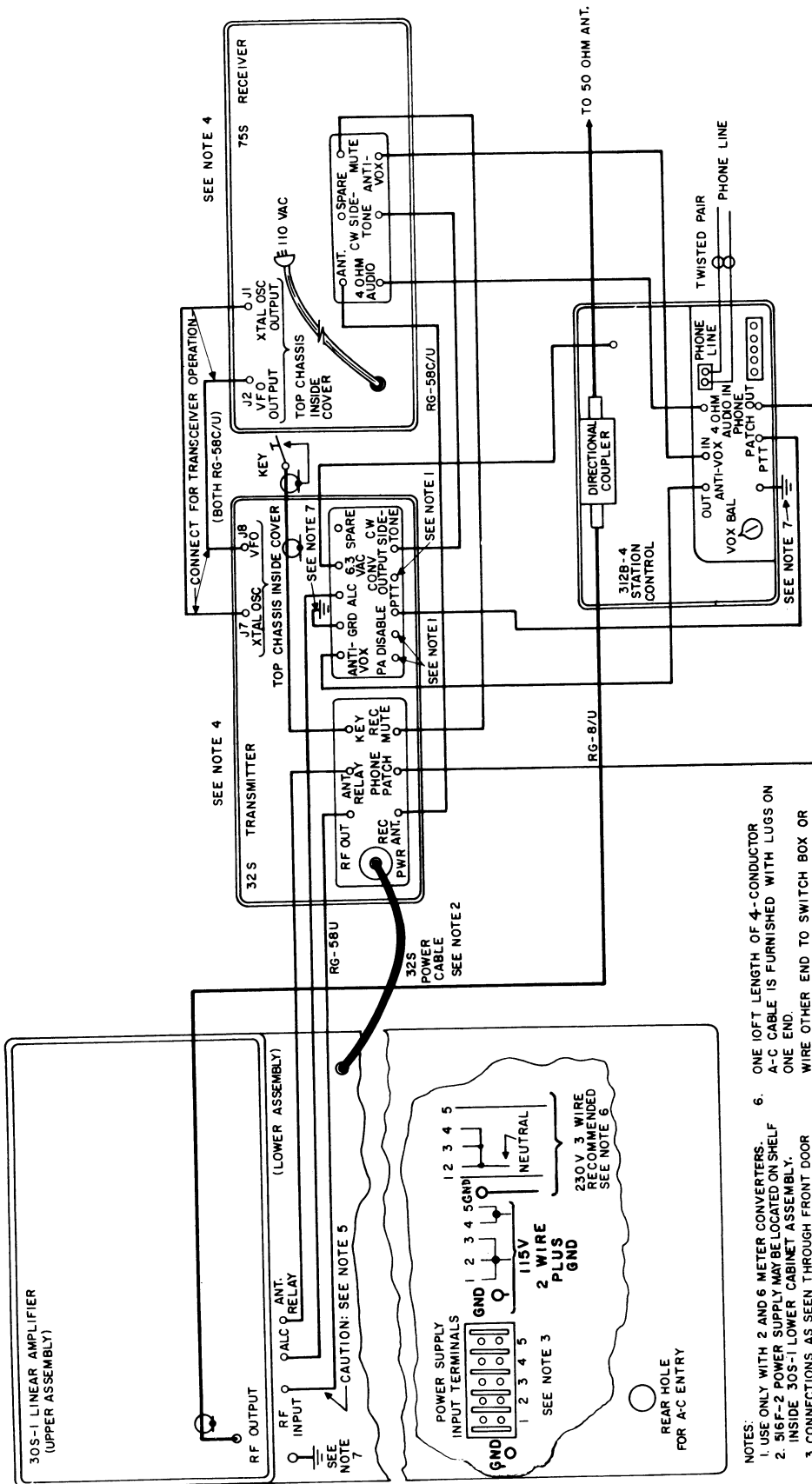


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30S-1 Plate Transformer Configuration and Terminal Strip Locations
Figure 1-1

- of polyethylene spiral wrapping is included with the 30S-1 for making a neat bundle of interconnecting wires behind the operating desk.
- o. If KWM-1 models above serial number 861 are used with the 30S-1, it will be necessary to bring out ALC and "ground-on-transmit" connections to P1, terminals 19 and 20. This will allow the switching circuits of the KWM-1 to control the antenna changeover relays of the 30S-1 when connected to J203 on the 30S-1. Make these breakout connections to P1, using shielded wire and connect

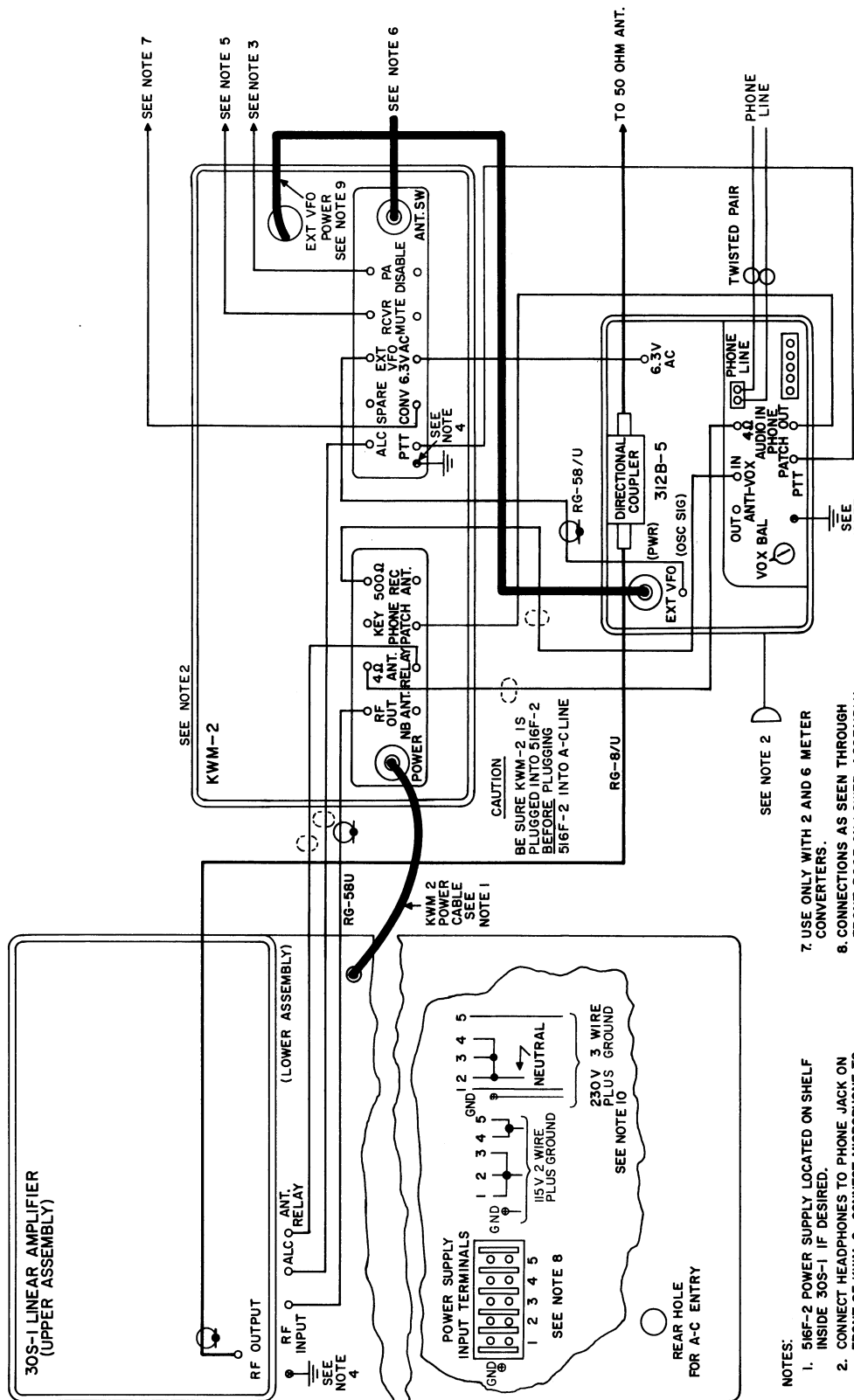
- to 30S-1 ALC and ANT. RELAY jacks with phono plugs.
- p. If KWM-1 models below serial number 861 are used with the 30S-1, it is necessary to make connections inside the KWM-1 for ALC. Use an ohmmeter to locate the feedthrough capacitor, C169, which is connected to pin 19 of J5. Connect a wire from this feedthrough capacitor to pin 7 of tube socket XV10. In addition, it will be necessary to connect an external dropping resistor and relay as shown in the detail of figure 1-4, for KWM-1 control



- NOTES:
1. USE ONLY WITH 2 AND 6 METER CONVERTERS.
 2. 56F-2 POWER SUPPLY MAY BE LOCATED ON SHELF INSIDE 30S-1 LOWER CABINET ASSEMBLY.
 3. CONNECTIONS AS SEEN THROUGH FRONT DOOR ON LOWER ASSEMBLY.
 4. CONNECT HEADPHONES TO PHONES JACK, FRONT OF 75S. CONNECT MICROPHONE TO MICROPHONE JACK, FRONT OF 312B-1.
 5. THIS COAXIAL CABLE IS FURNISHED IN 20.5 FT. LENGTH, DO NOT SHORTEN OR SUBSTITUTE ANY OTHER LENGTH.
 6. ONE 10FT LENGTH OF 4-CONDUCTOR A-C CABLE IS FURNISHED WITH LUGS ON ONE END. WIRE OTHER END TO SWITCH BOX OR CONNECTOR AS DESIRED.
 7. CONNECT TO EARTH GROUND.

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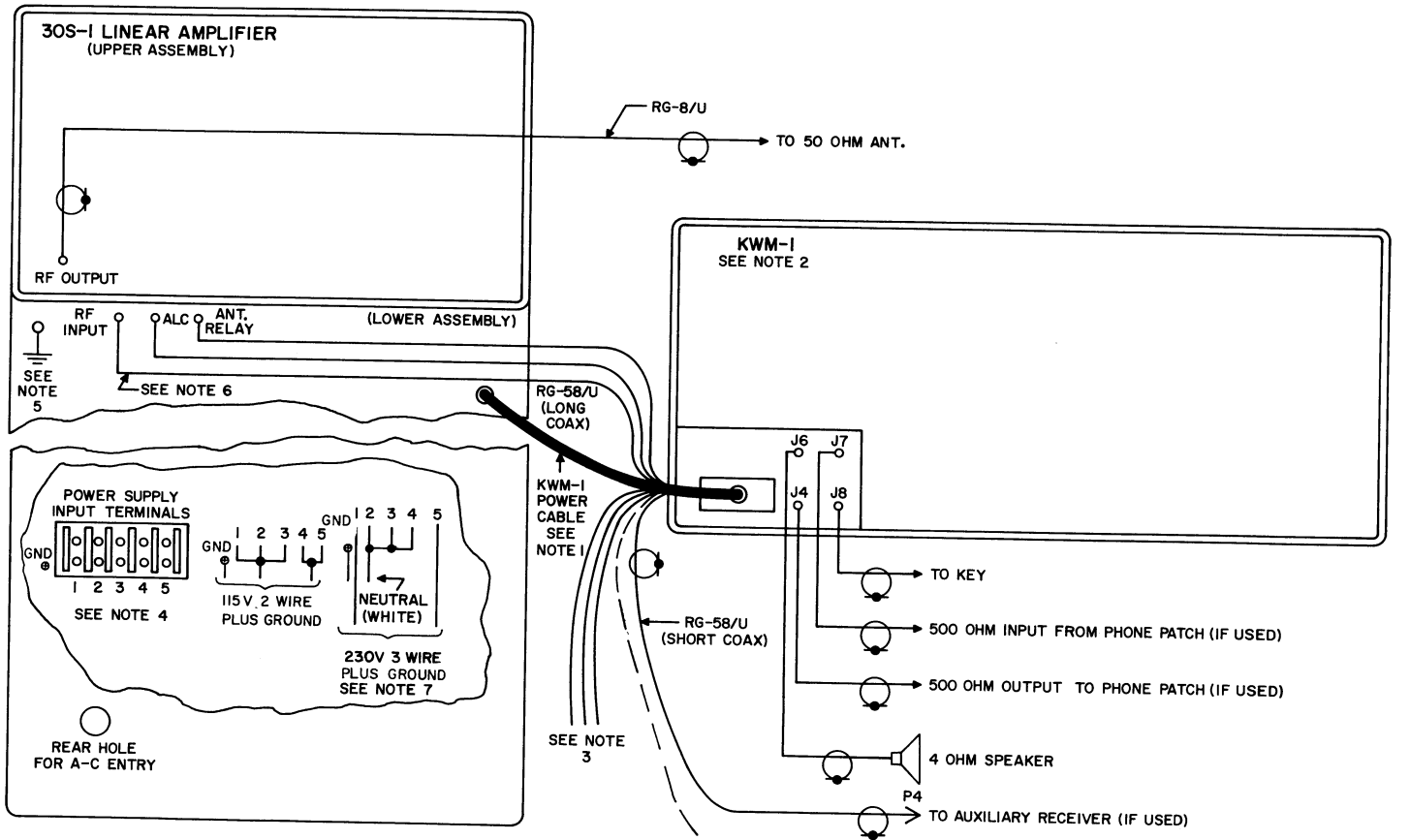
Station Interconnections With 32S-() and 75S-()
Figure 1-2



- NOTES:
1. 516F-2 POWER SUPPLY LOCATED ON SHELF INSIDE 30S-1 IF DESIRED.
 2. CONNECT HEADPHONES TO PHONE JACK ON FRONT OF KWM-2. CONNECT MICROPHONE TO MIC JACK ON FRONT OF 312B-5.
 3. USE ONLY WITH 2 AND 6 METER CONVERTERS. (CAUTION +275V DC PRESENT HERE)
 4. CONNECT TO EARTH GROUND.
 5. EXTERNAL RECEIVER MUTING.
 6. CABLE TO ANTENNA SWITCHING RELAYS. (IF USED)
 7. USE ONLY WITH 2 AND 6 METER CONVERTERS.
 8. CONNECTIONS AS SEEN THROUGH FRONT DOOR ON LOWER ASSEMBLY.
 9. EXTERNAL VFO POWER CABLE PLUGS INTO J17 ON CHASSIS.
 10. 10 FT LENGTH OF 4 WIRE (EACH NO. 12) CONDUCTOR WITH LUGS ON ONE END. CONNECT OTHER END TO SWITCHBOX OR PLUG AS DESIRED.

Station Interconnections With KWM-2
Figure 1-3

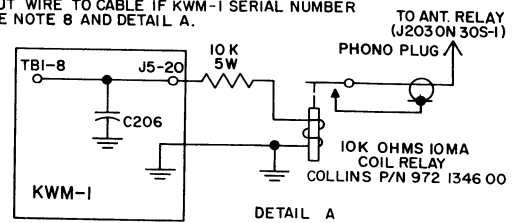
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NOTES:

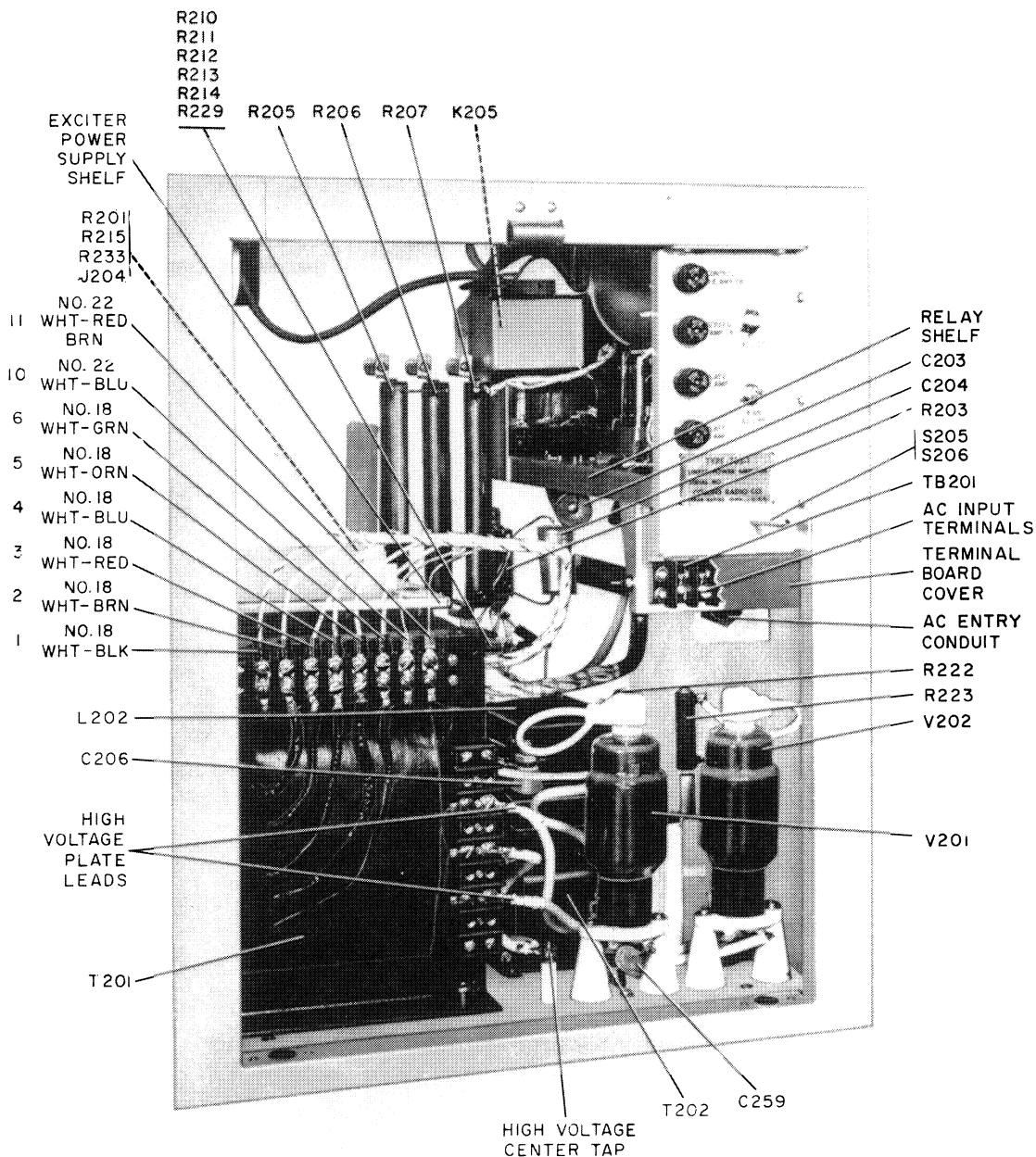
1. 516F-1 POWER SUPPLY MAY BE LOCATED ON SHELF INSIDE 30S-1 LOWER CABINET ASSEMBLY.
2. CONNECT HEADPHONES TO PHONE JACK ON FRONT OF KWM-1, CONNECT MICROPHONE TO MIC JACK ON FRONT OF KWM-1.
3. CABLE TO ANTENNA SWITCHING RELAYS, (IF USED).
4. CONNECTIONS AS SEEN THROUGH FRONT DOOR ON LOWER ASSEMBLY.
5. CONNECT TO EARTH GROUND.

6. THIS CABLE IS FURNISHED WITH 30S-1 IN 20.5 FT LENGTH. DO NOT CUT. ADD THE 2.5 FT LENGTH TO BRING TOTAL LENGTH TO 23 FT.
7. 10 FT LENGTH OF 3 WIRE (EACH NO. 12) CONDUCTOR WITH LUGS ON ONE END. CONNECT OTHER END TO SWITCH BOX OR PLUG AS DESIRED.
8. SEE DETAIL A FOR EXT RELAY CONNECTIONS FOR KWM-1 SWITCHING OF 30S-1 (KWM-1 SERIAL NUMBERS BELOW 861).



C432-14-4

Station Interconnections With KWM-1
Figure 1-4



*Power Supply Compartment, Parts Location and Wiring
Figure 1-5*

of changeover relays in the 30S-1. Using an ohmmeter, locate the feedthrough capacitor, C206, which is connected to pin 20 of J5 (in KWM-1). Connect a wire from terminal 8 of TB1 in KWM-1 to C206. Make corresponding breakout connection from P1-19 with shielded wire and connect breakout to 30S-1 ALC jack with a phono plug. External to the KWM-1,

connect a 10,000-ohm, 5-watt resistor and a relay coil in series from J5-20 to a ground on the rear of the KWM-1 chassis. Use a relay, such as Collins part number 972-1346-00, with a 10,000-ohm, 10-mA coil and a set of normally open contacts. Connect the normally open contacts through a piece of shielded wire (or microphone cable) and a phono plug

section 1
installation

to ANT. RELAY (J203) on the 30S-1. This arrangement will allow KWM-1 switching of 30S-1 changeover relays.

Warning

Be careful to avoid the 260-volt B+ present on the resistor and relay coil connections.

Note

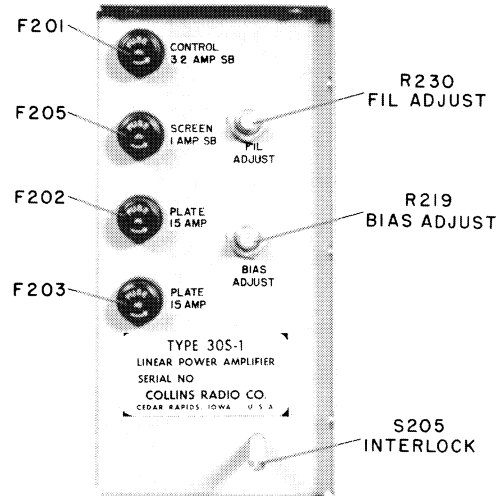
The rf cable supplied for connecting the 32S-() or the KWM-2 to 30S-1 is 20.5 feet long. Do not cut this cable. This length is optimum in maintaining the low-distortion figure for which the equipment was designed. An additional 2.5 feet of cable, with connectors, is required for connecting the KWM-1 output to the 30S-1. This makes a total of 23 feet for the KWM-1 connection.

1.2.2 Adjustment

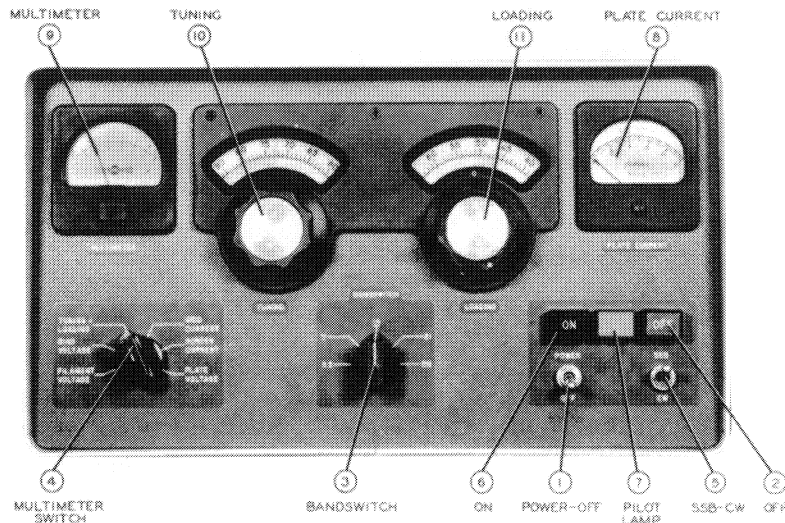
a. Refer to figure 1-7. Set POWER-OFF switch (1) to POWER. Set SSB-CW switch (5) to SSB and MULTIMETER switch (4) to FILA-

MENT VOLTAGE. Be sure the plate power is off and the rectangular red pilot lamp (7) is out. The following adjustments are made without excitation.

b. Set filament voltage to 6.0 volts ac with FIL ADJUST. Refer to figure 1-6.



Heater and Bias Adjustment Locations
Figure 1-6



30S-1 RF Linear Amplifier, Operating Controls
Figure 1-7

- c. Set MULTIMETER switch (4) to PLATE VOLTAGE.

Note

Due to the 3-minute delay of time-delay relay K202, plate voltage will not come on until 3 minutes after filament voltage has been applied. During this 3-minute wait, the exciter may be operated as a low-power station.

Warning

Do not make bias adjustments with the power on. Do not block the power supply interlock switch. Lethal voltages are present in the power supply.

- d. After the 3-minute delay time has elapsed, press the plate ON button. The rectangular red pilot lamp should light, and plate voltage should be indicated on the MULTIMETER (9).
- e. Set exciter MIC GAIN control fully counterclockwise to produce zero drive, and set the exciter EMISSION switch to TUNE position. Idling plate current will be indicated on the 30S-1 PLATE CURRENT meter (8).
- f. Remove the front cover from the power supply compartment; make a small change in setting of BIAS ADJUST; replace cover and read PLATE CURRENT meter. Repeat until the no-signal plate current is 200 mA.
- g. When these adjustments are completed, press the plate OFF pushbutton (2).

section 2

operation

2.1 OPERATION IN SSB OR CW SERVICE (Refer to figure 1-7.)

- a. Set POWER-OFF switch (1) to POWER.
- b. Set exciter band switch to desired band and exciter meter switch to PLATE. Adjust exciter idling plate current to 50 mA. Be sure 30S-1 and exciter ALC jacks are connected together. When the 3-minute delay time has elapsed, press plate ON pushbutton. Set exciter meter switch to ALC. Adjust exciter ALC ZERO for an exciter meter indication of zero ALC. Refer to procedure in exciter instruction book. Press 30S-1 plate OFF pushbutton.
- c. Tune and load the exciter into the antenna or dummy load, whichever is connected to RF OUTPUT jack J103 at the rear of the 30S-1. Tune and load 32S-() or KWM-() according to its instruction book, except load only to 200 mA plate current. This change in procedure for 32S-() or KWM-() is necessary to obtain the low system distortion for which this equipment was designed.

Note

Use a 100-watt dummy load (such as Collins DL-1, 52 ohms) unless antenna and feedline system present an swr not exceeding 1.25 to 1.

Caution

Do not leave the dummy load connected to the 30S-1 output with the 30S-1 power on unless dummy load used has power dissipating capacity equal to or greater than the output power of the 30S-1.

- d. Remove exciter output by turning microphone gain control to OFF. If a different make of exciter is used, place it in STANDBY.
- e. Press 30S-1 plate OFF button, and turn 30S-1 BANDSWITCH (3) to desired band.
- f. Set MULTIMETER switch (4) to TUNING & LOADING.
- g. Set SSB-CW switch (5) to desired mode of operation.

- h. Disconnect dummy load and connect antenna to RF OUTPUT jack.
- i. Press plate ON pushbutton (6). The pilot lamp (7) should light if the 3-minute delay time has elapsed.
- j. With exciter EMISSION switch in LOCK KEY position, increase exciter output by increasing microphone gain until 350-mA plate current is indicated on PLATE CURRENT meter (8).
- k. Observe the MULTIMETER (9). Adjust the TUNING control (10) for MULTIMETER dip, and adjust the LOADING control (11) for MULTIMETER 0 until the meter indication is 0 at the dip.
- l. Adjust exciter output (with exciter MIC GAIN control) until 30S-1 peak plate current is 300 mA for SSB or 400 mA for CW.
- m. Redip and reload with the TUNING and LOADING controls, keeping MULTIMETER indication at 0.
- n. Recheck PLATE CURRENT meter indication for proper value as given in step 1. Repeat steps 1 and m, as necessary, until power amplifier is loaded to 400 mA for CW or 300 mA peak for SSB. Do not switch from SSB to CW (or from CW to SSB) while operating. Be sure 30S-1 plate voltage is off when changing setting of SSB-CW switch (5).
- o. For SSB operation, set 32S-() (or KWM-2) EMISSION switch to USB or LSB. Set exciter METER switch to ALC. Adjust MIC GAIN for meter indication of 6 dB for 32S-() or KWM-2 (or S6 for KWM-1) for peak voice readings in normal operation of the exciter. For CW or RTTY operation, set EMISSION switch to CW. The transmitter is now ready to operate.
- p. Pressing the plate OFF pushbutton (2) automatically switches the exciter to the antenna for low-power operation.

Caution

Wait at least 5 seconds after pressing plate OFF button (2) before pressing plate ON button (6). This delay is necessary to allow the step-start circuit to recover.

Note

The cathode-input circuit on the 3.5-MHz band is factory tuned for minimum input vswr at 3.8 MHz. The vswr will increase slightly for operation on other parts of the band. This will cause small changes in the normal load setting of the exciter. It is possible, but not necessary, to adjust L114 for minimum vswr at a favored part of the 3.5-MHz band. The cathode input circuits for the 7-, 14-, 21-, and 28-MHz bands are broad enough that no adjustments are necessary within these bands.

q. Table 2-1 lists full-scale and normal meter indications for all scales of the multimeter.

Full-scale indication on the PLATE CURRENT meter is 1000 mA, and normal indication on this meter is 400 mA for CW or 300 mA on voice peaks for SSB. According to FCC regulations, the drive power to the grounded-grid amplifier must be added to pa plate power input to determine total final amplifier plate power input. The above plate current ratings keep the amplifier input within legal limits.

Caution

If the 30S-1 is to be driven by an exciter not having automatic load control (ALC), monitor the 30S-1 grid current continuously while transmitting, and keep the drive level at a point that just produces a slight kick in the grid current indication.

Table 2-1. Multimeter Scale Values.

MULTIMETER SWITCH SETTINGS	FULL-SCALE INDICATIONS	NORMAL INDICATIONS
FILAMENT VOLTAGE	10 volts ac	6.0 volts ac.
BIAS VOLTAGE	-100 volts dc	Voltage necessary to set idling plate current to 200 mA.
TUNING & LOADING	Not applicable	0 when 30S-1 is properly loaded.
GRID CURRENT	5.0 mA	Never more than 0.2 mA in CW, 0 in SSB.
SCREEN CURRENT	50 mA	Never more than ±25 mA.
PLATE VOLTAGE	5000 volts	2000 for CW. 3000 for SSB.