

COMMUNICATIONS EQUIPMENT MODIFICATION NOTE 27
(for Electronics Technicians)

SUBJECT : B220 Transmitter Upgrade

PURPOSE : Replacement of the B220 Power Amplifier (SR-410A), Power Supply (SR-410), and Exciter Directional Coupler Assembly (1A3A3)

EQUIPMENT AFFECTED : B220 Transmitters at regionally specified locations. Serial numbers of the affected transmitters will have a 74- prefix.

PARTS REQUIRED :

- 1 ea B220 Modification Kit consisting of an upgraded Power Supply (SR-410) and upgraded Power Amplifier (SR-410A)
- 1 ea SR-416ST INSTALLATION/OPERATION/MAINTENANCE Instruction Manual
- 1 ea Directional Coupler (P/N 410440) for the Exciter
- 1 ea Convenience Outlet (P/N 410872) power strip
- 1 ea Installation kit for mounting the power strip consisting of:
 - 1 ea drill drawing for locating mounting holes in rack
 - 2 ea H10084 #10 x 1/2" pan head screw
 - 2 ea H10000 #10 nut
 - 5 ea H1000D #10 flat washer
 - 2 ea H10003 #10 split lock washer
 - 3 ea MP0707 cable clamp
 - 3 ea H10064 #10 x 3/8" phillips head screw
- 1 ea AC power cable (P/N 410871 pigtail)
- 2 ea AC line cords (P/N W00004)
- 3 ea Meter shunts attached to power amplifier front panel meters
- 1 ea Name Plate, Transmitter (P/N 416108-04)

SPECIAL TOOLS AND TEST EQUIPMENT REQUIRED :

- 1 ea Dummy Load, 50 Ω , 160 MHz, 1.5 kW, SRS Model SR-417 or equivalent
- 1 ea Forward/Reflected Power Meter, SRS Model SR-417A, or equal

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SPECIAL TOOLS (Continued)	:	1 ea Microphone (see paragraph 1.5, SRS Manual Manual SR-416ST) 1 ea Electric drill 1 ea #7 or 7/32" drill bit for indicated holes (See Figure 5 this Mod Note) 1 ea Plastic Drop Cloth 1 ea Hand Truck, if available 1 ea High Voltage Grounding Stick
TIME REQUIRED	:	2 Electronics Technicians, 4 hours each
EFFECT ON OTHER INSTRUCTIONS	:	Any changes in the maintenance and quality control procedures will be addressed later
CERTIFICATION	:	This modification has been tested and STATEMENT verified at: Rochester, NY; Jackson, MS; and Nashville, TN.

General:

All references to drawings, figures, and paragraphs not specified refer to Instructional Manual SR-416ST supplied with this modification kit.

The upgrade of the B220 transmitters requires some on-site preparation. Perform the following procedures in order.

WARNING: DO NOT have all units extended on their slides at the same time. DO NOT remove the Power Supply from the cabinet until after the Exciter upgrade has been completed. The cabinet will tip over.

1. **Optional Low Power Operation During Equipment Modification**

A determination will have to be made regarding the need to keep the system operational, albeit at low power, during the removal of the old power supply and power amplifier and prior to the installation of the upgraded units. Assuming that the site is somewhat remote from the delivery and pickup point, then the desire to operate at low power will probably exist. If so, then the following procedure could be followed.

2. **Remove power from the transmitter, throw breaker switch.**

WARNING

DANGEROUSLY HIGH VOLTAGES OF UP TO 3000 VDC ARE PRESENT IN THE POWER SUPPLY WHEN POWER IS APPLIED. ALTHOUGH INTERLOCK SWITCHES PREVENT PRIMARY POWER CONTACTORS FROM TURNING ON, ADDITIONAL PRECAUTIONS SHOULD BE TAKEN TO PREVENT ELECTRICAL SHOCK. TURN OFF PRIMARY POWER AT THE BUILDING POWER DISTRIBUTION PANEL AND SECURE THE PANEL WITH A LOCK IF NECESSARY.

WARNING

GROUND HIGH VOLTAGE COMPONENTS IN THE POWER SUPPLY TO DISCHARGE FILTER CAPACITORS AND TO ENSURE THAT POWER IS NOT ACCIDENTALLY REAPPLIED.

3. Remove the Power Amplifier (PA) SR-410A

- a) Remove screened panel from the front of the SR-410A PA (remove four screws), and the four screws from the PA front panel. Disconnect the two control cables (W1 & W2) from the front of the PA. Use High Voltage (HV) Dead Stick to discharge HV components in PS. Disconnect the B+ and B-high voltage leads (red and black plastic screw caps) from the SR-410 power supply. The PA can now slide forward on its rails. Disconnect the two RF cables (W6 & W8) from the bottom of the unit. The PA can now be removed from the cabinet.
- b) Remove the four panels from the rear of the cabinet for access to the interlock assembly, 1A6, and the rest of the transmitter units.

4. Remove the Power Supply (PS), SR-410

See paragraph 9.3, Access for Servicing, in the SR-416ST Instruction Manual.

WARNING: Some mechanical assistance may be required due to the weight of this unit.

5. AC Cable Connection

Find a safe way to connect the AC cable from the interlock assembly, 1A6, to the primary 220 VAC input cable.

NOTE: Each AC power installation is unique. See warning in paragraph 2 above.

This method will allow the Exciter to operate at its normal input voltage of 220 VAC. This will allow the operation of the transmitter at **LOW POWER** as in paragraph 1 above. A possibility is to wire the Primary 220 VAC directly to TB1 on the interlock assembly, 1A6.

NOTE: If the current configuration is for 115 VAC primary input power, then the above steps should be repeated observing proper primary AC connections to the interlock assembly, 1A6 (see Table 2-2 of the SR-416ST manual).

6. Exciter to Low Pass Filter Connection

Connect the output of the Exciter to the bottom (31) of the Low Pass Filter Assembly (FL1) using the Exciter to PA coaxial cable (V8).

EXCITER SR-402A UPGRADE:

IF YOU HAVE NOT ALREADY DONE SO, REMOVE AC POWER FROM THE TRANSMITTER AT THIS TIME (see 2 above).

NEW DIRECTIONAL COUPLER INSTALLATION

1. Remove four screws on the front panel of the SR402A Exciter. Extend the unit fully on its slides.
2. Remove the top cover (15 screws).
3. Locate the Directional Coupler Assembly (A3) mounted on the rear panel (reference Figure 1 of this mod. note).
4. Disconnect the RF coax (V8P1) from A3J2 (RF output). Disconnect the BNC/N adapter from A3J1 (RF input).
5. Remove the two mounting screws that secure A3 to the rear panel.
NOTE: There are two screws recessed in the rear panel that secure J2 to A3 - DO NOT REMOVE.
6. Be careful to mark each wire as they are removed. Unsolder the RED wire (A1A2J1-2) from E1 on A3. Unsolder the BLACK wire (A1A2J1-4) from E2 on A3. Unsolder the WHITE/BK/BN wire (gnd) from E3 (reference Figure 2).
7. Using the NEW directional coupler assembly, reverse the procedure in step 6. Solder the RED wire to E1 (A1A2J1-2), the BLACK wire to E2 (A1A2J1-4), and the WHITE/BK/BN wire (gnd) to E3 (Reference Figure 4).
8. Install the new directional coupler assembly by replacing the two screws removed in step 5.
9. Connect the BNC/N adapter to A3J1 (disconnected in step 4).
NOTE: Do not re-connect RF coaxial connector (V8P1) at this time.
10. Verify that relay K1 is installed in the Exciter (reference Figure 1).
NOTE: This relay was included as part of Modification Note 23 to convert the B220 to VOX keying in place of the old 2400 Hz keying. All sites were sent materials to perform this modification. This relay is mounted to the right sidewall of the chassis (see Figure 1 of this mod note) directly under the "DANGER" shield.

ADJUSTMENT/ALIGNMENT OF THE EXCITER:

1. The following is the adjustment procedure for the newly installed directional coupler assembly (A3) (reference paragraphs 4.18 and 4.19 of manual SR-416ST included with this modification).
 - a. Connect calibrated dummy load (SR-417) to the power meter (SR-417A) load (output) connector. Connect the output connector (A3J2) on the rear of the Exciter unit to the transmitter input connector on the SR-417A power meter.
 - b. Remove the four screws holding the Modulator/Multiplier Assembly A1A1 (Reference Figure 1) and turn the Modulator/Multiplier tray upside down. The A1A audio/control assembly is now visible.
 - c. Verify that AC power has been removed from the Exciter. Unsolder jumper between E2 and E3 on Exciter audio/control assembly A2A1A2. This opens the power control loop. Resolder jumper between E1 and E3 temporarily (reference Figure 3).
 - d. Defeat the front interlock switch S1 on the cabinet, set the Exciter function switch to the Local position, reapply AC power, and turn the Exciter on. Defeat the interlock switch by slight left-to-right pressure on the interlock plunger, and pull plunger out until it "clicks" in the out position. (PA should be turned off.)
 - e. Set R5 on the directional coupler assembly (A3) PCB to midrange (reference Figure 1).
 - f. Set R5, R25, and R30 on audio/control assembly 1A2A1A2 to midrange (reference Figure 3).
 - g. Install microphone
 - h. Key Exciter and adjust power level control R1 on front of the Exciter for exactly 100W on the SR-417A Power Meter.
 - i. Adjust R5, reference Figure 4, on directional coupler A3 assembly PCB for a null in reflected power indication on MULTIMETER M.
 - j. Set Exciter POWER LEVEL (front panel) control for a 100W indication on the SR-417A power meter.
 - k. Adjust R5 on audio/control assembly 1A2A1A2 for 100W indication on Exciter FORWARD POWER meter (reference Figure 3).
 - l. Reduce power to 10W unkey Exciter, and disconnect output connector A332 from SR-417A power meter.

- m Key Exciter and adjust **R25** on audio/control assembly for equal indications of forward and reflected power (reference Figure 3).
- n Unkey Exciter and reconnect output connector A3J2 to input of SR-417A Power Meter.
- o Turn AC power off. Remove jumper between **E1** and **E3** and reconnect jumper (control loop) between **E2** and **E3** on audio/control assembly **1A2A1A2**.
- p Turn AC power on. Set front panel POWER LEVEL control fully clockwise, and adjust **R30** on audio/control assembly **1A2A1A2** for 100W maximum output (reference Figure 3).
- q Turn off power.
- r Remove dummy load SR-417, Power Meter SR-417A, and RF cable from Directional Coupler output, **A3J2**.
- s Reconnect the RF coaxial cable (**V8P1**) to **A3J2**. Replace the Modulator/Multiplier Assembly **A1A1** and replace the Exciter top cover (15 screws). Slide the Exciter back into the cabinet and replace the 4 front panel screws.
- t Return Exciter function switch to the **Remote** position.

NOTE: Before proceeding with the next step, check to make sure if there is an outlet strip already installed. If not, proceed to the next step.

2. INSTALLATION OF OUTLET STRIP, P/N 410872

- a. Remove the AC line cord connections for the Remote Control SR-402RA, and Maintenance Panel SR-415() from the interlock assembly, **1A6**. Remove four screws from the front panels of the Remote Control (SR-402RA) and Exciter (SR-402A) units. Slide both of these units forward on their slide rails until they lock in place.
- b. The Maintenance Panel (SR-415) is not on slide rails and may be removed to facilitate the installation of the power strip if necessary. Remove the four screws from the front panel, remove the SR-415.
- c. Now you can install the model 410872 Convenience Outlet (power strip). See Figure 5 for hole measurements or use drill drawing furnished in modification kit.

- d. Cover with a plastic drop cloth any assemblies that are in the transmitter cabinet to prevent metal chips or filings from falling into them during the drilling process. Place masking tape on the inside of the cabinet where the new holes are to be drilled for mounting the outlet strip. This will help to keep the drill shavings from falling into the equipment. Using the drawing supplied, drill two holes in the rack assembly for mounting the power strip.
- e. Mount the power strip with the hardware supplied above the slide rail assembly. Route the AC power cord for the power strip down along the side of the rack, behind the slide rails, to the interlock assembly, 1A6. Using the three (3) MP0707 cable clamps, H1000D flat washers, and H10064 screws, secure the AC power cord to the three self-tapped channels on the side panel of the rack.
- f. Coil and TyWrap the excess AC power cord before plugging into the pigtail. This will prevent the excess AC cable from dangling into the power supply area.
- g. The Remote Control and Maintenance Panel can now be connected to the power strip with the new line cords supplied. There are also spare outlets (4) for test equipment, soldering irons, etc.
- h. The pigtail (with female AC connector on one end) P/N 410871 (W11) will be wired into the Interlock Assembly, **1A6** as follows:

For 220 VAC Primary Power Input:

- 1) Connect both the green and white wires to Interlock Assembly terminal #3 on terminal block **(TB1-3)**
- 2) Connect the black wire to terminal #1 on the terminal block **(TB1-1)**
- 3) Refer to Figure 2-5 on page 2-10 of the new maintenance manual for detail
- 4) Dress the pigtail around the power supply blower motor and TyWrap to the Exciter power cord

For 115 VAC Primary Power Input: (Refer to figure 2-5 on page 2-10 as in para: d. 3.)

- 1) Connect the green wire to terminal 3 on **TB1 (TB1-3)**
- 2) Connect the black wire to terminal 1 on **TB1 (TB1-1)**
- 3) Connect the white wire to terminal 2 on **TB1 (TB1-2)**

3. INSTALLATION OF POWER SUPPLY & POWER AMPLIFIER

a. Install/wire new SR-410 Power Supply (1A4) by reversing the procedure used in step 2.b, page 3 of this modification. Affix the "DANGER - HIGH VOLTAGE" warning decal to the front lip of the Interlock shelf.

b. Install the upgraded Power Amplifier SR-410 in the cabinet.
NOTE: The upgraded Power Amplifier will have front panel meter shunts installed for shipping purposes. INTEC will tag the meter shunts on the upgraded units instructing NWS personnel to do the following:

NOTE: THESE SHUNTS MUST BE REMOVED AND SHOULD BE INSTALLED ON THE POWER AMPLIFIER METERS BEING RETURNED TO INTEC FOR FUTURE UPGRADE.

c. The following procedures should be followed prior to placing the system into operation.

- 1) Tune Power Amplifier following Procedure 4.17.3 of the Manual SR-416ST
- 2) Adjust Power Amplifier Directional Coupler following Procedure 4.18.3 of the Manual
- 3) Calibrate the Power Amplifier Power Meter Circuits following Procedure 4.20 of the Manual

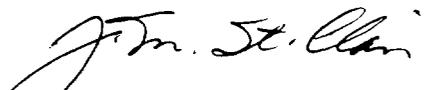
d. A new system nameplate is included in the modification kit. The old nameplate should be removed and the new one installed in its place using the existing hardware.

COMPLETION OF MODIFICATION:

This modification shall be completed within 24 hours of receipt. The Power Supply and Power Amplifier removed from the B220 transmitter should be placed in the same containers the upgrade equipment was received in from INTEC. These containers will be picked up the following morning after delivery for shipment back to INTEC.

REPORTING MODIFICATION:

Target date for reporting this modification is 30 days after receipt of B220 upgrade equipment. Report completed modifications on WS Form H-28, Engineering Progress Report, according to instructions in EHB-4, part 2, using equipment code B222. Report Serial Numbers of the Power Supply and Power Amplifier on the H-28.



**J. Michael St. Clair
Chief, Engineering Division**

Attachments

- A. Figures 1 through 5, B220 Upgraded Transmitter**

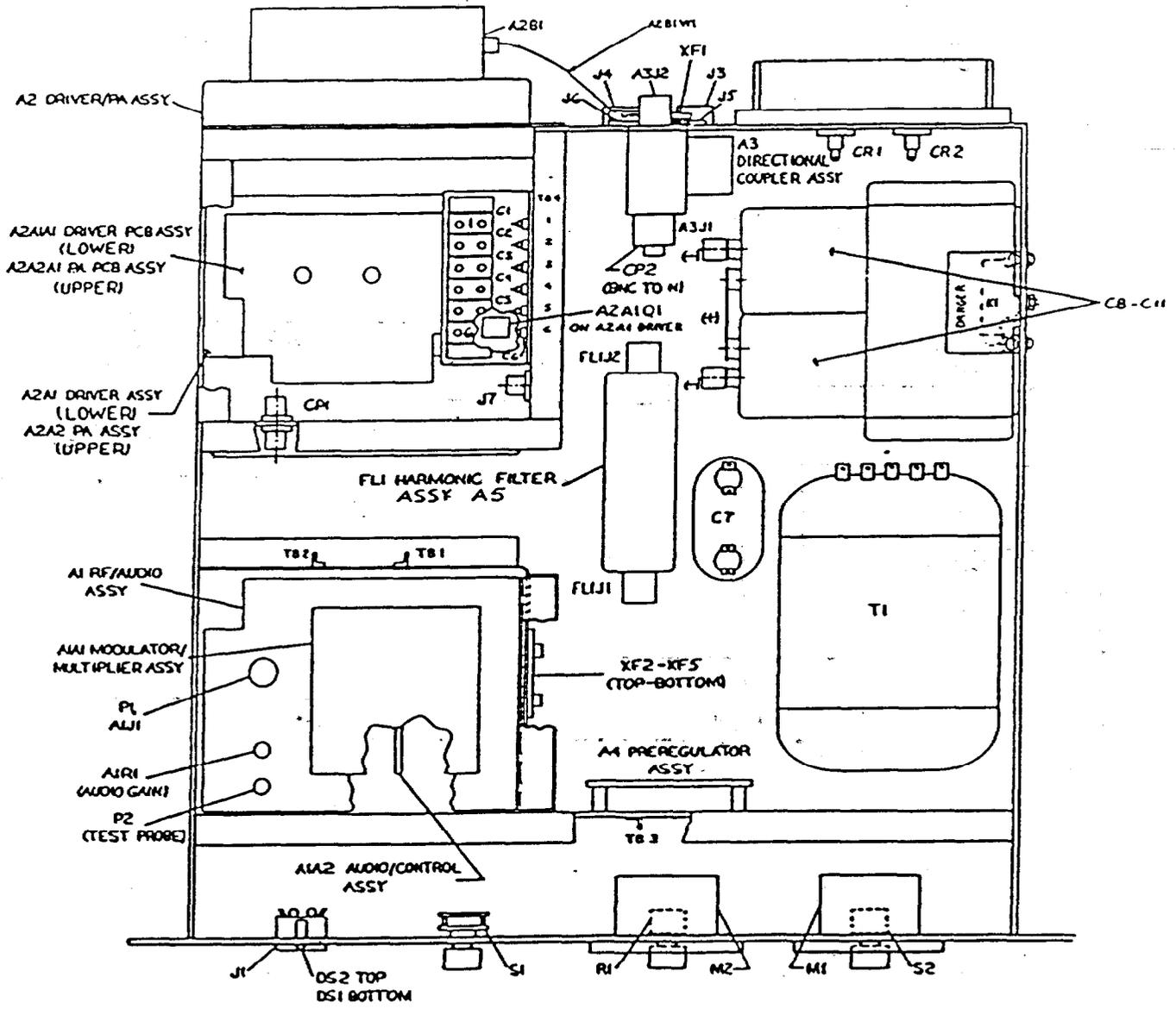


FIGURE 1

EXCITER UNIT CHASSIS, COMPONENT LOCATIONS

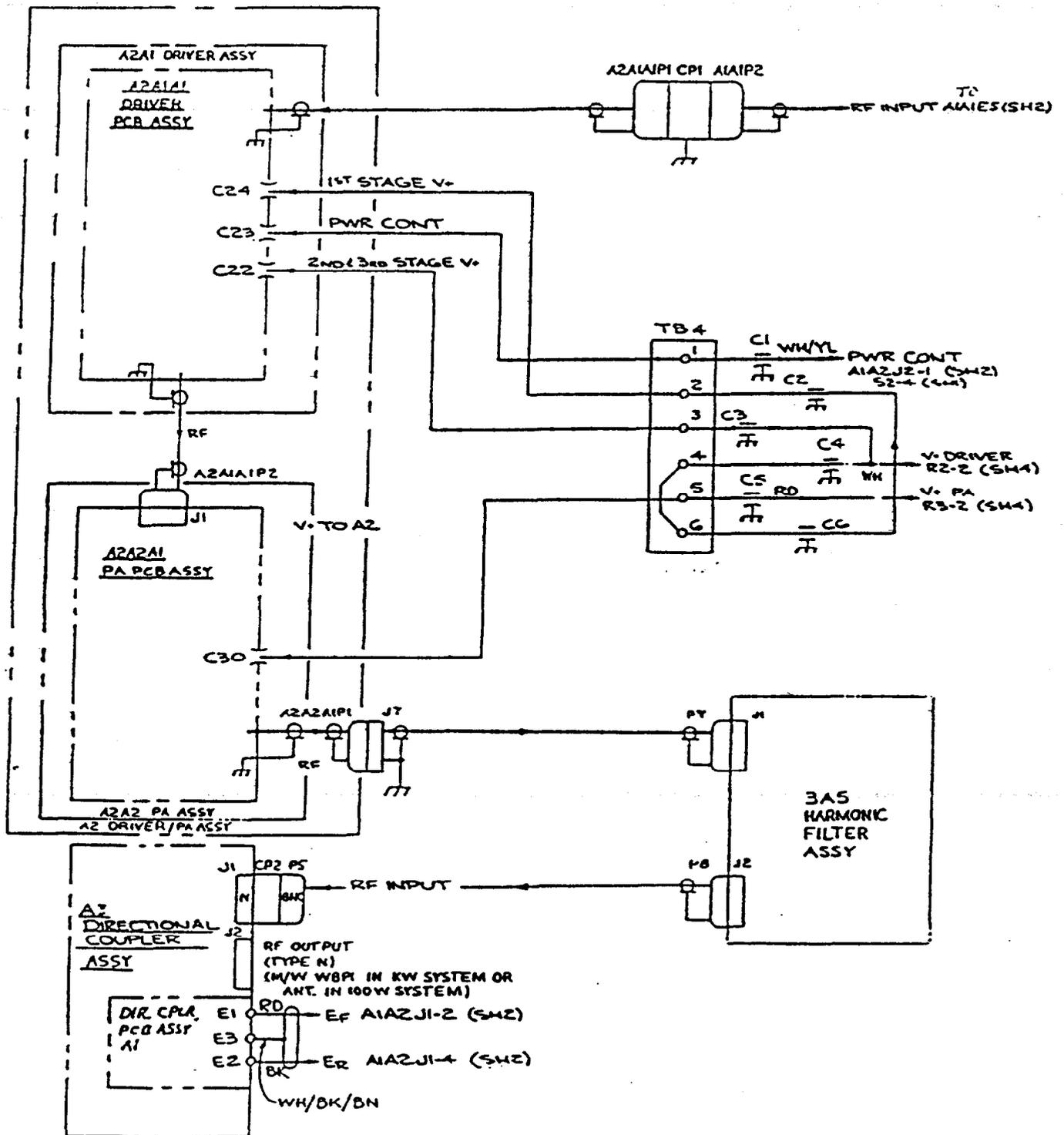


FIGURE 2

EXCITER UNIT, SCHEMATIC DIAGRAM

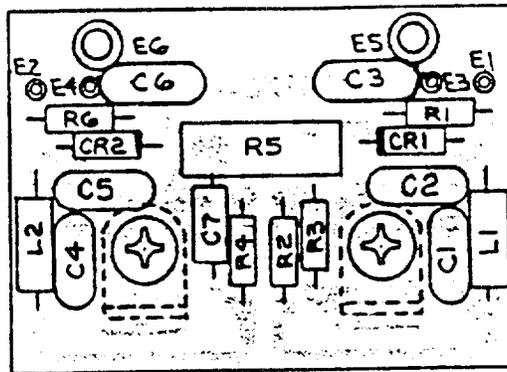


FIGURE 4
Directional Coupler PC Board Assembly A1, Component Location

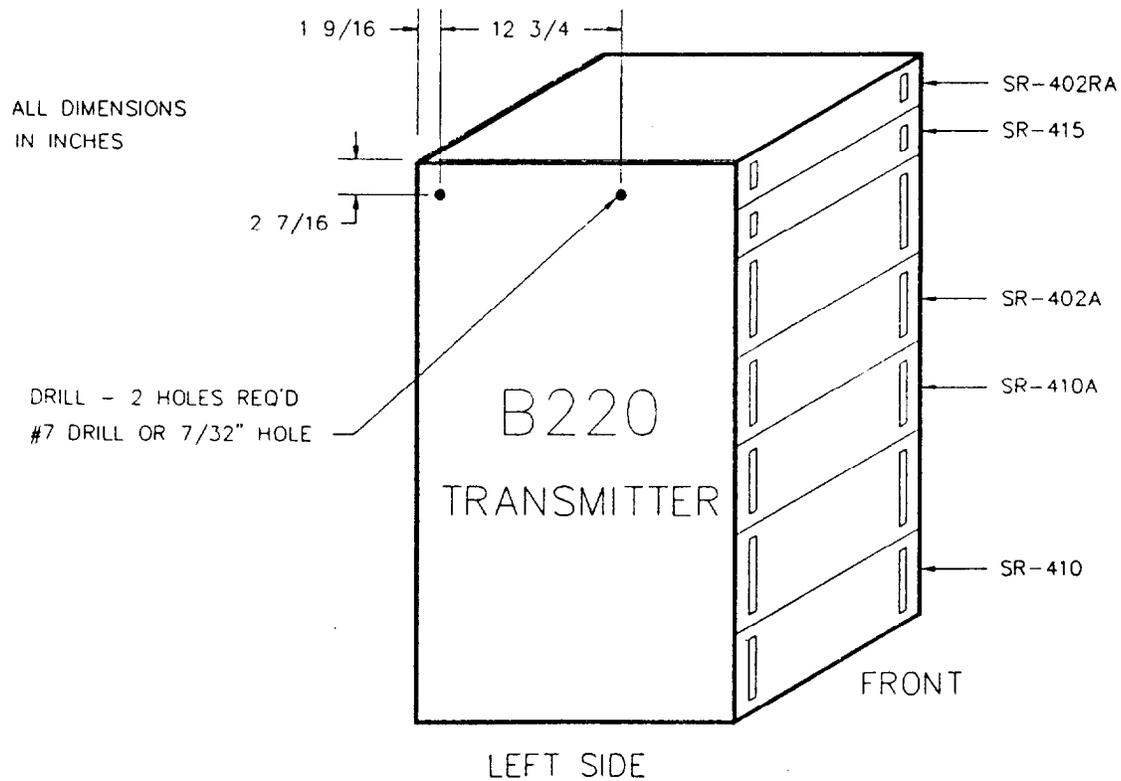


FIGURE 5
B220 Upgraded Transmitter