

## MODEL 242 REMOTE VFO

TEN-TEC Model 242 Remote VFO is an accessory addition to the TRITON IV transceiving system which allows setting up two frequencies of operation. A MODE switch with LED indicators provides selection of any one of six modes of operation: TRITON transmit and receive; REMOTE transmit and receive; TRITON transmit-REMOTE receive; REMOTE transmit-TRITON receive; TRITON transmit-both receive; REMOTE transmit-both receive. Full instant break-in is retained no matter what mode is selected, and because of the broadband design in the TRITON, frequencies, even though far removed from one another but on the same band, will be processed equally and under optimum conditions in the transmitter without readjustment.

In addition to the remote VFO capability, a two position crystal oscillator may be selected as the remote generator for fixed frequency operation, such as for MARS or net operation. Out-of-band crystals within limits outlined below may be selected, as well as in-band frequencies.

Model 242 covers all Amateur HF frequencies between 3.5 and 29.0 MHz. Additional crystals are available to extend the 10 meter band to 30.0 MHz.

Transceivers with Serial Numbers below 1400 require a simple VFO modification described in Service Note SN-1-540, which is attached to and a part of these instructions. Failure to perform this modification will result in unacceptable break-in performance and severe chirp.

INSTALLATION \*

To install Model 242 into the TRITON IV system, proceed as follows:

- 1.) Remove dummy ACCESSORIES plug from socket on rear panel of TRITON IV. Save plug for possible use in future if additional accessories are added.
- 2.) Insert plug attached to Model 242 cable into TRITON ACCESSORIES socket.
- 3.) If it is intended that Model 242 be placed along side of the TRITON, with both units raised by means of their snap-down legs, it is recommended that the two plastic leg extenders supplied with the unit be installed on the two rear rubber feet. This will result in the two front panels being in the same plane. To do this, remove the two rear feet by unscrewing the screws securing them. With the screws still through the rubber feet, place a  $\frac{1}{2}$ " long extender on each screw and reinstall the feet.
- 4.) Although the table on page 3 of SN-1-540 indicates that the dummy plug should be inserted into socket on rear of Model 242, this is unnecessary. The required jumper between pins 6 and 7 has been installed in the cable plug.

\* If more than one accessory is used with the TRITON IV, see special instructions in Service Note SN-1-540, attached.

FULL TEN METER COVERAGE

Model 242 as shipped from the factory has VFO mixer crystals installed which permit operation between 28.0 and 29.0 MHz. Two additional crystals are available as accessories which extend coverage to 30.0 MHz. Model 212 Crystal provides coverage in the 29.0 to 29.5 MHz segment and Model 213 in the 29.5 to 30.0 MHz segment.

To install either or both of these crystals, remove the two screws on the back lip of the top cover and slide top back and out of grooves. A two-crystal socket is mounted on the small PC board that is an integral part of the four position, 28-30 MHz front panel switch. Plug Model 212 into the socket adjacent to the two crystals already wired into the PC board, and Model 213 crystal into



the socket farthest from the wired-in crystals. In these positions the covered frequencies will correspond to the front panel markings for this switch. See photo of 80334 assembly for socket location. Crystals are marked with operating frequencies and TEN-TEC part numbers as follows:

<u>Model</u>	<u>Operating Frequency</u>	<u>Coverage</u>	<u>Part No.</u>
212	14.990 MHz	29.0 to 29.5	48009
213	15.490 MHz	29.5 to 30.0	48010

#### CRYSTAL OPERATION

TEN-TEC, Inc. does not supply crystals for fixed frequency operation since there are an infinite number of frequencies that may be selected. It is recommended that crystals for your desired operating frequencies be purchased from a reliable crystal manufacturer, to the specifications outlined below. It is not necessary that either or both positions be filled with crystals.

#### Out-Of-Band Limits

<u>Band</u>	<u>Frequency Range</u>
80	3.4 to 4.1 MHz
40	6.9 to 7.4 MHz
20	13.8 to 14.55 MHz
15	20.8 to 21.65 MHz
10	27.8 to 30.0 MHz

#### Crystal Specifications

Case: HC-6/U.

Terminals: .050" diameter on .486" centers.

Mode: Fundamental only. Parallel Resonance.

Load Capacitance: 20 pF. (A 32 pF crystal will operate at a slightly higher frequency.)

Frequency:

<u>Band</u>	<u>Mode</u>	<u>Crystal Frequency (f)</u>
80-40	SB-N	$f = \text{DOF} + 9.000000 \text{ MHz}$
80-40	CW	$f = \text{DOF} + 9.000750 \text{ MHz}$
20-15-10	SB-N	$f = \text{DOF} - 9.000000 \text{ MHz}$
20-15-10	CW	$f = \text{DOF} - 9.000750 \text{ MHz}$

DOF = Desired Operating Frequency

#### Crystal Installation

- 1.) Remove top from Model 242.
- 2.) Sockets are an integral part of the vertical PC board that incorporates the MODE and REMOTE switches. Mount HC-6/U crystals vertically into the terminals provided and shown on photo of 80333 assembly. Socket nearest switch decks is for X-1 position.
- 3.) Trimmer capacitor C1, located above X-1 crystal socket, allows a slight trimming of the X-1 crystal frequency and C2, above socket for X-2 crystal, that of X-2 frequency. The amount of frequency deviation depends on the crystal's cut, frequency, case capacitance and other characteristics, but nominally is about  $\pm 1.5 \text{ MHz}$ .
- 4.) After frequency is trimmed, replace top.



## OPERATION

- 1.) Select desired switching mode with MODE switch. Determination of the mode selected is by means of the four small LEDs located to the right of the dial scale. The two red LEDs in the TX column indicate which unit determines the transmitted frequency (TRITON or REMOTE) and the two yellow LEDs in the RX column indicate which unit is utilized for receiving.
- 2.) If remote crystal control is desired, position REMOTE panel control to either X-1 or X-2 position. The two red LEDs located on either side of the main dial skirt, designated X-1 and X-2, will visually indicate which position is selected.
- 3.) If remote VFO operation is desired, position REMOTE switch to VFO position.
- 4.) Select desired band with BAND switches on both Model 242 and TRITON IV. Main BAND switches on both units must be set to same band, but 10 meter segments need not be the same. If crystal control is used for remote position, operating frequency must correspond to setting of BAND switch on TRITON IV.
- 5.) OFFSET control on TRITON will only affect the VFO in the TRITON and not the remote VFO.
- 6.) When using both VFOs for receiving (MODES 5 and 6), bear in mind that the stronger signal received will control the AGC and sensitivity of both signals. If the stronger signal intermittently transmits, the gain will change accordingly. Also, with dual reception, there may be minor birdies present on some bands as a result of mixer products of the two VFO signals in the mixer.
- 7.) Using Model 242 with Model 244 Digital Readout - When Model 244 is also used in the TRITON system, it will read whatever VFO is in use at the time. Unstable digital readings may occur when in the CW mode due to the instant break-in switching between two frequencies. To measure transmitted CW frequency, take the reading with TRITON MODE switch in the LOCK position.

## THEORY OF OPERATION

The VFO subassembly used in Model 242 is identical to that used in TRITON IV. In addition to this assembly, switching circuits for supplying operating voltages to the two VFO oscillator assemblies, a crystal oscillator and emitter follower, and switched rf emitter followers for the two VFO signals are contained on two additional assemblies.

Referring to CONTROL ASSEMBLY 80335, secondary R and T control voltages are developed from transistors Q1 and Q2, controlled by the "t" voltage coming from the TRITON. The R voltage is fed to a series of programing diodes on SWITCH S/A 80333 (D2 thru D5), and the T voltage to diode D1. Selection by means of S1a and S1b of the MODE switch on this assembly determines which terminals, B<sub>TRI</sub> or B<sub>REM</sub>, receives the T and R voltages. B<sub>TRI</sub> and B<sub>REM</sub> feed the bases of switching transistors Q3 and Q4 on 80335. These transistors supply operating voltages E<sub>TRI</sub> and E<sub>REM</sub> to the TRITON and/or remote VFO, as well as to the two rf emitter followers Q5 and Q6 on 80335.

Rf from the TRITON VFO is fed to the input of Q5 and rf from Model 242 oscillator to Q6. These stages are coupled together at their output terminals and feed the TRITON mixer circuits via pins 6 and 7 of the ACCESSORIES socket. The unused oscillator, although continuously operating because of chirp considerations, needs to be effectively isolated from the TRITON mixer circuits so that only one frequency is transmitted. This is accomplished by turning off the unused emitter follower and the unused mixer and output stages in the two VFO subassemblies, 80277.

Sections S1c and S1d on 80333 MODE switch control the LED mode indicators.

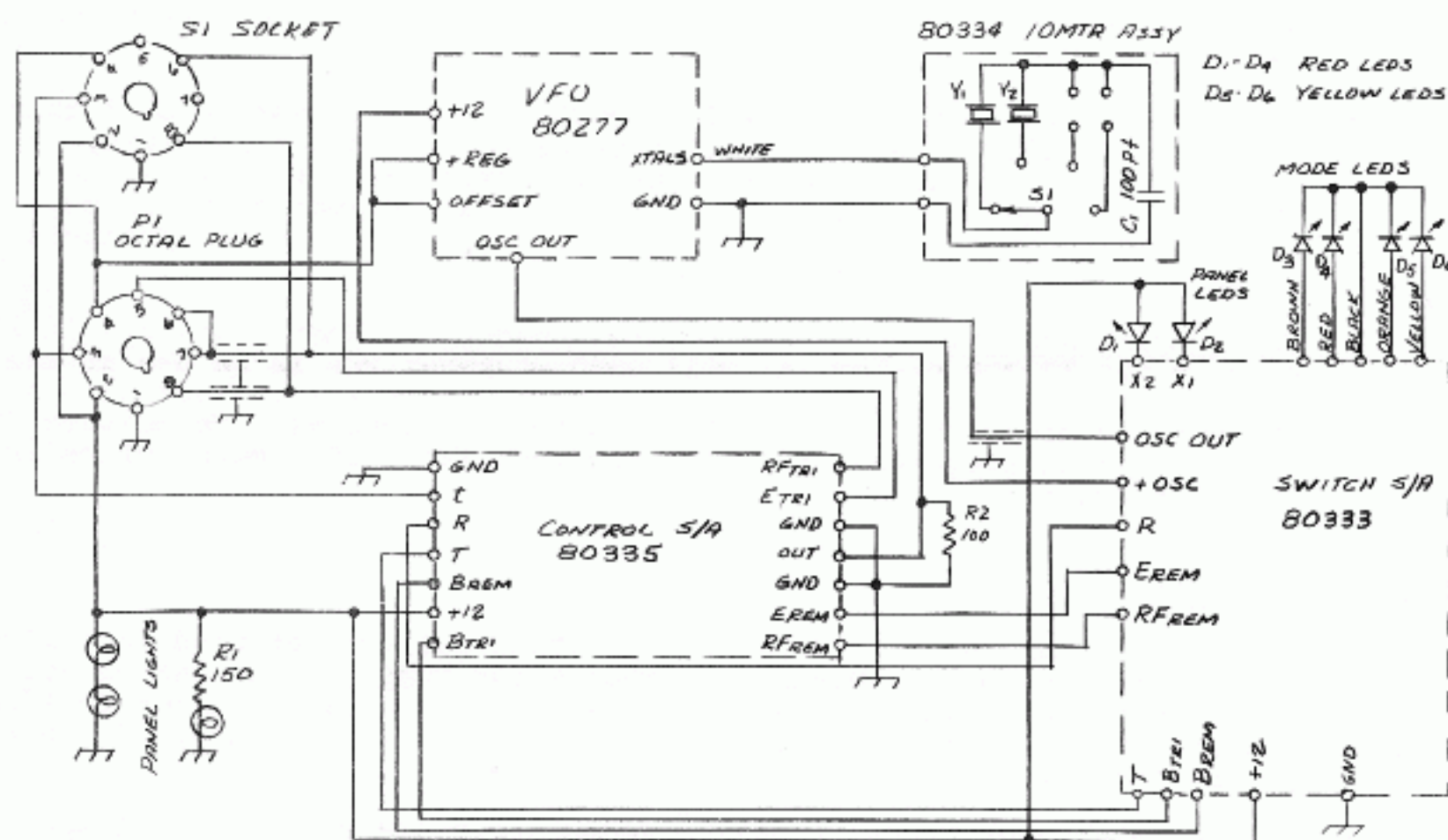


Q1 on this assembly is a FET Colpitts crystal oscillator whose output is fed to emitter follower Q2. The oscillator circuit is continuously powered from the +12 volt buss and regulated to approximately 9.1 volts by zener diode D6. The emitter follower power source is switched on through S2c and the EREM buss line. S2a selects the desired crystal and S2b controls the voltage to either the X-1 or X-2 LED. Diode D7 maintains a constant rf level from the oscillator, independent of crystal frequency, activity or other characteristics.

# ALIGNMENT AND SERVICING

Please refer to the TRITON IV Owner's Manual for specific information on measuring voltages, removing plug-in assemblies, etc. This information appears on pages 3-1 to 3-3. The VFO subassembly in Model 242 is identical with subassembly 80277 in the TRITON, and information on alignment and servicing this unit is contained on pages 3-10 through 3-13. It is not repeated here. Subassemblies unique to Model 242 are described below.

## MAIN BLOCK DIAGRAM

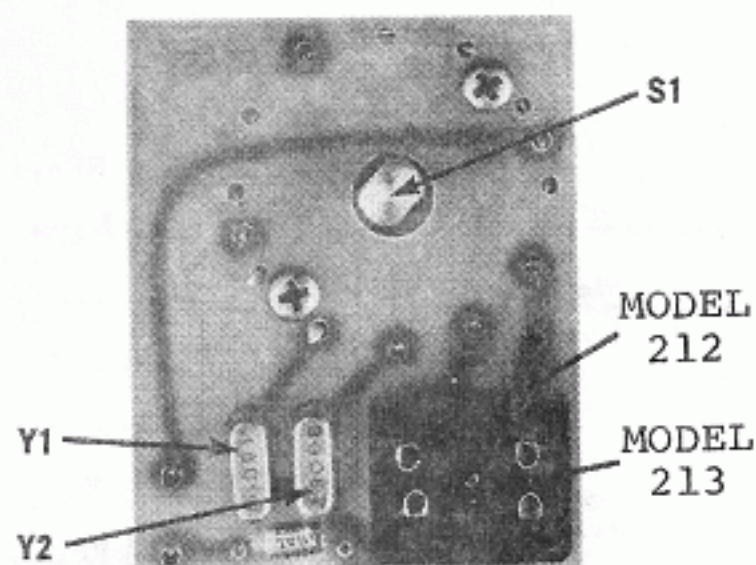


7-77 MODEL 242

## 80334 TEN METER ASSEMBLY

This small PC assembly is integral with the 28-30 MHz switch which selects the desired segment of the ten meter band. It only contains crystals Y1 and Y2, which provide coverage for 28.0 to 28.5 and 28.5 to 29.0 MHz, two crystal sockets for the additional ten meter crystals, Models 212 and 213, and the switch. There are no active components on this assembly and no alignment controls. Refer to photo below for crystal socket location and to main block diagram for schematic.





80334 TEN METER ASSEMBLY

# 80335 CONTROL ASSEMBLY

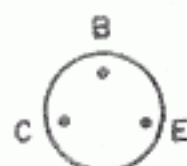
This plug-in assembly contains the secondary R and T voltage switches, Q1 and Q2, and the power transistor switches, Q3 and Q4, which provide operating voltages, ETRI and EREM, for the switched stages of the VFOs and rf emitter followers. Transistors Q5 and Q6, the rf emitter followers, feed a common output line which drives the TRITON mixer stages. No adjustments are required on this assembly.

Pin Voltage Readings - (REMOTE switch in VFO position, MODE switch in #3 pos.)

Pin	Transmit	Receive	Pin	Transmit	Receive
GND	0	0	RF <sup>REM</sup>	0	0
t	10.4	0.2	E <sup>REM</sup>	0	11.2
R	.05	12.8	GND	0	0
T	12.5	.05	OUT	0	0
B <sup>REM</sup>	.05	12.3	GND	0	0
+12	13.8	13.8	E <sup>TRI</sup>	10.8	0
B <sup>TRI</sup>	12.0	.05	RF <sup>TRI</sup>	0	0

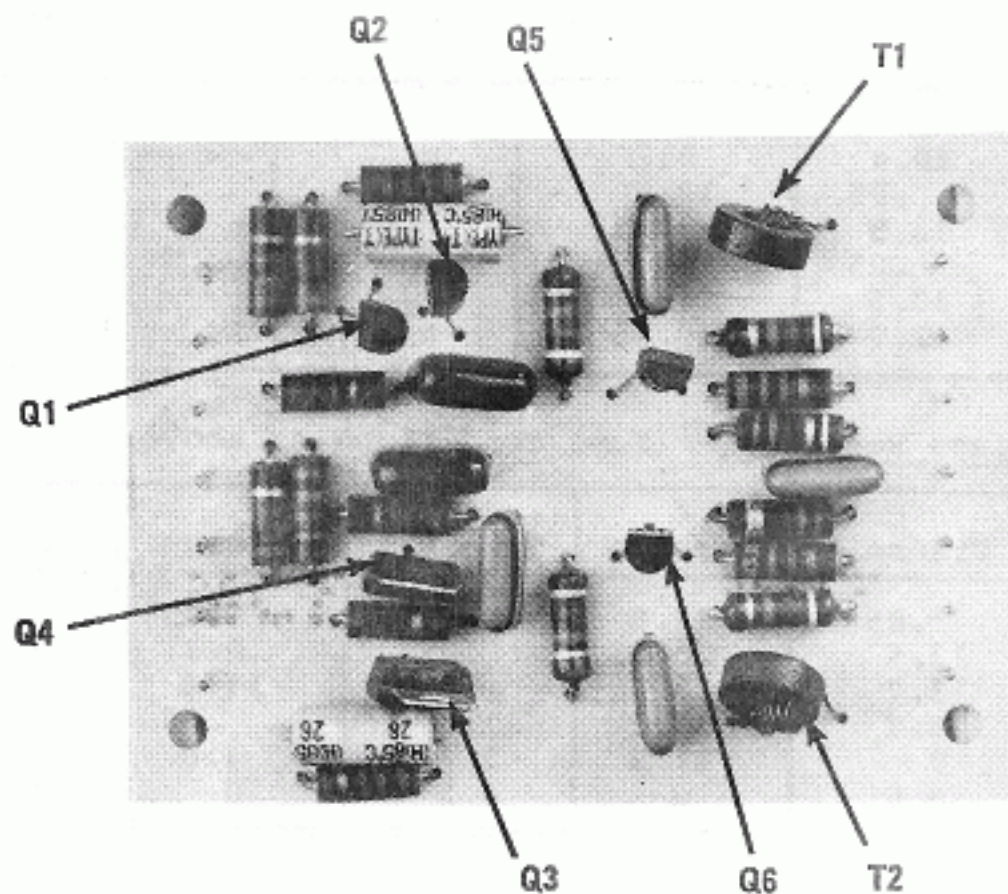
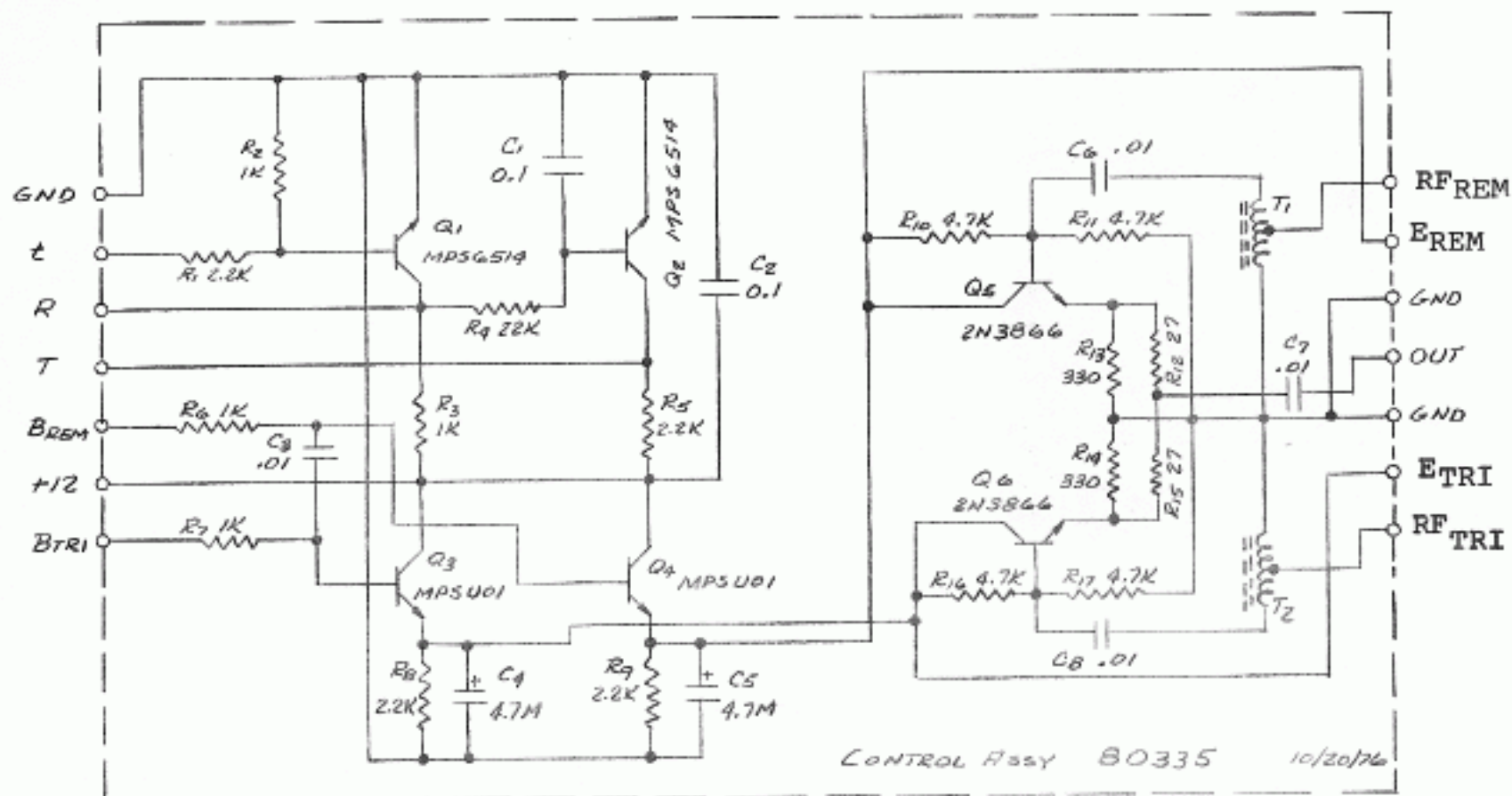
Semiconductor Voltage Readings - (Same conditions as above.)

Transistor	Collector		Base		Emitter	
	Transmit	Receive	Transmit	Receive	Transmit	Receive
Q1	.05	12.8	0.7	.05	0	0
Q2	12.5	.05	.05	0.7	0	0
Q3	13.7	13.7	.05	11.8	0	11.2
Q4	13.7	13.7	11.4	.05	10.8	0
Q5	0	11.2	0	4.8	3.5	4.1
Q6	10.8	0	4.8	0	4.1	3.5



Tabs on Q3 and Q4 are collector terminals.  
Transistor pins viewed from top of board.





80335 CONTROL SUBASSEMBLY



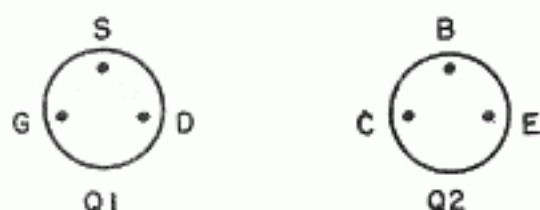
## 80333 SWITCH SUBASSEMBLY

This PC assembly is integral with the MODE and REMOTE front panel switches, and is mounted vertically behind the sub-panel. Steering diodes D2 through D5 apply the R voltage to the base of the proper power switch located on 80335 CONTROL assembly when receiving. This is determined by the position of the MODE switch. Diode D1 applies the T voltage to the bases when transmitting, as selected by the position of the MODE switch. The second wafer of this switch, S1c and S1d, apply voltage to the proper MODE LEDs, located on a separate small PC board behind the sub-panel. The crystal oscillator and its emitter follower are also on this assembly, along with the two crystal socket terminals and trimmer capacitors. These trimmers are adjusted for the correct operating frequency when the desired crystal is switched into the circuit by REMOTE panel control. The trimmer adjustments are the only alignment components on this assembly.

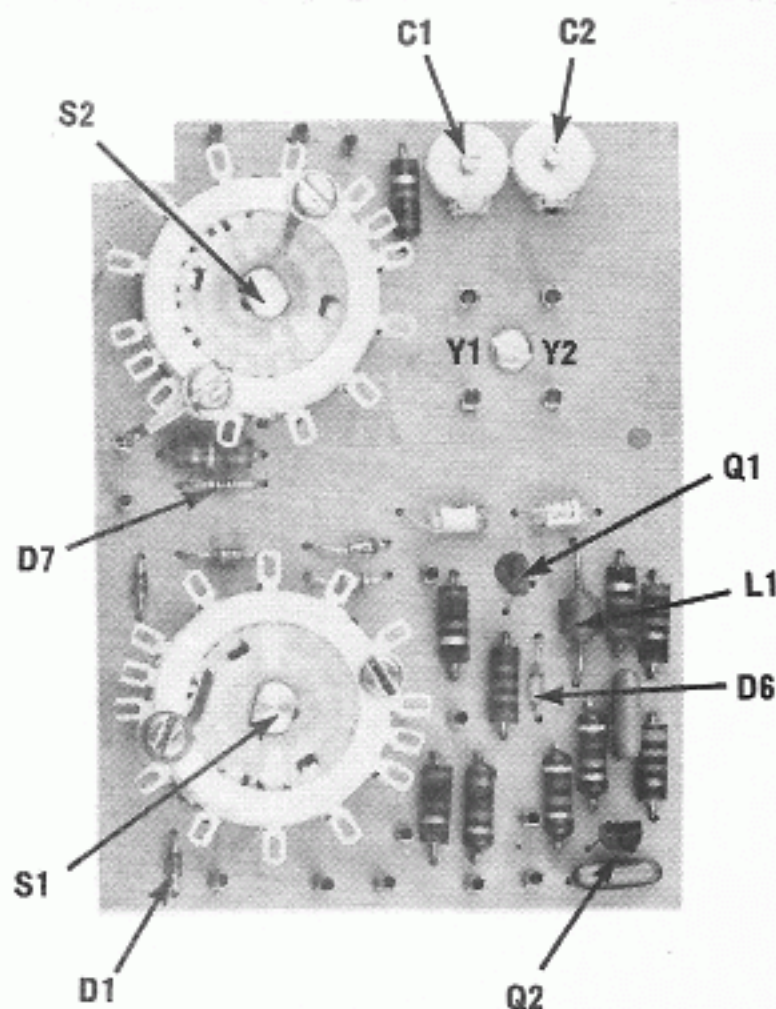
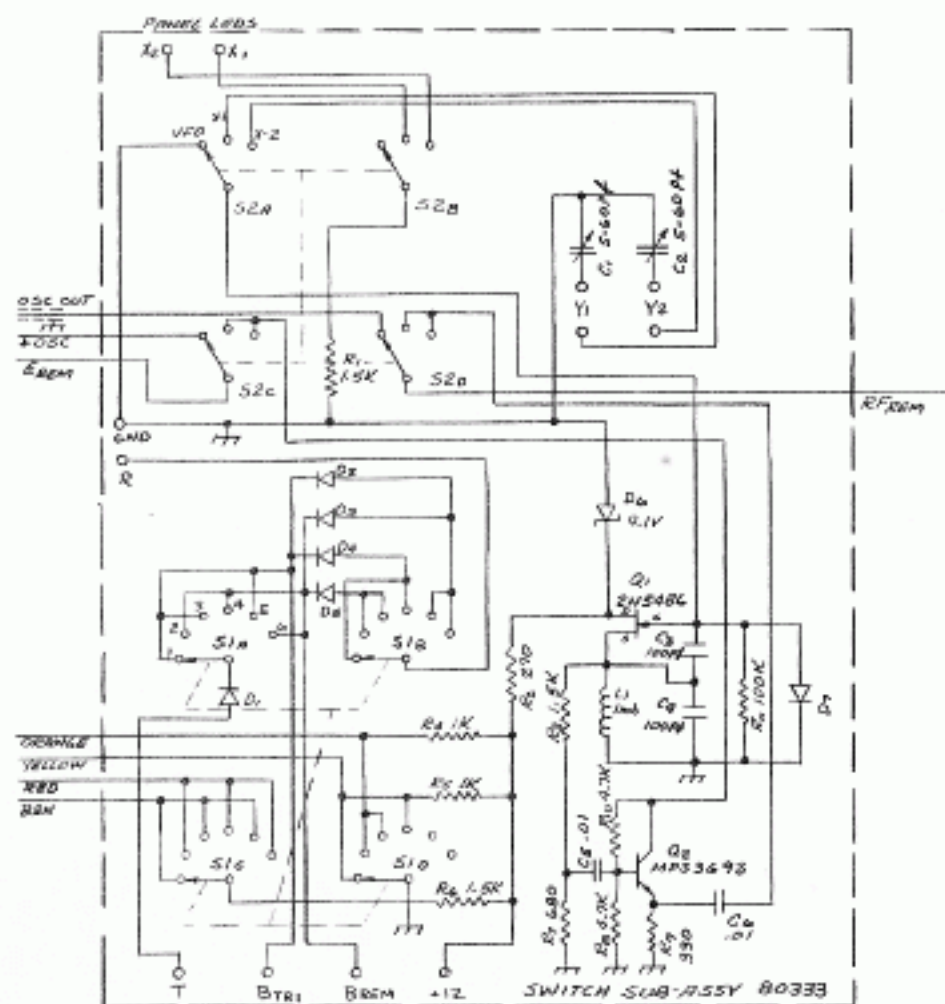
Since this assembly is not a plug-in, only semiconductor voltages are given.

Semiconductor Voltage Readings - (REMOTE switch in X-1 position; crystal installed in X-1 socket; MODE switch in #3 position.)

Transistor	Drain/Collector		Gate/Base		Source/Emitter	
	Transmit	Receive	Transmit	Receive	Transmit	Receive
Q1 FET	9.1	9.1	0	0	0.1	0.1
Q2	0	11.1	0	5.0	0	4.3



Transistor pins viewed from top of board.



80333 SWITCH SUBASSEMBLY



## Service Note SN-1-540

When using TRITON IV accessories that plug into the ACCESSORIES socket on the rear panel of the unit, several procedures should be followed, especially when more than one accessory are used in the station set-up. The order in which the accessories are serially connected, and the required jumpers and their location, be it on a dummy plug or in one of the cable connectors, are outlined below for all possible combinations. Accessories requiring these procedures are:

Model 240	One-Sixty Converter
Model 241	Crystal Oscillator
Model 242	External VFO
Model 244	Digital Readout

In order to simplify these procedures and instructions, it is recommended that the VFO modification detailed below be made, even though the external VFO, Model 242, is not incorporated at this time. This modification will not affect the operation of any other accessory, provided that the jumpers in the accessories used are changed to agree with the information given in this Service Note. TRITON IVs with Serial Numbers greater than 1400 already have this modification.

## VFO MODIFICATION

This modification is necessary when using the external VFO, Model 242, so that the instant break-in feature of the TRITON system is maintained. Even though Model 242 may not be used at this time, performing the modification now will eliminate further alterations to the jumper positions in the future, and will bring TRITONs with S.N. below 1400 up to present day status. Modified units should be so noted by applying the adhesive label supplied to the TRITON rear panel near the ACCESSORIES socket.

- 1.) Remove top and bottom plates from TRITON IV.
- 2.) Remove SSB GEN. assembly, 80282, and bend fibre insulator up to expose cables underneath.
- 3.) Unsolder the three red wires that are attached to the thru-terminal on the right top side of the VFO compartment. This terminal is the one farthest to the rear of the TRITON and is the +12 volt line.
- 4.) Locate the one red wire that runs to the 47 ohm resistor on the terminal strip near the meter lamp. Clip this wire from the resistor.
- 5.) Work the remaining two wires back through the harness ties to where they emerge from under the CONTROL BOARD assembly.
- 6.) Twist these two leads and dress them to the 47 ohm resistor lug just mentioned. Solder.
- 7.) Unsolder the orange lead from the center VFO thru-terminal and resolder it to the one that had the three red leads. (This lead goes to pin 5 of the ACCESSORIES socket.)
- 8.) Take the discarded red lead and solder it between the center thru-terminal on the VFO compartment and the second terminal lug from the right on the front PC socket for the SSB GEN. assembly. This lug is the + regulated line and should already have an orange and a white lead in place.
- 9.) Lay fibre insulator back down and replace SSB GEN. assembly.



- 10.) Remove top plate of VFO compartment.
- 11.) Locate and remove red wire running from rear thru-terminal to PC assembly inside of compartment.
- 12.) Solder one millihenry choke between these two points. Replace top and turn TRITON over.
- 13.) In bottom section of VFO compartment locate and unsolder white wire going to wafer switch mounted on rear inside compartment surface.
- 14.) Resolder this lead to the solder dot on the center switch wafer immediately opposite the lug just vacated. In other words, transfer this lead from the rear wafer to the corresponding lug of the center wafer.
- 15.) With a piece of bare hook-up wire about 3/4" long, jumper the vacated lug on the rear wafer to either adjacent lug with green leads already attached. Turn TRITON right side up.

Due to the added current drain through pin 2 of the ACCESSORIES socket when several accessories are used, the voltage drop and power loss of L1, the small choke in series with the +12volt line may become excessive. The following steps rewire the circuit so that pin 2 of the socket goes directly to the power supply line instead of through L1.

- 16.) Locate the red lead going from pin 2 of the ACCESSORIES socket to the top lug of the four lug terminal strip mounted on the chassis side near the socket. Unsolder only this lead at the terminal lug location.
- 17.) Resolder this lead to the fuse post body terminal, the one with the heavy red lead going to the final amplifier assembly.
- 18.) Again referring to pin 2 of the ACCESSORIES socket, locate the second red lead soldered to it -- the one going through the chassis grommet to the bottom side of the chassis. Unsolder only this lead from pin 2 and feed it back through the cable tie to gain additional free length.
- 19.) Re-route the lead under the socket to the top lug of the terminal strip and solder.
- 20.) Replace top and bottom plates. Affix label noting mod. change to rear panel.
- 21.) If dummy plug for socket has jumper between pins 4 and 5, remove and jumper pins 2 and 5.

NOTE: To determine whether an existing TRITON IV has the VFO modification, slide back the top plate and note the wires going to the VFO thru-terminals. If a single orange lead is connected to the rear-most terminal, the modification has been made. If there are three red wires at this terminal, the modification has not been made.

IT IS VERY IMPORTANT FOR PROPER VFO OPERATION THAT PINS 4 AND 5 OF DUMMY PLUG BE JUMPED IF MODIFICATION IS NOT INCORPORATED AND PINS 2 AND 5 IF MODIFICATION IS MADE. FAILURE TO COMPLY WILL RESULT IN UNSTABLE VFO PERFORMANCE.

#### INTERCONNECTING ACCESSORIES

The table below shows all possible accessory combinations that are workable as a system, the jumpers required and their location. When two or three accessories are used together, serially connect them in the same order as listed. Models 241 and 242 and Models 241 and 244 cannot be used together.



SYSTEM	JUMPERS REQUIRED	LOCATION OF JUMPERS	LOCATION OF DUMMY PLUG	NOTE
TRITON alone	2 to 5 * 6 to 7 to 8	Dummy Plug	TRITON	
TRITON to Model 240	2 to 5 * 6 to 7 to 8	Dummy Plug	Model 240	
TRITON to Model 241	6 to 7	241 Plug **	Not Used	
TRITON to Model 242	6 to 7	Dummy Plug	Model 242	VFO Mod. Required
TRITON to Model 244	2 to 5 * 6 to 7 to 8	244 Plug	Not Used	
TRITON to Model 240 Model 241	6 to 7	241 Plug **	Not Used	
TRITON to Model 240 Model 242	6 to 7	Dummy Plug	Model 242	VFO Mod. Required
TRITON to Model 240 Model 244	2 to 5 * 6 to 7 to 8	244 Plug **	Not Used	
TRITON to Model 242 Model 244	6 to 7	244 Plug **	Not Used	VFO Mod. Required
TRITON to Model 240 Model 242 Model 244	6 to 7	244 Plug **	Not Used	VFO Mod. Required

\* Pins 2 to 5 if VFO modification has been made. Pins 4 to 5 if modification has not been made.

\*\* Other wires and/or cables may be connected to pins 6, 7 and 8 which should not be changed.