

3M

Dynatel™ 965DSP-B

Subscriber Loop Analyzer



Instruction Manual

October, 1997
78-8097-6012-3 Rev A

Welcome to the Instruction Manual for the 965DSP-B. 'DSP' means 'Digital Signal Processor.' Digital Signal Processing allows the 965DSP-B instrument to provide the fast and flexible test functions needed for diagnostic testing. 'B' means 'Basic'. The 'B' version does not have the TDR function found in the 965DSP.

This document will give you a brief overview of the product, a description of the test functions, and some technical hints on how to find common problems on telecommunications cables.

This document is not meant to be a substitute for diagnostic test training. For further information on complete training, contact 3M Telecom Systems Technical Service at: 800 426 8688.

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Out of Box

Here's what you will find when you unpack the shipping box:

- 965DSP-B
- Carrying Case
- NMH Battery Pack
(inside the 965DSP-B)
- Spare Battery Holder
- Test Leads
 - Red/Black Pair
 - Blue/Yellow Pair
 - Green Lead
- Shorting Strap
- AC/DC Adaptor
- Power Cord
- Instruction Manual
- Quick Card
- Warranty Card

The 965DSP-B comes in the carrying case and should remain in the case to give extra protection from shock and the environment.

The 965DSP-B comes with the battery pack already installed. You may need to charge the battery before using the unit. Please see page 39 for information on charging the battery pack.

The Spare Battery Holder holds six "AA" alkaline batteries, and should only be used if the battery pack is discharged and the AC/DC converter is not available.

The 965DSP-B comes with 5 test leads. Red, Black and Green are used for most functions. Yellow is used for RFL. The Shorting Strap is only used in RFL.

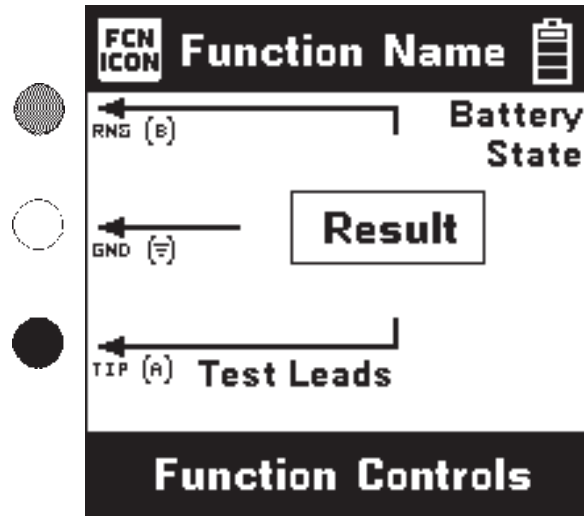
The AC/DC adaptor will convert 110 or 220 Vac into the 12 Vdc used for charging the 965DSP-B. A North American 110 Vac Power Cord is provided.

Additional information is also found in the 965DSP-B help screens. For Technical Service, Warranty or Repair questions call: 800 426 8688 or contact your Local 3M Representative.

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Austin, Texas 78726-9000 USA

Screen

The 965DSP-B screen is a graphical LCD (Liquid Crystal Display) that gives high resolution for viewing text and graphics. The screen format is similar to the following for most functions.

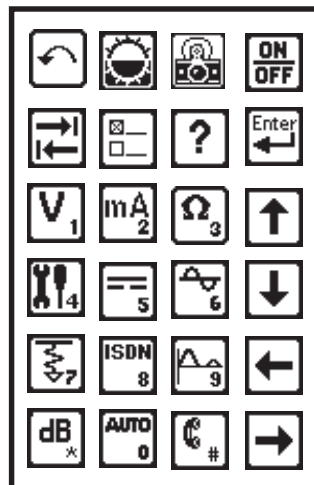


Test Leads

Test Lead icons are shown on each measurement screen. They always point to the color dots on the front label that corresponds to the real test leads.

Keypad

The 965DSP-B Keypad has twelve yellow and red "Control Keys" and twelve blue "Function Keys".



Control Keys

Use the red and yellow keys to control the actions and the setup of the 965DSP-B and its functions. The active control keys for each function are shown at the bottom of the corresponding screen.



Use the [Back] key to return to a previous step in a function.



Use the [Contrast] key to adjust the contrast or to turn the backlight on or off.



The [Save] key is reserved for future software enhancements, and is a 'dash' or 'minus' sign when editing numbers.



Use the [On/Off] key to turn the 965DSP on or off.



Use the [Tab] key to select between different options.



Use the [Setup] key to change the setup of any function.



Use the [Help] key to get help with any screen.



Use the [Enter] key to accept changes or move to the next step in a function.




Use the [Up] and [Down] keys to scroll to different menu options.





Use the [Left] and [Right] keys to move between different options.

Editing

Use the following keys when editing numbers:

Use  to insert a space to the left of the cursor.

Use  to delete the number above the cursor.

Use  to add a 'dash' in a telephone number or a minus sign for levels or temperature.

Function Keys

Use the blue keys to select the different test functions in the 965DSP-B. The blue keys become number keys when editing.



Use the [Voltage] key to measure DC or AC voltage.



Use the [Current] key to measure loop or ground Current.



Use the [Resistance] key to measure resistance.



Use the [Toolbox] key to access: Load Coil Count, Self-Calibration, Ohms to Distance, or Caller ID.



Use the [Opens] key to find the distance to an 'open' (or break) in a pair or cable.



Use the [Tone] key to send tones for pair identification or measuring loss.



Use the [RFL] key to find the distance to a resistance fault on a pair.



Use the [ISDN] key to verify the presence of an ISDN signal, and to measure near-end and far-end errors on an active ISDN line.



The [TDR] key is not used in the 965DSP-B. Contact 3M Customer Service at 800 426 8688 concerning TDR upgrades.



Use the [dB] key to measure Loss, Noise, Longitudinal Balance, or Wideband Loss.



Use the [Auto] key to perform a series of tests on an Active or Inactive pair.



Use the [Talk Set] key to dial numbers or to place a phone call on a working pair.

All functions (except for Tone and TDR) 'time out' in five minutes if no key has been pressed. Tone and TDR time out after 30 minutes.

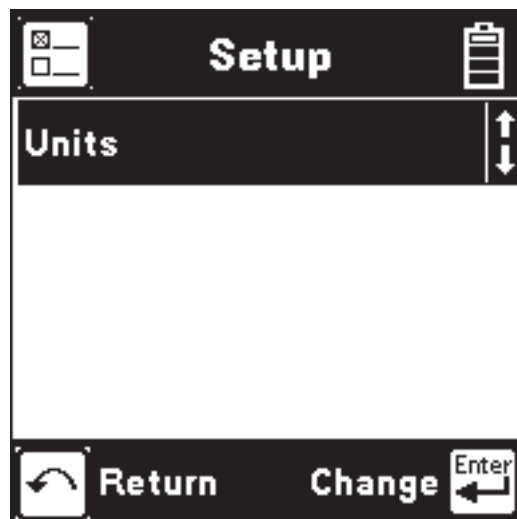
Welcome Screen

This is the screen you see when you first turn on the 965DSP-B. It shows the model name, serial number, copyright date, software version, and the version country.



When the Welcome screen shows, press [Setup] to go to the Setup screen.

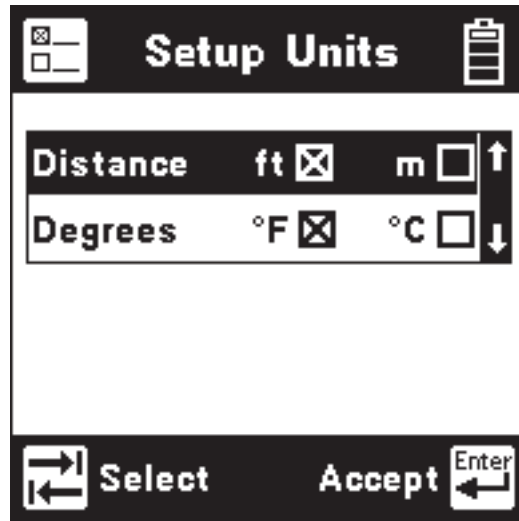
Setup



Press [Enter] to change the Units of Measurements (Distance and Temperature).

Press [Back] to return to the Welcome screen.

Units

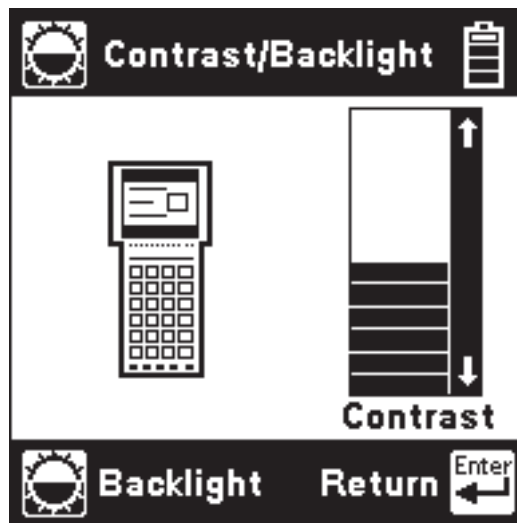


Use the [Up] and [Down] keys to highlight either Distance or Degrees. Use the [Tab] key to select the units of measurement.

Use [Enter] to accept the changes and return.
Use [Back] to return without making changes.

Contrast

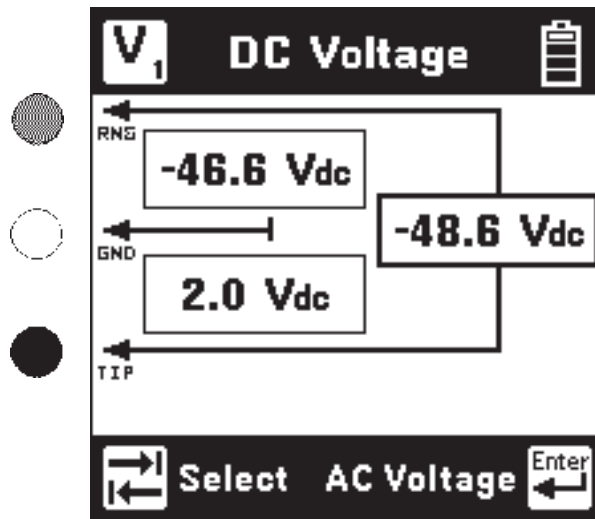
Press the [Contrast] key to display the contrast screen. Use the [Up] and [Down] arrow keys to adjust the contrast. Press the [Contrast] key again to turn the backlight on or off.





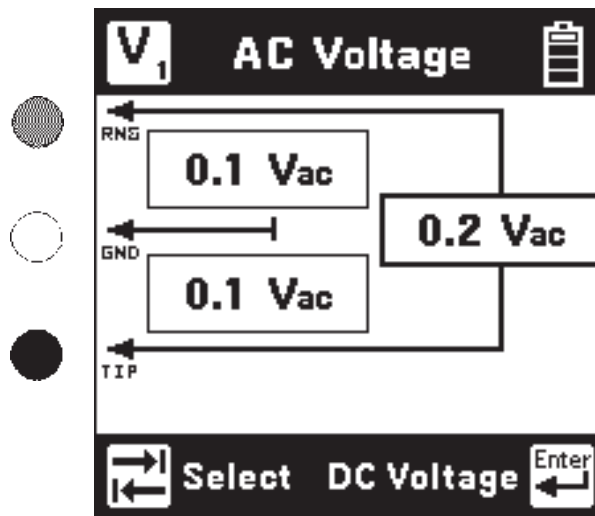
Voltage

This function first measures and displays the DC voltage between the Red and Black test leads.



Press the [Tab] key to move to the next test lead configuration.

Press the [Enter] key to switch between DC and AC voltage.



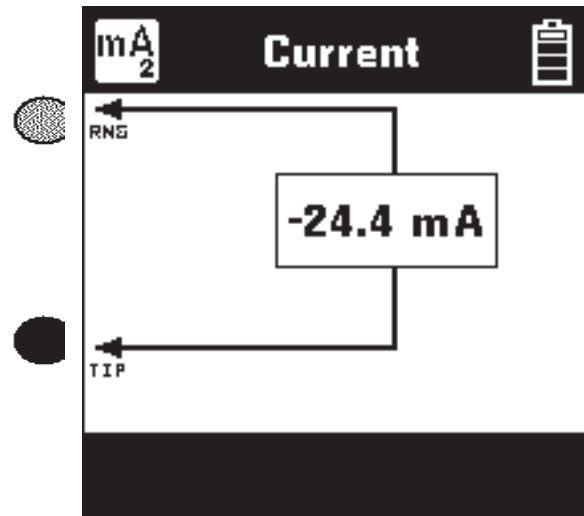
Press the [Tab] key to move to the next test lead configuration.

Press the [Enter] key to switch between AC and DC voltage.

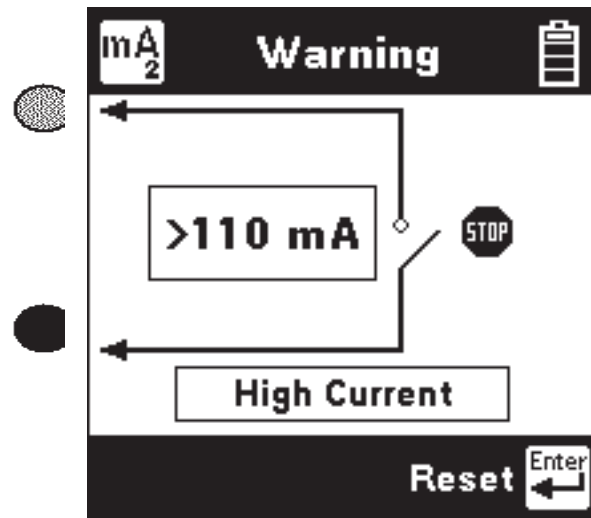


Current

This function measures the current flowing into the Red and Black test leads (and a 430 Ohm resistor inside the 965DSP-B). Connect the Red and Black leads to the pair to measure loop current. Connect the Red lead to the voltage side of the pair and the Black lead to ground to measure ground current.



If the Current is greater than 110 mA , you will see the following 'Current Warning' screen:

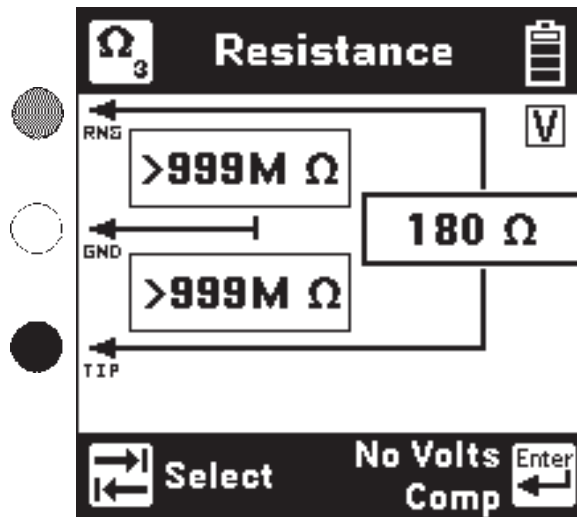


This screen indicates that a high current has been detected between the test leads and that the 965DSP-B has opened an internal relay to protect itself from damage. Use standard safety practices for disconnecting the test leads. Press the [Enter] key to start the Current test again.



Resistance

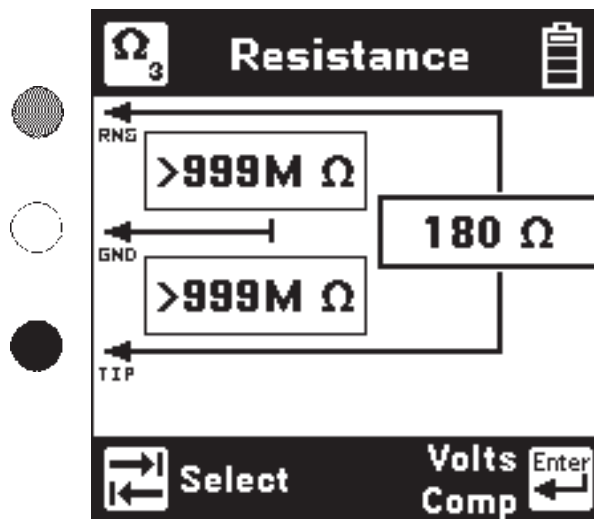
This function first measures the resistance between the Red and Black test leads.



Press the [Tab] key to move to the next test lead configuration.

The “V” in the upper right corner of the screen indicates that the resistance measurement compensates for C.O. voltage on the line.

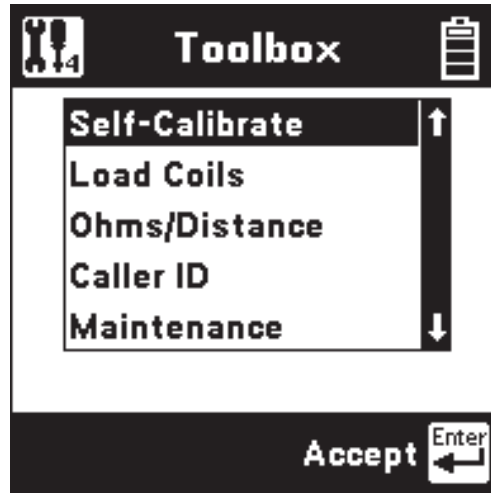
Press the [Enter] key to remove the voltage compensation. Use this test only if you have first determined there is no DC voltage on the pair (by using the Voltage function). The non-compensated measurement is slightly faster, but is not as accurate if there is voltage on the line.





Toolbox

Use the [Up] and [Down] arrow key to move to the desired 'tool', then press the [Enter] key to accept the choice.



The Toolbox contains four additional functions:

- Self-Calibrate
- Load Coils
- Ohms to Distance
- Caller ID

Descriptions of these functions are found in the following pages.

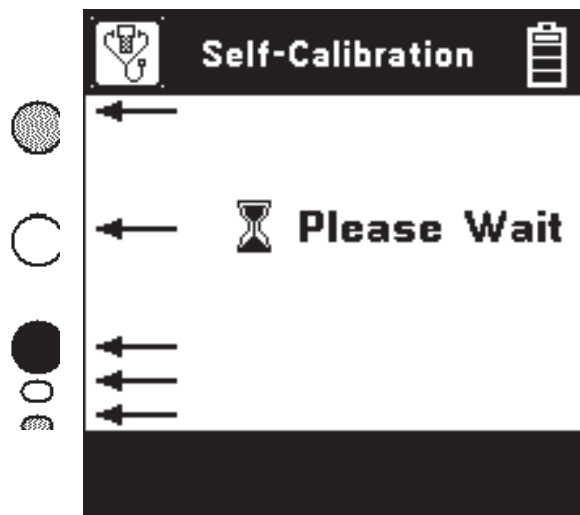
The fifth item in the menu (Maintenance) is only used during 965DSP-B factory service.



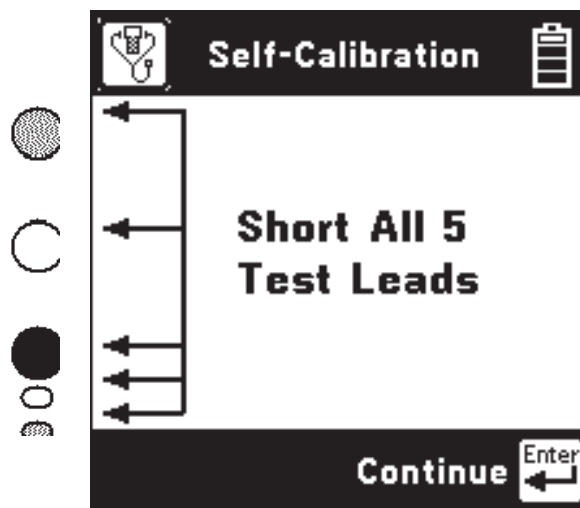
Self-Calibration

Use this function to calibrate the 965DSP-B anytime the outside temperature changes by more than 35°F (20°C). Calibrate the 965DSP-B at the same temperature at which it will be used.

You will see the following screen as soon as you select Self-Calibration from the Toolbox. Test lead connections (open or shorted) are not important during this phase of the calibration.



Short all five leads when prompted, then press [Enter] to continue.

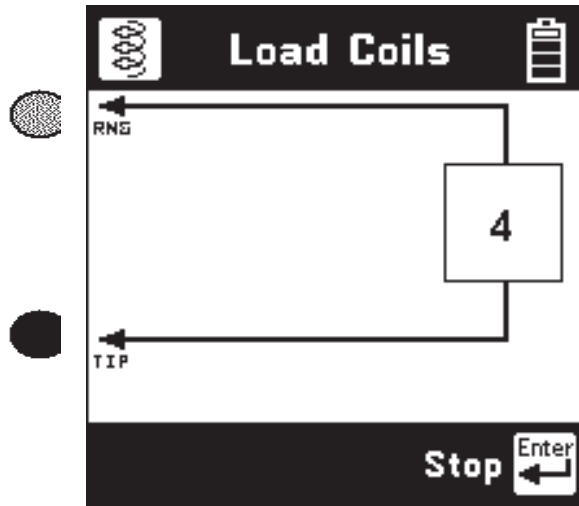


The screen shows "Self-Calibration Complete" when the calibration is done.



Load Coils

This function takes about one minute to count up to four load coils on the pair. You will see the word 'Counting' in the display while the test is in progress. You will see the word 'Done' when the test is complete.



Press the [Enter] key at any time if you wish to stop the count earlier. The screen then shows the number of load coils counted and the word 'Stopped' on the screen.

If you are only looking to see if a line has load coils or not, you may elect to stop the test after one load coil has been detected.

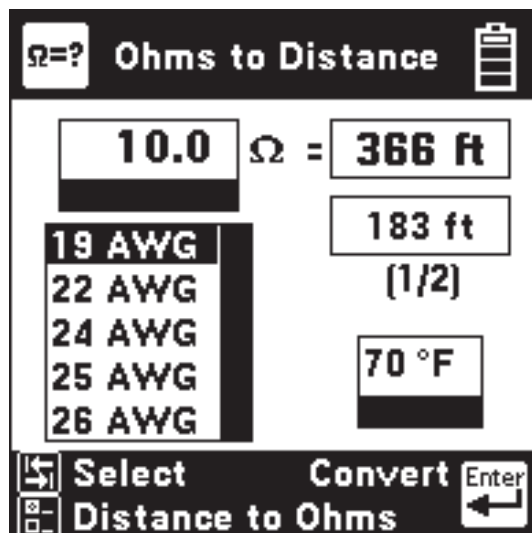
After the test is done or was stopped, press the [Enter] key to repeat the load coil count. Press the [Back] key to return to the Toolbox menu.

Note that you must have 2000 feet (600 meters) before and after each load coil for the Load Coil function to count properly.



Ohms/Distance

Use this function to convert between Ohms and Distance based on the temperature and wire gauge entered.



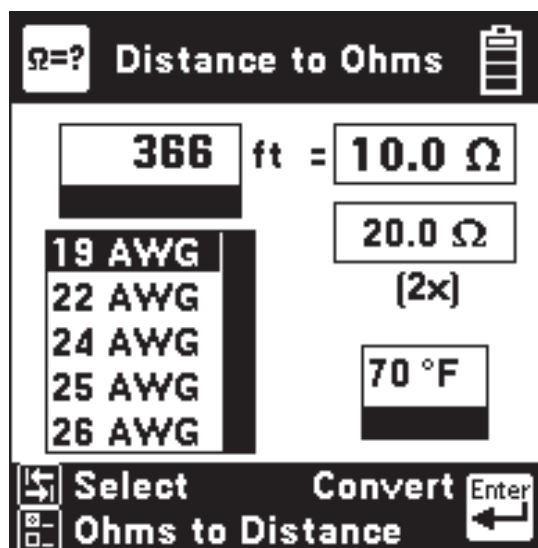
Enter the value of Ohms, then press the [Tab] key to select wire gauges or temperature.

If you select wire gauges, press the [Up] and [Down] keys to select the desired gauge.

If you choose temperature, enter the value of the desired temperature using the Blue keys.

Press the [Enter] or the [Tab] key when you are ready to convert from Ohms to Distance.

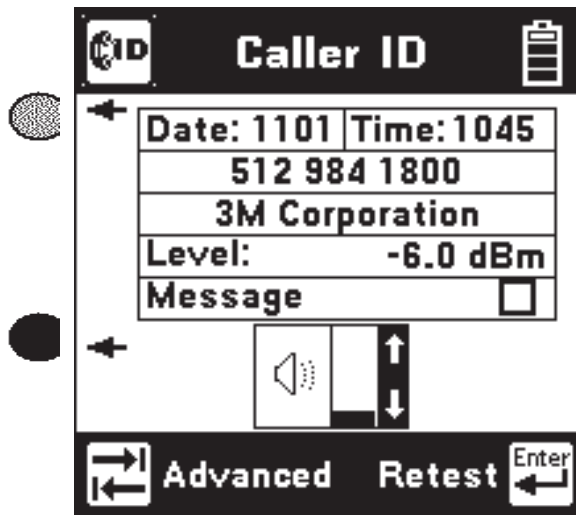
Press the [Setup] key to enter distance instead of Ohms. All control keys work the same when entering distance.



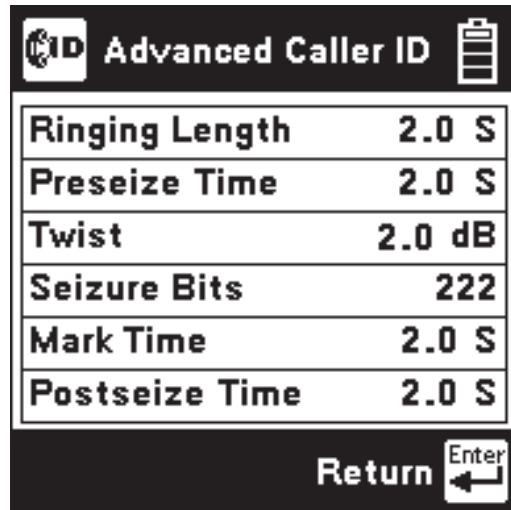


Caller ID

This function detects the Caller ID signal sent on the pair and displays the calling number, the name of the calling party, the signal level, and the message status. Certain result boxes may be blank if the information is not available from the Caller ID signal.



Use the [Up] and [Down] arrows to adjust the speaker volume. Press the [Tab] key for advanced Caller ID data.



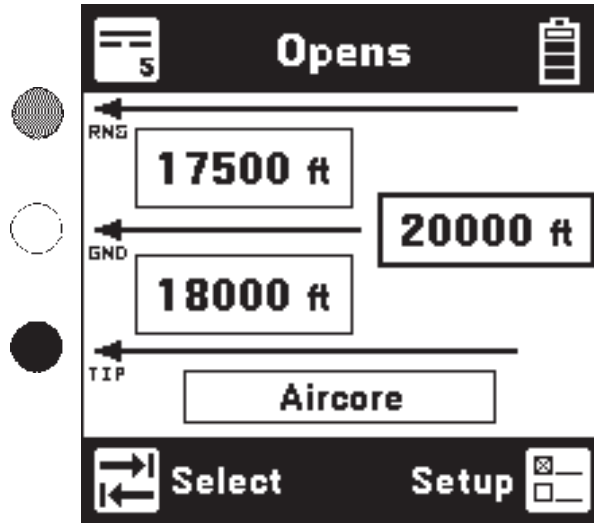
This screen shows advanced information for diagnosing Caller ID protocol problems.

Press the [Enter] key to return to the previous screen.



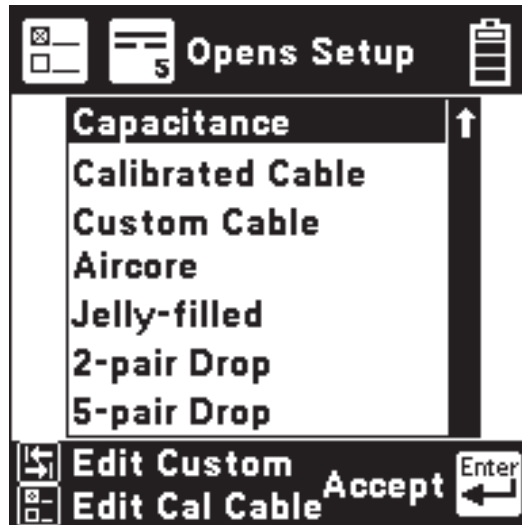
Opens

This function shows the distance to an ‘open’ (or ‘break’) based on the cable type chosen. The Opens function is most accurate if other pairs in the cable are active. If other pairs are not active, you must short at least 30% of the other pairs to the cable shield.



The 965DSP-B will first measure the distance to an open between Red and Black. Press the [Tab] key to move to the next test lead configuration.

Press the [Setup] key to change the Cable Type, or to select Capacitance.

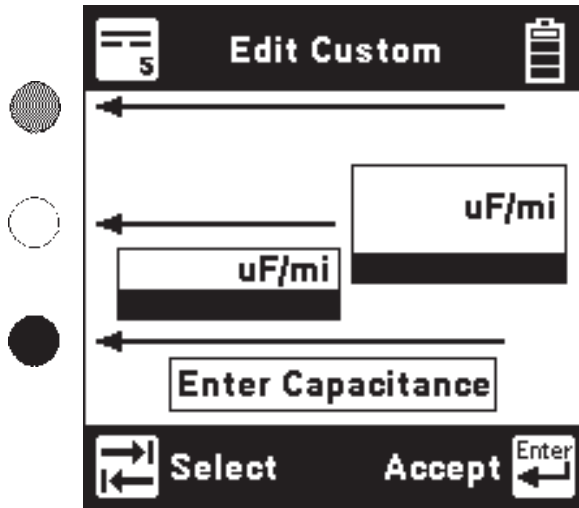


Press the [Up] or [Down] keys to move to a desired cable type. Press the [Enter] key to accept the choice and return to the main Opens screen. Press the [Back] key to return without changing the cable type.

Press the [Tab] key to edit the “Custom” cable type. Press the [Enter] key to edit the “Calibrated Cable” type.

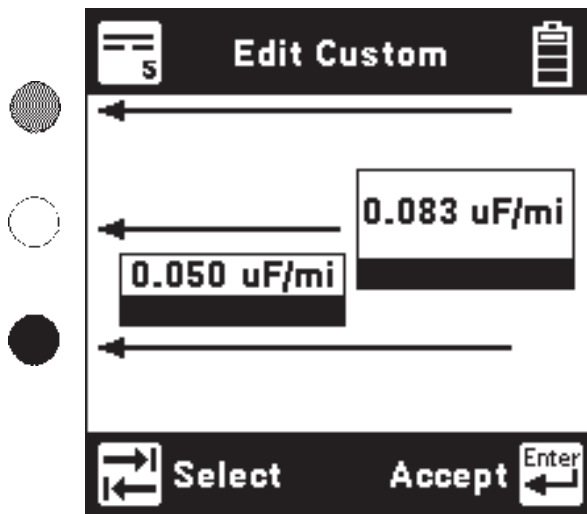
Edit Custom

Use this function to change the value of the “Custom Cable” type. You should use Custom Cable if you are using a specific type of special cable on a regular basis.



First enter the red to black capacitance/distance using the Blue keys. This capacitance is sometimes called ‘Mutual’ capacitance.

Then press [Tab] and use the Blue keys to enter the capacitance/distance for Black to Green. This capacitance is sometimes called the ‘Pair to Shield’ or ‘Pair to Ground’ capacitance.

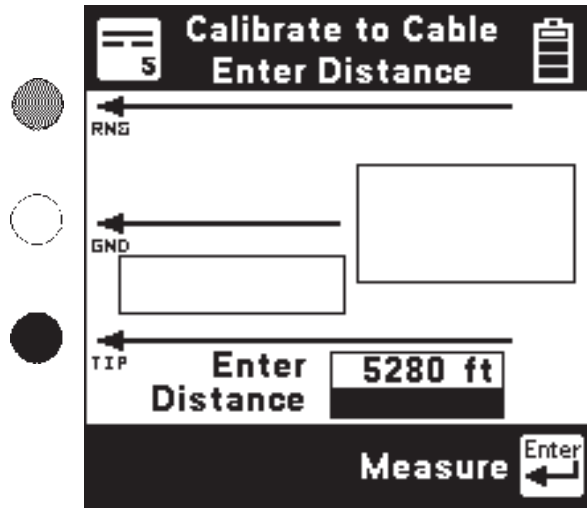


Press [Enter] to accept the changes and return to the Opens Setup screen. Press [Back] to return without making changes.

Calibrate to Cable

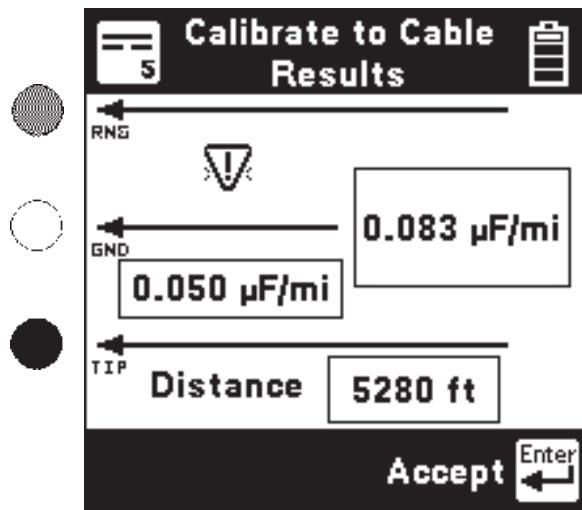
Use this function to measure the capacitance of a known good pair within a cable of known length. This value can be used as a 'Calibrated Cable' (or 'reference') to find the distance to an 'open' on the same or similar cable.

Connect the Red and Black leads to the pair (to be used as a reference) and Green to shield.



Enter the length of the section and press the [Enter] key to measure the capacitance.

The 965DSP-B will then display the measured capacitance/distance for the reference pair.



Press the [Enter] key to accept the results as the new "Calibrated Cable" and return to the Setup screen. Press [Back] to return without saving the results. ⚠ (if shown) indicates the Ring-Ground capacitance differs from Tip-Ground.



Tone

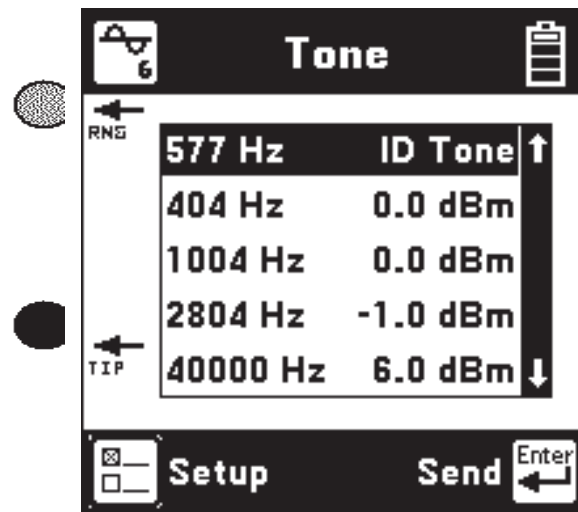
Use this function to send a tone on a pair.

Use the [Up] and [Down] keys to select the desired tone. Note that the top tone on the list is always sent as an interrupted (beeping) tone.

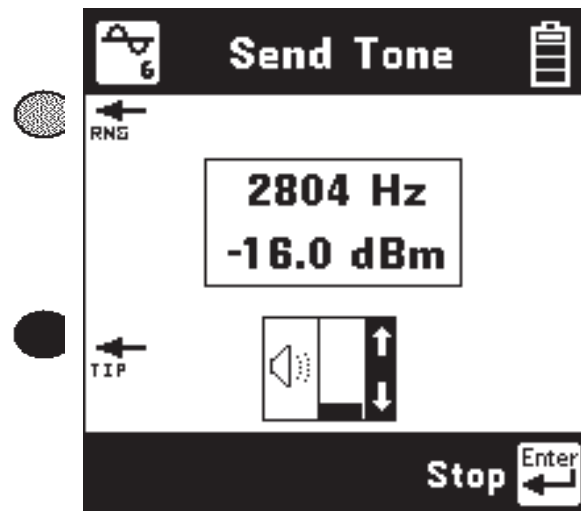
The other four tones are continuous tones.

Use the interrupted tone for Pair Identification.

Use the continuous tones for measuring Loss by using a separate 965DSP or another instrument.

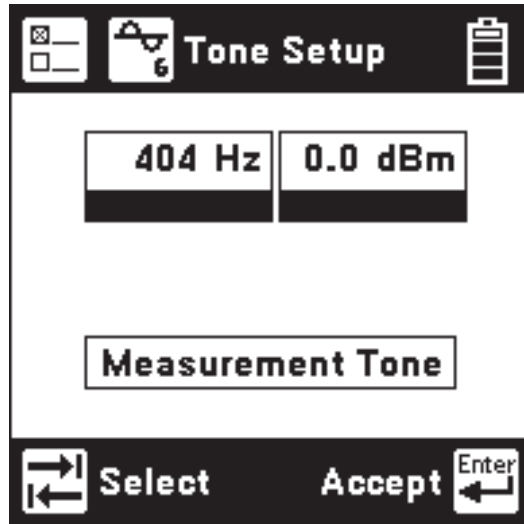


Press the [Enter] key to send the selected tone.



Press the [Up] and [Down] keys to adjust the volume of the tone heard in the 965DSP-B speaker. Note that the volume control does not affect the level of the tone sent on the pair.

Press the [Setup] key to edit the selected tone.



Press the [Tab] key to select either Frequency or the Level for editing.

Press the [Enter] key to accept the changes and return to the Tone Menu screen.

Press the [Back] key to return without making changes.

You may only change the frequency of the ID Tone. The level is fixed at its maximum value.

You may not change the frequency or level of the 40000 Hertz tone. Use the 40000 Hertz tone in conjunction with Wideband Loss (see page 39) as a pre-qualification test for ISDN.

The 40000 Hertz tone is sent with a source impedance of 135 Ohms. All other tones are sent with a source impedance of 600 Ohms.

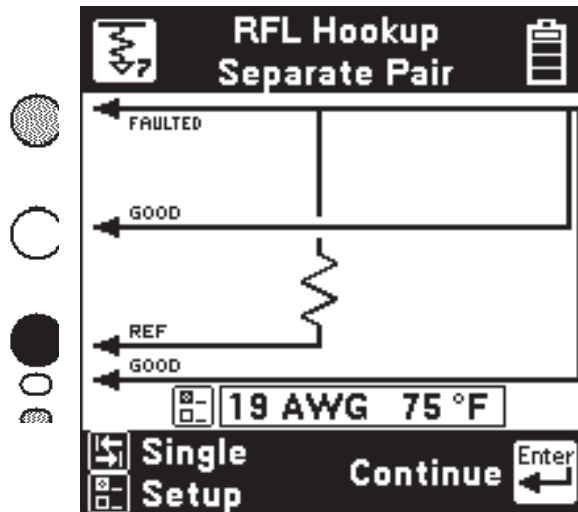


RFL (Resistance Fault Locate)

Use this function to locate a Resistance Fault on a pair or on a single conductor.

The function first shows two possible hookups: Separate Pair or Single Pair. Use the [Tab] key to switch between the two hookups.

Separate Pair: (This is the preferred hookup)



You must first use the Resistance function to identify the faulted conductor and a separate good pair (a pair with no faults).

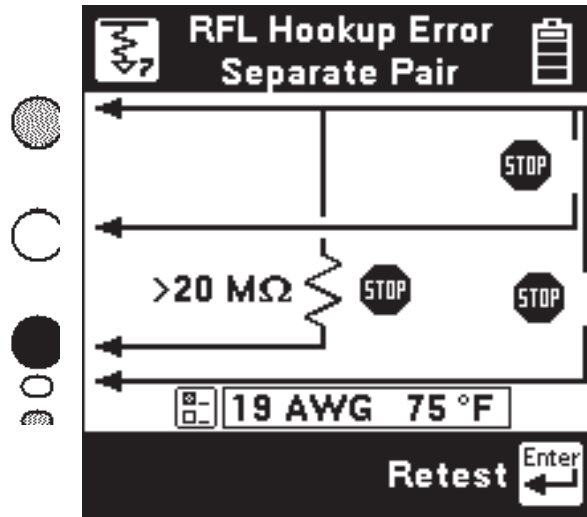
Once you identify the wires, connect the Strap at a 'far-end' access point to the same faulted conductor and separate good pair.

Press the RFL key and select "Separate Pair." Connect the Red test lead to the faulted wire. Connect the Black Lead to the reference. (The reference is the return path for the fault and could be the shield or another wire in the cable.)

Connect the Green and Yellow test leads to the separate good pair.

Press the [Enter] key after you make the above connections.

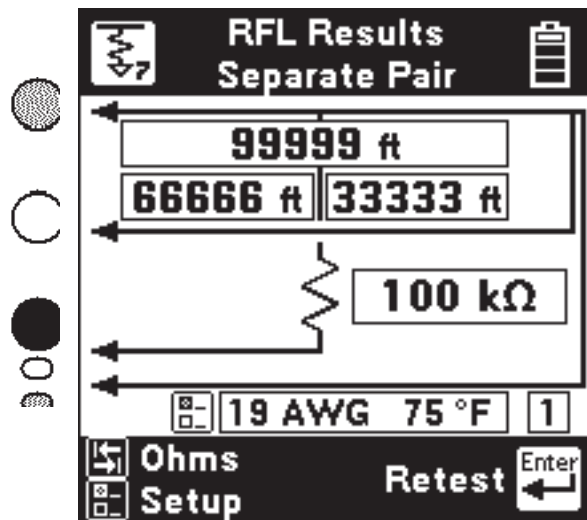
If there is a problem with the connection, you will see the "Hookup Error" screen on the next page. If the connections are OK, the 965DSP-B will go directly to the "RFL Results" screen.



There are three possible hookup errors: 1) the fault is greater than 20 MΩ, 2) the Red/Green strap is bad, 3) the Red/Yellow strap is bad.

The screen will show the combination of errors that has been detected. Correct the errors and press the [Enter] key to repeat the hookup test.

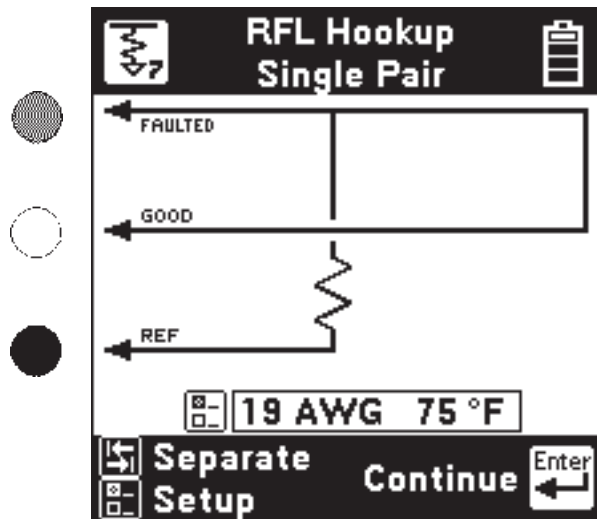
If no errors in the hook-up are detected, the 965DSP-B will go directly from the hook-up screen to the following results screen.



If the Yield Sign ∇ shows beside the results, this indicates a possible inaccuracy in the results (due to noise or other line conditions).

Press [Tab] to show readings in Ohms instead of distance. Press [Enter] to repeat the fault locate using the same Distance to Strap. Press [Setup] to go to the RFL setup screen.

RFL Single Pair



Use the RFL Single Pair hookup when only one wire in a pair is faulted and a reference pair is not available. Use the Separate Pair hookup for all other cases; it is the preferred method.

You must first use the Resistance function to identify a faulted conductor in a pair and to verify that the other conductor is not faulted.

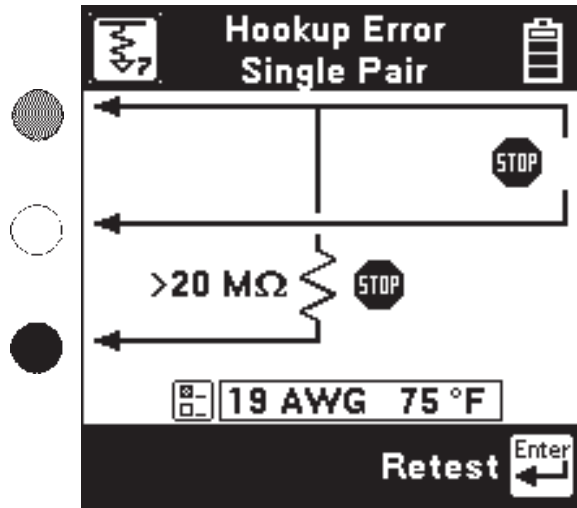
Once you identify the wires, connect the Strap at a 'far-end' access point to the same faulted conductor and good conductor.

Press the RFL key and select "Single pair". Connect the Red test lead to the faulted conductor in the pair. Connect the Green test lead to the unfaulted conductor in the same pair.

Connect the Black Lead to the reference. (The reference is the return path for the fault and could be the shield or another wire in the cable.)

Press the [Enter] key after you have made the above connections.

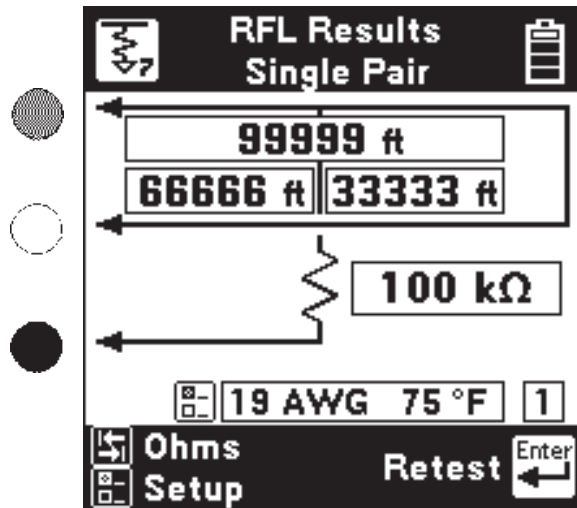
If there is a problem with the connection, you will see the "Hookup Error" screen on the next page. If the connections are OK, the 965DSP-B will go directly to the RFL results screen.



There are two possible single pair hookup errors: 1) the Fault is greater than 20M Ohms, or 2) the Red/Green strap is bad.

The screen will show the combination of errors that have been detected. Correct the errors and press the [Enter] key to repeat the test.

If the hookup test detects no errors, the 965DSP will go directly to the following results screen.

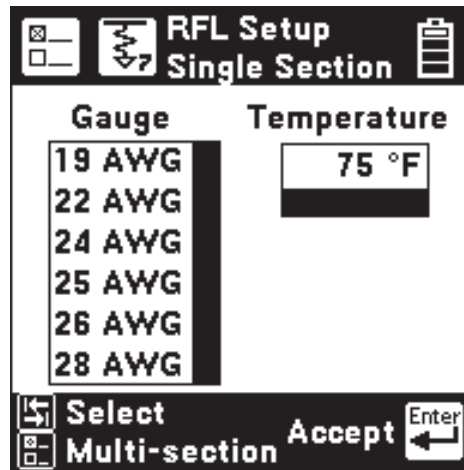


Press [Tab] to show readings in Ohms instead of distance. Press [Enter] to repeat the fault locate using the same Distance to Strap. Press [Setup] to go to the RFL setup screen.

The number in the lower right corner is the section number of the fault when Multiple Gauge is selected. The screen shows "1" for Single Section (Single or Separate Pair).

RFL Setup

Use the RFL Setup to change the Gauge and/or the Temperature of a single section of cable.



Press the [Tab] key to select either the Wire Gauge menu or the Temperature for editing.

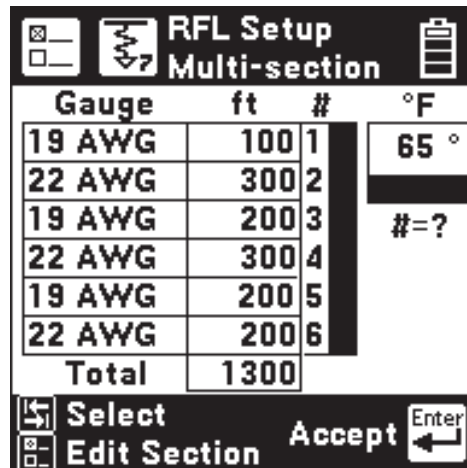
If you select the Wire Gauge menu, press the [Up] and [Down] keys to select the desired gauge.

If you choose Temperature, enter the value of the desired temperature using the blue keys as a numeric keypad.

Press the [Enter] key to accept the changes and return to the previous screen. Press the [Back] key to return without saving the changes.

Press the [Setup] key if you would like to go to the Multi-Section Setup.

RFL Multi-section Setup

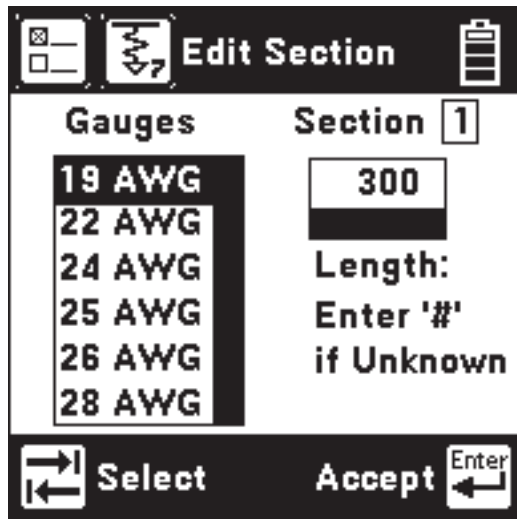


The Multi-Section screen shows a summary of the lengths for up to six sections. The screen also shows the common temperature for all six sections.

Press the [Tab] key to select either the Section Information or the Temperature for editing.

If you choose Temperature, enter the value of the desired temperature using the Blue keys as a numeric keypad.

If you chose to edit the section information , use the [Up] and [Down] keys to select the desired section, then use the [Setup] key to edit the selected section and go to the following screen:



Press the [Tab] key to select either the Wire Gauge menu or the Section Length.

If you select the Wire Gauge menu, press the [Up] and [Down] keys to select the desired gauge.

If you choose Section Length, enter the value of the desired temperature using the blue keys.

Press the [Enter] key to accept the changes and return to the previous screen. Press the [Back] key to return to the previous screen without making changes.

Press the [Enter] key from the RFL Multi-section screen (shown on page 27) to perform a multi-section RFL measurement.

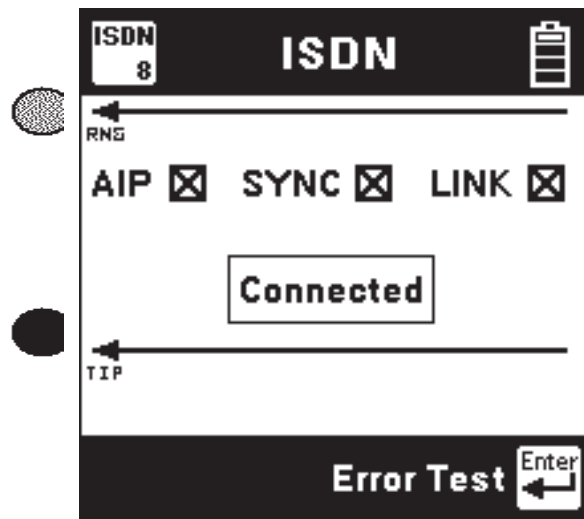


ISDN

Use this function to detect a 2B1Q ISDN signal on a pair, and to measure near-end and far-end errors on an active ISDN line.

2B1Q ISDN is sometimes called NI (National Implementation) ISDN.

Note: the 965DSP-B will not detect older ISDN formats (such as ATT AMI, NTI AMI, etc.).



Connect the Red and Black leads to the pair and press the [Enter] key. The 965DSP-B displays the word “Connecting” while the test set goes through three steps:

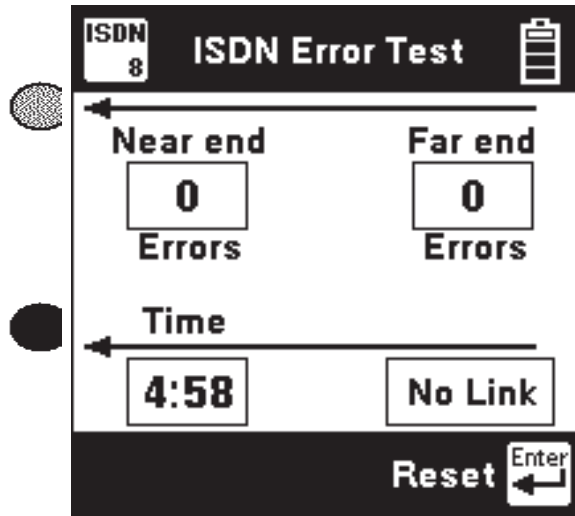
- 1) AIP (Activation In Progress),
- 2) Sync (Synchronization) , and
- 3) Link. (successful connection).

If any of these three tests is unsuccessful, the words “Link Failed” show in the screen.

Once a link is established with an ISDN signal, the screen will display “Link Completed” in the main screen and “Error Test” at the bottom.

Press the [Enter] key to perform an Error Test on the active pair.

ISDN Bit Error Test



The 965DSP-B will count and display the number of Near-End and Far-End errors.

“Near-end” errors are the errors detected at the 965DSP-B. “Far-End” errors are errors detected at an ISDN line card. (The far-end count is transmitted to the 965DSP-B over the ISDN link.)

The screen displays the elapsed time since the start of the ISDN Error Test. Standard practice is to monitor the line for a fixed period of time (5 or 15 minutes) and count the number of errors.

The 965DSP-B will automatically stop counting errors after 15 minutes.

The word “Link” will be displayed as long as the 965DSP-B is linked to the ISDN line. If the link is lost, the screen will display “No Link”.

Press the [Enter] key to start the test again.



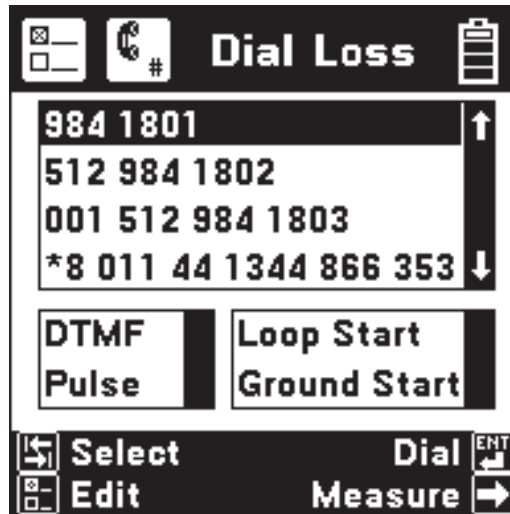
dB

Use this function to measure Loss, Noise, Longitudinal Balance, or Wideband Loss.



Press the [Up] or [Down] keys to move to a test. Press the [Enter] key to accept the choice.

For Loss, Noise and Longitudinal Balance, you will first be asked to dial a number (for a quiet line, milliwatt line, etc.) before starting the test.

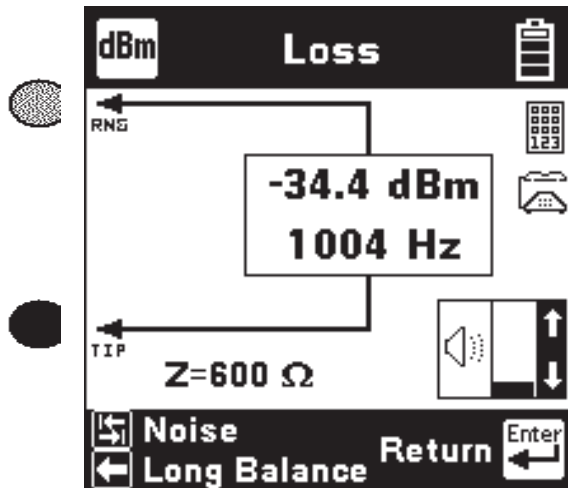


See “Talk Set” on page 38 for more information on dialing numbers. The “Dial Noise” and “Dial Longitudinal Balance” screens appear the same as above, except for the screen titles.

Separate lists of phone number are kept for each function. Press the [Right Arrow] key to measure Loss after the test line answers.

Loss

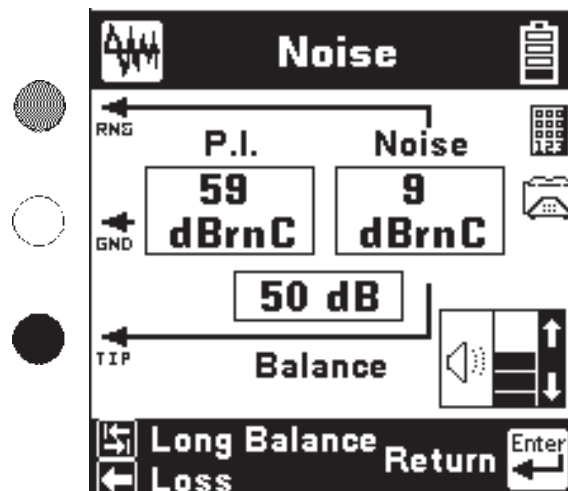
Use this function to measure loss from the far end to the near end using a tone between 200 Hertz and 20k Hz. You must use a separate instrument to generate the tone at the far end.



Press the [Tab] key to go to Noise. Press the [Left Arrow] key to go to Longitudinal Balance. Press [Enter] to return to the dB menu. Press [Up] and [Down] to adjust the speaker volume. Use the Blue keys to send DTMF tones.

Noise

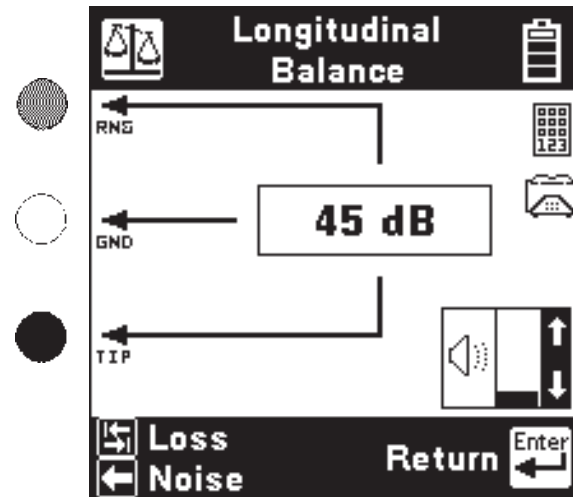
Use this function to measure the Noise, Power Influence and calculated Balance of the pair and ground. Connect the Red and Black test leads to the pair, and the Green lead to ground.



Press the [Tab] key to go to Longitudinal Balance. Press the [Left Arrow] key to go to Loss. See Loss above for other control keys.

Longitudinal Balance

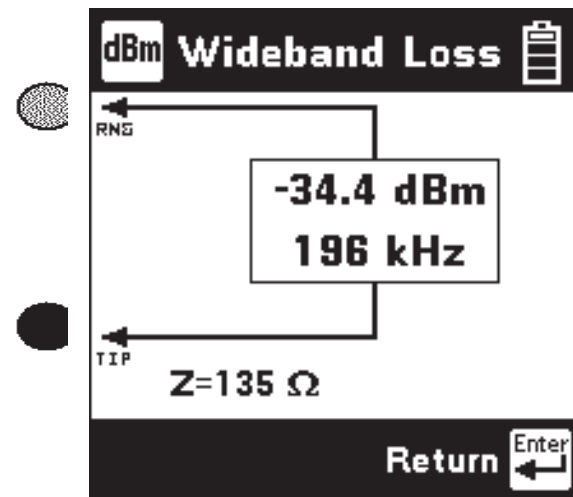
Use this function to measure the active Longitudinal Balance on the pair. The 965DSP automatically goes off-hook to measure Longitudinal Balance.



Press the [Tab] key to go to Loss. Press the [Left Arrow] key to go to Noise. Press [Enter] to return to the dB menu. Press [Up] and [Down] to adjust the speaker volume. Use the Blue keys to send DTMF tones.

Wideband Loss

Use this function to measure the loss of a far end tone between 20k Hz and 200k Hz.



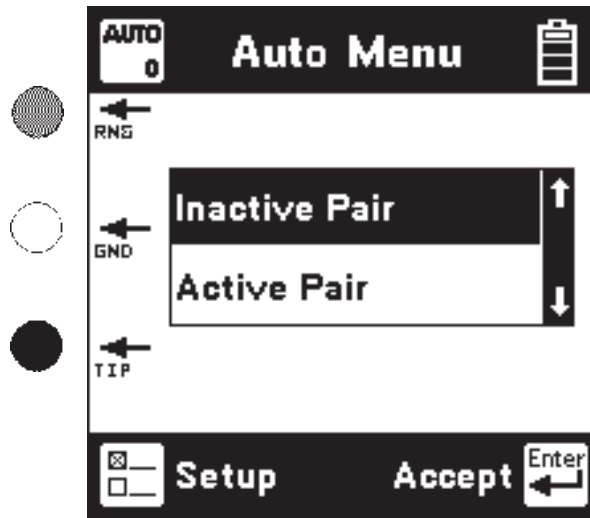
The screen displays the signal level in dBm, and the frequency of the tone in kilohertz.

Press [Enter] to return to the dB menu.



Auto

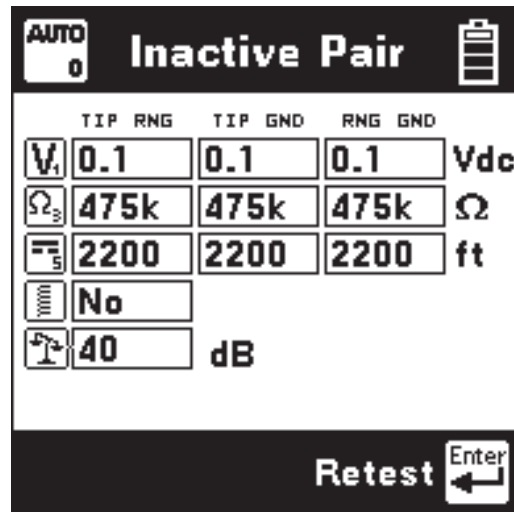
Use this function to perform an automatic sequence of tests on an inactive or active pair.



Press the [Up] or [Down] key to move to the Inactive or Active test. Press the [Enter] key to accept the choice go and to the measurement.

Inactive Pair

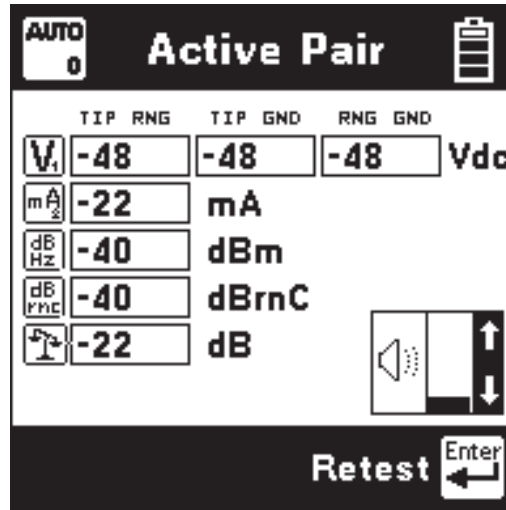
Inactive tests are performed on non-working lines and include: DC Volts, Resistance, Opens, Load Coils, and Capacitive Imbalance.



The results appear as each test is completed. If a test cannot be done, “***” appears in the appropriate result box.

Active Pair

Active tests are performed on working lines and include: DC Volts, Current, Loss, Noise and Longitudinal Balance.



The results appear as each test is completed. If a test cannot be done, “***” appears in the appropriate result box.

The Active Pair test uses the phone numbers stored in memory when dialling a test line for Loss, Noise and Longitudinal Balance.

Auto Setup

Press the [Setup] key from the Auto Menu screen to go to the Auto Setup.



Auto Setup (continued)

There are three choices in the Auto Setup menu:

- Dial Loss
- Dial Noise/Longitudinal Balance
- Opens Cable Type

Press the [Up] or [Down] keys to move to a desired selection. Press the [Enter] key to accept the choice. Use the [Back] key to return to the Auto Menu.

Dial Loss:

Use this setup to enter a ‘milliwatt’ or ‘Dynatel 1020’ test line number for the Active Pair Loss measurement.

The screen and controls for the Auto Dial Loss setup are similar to the Dial Loss screen.

Dial Noise/Longitudinal Balance

Use this setup to enter a ‘quiet’ test line number (or a ‘1’ to break dial tone) for both the Active Pair Noise and Longitudinal Balance measurements.

The screen and controls for this setup are similar as the Dial Noise screen.

Opens Cable Type:

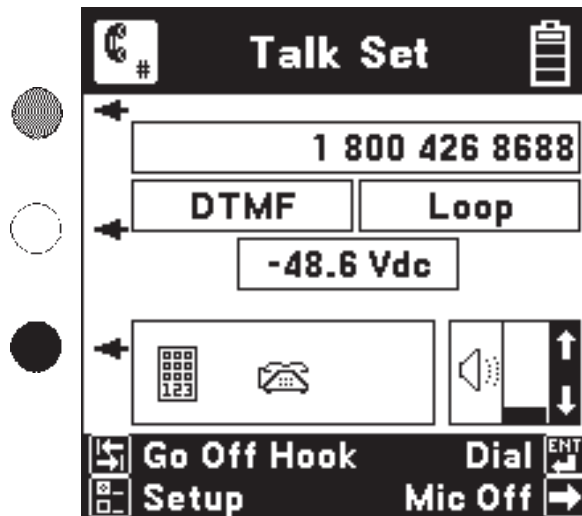
Use this setup to select the Cable Type used for the Inactive Pair Opens measurement. Note that you may not select Capacitance from this menu.



Talk Set

This function allows you to use the 965DSP-B as a Talk Set on active pairs, or to send DTMF tones or pulses on inactive pairs.

Connect the Red and Black leads to the pair for Loop Start. Also connect the Green lead to ground for Ground Start.



This screen displays the last number dialed, the DC voltage on the line, and the signal format for dialing. You can use DTMF or pulse dialing, or select between loop or ground start.

Use the [Setup] key to change these settings or to select and edit a stored phone number.

The blue keys become number keys in Talk Set. Use the [Backup] key to exit Talk Set before going to another function.

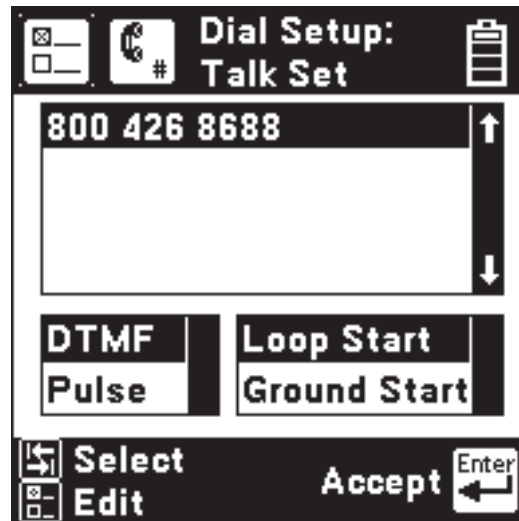
Use the [Tab] key to switch between on-hook and off-hook. Use the [Enter] key to dial (send) the number in the display.

Use the [Right] arrow key to turn the microphone on and off.

The speaker is active during the Talk Set function. Use the [Up] and [Down] arrow keys to adjust the volume. The maximum volume is limited in the Talk Set function to prevent unwanted feedback.

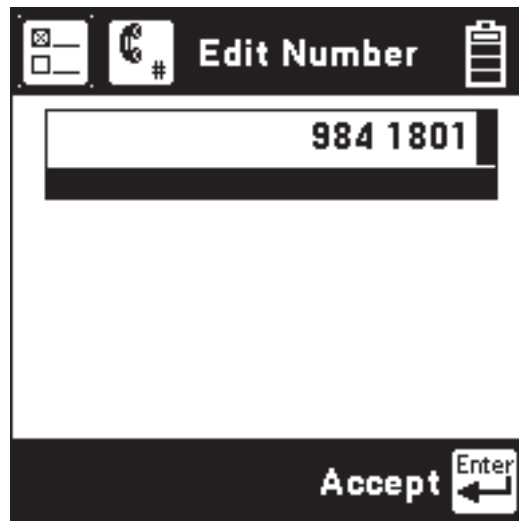
Talk Set Setup

Press the [Setup] key to access the telephone number directory.



Use the [Up] and [Down] arrow keys to move to a desired number. Use the [Tab] key to highlight a desired menu. Use the [Enter] key to accept the choice and return to the previous screen.

For any number highlighted, press the [Setup] key to edit the number.



Use the blue keys to change the number. See the Editing instructions on page 6 for additional information. Press the [Enter] key to accept the changes and return to the previous screen.

Use the [Back] key to return to the previous screen without making changes.

Care and Maintenance

Battery Pack: The 965DSP-B uses a Nickel Metal Hydride (NMH) battery pack. Typical life of the battery pack is two years.

To change the battery pack: 1) loosen the six screws on the battery compartment door and remove the door, 2) remove the old pack, then 3) unplug the battery connector.

To install a new battery pack: 1) plug in the battery connector, 2) place the pack in the battery compartment, then 3) replace the door and tighten the screws.

Charging:

The battery pack must be charged on a regular basis. You can use the 965DSP-B for up to 12 hours typical usage (6 hours continuous usage).

The time between charges may be reduced if you use the backlight frequently or if you work in very cold weather.

Typical charging time is two hours.

Level of Charge:

The battery icon in the upper right of all screens indicates the battery charge. Four black "bars" indicate full charge. Zero black "bars" indicate the battery pack is very low and should be charged immediately.

AC/DC Adaptor:

Use the AC/DC adaptor to charge the NMH battery pack. Plug the AC cord into the AC/DC adaptor and into a power outlet. Plug the DC cord into the 965DSP-B.

IR Port:

The IR Port on the top of the 965DSP-B is used for uploading new software enhancements.

An IR to RS-232 adaptor cable is provided with software enhancements.

Battery Holder:

The plastic battery holder that comes with the 965DSP-B uses six “AA” alkaline batteries (alkaline batteries are not included).

Use alkaline batteries only when the NMH battery pack is discharged and the AC/DC adaptor is not available. Typical lifetime of the alkaline battery pack is eight hours of normal use (less if you use the backlight or work in very cold weather).

The alkaline battery pack is installed the same way as the NMH pack.

Test Leads:

The 965DSP-B comes with a Red/Black test lead pair, a Blue/Yellow test lead pair, and a separate Green test lead.

The Red/Black and Green test leads are used for most measurements. The Yellow lead is used with RFL. The shorting ‘strap’ that comes with the 965DSP-B is used with RFL.

Keep the test leads clean and dry at all times to insure best accuracy of the measurements. Use soap and water to clean them if necessary.

Replacement Items:

You may order any of the following replacement items from 3M. Contact 3M Telecom Systems Division customer service at 800 426 8688 for more information.

Accessory	3M Part Number
NMH Battery Pack	80-6108-6473-0
Red/Black Test Lead Pair	80-6108-6435-9
Blue/Yellow Test Lead Pair	80-6108-6436-7
Green Test Lead	80-6108-6437-5
Ground Strap	80-6109-3830-2
AC/DC Adaptor	80-6108-6393-0
Carrying Case	80-6108-6392-2
Alkaline Battery Holder	80-6108-6472-2

Repair:

Many apparent failures with the 965DSP-B can be corrected by simple procedures.

Symptom	Cause	Solution
Unit does not turn on	Discharged battery pack. AC/DC adaptor disconnected. NMH battery pack old.	Charge battery pack. Check AC/DC adaptor cords. Replace battery pack.
Screen goes blank	Battery voltage low.	Charge battery pack.
Dark lines across screen	Battery voltage low.	Charge battery pack.
Error Messages	Battery voltage low.	Charge battery pack.
Inaccurate results	Battery voltage low. Test lead broken. Improper connections.	Charge battery pack. Replace test lead. Check Connections.
No results	Test lead broken Improper connections.	Replace test lead. See on-screen hookups.
Resistance reads less than 999 M Ohms when test leads disconnected.	Test Leads dirty	Clean Test Leads
Error messages during Self-Calibration.	Test Leads not shorted properly when prompted.	Check Connections.

If the above solutions do not fix the problem, the 965DSP-B may need repair.

Please make a note of the conditions when any failure occurred and record any error messages that may have appeared on the screen, then call 3M Telecom Repair Service at 800 426 8688 for further details on repair service.

965DSP-B Specifications:

Size:	4x10x2.5"	(10x25x6 cm)
Weight:	3.3 lbs	(1.5 kg)
Operating Temp:	0 to 140°F	(-18 to 60°C)
Storage Temp:	-40 to 165°F	(-40 to 70°C)

Function	Range	Accuracy	
Voltage:	0 to 30 Vdc, Vac	0.5 V	
	30 to 300 Vdc	0.7 V	
	30 to 250 Vac	0.7 V	
Current:	-60 to 60 mA	1% +/- 0.3 mA	
	-110 to -60 mA	2%	
	60 to 110 mA	2%	
Resistance:	0 to 100k Ω	1% +/- 5 Ω	
	(1% +/- 50 Ω if C.O. voltage present)		
	100k Ω to 10M Ω	3%	
	100M Ω to 1000M Ω	10%	
Load Coils:	0 to 4		
Opens:	3 to 10000 ft	1% +/- 3 ft	
	(1m to 3 km)	(1% +/- 1 m)	
	10000 to 50000 ft	5%	
	(3 to 15km)		
	50000 to 100000 ft	10%	
	(15 to 30 km)		
Tone:	200 to 20kHz,	1 Hz	
	-20 to +1 dB	0.2 dB	
	40kHz, 6dBm	10Hz, 0.5dB	
RFL fault size:	0 to 20 M Ω		
RFL loop resist.:	0 to 7000 Ω		
RFL fault locate:	0 to 99 Ω	0.1% of RTS	
		+/- 0.01 Ω	
	100 to 999 Ω	0.2% of RTS	
	1000 to 7000 Ω	1% of RTS	

(RTS: Resistance to Strap. Distance to fault depends on the wire gauge and temperature selected.)

Loss:	-40 to 10 dBm	0.5 dB
	200 to 3000 Hz	2 Hz
	3 kHz to 20 kHz	10 Hz

Wideband Loss:	-46 to 10 dBm	1 dB
	20k to 200kHz	100 Hz

Noise Metallic:	0 to 50 dBrc	2 dB
Noise to Ground:	40 to 100 dBrc	2 dB
Auto:	(Same as individual functions)	

New Product Limited Warranty:

3M Telecom Systems (herein referred to as the Seller) warrants its products to be free from defects in material and workmanship, subject to the following terms and provisions:

- a) All instruments are warranted for 12 months after date of shipment from the Seller to the original purchaser.
- b) Seller's obligations under this warranty are limited to repairing, replacing, or adjusting at Seller's option any of Seller's products which after normal and proper usage, proves to be defective on Seller's inspection, provided that the purchaser shall have reasonably inspected products when received and notified the Seller of any apparent defects within 15 days of receipt of shipment. Seller shall not be liable for any injury or for any manufacturing costs of the buyer, or any other special consequential damages incurred by the buyer by reason of the use of any of the Seller's equipment.
- c) Equipment delivered by the Seller shall not be considered defective if it satisfactorily fulfills the order or complies with the published specifications on standard catalog items. This warranty does not extend to any of Seller's products which have been subjected to misuse, neglect, accident or improper applications, nor shall it extend to units which have been repaired or altered outside of the Seller's factory, nor to any associated instruments, equipment or apparatus.

Important Purchaser Notice

All statements, recommendations, and technical information related to Seller's products are based on information believed to be reliable, but the accuracy or completeness thereof is not guaranteed. Before using the equipment, the buyer should determine the suitability of the product for the intended use, and assumes all risk and liability whatsoever in connection with that use.

All statements or recommendations not contained in Seller's standard publications shall have no force or agreement unless an agreement signed by the officers of Seller, and the above is made in lieu of all warranties, expressed or implied.

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