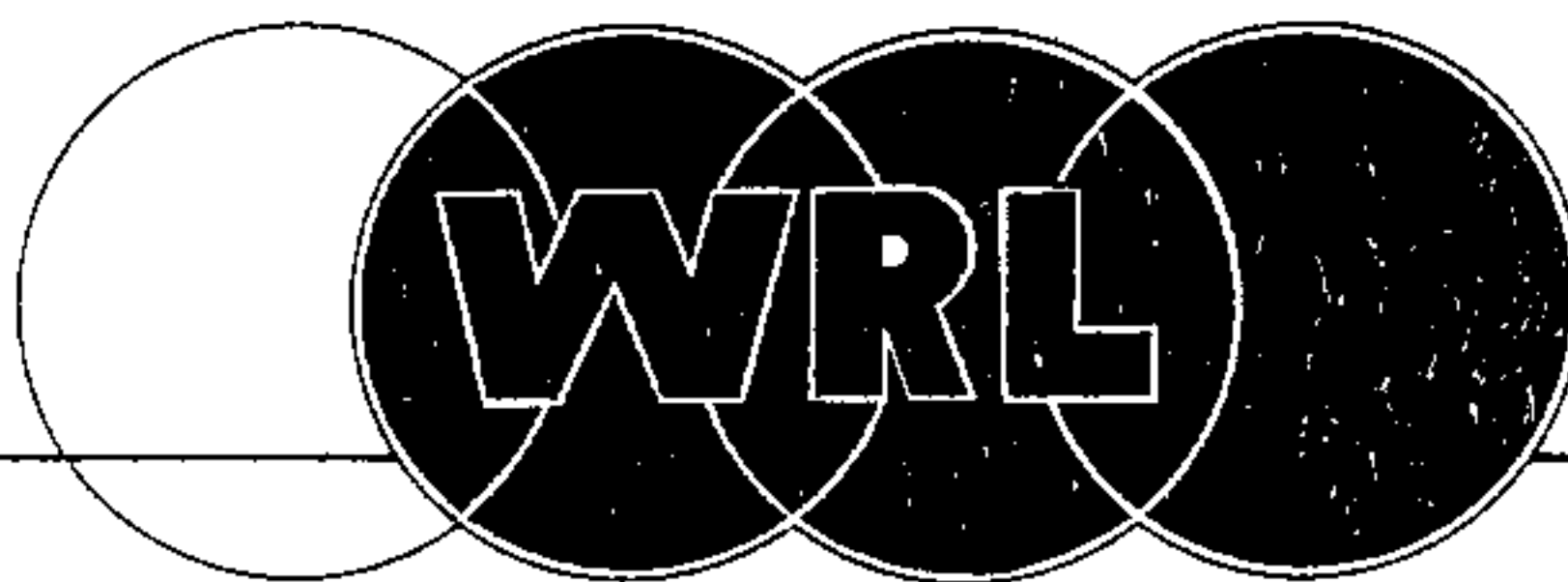


INSTRUCTION

Manual

METEOR SB-175



MANUFACTURED & SOLD EXCLUSIVELY BY

WORLD RADIO LABORATORIES

COUNCIL BLUFFS, IOWA

METEOR SB-175 ADDENDA SHEET

9-10-63

Resistor R6, the 5763 cathode resistor, has been changed to 470 ohm, 1 watt, part number 10-49B, priced at 18¢. This change reduces the input to the 5763 and increases the life of the tube, especially in 10 and 15 meter operation. Please write in these changes in the schematic and parts list.

Changes have been made for decreased TVI which affect the GRID tuning control on the 10 meter band. The "SPECIAL 10 METER NOTE", top paragraph of page 15, should be changed to read:

SPECIAL 10 METER NOTE: In the T(tune) or AM position, the proper point for the GRID tuning knob on 10 meters may fall to the left of the ten meter line, into the "15-20" area. This will be the proper point for ten meter operation, due to coil and lead changes to reduce TVI. The proper point will be the first large grid current rise -- well up into the gray GRID scale on the meter -- when tuning from the top of the 10 meter marking down into the 15-20 meter marking. It will fall near the dividing line between 10 and 15-20. On SB, the proper point will be in the 10 meter marking.

SB-175 METEOR TRANSMITTER

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WRL WARRANTY - BACK COVER

SECTION 1 - GENERAL INFORMATION

1-1 - INTRODUCTION:

The SB-175 "Meteor" Transmitter by World Radio Mfg. Division is designed for amateur radio operation on all bands from eighty through ten meters. It is a compact, solidly constructed unit, suitable for fixed or mobile operation at 175 watts CW input, 140 watts PEP double sideband input and 100 watts AM input. The cabinet is modern and functional, designed for free airflow to keep temperatures within the transmitter as low as possible for a unit of such power in so small a space. The heavy gauge aluminum front panel is gold anodized for best appearance and resistance to scratches, mars and fingerprints. The pi-network RF output circuit is designed for proper operation into a 50 ohm load with up to 2:1 SWR on all bands. The SB-175 frequency can be controlled by a suitable crystal or an external VFO (see Section 5-3 and 5-4). An external power supply is necessary (see Section 3-4 and 3-5).

1-2 - CIRCUIT DESCRIPTION:

(a) The RF stages - A 6CL6 miniature pentode is used as a crystal-oscillator/buffer/multiplier. A VFO-XTAL switch, on the rear panel of the transmitter, changes this tube from an oscillator/multiplier, used with crystal-control, to a buffer/multiplier when used with external VFO control. The second RF stage is a 5763 miniature beam power pentode used as a driver/multiplier. The final RF stage consists of two 6DQ6B beam power pentodes operating in parallel for AM and CW, and operated as a balanced modulator with the grids in push-pull and plates in parallel for double sideband. This stage is inherently self-neutralized in DSB operation. For AM and CW, a neutralizing circuit of the bridge type is switched in.

(b) The audio stages - A 6D10 G. E. compactron tube, a triple-triode, is used as a speech amplifier/driver. The coupling circuits are designed to reduce all frequencies below about 350 cycles at a rapid rate, to give crisper, easier-to-copy sound, especially on DSB. The coupling circuits include roll-off capacitors to reduce all frequencies beyond approximately 3500 cycles to reduce splatter and unnecessary bandwidth. A 6AQ5A beam power pentode is used as a screen modulator with the necessary switching to modulate the 6DQ6B screens in push-pull on DSB and in parallel for AM operation.

SECTION 2 - SPECIFICATIONS

DIMENSIONS, approximate	11-1/2 inches long, 5-1/8 inches high, 8-1/2 inches deep, excluding mounting bracket and feet.
SHIPPING WEIGHT	15 pounds
NET WEIGHT	10 pounds
TYPES OF EMISSION	CW, AM, DSB
POWER INPUT	CW - 175; AM - 100; DSB - 140 PEP watts
POWER SUPPLY REQUIREMENT	Filament, 6.3 volts @ 4.8 amperes or 12 volts @ 2.4 amperes Low B-plus, 300 volts @ 125 milliamperes High B-plus, 600 volts @ 300 milliamperes NOTE: For CW operation, Low B-plus current is reduced to 100 milliamperes. For AM or SB operation, High B-plus current is reduced to 200 milliamperes.
AUDIO INPUT	High impedance crystal, ceramic or dynamic microphone. Mic should have 3-wire, .206 diameter barrel plug, such as Switchcraft S-260, S-280, or 480, or military or surplus PJ-068 or PL-68.
CARRIER SUPPRESSION	In DSB operation, the carrier is suppressed approximately 40 decibels below peak output.
FREQUENCY	Amateur bands 80, 40, 20, 15 and 10 meters, with complete coverage between 3.5 and 9.0 mc. for MARS, CAP or commercial use. Fre- quency controlled by front panel crystal or external VFO.
STATION CONTROL	Rear socket provides 11 pins for connection to: 6 or 12 volt filament supply, 300 volt and 600 volt B-plus, external VFO, push-to-talk circuit and 1 unused pin for any extra use by the individual. The Mic. Gain Control also operates a filament switch.
CW KEYING	Standard 1/4 inch closed circuit phone jack on rear.

TUBES

6 tubes: 6D10 compactron audio, 6AQ5A modulator, 6CL6 oscillator/buffer/multiplier, 5763 multiplier/driver, (2) 6DQ6B final amplifier. (8 tube functions)

RF OUTPUT

Standard UHF series coaxial jack. Circuit will match 50 ohms on all bands. Accepts Amphenol 83-1SP or surplus PL259 connector.

SECTION 3 - INSTALLATION

3-1 - UNPACKING:

Remove packing material carefully. In case of hidden damage, notify carrier and file claim stating the extent of damage. Check all labels and tags for any special instructions. Fill out warranty registration card and mail it.

3-2 - LOCATION, FIXED OPERATION (AC): The SB-175 should be so located that free air circulation through the cabinet is not hindered. That is, do NOT put ANYTHING on top of the cabinet -- books, papers, another piece of equipment. The SB-175 may be placed on top of other equipment if said other equipment does not produce too much heat. Leave at least 2 inches of space on each side of the cabinet. The back of the cabinet may be placed against another object or wall, if necessary. The SB-175 uses larger front feet than rear ones to tilt the panel for easier viewing and operation.

3-3 - LOCATION, MOBILE: The SB-175 has four threaded female mounts (8-32 thread), two in each side of the cabinet. A bracket using either pair of these mounts may be locally fabricated or WRL's 175-MB mobile bracket can be used. The bracket should be such that there is at least 3/8 inch clear space above the top of the cabinet to allow for air circulation. 8-32 wing-screws are supplied with the WRL 175-MB bracket or may be obtained locally.

3-4 - POWER SOURCE, FIXED: A suitable AC power supply should deliver the following voltages:

- (1) Filament, 6.3 volts @ 4.8 amperes or 12.6 volts @ 2.4 amperes AC or DC.
- (2) Low B-plus, 300 volts @ 125 milliamperes.
- (3) High B-plus, 600 volts @ 300 milliamperes.

NOTE: If only CW operation is contemplated, the Low B-plus supply need be only 300 volts @ 100 milliamperes. If only AM, SB or novice-rating CW operation is contemplated, the High B-plus supply need be only 600 volts @ 200 milliamperes.

We recommend the World Radio PSA-63 power supply with PSA-PTT push-to-talk kit added. A matching cable is also available. The PSA-63 is available in wired or kit form.

3-5 - POWER SOURCE, MOBILE: The SB-175 can be used with either 6 or 12 volt automotive electrical systems (see Section 3-6 for connections). A suitable DC supply must deliver 300 volts @ 125 milliamperes and 600 volts @ 200 milliamperes for AM or SB operation. This is suitable for low-power CW

operation also. For full power CW operation, the necessary voltages are 300 volts @ 100 milliamperes and 600 volts @ 300 milliamperes. The coil of the power supply control relay can be wired for push-to-talk operation, as shown in Table 3-6. When so connected, turning off the filaments with the switch on the Mic. control, will remove control voltage from the relay.

3-6- POWER CONNECTIONS: The eleven pin plug, on the rear panel of the SB-175, provides for all power connection, push-to-talk connection and VFO input. Make connections according to the following table. The Mic. control operates a filament ON-OFF switch in the counter-clockwise position, useful for mobile operation or home-brew power supplies.

For 6 volt filament	For 12 volts filament	Low B+	High B+	VFO Input	Push-to-talk control lead
Jumper Pins 3 and 4 Ground Pin 1. Hot lead to Pin 2	Ground Pin 1 Hot lead to Pin 3. No jumpers	Pin 9	Pin 10	Pin 5, hot. Shield to Pin 4	Pin 8 is connected to TIP of mic. jack
Relay control for mobile use: 12 volt; One side of relay coil to Pin 6, other to Pin 8. 6 volt; one side to Pin 7, other to Pin 8.					

When operating in a fixed station with a 115 VAC coax antenna relay, the relay is NOT controlled by the Meteor but by the power supply switching. When using the WRL PSA-63 AC power supply, the terminals from the 115 VAC coil on the relay are simply connected to pins 5 and 7 of the power supply output socket. The relay will be energized when the B-plus switch is "ON". When using the homemade or different commercial supply, it will be necessary to ascertain the proper connections from the circuitry involved.

Pin 11 is not used and may be used by the operator for any external control purposes desired.

3-7 - VFO CONNECTIONS: If the SB-175 is used with an external VFO, a short lead, not over 3 feet, of RG-59/U or similar coaxial cable should connect the VFO to the SB-175. Connect the shield of the coaxial cable to Pin 4 of the 11-pin power plug on the rear of the SB-175. Connect the inner conductor of the coaxial cable to Pin 5 of this plug. Be sure VFO-XTAL switch on rear of SB-175 is in VFO position. VFO output frequency should be on 160 or 80 meters for 80 meter operation; on 80 or 40 meters for 40 meter operation; on 40 meters for 20, 15 or 10 meter operation. For a temporary VFO operation, the VFO may be plugged into the front panel XTAL socket with the grounded lead plugged into the right-hand pin. Be sure to put XTAL-VFO switch in VFO position. The VFO output coils should be peaked to supply maximum drive to the transmitter for either permanent or temporary use. Remove any crystal from XTAL socket when using VFO, or two frequencies may be transmitted. See Sections 5-3 and 5-4.

3-8 - PUSH - TO - TALK CONNECTIONS: Pin 8 of the 11-pin power plug is connected to the tip of the mic. jack. The microphone should be wired so that its push-to-talk switch is connected to the tip of the mic. plug. See Section 3-10 for suitable microphone plugs. When the push-to-talk switch on the microphone is closed, Pin 8 of the power plug is grounded. Pin 8 of the power plug should be connected to the coil of a DC-operated relay which will turn on the power supply. We recommend the PSA-PTT kit which consists of a 6 volt DC relay, a semi-conductor diode and a 250 mfd filter condenser to provide DC to operate the DC relay from a 6.3 volt AC filament source. Use of AC in the relay circuit is likely to induce hum in the audio, although, due to the rapid drop in audio frequency response below 350 cycles, such operation may be possible in an emergency. See Section 3-5 and 3-6 for mobile connections.

3-9 - KEY JACK: The key jack is a standard 2-wire closed circuit 1/4 inch jack. Any standard straight or semi-automatic mechanically operated key may be used. If electronic keying is used, the keyer must be able to pass full cathode current of the final amplifier plus cathode current of the oscillator, approximately 300 milliamperes. Voltage across the key is limited to approximately 55 volts.

3-10 - MIC. JACK: The microphone circuit is suitable for any hi-impedance crystal, ceramic or dynamic mic. The jack will accept a 3-circuit plug with .206 inch barrel and tip diameter, such as Switchcraft S-260, S-290, or #480, or military/surplus plugs PJ-068 or PL-68. The microphone cable should be wired with the push-to-talk lead to the tip, the "hot" audio lead to the ring, and the shield to the sleeve (chassis ground).

3-11 - R.F. OUTPUT AND RECOMMENDED ANTENNAE: The RF output jack will accept the standard UHF series coaxial connector, such as Amphenol 831SP or surplus PL259. The pi-network circuit is designed to load properly into a 50 or 75 ohm antenna on all bands. An antenna with standing wave ratio of over 1.5 or 2.0 may be difficult to load. If it is impossible to alter the antenna for a better match, the length of the coaxial cable feeding the antenna may be lengthened or shortened until a satisfactory loading condition is obtained. IF IT IS NECESSARY TO LENGTHEN OR SHORTEN THE FEEDLINE TO LOAD PROPERLY, IT IS POSITIVE PROOF THAT THE ANTENNA IS MISMATCHED, HAS STANDING WAVES, and IS NOT OPERATING AT MAXIMUM EFFICIENCY. With an SWR of 2.0 to 1, about 10% of the transmitter power is reflected back from the antenna. With an SWR of 6.0 to 1, 50% of the transmitter power is reflected back from the antenna! It is strongly recommended that a properly matched antenna be used, both for maximum efficiency and strongest signal and to prevent possible damage to the final tank circuit and tubes due to reflected power. Most commercially made beams, trap antennae and mobile antennae will be satisfactory but, if there is any difficulty in getting proper loading, buy, beg or borrow a standing wave meter and measure the SWR --- and then do something about it! A good antenna tuner is a satisfactory solution when nothing can be done to the antenna itself to improve the match.

3-12 - INSTALLATION or REMOVAL OF THE TRANSMITTER IN THE CABINET:

- (1) Removal - Remove the sheet metal screws securing the rear panel and the vertical chassis to the cabinet. Slide the transmitter out of the rear of the cabinet.
- (2) Installation - Slide the transmitter into the cabinet from the rear until the front panel is all the way forward. Install the sheet metal screws holding the vertical chassis and the rear panel to the cabinet.

3-13 - CRYSTAL CONTROL OPERATION FOR DSB or AM: When operating the SB-175 on DSB or AM, a set of external relay contacts must be used to key the oscillator. The reason for this is the oscillator does not stop oscillating instantly when going from transmit to receive. This will cause the receiver to be blocked for a short time.

To key the oscillator, put a plug in the key jack on the SB-175. Connect the normally closed contacts on transmit to the key jack. These relay contacts may be available on the antenna relay. If there are no contacts available on the antenna change relay, an external relay should be wired in parallel with the antenna change relay and its contacts to be used to key the oscillator.

SECTION 4 - FUNCTION OF OPERATING CONTROLS

4-1 - XTAL-VFO SWITCH: Changes 6CL6 tube from oscillator/multiplier when in XTAL position to buffer/multiplier when in VFO position. Also, connects Pin 5 of power socket (VFO input pin) to the control grid of the 6CL6 in the VFO position.

4-2 - MIC.: Gain control to adjust for full modulation with various voices and microphones. Also operates filament OFF-ON switch in counter-clockwise position.

4-3 - FUNCTION: Switch to select various functions. In CW, connects all circuits for CW operation. In T, connects circuits for tune-up. In AM, connects circuits for AM voice operation. In SB, connects circuits for double sideband suppressed carrier voice operation.

4-4 - BAND: Switch to select frequency band - 80, 40, 20, 15 or 10 meters.

4-5 - METER SWITCH: Switches meter circuits so that meter indicates final amplifier grid current in "G" position of switch and final amplifier cathode current in "P" position of switch.

4-6 - GRID: Dual-section tuning condenser tunes the grid coils of the final amplifier to the desired operating frequency. * (See "special note" below.)

4-7 - LOAD: Triple-section variable condenser, output section of the final amplifier pi-network tank circuit. Controls coupling ("loading") to the antenna.

4-8 - TUNE: Dual-section condenser with extra-wide plate spacing. Input condenser of the final amplifier pi-network tank circuit. Controls tuning ("resonance") of the final amplifier.

4-9 - METER: Indicates grid current of the final amplifier when meter switch is in "G" position. Satisfactory operation indicated when the meter pointer, when tuned for maximum, is anywhere in the shaded area of the GRID scale. Meter indicates cathode current of the final amplifier when the meter switch is in the "P" position. Satisfactory operation indicated on CW when the reading, after resonating the TUNE control, is in the CW shaded area; for AM when in the AM shaded area; for SB when peak swing on speech modulation is in the SB shaded area. See Sections 5-6, 5-7, 5-8 and 5-9.

*** SPECIAL NOTE. IMPORTANT.** When operating crystal controlled in the 80 and 40 meter bands, in any mode (CW, AM or SB), the GRID control must be adjusted slightly clockwise (higher frequency) than the point of maximum grid current on the meter for reliable crystal starting. This applies only to 80 and 40 meters and only when using crystal control, not VFO.

SECTION 5 - OPERATION

5-1 - PREPARATORY: (a) Connect proper power supply as detailed in Sections 3-4, 3-5, 3-6 and 3-8.

(b) If already neutralized, proceed with the following steps. As received from the factory, the transmitter is neutralized. If the 6DQ6B tubes have been replaced or, if the neutralization capacitor setting has been changed, neutralize as described in Section 5-2.

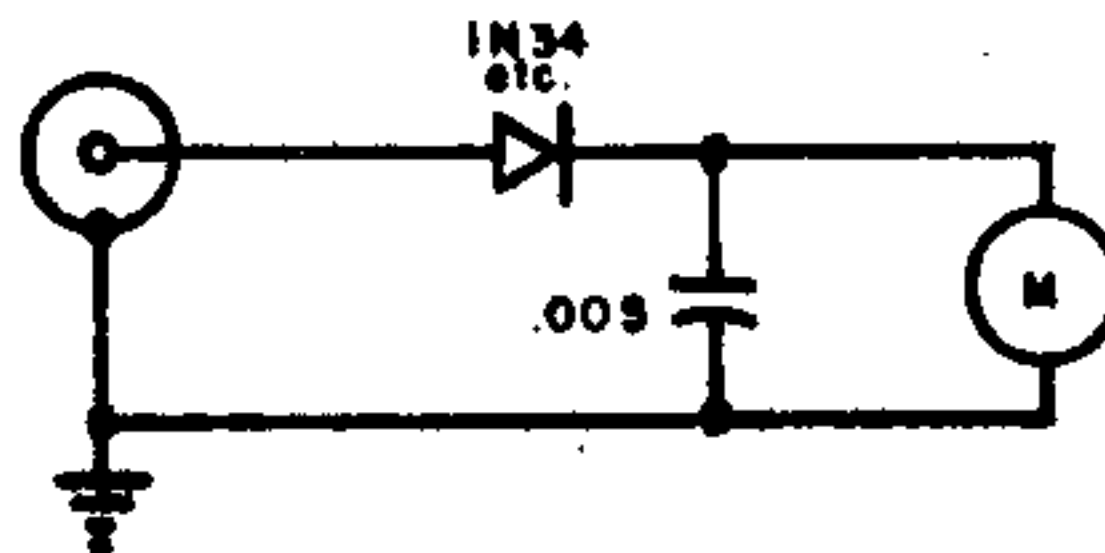
(c) With transmitter neutralized, connect suitable antenna (see 3-11) to RF output jack. We recommend RG-58/U, RG-8/U or RG-14/U coaxial cable. RG-58/U is the least expensive, RG-14/U has the least losses and RG-8/U is the most commonly accepted for ham useage.

(d) For AM or SB operation, connect a suitable microphone to the mic. jack. That is the smaller-diameter jack on the rear panel. (See 3-11)

(e) For CW operation, plug a suitable key (see 3-9) into the key jack, the larger-diameter of the two jacks on the rear panel.

(f) Turn on filament switch by rotating Mic. control clockwise until it clicks. The "OFF" position is all the way counter-clockwise.

5-2 - NEUTRALIZING: Under normal conditions, neutralizing the transmitter should be necessary only when replacing the 6DQ6B tubes or if the setting of the neutralizing condenser has been changed from the factory setting. Necessary equipment consists of a sensitive RF indicator, such as a grid dip meter or an RF voltmeter. A simple rectifier crystal diode can be used with any standard VOM or VTVM, as sketched below.



The steps involved in neutralizing, after removing transmitter from cabinet, are as follows:

(a) With power OFF, unsolder the jumper from terminal strip 1, lug 1 to terminal strip 1, lug 2. This is the terminal strip closest to the power socket.

Lug 2 has a lead to Pin 10 of the power plug. The jumpered lugs are directly to the rear of the large coil. It is only necessary to unsolder one end of the jumper and bend it away from the lug. This will remove plate voltage from the final amplifier.

(b) Couple a grid dip meter to the final tank coil 10/15 meter section with grid dip meter tuned to 21 megacycles and only filament voltage applied to the grid dip meter, OR connect RF voltmeter to SB-175 coaxial output jack.

(c) Apply filament voltage only to SB-175.

(d) Plug in crystal near 7.000 megacycles or set VFO near 21.000 megacycles.

(e) Set SB-175 bandswitch to 15 meters.

(f) Set SB-175 Function switch to T (tune).

(g) Set SB-175 meter switch to G.

(h) Apply B-plus voltage to SB-175.

(i) Tune GRID for maximum indication on SB-175 meter. If offscale, detune GRID slightly until meter is not pinned.

(j) Tune both TUNE and LOAD controls for maximum reading on the Grid dip meter or RF voltmeter, whichever is being used. Settings of both TUNE and LOAD will be somewhere between 4 and 7 on their respective dials.

(k) Adjust the neutralizing capacitor for minimum reading on the grid dip or RF voltmeter. The neutralizing condenser is the mica compression trimmer adjacent to the GRID tuning condenser on the top of the chassis. Tuning of the neutralizing condenser will affect tuning of the GRID tuning condenser. Repeak the GRID for maximum on the SB-175 as necessary. Start with the neutralizing condenser screwed down as tight as it will go without forcing. The proper adjustment will be backed off about 1/3 to 3/4 turn from this point.

(l) After neutralizing, remove all power from the SB-175.

(m) Resolder the jumper opened up in Step a.

(n) Reinstall SB-175 in cabinet.

5-3 - CHOICE OF BANDS: The SB-175 may be operated on any amateur band from 80 through 10 meters by proper choice of crystal or VFO frequencies and use of a suitable antenna.

(a) Antenna: The antenna should present a 50 ohm load with a standing

wave ratio (SWR) of not over 2.0 to 1 at the band in use. Trap dipoles using one set of traps will usually be satisfactory for 80 and 40, sometimes also for 15. The "Hy-Gain Hy-Tower" is suitable for all bands. Several manufacturers make three-band beams suitable for 20, 15 and 10 meters. The point is that the antenna, be it a simple dipole or vertical or complicated beam, should closely match a 50 ohm coaxial cable on the band in use.

- (b) Crystal or VFO frequency: See table below for crystal frequencies for the various bands. The VFO output frequencies should be the same as the marked crystal frequencies; such is the case with virtually all manufactured commercial VFO's now in production.

BAND	80 (3.5-4.0)	40 (7.0-7.3)	20 (14.00-14.35)	15 (21.00-21.45)	10 (28.00-29.7)
XTAL or VFO Freq. (Mc.)	3.5 to 4.0 or *1.75 to 2.0	7.0 to 7.3 or *3.5 to 3.65	7.0 to 7.175	7.0 to 7.15	7.0 to 7.425**
* Possibility of tuning to wrong harmonic exists with these frequencies. Be absolutely sure GRID tuning knob is in the 80-40 range when tuning for maximum grid current. ** see Page 15					

- 5-4 - CRYSTAL or VFO: (a) Crystal: Any crystal of the proper frequency (see 5-3) and proper pin spacing and size (FT-243 type holder, 1/2 inch pin spacing, .093 diameter pins) can be plugged into the front panel XTAL socket. Be sure the XTAL-VFO switch on the rear panel is in the XTAL or uppermost position. Follow tuning instructions in the remainder of this section.
- (b) VFO: Any STABLE VFO with output on the proper frequencies (see table in 5.3) and sufficient output to drive the grid of a 6CL6 can be used in place of a crystal to control the frequency of the SB-175. The VFO should be of the high-impedance output type, that is, the output should be taken from the plate of the last stage of the VFO through a small coupling condenser to the output jack. It should not be a link-coupled output, as this may

not develop enough voltage to drive the 6CL6. The VFO output coils will probably need to be peaked for maximum drive when first connected to the SB-175. Length of cable between the VFO and the SB-175 will affect the tuning of the output coils of the VFO. See Section 3-7 for cable and connections. Be SURE to put XTAL-VFO switch in VFO (lower) position and no crystal is plugged into the XTAL socket.

5-5 - GRID TUNING: After making the connections described above (power supply, neutralizing if necessary, antenna, VFO or XTAL, microphone or key) proceed with tune up as follows:

- (a) Place FUNCTION switch in "T" position.
- (b) Place bandswitch in position for desired band.
- (c) Plug in crystal of suitable frequency or set VFO to suitable frequency.
- (d) Place METER switch in "G" position.
- (e) Turn on AC switch of PSA-63 power supply if used, or apply filament voltage only from other power supply. Let warm up two minutes.
- (f) Turn on B+ switch of PSA-63 power supply if used or apply 300 and 600 volts DC from other power supply.
- (g) Tune GRID control for maximum indication on the meter, making sure that the pointer of the GRID control is in the marking corresponding with the desired band. On some bands it is possible to get a substantial meter reading at an undesired frequency. For instance, when operating 15 meters, tripling from the 7 mc. crystal or VFO, a meter reading will be found with the GRID tuning in the 10 meter section, quadrupling from 7 mc. It is possible to "pin" the meter on some bands with some crystals, however this is not excess drive enough to cause any damage and will drop to the proper level when the FUNCTION switch is in the other positions. As long as meter pointer is in the shaded GRID area when tuned for maximum, drive is satisfactory.

SPECIAL NOTE. Important. When operating 80 or 40 meters using crystal control, tune the GRID control slightly clockwise (higher frequency) than the point that gives maximum grid current. This will give better keying and assure that the crystal will oscillate. **SPECIAL 10 METER NOTE:** In T (tune) or AM position, the proper point for GRID tuning will be just about on the line between the 10 and 15-20 portions of the grid scale. Do not tune up on the small peak in the center of the 10 meter scale, as this is 35 mc. On SB, the proper peak will fall near the center of the 10 meter scale.

- 5-6 - AM TUNE and OPERATE:
- (a) After completing the steps in 5-5, switch the METER switch to "P".
 - (b) If operating 80 or 40 meters, set the LOAD control to 2 and the TUNE control to 1. If operating 20, 15 or 10 meters, set the LOAD control to 4 and the TUNE control to 7.
 - (c) Switch the function switch to AM.
 - (d) Adjust TUNE control to MINIMUM reading of the meter.
 - (e) Switch function switch to CW. If the meter (in "P" position of meter switch) then reads above or below the red CW square, re-adjust the TUNE and LOAD controls slightly, always adjusting the TUNE control for MINIMUM meter reading as a final step until meter reading is in the center of the red CW square.
 - (f) Switch the function switch back to AM position. The meter should fall to somewhere in the AM and SB squares.
 - (g) Next set the MIC. control about half-way (straight-up or "12 o'clock") and speak into the microphone. There should be a slight movement of the meter. If there is no movement of the meter, advance the MIC. control until some meter movement shows when speaking. If there is more than a slight flicker, decrease the gain control setting.

- 5-7 - SB TUNE and OPERATE:
- (a) After completing the AM setup described in 5-6, set the METER switch to "G".
 - (b) Set the FUNCTION switch to SB.
 - (c) Re-adjust the GRID control for maximum meter reading. The correct setting will be slightly clockwise of the setting arrived at in the preceding steps.
 - (d) Then switch the METER switch to "P". The meter should read near the low end of the scale. Speak into the microphone and adjust the MIC. control setting until the meter kicks up into the red SB square at the loudest speech sounds. Advancing the MIC. control beyond this point will increase distortion without increasing effective talk power. Do NOT change setting of the TUNE and LOAD controls arrived at in Section 5-6.
- 5-8 CW TUNE and OPERATE
- (a) Follow steps A through E in Section 5-6.
 - (b) Plug a suitable hand or mechanical semi automatic key into the keyjack. A fully automatic key can be used if its circuitry can withstand the approximately 55 volts across the contacts when open and the approximately 300 milliamperes flowing through the contacts when closed.
- 5-9 - NOVICE OPERATION:
- (a) Set transmitter for AM operation as in 5-6.
 - (b) Turn MIC. control counter-clockwise until resistance is felt. Turning further will turn off the filament switch attached to this control. Do not turn off the filaments.

- (c) Re-adjust TUNE and LOAD controls until the meter reads at the lower edge of the red SB square, always adjusting the TUNE control for MINIMUM meter reading as the last step.
- (d) Plug key into keyjack on the rear. Let FUNCTION switch remain in the AM position -- this reduces the screen voltage to the final amplifier and permits operation at reduced Novice power, 75 watts.

5-10 - CAP, MARS, and OTHER OUT-OF-HAM-BAND OPERATION: The SB-175 will provide complete frequency coverage between 3.500 and 10.000 megacycles. Between 5.300 and 6.500 mc., a minor change in the pi-network may be needed, or an external antenna tuner may be used, as described below. The following table gives approximate dial settings for various frequencies in the 3.5 to 10 megacycle range, when the antenna SWR is 1.0 to 1 fed with 50 or 52 ohm coaxial cable.

FREQUENCY	BANDSWITCH	GRID	TUNE	LOAD
3.5 Mc.	80	low end 80	2.1	1.9
3.9 "	80	center 80-40	3.0	2.9
4.3 "	80	40	3.5	3.5
5.3 "	80	20	5.0	5.5
5.3 "	*	20	2.7	1.2
5.75 "	*	on 20-15 dash	3.1	2.1
6.0 "	*	15	3.2	2.8
6.5 "	*	15	4.0	3.2
6.5 "	40	low end 80	4.0	3.2
6.8 "	40	80	4.2	3.5
7.0 "	40	center 80-40	4.3	3.5
8.0 "	40	40	5.1	4.5
9.0 "	40	20	5.5	5.5

*In the frequency range between approximately 5.300 and 6.500 megacycles, the grid tuning should be operated in the 80 meter position and the output pi-network should be in the 40 meter position. This may be accomplished in either of two ways,

- (a) The 80 meter portion of the pi-network coil may be jumpered out at the plate bandswitch by connecting terminals 1 and 2 together either with a temporary clip, or, if no operation

below 5.3 megacycles is expected, by a soldered wire. This is the portion of the largest coil between the chassis and the first tap.

- (b) The strap between the wheel on the grid band switch and the wheel on the plate bandswitch may be disconnected and the plate bandswitch may be manually rotated to the 40 meter position.
- (c) If either of these alternatives is unattractive in your particular operation, an external antenna tuner may be improvised to transform the load to one which the pi-network can match in the 80 meter position. This may not be possible in all cases, however.

We recommend method (a), especially where there is to be no operation between 3.5 and 5.3, as this method leaves the other bands -- completely unchanged. Where there is no danger of inexperienced hands getting behind and inside of the transmitter when it is in operation, the back can be removed and left off for easy access to the plate coil and the jumper can be an ordinary alligator clip which will fit directly across the switch pins with no solder needed, for most rapid installation or removal. A small ceramic insulated knife-switch or relay could be adapted to make this operation even simpler, where frequent change between the 3.5 to 5.3 mc. region and the 5.3 to 6.5 mc. region is expected.

As the SB-175 is primarily a "ham" transmitter, WRL has not included a sixth switch position which would cover this range, but as a service to those commercial, CAP, MARS, and other interests who operate in the 5.3 to 6.5 mc. range, the above information has been compiled to enable easy operation on these frequencies.

6-2 - SB-175 VOLTAGE CHART

Taken with 20,000 ohm per volt meter. Line voltage 117 volts. Power supply WRL PSA-63.

Pin #	1	2	3	4	5	6	7	8	9	10	11	12
<u>6D10</u> CW T AM SB	Fil. See note 1	75 95 83 90	1.7 1.7 1.6 1.7	1.7 1.5 1.7 1.7	65 80 70 70	1.4 1.6 1.4 1.5	0 0 0 0	0 0 0 0	0 0 0 0	65 85 75 75	0 0 0 0	Fil. 6.3 1-12
<u>6AQ5A</u> CW T AM SB	0.5 0.5 0 0	0 0 22 22	Fil. 3 & 4 6.3V Note 1	Fil. 3&4 6.3V Note 1	0 0 300 310	0 0 300 310	0.5 0.5 0 0	-- -- -- --	-- -- -- --	-- -- -- --	-- -- -- --	-- -- -- --
<u>6CL6</u> CW T AM SB	** 0.4 0.45 0.4 0.4	* * * *	145 170 150 155	Fil. see Note 1 "	Fil. 4&5 6.3V Note 1	** 320 400 340 360	0 0 0 0	145 170 150 155	* * * *	-- -- -- --	-- -- -- --	-- -- -- --
<u>5763</u> CW T AM SB	** 320 400 340 360	320 400 340 360	0 0 0 0	Fil. See Note 1	Fil. See Note 1	180 220 180 200	4.3 5.8 4.8 5.0	* * * *	* * * *	-- -- -- --	-- -- -- --	-- -- -- --
<u>6DQ6B</u> front CW T AM SB	* * * *	Fil. See Note 1	187 0 155 0	187 0 155 0	** -30 -55 -35 -55 (See#2)	* * * *	Fil. See Note 1	3.6 0.25 2.2 0.5	-- -- -- --	-- -- -- --	-- -- -- --	-- -- -- --
<u>6DQ6B</u> rear CW T AM SB	* * * *	Fil. See Note 1	187 0 155 0	187 0 155 0	-30 -55 -35 -55 (See#2)	* * * *	Fil. See Note 1	3.6 0.25 2.2 0.5	-- -- -- --	-- -- -- --	-- -- -- --	-- -- -- --

See next page for footnotes.

* Do Not Measure

** Use RF choke in series with ungrounded meter lead

Note 1: Measure filament voltage between filament pins of each tube, not between pin and ground.

Note 2: Will vary between wide limits, depending on the amount of grid drive. Must be at least - 25 volts.

6-3 - SB-175 RESISTANCE CHART

Unit UNPLUGGED from power supply

Bandswitch on 80 meters

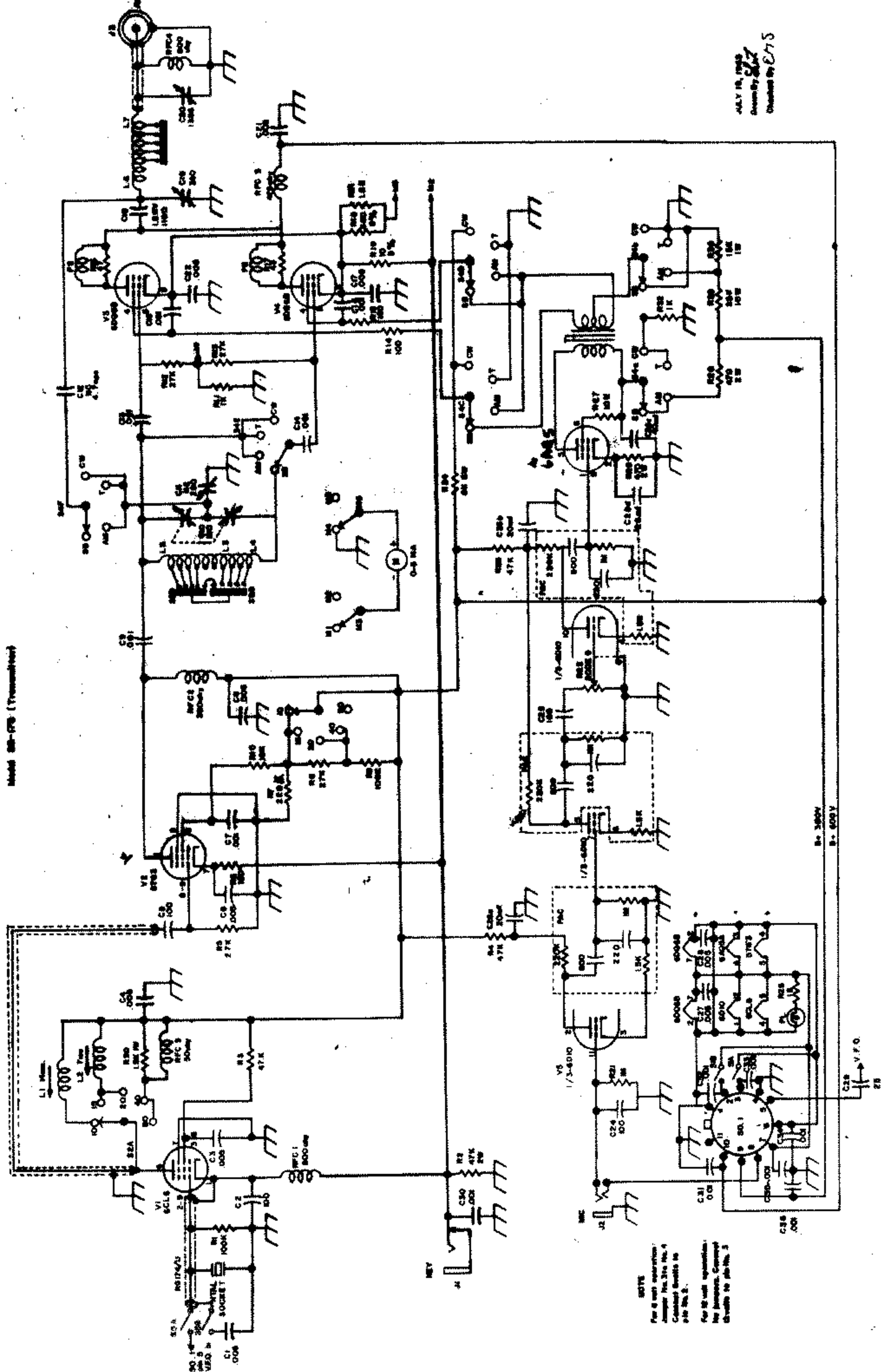
Pin #	1	2	3	4	5	6	7	8	9	10	11	12
<u>6D10</u>		*			*							
CW	0	250K	1.5K	1.5K	250K	1.5K	1.0meg.	0	0 to	250K	1meg.	0.3
T	0	250K	1.5K	1.5K	250K	1.5K	1.0meg.	0	1/2meg	250K	1meg.	0.3
AM	0	250K	1.5K	1.5K	250K	1.5K	1.0meg.	0	note 1	250K	1meg.	0.3
SB	0	250K	1.5K	1.5K	250K	1.5K	1.0meg.	0		250K	1meg.	0.3
<u>6AQ5A</u>												
CW	1meg.	470	1.0	0.3	400	10K	1meg.	--	--	--	--	--
T	1meg.	470	1.0	0.3	400	10K	1meg.	--	--	--	--	--
AM	1meg.	470	1.0	0.3	40K*	50K*	1meg.	--	--	--	--	--
SB	1meg.	470	1.0	0.3	40K*	50K*	1meg.	--	--	--	--	--
<u>6CL6</u>			*									
CW	15	100K	80K	0	0.3	40K*	0	80K*100K	--	--	--	--
T	15	100K	80K	0	0.3	40K*	0	80K*100K	--	--	--	--
AM	15	100K	80K	0	0.3	40K*	0	80K*100K	--	--	--	--
SB	15	100K	80K	0	0.3	40K*	0	80K*100K	--	--	--	--
<u>5763</u>	*	*										
CW	40K	40K	0	1.0	0.3	100K	150	27K	27K	--	--	--
T	40K	40K	0	1.0	0.3	Note	150	27K	27K	--	--	--
AM	40K	40K	0	1.0	0.3	2	150	27K	27K	--	--	--
SB	40K	40K	0	1.0	0.3		150	27K	27K	--	--	--
<u>6DQ6B</u> front												
CW	NC	1.0	50K*	50K*	28K	open	0.3	10	--	--	--	--
T	NC	1.0	0	100	28K	cir-	0.3	10	--	--	--	--
AM	NC	1.0	50K*	50K*	28K	cuit	0.3	10	--	--	--	--
SB	NC	1.0	1.05K	1.15K	28K	"	0.3	10	--	--	--	--
<u>6DQ6B</u> rear												
CW	NC	0	50K*	50K*	28K	open	0.3	10	--	--	--	--
T	NC	0	0	100	28K	cir-	0.3	10	--	--	--	--
AM	NC	0	50K*	50K*	28K	cuit	0.3	10	--	--	--	--
SB	NC	0	1.25K	1.35K	28K	"	0.3	10	--	--	--	--

* Electrolytic condenser in this circuit. Reading may vary $\pm 30\%$.

Note 1: Depends on volume control setting.

Note 2: Varies with bandswitch setting. 100K on 80, 60K on 40 and 20, 50K on 15 and 10.

Model 22-770 (Transmitter)



JULY 10, 1949
 Drawn by *[Signature]*
 Checked by *[Signature]*

NOTES
 For 4 volt operation:
 jumper No. 3 to No. 4
 Connect No. 5 to
 No. 2.
 For 10 volt operation:
 No jumper. Connect
 No. 5 to No. 2.

SECTION 7 - PARTS and ORDERING INFORMATION

7-1 - HOW TO ORDER REPLACEMENT PARTS:

- (a) If part is judged defective in manufacture within warranty period of one (1) year from time of purchase. See warranty on back page.

Write to: World Radio Laboratories, Inc.
3415 West Broadway
Council Bluffs, Iowa
ATTN: Warranty Dept.

describing the trouble and the parts believed defective. Give part number and description shown in Parts List (7-2). The Warranty Department will issue instructions to you.

DO NOT RETURN PARTS WITHOUT WRITTEN AUTHORIZATION FROM WORLD RADIO.

If a part is defective, it will be replaced by World Radio.

- (b) Replacement of parts after warranty period.

Write to: World Radio, Attn: Replacement Parts.

Describe the part as shown in the Parts List (7-2), giving both the number and the description. Also include the serial number of your transmitter which is located between the power socket and the VFO-XTAL switch on the rear of the chassis. We will ship at the current price if you have an open account with us or, if you so request, we will inform you of price and availability before shipping.

Prices shown in Parts List (7-2) subject to change without notice.

7-2 - PARTS LIST - SB-175 Meteor Transmitter

WRL Stk. No.	Schematic Diagram Designation	Description	Price
<u>Resistors</u>			
10-4	R7	220K, 1/2 watt	\$.12
10-7	R14, R15	100 ohm, 1/2 watt	.12
10-10	R21, R1	1 meg., 1/2 watt	.12
10-13	R3, R4, R23	47K, 1/2 watt	.12
10-14	R8, R12, R13	27K, 1/2 watt	.12
10-17	R31	1800 ohm, 1/2 watt	.12
10-19A	R10, R27	10K, 1 watt	.18
10-20A	R30	15K, 1 watt	.18
10-21A	R20	1.5K, 1 watt	.18
10-32	R9	100K, 1/2 watt	.12
10-42	R11, R32	1K, 1/2 watt	.12
10-43	R6	150 ohm, 1/2 watt	.12
10-44A	R19	10 ohm, 1 watt 5%	.30
10-45A	R18	680 ohm, 1 watt 5%	.30
10-47B	R26, R28	470 ohm, 2 watt	.24
10-48C	R24	6K, 5 watt	.48
10-49A	R5	27K, 1 watt	.18
10-50D	R29	25K, 10 watt	.72
10-51	R25	18 ohm, 1/2 watt	.12
10-52B	R2	47K, 2 watt	.24
13-3	R22, S1A, S1B	1/2 meg. potentiometer with DPST sw.	1.62
18-1	PAC	Erie PAC	.70
<u>Capacitors</u>			
20-8	C29	25 mmf ceramic disc	.10
20-9	C1, 3, 4, 6, 8, 17, 21, 22, 27, 28	.005 mf ceramic disc	.15
20-23	C2, 5, 24, 37	100 mmf ceramic disc	.15
20-24	C7, 9, 13, 14, 15, 16, 30, 31, 32, 33, 34, 35, 36	.001 mf ceramic disc	.15
20-25	C12	4.7 mmf, 1000 volt type DTZ disc	.30
20-26	C25	180 mmf ceramic disc	.15
22-6	C18	1100 mmf, 1000 volt DCW mica	.49
24-13	C26A, B, C, D	40-20-20 mf @ 350 VDC & 25 mf @ 25 VDC electrolytic can	1.90

7-2 - PARTS LIST - SB-175 Meteor Transmitter

WRL Stk. No.	Schematic Diagram Designation	Description	Price
<u>Capacitors, Cont'd.</u>			
25-8	C10	180 mmf/sec., two sec. variable grid-tuning	\$ 2.40
25-9	C19	180 mmf/sec., two sec. variable plate-tuning	3.20
25-10	C20	452 mmf/sec., 3 sec. variable plate-loading	3.15
26-3	C11	25-280 pf, 4 plate trimmer, neutralizing	.60
<u>Chokes & Coils</u>			
30-3	RFC1, 4	800 uhy RF choke, 50 ma, 2 pie	.45
30-4	RFC 5	50 uhy RF choke	.35
30-6	RFC 3	425 uhy RF choke ceramic form	.80
30-7	RFC 2	350 uhy RF choke, 50 ma, 1 pie	.40
34-2	R16, R17, (PS)	Parasitic suppressor	.30
40-5	L2	Slug tuned, buf. grid, 7 mc., coil	.70
40-6	L1	Slug tuned, buf. grid, 14 mc., coil	.70
40-7	L3	Phenolic form, final grid, 80-40-20, coil	.80
40-8	L4, L5	Air wound final grid, 15-10, coil	.15
40-9	L7	Phenolic form, final plate, 80-40-20 coil	1.15
40-10	L6	Air wound final plate, 15-10, coil	.35
<u>Switches</u>			
51-2	S5	Slide type, DPST, XTAL-VFO	.22
51-4	S6	Slide type, DPDT, METER	.22
53-1	S4	Rotary 6-pole, 4 pos., 2 wafers, FUNCTION	3.10
53-2	S2	Rotary bandswitch exciter 4-pole, 5-position, 3 wafer	5.50
53-3	S3	Rotary final plate bandswitch 1 wafer, 5-position, progressive shorting	1.60
<u>Miscellaneous</u>			
61-3		7 pin min. tube socket	.21
61-6		12 pin, compactron socket	.20
61-9		Octal tube socket	.20
61-8		Cable socket, female, 11 pin	.46
62-1S		9 pin mica filled tube socket top mt. /w. shield	.32

7-2 - PARTS LIST - SB-175 Meteor Transmitter

WRL Stk. No.	Schematic Diagram Designation	Description	Price
<u>Miscellaneous, Cont'd.</u>			
64-1		.095 pin crystal socket, 31/64 spacing	\$.20
67-2		Pilot lamp socket for #12 lamp	.20
74-3	T1	Transformer, audio, screen modulation	2.80
80-2		Terminal strip, 2 lug	.05
80-3		Terminal strip, 4 lug and ground	.05
80-4		Terminal strip, 1 lug, RH	.05
90-3		Extruded washer, phenolic #6	.10
90-4		Flat washer, nylon #6	.05
92-1		Rubber grommet, 3/8" black	.05
92-3		Rubber grommet, 1/4" black	.05
93-1		#20 black plastic sleeving	.05/foot
101-1	J3	Coax chassis receptacle SO-239/83-1R	.49
102-1	J1	Jack, Key, closed circuit 1/4" I.D. hole	.27
103-3	J2	Jack, Mic., 3-way, PTT, (ring-tip-end) 3/16" hole	.39
109-2		Plug, 11 pin, octal style with snap ring	.24
110-5763	V2	5763 tube	2.53
110-6AQ5	V6	6AQ5A tube	1.07
110-6CL6	V1	6CL6 tube	1.87
110-6D10	V5	6D10 tube	2.05
110-6DQ6B	V3, V4	6DQ6B tube	2.08
113-#12	PL	#12 pilot lamp	.20
115-2	M	Edgewise movement, 5 ma. 5%, hi-temp case, 2 color dial	4.55
120-2		#6-32 x 1/4" BHMS, plated	.05
120-3		#6-32 x 3/8" BHMS, plated	.05
120-5		#4-40 x 1/4" BHMS, plated	.05
120-8		#3-38 x 1/4" BHMS, plated	.05
120-13		#4-40 x 1/2" RHMS, plate steel	.05
120-17		#6-32 x 1/8" hex (Allen) head, set screw	.15
120-20		#6-32 x 5/8" BHMS, plated	.05
121-1		#6-32 x 1/4" hex nut, plated	.05
121-2		#4-40 x 3/16" hex nut, plated	.05
121-7		3/8-32 control nut	.05

7-2 - PARTS LIST - SB-175 Meteor Transmitter

WRL Stk. No.	Schematic Diagram Designation	Description	Price
<u>Miscellaneous, Cont'd.</u>			
121-8		Weld nut, 8/32 weld dots on barrel side	\$.10
123-2		#6 x 1/4" sheet metal, BH, oxide coat	.05
124-1		Solder lug #4 bent, tear drop style	.05
124-2		Solder lug #6 ground lug, int. tooth, bent	.05
124-6		Lockwasher #6, int. tooth, plated	.05
124-12		#6 x 3/8" x 1/32" flat steel washer	.05
124-11		Control lockwasher	.05
124-14		Mount plate, steel, for 4-prong can cap.	.05
124-15		Plate clip 1/4" spring steel	.05
124-23		Rivets	.05
125-2		8-32 x 1/4" Allen head set screw	.15
130-5		Knob, black, with set screw, small dia. #1913	.20
130-6		Knob, black, with set screw, large dia. #1920	.20
130-7		Knob, black, bar-type with set screw, #1500	.20
133-6		Foot, polyethylene, black, large size	.05
133-7		Foot, polyethylene, black, small size	.05
133-8		Plastic shipping bag	.05
140-8		Cabinet, steel, perforated	14.20
141-7		Panel anodized alum., 3/32" punched and screened	4.25
142-8		Chassis, plated & irridited, audio and exciter, horz.	4.40
142-9		Chassis, plated & irridited, final amp., vertical	2.20
146-10		Flat Z bracket, trimmer mount	.15
150-3		Bandswitch coupler wheel, aluminum	.30
150-4		Brass strip, 3/8" wide, 7 inches	.10
150-5		Brass strip, bandswitch coupler	.10
153-2		Shaft 1/4" dia., 2-1/4" lg., fiber	.15
160-2		Wire #20, tinned copper, plastic, insul. white	.10/10 feet
160-3		Wire #20, tinned copper, plastic, insul. brown	.10/10 feet

7-2 - PARTS LIST - SB-175 Meteor Transmitter

WRL Stk. No.	Schematic Diagram Designation	Description	Price
<u>Miscellaneous, Cont'd.</u>			
160-4		Wire #20, tinned copper, plastic, insul. gray	\$.10/10 feet
160-5		Wire #20, tinned copper, plastic, insul. green	.10/10 feet
160-6		Wire #20, tinned copper, plastic, insul. orange	.10/10 feet
160-7		Wire #20, tinned copper, plastic, insul. yellow	.10/10 feet
160-8		Wire #20, tinned copper, plastic, insul. red	.10/10 feet
160-9		Wire #20, tinned copper, plastic, insul. blue	.10/10 feet
160-10		Wire #20, tinned copper, plastic, insul. black	.10/10 feet
160-13		Wire #18, tinned copper, plastic, insul. black	.15/10 feet
160-14		Wire #18, tinned copper, plastic, insul. white, with black tracer	.15/10 feet
160-15		Wire #18, tinned copper, plastic, insul. white with red tracer	.15/10 feet
160-16		Wire #20, tinned copper, solid bare, use 164-1	.10/10 feet
165-1		Coax cable, RG-174/U	.05/foot
165-2		Coax cable, RG-58, 6" lg.	.07/foot
172-9		Shaft coupler, grid cond., 1/4" to 1/4", rigid	.30
182-10		Carton, shipping, with fillers	1.74
183-22		Manual, Instructions	3.00

Model SB-7P5 (Transmitter)

