Modifying the Triton IV for FSK Operation

(Probably adaptable to other PTO style Ten-Tec Transceivers)

KG6TT Comments: *I am not sure of the original source of this modification, although I don't believe it came from Ten-Tec.*

As originally written the mod was developed for the Triton IV, model 540, but would surely work as stated for the model 544 as well. My copy was in very poor I retyped it for clarity and minor corrections/additions.

With a little reconfiguration regarding connection points it should work equally well for other PTO style Ten-Tec transceivers such as the Omni A and D transceivers, the Corsair family and even the original Delta. I am not sure I would attempt this on an Argosy or a Scout due to the 100% duty cycle characteristic of FSK operation and of course the Scout's unusual frequency stabilizer via microprocessor control would be an issue too. Whether you use a Triton, Omni, Delta, or Corsair you might seriously consider adding a cooling fan to the rig's external heat sink (Ten-Tec sells an optional fan assembly for the Orion/Jupiter/Pegasus that also mounts directly on the rigs I already mentioned (not the Argosy or Scout). These rigs are rated at full output at 100% duty cycle but without a fan that heatsink can get painfully hot to the touch.

One possible drawback of this FSK modification is that since you are operating basically in a modification of the rig's CW mode, the received tone pairs would not have the high tone offset of traditional FSK, instead you would have a low-tone offset based on the transceiver's 750Hz CW offset (plus or minus 170Hz… not sure which). However, modern computer programs like MMTTY allow for the use of non-standard receive tones and to easily reverse the tones should they be reversed (but older hardware-based RTTY terminals may not be so forgiving). Still, as you are operating in the Triton's CW mode, the CW-1 (narrow) position should provide reasonable receive characteristics for 170Hz shift.

On to the mod…

To implement this modification you will need the following parts:

a) a small 10,000 ohm trimpot (recommend a multi-turn variety)
b) a mercury wetted (fast) contact relay such as a CLARE #HGSR51111M00
c) a small diode (1N4148)
d) a DPDT switch or a small DPDT relay (12vdc coil)
e) two panel jacks or 'pig-tails' to interconnect the modified transceiver to the incoming FSK and PTT signal lines (RCA style?)

(Both relay types are available through Radio Shack as are 1N4148 diodes)

TEN-TEC
Early S.N. Triton IV Modifications
Published April 5, 1976

In the several months that the TRITON IV has been in production, only two minor modifications have been made. You may or may not deem them important enough for you to incorporate into your transceiver, but they are given here for your information.

First Modification – Lowering Value of Regulated Voltage (SN 800 to approx. 1170)

The regulated voltage from the integrated circuit regulator IC-1 on CONTROL BOARD was originally designed to be 9.0 volts. In some cases, where the TRITON is powered from a storage battery with less than full charge, the regulator tended to drop out of regulation under load, due to the battery voltage dropping. This may cause FMing in a SSB transmission, or a slight chirp in CW. To correct this, the value of voltage was lowered to approximately 8.0 volts by changing the value of R24 on the CONTROL BOARD from 1k to 2.2k. Referring to the photograph on page 3-36, the resistor in question is the one between the resistor mounted on end and the 270 ohm horizontal resistor to the right of IC-1.

Because of this change, the voltages read at the +REG terminals of the VFO, CONTROL BOARD and IF-AGC assemblies will be 8.0 volts.

Second Modification – Changing RF Control Characteristics (SN 800 to approx. 1145)

On page 2-9, Operating Hint 11 tells of a method to overcome possible receiver front-end overload in the presence of strong signals. Although this method is effective, an improvement in the cross-modulation characteristics of the transceiver can be achieved with this modification. It results in the RF amplifier gain being reduced at a faster rate as the RF control is turned CCW than before as compared to the reduction in the I-F gain with the same control.

The modification consists of adding one resistor and a zener diode to the main chassis assembly, the change in value of one resistor already on the chassis and re-wiring of the center pin on the CRYSTAL CALIBRATOR socket to gain a tie point. Materials needed are readily obtained from any pats distributor, but should you not be able to obtain them, we will send them to you on request. When writing, please include our Serial Number. Parts needed are: 1 – 2.2k, ½ w resistor; 1-33k, ½ w resistor; 1 – 8.2 volt zener diode (1N756A, 1N5734A or equivalent.); one ft. hook-up wire.

1.) Referring to Page 3-6, locate and remove aluminum rack plate over the R.F. AMP assembly. It is held in place with four screws. Do not rotate slugs or otherwise move them from their settings.

2.) Locate bare jumper wire on R.F. AMP. Assembly, just over Q1 in photograph on page 3-9. Clip this wire in two places and remove piece.
3.) Re-assemble rack cover plate. Turn TRITON over and remove bottom plate.
4.) Locate CRYSTAL CALIBRATOR assembly. Remove three screws holding assembly in chassis and unplug from socket.
5.) Solder one end of 2.2k resistor to terminal with green wire (DEFEAT), and the other resistor lead t unused terminal next to it.
6.) With diagonal cutters, clip off the bottom part of center terminal pin on CRYSTAL CALIBRATOR assembly. Cut should be made as close to PC board as possible so that when assembly is re-inserted into socket, pin stub does not contact socket lug. (This terminal is marked +12 on calibrator schematic, but is unused because a second +12 terminal on this assembly is actually used.)
7.) Solder one end of approximately one foot of hook-up wire to lug with only the 2.2k resistor lead. Dress lead toward front of unit to RF control location.
8.) Reinstall calibrator assembly.
9.) Locate the three lug terminal strip mounted on front sub-panel near the RF control. The strip is visible through cutout in the bottom as shown on page 3-7.
10.) Remove white wire from the lug nearest the RF control and solder it to the left lug of the control – the lug with blue striped white lead already in place.
11.) Remove the 10k resistor from right control lug and ground lug of terminal strip and replace it with a 33k resistor.
12.) Install a 8.2 volt zener diode (1N756A, 1N5734A or equiv.) from left lug on the terminal strip to center lug. Diode cathode, which is indicated with a band, goes to the left lug and anode lead to center lug.
13.) Solder free end of the hook-up wire from calibrator assembly to center lug of the terminal strip.
14.) Re-assemble the transceiver.

TEN-TEC SERVICE NOTE
SN-2-540

Subject: Receiver reed relay malfunction in the TRITON IV.

We have had a number of instances recently where the reed relay on the SWR-ALC assembly 80284 does not consistently close to connect the antenna to the receiver input circuit after transmitting. The received signal is either completely lost or much reduced in strength whenever this condition presents itself.

It was first thought that contaminants in the reed switch worked their way between the contacts, but on checking a defective relay with an ohmmeter, it usually was found to be OK. However, when switching circuits without any voltage or current present, as is the case with the antenna input circuit, it was found that a film builds up on the contacts which results in the malfunction observed. Either a small voltage or current through the contacts is sufficient to break the film. The ohmmeter provides this necessary ingredient for proper operation, but the antenna circuit does not.

To remedy the problem we have added a resistor on the assembly so that a small DC current passes through the contacts in both receive and transmit modes. It is suggested that this modification be made on all Model 540 transceivers with serial numbers between 00800 and 01749 and also between T-1000 and T-1265.

To perform the modification, simply solder a 10k ½ watt resistor to the pins on the SWR-ALC assembly designated Rx ANT and +12. This can be done on the top side of the assembly. (The Rx ANT terminal is the end one near diodes D4 and D5. The +12 terminal is the center terminal of the seven in line.) See manual, page 3-32.

You should notice an immediate cure to the “sticky relay problem, but with a minute or so of continuous T/R cycling, the contacts should thoroughly break the film and provide reliable relay operation.

TEN-TEC

Improving the TRITON IV's Receiver Dynamic Range

Published December, 1976

(*KG6TT Comment: This was extracted from a letter sent from Ten-Tec to new Triton IV owners.)*

We have incorporated another modification in the TX-RX MIXER assembly to further improve receiver dynamic range. This mod is in addition to the one in the RF gain control circuit. It is suggested that it be made only if you are experiencing cross-mod problems from a station on the same band and in the immediate vicinity of your QTH. If incorporated, the S-Meter will need re-calibrating (R20 on IF-AGC assembly). The component changes on the TX-RX MIXER assembly are as follows:

Component	Old Value	New Value
R2	180 ohms	100 ohms
R3	10k	2.2k
R6	1.5k	470 ohms
R7	820 ohms	470 ohms
C2	.01 mf	24 pf
Add C20		.001 mf across R3

If we can be of any possible assistance, please do not hesitate to write. It is one of those extra benefits you get by buying American made products.

73,

The TEN-TEC Staff

GENERAL INSTRUCTIONS
TEN-TEC TRITON IV ACCESSORIES

Service Note SN-1-540
Part Number 74063

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 jumps 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 and orange and a white lead in place.

9.) Lay fibre insulator back down and replace SSB GEN. accessory.

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 ¾" 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 +12 volt 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 soldering 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 resolder.

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 tip 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 area three red wires at this terminal, the modification has not been made.

IT IS VERY IMPORTANT FOR PROPER OPERATION THAT PINS 4 AND 5 OF DUMMY PLUG BE JUMPERED 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 what are workable as a system, the jumpers required and their location. When two or three accessories and used together, serially connect them to the same order as listed. Model 241 and 242 and Models 241 and 244 cannot be used together.

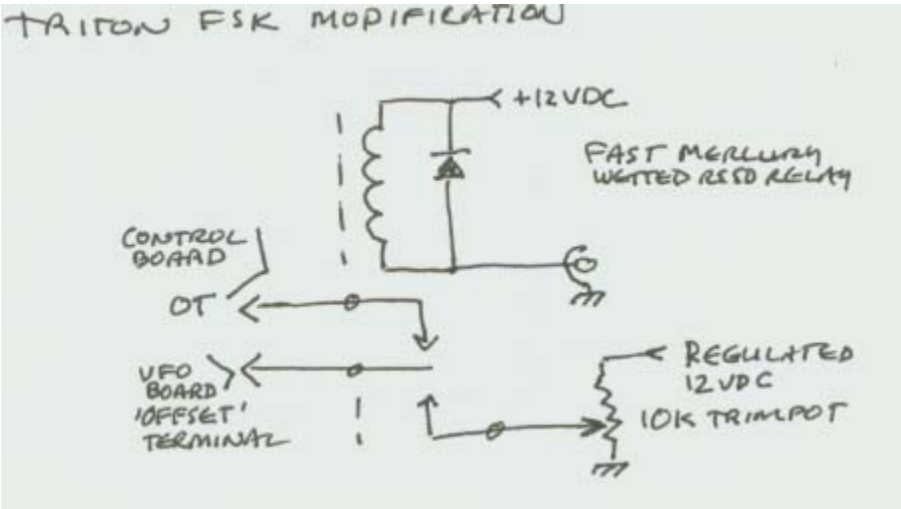
SYSTEM	JUMPERS REQUIRED	LOCATION OF JUMPERS	LOCATION OF DUMMY PLUG	NOTE
TRITON alone	2 to 5 *	Dummy Plug	TRITON	
TRITON to Model 240	2 to 5 * 6 to 7 to 8	Dummy Plug	Model 240	
TRITON to Model 241	6 to 7	241 Plug **	Not Used	Coax to Pin 6 Coax to Pin 8
TRITON to Model 242	6 to 7	Dummy Plug	Model 242	VFO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

* 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 that should not be changed.

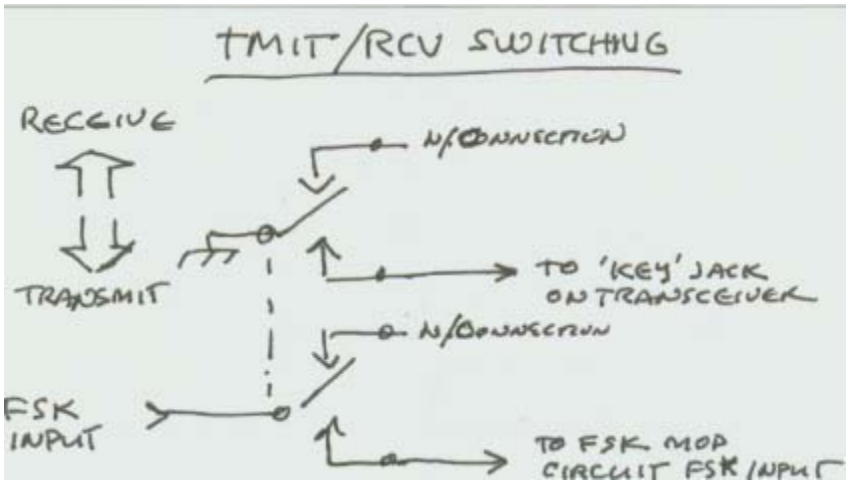
Then:

1. Remove top cover of TRITON and locate the control board which is located at front right side.
2. Mount the outer terminals of the trimpot between the TREG and GND terminals on the Trion control board.
3. Mount the relay on the panel behind the control board. Note that relay must be mounted in a vertical position. The relay is easily glued to the panel.
4. Remove the existing wire from control board terminal “OT” and connect it to Relay common terminal. Connect a wire for the relay NC (normally closed) terminal to terminal “OT”. Connect a wire from the center (adjustable) trimpot terminal to the NO (normally open) relay terminal.
5. Connect one side (+) of the relay coil to +12vdc on the TRITON control board. The other Relay coil terminal is the FSK line and should be brought to a phono jack on the TRITON rear panel. The existing ‘sidetone’ phono jack may be disconnected and used as your new FSK jack.
6. Connect the small diode across the relay coil terminals (cathode of diode to +12vdc relay terminal).



To adjust for the proper 170Hz shift you will need a frequency counter. Connect the frequency counter to the TX VFO output that is available at pin 6 on the TRITON rear panel accessory socket. Turn the transmitter on by placing the front panel mode switch in the lock mode. With the FSK line ungrounded, note the VFO frequency. Now ground the FSK line and adjust the trimpot for 170Hz offset.

For RTTY operation you will find it convenient to install a XMIT/RCV DPDT switch that should be placed for your convenience. Optionally a small DPDT 12vdc relay could be used for this function with the relay activation controlled by the PTT signal coming from the FSK device (i.e. TNC or computer). This switch or relay should be wired as illustrated below:



For RTTY operation place the TRITON in CW mode. In the receive position the normal RIT function will be operative. In the transmit position the carrier will be turned on and you are in position to frequency shift key your transmitter for RTTY operation.

TEN-TEC SERVICE NOTE
TN-1-540
11-76

To: All Triton IV Owners

Subject: Zero Beating Triton IV to incoming CW signal. A modification that you may want to make.

Many times there is more than one way to accomplish a given objective. A case in point is the method of tuning a transceiver on CW so that the transmitted signal is on the same frequency as the incoming signal.

In the case where separate transmitter and receiver units are used, it is an easy matter to tune the exciter portion of the transmitter on and match both carriers in the receiver. With transceivers, this is an impossibility because both sections cannot function simultaneously, having some portions common to both. It wouldn't be a problem except for two reasons. First, the incoming signal, to be heard, must be tuned off the zero beat point so that an audible signal is produced. Second, when a single crystal filter is used t develop the SSB signal for both transmitter and receiver (where the carrier frequency is well down one side of the passband characteristic), it is necessary to shift the CW carrier up this skirt so that it is well within the filter passband.

Early model SSB/CW transceivers neglected to take into account these factors, and the "leap-frogging" phenomenon was prevalent. Offset or incremental tuning solved this problem, but the method of tuning in the station to the desired beat note varied, depending on the scheme of developing the CW carrier used. In TRITON, we shift the 9 MHz carrier generator 750 Hz up into the passband of the filter when transmitting CW, and back down to the skirt when receiving. If we did not go down the skirt, the received signal would have audible beats on either side of the zero point – a condition that not only causes confusion when tuning in a station as to what is the correct side to have the transmitter correct, but also causes twice the QRM problem. An interfering station may be on either of the two sides of zero beat instead on one. With this scheme, the transmitter will be set to the incoming frequency whenever the received signal is set to a 750 Hz beat, provided that no receiver offset is involved. If it is, no telling what the transmitted frequency is.

To make setting of the beat to 750 Hz easier, we designed our model 245 CW filter to have a passband centered at 750 Hz. Therefore, when the S-meter is peaked on the incoming, and OFFSET is disabled or centered, the transmitter frequency will be on target. For the purist who really wants to get <u>exactly</u> on frequency, S-meter peak is not well defined, or the OFFSET, if engaged, may not be set exactly to the center position. For these fellows, we have a modification that will permit exact setting of the transmitter. We don not intend to incorporate this change into our production units, however, since

there is a slight sacrifice in control flexibility in another area[1]. It is purely a matter of choice.
The modification is simple and requires the addition of only one 10k resistor. When installed, the OFFSET control will retain its normal function in both SSB and CW when engaged, but when the knob is pulled out, and only when the MODE switch is in the CW positions, the 9 MHz carrier generator will be shifted into the passband when receiving by the same 750 Hz that it is when transmitting. With this shift, the receiver will now show beat notes on either side of zero beat so that the incoming signal can be set to zero beat easily (*KG6TT comment: Just tune to the audible null in the middle*). And, because this shift is now present in both receive and transmit modes, the transmitted frequency will be as close to the incoming frequency as you can set the zero point. (When using this circuit, you will automatically disable any possible receiver offset error, since the OFFSET control has to be pulled out to attain these conditions.)

To make the modification, proceed as follows:

1.) Remove top from TRITON IV.
2.) Remove all screws from bottom plate except those holding the speaker bezel and snap-down legs. The bottom can then be slid back several inches – all that is necessary.
3.) Remove CONTROL BOARD. Position TRITON in front of you so that it is upright and with front panel toward you. CONTROL BOARD should then be to the right side of the unit. Turn back fishpaper so that sockets are exposed.
4.) Clip one lead of the 10k resistor to 3/8" length and solder this lead to the third lug from the left on the CONTROL BOARD socket nearest to you. This lug should already have a solid grey and grey/white stripped lead.
5.) Clip the remaining resistor lead to ¼" and solder a 10" length of hook-up wire to it.
6.) Using a 1" length of 1/8" diameter plastic tubing (plastic soda straw is OK) (*KG6TT comment: heat shrink tubing works nice for this*), slide it over free end of wire and all the way over resistor and solder splice. Dress resistor down to chassis and free end of wire through hole in chassis under panel meter, and over to MODE switch location.
7.) Replace CONTROL BOARD.
8.) Locate small transistor wired to lugs on rear deck of MODE switch. Note that there is a 10k resistor soldered to center (base) lead. Trim any excess length from hook-up wire, strip and 1/8" and tack solder it to this junction. It is suggested that the wire be soldered to the resistor portion of the lead and not to the transistor lead.
9.) Slide back bottom plate and insert screws.

Note: This modification in no way affects the operation of the TRITON IV on sideband. The normal tuning procedure is to tune in the station for the most natural tone quality with OFFSET either centered or off. The transmitter will then be on the same frequency. HOWEVER be aware that if you tune a CW signal in the SB-N position, or a sideband signal in the CW-2 position, the

tuning system reverts to the normal TRITON system in the first case, and is not correct in the second. If cross mode positions are used, make sure that OFFSET control is engaged.

[1] I believe this modification became a standard component of the ‘digital’ version of the Triton IV (Model 544) and later with the first Omni and Corsair transceivers – KG6TT