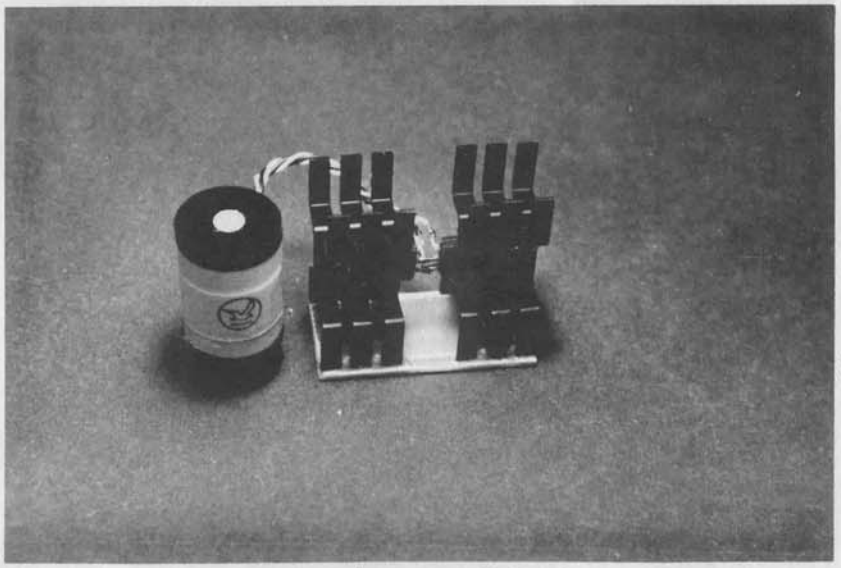
SKYTEC

TUBESTERS

Solid State Tube Replacements
for
Collins Radio Receivers 75S-1, 75S-3/3A, 75S-3B/C
and
Collins Radio Transmitters 32S-1, 32S-3

Typical Tubesters

75S-30 Installation



ST101A/B Audio Output

DL9YG

INSTALLATION MANUAL
Tubester Set 75S-1

INSTALLATION MANUAL

for

Tubester Sets 75S-1

The receivers will operate just fine with only one Tubester replacing a tube, or with any mix of Tubesters and tubes, or with all Tubesters. They may be exchanged for the tubes in any order, and no precautions need be observed in operating the receivers after they are installed. However, TUBESTERS WILL BE DESTROYED IF INSTALLED OR REMOVED WHILE THE RECEIVER POWER IS ON, OR IF INSTALLED IN THE WRONG SOCKET AND POWER TURNED ON.

One additional caution: The heat sinks on the power transistors are "hot". Assure that they don't touch chassis metal after installing the Tubesters, and don't touch the sinks with the receiver power on.

SHORT FORM INSTALLATION INSTRUCTIONS:

Remove the tubes and put the Tubesters in the sockets for which they are labeled.
Put the Mute Jack Adaptor in the Mute jack, and the transmitter cable in the Adaptor.
Install the Clip-on Capacitor per Paragraph 5.b., Page 2. (This requires removing the the receiver from its cabinet. It is not essential, and may be omitted or postponed).
Turn the power switch to STANDBY. The receiver should respond instantly.

Then:

Zero the S-Meter
Set the Calibrator to WWV.
Touch-up the RF and OSC trimmers on all bands.
Set R57 RF Gain Adjust, per the Collins manual or Paragraph 11, Page 3.

The installation is complete.

STEP BY STEP INSTALLATION INSTRUCTIONS:

1. Turn on the receiver. Using the USB mode, RF Gain Control maximum, any band, assure that the receiver operates properly. Turn the receiver off.

2. Remove the (3) 9-pin tubes. Place the color dots from the 9-pin Tubester package near the tube markings on the chassis; they will aid in proper socket Tubester installation:

Color	Tubester Type	Will Replace	At
White	ST201	(6U8A or 6EA8)	V6
Silver	ST203	(6U8A or 6EA8)	V2
Orange	ST204	(6U8A or 6EA8)	V3

3. Install the (3) 9-pin Tubesters. Take care that the ST204 heat sink does not touch metal; it may be bent or twisted a bit for clearance without damage.

4. Turn on the receiver. It should respond and operate normally. Turn it off.

5. a. Remove the (7) 7-pin tubes from the receiver. Place the color dots near the tube markings on the chassis:

Color	Tubester Type	Will Replace	At	Color	Tubester Type	Will Replace	At
Red	ST101A	(6BF5)	V8	Black	ST105	(6AT6)	V7
Gold	ST102	(6AU6)	V301	Y'low	ST106A	(6BA6)	V4
Green	ST103	(6DC6)	V9	Pink	ST107	(6BA6)	V5
				Blue	ST108	(6DC6)	V1

b. STA-3 Clip-on Capacitor: (Note: The receiver must be removed from its cabinet to add this capacitor from the AGC line to chassis ground. It greatly improves the AGC "hang" for SSB and CW listening. However, it is not essential to operation of the receiver with the Tubesters, so its installation may be omitted or postponed).

On a 3-lug terminal strip beneath the chassis near the right front corner, the lug nearest the Phones jack is a point on the "AGC line". Attach the capacitor clip with the plastic boot to this lug; the bare clip to the center lug of the three, or to the center terminal of the nearby small potentiometer, either of which is chassis ground. Re-encase the receiver.

c. STA-5 Mute Jack Adaptor: Install the Adaptor in the Mute jack at the rear of the receiver, and insert the Mute control cable in the Adaptor. If the cable is not terminated in a transmitter Receiver Mute jack, short the termination.

6. RF Gain Adjust (R57) initial setting: Measure the resistance from Pin 7 of V4 to chassis ground. You may wish to record this reading if it represents the optimum setting of R57 with tubes installed. Then adjust R57 for a resistance at Pin 7 of 350 ohms.

7. a. Install the ST101A at V8: Temporarily insert the cased portion in the tube socket, and dress the cable so that the power transistor base plate lies flat on the chassis in front of V8 and the fuse, noting the position that makes the neatest installation. Remove the Tubester, peel off the paper from the double-stick tape, and press the power transistor assembly to the chassis "first", then re-insert the cased portion in the V8 socket.

b. Install the other (6) Tubesters.

FUSING NOTE: Equipment is best protected when fused with the lightest fuse that will hold in normal operation. Either a 1 Ampere wire fuse or a ½ Ampere Slo-Blo fuse will hold with the Tubesters installed. You may wish to check your fuse now, and change to one of the lighter fuses at your earliest convenience. We prefer the ½ Ampere Slo-Blo, but the use of Slo-Blo fuses is controversial.

8. Turn the power switch to STANDBY. The receiver should respond instantly.

9. De-tune the Preselector or otherwise eliminate incoming signal, then zero the S-Meter with "S Meter Zero" R13. Assure that RF Gain Control is at maximum for this adjustment. Re-tune the Preselector.

10. Make the following alignment touch-ups. All are in accord with your Collins manual:

a. Tune in WWV and zero-beat the Calibrator by adjusting "100KC ADJUST" C61.

b. Tune to 100 on the dial and set the pointer with the Crystal Calibrator, then check the 0 and 200 dial positions for end point spread. ST102 matches the tube closely. There should be less than 2 KHz change in the dial center calibration and less than 1 KHz change in the end point spread. Return the Function switch to STANDBY.

c. RF Alignment Touch-up: Set the dial at 100, either LSB or USB mode, RF Gain maximum. Band-by-band, set the Preselector per the following table and peak the ANT, RF and OSC trimmers for maximum signal (these are the two rows of trimmers beneath the Preselector yoke-and-rod assembly):

Band Switch	Set Preselector Logging Scale	Band Switch	Set Preselector Logging Scale
3.6	2.1	21.0	7.9
7.0	3.9	28A	8.9
14.2	6.6		

The Collins manual describes a way of gimmicking the Calibrator to provide a variable level signal source for this alignment, and recommends using a 47 ohm dummy load in the antenna jack during the procedure. These are certainly applicable with the Tubesters installed. However, we prefer peaking these trimmers with the antenna that we use on each band connected, simply using front-end noise and/or incoming signals at or near 100 on the dial as the signal sources.

d. IF Alignment: The ST106 and ST107 IF Tubesters match the tube so closely that none of the IF circuits in the receiver need be touched due to their exchange for the tubes. Should you wish to check your receiver's IF alignment, the Collins manual procedures apply.

11. RF Gain Adjust (R57): Setting this potentiometer per the Collins manual requires an RF signal generator not readily available to most amateurs. The following simple "by ear" alternate procedure will result in just as nearly optimum a setting of this important adjustment:

Place the receiver in normal operation on one of the higher bands, with Preselector peaked, RF Gain Control maximum and Audio Gain at your normal listening level. Rotate R57 fully counter-clockwise (minimum gain position), then turn it back up just far enough to bring weak signals and front-end noise to an easily audible level, and NO FARTHER. Higher settings will decrease the receiver's dynamic range without improving the minimum level of signal that can be copied.

The Tubester Set installation is complete.

Functions of the Accessories

The Clip-on Capacitor is .33uf Tantalum, 35 volt. Placing it across the AGC line to ground makes the "hang" characteristic optimum for SSB and CW. It compensates for a time-constant reduction caused by the RF and IF Tubesters' inputs loading the line.

The Mute Jack Adaptor consists of a ~~resistor (390 ohms in the STA-4, 820 ohms in the STA-5)~~ IN 4148 or 01006 between an RCA plug and jack. With the panel switch in STANDBY, RF Gain control at maximum, and the receiver enabled remotely (by the transmitter relay in the usual installation) the Adaptor resistance between the Mute line and ground establishes the normal AGC threshold with the Tubesters installed.

(The "threshold" is the no-signal voltage on the AGC line, normally about -0.8V, furnished through a high resistance from the RF Gain control wiper. The RF and IF Tubesters can not have as high DC input impedance as do the grids of pentode tubes, and they pull the threshold down to near ØV with the Mute line grounded).

Turning the panel switch to OPERATE grounds the Mute line ahead of the Adaptor, and under no-signal conditions the AGC line at near ØV is evidenced by the S-Meter reading below "0" and front-end noise increasing. Backing off the RF Gain panel control to bring the S-Meter up to "0" will set the same AGC threshold in OPERATE that is established by the Adapter in STANDBY with RF Gain at maximum.

S-Meter Operation

With the RF and IF Tubesters installed and the S-Meter zeroed per the instructions (no incoming signal, Mute Jack Adapter installed, Function switch in STANDBY), the S-Meter will give readings from 0 to about 85 DB corresponding to AGC voltages on the same curve as that with the vacuum tubes installed. Toward the high end of the meter scale the ST107 Tubester current is so low that increasing AGC has little effect on the reading.

Receiver Model Tubester Interchangeability

All but two of the Tubesters furnished in the Sets are suited for use in the proper sockets in any of the 75S- receivers. The two exceptions are:

The ST101A Audio furnished with the Sets 75S-1 and 75S-3/3A will draw about 5 watts input in these models, which have 145V "plate" voltage on the stage with the Tubesters installed. THE ST101A WILL BURN OUT IF INSTALLED IN A 75S-3B/C.

The ST101B Audio furnished with the Sets 75S-3B/C will draw about 5 watts input in these models, which have 185V "plate" voltage on the stage. The ST101B may be used in the 75S-1 or 75S-3/3A, but about 1/3 less maximum audio output will be available.

The ST106A IF Tubester furnished with the Sets 75S-1 and 75S-3/3A has an additional input attenuator circuit that makes R57 effective. The ST106A may be used in the 75S-3B/C; its attenuator circuit is negated by the grounded Pin 7 of V6 in these models

The ST106B IF Tubester furnished with the Sets 75S-3B/C may be used in the 75S-1 or 75S-3/3A, but if so the R57 "RF Gain Adjust" will be almost ineffective.

CIRCUIT DESCRIPTIONS: The table below describes the Tubester circuits:

Tubester Type	Function	LowVolt FET	LowVolt MOS	High Voltage FET	High Voltage Xtr	High Voltage Pxtr	Cr	R	C	Type circuit
ST101	Audio Output				1	2		7	2	Preamp dc cpld to two power txtrs
ST102	VFO	1				1		3		Cascode HF Oscillator, low noise
ST103	Xtl Calibr			1	1			2	1	Dc cpld xtal oscillator
ST104	Tunable BFO		1		1		1	7	1	Dc cpld oscillator-amplifier
ST105	AGC/Det/Aud	1		1			2	1	1	Cascode amp, dual diode
ST106A	IF Amp	1				1	3	5	4	Shielded cascode amp with diode atten circuit controlled by R57
ST106B	IF Amp	1				1	1	5	3	Shielded cascode amplifier
ST107	IF Amp	1				1	1	5	3	Shielded cascode amp, FET selected dc characteristics to drive S-Meter
ST108	RF Amp		1		1			8	2	Cascode VHF amplifier, low noise
ST201a	Prod.detctr	1		1				1	1	Cascode amplifier
b	Xtal BFO				2			5	3	Ac cpld xtal oscillator-amplifier
ST202a	IF Amp	1		1				1	2	Cascode amp with neutralizing cap
b	Q Mult	1		1				1	2	Cascode amp with padder capacitor
ST203a	First mixer	1		1				1		Cascode amp
b	Het osc				1	1		7	4	Xtal osc ac cpld to power amplifier
ST204a	Secnd mixer	1			1		1	3	2	Cascode amp
b	Cath folwr					1		2	1	Power emitter follower

WARRANTY: Tubesters are guaranteed free from defects and to operate properly when delivered; any defective units will be replaced immediately at no cost. In addition, the Tubesters are warranted to their original purchaser for an extensive service period, as follows:

Should a Tubester fail under normal operating conditions within one year after delivery, it will be repaired or replaced by Skytec at no charge save for a $2 packing and mailing fee.

Beyond the one-year full coverage period, any unit that fails under normal operating conditions will be repaired or replaced for 50% of its list price plus $2 mailing. This warranty extension will remain in effect for so long as the Tubester market makes possible continued manufacture and sale of these products by Skytec.

End of Manual

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