

TUBESTERS

by

SKYTEC

**SOLID STATE TUBE REPLACEMENT
FOR
COLLINS RADIO RECEIVERS
75S-1, 75S-3/3A, 75S-3B/C**



Mail: Box 535
Talmage, Ca 95481
UPS: 444 Crestview Drive
Ukiah, Ca 95482

Dear Customer:

I am pleased to send you the quotations and descriptions on Tubesters for the 32S-1 and 32S-3 transmitters. Deliveries will begin by September 3, 1979 and will be made in the sequence in which the orders are received. * NOTE

We anticipate and greatly desire a sizable initial order backlog. We will acknowledge your order by return mail with a scheduled shipment date, and will not deposit your check or Bank Card charge slip prior to fifteen days in advance of that date.

We greatly appreciate your business.

* Sep. & Oct. SOLD OUT, QUOTING EARLY NOV., 1979.

Jim Bowles, W6DLQ
July 11, 1979
S-72

Jim



Dear Mr. _____ : Thank you for requesting information on TUBESTERS.

Tubesters ("toob'-sters") are transistor circuits in plastic cases with pin bases matching miniature tube sockets. Each Tubester type performs the function of a vacuum tube, or the two functions of a dual tube, in a particular radio circuit. The Tubester may be simply plugged in and used interchangeably with the tube in the socket for which it is labeled.

Our Tubester product line includes units for all of the tube positions in the Collins 75S-1, 75S-3/3A and 75S-3B/C receivers; for twelve of the fifteen in the Collins 32S-1 transmitter; and for eleven of the fifteen tube positions in the 32S-3 transmitter. The Tubesters may be purchased individually or in Sets for the various S-Line models.

Tubester Sets upgrade the receivers to full solid state, enhancing all of their unequalled performance features while adding the instant-on, instant stability, cool operation advantages of modern design. The Transmitter Sets reduce the heat dissipation during standby a full 50%; all operating features and power output capability are unchanged.

I am pleased to enclose our descriptive literature.

Jim Bowles, W6DLQ

SKYTEC, Box 535, Talmage, Ca 95481. (707) 462-6882

Application note: Each Tubester type replaces the tube only in the exact circuit for which it is designed. (It is not possible to make a "solid-state 12AT7" or any other tube type general replacement). None of the S-Line Tubesters will work in any other radio, not even in the KWM-2 nor in the earlier Collins models.

Solid State Tubes for
Collins Receivers 75S-1,
75S-3/3A and 75S-3B/C;
and Collins Transmitters
32S-1 and 32S-3.



Order from
SKYTEC
Box 535
Talmage, Ca 95481
(707) 462-6882

TUBESTER PRICES AND TERMS

RECEIVER TUBESTERS listed below will replace any or all of the receiver's vacuum tubes:

Tubester Type	Unit Price	Replaces tube in position			Tubester Type	Unit Price	Replaces tube in position		
		75S-1	75S-3/3A	75S-3B/C			75S-1	75S-3/3A	75S-3B/C
ST101A	\$ 15.	V8	V10	-	ST106B	\$ 8.	-	-	V6
ST101B	15.	-	-	V10	ST107	8.	V5	V7	V7
ST102	8.	V301	V301	V301	ST108	9.	V1	V2	V2
ST103	\$ 6.	V9	V1	V1	ST201	\$ 12.	V6	V8	V8
ST104	8.	-	V11	V11	ST202	11.	-	V5	V5
ST105	7.	V7	V9	V9	ST203	13.	V2	V3	V3
ST106A	10.	V4	V6	-	ST204	12.	V3	V4	V4

RECEIVER TUBESTER SETS make the receivers entirely solid state, and are favorably priced. They include one each of the applicable Tubesters tabulated above, two small accessories, and an Installation Manual. The set prices are about 15% less than the unit prices total:

Tubester Set 75S-1 (Includes 10 Tubesters) \$ 85.00
Tubester Set 75S-3/3A (Includes 12 Tubesters) 101.00
Tubester Set 75S-3B/C (Includes 12 Tubesters) 99.50

TRANSMITTER TUBESTERS listed below will replace up to 12 of the 15 tubes in the 32S-1, and 11 of the 15 tubes in the 32S-3. (It is not possible to provide plug-in solid state replacements for the V7 Driver, V8 or V9 Power Amplifiers, or the V13 VR in the 32S-3):

Tbstr Type	Unit Price	Replaces tube in		Tbstr Type	Unit Price	Replaces tube in		Tbstr Type	Unit Price	Replaces tube in	
		32S-1	32S-3			32S-1	32S-3			32S-1	32S-3
ST301	\$ 12.	V1	V1	ST305	\$ 11.	V5	V5	ST312	\$ 10.	V12	V12
ST302	12.	V2	V2	ST306	12.	V6	V6	ST310	6.	V13	-
ST303	10.	V3	V3	ST310	6.	V10	V10	ST314	11.	V14	V14
ST304	11.	V4	V4	ST311	13.	V11	V11	ST315	8.	V301	V301

TRANSMITTER TUBESTER SETS include one each of the applicable Tubesters tabulated above and an Installation Manual. The Set prices are about 15% less than the unit prices total. (Note that Tubesters for V7, V8, V9 and, in the 32S-3, V13 are neither included nor available):

Tubester Set 32S-1 (Includes 12 Tubesters) \$104.00
Tubester Set 32S-3 (Includes 11 Tubesters) 99.50

SHIPPING CHARGES: For shipment TO ANY USA POINT add \$2 to the prices total on your order; we will ship the fastest and most suitable of First Class Mail, UPS or UPS Blue Label. TO CANADA add \$5 to the prices total; we will ship Registered Air Mail. TO ALL OTHER COUNTRIES add \$10 to the prices total; we will ship the best Registered Air service available.

TERMS: Our terms are cash with order or UPS COD. W6's add 6% tax. We accept your personal check or Bank Charge Card. Should you be dissatisfied with a Tubester set and return it undamaged within two weeks, we will refund 85% of your purchase price.

DELIVERY: Receiver Tubesters are shipped within 10 days, Transmitter Tubesters within 20 days after receipt of order. Postcard Order Acknowledgment is made by return mail.

Solid State Tubes for
Collins Radio Receivers
75S-1, 75S-3/3A, 75S-3B/C

RECEIVER TUBE-STER DESCRIPTIONS



CIRCUITS: The Tubester circuits use an FET, MOSFET or bipolar transistor and a high voltage transistor in a cascode, direct coupled or AO coupled amplifier or oscillator-amplifier configuration, as detailed on page 4, following. The devices chosen are the finest state-of-the-art for their function. For example, the 3N204 used as the ST108 RF Amplifier input is a dual-gate MOSFET, back-to-back diode protected, low-noise, extremely low feedback capacitance device ideally suited for applications which previously only vacuum tubes could fulfill. The other devices used were selected for their function with equal care.

All but three of the receiver Tubesters operate at less than $\frac{1}{2}$ watt input, and the circuits are completely enclosed in their plastic cases. The ST203 and ST204 must run at about 1 watt input to provide oscillator drive to the transmitter in Transceiver; their high voltage power transistors protrude from the case tops and have heat sinks attached. The ST101 Audio Output uses two power transistors with four heat sinks to dissipate about 5 watts; the assembly mounts neatly to the chassis with a strip of double-sided tape (see cover photo).

The two accessories included with the Tubester Sets are a plug-like Mute Jack Adapter and a Clip-on Capacitor that reset the AGC threshold with the RF and IF Tubesters installed.

PERFORMANCE: The Tubester sets make the Collins receivers entirely solid state. The "instant on" characteristic is at first startling, and remains a real pleasure; so nice to be able quickly to take a quick look at the band! The receiver is instantly on and instantly stable, requiring only one or two seconds after turn-on to reach "long term" stability.

The RF, IF and Mixer Tubesters have slightly higher gain than the tubes replaced; the resulting improvement in over-all gain is of particular value to the 75S-1 receiver, and to the 75S-3 on the higher bands. The Tubester oscillators hold the injections to the mixers tightly within specifications. The receivers are quieter, and extensive side-by-side tests give the Tubester-equipped receivers a definite improvement in signal-to-noise ratio.

All Collins published specifications are met with the Tubesters installed with the exception that the maximum audio power output available is one watt; this was a design choice as to how much heat to dissipate in the ST101 Audio Output Tubesters. The audio gain and sensitivity remain the same; the audio output is ample loud speaker volume for all ordinary operating environments, and the decrease in maximum-available audio power is rarely noticed.

POWER INPUT REDUCTION: With Tubesters the power transformer gets barely warm after several hours of operation. Power inputs to our 75S-3C measure 70 watts with tubes, just 32 watts with Tubesters. The fuse may be replaced with a $\frac{1}{2}$ Ampere Slo-Blo if desired.

INSTALLATION: The Tubesters simply plug in to replace the tubes. No modification of the receiver is needed or recommended.

ALIGNMENT TOUCH-UP: The Tubesters match their tube counterparts very closely, and the re-alignment needed for peak performance is merely to touch up the RF and Oscillator tuned circuit trimmers. The VFO, band-pass IF transformer, filter and IF sections of the receiver need not be touched. While all alignments are in accord with your Collins manual, step-by-step instructions are given in the Tubester Installation Manual for your convenience. No special skill, special tools or external equipment are required, and all of the alignment points are readily accessible beneath the cabinet lid.

EXPECTED LIFE: The Tubesters are rated for continuous duty, and no precautions need be followed in operating the Tubester-equipped receivers. All components operate well within their voltage and power ratings, and their life expectancy is unlimited.

TRANSMITTER TUBE/ESTER
DESCRIPTIONS



CIRCUITS: Like the receiver circuits, the transmitter Tubesters use an FET, MOSFET or bipolar transistor and a high voltage transistor in a configuration suited to the gain and control requirements of the stage. However, seven of the transmitter stages must provide significant power output, and the transmitter power supply voltage exceeds +300 volts. (In the typical 32S-1 or 32S-3 using the Collins 516F-2 power supply the nominal "+275 Volt" supply line is actually between +340V and +365V during Standby, dropping to between +300V and +320V in PTT or Key Down). To meet these higher power and voltage requirements, the NSD135 TO-202 power transistor rated at 375 volts is used extensively in these circuits, and added cooling provision is made in the casing.

The ST303 IF Amplifier and the ST306 RF Amplifier use a MOSFET-NSD135 combination to meet the multi-purpose requirements of high gain, some power output with linearity, and "grid" control response to the ALC voltages. Open-top cases are used to provide adequate ventilation to the power transistors. Similar treatment is given to the ST304 1st Mixer and the ST314 Vox/Anti-Vox amplifiers. The NSD135 is used also in the ST304 2nd Mixer, but the open-top case is not needed; it is fully enclosed. The ST312 Heterodyne Oscillator and the ST311 Vox Relay Actuator run at about 1½ watts input; their NSD135 transistors protrude from the cases, with heat sinks attached.

PERFORMANCE: Operation and performance of the transmitters are unchanged with any or all of the Tubesters installed for the tubes. The following individual characteristics are noteworthy:

The ST301 1st and 2nd Audio has a few db more gain than the tube replaced. The Side Tone Oscillator of the ST311 has slightly less output than the tube, but ample for its CW monitor and Vox-activating functions. The input circuits of the ST305 Mixer match the grid-block keying characteristics of the tube, maintaining the excellent Collins keying shape.

The DX Engineering LC-1-32S Speech Processor may be used at V3 with the ST303 Tubester installed in it. The input circuits of the ST303 IF and the ST306 RF are designed to give normal ALC control with or without the processor.

The ST314 Vox/Anti-Vox amplifier, ST310 Vox Rectifier and ST311 Vox Actuator provide the normal VOX control; a Schmitt Trigger circuit in the ST311 gives the system improved stability. The ST315 VFO is more stable than the tube during the early minutes of warm-up.

HEAT REDUCTION: is an important improvement in the transmitters made by the Tubesters.

The heat in the cabinet is a full 30 watts less, due mostly to the eliminated filaments. This represents a surprising 50% reduction in wasted power and heat when the transmitter is in Standby. Since usually the transmitter is in Standby a much larger percentage of the total power-on time than it is Key Down or PTT, the transmitters run much cooler.

INSTALLATION AND ALIGNMENT: The Tubesters simply plug in to replace the tubes. No modification of the transmitter is needed or recommended. The RF and OSC trimmers will need touch-up after the exchanges at V5, V6 and V12; the ALC Zero re-set with the V3 exchange; and the Vox gain and time constant settings may be changed slightly when ST314 and ST311 are installed. All alignments are in accord with the Collins manual, and full instructions are included in the Installation Manual furnished with the Tubester Sets.

CIRCUIT DESCRIPTIONS
and
WARRANTY



CIRCUIT DESCRIPTIONS: The following table describes the Tubester circuits:

Tubester Type	Function	LowVlt FET MOS	HighVoltage FET B1P.Pwr	Or R O	Type circuit
ST101	Audio Output		1 2	7 3	Preamp dc cpld to two power transistors.
ST102	VFO	1	1	3 2	Cascode HF Osc., low noise, tuned caps.
ST103	Xtl Calibr.	1	1	3 3	Ac cpld two-stage xtal oscillator.
ST104	Tunable BFO	1	1	1 7 1	Do cpld oscillator-amplifier.
ST105	AGC/Det/Aud	1	1	2 1 1	Cascode amplifier, dual diode.
ST106A	IF Amplifier	1	1	2 6 4	Cascode amplifier with diode attenuator controlled by R57, "RF Gain Adjust".
ST106B	IF Amplifier	1	1	5 3	Cascode amplifier.
ST107	IF Amplifier	1	1	5 3	Shielded cascode amp, FET selected Idde to drive S-Meter.
ST108	RF Amplifier	1	1	8 2	Cascode VHF amplifier, low noise.
ST201a	Product Dect	1	1	1 1	Cascode amplifier.
ST201b	Xtal BFO		2	5 3	Ac cpld xtal oscillator-amplifier.
ST202a	IF Amplifier	1	1	1 2	Neutralized cascode amplifier.
ST202b	Q Multiplier	1	1	1 2	Cascode amplifier with padder capacitor.
ST203a	First Mixer	1	1	2 1	Cascode amplifier.
ST203b	Het. Osc.		1 1	6 3	Xtal osc ac cpld to power amplifier.
ST204a	Second mixer	1	1	4 2	Cascode amplifier.
ST204b	Cath folwr		1	3 1	Power emitter follower.
ST301a	1st Audio		1 1	1 1	Cascode amplifier.
ST301b	2nd Audio	1	1	3 1	Cascode amplifier, high gain.
ST302a	Cath Folwr	1	1	3	Emitter follower.
ST302b	BFO			3 2	Ac cpld two-stage xtal oscillator.
ST303	IF Amplifier	1	1	7 4	Cascode pwr amp biased to drive ALC Mtr.
ST304	1st Mixer	2	2	5 2	Dual cascode amplifiers.
ST305	2nd Mixer	1	1	5 2	Special purpose cascode amplifier.
ST306	RF Amplifier	1	1	6 2	Pwr cascd amp biased for ALC control.
ST310	Dual diode			2	Dual 600 PIV Diodes
ST311a	VOX Rly Act.	1	1 1	2 4	Schmitt Trigger dc cpld to power amp.
ST311b	Tone Osc.	1	1	1	Cascode oscillator.
ST312	HF Xtal Osc.		1 1	6 3	Xtal osc ac cpld to power amplifier.
ST314	VOX/AV Amps.	2	2	3	Dual cascode audio amplifiers.
ST315	VFO	1	1	1 2 3	Cascode HF Osc., tuned capacitors.

WARRANTY: Tubesters are guaranteed free from defects and to operate properly upon delivery; any defective units will be replaced promptly at no cost, postage paid within the USA. In addition, the Tubesters are warranted for an extensive service period, as follows:

Within one year after delivery, any Tubester that fails under normal operating conditions will be repaired or replaced at no charge except for a \$2 handling and postage fee.

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

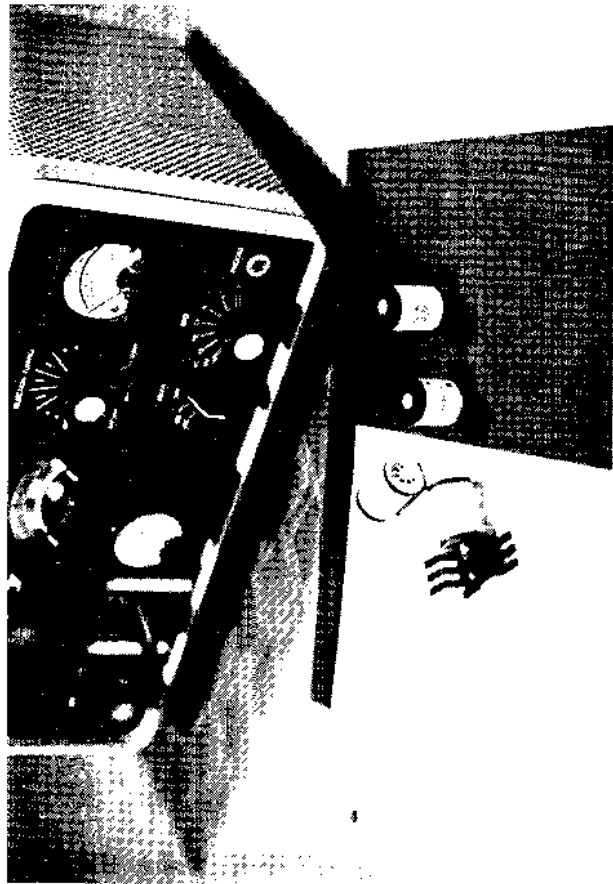
THIS WARRANTY IS MADE BY SKYTEC TO THE ORIGINAL TUBESTER PURCHASER; IT IS NOT TRANSFERABLE.

SKYTEC, Box 535, Talmage, Ca 95481 (707) 462-6882

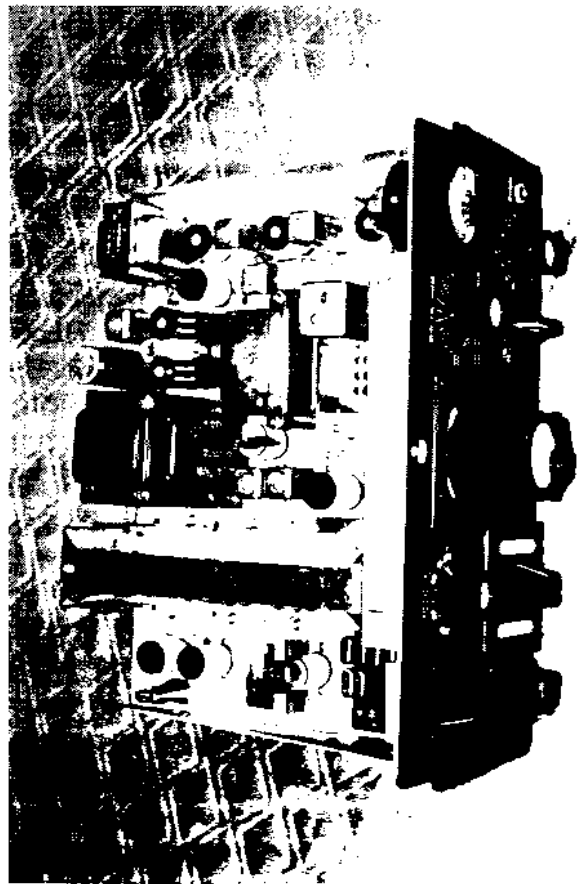


TUBE S T E R S

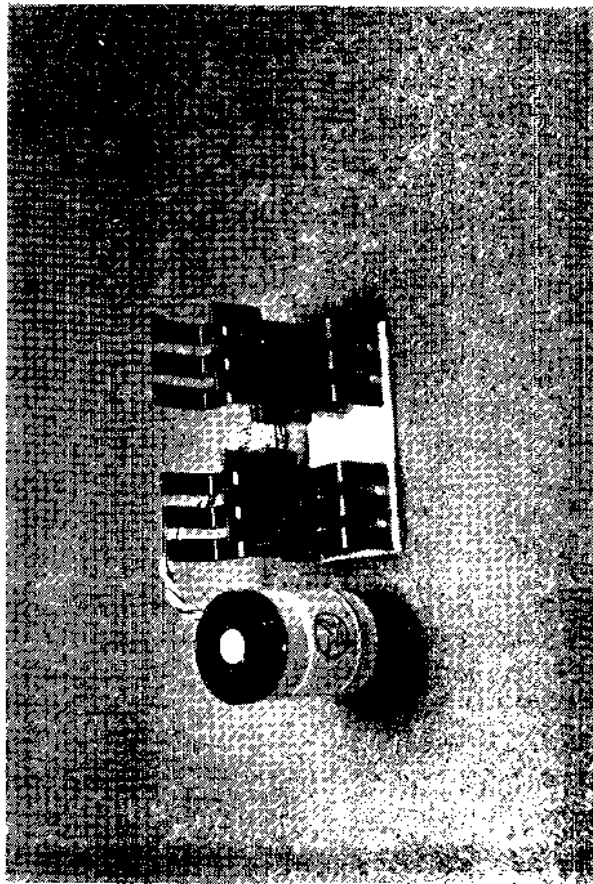
Solid State Tube Replacements
for
Collins Radio Receivers 75S-1, 75S-3/3A, 75S-3B/C
and
Collins Radio Transmitters 32S-1, 32S-3



Typical Tubesters



75S-3C Installation



ST101A/B Audio Output



Tubester Sets 75S-1, -3, -3A, -3B, -3C

DESCRIPTIONS: Tubesters ("toob'-sters") are transistor circuits in plastic cases with pin bases matching miniature tube sockets. Each Tubester type performs the active element function of a vacuum tube, or of the two sections of a dual element tube, in a particular radio circuit. The Tubester may be simply "plugged in" and used interchangeably with the tube in the socket position for which it is labeled.

The Tubester circuits use an FET, MOSFET or bipolar transistor and a high voltage bipolar transistor in a cascode, direct coupled or AC coupled amplifier or oscillator-amplifier configuration. Three of the Tubesters use power transistors equipped with heat sinks: The Heterodyne Oscillator section of ST203 and the Cathode Follower section of ST204 drive the transmitter when cabled for Transceive; each draws about 1 watt input. The ST101(A,B) Audio Output has two power transistors with four heat sinks to dissipate about 5 watts; the power transistor assembly mounts neatly to the chassis with a strip of double-sided tape. The other receiver Tubester types draw less than $\frac{1}{2}$ watt power input per section.

Two small accessory items are included with the Tubester Sets: A plug-like Mute Jack Adapter containing a resistor that resets the AGC threshold with the RF and IF Tubesters installed, and a Clip-on Capacitor that improves the AGC "hang" characteristic.

PERFORMANCE: The Tubester sets make the Collins receivers entirely solid state. The "instant on" characteristic is at first startling, and remains a real pleasure. The receiver is instantly on and instantly stable, requiring only one or two seconds after turn-on to reach the unequalled long-term stability that is characteristic of these receivers.

The RF, Mixer and IF Tubesters have slightly higher gain than the tubes they replace. The oscillator injections to the mixers and product detector are tightly within specifications. Extensive side-by-side listening tests with two 75S-3B receivers, equipping them alternately with Tubesters and tubes, give the Tubesters a slight but definite edge in sensitivity and signal-to-noise. AGC action remains adequate, and the manual RF gain control response is essentially unchanged.

Users report and we agree that the receivers "sound better" with the Tubesters. This subjective improvement is due to a combination of less abrupt AGC compression of the SSB envelope; a slightly better product detector-BFO injection in the ST201; and a tiny bit of tinkering we couldn't resist in the frequency response of the first audio ST105.

All Collins published specifications are met with the Tubester-equipped receivers, with the exception that the maximum audio power output is one watt. This was a design choice as to how much heat to dissipate in the ST101 (A,B) Audio Output Tubesters. The audio gain and sensitivity remain the same, and the one watt output provides ample loud speaker volume for all but extremely noisy environments.

POWER INPUT REDUCTION: With Tubesters the power transformer gets barely warm after several hours of operation. Power inputs to our 75S-3C measure 70 watts with tubes, just 30 watts with Tubesters. The fuse may be replaced with a $\frac{1}{2}$ Ampere Slo-Blo if desired.

EXPECTED LIFE: The Tubesters are rated for continuous duty, and no precautions need be followed in operating the Tubester-equipped receivers. All components operate well within their voltage and power ratings, and their life expectancy is unlimited.

INSTALLATION: The Tubesters simply plug-in to replace the tubes. No modification of the receiver is needed or recommended.



Solid State Tubes for Collins Radio Receivers

Tubester Sets 75B-1, -3, -3A, -3B, -3C

ALIGNMENT TOUCH-UP: The Tubesters match their tube counterparts very closely, and the re-alignment needed for peak performance is merely to touch up the RF and Oscillator tuned circuit trimmers. The VFO, band-pass IF transformer, filter and IF sections of the receiver need not be touched. While all alignments are in accord with your Collins manual, step-by-step instructions are given in the Tubester manual for your convenience. No special skill, special tools or external equipment are required, and all alignment points are readily accessible beneath the cabinet lid.

CIRCUIT DESCRIPTIONS: The table below describes the Tubester circuits:

Tubester Type	Function	LowVlt		High Voltage			Gr	R	C	Type circuit
		FET	MOS	FET	Xtr	Pxtr				
ST101	Audio Output				1	2		7	2	Preamp dc cpld to two power txtra
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 amp, low noise
ST201a	Prod detctr	1		1			1	1		Cascode amplifier, low freq response
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						Cascode amp
b	Het osc				1	1	7	4		Xtal osc ac cpld to power amplifier
ST204a	Second mixer	1			1		1	3	2	Cascode amp
b	Cath folwr					1		2	1	Power emitter follower

WARRANTY: Should a Tubester fail under normal operating conditions in the circuit for which it is designated SKYTEC will repair or replace it for its original purchaser at no charge.

Tubesters blown by accidental insertion or removal with power on, or installation in the wrong socket will be repaired or replaced for their original purchaser at 50% of the unit list price plus a \$1 mailing charge.

WARRANTY PERIOD: The warranty has no time limit, and SKYTEC will honor it unconditionally at least through calendar 1981. At such time as the Tubester market no longer supports a sales and manufacturing activity, it is our plan to maintain or establish a continuing service source from which Tubester Set owners may purchase repair, replacements and/or schematics and components. It may be possible also to provide a continuing Warranty Contract on a small annual fee basis.



TUBESTERS

Solid State Tubes for
Collins Radio Transmitters
32S-1 and 32S-3

Price and Delivery Quotations

The following Tubesters will replace twelve of the fifteen tubes in the 32S-1 transmitters, and eleven of the fifteen tubes in the 32S-3 transmitters:

(It is not feasible to provide plug-in solid state replacements for the V7 Driver nor for the V8 and V9 Power Amplifiers. It is not practical to solid-state replace the V13 Voltage Regulator in the 32S-3 without modifying the chassis for heat sinking).

Tubester Type	Unit Price	Replaces Tube at	Function	Tubester Type	Unit Price	Replaces Tube at	Function
ST301	\$ 9.	V1a.	1st Audio	ST310	\$ 5.	V10a	Vox Rectifier
		b	2nd Audio			b	Anti-Vox Rect.
ST302	12.	V2a	Cath. Follower	ST310	5.	V13 in	ALC Rectifier. (Not
		b	BFO			32S-1	used in the 32S-3)
ST303	10.	V3	IF Amplifier	ST311	13.	V11a	Relay Actuator
						b	Side Tone Oscillator
ST304	11.	V4a	1st Mixer	ST312	9.	V12	HF Oscillator
		b	same	ST314	9.	V14a	Vox Amplifier
ST305	12.	V5a	2nd Mixer			b	Anti-Vox Amplifier
		b	same	ST315	8.	V301	VFO
ST306	12.	V6	RF Amplifier				

When ordering one or more of the Tubesters listed above add \$1.50 to the prices total for packing and First Class postage. W6's add 6% tax.

Transmitter TUBESTER SETS are favorably priced:

Tubester Sets for the transmitters include one each of the applicable Tubesters listed above. The Set prices are about 10% less than the unit prices total, and include shipment to any USA or Canadian point via First Class Mail or UPS Blue Label:

Tubester Set 32S-1 (Includes 12 Tubesters) \$104.00

Tubester Set 32S-3 (Includes 11 Tubesters) \$ 99.50

Foreign purchasers add \$10. to the above Set prices. We will ship lowest cost Air, and will insure or certify the shipment as the international regulations permit.

Terms: Our terms are cash with order or UPS COD. W6's add 6% tax. We accept your personal check or Bank Card charge number. Should you be dissatisfied with a Tubester Set and return it undamaged within two weeks, we will refund 85% of your purchase price.

Delivery: Please refer to cover note for delivery status.

Order from:
SKYTEC
Box 535
Talmage, Ca 95481
(707) 462-6882
Any time, 7 days

Jim Bowles, W6DLQ
Owner, Skytec



Tubester Sets 32S-1 and 32S-3

DESCRIPTIONS: The transmitter Tubesters are similar to the receiver Tubesters in circuitry design approach and packaging. (Reference the receiver Tubester literature descriptions). The ST311a Relay Actuator section dissipates about 1.5 watts, and it is equipped with a heat sink protruding from the case top; all others dissipate less than one watt per section, and are completely enclosed in their cases.

PERFORMANCE: Operation and performance of the transmitters are unchanged with any one or any number of the Tubesters exchanged for the tubes that they replace. The following individual Tubester characteristics are noteworthy:

The ST301 1st and 2nd Audio has a few db more gain than the tube replaced, and will show a lower hum level in laboratory tests; we can tell no difference on the air. The Side Tone Oscillator ST311b has a bit less output than the tube replaced, but ample for its CW monitor and Vox-activating functions. The ST314 Vox and Anti-Vox Amplifiers, ST310 Vox Rectifiers, and ST311a Actuator provide the normal Vox characteristics. Installing the second ST310 at V13 in the 32S-1 makes that portion of the circuit identical to that of the 32S-3.

The input circuits of ST305a,b 2nd Mixer are tailored to match the grid-block keying characteristics of the tube. The input circuits of ST303 IF and ST306 RF Amplifiers provide normal ALC response, and a padding circuit in ST303 compensates for its lower current drain to provide normal panel meter readings of ALC compression.

ST302b BFO, ST312 HF Oscillator and ST315 VFO provide injection voltages tightly within the manual specifications. The ST315 VFO is more stable than the tube during the early minutes after power turn-on. The ST304 1st Mixer matches the tube almost identically at V4.

The DX Engineering LC-1-32S Speech Processor may be used. It will operate normally at V3 with the ST303 IF Tubester installed in it.

POWER INPUT REDUCTION: A Tubester Set installed reduces the transmitter's input power about 30 watts. While this is only a small percentage of the "key down" power consumption, it is a surprising 50% reduction in the heat dissipated within the transmitter during stand-by.

INSTALLATION AND ALIGNMENT: The Tubesters simply plug-in to replace the tubes. No modification of the transmitter is needed or recommended. The RF and OSC trimmers will need touch-up after the exchanges at V5, V6 and V12; the ALC Zero re-set with the V3 exchange; and the Vox gain and time constant control settings may be changed slightly when ST310 and ST314 are installed. All alignments are in accord with the Collins manual, and full instructions are included for your convenience in the Tubester manual furnished with the Sets.

SKYTEC TUBESTER WARRANTY

Should a Tubester fail under normal operating conditions in the circuit for which it is designated SKYTEC will repair or replace it for its original purchaser at no charge.

Tubesters blown by accidental insertion or removal with power on, or installation in the wrong socket will be repaired or replaced for their original purchaser at 50% of the unit list price plus \$1. for mailing.

This warranty has no time limit, and SKYTEC will honor it unconditionally at least through calendar 1981. When the Tubester market no longer supports a sales and manufacturing activity, it is our plan to maintain or establish a continuing service source from which Tubester set owners may purchase repair, replacements and/or schematics and components. It may be possible also to provide a continuing Warranty Contract on a small annual fee basis.



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 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 $\frac{1}{2}$ 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 $\frac{1}{2}$ 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 Presselector 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 Presselector.



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):

<u>Band</u> <u>Switch</u>	<u>Set Preselector</u> <u>Logging Scale</u>	<u>Band</u> <u>Switch</u>	<u>Set Preselector</u> <u>Logging Scale</u>
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.

1. 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 390 ohm resistor in the STA-4, a 1N4148 diode in the STA-5, 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 impedance 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 0V 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 0V 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.

WARRANTY

Tubesters are guaranteed to be free from defects and to operate properly upon delivery; any defective units will be replaced promptly at no cost, postage paid within the USA. In addition, the Tubesters are warranted for an extensive service period, as follows:

Within one year after delivery, any Tubester that fails under normal operating conditions will be repaired or replaced at no charge except for a \$2 handling and postage fee.

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

THIS WARRANTY IS MADE BY SKYTEC TO THE ORIGINAL TUBESTER PURCHASER; IT IS NOT TRANSFERABLE.

End of Manual

SKYTEC
Box 535
Talmage, Ca 95461



Installation Manual
for
Tubester Sets 75S-3/3A and 75S-3B/C

Page 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. Clip the Clip-on Capacitor booted lead to the top lug of the AGC switch, the bare clip to the dial light cover. The switch is behind the panel, just left of the S-Meter. 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.
Check the BFO and adjust L10 if needed.
Check the Rejection Tuning and peak the notch with L8 and R77.
Set R57 IF Gain, per the Collins manual or Paragraph 11, Page 3 following.

The installation is complete.

STEP BY STEP INSTALLATION INSTRUCTIONS:

1. Turn on the receiver. Using the USB mode, RF Gain maximum, Rejection Tuning OFF and BFO OFF, any band, assure that the receiver operates properly. TURN THE RECEIVER OFF.
2. Remove the (4) 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	Color	Tubester Type	Will Replace	At
White	ST201	(6EA8 or 6U8A)	V8	Silver	ST203	(6EA8 or 6U8A)	V3
DrkBlu	ST202	(12AX7)	V5	Orange	ST204	(6EA8 or 6U8A)	V4

3. Install the (4) 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.
5. Align the Notch Filter: Using either side band mode, Rejection Tuning Off, tune in the calibrator on any band to the center of the IF pass-band, an audio tone of about 1350 Hz (the exact frequency is not critical). Turn the Rejection Tuning knob to its center position (pointer straight up), then adjust L8 and R77 for maximum rejection of the signal. The adjustments interact, so adjust them alternately a few times. The null should give 9S-units or better rejection. Turn Rejection Tuning off.



6. a. Turn the receiver OFF. Remove the (8) 7-pin tubes. Place the color dots near the tube markings on the chassis:

Color	Tubester Type	Will Replace	At
Red	ST101*	(6BF5)	V10
Gold	ST102	(6AU6)	V301
Green	ST103	(6DC6)	V1
Brown	ST104	(6DC6)	V11

Color	Tubester Type	Will Replace	At
Black	ST105	(6AT6)	V9
Y'low	ST106*	(6BA6)	V6
Pink	ST107	(6BA6)	V7
Blue	ST108	(6DC6)	V2

* ST101A in 75S-3/3A
ST101B in 75S-3B/C

* ST106A in 75S-3/3A
ST106B in 75S-3B/C

- b. STA-3 Clip-on Capacitor: Attach the clip with the plastic boot to the top-most lug of the AGC OFF-FAST-SLOW switch located directly behind the control on the front panel, and attach the bare clip to the dial light cover edge (chassis ground).
- c. STA-4 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.
7. a. Install the ST101A or ST101B at V10: 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 V10 and V11, 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 V10.
- b. Install the remaining (7) 7-pin 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 $\frac{1}{2}$ 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 $\frac{1}{2}$ 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. You should find 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, Rejection Tuning OFF, BFO OFF. 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 long Preselector yoke-and-rod assembly):

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

Note: 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, should you wish to use them. 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.
- e. Tunable BFO: Turn on the Calibrator and zero-beat the signal using the USB mode with the BFO OFF. Now turn on the BFO to position "0". If the Calibrator signal is not again zero-beat or close enough to it, zero-beat it by turning the slug in L10.

11. RF GAIN ADJUST (R57) in 75S-3/3A; termed IF GAIN ADJUST (R57) in 75S-3B/3C: 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 on this important adjustment:

Place the receiver in normal operation on one of the higher bands, with Preselector peaked, RF Gain 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) 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 0V 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 0V 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	Low Volt		High Voltage			Cr	R	C	Type circuit
		FET	MOS	FET	Xtr	Pxtr				
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: Should a Tubester fail under normal operating conditions in the circuit for which it is designated SKYTEC will repair or replace it for its original purchaser at no charge.

Tubesters blown by accidental insertion or removal with power on, or installation in the wrong socket will be repaired or replaced for their original purchaser at 50% of the unit list price plus a \$1 mailing charge.

WARRANTY PERIOD: The warranty has no time limit, and SKYTEC will honor it unconditionally at least through calendar 1981. At such time as the Tubester market no longer supports a sales and manufacturing activity, it is our plan to maintain or establish a continuing service source from which Tubester Set owners may purchase repair, replacements and/or schematics and components. It may be possible also to provide a continuing Warranty Contract on a small annual fee basis.

End of Manual

SKYTEC
Box 535
Talmage, Ca 95481
(707) 462-6882



TUBESTERS

Solid State Tubes for
Collins Radio Receivers
75S-1 and 75S-3/3A/3B/3C
Effective Nov. 1, 1978

Service Bulletin No. 1: New Tubester type ST101A

Effective Nov. 1, 1978 Tubester Sets 7A8 and 7A7 include a new Tubester type ST101A, Audio Output, V8 in the 75S-1 or V10 in the 75S-3, replacing the ST101. This Bulletin makes the new audio Tubester available to previous Set purchasers on either a straight purchase or an exchange-purchase basis.

The ST101A is capable of about 67% more audio power output in the receivers than the ST101. This improvement is significant for operation in other than quiet ambient environments. As the two types have the same gain and frequency response, the ST101A offers no advantage over the ST101 for low level loudspeaker or earphone operation.

Total power input to the ST101A is 5 watts. The $\frac{1}{2}$ Ampere slo-blo fuse recommended for Tubester-equipped receivers using the ST101 is adequate also with the ST101A. (The power input to the ST101 is 3 watts. The 6BF5 tube draws about 19 watts, including 7.5 watts filament).

Description: The circuit uses two TIS131 (or NDS131) high voltage power transistors selected for like beta characteristics operating Class A in parallel, direct driven by an A5T 5058 high voltage emitter follower. An effective 1180 ohms of emitter resistance seen by each power transistor includes a 180 ohm individual un-bypassed portion, providing inverse feedback and a high degree of DC stability. The power transistors are operated well within their voltage/current safe-operating range, and four Thermaloy 6053B heat sinks provide adequate cooling.

The 131 transistors and their heat sinks are mounted on a 15/16" by 1 7/8" fiberglass base. Peel-off double-sided tape on the base provides easy and positive mounting of the assembly to the receiver chassis. A 3" cable connects the remote assembly to the rest of the circuit, which is mounted in the usual Tubester "plug-in" case.

Price and Availability: The unit price of the ST101A is \$15. Please add \$1.50 to the prices total on your order to cover our packing and air shipment costs. Delivery will normally be made 7 to 10 days after receipt of order.

Exchange for the ST101: For those not wishing to keep their ST101 as a spare, we will accept it for \$5. credit toward purchase of the ST101A. The net exchange price including shipment is \$11.50 outside California, \$12.10 including California sales tax. It is not necessary to return the ST101 being exchanged until you have received the ST101A ordered; the ST101A carton will simplify your return of the old unit.

#####

for
Tubester Sets 32S-3

The transmitter will operate fine with only one Tubester replacing a tube, or with any mix of Tubesters and tubes. They may be exchanged in any order, and no precautions need be observed in operating the transmitter after the Tubesters are installed. However, THE HIGH VOLTAGES ARE DANGEROUS. Make doubly sure that the power is turned off before installing or removing a Tubester, and that it is installed only in the proper socket.

These instructions describe installing the Tubesters in three groups rather than all at once, and checking the transmitter operation and adjustments at each step. This will simplify locating any malfunction or adjustment errors should they occur. The Tubester Sets are sub-packaged to facilitate this procedure.

Prior to Tubester installation, assure that the transmitter operates normally, then turn the power OFF.

PACKAGE 1:

1. Replace the tubes with the Tubesters from Package 1. Placing the color dots on the chassis near the tube markings will be helpful in proper socket installation:

Dot Color	Tubester Type	Replaces	At
Green	ST301	(6U8A or 6EA8)	V1
Orange	ST310	(6AL5)	V10
Red	ST311	(6U8A or 6EA8)	V11
Brown	ST314	(12AT7)	V14

2. Turn on the transmitter. The Vox Relay may actuate momentarily as the high voltage comes up. Check transmitter operation in all modes. The Vox Gain, Anti-Vox Gain and Vox Time Constant settings may need slight adjustment to get your preferred VOX characteristics. The CW Sidetone Adjust (located below and just to the left of the meter) may need increasing for CW monitoring. No other adjustments are affected. Turn power OFF.

Package 2:

1. Replace the tubes with the Tubesters from Package 2:

Dot Color	Tubester Type	Replaces	At
Lt. Blue	ST302B	(6U8A or 6EA8)	V2 (Replace tube shield over ST302B).
White	ST303	(6DG6 or 6CB6)	V3 Note: If the DX Engineering Speech Processor is used, install ST303 in it.
Yellow	ST304	(12AT7)	V4
Gold	ST315	(6AU6 or 7543)	V301

2. Before turning power on, turn the ALC ZERO potentiometer (located just to the rear of V2) to its maximum resistance position, fully "clockwise".
3. Turn the transmitter on. Operation should be normal. Make two adjustments:
 - a. With RF Gain at minimum, actuate PTT, switch Meter to ALC, and set the meter to zero by adjusting the ALC ZERO potentiometer.
 - b. Set the Dial Pointer by monitoring SYNC mode in the receiver.
4. Assure that the transmitter operation is normal, then turn transmitter OFF.

INSTALLATION MANUAL Tubester Sets 32S-3

PACKAGE 3:

When any of these three Tubesters are exchanged for the tubes it is necessary to touch up the RF alignment. The following procedure is in accord with Section 4.5.4, "RF Circuits Alignment" in the Collins 32S-3 manual. Stated simply, the RF Trimmer capacitors, located in two rows beneath the Exciter Tuning assembly, are adjusted to give maximum drive to the PA tubes with the Exciter Tuning and main dials set as prescribed for each band.

If the 32S-3 is cabled to a 75S- receiver for TRANSCEIVE, the transmitter's XTAL OSC trimmers have no effect. Their adjustment may be deferred until "XMTR XTAL OSC" cabling is desired; the V12 socket even may be left empty. Just assure that the receiver has the matching band, Preselector and tuning dial settings during the RF trimmer alignments.

1. Replace the tubes with the Tubesters from Package 3:

Dot Color	Tubester Type	Replaces	At	Notes
Pink	ST305B	(12AT7)	V5	Replace tube shield over the ST305B.
Dark Blue	ST306	(6AH6)	V6	REMOVE SPRING, then replace tube shield
Silver	ST312B	(6DC6 or 6CB6)	V12	over the ST306

2. Connect the transmitter to a dummy load. Select band 28A if 10 meter operation is anticipated; otherwise select any band. Set the Exciter Tuning per the following table. Set the Dial at 100; PA Tuning at the band number on its dial; RF Gain to minimum; and Meter switch to PA Plate.

Band Switch	Exciter Tuning Logging Scale	Band Switch	Exciter Tuning Logging Scale
28A	9.0	14.0	6.4
3.6	2.1	21.2	7.8
7.0	3.8		

3. Turn power on and allow warm-up. Turn EMISSION switch to TUNE.
- 4.a. Advance RF Gain (near maximum may be required) and rock Exciter Tuning slightly if needed to get PA Plate current indication. Dip PA Plate current with PA Tuning. Now and through the remainder of the alignment, as the drive is increased by peaking the trimmers, reduce RF Gain to keep PA Plate current between 2 db and 4 db.
- b. Adjust the XTAL OSC, MIXER PLATE, RF AMP and DRIVER PLATE trimmers for this band for maximum PA drive. (If cabled for TRANSCEIVE, peak the receiver Preselector and/or the receiver OSC trimmer instead of the transmitter XTAL OSC trimmer). If the Exciter Tuning was moved off its alignment point to get initial drive indication, work it back to the proper setting while making compensating trimmer adjustments. The alignment is then complete for this band.
5. Perform steps 4.a and 4.b above for the other bands.

The Tubester Set installation is complete.

Notes

MIC GAIN Settings: In LSB and USB the MIC GAIN setting needed for the desired drive will be little changed with the Tubesters installed. However, in TUNE, LOCK KEY and CW the control will have to be turned farther Clockwise. THIS IS NORMAL. In these modes the audio is bypassed, and MIC GAIN simply varies a potentiometer that has been switched into the cathode of V6. It takes less "cathode" resistance to cut back the gain of the ST306 Tubester, and any MIC GAIN setting needed up to nearly fully Clockwise is ok.

KEYING SHAPE Settings: With the ST305B at V5, second mixer (the stage that is "grid-block" keyed in the Collins), the normal range of hard-to-soft keying is available by setting the Keying Shape control from about "ten o'clock" for "hard", on around to fully clock-wise for maximum "soft". Setting the control further counter-clockwise than about "ten o'clock" may result in mild key clicks.

ALIGNMENT TIPS: If the RF Trimmer adjustments are so far out that no drive indication is found on the 32S-3 meter, use the 75S- receiver as a signal strength meter. With a short wire or no antenna, tune in the transmitter's signal, then peak the trimmers for maximum S-Meter reading. The receiver can also replace the "RF Voltmeter" and the "general coverage receiver" called for by the Collins manual for these alignments:

Carrier Balance: With the 32S-3 in LSB or USB, any frequency, MIC GAIN OFF, PTT ON, tune in the signal (residual carrier) on the receiver, null it with R14 and C11 "CARRIER BAL".

First Mixer Balance: Tune the 32S-3 on 21.1 Mhz, LOCK KEY, with a small amount of drive. With the receiver find a signal at 21.556 Mhz; it will be weak and some antenna will be needed. This is the BFO riding through. Null the signal with R27 and C26, "1st MIX BAL".

WARRANTY

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

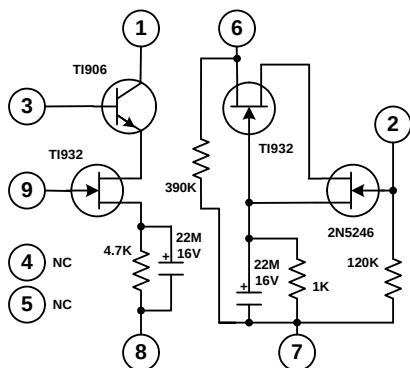
Within one year after delivery, any Tubester that fails under normal operating conditions will be repaired or replaced at no charge except for a \$2 handling and postage fee.

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

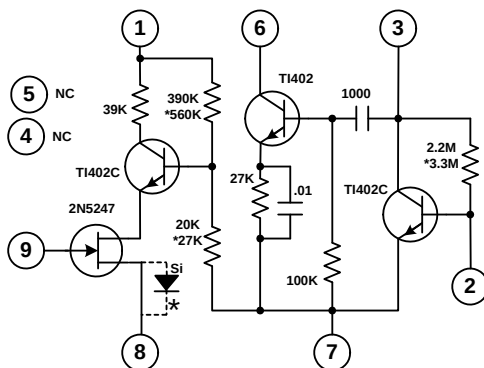
THIS WARRANTY IS MADE TO THE ORIGINAL TUBESTER PURCHASER; IT IS NOT TRANSFERABLE.

End of Manual

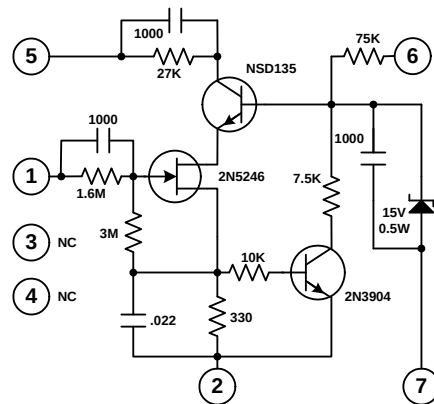
SKYTEC, Box 535, Talmage, Ca 95481 (707) 462-6882



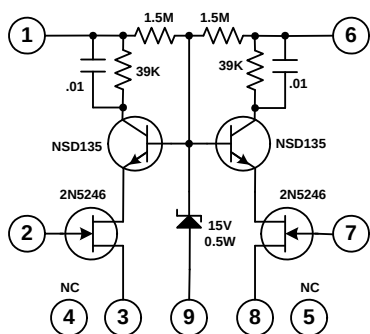
ST301 / V1



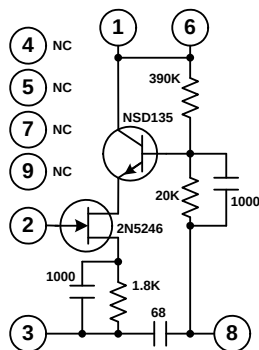
**ST302 / V2
ST302B / V2***



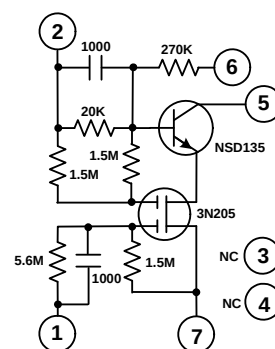
ST303 / V3



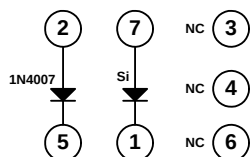
ST304 / V4



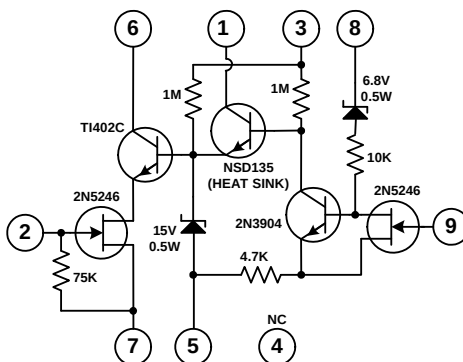
ST305 / V5



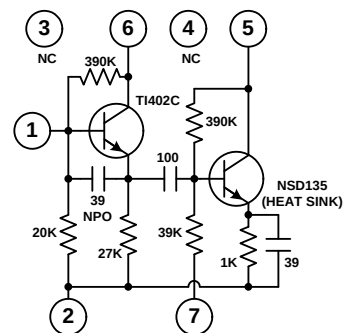
ST306 / V6



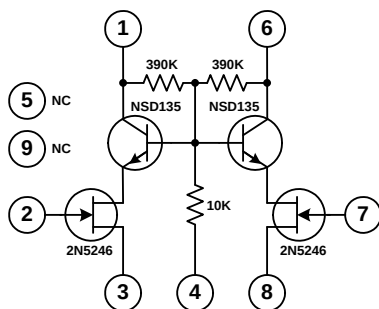
ST310 / V10



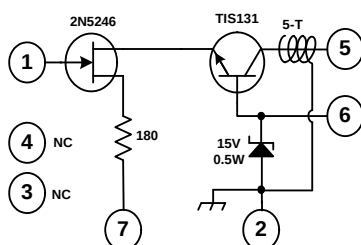
ST311 / V11



ST312 / V12



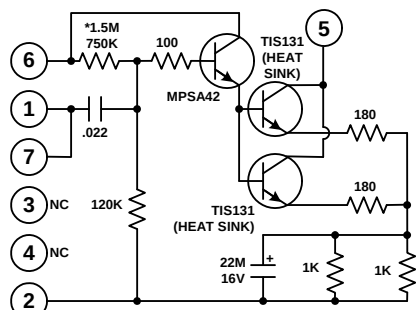
ST314 / V14



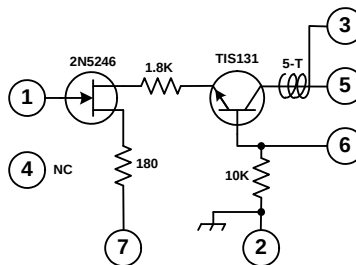
ST315 / V301

**SKYTEC
TUBESTERS
FOR 32S3 SERIES
TRANSMITTERS --
"AS FOUND"**

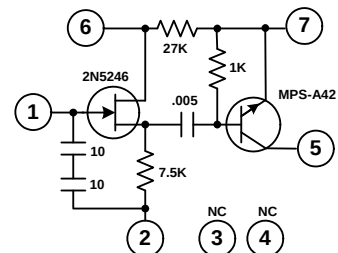
KH6GRT



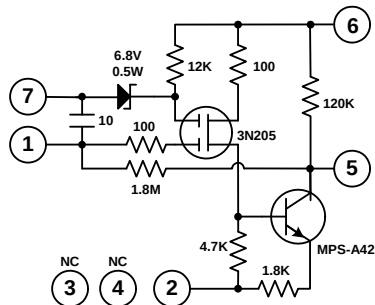
ST101A / V8S1 / V10S3
ST101B / V10 S-3B/C*



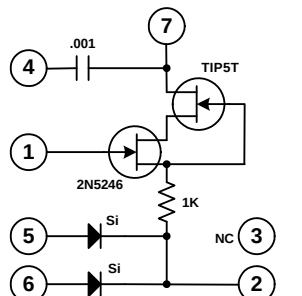
ST102 / V301



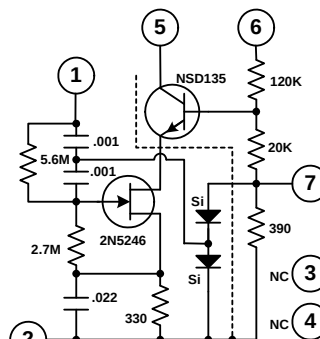
ST103 / V9S1 / V1S3



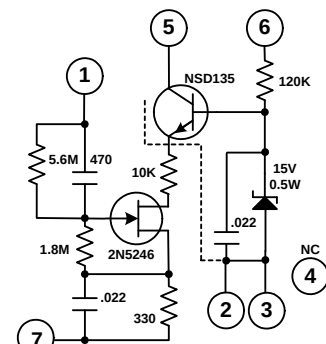
ST104 / V11S3



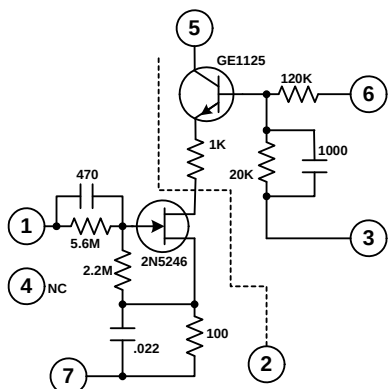
ST105 / V7S1 / V9S3



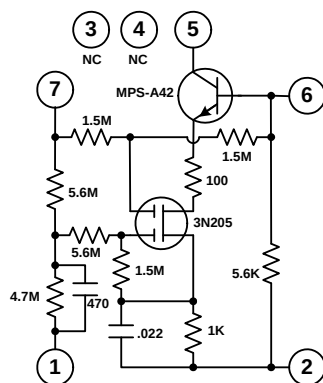
ST106-A3 / V6S3



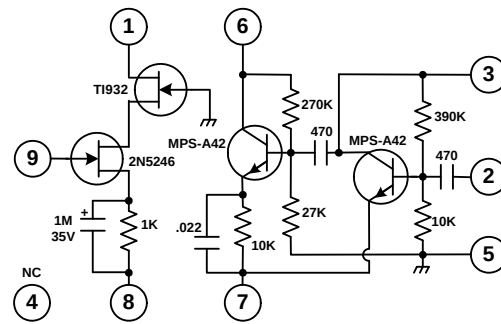
ST106B / V6 S-3B/C



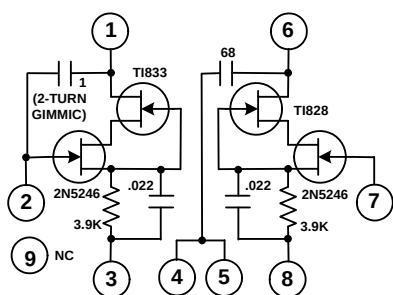
ST107 / S5V1 / V7S3



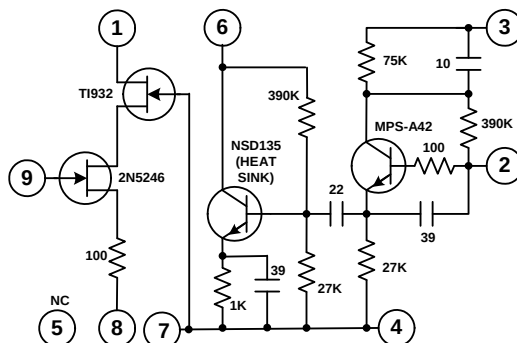
ST108 / V1S1 / V2S3



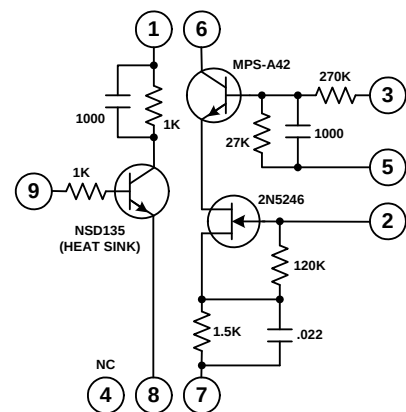
ST201 / V6S1 / V8S3



ST202 / V5S3



ST203 / V2S1 / V3S3



ST204 / V3S1 / V4S3

SKYTEC TUBESTERS FOR 75S SERIES
RECEIVERS -- "AS FOUND"

KH6GRT