

TN950

Daniels MT-4R and MT-4D with IFR 2975 by Aeroflex Test Procedures

***Technical Note for Tuning, Testing
Maintaining and Servicing
MT-4R and MT-4D P25 Digital Radio Systems
with the IFR 2975 by Aeroflex***

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This product has been discontinued and is no longer manufactured by Daniels Electronics Ltd.

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures

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Important Information

This Technical Note is intended as an aid to configuring and testing Daniels radios using an IFR 2975 Service Monitor by Aeroflex. Neither Daniels Electronics Ltd. or Aeroflex Inc. assume responsibility for damaged caused to either unit as a result of misinterpretation or misuse of this procedure. Daniels manufactured Products are warranted against defective materials and workmanship. This warranty does not extend to damage due to misuse, neglect, accident, improper configuration or installation. Daniels and Aeroflex shall be released from all obligations under its respective warranty in the event the Products are subject to misuse, neglect, alteration, accident, improper installation or testing, or if un-authorized repairs are performed by the Customer or others.

These procedures can be modified, changed and altered at any time to better suit your specific needs and requirements. The alarm points set in the IFR 2975 test set do not necessarily reflect a radio system that is not operating to specification. Refer to Daniels Electronics Instruction Manuals for complete radio system specifications.

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures

General Set-Up and Connections

Uploading Daniels Configurations:

The IFR 2975 allows for configuration files to be saved and recalled on the test set. These configuration files can also be uploaded to the test set from a floppy disk (files can also be uploaded from your computer if the test set is connected to your network).

The IFR 2975 configuration files are available from Daniels website at www.danelec.com under the links Library then Technical Notes (the file is located right below the link to this Technical Note). The file can be downloaded, then unzipped and copied onto a floppy disk (or transferred on the network).

Firmware version 1.8.1 or higher is required on your IFR 2975 to use these configuration files. To check the firmware version of the IFR 2975, go to System (7) then Version (3). If Version 1.8.1 or higher is not installed in the IFR 2975, go to www.P25.com for the latest update.

Insert the floppy disk into the drive and go to System (7) then Save / Recall Setups (6). Click on the BACKUP SETUP button on the right hand side of the screen. In the window that opens, click on the BACKUP TO button and select RESTORE FROM floppy. This will download the Daniels directory to the internal drive of your IFR 2975.

The recalled setups could affect some of the System Configuration settings on the IFR 2975 (such as the 10 MHz reference selection). You may need to change and re-save these saved files depending on your system configuration (eg. if you are using an EXTERNAL 10 MHz reference).

RF frequency and Modulation Type Settings:

After recalling a setup, the RF frequency will need to be changed to your specific RF frequency of the receiver and / or transmitter (except for the Reference Oscillator tests).

Also, after recalling a setup for the receiver or duplex tests, the IFR 2975 sometimes turns the MOD TYPE to OFF on occasion. This will need to be turned to either P25 or FM depending on the test. Once the MOD TYPE is selected the default settings will appear for the modulation. Please note that some of the setups that are recalled are generic and may need to be changed for your specific receiver and transmitter settings.

The generic saved setups are as follows:

Audio = 1000 Hz @ 1.5 KHz deviation (for wideband set this to 3.0 KHz deviation)

CTCSS = 100.0 Hz @ 0.35 KHz deviation (for wideband set this to 0.5 KHz deviation)

NAC = 293

TGID = 1

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures**General Set-Up and Connections****RSS Software:**

Check the model number of the receiver or transmitter on the bottom of the front panel (MT-4R or MT-4D) and start the appropriate RSS program on the computer. Ensure you are connected via the RPIM cable and module to the A or B RJ45 connectors on the front of the transmitter or receiver. Read the transmitter or receiver programming and familiarize yourself with the settings (RF frequency, wide / narrowband, digital / analog, CTCSS / NAC codes, etc.).

Adapters, Cables and Extender Cards:

Various adapters, cables and extender cards are required for the different radio tests. Extender cards and adapters are available from Daniels Electronics. The receiver reference oscillator and front end filter tests require an SMB - BNC adapter and the MT-4R equipment requires a small SMB - SMB cable for the reference oscillator test as well. The SMB adapters and cables are included in the A-TK-04 Tool Kit.

Control Cards:

Some Daniels MT-4 radio systems may have an AC-3E Audio Control Card or CI-BC-4E Base Control Card for use in the radio system. The Control Cards connect to the receiver and transmitter balanced audio lines with an unbalanced load, which could cause some measurements to be in error. If the radio system includes an Audio Control Card or Base Controller, remove the control card from the rack for the individual receiver and transmitter tests unless otherwise noted.

Audio Connections:

The Receiver, Transmitter and Auxiliary Balanced audio lines are available for connection on Daniels extender cards or by connecting to the back panel A-PNL-AUX96-3 screw terminal option. The extender cards have solder points available on each signal line that can have a small wire loop soldered to them for easy connection with clip-on type clips.

Audio Control Card and Base Controller Extender Card pins (EC-96D1):

Auxiliary 1 Audio output = B11 & A11

Auxiliary 2 Audio output = C1 & C3 (Audio Control Card); C2 & C4 (Base Controller)

Auxiliary 1 Audio input = C19 & C20

Auxiliary 2 Audio input = B14 & A14

Receiver and Transmitter Extender Card pins (EC-48RD):

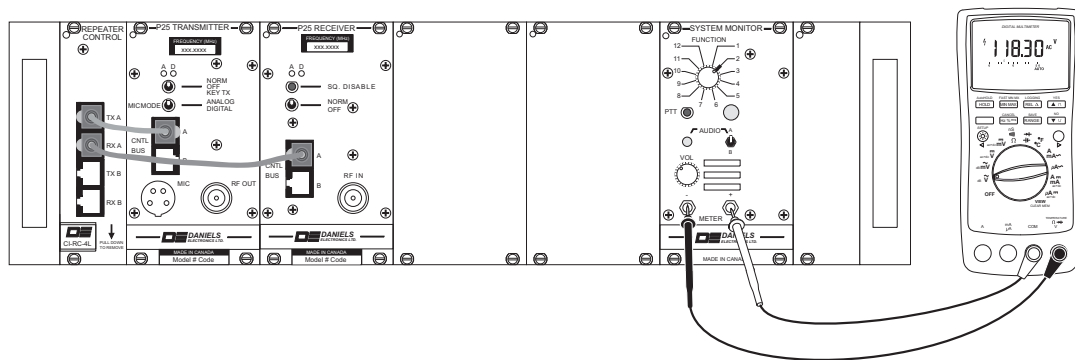
Rx Balanced Audio output = B26 & Z26

Tx Balanced audio input = B18 & Z18

Optionally, the Receiver audio output can also be connected to by the Meter Jacks on the front panel of the System Monitor (this is the de-emphasis audio line out of the receiver). If connecting to the System Monitor, ensure the A/B switch is in the proper position and the 12-position rotary switch is in position 8. Do NOT use the System Monitor connection for the Rx Balanced Audio Level Test.

MT-4 Radio Systems**TN950 Daniels MT-4R/D and IFR 2975 Test Procedures****System Monitor Testing****System Voltage Testing:**

The first stage of testing a Daniels radio system is to perform a basic system check on the supply and regulated voltages. The System Monitor module is designed with a convenient and easy test point built in to the front panel. This test point allows a technician access to the DC supply and regulated voltages. Simply connect a standard Digital Volt Meter (DVM) to the METER jacks on the front panel of the System Monitor. See the diagram below:

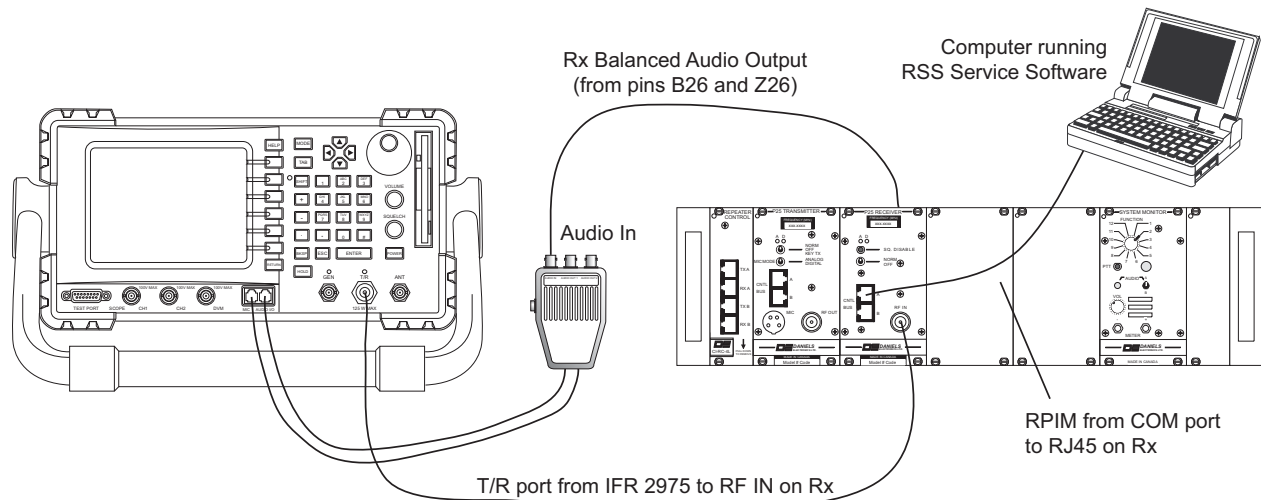


The FUNCTION rotary switch on the front panel of the System Monitor will allow you to test various points in the radio system. Following is a list of System Monitor rotary switch positions, the functions they measure and the parameters measured (please note that switch position 8 requires a carrier and audio tone injected into the receiver):

1	No Connection	Not Used
2	Supply Voltage	+10 Vdc to +17 Vdc (+13.8 Vdc nominal)
3	+9.5 Volts Regulated	+9.5 Vdc (± 0.1 Vdc)
4	Rx A Carrier Strength	Not Used for MT-4R and MT-4D Systems
5	Rx B Carrier Strength	Not Used for MT-4R and MT-4D Systems
6	Rx A +6.0 Volts	Not Used for MT-4R and MT-4D Systems
7	Rx B +6.0 Volts	Not Used for MT-4R and MT-4D Systems
8	Rx A / B Audio	Receiver Audio (NOT Rx Balanced Output)
9	Spare	Not Used
10	Spare	Not Used
11	Rx A Priority COR	Not Used for MT-4R and MT-4D Systems
12	Rx B Priority COR	Not Used for MT-4R and MT-4D Systems

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures**Receiver Testing****Receiver Analog Testing (Rx Ana):**

Connect the IFR 2975 and Daniels Radio as follows:



On the IFR 2975, recall Daniels setup 1 (Rx_Ana) from your internal drive. Enter the correct RF frequency, select the MOD TYPE to FM and set it for a 1.0 KHz tone and ensure that the deviation level is set correctly for your receiver (wide / narrow). Enter the CTCSS tone (if used) and deviation level.

On the RSS software, ensure that the Subaudible Tones selection is set to "Don't pass" or the IFR 2975 will conduct all tests with CTCSS tones on the audio, giving erroneous measurements.

Distortion:

Inject -70 dBm RF carrier level into the receiver and measure the distortion on the meter. The High Alarm is set to 3.0 %.

Sensitivity:

Monitor the SINAD meter while slowly reducing the RF carrier level. The 12 dB SINAD point should be at an RF carrier level less than the specified Analog Sensitivity point of the receiver (typically -116 or -118 dBm). The high and low alarms are set for 11.5 and 12.5 dB SINAD to help you locate the 12 dB SINAD point. When the indicator bar turns green, the signal is close to 12 dB SINAD.

If the Distortion or SINAD measurements are not within Daniels published specifications, the Front End may need re-alignment. Refer to the Receiver Front End Alignment and Tuning section.

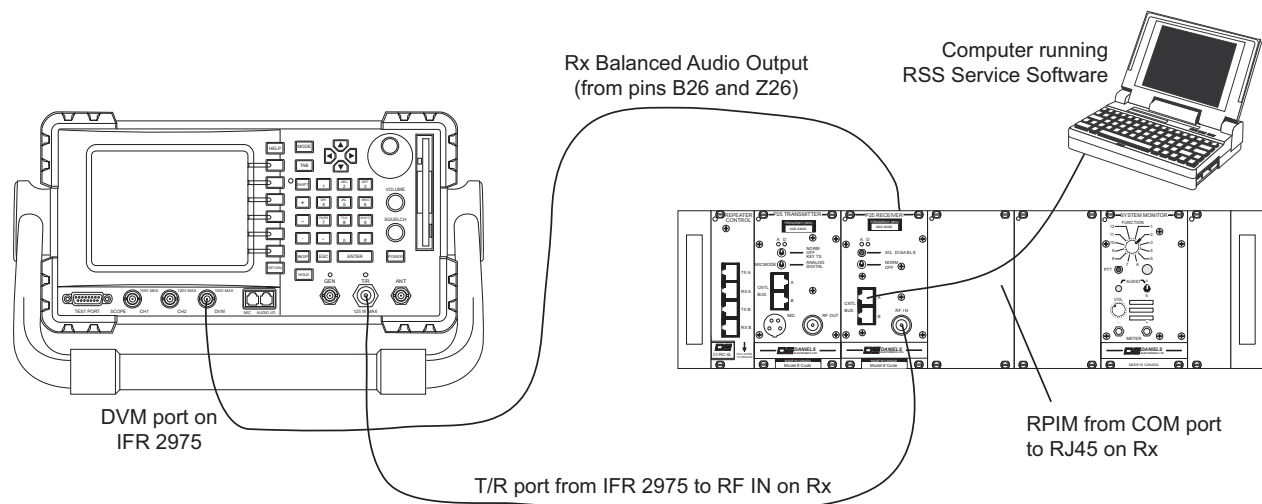
TN950 Daniels MT-4R/D and IFR 2975 Test Procedures**Receiver Testing****Receiver Analog Testing (Rx Ana) Continued...:****Squelch:**

Adjust the RF carrier level up and down until the receiver squelches and unsquelches. There should be approximately 3.5 dBm of hysteresis on MT-4D receivers (less on MT-4R). The squelch point can be adjusted on the RSS software.

Audio Level:

The audio level adjustment is not required when connecting the receiver in a repeater configuration. The audio level adjustment can be done on both the Rx Balanced Audio Output and the Auxiliary Balanced Output (1 and 2). The Auxiliary Balanced Output is only available on the AC-3E Control Card or CI-BC-4E Base Control Card.

To adjust the receiver balanced audio output, disconnect the Rx Balanced audio output from the Audio Input of the IFR 2975 (audio box) and connect it to the DVM input directly on the IFR 2975 (no external load is required as the internal 600 ohm load of the IFR 2975 is used). See the diagram below.

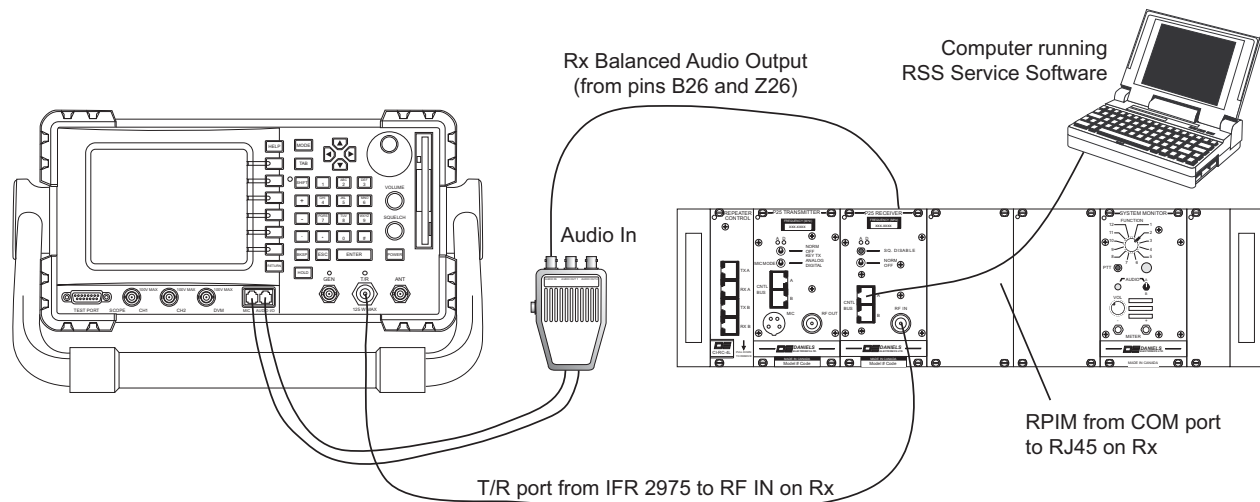


Adjust the Rx Balanced Audio Output level adjustment (R34 on MT-4D, R6 on MT-4R) for -8.0 dBm audio level (308 mVrms @ 600 ohms). The high and low alarms are set at -7.5 dBm and -8.5 dBm audio levels.

To adjust the auxiliary balanced audio output, plug the AC-3E Control Card or CI-BC-4E Base Control Card into the subrack using an extender card, disconnect the Rx Balanced audio output and connect the Auxiliary Balanced audio output to the DVM input directly on the IFR 2975 (no external load is required as the internal 600 ohm load of the IFR 2975 is used). Adjust the Auxiliary Balanced Audio Output level adjustment (R13 for Aux Out 1, R56 for Aux Out 2) for 0.0 dBm audio level (775 mVrms @ 600 ohms).

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures**Receiver Testing****Receiver Digital Testing (Rx_Dig):**

Connect the IFR 2975 and Daniels Radio as follows:

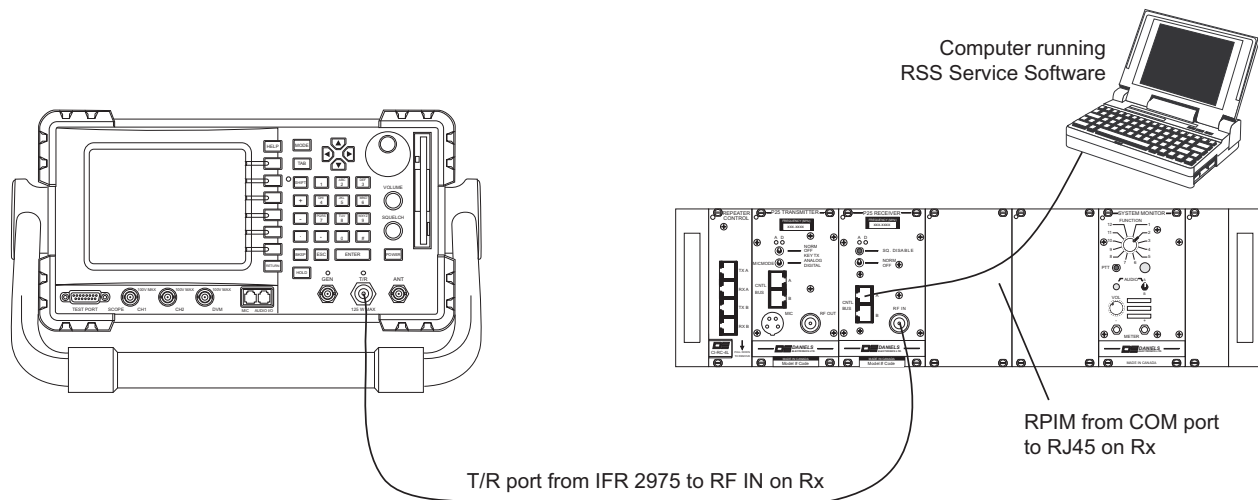


On the IFR 2975, recall Daniels setup 2 (Rx_Dig) from your internal drive. Enter the correct RF frequency, select the MOD TYPE to P25 and set it for the SPEECH test pattern (or optionally the 1011 test pattern).

Inject the correct NAC codes (and TGID if programmed) and ensure that the receiver is operating. There are no specific measurements to make on this test, just verify that the receiver is operating.

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures**Receiver Testing****Receiver Bit Error Rate Testing (Rx BER):**

Connect the IFR 2975 and Daniels Radio as follows:



On the IFR 2975, recall Daniels setup 3 (Rx_BER) from your internal drive. Enter the correct RF frequency, select the MOD TYPE to P25 and set it for the STD 1011 test pattern (the 1011 test pattern will not operate correctly for this test).

In the receiver RSS software, enter the Service section and click on "BER Test". The receiver frequency should automatically be shown in the frequency box. Select the Modulation Type to "12.5 KHz / C4FM", Test Type to "Continuous", Audio to "Unmuted" and Number of Frames to "3". Click on the "Start" button to start the BER test. You should get 0% BER at the -70 dBm default RF carrier level.

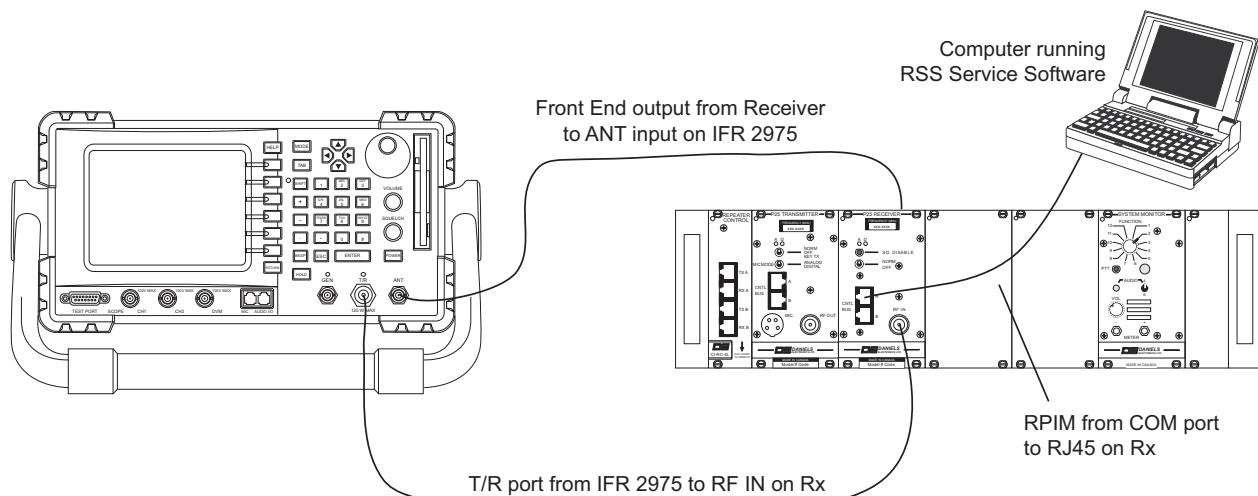
Monitor the BER reading while slowly reducing the RF carrier level. The 5% BER point should be at an RF carrier level less than the specified Digital Sensitivity point of the receiver (typically -118 dBm).

If the BER measurements are not within Daniels published specifications, the Front End may need re-alignment. Refer to the Receiver Front End Alignment and Tuning section.

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures**Receiver Testing****Receiver Front End Alignment and Tuning (Rx FETune):**

Tuning of the Front End filter is typically only required when the Analog or Digital Sensitivity or Analog Distortion do not meet published specifications, or when the receiver RF frequency is changed beyond the band pass of the filter (typically 5 - 7 MHz).

Connect the IFR 2975 and Daniels Radio as follows:



The internal cable in the receiver from the output of the front end terminates in an SMB connector. On the MT-4R equipment the SMB plugs directly into the RF Board. Disconnect the SMB cable from the RF Board connector and use the SMB-BNC adapter to connect this point to the ANT input on the IFR 2975. On the MT-4D equipment the SMB plugs into P6 on the Main Board. Disconnect the SMB cable from the P6 and use the SMB-BNC adapter to connect this point to the ANT input on the IFR 2975.

On the IFR 2975, recall Daniels setup 4 (Rx_FETune) from your internal drive. Enter the correct RF frequency and ensure the receiver is turned on. In the "Trace" box on the right hand side of the screen click on the "Run" button. The filter waveform should appear. Click on Options then Configure Markers to add optional markers to the spectrum analyzer.

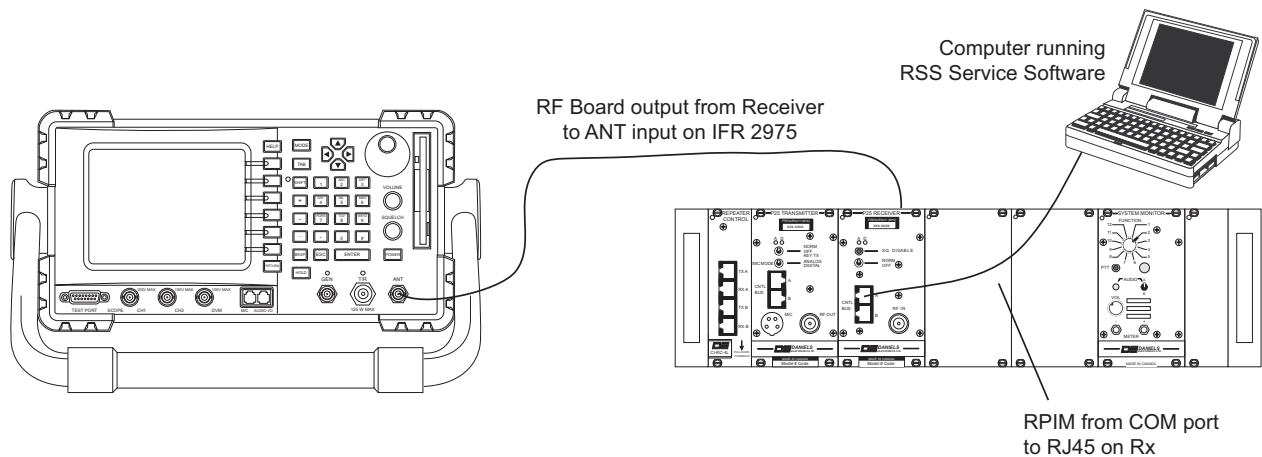
To tune the Front End filter, remove the dust caps on the variable capacitors and, starting from the capacitor closest to the front panel of the receiver and moving back, tune the filter to its new frequency.

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures

Receiver Testing

Receiver Reference Oscillator Adjustment (Rx_VHFRef; Rx_UHFRef):

Connect the IFR 2975 and Daniels Radio as follows:



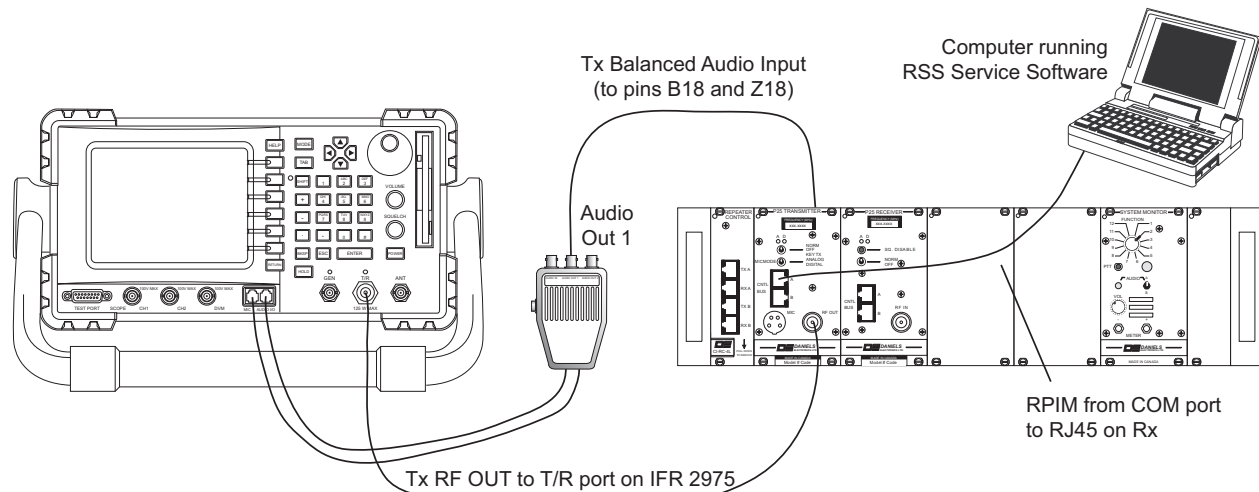
The reference oscillator test on the receiver requires a connection directly into the RF Board, which uses an SMB connector. The SMB-BNC adapter is required for this connection. On the MT-4R equipment, a small SMB-SMB cable is required to connect to the SMB jack that is mounted on the RF Board (beneath the Front End). On the MT-4D equipment the SMB-BNC adapter can be plugged directly into the cable that is normally connected to P2.

On the IFR 2975, recall Daniels setup 5 (Rx_VHFRef) or setup 6 (Rx_UHFRef) from your internal drive. The RF frequency is automatically set for either the VHF or UHF reference frequency (depending on the file recalled).

In the receiver RSS software, enter the Service section and click on "Reference Oscillator". The reference oscillator frequency should automatically be shown in the frequency box. This frequency is fixed and cannot be changed. Click on the "Enable" button and the receiver will generate the reference frequency out of the RF Board into the IFR 2975.

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures**Transmitter Testing****Transmitter Analog Testing (Tx Ana):**

Connect the IFR 2975 and Daniels Radio as follows:



On the IFR 2975, recall Daniels setup 7 (Tx_Ana) from your internal drive. Enter the correct RF frequency on the IFR 2975, set the MIC MODE switch on the front panel of the transmitter to Analog, and flip the other switch to KEY TX.

FGEN1 is configured to inject a 1.0 KHz tone at -8.0 dBm (0.872 Vpp) into the transmitter balanced input.

Distortion:

The distortion meter will read demodulated audio and give you a transmitter distortion reading. The High Alarm is set to 3.0 %.

RF Power:

Monitor the RF power output of the transmitter. The High Alarm is set at 8.5 Watts and the Low Alarm is set at 2.0 Watts. Adjust R7 in the Transmitter Amplifier section to change the RF output power. Transmitter RF power output will vary slightly with the 10 - 17 Vdc input.

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures

Transmitter Testing

Transmitter Analog Testing (Tx Ana) Continued...:

Deviation level:

The deviation level adjustment is not required when connecting the transmitter in a repeater configuration. The audio level adjustment can be done on both the Tx Balanced Audio Input and the Auxiliary Balanced Input (1 and 2). The Auxiliary Balanced Input is only available on the AC-3E Control Card or Base Controller.

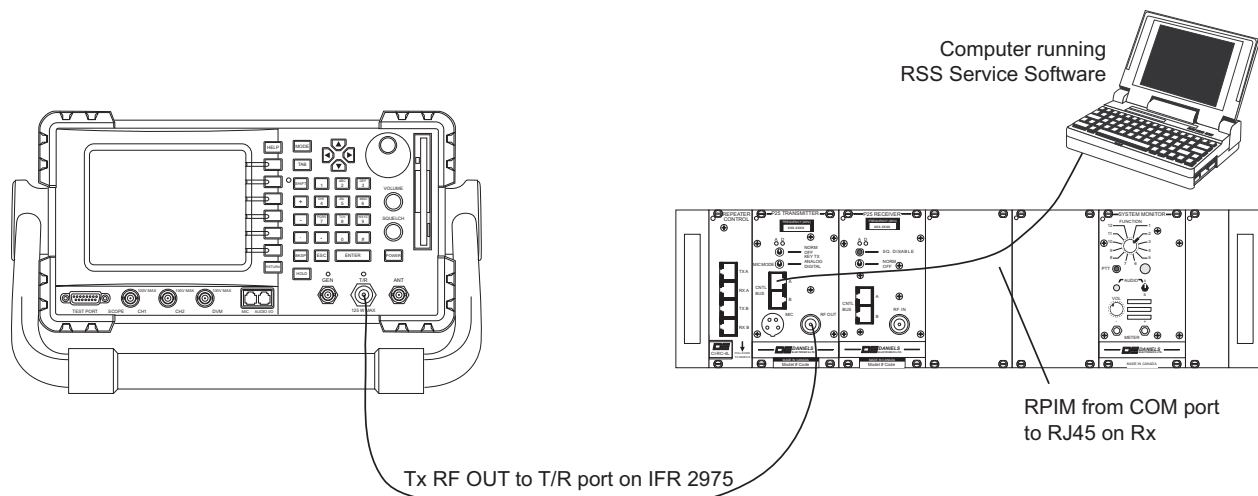
Change the Audio Filter (below DEMOD) from BANDPASS to 15 KHz LP for a more accurate deviation reading.

To adjust the transmitter balanced audio input, FGEN1 is configured to inject a 1.0 KHz tone at -8.0 dBm (0.872 Vpp) into the Tx Balanced audio input. Adjust the Tx Balanced Audio Input level adjustment (R16 on MT-4D, R118 on MT-4R; these are the closest pots to the front panel of the transmitter) for deviation of +/- 1.5 KHz (narrowband) or +/-3.0 KHz (wideband). The high and low alarms are set at +/-1.4 KHz to +/- 1.6 KHz deviation.

To adjust the auxiliary balanced audio input, plug the AC-3E Control Card or Base Controller into the subrack using an extender card, disconnect the Tx Balanced audio input and connect the Auxiliary Balanced audio input to the Audio Out 1 on the IFR 2975(audio box). Configure FGEN1 to inject a 1.0 KHz tone at 0.0 dBm (2.191 Vpp) into the Auxiliary Balanced audio input. Adjust the Auxiliary Balanced Audio Input level adjustment (R120 for Aux In 1, R123 for Aux In 2) for deviation of +/- 1.5 KHz (narrowband) or +/-3.0 KHz (wideband). The high and low alarms are set at +/-1.4 KHz to +/- 1.6 KHz deviation.

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures**Transmitter Testing****Transmitter CTCSS Testing (Tx CTCSS):**

Connect the IFR 2975 and Daniels Radio as follows:

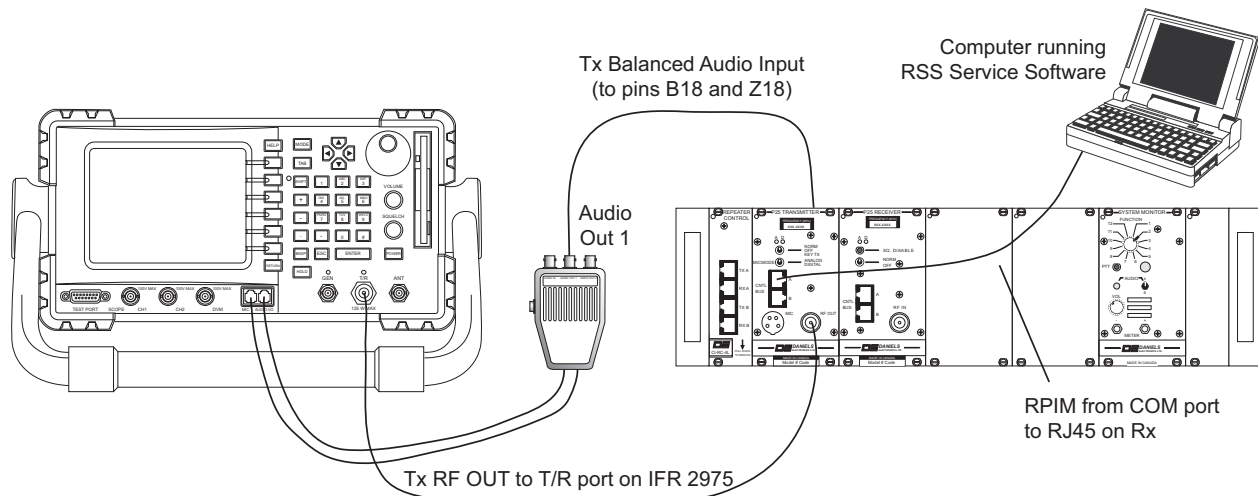


On the IFR 2975, recall Daniels setup 8 (Tx_CTCSS) from your internal drive. Enter the correct RF frequency on the IFR 2975, set the MIC MODE switch on the front panel of the transmitter to Analog, and flip the other switch to KEY TX.

This test will show the frequency and deviation level of the CTCSS tone programmed into the transmitter. The CTCSS deviation level should be ± 0.35 KHz (narrowband) or ± 0.7 KHz (wideband). The high and low alarms are set at ± 0.3 KHz to ± 0.8 KHz deviation. These deviation levels are not adjustable.

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures**Transmitter Testing****Transmitter Digital Testing (Tx_Dig):**

Connect the IFR 2975 and Daniels Radio as follows:



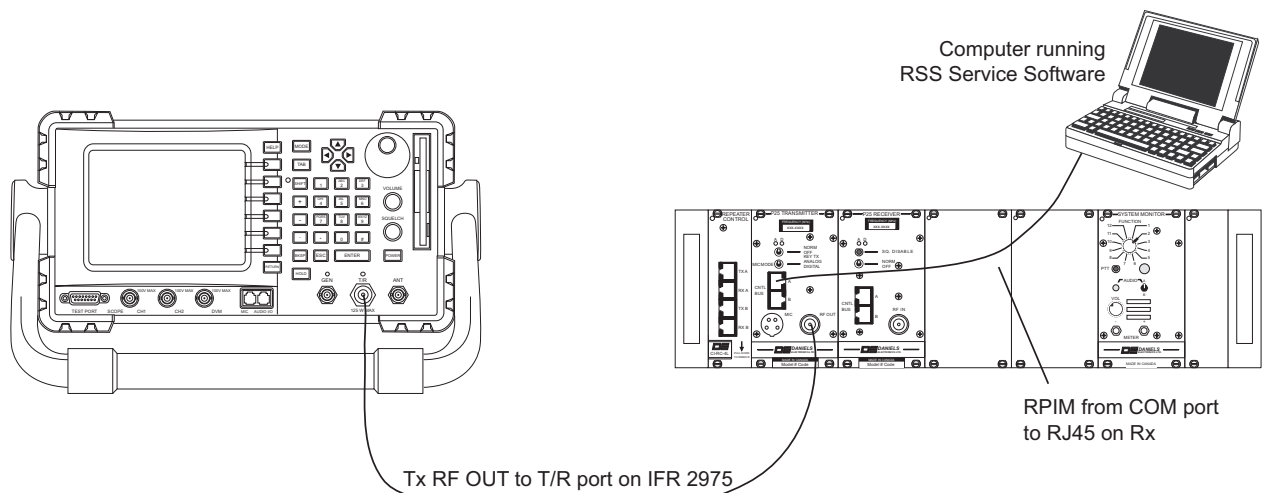
On the IFR 2975, recall Daniels setup 9 (Tx_Dig) from your internal drive. Enter the correct RF frequency on the IFR 2975, set the MIC MODE switch on the front panel of the transmitter to Digital, and flip the other switch to KEY TX.

FGEN1 is configured to inject a 1.0 KHz tone at -8.0 dBm (0.872 Vpp) into the transmitter balanced input. A Continuous tone injected into the transmitter will be demodulated as a "fluctuating" audio level and tone. This is inherent in all P25 radio systems. Optionally, a microphone can be connected to the front panel of the transmitter and the tester can speak into the microphone and listen to the demodulated audio on the IFR 2975.

Ensure the correct NAC, TGID and Unit ID codes are being transmitted properly. The NAC TGID and Unit Id codes are all programmed into the transmitter via the RSS software. There are no specific measurements to make on this test, just verify that the transmitter is operating.

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures**Transmitter Testing****Transmitter Modulation Fidelity Testing (Tx ModFid):**

Connect the IFR 2975 and Daniels Radio as follows:



On the IFR 2975, recall Daniels setup 10 (Tx_ModFid) from your internal drive. Enter the correct RF frequency on the IFR 2975 and set the transmitter front panel switch to NORM. The MIC MODE switch on the front panel can be set to either Digital or Analog (this test does not make use of the front panel switch).

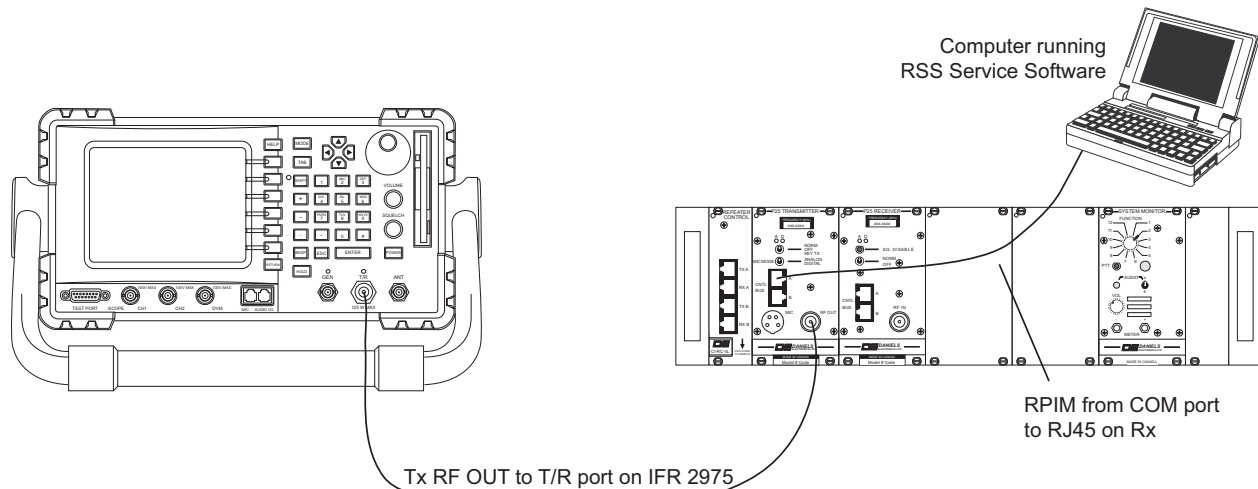
In the transmitter RSS software, enter the Service section and click on "Test Pattern". Enter the transmitter frequency in the frequency box. In the Test Pattern window select "C4FM Modulation Fidelity". Click on the "Key Tx" button and the transmitter will begin generating the test pattern out the RF output (In MT-4R models the LED on the front panel does not light up).

Measure the Modulation Fidelity of the transmitter. The transmitter should not read more than 5% Modulation Fidelity. If the Modulation Fidelity is more than 5%, the transmitter will need to be returned to the factory for service. The high alarm point is set at 5%.

Note: When exiting the "Reference Oscillator" in the Service section, exit from the Service section completely and then re-enter the Service section before entering the "Test Pattern", or a software bug will prevent a test pattern from being generated (Daniels Electronics Service Bulletin SB-0022).

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures**Transmitter Testing****Transmitter Reference Oscillator Adjustment (Tx_VHFRef; Tx_UHFRef):**

Connect the IFR 2975 and Daniels Radio as follows:



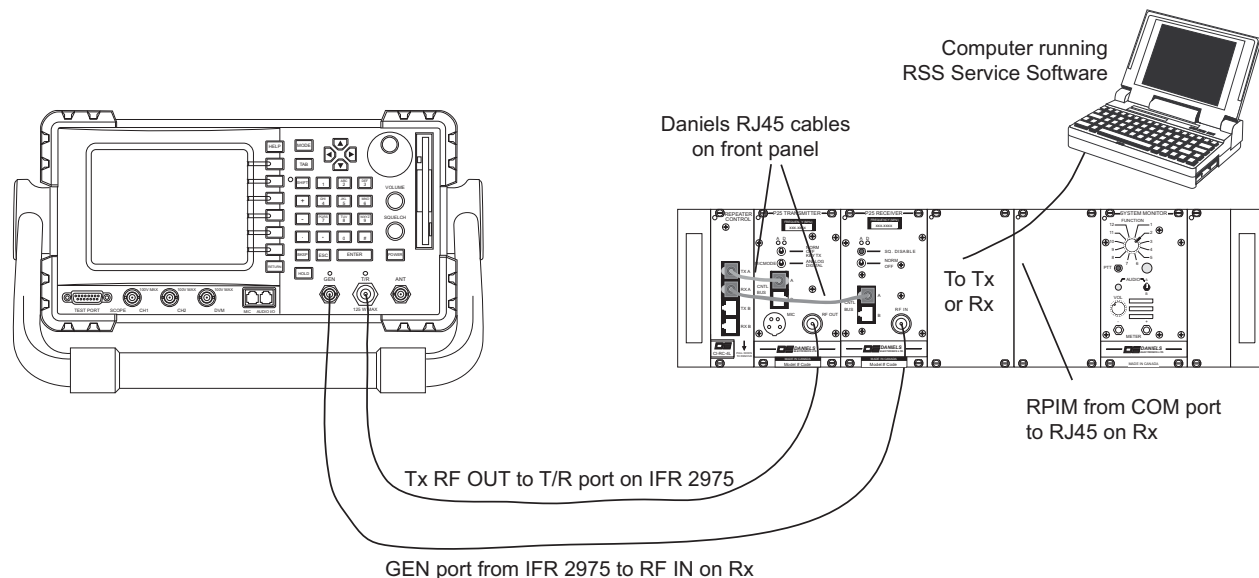
On the IFR 2975, recall Daniels setup 11 (Tx_VHFRef) or setup 12 (Tx_UHFRef) from your internal drive. The RF frequency is automatically set for either the VHF or UHF reference frequency (depending on the file recalled). Set the transmitter front panel switch to NORM. The MIC MODE switch on the front panel can be set to either Digital or Analog (this test does not make use of the front panel switch).

In the transmitter RSS software, enter the Service section and click on "Reference Oscillator". The reference oscillator frequency should automatically be shown in the frequency box. This frequency is fixed and cannot be changed. Click on the "Enable" button and the transmitter will generate the reference frequency out of the RF output into the IFR 2975.

Monitor the RFERR (RF Error) window on the IFR 2975. To change the reference frequency click on the softpots in the RSS software. Adjust until the RF error is as close to 0 Hz as possible. Click on the "Program" button to program in the new Reference Oscillator softpot value. The high and low alarms are set at + / -177 Hz for VHF and +/- 469 Hz for UHF (the specification of +/- 1 ppm).

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures**Repeater (Duplex) Testing****Duplex Analog Testing (Dup Ana):**

Connect the IFR 2975 and Daniels Radio as follows:



On the IFR 2975, recall Daniels setup 13 (Dup_Ana) from your internal drive. Enter the correct RF frequencies for the receiver and transmitter, select the MOD TYPE to FM and set it for a 1.0 KHz tone and ensure that the deviation level is set correctly for your receiver (wide / narrow). Enter the CTCSS tone (if used) and deviation level. Set the receiver and transmitter front panel switch to NORM. The MIC MODE switch on the transmitter front panel can be set to either Digital or Analog (this test does not make use of the front panel switch).

Ensure that the receiver and transmitter are connected to the repeater controller via the RJ45 cables on the front panel (In some systems, the Rx and Tx may be connected directly together using the RJ45 cables).

Demodulated Audio Frequency:

Check the COUNT meter on the meter panel. The demodulated audio should read the same as the modulated input. The low and high alarms are set for 995 Hz and 1005 Hz.

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures**Repeater (Duplex) Testing****Duplex Analog Testing (Dup Ana) Continued...:****Deviation level:**

Check the deviation level. Ideally the deviation level out of the transmitter should match the input to the receiver (1.5 KHz). Typically the deviation level is high or low approximately 0.2 to 0.3 KHz. Currently there is no way to adjust the repeater deviation level matching. The low and high alarms are set for 1.10 KHz and 1.90 KHz.

Distortion:

The distortion meter will read demodulated audio and give you a complete repeater system distortion reading. The High Alarm is set to 3.0 %.

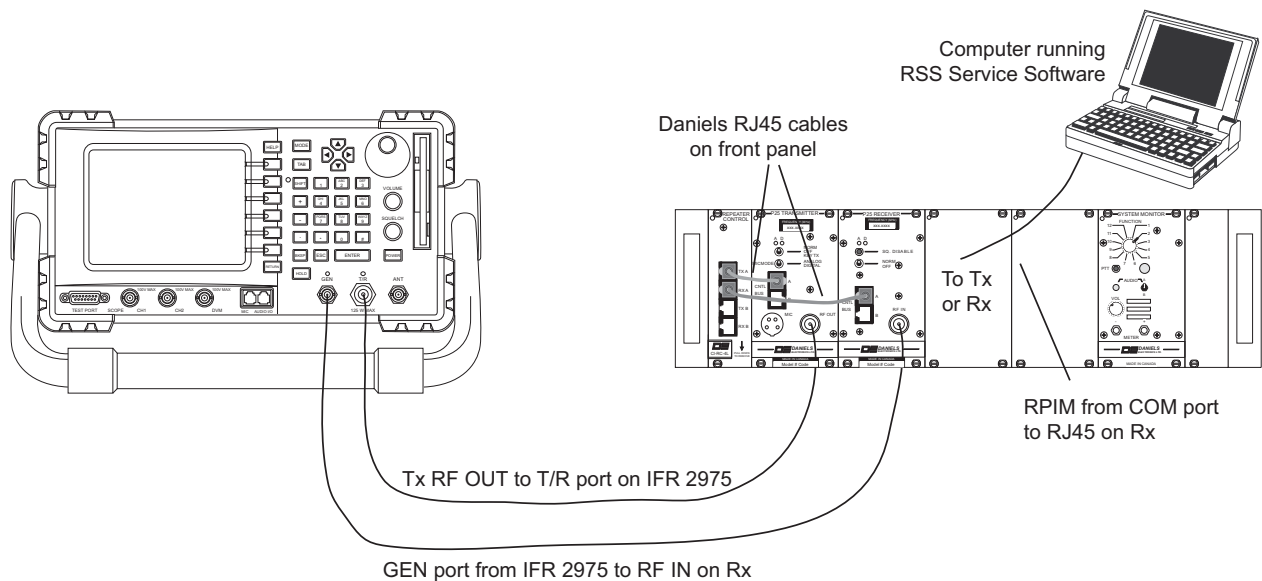
RF Power:

Monitor the RF power output of the transmitter. The High Alarm is set at 8.5 Watts and the Low Alarm is set at 2.0 Watts. Adjust R7 in the Transmitter Amplifier section to change the RF output power.

This product has been discontinued and is no longer manufactured by Daniels Electronics Ltd.

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures**Repeater (Duplex) Testing****Duplex Digital Testing (Dup_Dig):**

Connect the IFR 2975 and Daniels Radio as follows:



On the IFR 2975, recall Daniels setup 14 (Dup_Dig) from your internal drive. Enter the correct RF frequencies for the receiver and transmitter, select the MOD TYPE to P25 and set it for the SPEECH test pattern (or optionally the 1011 test pattern). Inject the correct NAC codes (and TGID if programmed) in the DOWNLINK DATA section. Set the receiver and transmitter front panel switch to NORM. The MIC MODE switch on the transmitter front panel can be set to either Digital or Analog (this test does not make use of the front panel switch).

Ensure that the receiver and transmitter are connected to the repeater controller via the RJ45 cables on the front panel (In some systems, the Rx and Tx may be connected directly together using the RJ45 cables).

There are no specific measurements to make on this test, just verify that the system is operating correctly.

NAC:

Check to make sure your receiver unsquelches on the proper NAC code. If the NAC is set for \$F7F in the receiver, ensure that the system transmits the NAC code it receives.

TN950 Daniels MT-4R/D and IFR 2975 Test Procedures

Repeater (Duplex) Testing

Duplex Digital Testing (Dup Dig) Continued...:

TGID:

Check to make sure your receiver unsquelches on the proper TGID code (if used). Ensure that the system transmits the TGID code it receives.

Unit ID (SID):

Ensure that the system transmits the Unit ID code it receives.

*After changing the TGID or Unit ID the SEND button in the DOWNLINK DATA window must be clicked to send the information.

*The TGID and Unit ID programmed into the transmitter via the RSS software are only transmitted when keying the transmitter in a non-repeater mode (see the Transmitter Digital Testing). In repeater mode the system transmits the TGID and Unit ID it receives.

Emergency Bit (EMG):

Ensure that the system transmits the Emergency Bit it receives.

Algorithm ID:

The Algorithm ID is typically set for 80 for CLEAR operation.

To ensure encrypted signals will pass through the repeater:

Click on the DOWNLINK DATA window to open the full window. Set the ALGID to 81 or select the DES option in the box to the right (this will change the ALGID to 81). Ensure the KEY ID is set to 0000.

Click on the UPLINK window to open the full window. In the ES DATA portion of the window the KID will read 0000, the ALGID will read 81, and the MI data will be constantly changing.