

Midland Syntech Repeater and Bi-directional Repeater Link Modification

Revision August 2007 skipp025@yahoo.com

Introduction: Two Midland Syntech Mobile Radios make a very nice Repeater or Bi-directional Link Station when properly modified. For straightforward duplex repeater operation only the receive radio is modified to supply valid carrier operated squelch logic, audio and ground connections. In a Bi-directional Link Station configuration both radios receive the exact same modifications described below.

Description: A 2N7000/VN10 FET controlled Dual Pole, Dual Throw Relay supplies valid COR output logic from a repeater receiver system in addition to a transmit lock out function in both radios when used for a bi-directional link station. Both the repeater and bi-directional radios may be the same or mixed band and frequency range.

Audio, Transmit and COR Logic use the same rear panel Molex type connector. Some of the unused and reconfigured rear panel Molex Jack connections are rewired to support this modification. The small DPDT Relay is easily anchored inside the radio on the chassis next to the receiver board using RTV Silicone Adhesive. After the FET Relay Control Circuit is constructed right on top of the relay and the entire assembly is mounted inside the radio, most of the remaining modification involves simply routing wires.

Relay Interface: The small 12 Volt DC Dual Pole, Dual Throw Relay is keyed on/off by a small 2N7000 FET wired to negative lead ground start with a valid audio (speaker on) logic supplied from the receiver squelch circuit. A Midland VHF 70-340/341 Radio supplies Relay DC Power (pin 6), Ground (pin 1) and COS (a control voltage on pin 2) from a normally unused Receiver Board J-359 location. With a bit of homework the same relay control connections may be located in other radio models with different circuit board layouts. One early version of this modification in a Midland 8 channel radio used a valid sub-tone detected logic line routed from the CTCSS/DCS board. The 70-340/341 relay connections made using the described J-359 solder pads allow both user selected Carrier Squelch and CTCSS control using the receive radio front panel Monitor Button.

A 2N7000 FET is wired to negative lead key (ground start) the 12 Volt DPDT Relay. The FET Drain Lead is soldered to the relay coil minus or negative side. The FET Source Lead is routed to ground at J-359 pin-1. The same ground connection is also supplied to the wiper of one relay pole set. A 1N914 type diode is soldered across the relay coil to reduce the back EMF Voltage (Magnetic Field Collapse) Spike when the relay opens. A 470K-¼ watt resistor is placed in series with the gate lead connection to J-359 pin 2. An additional 1.2 Meg Ohm ¼ watt resistor is soldered from the FET Gate to ground to provide a voltage drain path and ensure the gate voltage will drop toward zero volts when the J-359 pin-2 control voltage is removed.

COR Logic: A valid received signal will open the squelch and provide enough DC Voltage at J-359 pin-2 to turn on the control FET. A short (yellow) wire is soldered from J-359 pin 2 to the FET Gate series path 470K Resistor. A short (red) wire is soldered from J-359 pin-6 to one side of the relay coil to provide the approximate 12-volt relay dc supply. A short (black) wire from J-359 pin-1 supplies ground to the FET Source.

Repeater Transmit Audio is provided from the receive radio speaker (positive) lead direct to the microphone input of the transmit radio. The higher level audio input used at the transmit radio microphone jack works very well with a direct speaker audio source. You can operate with the internal speaker enabled or disabled. Don't discount using this direct speaker out to microphone input audio connection method as the transmit audio at the radio mic input jack is normally amplified up toward consumer audio line level values by a 2-transistor preamplifier circuit within the hand/desk microphone.

Transmitter lockout prevents a valid bi-directional link radio from going into reverse direction transmit mode while a valid received signal holds the COR (relay) on. A valid receiver COR transmitter lockout function helps to prevent linked radio and repeater system transmit or receiver logic pumping based on detection of undesired

remote end long squelch tails. The external transmit key PTT (ground to transmit) Molex Jack logic input is routed through half of the available DPDT Relay section wired to be enabled only when the relay is off (no valid received signal present).

Remaining modifications and connections specific to the Midland 70-340/341 VHF Radio.

A few added internal wire jumpers and three of the rear Molex Connector/Jack connections are rewired to complete the complete bi-directional link radio modification. A standard repeater receiver radio need only provide valid COR, Ground, Receive Audio and the external transmitter key logic input may be omitted. The standard repeater transmitter radio may be used unmodified by simply routing the repeat key, audio and ground connections through the front panel microphone jack. Like the bi-directional modification the transmit radio required input connections may also be routed through the rear panel Molex connector. For normal repeater station operation the transmit radio front panel microphone jack is simple and easy.

The completed VHF Midland 70-340/341 bi-directional link radio modification requires the following steps:

Locate the unused floating end of red wire from rear panel Molex Jack pin-8. The other end of the pin-8 red wire has a small two-pin white plug designed and used with some option not normally included in the standard 70-340/341 Radio operation. The unused small white plug is cut off and the red wire becomes the external transmit key line input path when soldered to the normally closed pole of the relay lockout function.

The following two connections reuse rear panel jack positions not used or required for normal operation of the Midland 70-340/341 VHF Radios in repeater or link radio applications.

The brown wire from rear panel Molex jack pin-2 normally routes to Receiver Board J-351 pin-1. The wire is cut about ½ inch from J-351 pin-1 and routed as the Valid COR Output (active low to ground) Logic soldered to the relay second section normally-open pole. The original pin-2 function was to provide ground for the mic hang-up CTCSS circuit.

The brown wire from rear panel Molex Jack pin-1 normally routes to Transmit Board J-363 pin-1. The wire is cut about ½ inch from J-363 pin-1 and soldered as the external transmitter audio input to the back side of the front panel microphone jack pc-board location as shown in the pictorial diagram.

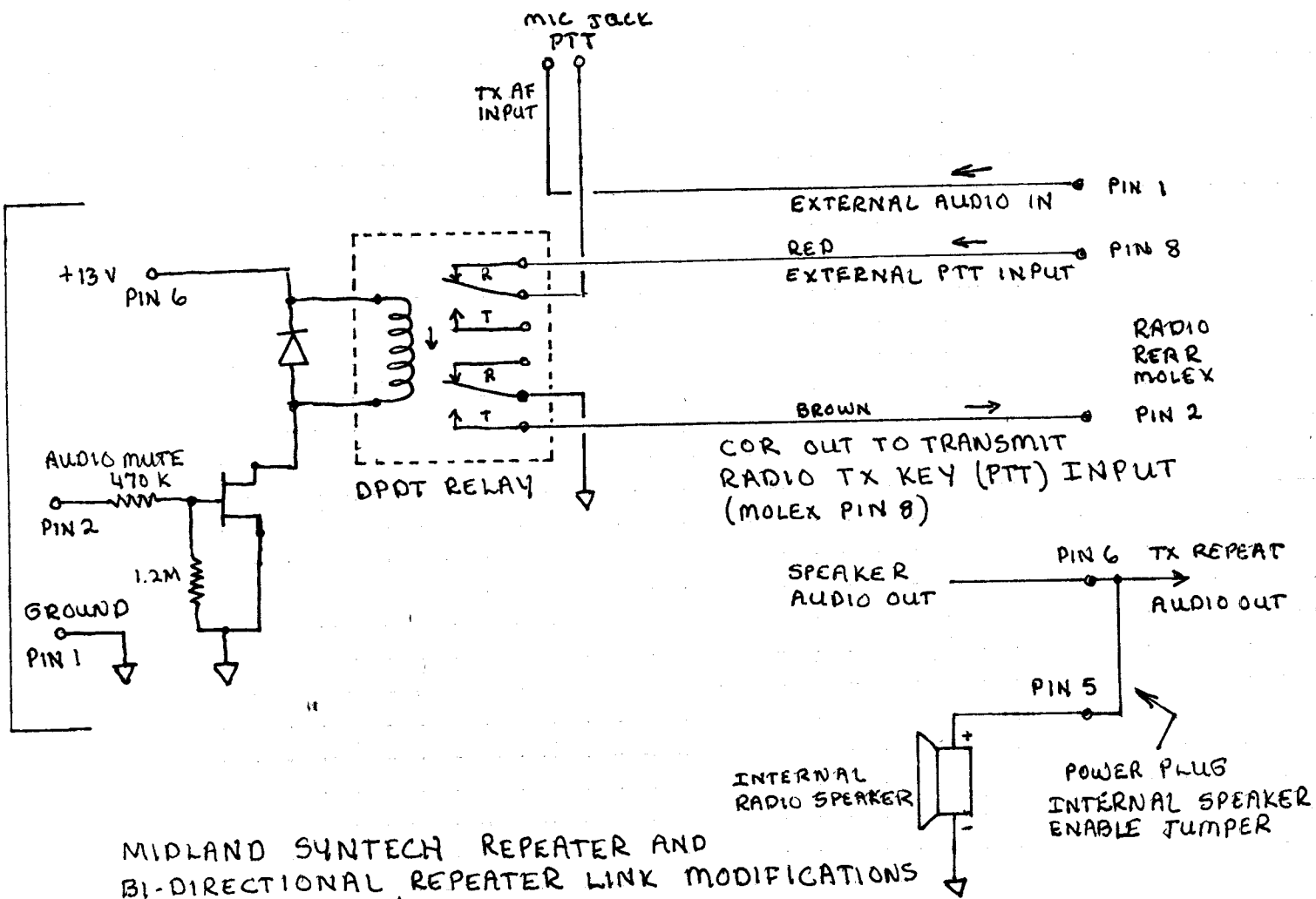
An added white wire is soldered and routed from the relay wiper used with the lockout function to the back side of the front panel microphone jack pc-board location as shown in the pictorial diagram. This wire provides the external transmit key function to the microphone input jack path through the relay in the normally off position.

Operation: The radio may be operated in both Carrier Squelch and/or standard CTCSS/DCS operation by simply programming the desired codes into the Eprom Module. In normal operation the receive radio front panel Monitor Switch position selects relay operation with Carrier Squelch or standard CTCSS/DCS. Carrier Squelch Operation is useful for quick checks and when setting audio levels.

Volume knob control-pot rotation from 1/3 up to 2/3-rotation set up a nearly ideal transmit audio level, which are best verified using a Communications Service Monitor. Higher receiver radio volume control setting simply add additional transmit audio compression. A modest amount of audio compression helps to bring up the average transmitter audio level. Excessive amounts of audio compression can make transmit audio hard to understand. The repeater and bi-directional link radio functions described in this text may be used with other radio brands and models providing you are able to properly adapt the provided information.

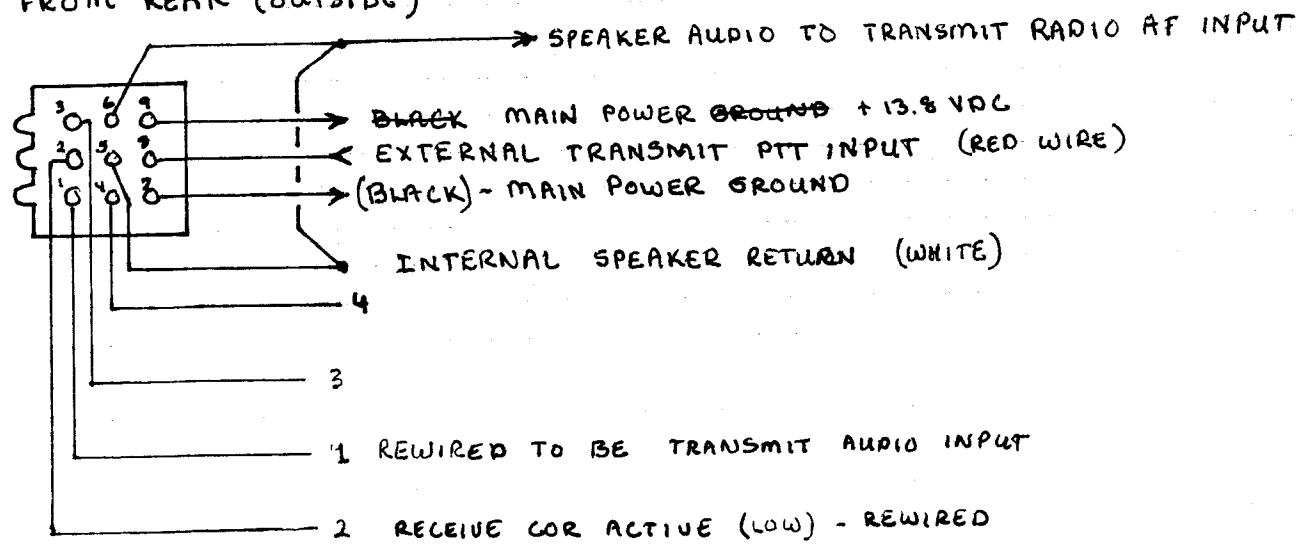
Good luck and enjoy,
Cheers,
Skipp

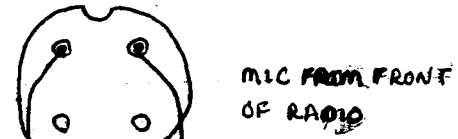
ALL USE J-359 RX BOARD



MIDLAND SYNTECH REPEATER AND
 BI-DIRECTIONAL REPEATER LINK MODIFICATIONS
 REVISION JULY/AUGUST 2007
 SKIPP Ø25 @ YAHOO.COM

LOOKING AT RADIO MOLEX
 JACK FROM REAR (OUTSIDE)



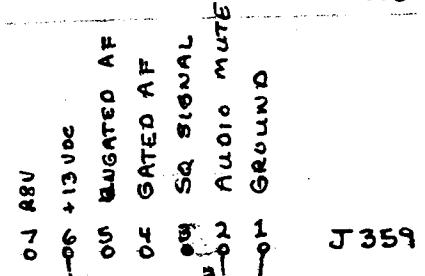


INTERFACE BOARD

TX-MIC AUDIO

BLACK GND

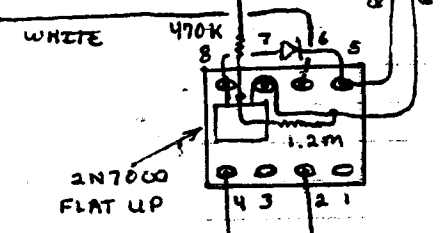
PTT-THROUGH RELAY FORMS RX VALID LOCKOUT FUNCTION
 * ONLY REQUIRED FOR BI-DIRECTIONAL OPERATION.



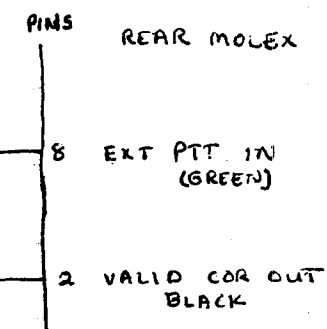
J359

connection to pin can be made to pin 3.

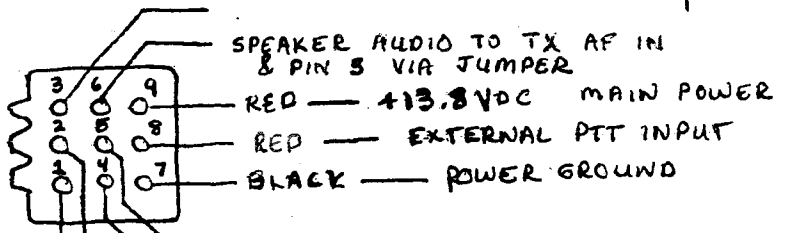
skipp025@YAHOO.COM



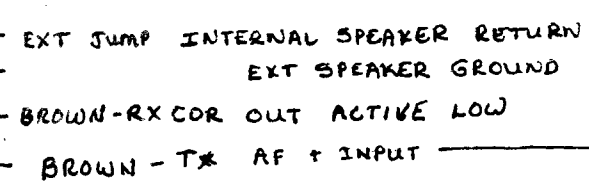
HASCO RELAY DPDT

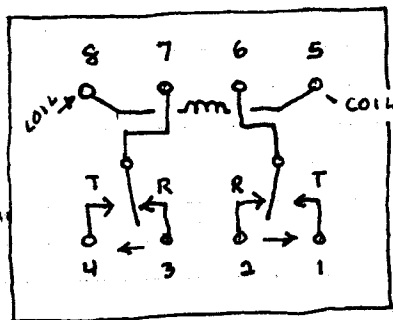


LOOKING AT RADIO MOLEX FROM REAR



MIDLAND SYNTECH TO REPEATER MODIFICATION

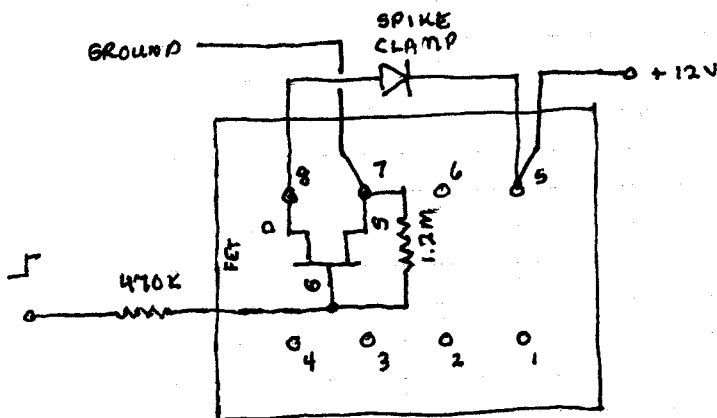




HASCO 12V DPDT RELAY
SSD203PU

USE ANY 12V DPDT RELAY
WITH A COIL RESISTANCE
GREATER THAN 100 Ω

PIN		PIN	
1	NO-A	5	COIL
2	NC-A	6	WIPER-A
3	NC-B	7	WIPER-B
4	NO-B	8	COIL



skipp.025@YAHOO.COM