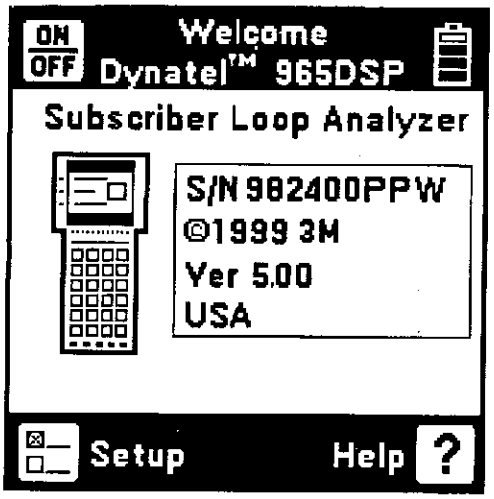
3M

Dynatel™ 965 DSP Series
Subscriber Loop Analyzers



Instruction Manual

March 2000
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Welcome to the Instruction Manual for the 3M™ Dynatel™ 965DSP family of Subscriber Loop Analyzers. This document will give you a brief overview of the products, a description of the test functions, and some technical hints on how to find problems on telecommunications cables.

Table of Contents:

Out of the Box

What you will find when you unpack the shipping box:

- 3M™ Dynatel™ 965DSP Series Subscriber Loop Analyzer
- Carrying case
- NiMH battery pack (inside the 965DSP)
- Spare battery holder
- Test Leads (red/black pair, blue/yellow pair, green)
- Shorting strap
- AC charger
- Power cord
- Instruction manual
- Quick card and Warranty card
- Self-test board

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

A NiMH battery pack is already installed in the 965DSP. You may need to charge the battery before using the unit. Please see Care and maintenance section. The Spare Battery Holder holds six "AA" alkaline batteries and should only be used if the NiMH battery pack is discharged.

The 965DSP comes with 5 test leads. Red/black, Blue/yellow and green are used for most functions. Yellow is used for RFL, yellow and blue are used for TDR (not in the 965DSP-B). The Shorting Strap is only used in RFL mode.

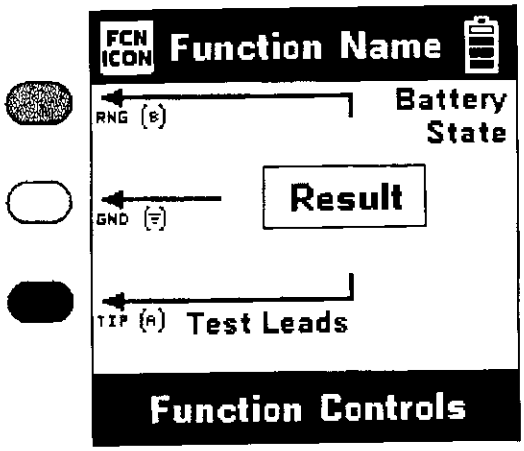
The AC charger will convert 110 or 220 Vac into the 12 Vdc used for charging the 965DSP. A North American 110 Vac Power Cord is provided with the unit. The AC charger is meant for charging the NiMH battery pack only. **Do not use the AC charger to power the 965DSP during normal operations.**

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

3M Telecom Systems Division
6801 River Place Boulevard,
Austin, Texas 78726-9000 USA

Screen

The 965DSP 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.

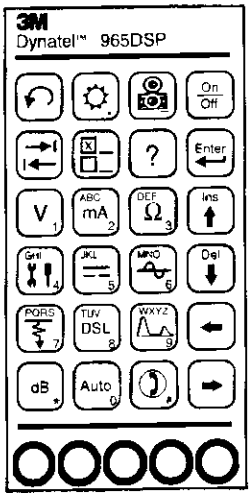


Test Leads

The Test Lead icons are shown on each of the measurement screens. Each lead points to a color dot on the front label that corresponds to the actual test lead. The test leads have the labels "RNG" (ring), "GND" (ground) and "TIP" (tip) for the US and Canada. These labels correspond to "B", Ground, and "A" for other countries.

Keypad

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



Note that the TDR function is inactive in the 965DSP-B.

Control Keys

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

Use the [Save] key for saving Auto Test results and Single Trace TDR traces (not in 965DSP-B)

Use the [On/Off] key to turn the 965DSP on or off (see also "time out" on page 7)

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 or insert and delete characters when editing.

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

Editing

Use the following keys when editing numbers:

Use  or  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 signal levels or temperature.

Function Keys

Use the blue keys to select the different test functions in the 965DSP. 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: Self-Cal, Load Coils, Special and Ground Resistance, K-Test, Ohms/Distance, Stored Results, Caller I.D. (US and Canada), Splice Locate and Maintenance.

Use the [Opens] key to find the distance to an 'open'.

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 [DSL] key to operate the ISDN datalink and other DSL functions (if equipped)

Use the [TDR] key to display a Time Domain Reflectometer trace of one or two pairs (not in the 965DSP-B).

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

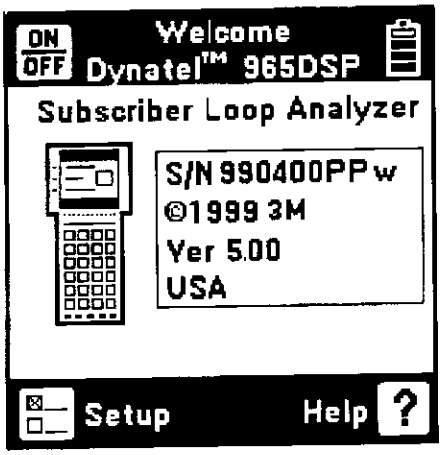
Use the [Auto] key to perform a series of tests on an Active, Inactive or Wideband pair.

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

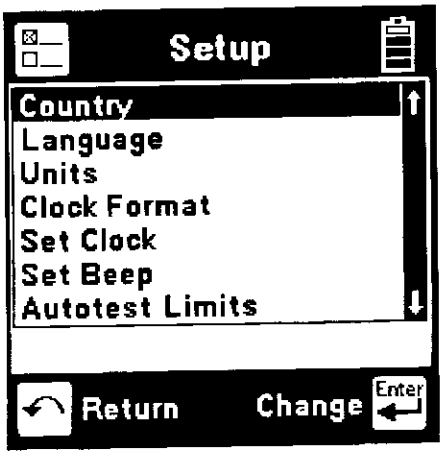
Time Out: All functions (except for Autotest, ISDN datalink, TDR, Dial and Tone) "time out" in 5 minutes if no key is pressed and the 965DSP will turn off. ISDN and TDR time out after 30 minutes, Dial and Tone timeout is 120 minutes, and Autotest times out in 10 minutes.

Welcome Screen

This is the screen that you see when you first turn on the 965DSP. It shows the model name, serial number, copyright year, software version, and the selected country. The battery symbol in the upper right-hand corner of the display gives an indication of the approximate battery capacity. Each bar represents one-quarter of the full capacity. If the spare battery holder with the alkaline batteries is installed in place of the NiMH battery pack, the battery level will not be monitored and the battery symbol will not be visible in the displays.



Press [Setup] to go to the general Setup screen from the Welcome screen.

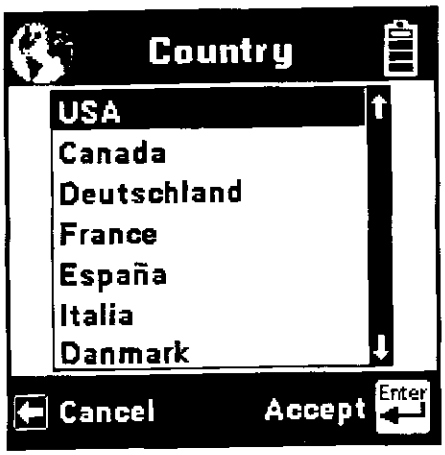


Use the [Up] and [Down] keys to highlight a menu item: country, language, units, clock format, set clock, set beep, or threshold setup. Press the [Enter] key to select the highlighted item.

Use [Back] to return to Welcome Screen without making changes.

Country

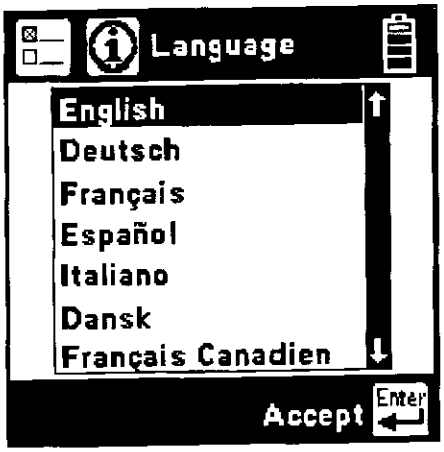
Use the Country setup to configure the 965DSP for a specific country. Selecting a new country will configure the 965DSP with the setups for language, units, clock format, wire gauges, and cable types for that particular country.



Use the [Up] and [Down] keys to highlight a Country. Use [Enter] to select a country. You will be warned about changing country-specific default values and asked to confirm or cancel your selection.

Language

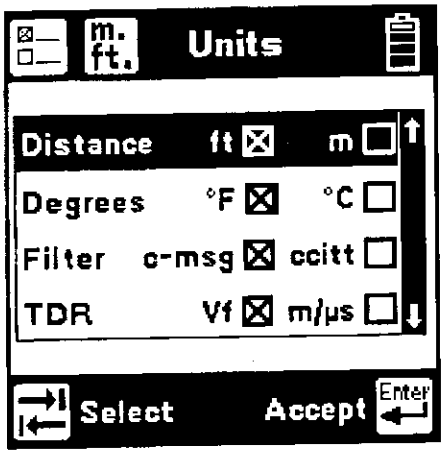
Use the Language setup to change **only** the language in the 965DSP. Country-specific default values are not affected.



Use the [Up] and [Down] keys to highlight a new language. Use [Enter] to accept the changes and return. Use [Back] to return to the Welcome Screen without making changes.

Units

Use the Units setup to change the units of measurement for the 965DSP:



Use the [Up] and [Down] keys to highlight the option. Use the [Tab] key to select the parameter for each unit of measurement:

Distance: *Feet or Meters:* This affects all distances displayed in the 965DSP.

Degrees: *Fahrenheit or Centigrade:* This affects all temperatures used in the 965DSP.

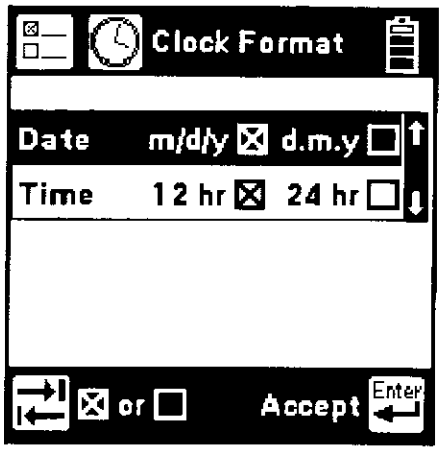
Filter: *C-Message or CCITT*: This affects the filter used in the Noise function. Use the C-Message filter in the US and Canada. Use the CCITT (also called "Psophometric") filter in all other countries.

TDR: *Vf (Velocity Factor) or m/µS (meters per microsecond):* This affects the TDR "velocity of propagation." Use "Vf" in the US and Canada. Use "m/µS" in other countries.

Use the [Enter] key to accept any changes and return. Use the [Back] key to return to the Welcome Screen without making changes.

Clock Format

Use the Clock Format setup to change the format of the clock. The clock is used for the timestamp and datestamp in stored results.



Use the [Up] and [Down] keys to highlight either the date or time. Use the [Tab] key to select the format parameter:

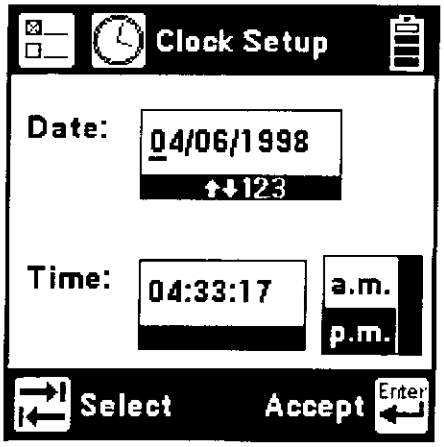
Date: *m/d/y (month/day/year) or d.m.y (day.month.year).* The m/d/y format is used in the US and Canada. The d.m.y format is used in most other countries.

Time: *12 hours or 24 hours:* This affects the number of hours displayed in the clock. The 12 hour clock (with a.m. and p.m.) is used in the US and Canada. The 24 hour clock format is used in most other countries.

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

Set Clock

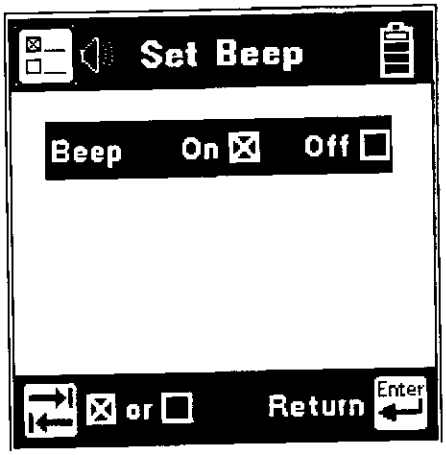
Use the Set Clock setup to change the date and time.



Use the [Tab] key to select either the date, time, or a.m./p.m. Use the [Left] and [Right] keys to select the digit to change. Use the Blue keys to enter the values. Use the [Up] and [Down] keys to select a.m. or p.m. Use [Enter] to accept the changes and return. Use [Back] to return to the Welcome Screen without making changes.

Set Beep

Use the Set Beep setup to turn the key beeps on or off.



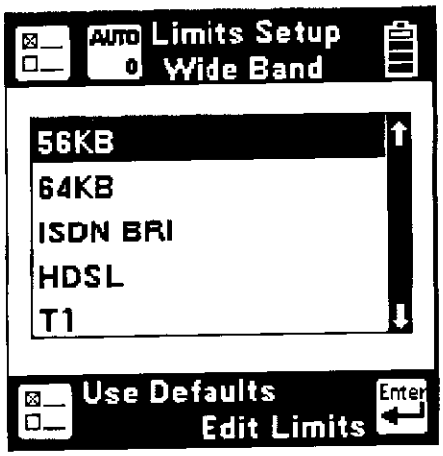
Use the [Tab] key to toggle between on or off. Use the [Enter] key to return.

Auto Test Limits

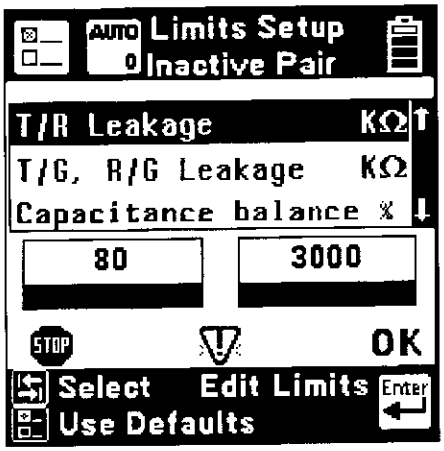
Use the Auto Test setup to change the pass/fail threshold values for the Inactive Pair, Active Pair and Wideband auto tests.

Use the [Up] and [Down] keys to highlight the desired Auto Test parameters to modify. Press the [Enter] key to select the highlighted choice or press the [Setup] key to restore the factory default values for the selected auto test.

If Wideband is selected, a list of the available wideband services is displayed. Use the [Up] and [Down] keys to select the wideband service to modify. Press the [Enter] key to select the highlighted choice or press the [Setup] key to restore the factory default values for the selected service.



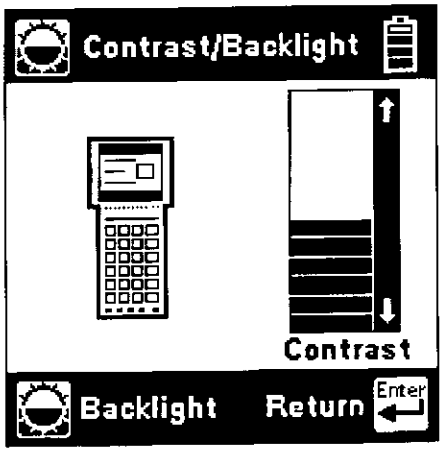
When the Inactive Pair, Active Pair or specific Wideband service is selected, the Threshold Limits screen will be displayed. This screen displays a list of measurements performed in the selected auto test and the corresponding pass/fail limits for each measurement. The limits indicate the values at which the measurement result passes (OK), is marginal (Yield Sign) or is unacceptable (Stop Sign). The lower limit threshold value is shown in the box on the left, the upper limit in the box on the right. If the test result value is less than or equal to the lower limit in the left box or greater than or equal to the upper limit in the right box, the pass/fail result will correspond to the symbol under the box (either Stop or OK). If the test result value is between the upper or lower limit, the pass/fail result will be marginal (Yield Sign).



Use the [Up] and [Down] keys to highlight the desired test. Use the [Tab] key to move the cursor to the limit value and enter the new value using the Blue keys. Press the [Setup] key to restore the factory default values for the selected test. Press the [Enter] key to accept the changes or the [Backup] key to ignore all changes and return to the Threshold Setup screen. If invalid limits are entered, a warning screen will be displayed. Press the [Enter] key to return to the Edit Limits screen and make the appropriate changes to the limit.

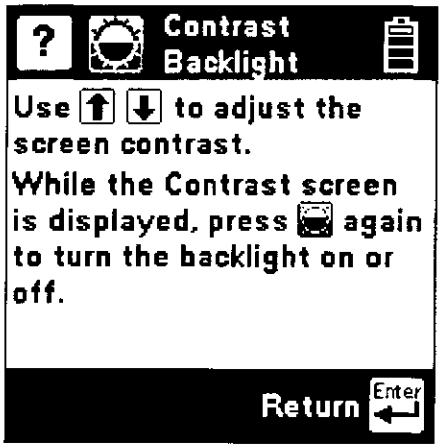
Contrast/Backlight

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. Use the [Enter] key to return.



Help

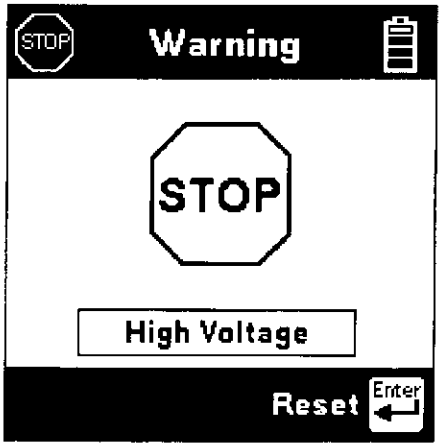
Press the [Help] key at any time in any screen (not just the Contrast screen) to get help with the present function.



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

High Voltage

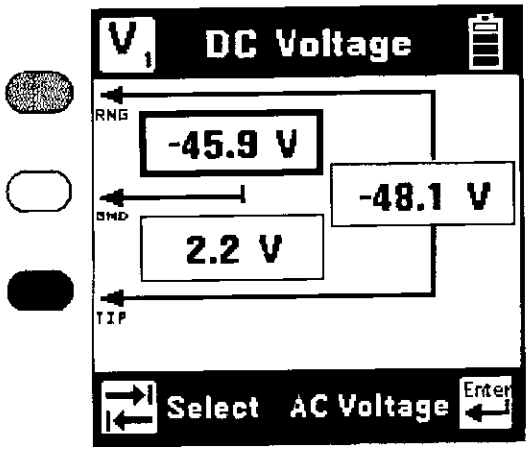
This screen indicates that a high voltage (120 VAC/ VDC or greater) has been detected between the test leads when not in the Voltage Mode. The 965DSP has opened an internal relay to protect itself from damage. Use standard safety practices for disconnecting the test leads since high voltage may be present.



Press the [Enter] key to restart the 965DSP.

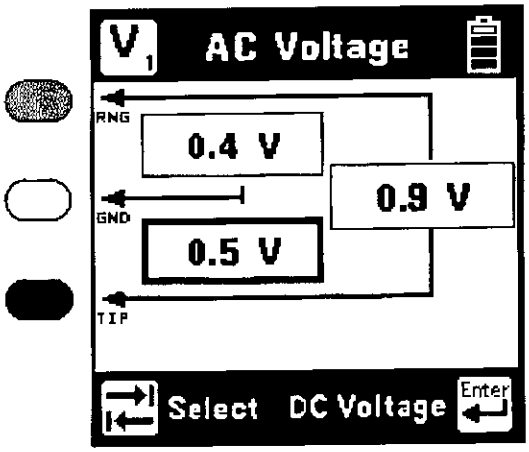
Voltage

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. The highlighted reading is "live" and the unhighlighted readings are the last values.

Press the [Enter] key to switch from the DC to the AC voltage measurement.

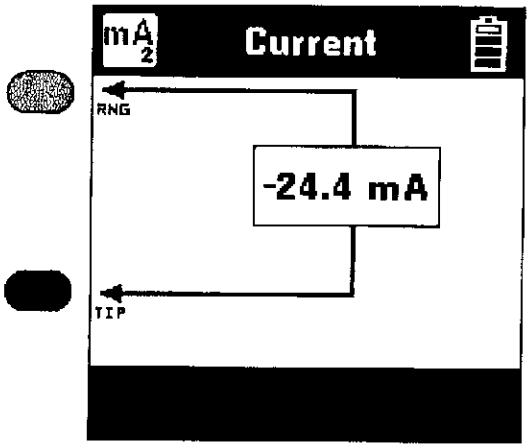


Press the [Tab] key to move to the next test lead configuration.

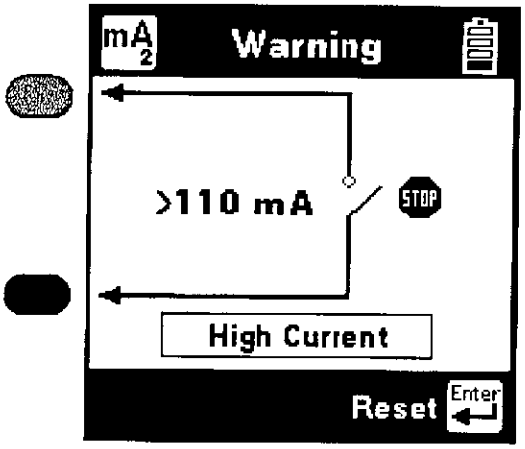
Press the [Enter] key to switch from the AC to the DC voltage measurement.

Current

This function measures the DC current flowing through a 430 Ohm resistor inside the 965DSP. Connect the Red and Black leads to the pair to measure loop current.



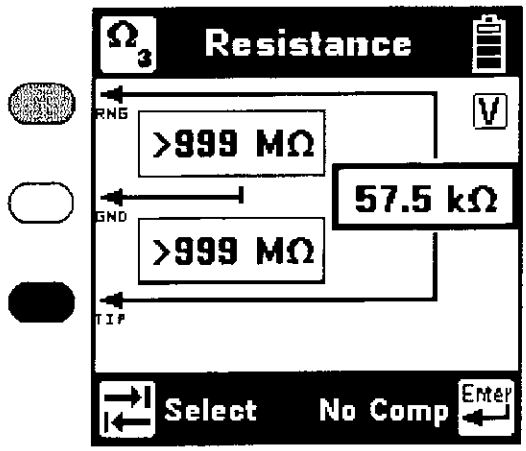
If the Current is greater than 110 mA , you will see the following 'Current Warning' screen:



This screen indicates that a high current has been detected between the test leads and that the 965DSP 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 measurement again.

Resistance

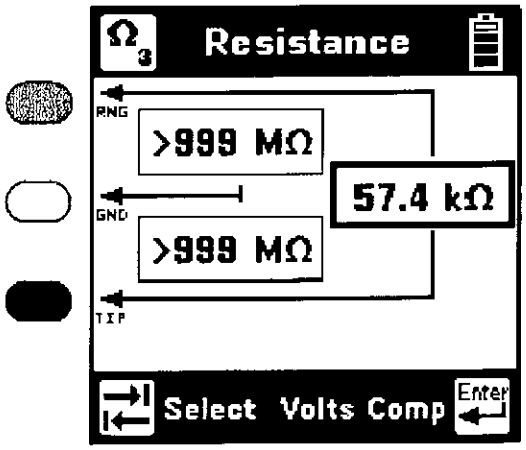
This function first measures the resistance between the Red and Black test leads.



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.

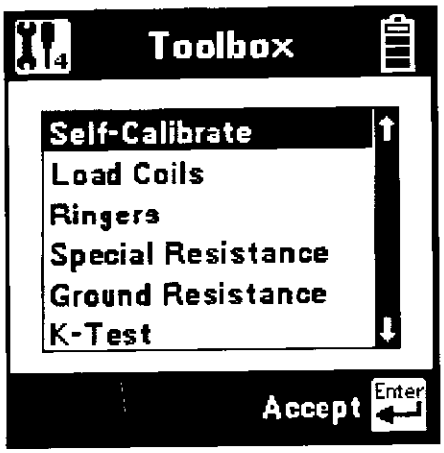
Press the [Enter] key to remove the voltage compensation. Use this test only if you have first determined there is no DC voltage on the pair (by using the Voltage function). The non-compensated measurement is slightly faster, but is not as accurate if there is voltage on the line.

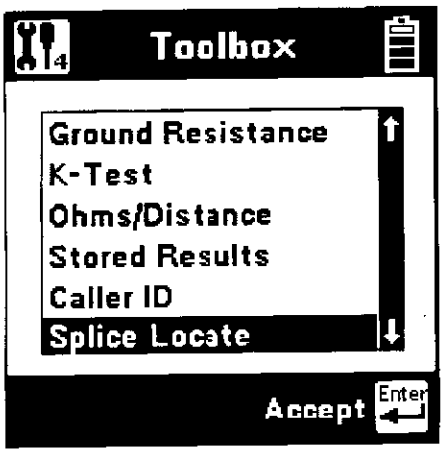


The resistance measurement can be affected by moisture on the test lead clips or terminal face. For the most accurate measurement make sure that these areas are dry.

Toolbox

The "Toolbox" menu contains ten or eleven items depending on which Country has been selected under Setup (Caller ID is available only in North America). Only six menu items are visible at any time. Use the [Up] and [Down] arrow keys to move to the desired test, then press the [Enter] key to accept the choice.





Descriptions for the first ten items are found in the following pages.

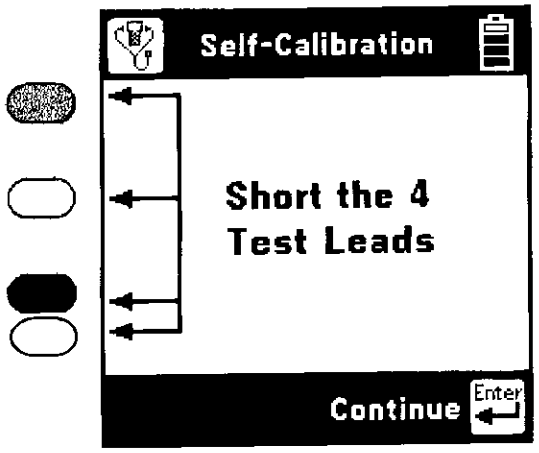
The last item in the menu (Maintenance) is reserved for use only during factory setup and service of the 965DSP.

Self-Calibration

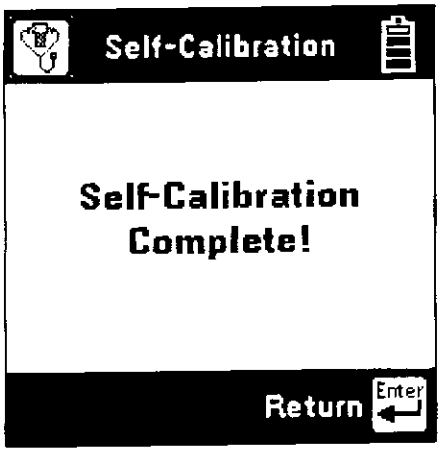
Use this function to calibrate the 965DSP anytime the outside temperature changes by more than 35°F (20°C). Calibrate the 965DSP at the same temperature at which it will be used.

You will see the following screen as soon as you select Self-Calibration from the Toolbox.

Short the red, green, black and yellow leads together when prompted, then press [Enter] to continue.

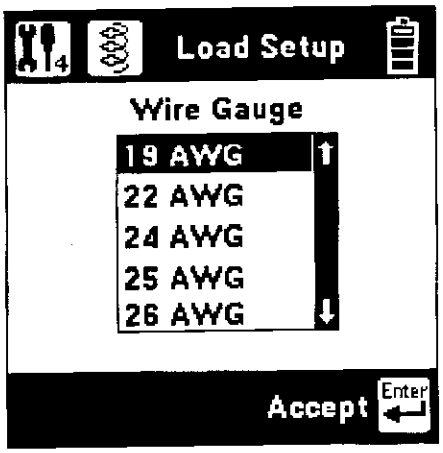


The screen shows "Self-Calibration Complete" when the calibration is done, or "Self-Calibration Failed" if the calibration fails. In this last case, check the test lead connections and try again.



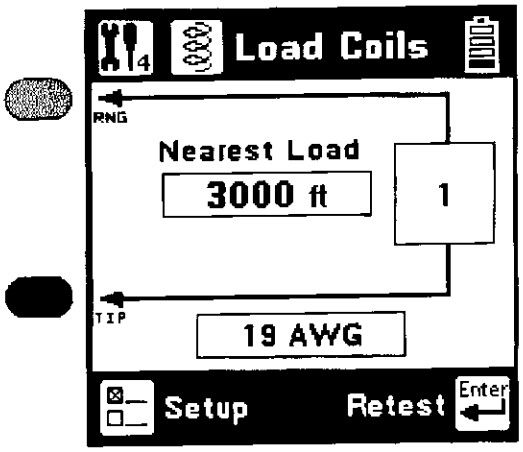
Load Coils

This function counts up to five load coils on the pair and determines the distance to the first one. The distance measurement requires that you specify the wire gauge of the pair. This is done in the Load Setup screen. Use the [Up] and [Down] arrow keys to highlight the correct wire gauge. Use [Enter] to accept that choice.



The Load Coils screen will appear and an hour glass will be visible at the bottom of the screen during the measurement. When complete, the load coil count will be visible in the box on the right and the distance to the first load coil will be visible in the box labeled "Nearest Load".

If no load coils are present the count will be 0 and "Not Found" will be visible in the "Nearest Load" box.



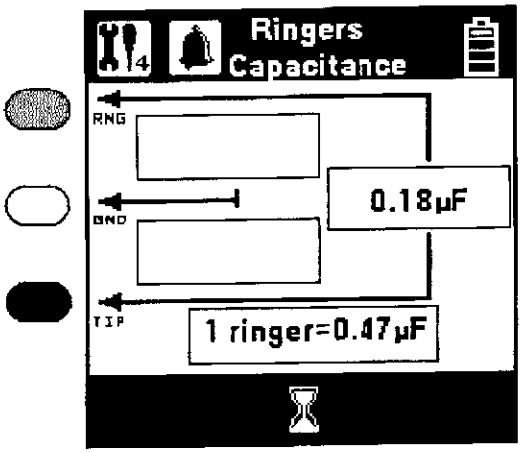
After the test is done, press the [Enter] key to repeat the load coil count. Press the [Back] key to return to the Toolbox menu or press the [Setup] key to change the wire gauge.

It is not necessary to have any particular length of cable before the first load coil, but you must have at least 3000 feet (1000 meters) of cable after each load coil for the Load Coil function to count properly.

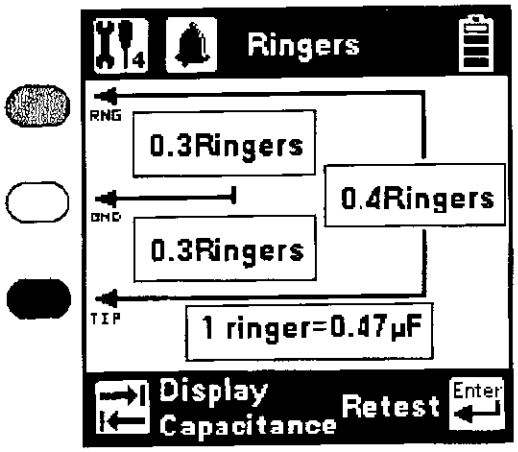
You may also use the TDR function (not in the 965DSP-B) to find the distance to the first load coil on the pair.

Ringers

This function measures the capacitance associated with one or more ringer circuits on the line or the equivalent number of ringers (1 ringer = 0.47 uF). Either the Ringers Capacitance screen or the Ringers (equivalent) screen will be displayed depending on which was last selected. During the measurement an hour glass will be visible at the bottom of the display.



When the measurement is complete, the Ring-Ground, Tip-Ring and Tip-Ground capacitance will be displayed. To display the equivalent ringer count, press the [Tab] key.

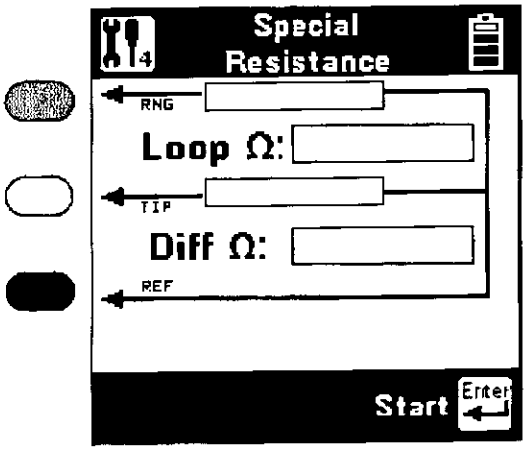


Pressing the [Tab] key again will return the screen to Ringers Capacitance. Press the [Enter] key to repeat the test.

Special Resistance

Use this function to measure the:

- Loop Resistance between the Red and Green test leads.
- Resistance of each conductor connected to the Red and Green test lead.
- Resistance Difference between the two conductors.



Connect the Red lead to one side of the pair.

Connect the Green lead to the other side of the pair. Connect the Black to a reference wire.

Note that the "reference wire" can be a separate wire or the shield of the cable.

Connect the Strap at a 'far-end' access point to the two conductors of the same pair, and to the reference wire.

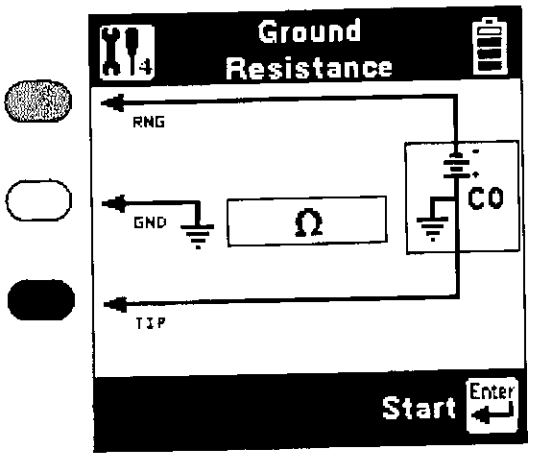
Press the [Enter] key to start the test.

After the 965DSP displays the results, press the [Enter] key to repeat the test.

Use the [Back] key to return to the Toolbox.

Ground Resistance

Use this function to measure the resistance of the ground between a Central Office (C.O.) and the 965DSP by using an active pair.



Connect the Red lead to Ring (the negative side of the C.O. battery) of the active pair.

Connect the Black lead to Tip (the positive side of the C.O. battery).

Connect the Green lead to Ground.

Press the [Enter] key to start the test.

After the 965DSP displays the results, press the [Enter] key to repeat the test.

The 965DSP will show the message "Check Leads" if the test leads are not connected as shown in the screen diagram.

Note: The Ground Resistance function will only work on pairs that are connected to C.O. switches with Tip (or "A") connected to ground.

Pairs connected to "floating" switches (such as the AT&T #5ESS) will not give correct results.

K-Test

Use this function to find the approximate distance to a resistance fault when both wires in a single pair are faulted at the same place, and a separate good pair is not available.

The resistance faults must be to the cable shield or to another conductor in the cable ("reference" wire).

One fault must be at least twice as "heavy" as the other fault (e.g., 5kΩ is twice as "heavy" as 10kΩ).

The sum of both faults must be at least 100 times the loop resistance (for instance, if the loop resistance is 50Ω, the "lighter" fault must be 5kΩ or greater).

You must first make a measurement with the far-end "open" (the strap disconnected).

You must then repeat the measurement with the far-end "closed" (the strap connected).

You may choose to use a "far-end switch" to open and close the far-end. The 3M KM Test Switch Model 1162 is recommended for this application. The 965DSP will automatically send tones on the Blue and Yellow leads to communicate with the 3M far-end switch.

You may also choose to manually open and short the far-end during the test. However, it is very important that the time between opening and shorting the pair be as short at possible to insure best results.

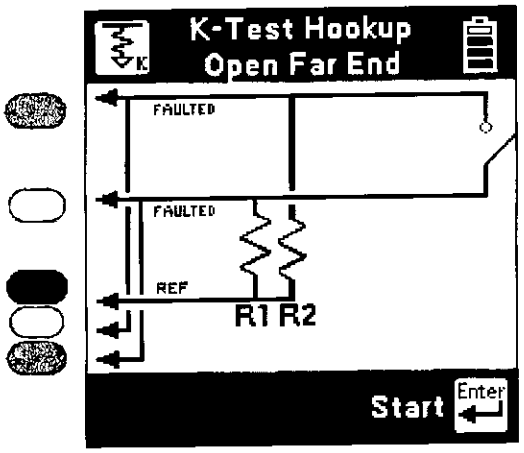
Resistance Check:

Before you start the K-Test measurement, use the Resistance function to measure the resistance from both sides of the pair to the reference wire.

When you have identified the lighter and heavier faults, then proceed to the K-Test in the Toolbox.

Open Far End:

Start the K-Test by opening the far end.



Connect the Red lead to R2, the wire to the heavier fault (lowest resistance value). Connect the Green lead to R1, the wire with the lighter fault resistance (the highest resistance value).

Connect Black to the reference wire (either the shield or another conductor in the cable).

If you are using a far-end switch (3M KM Test Switch Model 1162) to open and close the far-end, you should also connect the Blue and Yellow leads to the pair under test. Also, connect the far-end switch to the pair under test at the far-end access point.

Press the [Enter] key to start the test.

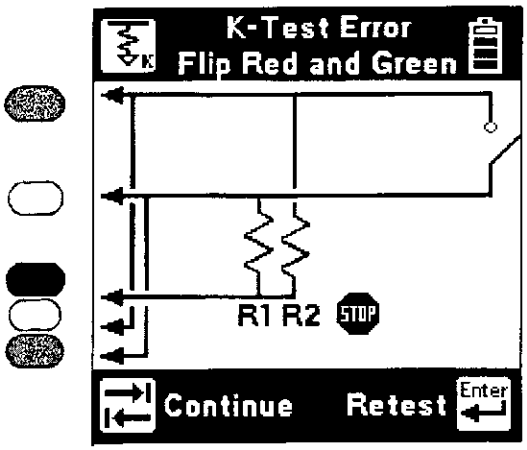
If you are using a far-end switch, the 965DSP will automatically send a command to the device to open the far-end.

The 965DSP will first make a measurement to verify that the heavier fault is connected to Red and the lighter fault is connected to Green.

If the size of faults is reversed, you will see the following screen: K-Test Error

K-Test Error: Flip Red and Green:

This screen indicates that the connections to the Red and Green leads are reversed, and the leads should be swapped or "flipped." Leave the Black lead connected to the reference wire.

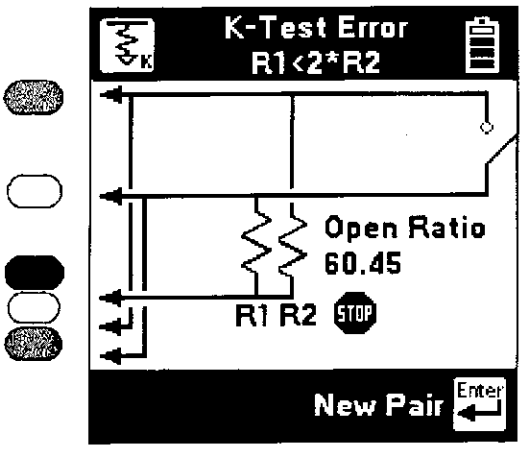


Press the [Enter] key to retest the connection **after** swapping the leads, or press the [Tab] key to continue without retesting the connection.

Note: The results may not be correct if the fault resistances are reversed.

*K-Test Error: R1<2*R2:*

The 965DSP checks to see that the fault on the Green lead is at least twice the value of the fault on the Red lead. This screen indicates that the ratio of the faults is too low.

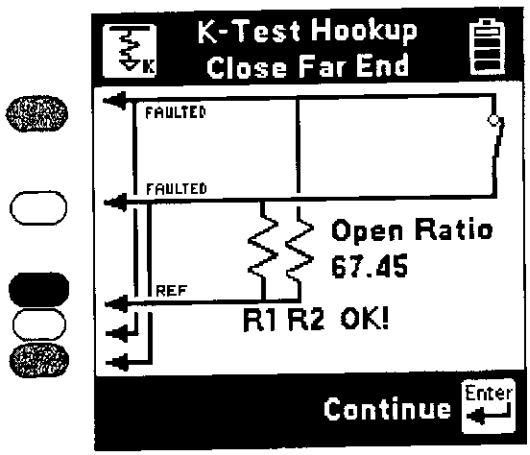


The "Open Ratio" value displayed on the screen is the ratio of R1/(R2+R1) times 100. This value is used by some companies as part of the K-Test measurement. It is not needed to actually calculate the distance to the faults.

Press [Enter] to return to the initial "K-Test Hookup: Open Far-End" screen. You may also elect to go to the Resistance function and re-measure the resistances before repeating the K-Test.

K-Test Hookup: Close Far-End:

The 965DSP will display the following screen if it does not detect any hook-up errors during the "Open Far-End" test.

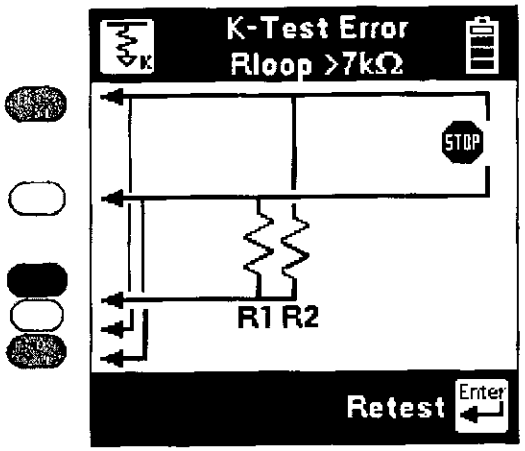


Note that the above screen indicates that the fault resistances (R1 and R2) are OK!

If you are using a far-end switch, the 965DSP will automatically send a command to close the far-end. If you are not using a far-end switch, you should manually short (or "strap") the far-end before you continue. Press [Enter] to continue the K-Test.

K-Test Error: Rloop > 7kΩ:

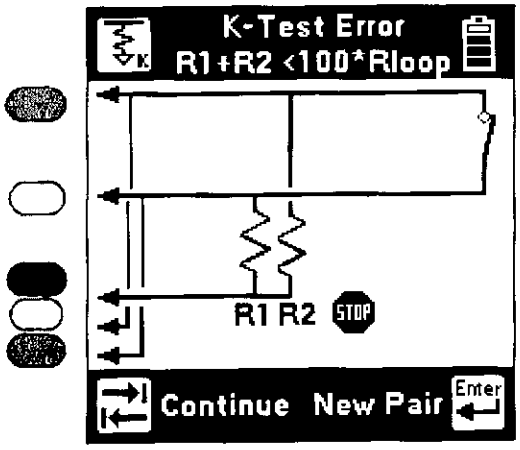
The 965DSP checks to see if the resistance of the loop is less than 7kΩ. If the resistance is greater than 7kΩ, then the distance to strap may be too long, the strap is not connected, or the far-end switch did not switch properly.



Check the connections, and press [Enter] to repeat the "Close Far-End" portion of the test.

*K-Test Error: R1+R2<100*Rloop:*

The 965DSP checks to see that the sum of the faults is more than 100 times the loop resistance. The 965DSP will display the following screen if the sum of the faults is less than 100 times the loop resistance.

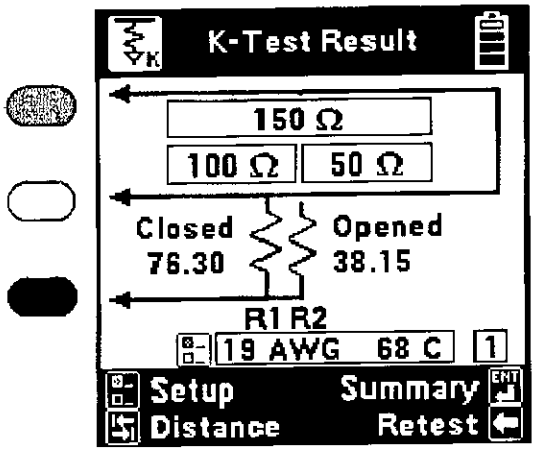


Press [Tab] to continue even though the fault values are too low. This may result in reduced accuracy of the measurement.

Press [Enter] to repeat the K-Test, starting with the "Open Far-End" screen. You should first find a new pair in the faulted cable with higher value fault resistances.

K-Test Results:

The 965DSP will display the following screen if there are no problems with the "Close Far-End" portion of the test:



The 965DSP displays the Resistance to Strap (RTS), Resistance to Faults (RTF) and the Resistance Strap to Faults (RSTF).

The 965DSP displays the open and closed fault ratios. These values are used in some countries as part of the K-Test.

Use the [Tab] key to display distances to the faults and strap instead of resistance.

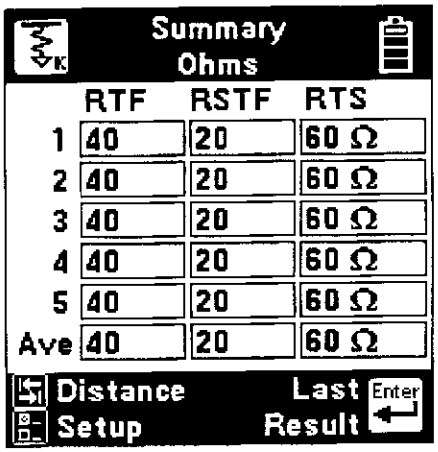
The 965DSP displays the last wire gauge and temperature selected. Use the [Setup] key to change either the wire gauge or the temperature used for the conversion from resistance to distance.

Use the [Left] arrow key to repeat the K-Test on the same pair. The screen keeps count of the number (in the lower right) of times the test is repeated.

Use [Enter] to see a summary of up to five K-Test measurements.

K-Test Summary:

If you press the [Enter] key in the previous screen, the 965DSP will display the following summary of up to five K-Test results:



The 965DSP displays the Resistance to Faults (RTF), Resistance Strap to Faults (RSTF), and the Resistance to Strap (RTS) for up to five measurements.

The 965DSP also displays the average value of the five measurements. In general, the average value of many readings is more accurate than a single reading.

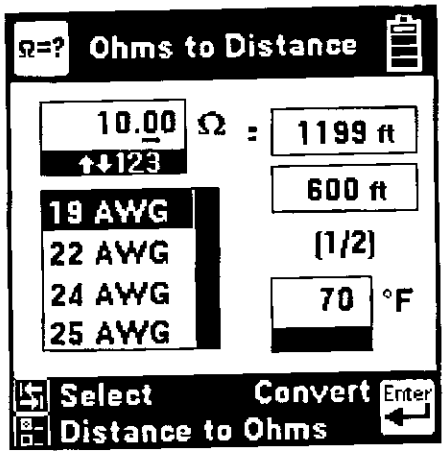
Use the [Enter] key to display the last K-Test result. Use the [Tab] key to select distance instead of resistance. Use the [Setup] key to change the wire gauge or the temperature used for the conversion from resistance to distance.

K-Test Setup:

The K-Test Setup screen is identical to the RFL Setup screen found on page 50. Please go to this page and follow the instructions for changing the wire gauge or temperature.

Ohms/Distance

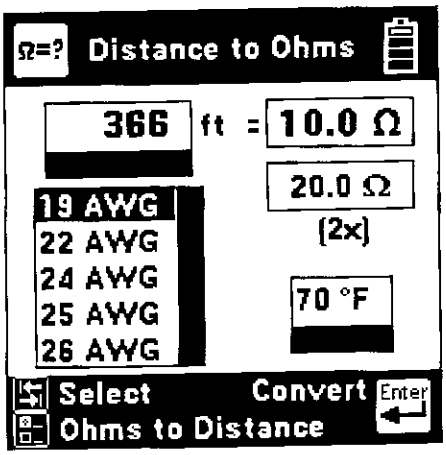
Use this function to convert from Ohms to Distance based on temperature and wire gauge.



Enter the value of Ohms, then press the [Tab] key to select gauge or temperature. If you select "gauge," 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.

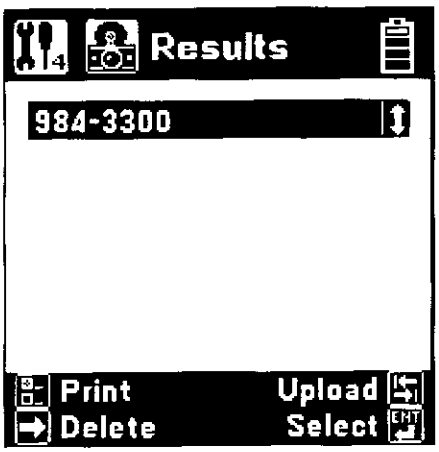
Press the [Enter] or the [Tab] key when you are ready to convert from Ohms to Distance. The screen shows the total loop length, and half the length (if you are measuring the distance to the end of a strapped pair).

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

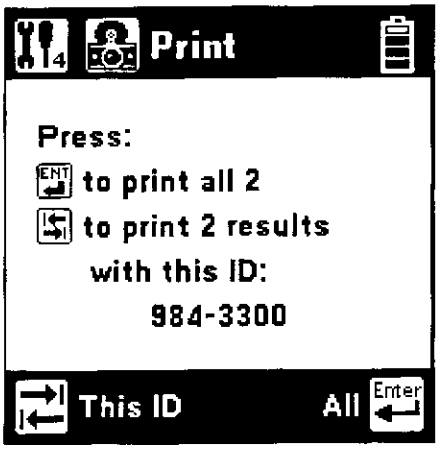


Stored Results

Use this function to view previously stored results of the Auto test or TDR function. If no results have been stored, "No Results Stored" will be visible on the screen. If one or more test results have been stored, the ID number for each will be displayed.

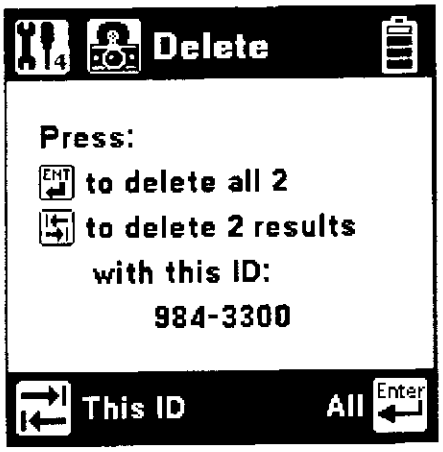


Press the [Setup] key to display the Print screen.



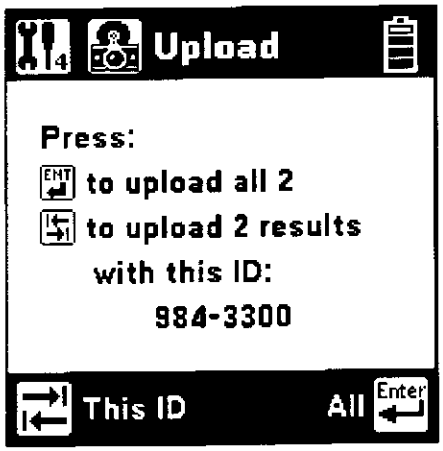
Press the [Enter] key to print all of the results. Press the [Tab] key to print the results of the selected ID. Press the [Esc] key to return to the main Results screen without printing.

Press the [Right] key to display the Delete screen.



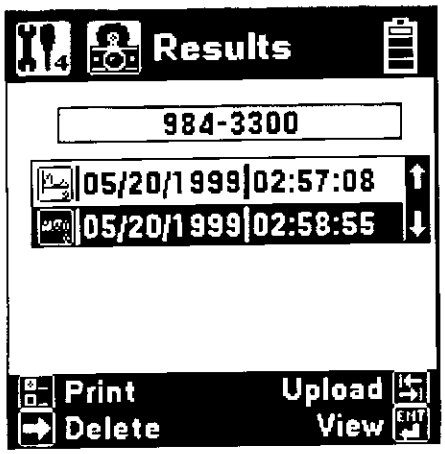
Press the [Enter] key to delete all saved results. Press the [Tab] key to delete the saved results of the selected ID. Press the [Esc] key to return to the main Results screen.

Press the [Tab] key to display the Upload screen.



Press the [Enter] key to upload all of the saved results of the selected ID. Press the [Esc] key to return to the main Results screen.

Use the [Up] and [Down] keys to highlight the desired stored result. Press the [Enter] key to select the highlighted result and display the stored results list for that ID number by type (Auto test or TDR), date and time.



Use the [Up] and [Down] keys to highlight the desired stored result. Use the [Right] key to delete the selected result. Use the [Setup] key to print the selected result to a printer. Use the [Tab] key to upload the selected stored test results to a PC.

Press the [Enter] key to view the results for the highlighted selection. The results will be displayed in the format used in the actual test.

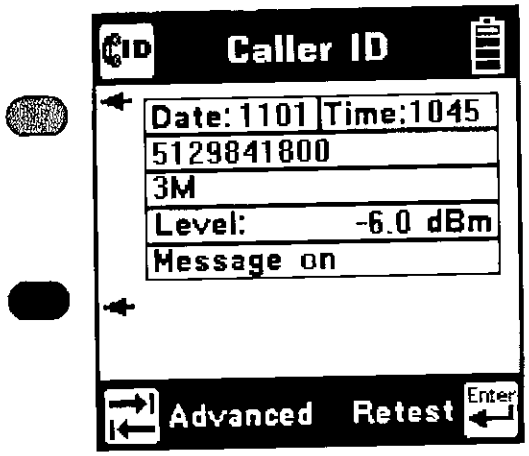
To print the results to a printer, you must have a compatible serial printer such as the Seiko DPU-414-30B and a printer IR adapter cable (3M PN 80-6110-2044-9). The printer should be configured for 9600 baud, 8 data bits, 1 stop bit, no parity.

To upload the test results to a PC requires a different IR adapter cable (3M PN 80-6109-9197-0) and the PC Link Communications software package.

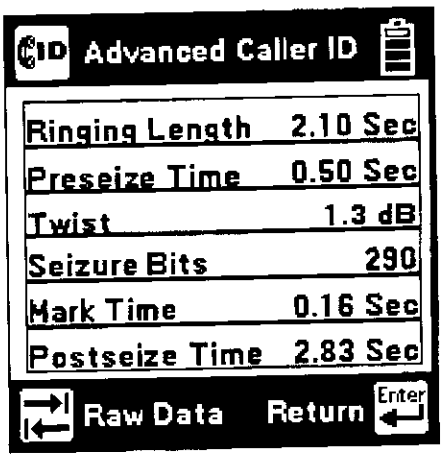
Caller ID

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

Note: The 965DSP Caller ID function is only valid in the US and Canada. "Caller ID" does not appear in the Toolbox for other countries.



Press the [Enter] key to retest or press the [Tab] key for advanced Caller ID data.



This screen shows advanced information for diagnosing Caller ID protocol problems. These measurements are defined as follows:

Ringing Length (A)

-The measured time duration of the first Ring Burst.

Preseize Time (B)

- The measured time period between the first Ring Burst and Channel Seizure.

Twist

- The ratio of the received Mark and Space signal levels.

Seizure Bits

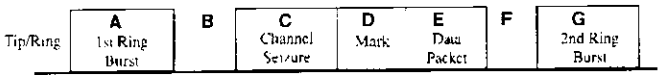
- The number of bits received during the Channel Seizure (C) period.

Mark Time (D)

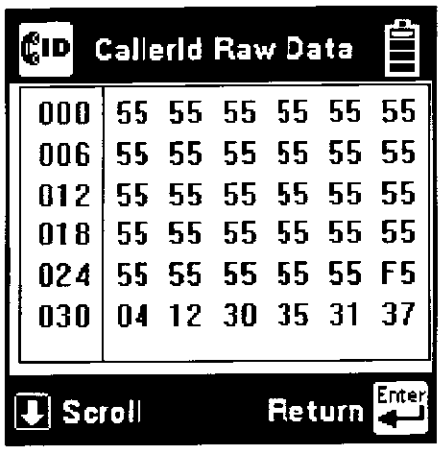
- The measured duration of the Mark period.

Postseize Time (F)

- The measured time duration between the Data Packet (E) and the Second Ring Burst (G).



Press the [Enter] key to return to the previous screen or press the [Tab] key to view the Caller ID Raw Data screen.

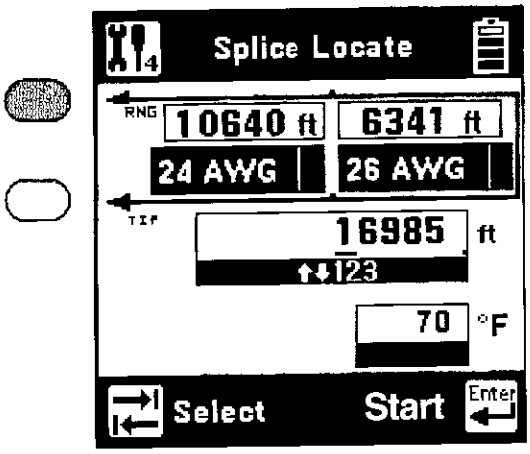


This screen displays a hexadecimal dump of all data in the Caller ID packet. This data may be used for analyzing compatibility problems between the Caller ID format implemented by the switch and the format implemented by the customer equipment.

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

Splice Locate

Use this function to find the location of a splice in two sections (of different wire gauges) of cable.



Connect the Red and Green leads to the pair.

Connect the strap at the far-end across the pair.

Use the [Tab] key to select either: 1) the first section wire gauge, 2) the second section wire gauge, 3) the Distance to Strap (DTS), or 4) the temperature.

If you select either section, use the [Up] and [Down] keys to select the wire gauge. You may **NOT** use the same gauge for both sections.

If you select either the DTS or the temperature, use the Blue keys to enter the appropriate value.

Press [Enter] when you have connected the 965DSP and have entered the correct gauges, temperature and distance to strap.

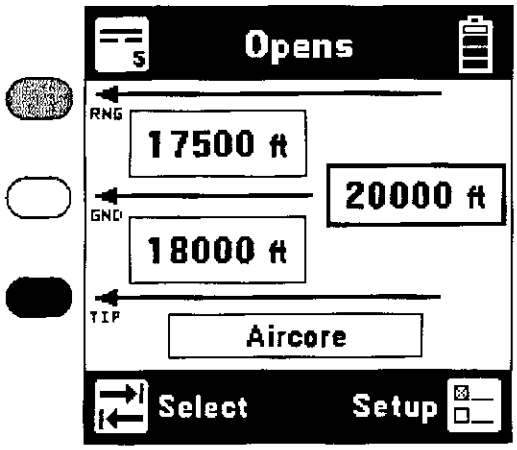
The screen will display the distance to the splice and the distance from the splice to the strap.

Press [Enter] to repeat the test after the results have been displayed on the screen.

Opens

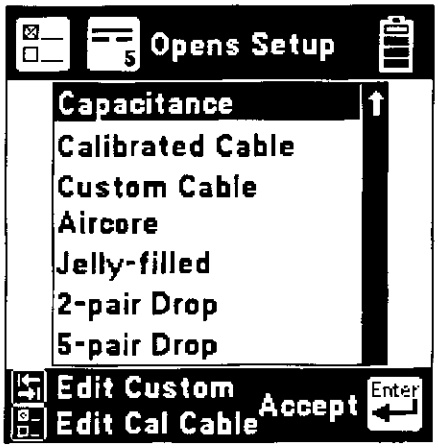
This function measures the distance to a complete "open" on a pair based on a selected cable type. "Opens" is more accurate if other cable pairs are active. If other pairs are not active, short at least 30% of the inactive pairs to the cable shield.

The TDR function may also be used to determine distance to a "partial" open (not in the 965DSP-B).



The 965DSP will first measure the "open" distance between Green and Black. Use the [Tab] key to move to the next lead configuration.

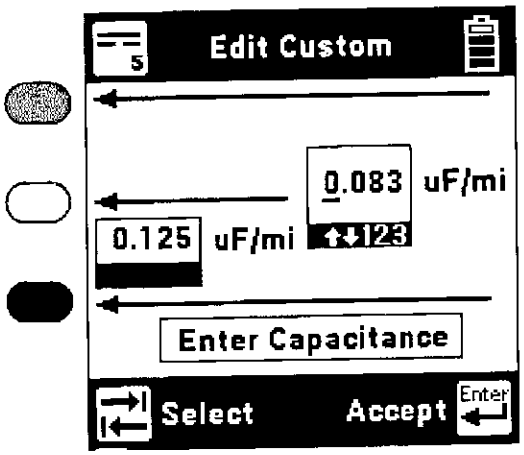
Press the [Setup] key to change the Cable Type, or to select Capacitance.



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 cable type.

Press the [Tab] key to edit the "Custom" cable type. Press the [Setup] key to edit the "Calibrated Cable" type.

Edit Custom: Use this function to change the value of the "Custom Cable" type. Select Custom Cable if you are using a specific type of special cable on a regular basis.



First enter the Red to Black capacitance per unit distance using the Blue keys. This is also called "Mutual" capacitance.

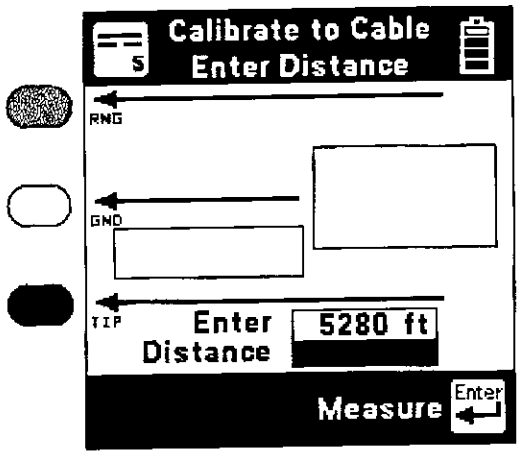
Then press [Tab] and use the Blue keys to enter the capacitance/distance for Black to Green. This capacitance is sometimes called the "Pair to Shield" or "Pair to Ground" capacitance.

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

Calibrate to Cable

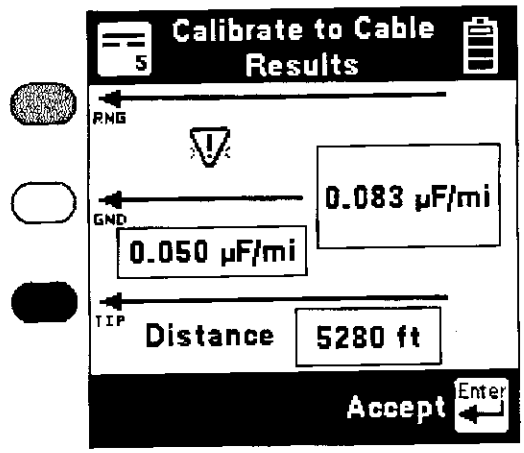
Use this function to measure the capacitance of a known good pair within a cable of known length. This value can be used as a 'Calibrated Cable' (or 'reference') to find the distance to an 'open' on the same or similar cable.

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 will then display the measured capacitance/distance for the reference pair.



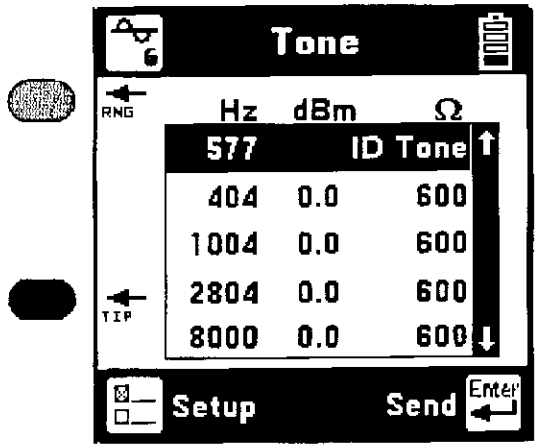
Press the [Enter] key to accept the results as the "Calibrated Cable" and return to the Setup screen. Press [Back] to return without saving.

The Yield Sign ▽ (if shown) indicates that the Ring (or B) - Ground capacitance differs from Tip (or A) - Ground by greater than 5%.

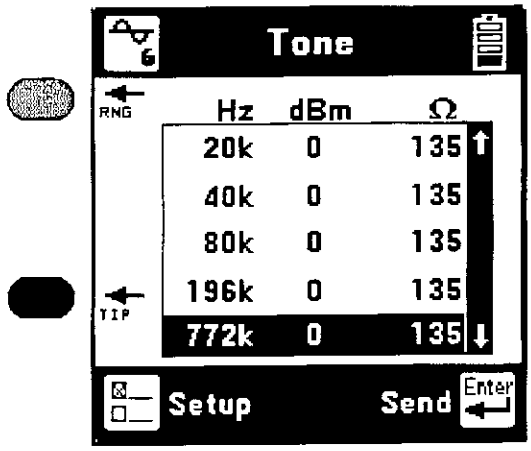
Tone

Use this function to send a tone on a pair. Use the [Up] and [Down] keys to select the desired tone. Note that there are ten tones. Use [Up] and [Down] to scroll through the tone selections.

There are three types of tones: ID Tone for pair identification and coiling, Precision Tone for 600 Ω loss measurements, and High Frequency Tone for 135 Ω wideband loss measurements. The ID Tone is always sent as an interrupted (beeping) tone. The other tones are continuous tones. The 965DSP automatically goes off-hook when an ID tone is sent.

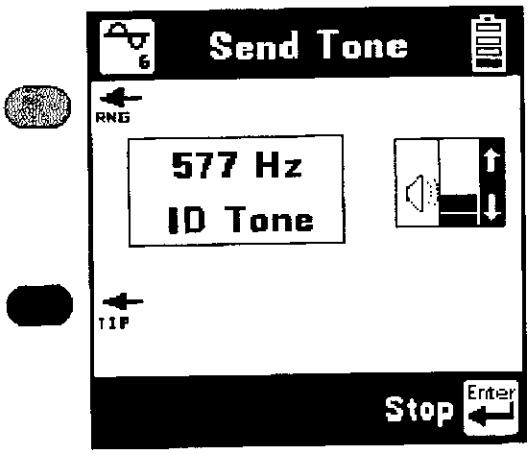


First 5 frequencies

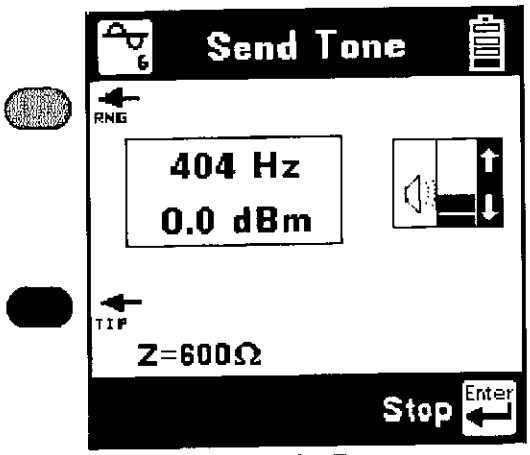


Second 5 frequencies

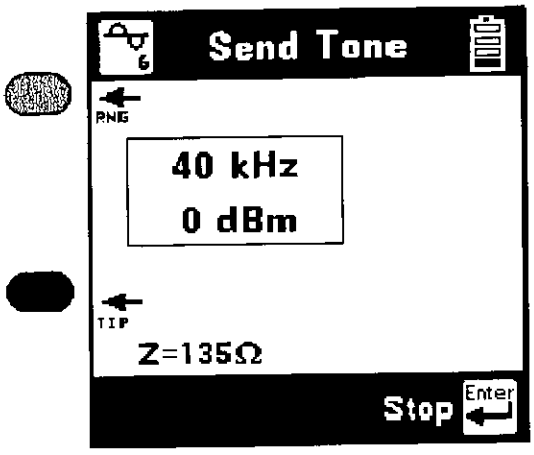
Press the [Enter] key to send the selected tone. The send tone screen varies, depending on which tone has been selected; ID Tone, Precision Tone, High Frequency Tone.



ID Tone



Precision Tone



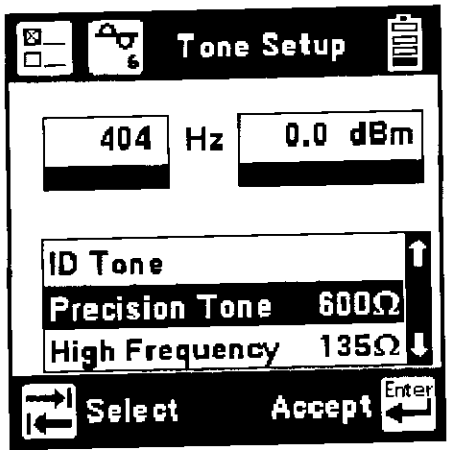
High Frequency Tone

The volume of the tone heard in the 965DSP speaker may be adjusted for the ID Tone and the Precision Tone. No tone is heard in the speaker for the High Frequency Tone.

Press the [Up] and [Down] keys to adjust the volume. The output impendance for the Precision Tone (600 Ω) and the High Precision Tone (135 Ω) will be visible in the lower left side of the screen. Use [Enter] to stop sending.

Note: The volume control does not affect the level of the tone sent on the pair.

Press the [Setup] key to edit the selected tone and go to the following screen:



Use the [Tab] key to select the tone type, frequency or level. Use the keypad to change the values.

The frequency range is 200 to 1000 Hz for ID Tones; 200 to 19999 Hz for Precision Tones; and 20 KHz to 1200 KHz for High Frequency Tones.

The output range for Precision Tones is -20.0 to +1.0 dBm. The output level for High Frequency Tone is fixed at 0 dBm. The ID Tone output is set at maximum level.

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

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

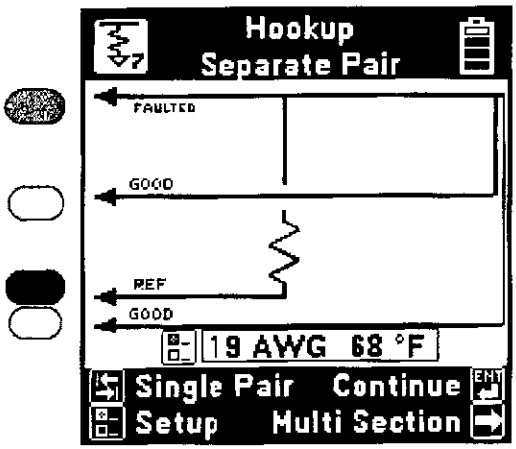
Note: The High Frequency Tone is fixed at 40KHz for some older versions of the 965DSP. Upgrades are available thru 3M Telecom Repair Service

RFL (Resistance Fault Locate)

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

The function first shows one of two possible hookups: Separate Pair or Single Pair. Use [Tab] 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" by pressing the [Tab] key.

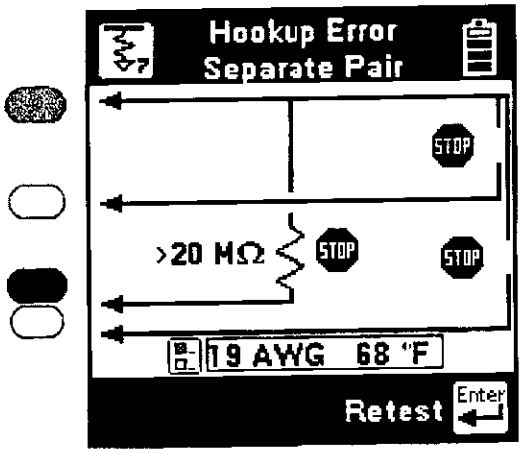
The hookup screen will show the last selected wire gauge and temperature. Use the [Setup] key to change the gauge, temperature or enter a known distance to Strap.

Note: Either the temperature or length (distance to Strap) must be selected as unknown.

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 can 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.

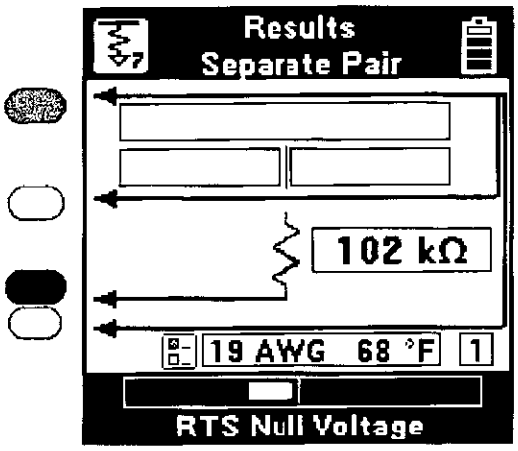
If there is a problem with the connection, you will see the "Hookup Error" screen on the next page. If the connections are OK, the 965DSP will go directly to the "RFL Results" screen.



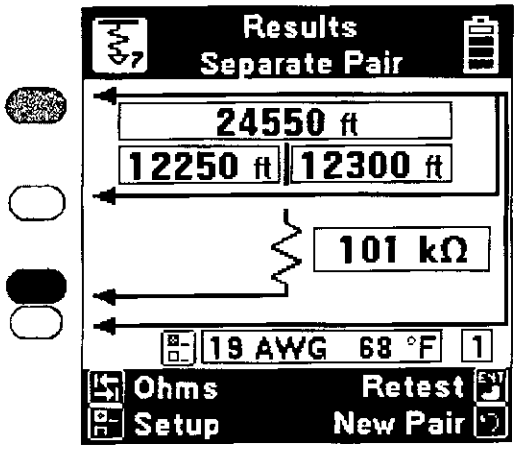
There are three possible hookup errors: 1) the fault is greater than 20 MΩ, 2) the Red/Green strap is bad, or 3) the Red/Yellow strap is bad.

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

If no errors in the hook-up are detected, the 965DSP will begin the measurement and go to the results screen.



During the measurement a bar graph of the measurement null voltage for RTS and then RTF will be visible at the bottom of the screen.



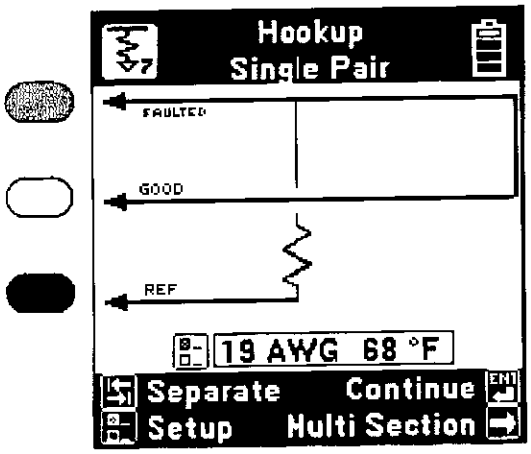
The screen shows the "Distance to Strap" at the screen top, the "Distance to Fault" on the left of the next line, and the "Distance Strap to Fault" on the right of the same line.

The screen shows the fault resistance beside the resistor symbol, the wire gauge, temperature and section number at the bottom.

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 again to return to distance. Press [Enter] to repeat the fault locate using the same Distance to Strap or the [Backup] key to test a new pair. Press [Setup] to change the Gauge or Temperature.

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.

The hookup screen will show the last selected wire gauge and temperature. Use the [Setup] key to change the gauge or temperature.

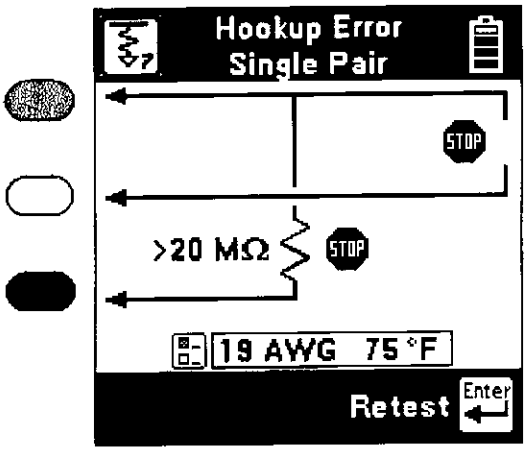
Press the [RFL] key and select "Single pair" using the [Tab] key.

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 wire could be the shield or another wire in the cable.)

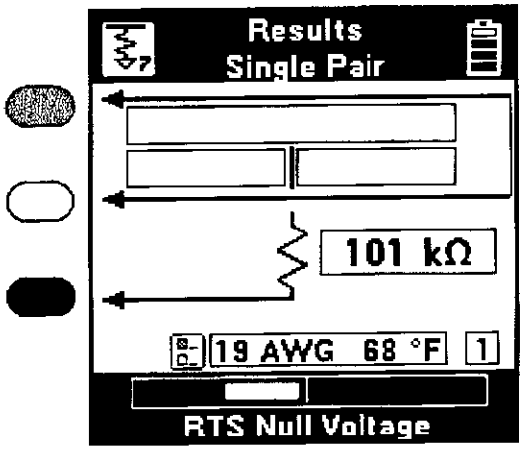
Press the [Enter] key after you have made the above connections. If the connections are OK, the 965DSP will go directly to the RFL results screen.

If there is a problem with the connections, you will see the "Hookup Error" screen.

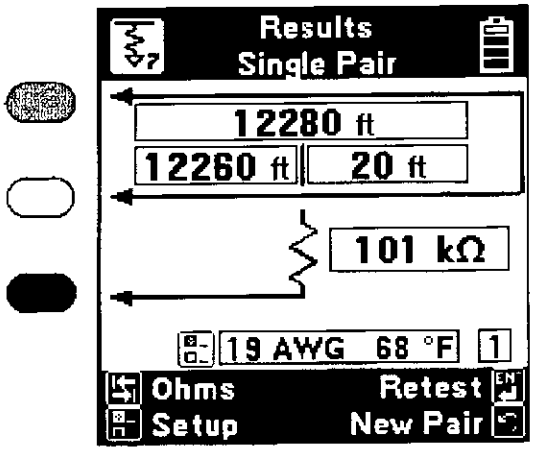


There are two possible single pair hookup errors: 1) the Fault is greater than 20 MΩ, or 2) the Red/ Green strap is bad.

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



During the measurement a bar graph of the measurement null voltage for RTS and then RTF will be visible at the bottom of the screen



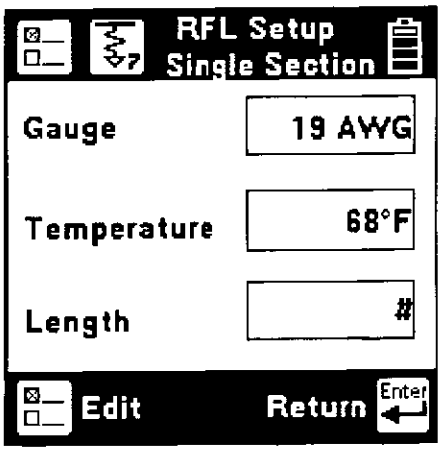
The screen shows the "Distance to Strap" at the screen top, the "Distance to Fault" on the left of the next line, and the "Distance Strap to Fault on the right of the same line. The screen shows the fault resistance beside the resistor symbol, the wire gauge, temperature and section number at the bottom.

Press [Tab] to show readings in Ohms instead of distance. Press again to return to distance. Press [Enter] to repeat the fault locate using the same Distance to Strap or the [Backup] key to test a new pair. Press [Setup] to change the Gauge or Temperature.

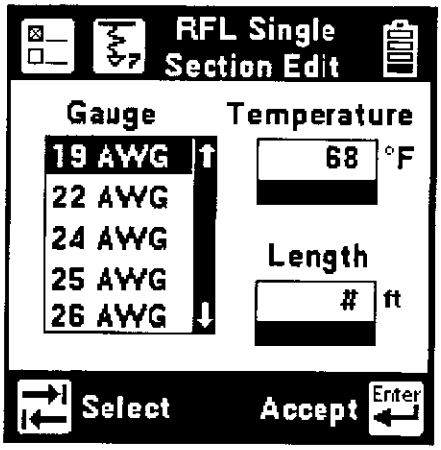
RFL Setup: Single Section

Use the RFL Setup to change the Wire Gauge and/or the cable Temperature or enter a known Distance to Strap.

Press the [Setup] key to display the current settings.



Press the [Enter] key to return without making changes. Press the [Setup] key to edit the values.



Press the [Tab] key to select either the Wire Gauge menu, the Temperature or Length (distance to Strap) for editing.

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

If you choose Temperature or Length, enter the new value using the blue keys as a numeric keypad. Either the Temperature or Length must be specified as unknown by entering a "*#*" for the value.

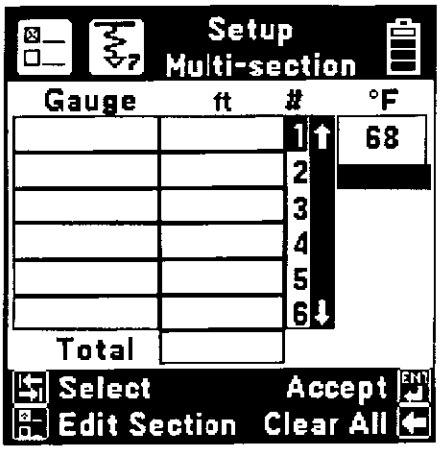
Note: Always enter the temperature of the cable, not the ambient temperature.

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 [Enter] key again to return to the hookup screen.

RFL Setup: Multi-Section

Use RFL Multi-Section when there is more than one section of cable (with different wire gauges) between the near-end and the far-end. RFL Multi-Section can be used with Single or Separate pair hookup.

While in the "Hookup Single Pair" or "Hookup Separate Pair" screen, press the [Right] key to select Multi Section. The wire gauge displayed near the bottom of the display will be replaced by "Multiple". Then press the [Setup] key to go to the Setup screen.



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

One cable parameter (a section length or temperature) should be left as unknown. If a value is entered for all parameters, temperature will be treated as an unknown and will be calculated by the 965DSP.

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

Edit Temperature:

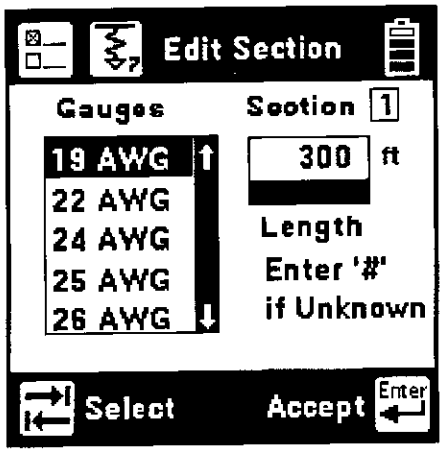
If the Temperature is known, enter the value of the desired temperature using the Blue keys as a numeric keypad.

Note: Enter the temperature of the entire cable. You may not enter separate temperatures for each section.

Enter "#" for the temperature if it is unknown and you want the 965DSP to compute the temperature.

Edit Section Information:

If you chose to edit the Section information, (gauge or distance) for any of the six sections, use the [Up] and [Down] keys to select the desired section, then press 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.

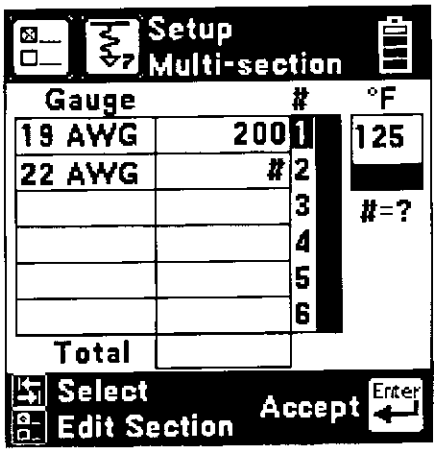
If you choose Section Length, enter the length of the section using the blue keys.

Note: If you are using less than the maximum of six sections, the distance of all unused sections is set to zero feet or meters.

You will see the message "Enter '#' if unknown" below the Edit Section Length if the temperature or another section has not previously been declared as unknown. Declare a section "unknown" by entering a "#" in the length box.

Press [Enter] to accept the changes for the section and return to the previous RFL Setup screen. Press [Back] to return without making changes.

The following is an example of the Setup screen for two sections. Note that the screen shows a "#" to indicate the distance is unknown.

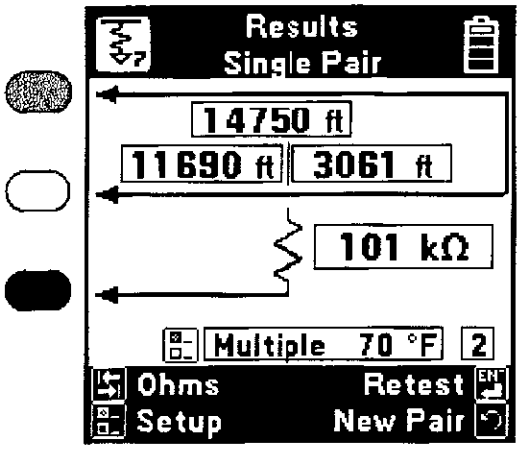


Press the [Enter] key to accept the changes and return to the "Setup: Multi-Section screen." Press [Enter] to continue with the RFL Measurement.

RFL Multiple Results

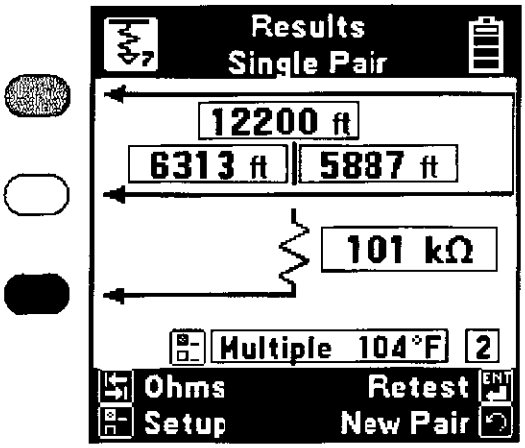
There are two possible formats for displaying the results of an RFL Multiple measurement:

1) The temperature is known. In this case the screen will show the calculated Distance to Strap (the sum of all sections) in the main result box and the "Distance to Fault"on the left on the next line and the "Distance Strap to Fault" on the right on the same line. The screen also shows the number of the faulted section at the lower right side of the screen.



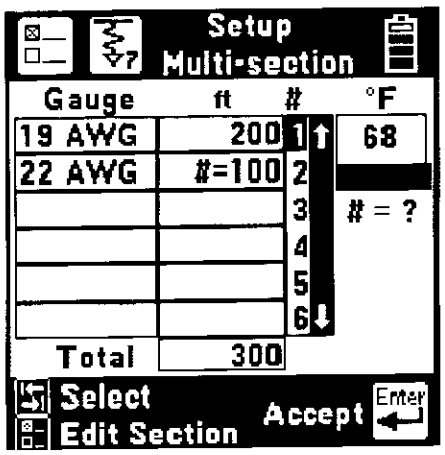
Press the [Tab] key to display the results in ohms. Press the [Enter] key to retest the same pair or the [Backup] key to test a new pair.

2) *The temperature is unknown.* In this case the screen will show the entered Distance to Strap (or the sum of all sections) in the main result box, and will show the calculated temperature at the bottom. The screen also shows the number of the faulted section at the lower right side of the screen.



If the calculated temperature is much different than the expected temperature, you should suspect that the entered DTS or the entered section information is incorrect.

Use [Tab] to convert between Ohms and Distance. Use [Setup] to display the RFL Multi-Section Setup screen again.

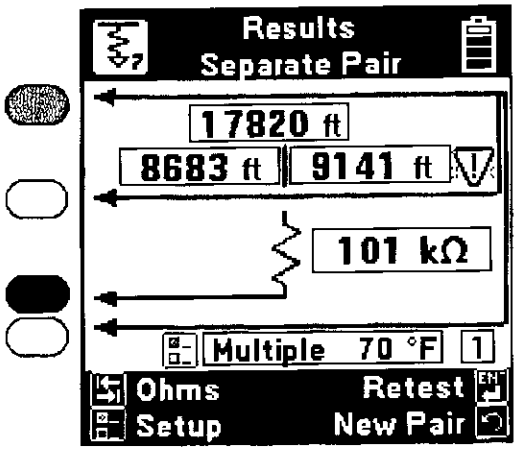


The multi-section screen will now show the computed length of the unknown section.

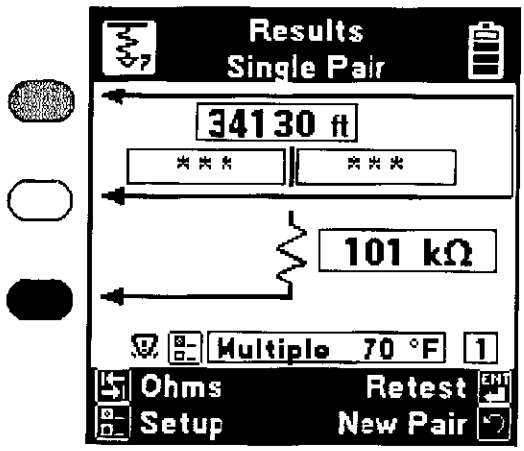
RFL Errors

One of several errors may occur during an RFL multi-section measurement.

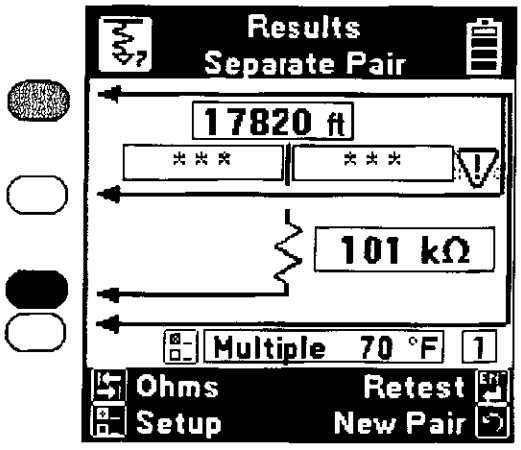
If the RFL measurement terminates due to a time-out, a "Yield Sign" will be displayed next to the DSTF or RSTF result, as shown. This indicates that the results may not be accurate. This could be caused by excessive noise on the pair.



If the temperature is known and the total of the specified section lengths is greater than the measured distance to strap, then the calculated unknown section length would be negative. This will cause a "Yield Sign" to be displayed to the left of the setup boxes and "***" to be displayed in the "Distance to Fault" and "Distance Strap to Fault" boxes as shown below.



If the red and green clips are reversed in a separate pair RFL measurement, the "Resistance to Fault" calculation may return a negative value. This will cause a "Yield Sign" to be displayed next to the DSTF or RSTF result and "***" in the DTF and DSTF boxes as shown below.



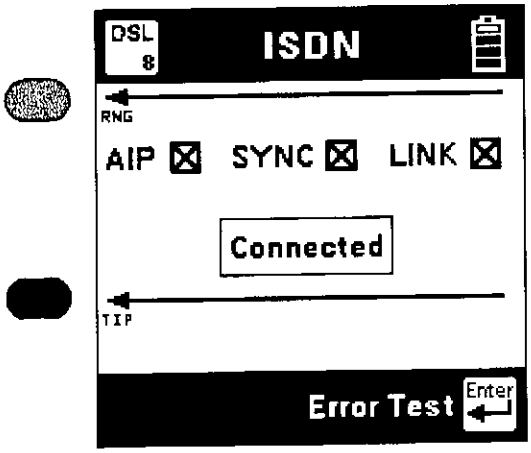
DSL

For the 965DSP and 965DSP-B, 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.

For the 965DSP/xDSL Subscriber Loop Analyzer, use this function for all ISDN and extended range DSL measurements. Refer to the Appendix at the back of this manual for details.

2B1Q ISDN is sometimes called "National Implementation" or "NI1" ISDN in the US and Canada. 2B1Q ISDN is called "Euro-ISDN" in Europe and other countries.

Note: The 965DSP will not detect older ISDN formats (such as ATT AMI, NT AMI, etc.).



Connect the Red and Black leads to the pair and press the [Enter] key. The 965DSP displays the word "Connecting" while the instrument 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" will show in the screen.

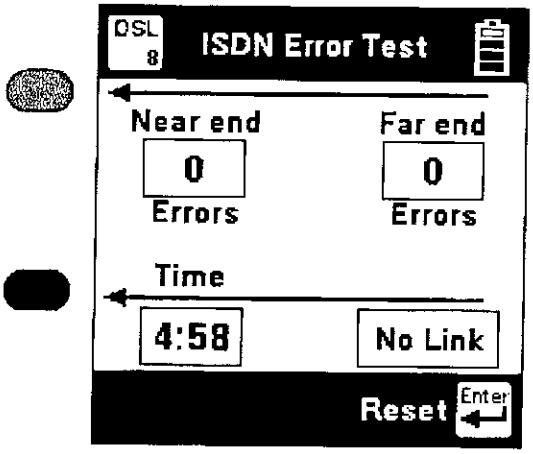
Once a link is established with an ISDN signal, the screen will display "Connected" in the main screen.

For the US and Canada, the [Enter] key will appear. Press the [Enter] key to perform an Error Test on an active NI1 (National Implementation) ISDN pair.

ISDN Error Test (US and Canada)

The 965DSP can perform a near-end and far-end block error test after linking to a NI1 ISDN line (US and Canada only).

Note: The 965DSP can not perform an Error Test on Euro-ISDN (Europe and other countries).



The 965DSP will count and display the number of near-end and far-end errors.

"Near-end" errors are the errors detected at the 965DSP. "Far-end" errors are errors detected at an ISDN line card. (The far-end count is transmitted to the 965DSP 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 (for example, 5 or 15 minutes) and count the number of errors.

Near-end and far-end errors are "blocks" of bit errors. If there are no block errors in a given period of time, this insures there will be no bit errors in the same period.

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

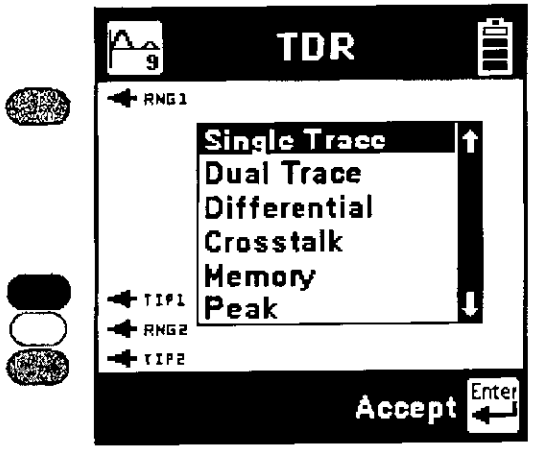
The word "Link" will be displayed as long as the 965DSP is linked to the ISDN line. If the link is lost, the screen will display "No Link."

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

TDR

This function shows the pair as a "trace" on the screen. The TDR measures the distance to events based on input about the pair. This function is not available in the 965DSP-B.

There are six modes to view a pair: 1) Use **Single Trace** to view a single pair. 2) Use **Dual Trace** to view two pairs at the same time. 3) Use **Differential** to view the difference between two pairs. 4) Use **Crosstalk** to view the electrical coupling between two pairs. 5) Use **Memory** to compare a "live" trace with a trace stored in memory. 6) Use **Peak** to display a history of maximum and minimum values with the live trace.



Press the [Up] or [Down] keys to move to a desired selection. Press the [Enter] key to accept the choice and start the measurement.

TDR Controls

The controls described below are valid for all modes, except the Memory mode. The 965DSP displays the controls and other parameters at the bottom of the screen.

Use the [Tab] and [Enter] keys to move forward or backward through the TDR controls.

Use the [Up] and [Down] keys to change the parameters for the control selected.

Individual controls and their parameters are described on the follow pages.

Length: 300 ft, 1000 ft, 3000 ft, 10 kft, 30 kft (100 m, 300 m, 1 km, 3 km, 10km)

Length allows you to set the distance (or span) from the left side of the screen to the right side. The left side of the screen is usually at the test set, and the right side is the furthest distance that can be displayed with the length selected.

Filter: is Out, is In

Filter allows you to switch in a filter to remove noise. You should use the filter if you see noise on the display. ***Note that switching in the filter may make it difficult to detect small events on the cable.***

Pulse Width: 5 ns, 34 ns, 235 ns, 1600 ns

Pulse Width allows you to select the width of the pulse sent out on the pair. The 965DSP automatically chooses the best pulse width for each length selected. Note that you can also change the pulse width independent of length.

Use a shorter pulse width to give better resolution of events. ***Note that a shorter pulse width will not go as far on the pair.***

Use a wider pulse width to see further on the pair. ***Note that the resolution of a wider pulse will not be as good as a shorter pulse.***

Pulse Width is also displayed at top right of screen.

Gain: x1, x2, x4, x8, x16, x32, x64, x128

Gain allows you to select the vertical gain of the TDR. Higher gain will make events look taller on the screen and is helpful for finding small faults.

Vp: 0.50 to 1.00 (75 to 150 m/uS)

Vp allows you to adjust the velocity factor ("propagation velocity") of the pair or cable. Different cable types have different values of Vp. To get the most accurate distance, Vp should be set to the exact value for the cable being tested. If in doubt, use a known length of the cable to calibrate Vp.

Note: Vp can be displayed in m/uS (see Units Setup on page 10 for more information).

The following is a list of approximate values for several cable types and gauges:

PIC:

19 AWG	0.72 (108 m/us)
22 AWG	0.68 (102 m/us)
24 AWG	0.67 (100 m/us)
26 AWG	0.66 (99 m/us)

JELLY-FILLED:

19 AWG	0.68 (102 m/us)
22 AWG	0.65 (97 m/us)
24 AWG	0.64 (96 m/us)
26 AWG	0.63 (94 m/us)

PULP:

22 AWG	0.69 (103 m/us)
24 AWG	0.68 (102 m/us)
26 AWG	0.67 (100 m/us)

Water in cable will increase the value of Vp. If the cable has water in it distances will appear shorter than they actually are. Vp is also displayed at the top left of the screen.

Zoom: **x1, x2, x4, x8, x16**

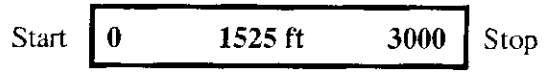
Zoom allows you to set the horizontal gain of the TDR. Higher Zoom will spread out the trace and make it easy to resolve the start of an event.

Move Cursor

Always align the cursor to the left side of an event in question. Cursor position is shown below trace.

Use the [left] and [right] arrow keys to move the cursor across screen. The distance from the 965DSP to cursor is always shown in the center of the distance bar.

Note: Subtract the five foot length of the test leads from measurement.



The "Start" and "Stop" numbers shown in the distance bar are the distances from the test set to the left and right side of the screen.

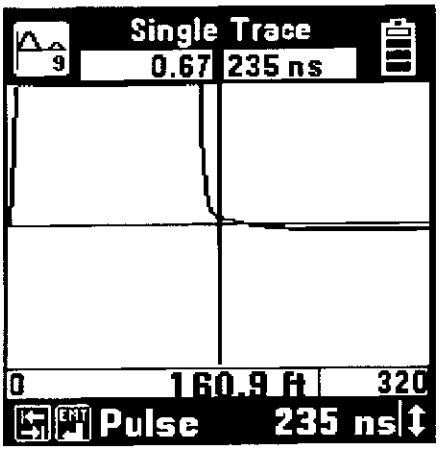
The Stop distance may be different from the Length selected due to the screen resolution.

The Start and Stop distances are also affected by zooming and panning (described below).

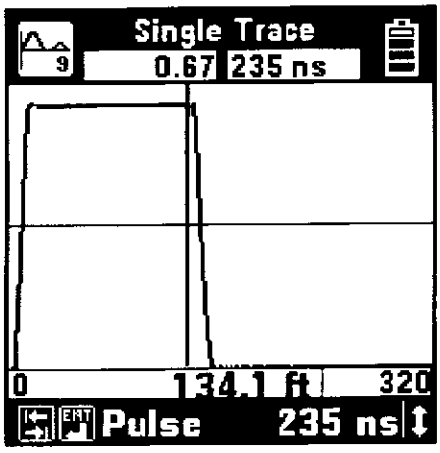
If you move the cursor to the right side of the screen, the screen will "pan" or move to the right.

If you move cursor to the left side of the screen (and the **start** distance is greater than 0 feet or meters), the screen will "pan" to the left.

If the cursor is moved to a position on the TDR trace that is out of viewing range (above the top of the screen or below the bottom), the trace is shifted up or down to bring it into view. The x axis will not move. The vertical offset will be maintained until the cursor is moved to another point that is out of viewing range or until one of the display controls is changed. This is demonstrated below. The first screen shows the TDR trace before offset.

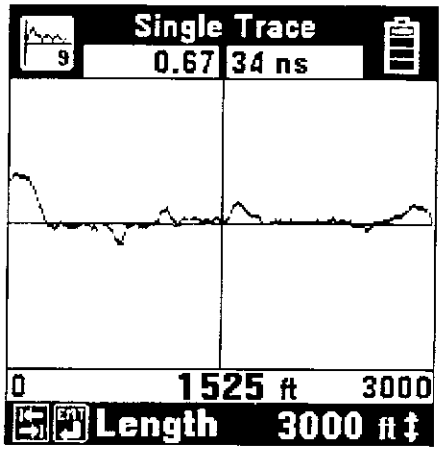


The next screen shows the TDR trace after offset.



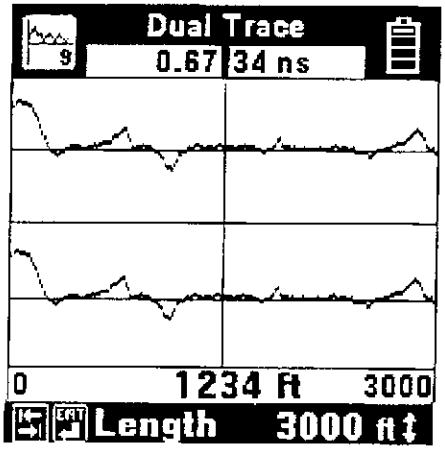
The vertical offset function affects all modes except Memory.

Single Trace



Connect the Red and Black test leads to the pair under test. All controls work as described above. Single Trace is used to view a single pair at a time.

Dual Trace



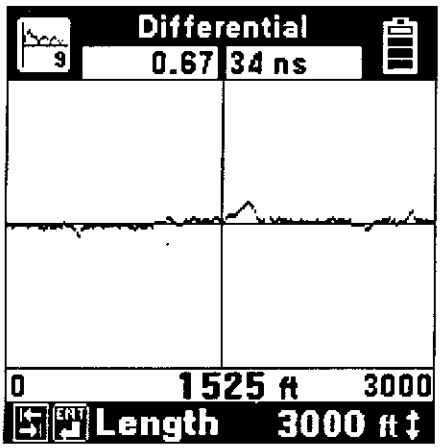
Connect the Red and Black test leads to the pair under test. Connect the Blue and Yellow test leads to the reference pair.

The pair under test is displayed at the top of the screen. The reference pair is displayed at the bottom of the screen. Any changes in the control parameters affect both traces. It is not possible to control each trace independently.

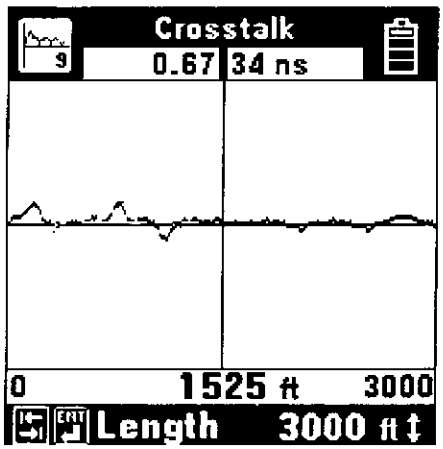
Dual Trace is used to compare two pairs at the same time (usually a faulted and a good pair).

Differential and Crosstalk

Use the Differential mode to display the difference between two pairs (usually a 'good' pair and a pair under test.)



Use the Crosstalk mode to display the amplitude and location of signals that "cross" from one pair to the other, as could be caused by a split.

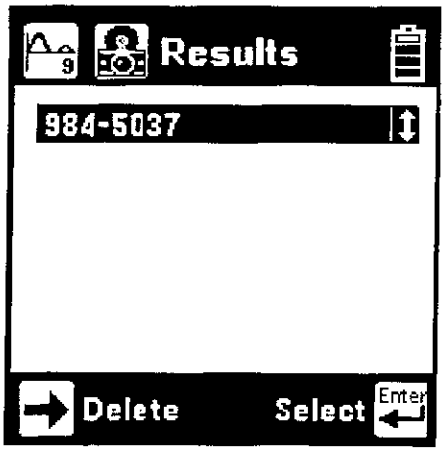


For both Differential and Crosstalk, connect the Red and Black test leads to the pair under test. Connect the Blue and Yellow test leads to the reference pair.

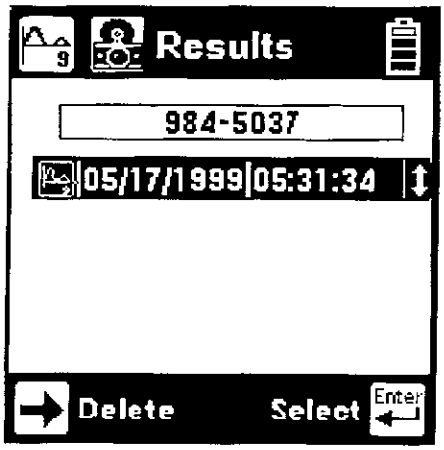
Memory:

Use the Memory mode to compare a pair under test (at the top of the screen) with a stored trace in memory (at the bottom).

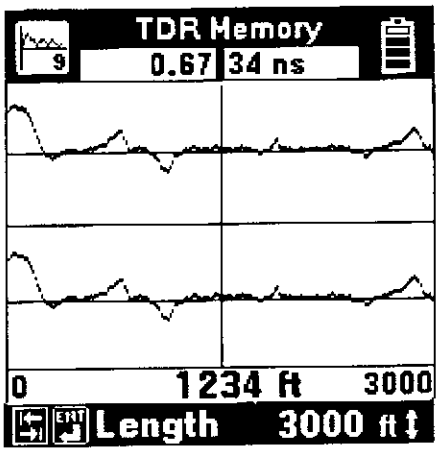
The first screen will show a list of the ID numbers for all stored TDR traces. Use the [Up] and [Down] keys to highlight the desired stored result. Use the [Right] key to delete the selected stored result. Use the [Left] key to delete all of the stored results.



Press the [Enter] key to select the highlighted result and display the stored results list for that ID number by type (TDR), date and time.



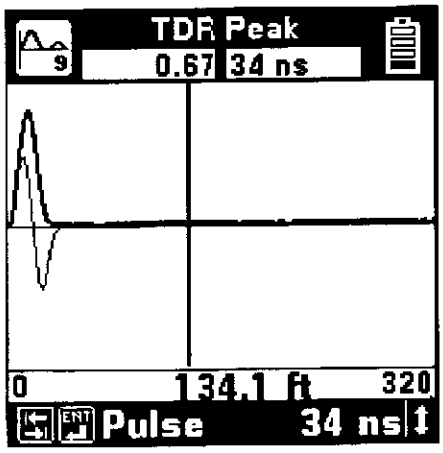
Use the [Up] and [Down] keys to highlight the desired stored result. Use the [Right] key to delete the selected result. Press the [Enter] key to display the stored trace on the bottom of the TDR screen and the "live" trace on the top.



You may move the cursor by using the [Left] and [Right] keys. The control settings for the stored trace can be viewed by pressing the [Tab] or [Enter] keys but the settings cannot be changed. The TDR Memory screen defaults to the control settings that were active when the stored trace was saved using the "TDR Save" function.

Peak:

Use the TDR Peak mode to capture events that may be intermittent. This mode continuously detects and displays the maximum and minimum traces that occur from the time that the mode is first selected. The 'live' trace is also displayed continuously. As a new maximum or minimum trace is detected, it will replace the previous one on the display.



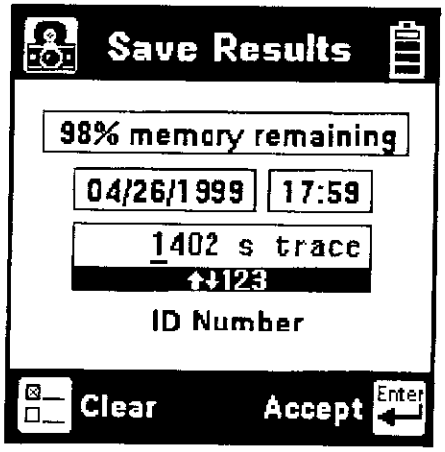
If the pair being tested is stable (no intermittent faults), then the minimum, maximum and "live" traces should appear as a single trace.

If any of the control values are changed, the peak histories will be erased and new values will begin to display.

TDR Save:

You can save any active "Single Trace" TDR screen. First, select the TDR control parameters so the screen appears as desired. Then press the [Save] key (camera icon) to save the trace.

The 965DSP will display the Save Results screen as follows:



The date and the time come from the 965DSP "system clock." See the "Set Clock" section on page 11 for further information on setting the clock, and also for information on the format of the date and time.

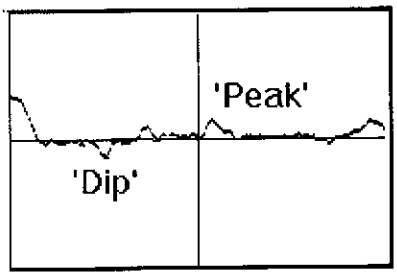
Use the blue keys to enter an alphanumeric ID. The ID may have up to twelve digits. Because there are not enough keys for all twenty-six letters, each of the number keys (except "1") also functions as letter keys for ID entry. Whether a number or letter is entered depends on how many times the key is pressed. As an example, if the Ohms key is pressed once, the number "3" will be displayed. If the same key is pressed twice, the letter "d" will be display, three times for the letter "e" and four times for the letter "f". When the desired number or letter is displayed, either press the key for the next number or letter, or the [Right] key if the same key is going to be pressed again. This will cause the previously

entered character to move to the left making room for the next one. Continue entering numbers or letters in this manner until all have been entered. If you enter more than 12 characters, the first entered character will be discarded. To change or delete any of the characters that have been entered, use the [Right] or [Left] key to move the cursor under the letter to be changed or deleted. To delete the character, press the [Down] key. To change the character, press the key of the new character once (for a number) or several times (for a letter). Once the ID has been entered, press the [Enter] key to save the current TDR trace information.

A total of 100 results for TDR can be saved. The percentage of remaining memory for results storage is shown in the box at the top of the screen.

Event Recognition

"Events" are the "dips" and "peaks" seen on the screen caused by faults or devices on the pair.



Launch Pulse: The first peak on the screen is the "launch pulse" which occurs where the 965DSP connects to the test leads (at a distance of 0 feet or meters). The distance to the cursor includes the five foot length of the test leads.

Fault: A resistance fault will show up as a dip on the screen. The lower the value of resistance, the lower the dip.

Open: A clean or dirty open will show up as a peak on the screen. The "cleaner" the open, the taller the peak. A complete open will be the tallest peak (other than the launch pulse). You can not see events past a complete open.

Short: A short (or zero-Ohm resistance fault) will show up as the lowest dip on the screen. You cannot see events past a short.

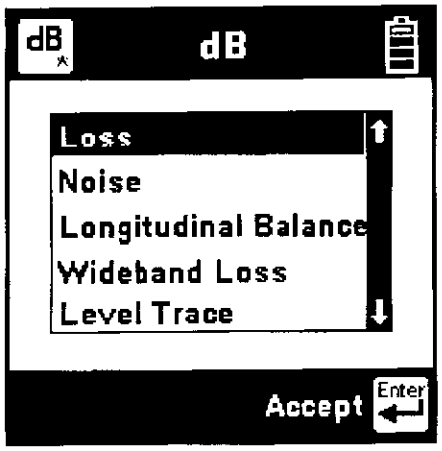
Load Coil: A load coil looks very similar to an open. If you think there is a load coil on the pair, use the 965DSP Load Coil function (in the Toolbox) to verify its presence. You can not see events past a load coil.

Bridge Tap: A bridge tap will look like a resistance fault and an open. (A dip followed by a peak.) The distance between the two events is the length of the bridge tap.

The start of a bridge tap looks like a resistance fault. Use the 965DSP Resistance function to measure the resistance on the pair. If there is no resistance, and you see a dip followed by a peak, you might suspect a bridge tap.

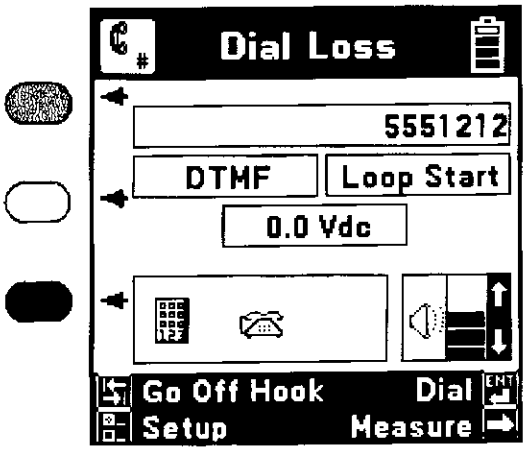
dB

Use this function to measure Loss, Noise, Longitudinal Balance, Wideband Loss, or perform a Level Trace.



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.

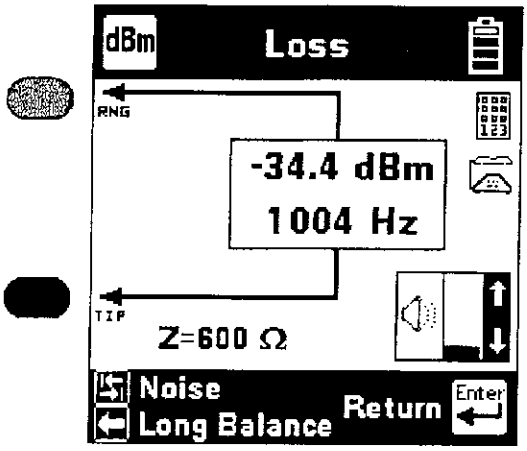


See "Talk Set" on page 95 for more information on dialing numbers. The "Dial Noise" and "Dial Longitudinal Balance" screens appear the same as above, except for the screen titles.

Separate lists of phone numbers are kept for each function. Press the [Right Arrow] key to bypass the dialing process and manually measure the loss.

Loss

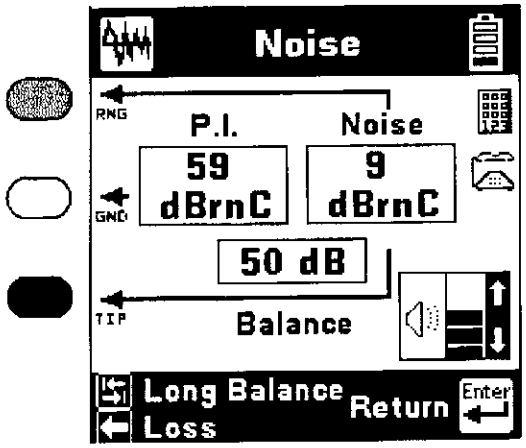
Use this function to measure loss from the far-end to near-end using a tone between 200 Hz and 20 kHz. You must use a separate instrument to generate the tone at the far-end.



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

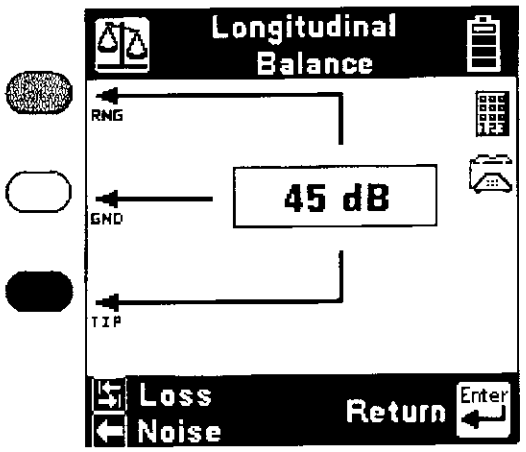
Use this function to measure the Noise, Power Influence and the calculated Balance of the pair and ground. Connect the Red and Black test leads to the pair, and the Green lead to ground.



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

Longitudinal Balance

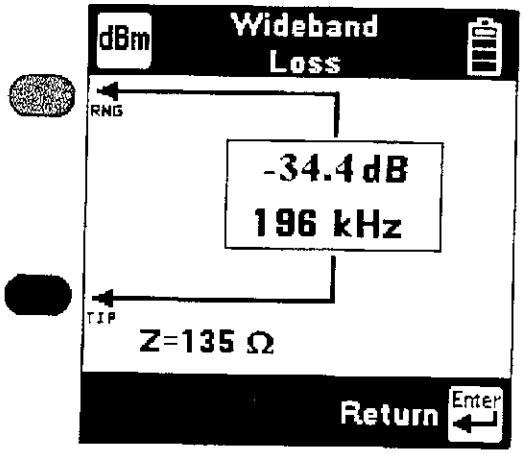
Use this function to measure the active Longitudinal Balance on the pair. The 965DSP automatically goes off-hook to measure Longitudinal Balance.



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

Wideband Loss

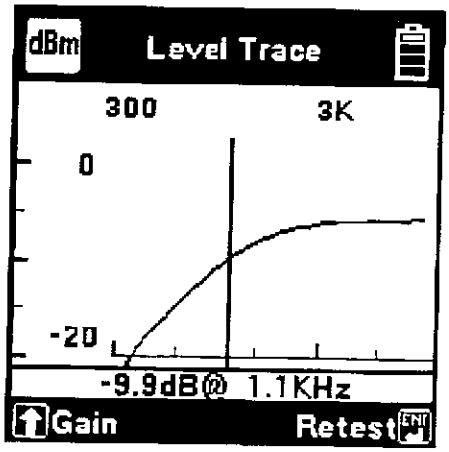
Use this function to measure the loss of a far-end tone between 20 kHz and 1200 kHz.



The screen displays the signal level in dBm, and the frequency of the tone in kilohertz. Press [Enter] to return to the dB menu.

Level Trace

Use this function to measure and display the AC impedance of an inactive pair as a function of frequency. This test can be used to analyze a pair for loading and bride tap problems. The result is displayed in a graph with relative impedance level displayed on the x-axis in dB and the frequency on the y-axis. Attach the red and black test clips to the pair to be analyzed.



"Swept Impedance screen"

A normal unloaded line would appear as a slowly decreasing line. Bulges or dips may indicate the presence of load coils.

Use the [Right] and [Left] keys to move the cursor across the graph. As the cursor is moved, a readout of the signal level and frequency will be displayed beneath the graph. A value of -3.53 dB corresponds to an impedance of 600 ohms at that frequency. 0 dB indicates a short-circuit and a large negative value corresponds to an open circuit. If part of the graph is off of the screen (out of view) use the [Down] key to reduce the gain. Use the [Up] key to increase the gain. Press the [Enter] key to repeat the test or the [Backup] key to return to the dB menu.

Auto Test

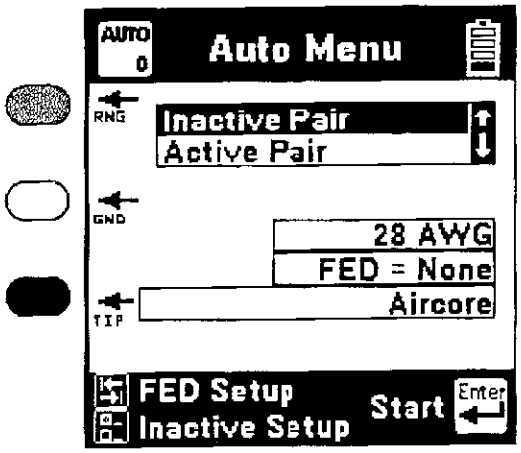
Use this function to perform an automatic sequence of tests on an Inactive, Active or Wideband pair. The Wideband auto test requires the use of a Far End Device (FED), either a 3M Far End Device or a CTC Smart Strap™. The Inactive pair auto test can be run with or without a FED. The Active pair auto tests are performed on a working pair without a FED using a test line number. Certain auto test results are compared against pass/fail limits to provide a quick-look of the pair condition. The pass/fail status is indicated in the results box by an 'O.K.' for pass, a 'Yield' sign for marginal and a 'Stop' sign for fail. Test values are also available for inspection in the test value screen. In this screen values that are marginal or have failed are indicated by a highlight around the result box. Refer to the tables starting on p.91 for the tests that are performed and the tests that have pass/fail limits for each test type.

Auto Test without FED

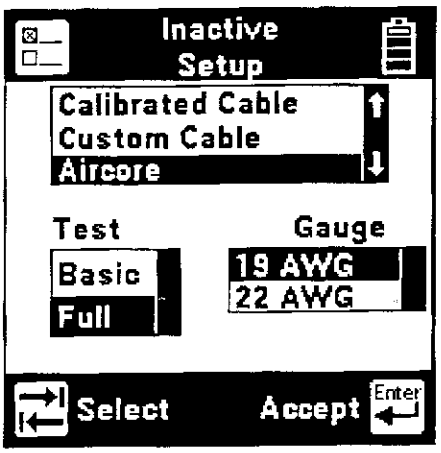
If a FED has not been previously selected, either the Inactive Pair or Active Pair screen will be visible. Use the [Up] and [Down] keys to select one or the other. If a FED has been previously selected, press the [Tab] key to select "None" under FED Setup.

Inactive Pair (without FED)

The Inactive Pair screen displays the wire gauge, FED Select status and the cable type.

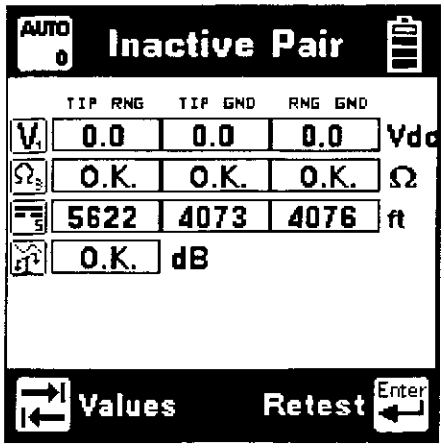


Use the [Tab] key to select a FED. Press the [Setup] key to change the Inactive pair parameters.

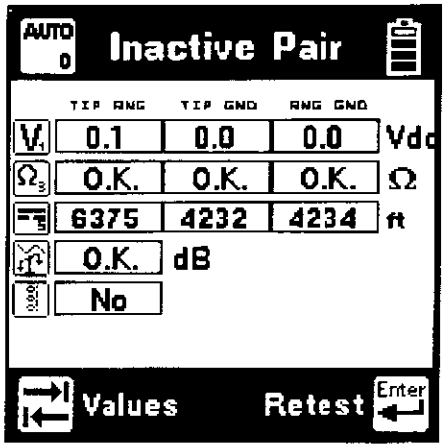


Use the [Tab] key to select the cable type, test type or wire gauge for editing. Use the [Up] and [Down] keys to highlight the desired cable type or wire gauge. Press [Enter] to accept the changes and return to the previous screen. Use the [Backup] key to return without making changes.

At the Auto Menu screen connect the red test lead to one conductor of the pair, the black test lead to the other conductor and the green test lead to ground. Press the [Enter] key to start the Auto test. The Inactive Pair results screen will appear.

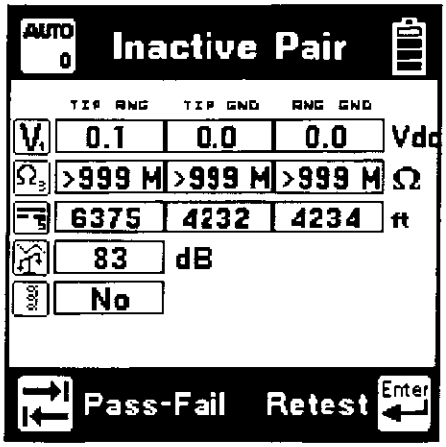


Inactive Pair - Basic Test



Inactive Pair - Full Test

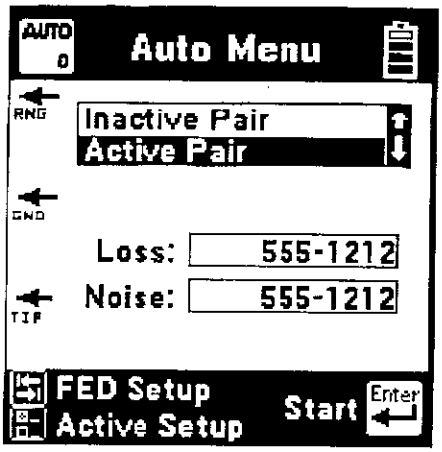
The test result values or pass/fail status will be displayed for each test. Press the [Enter] key to repeat the test. Press the [Tab] key to view the test values for all tests.



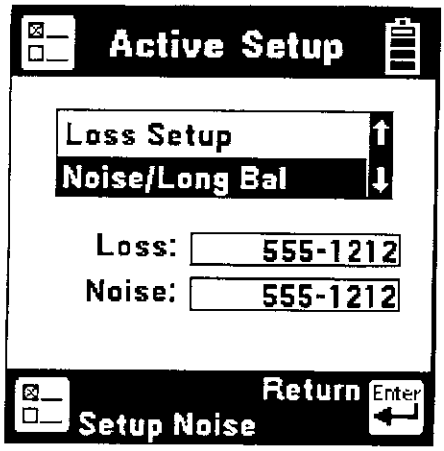
Press the [Tab] key to return to the pass/fail screen or [Enter] to retest.

Active Pair (without FED)

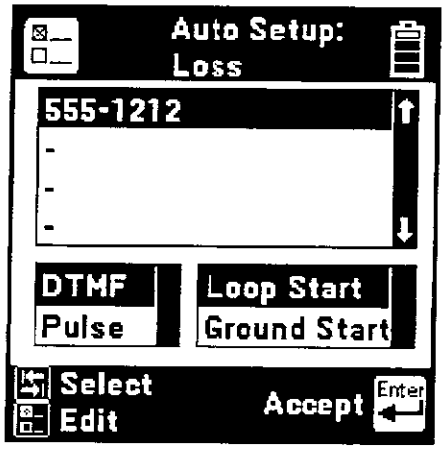
The Active Pair screen displays the Loss and Noise test line numbers.



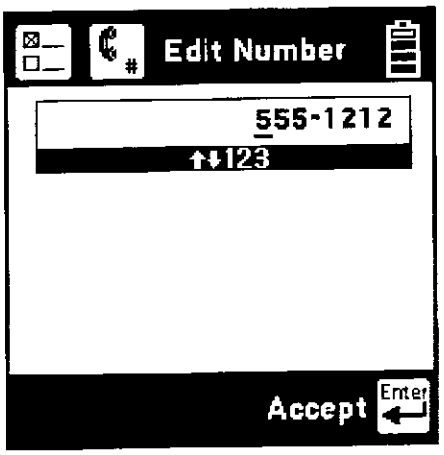
Use the [Tab] key to select a FED. Press the [Setup] key to change the Active pair parameters.



Use the [Up] and [Down] keys to select Loss or Noise/ Longitudinal Balance setup and press the [Setup] key.

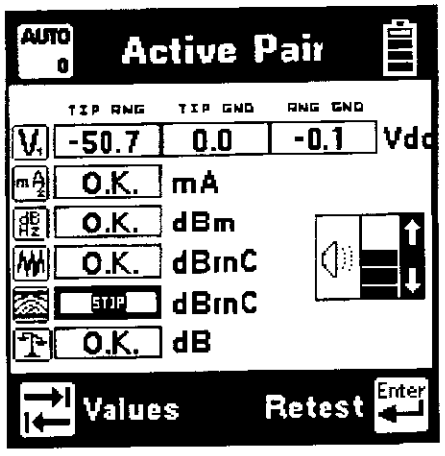


The Noise/Longitudinal Balance setup screen is identical except for the heading. Press the [Tab] key to select the parameter to edit. For the dial type and start type selections, use the [Up] and [Down] keys to select DTMF or Pulse dialing and Loop or Ground Start. If the test line number is selected, press the [Setup] key to enter or change the dial loss number.

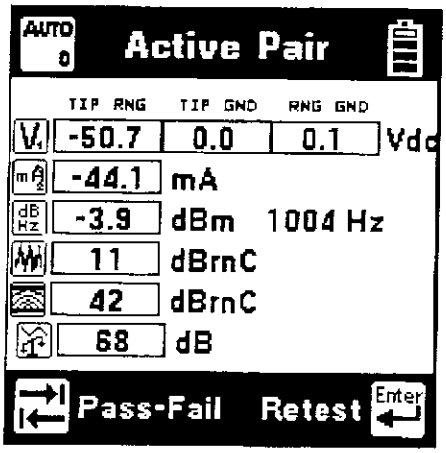


Use the blue keys to enter a number. Press [Enter] to accept the entry and return to the previous screen.

At the Auto Menu screen connect the red test lead to one conductor of the pair, the black test lead to the other conductor and the green test lead to ground. Press the [Enter] key to start the Auto test. The Active Pair results screen will appear.



The test result values or pass/fail status will be displayed for each test. Press the [Enter] key to repeat the test. Press the [Tab] key to view the test values for all tests.

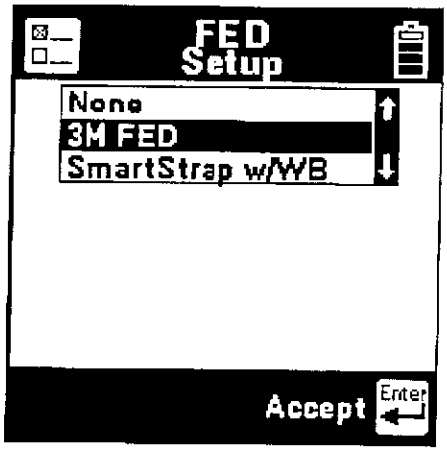


If the Power Influence measurement result is greater than 70 dBrnc (-20dBmop), then Noise Balance will be displayed. Otherwise Longitudinal Balance will be displayed. Press the [Tab] key to return to the pass/fail screen or [Enter] to retest.

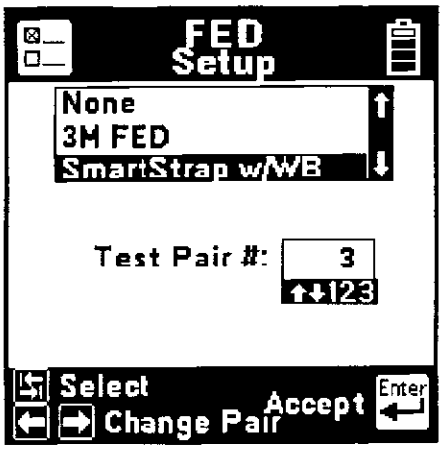
Auto Test with FED

The 965DSP will perform an Inactive or Wideband pair Auto test with a FED.

From the Auto Menu screen press the [Tab] key to go to the FED setup screen.



Use the [Up] and [Down] keys to select no FED, the 3M FED or the CTC Smart Strap™. If a CTC Smart Strap is selected, you must also enter the pair number to be tested.



Use the [Tab] key to highlight the Test Pair number box. Use the blue keys to enter the desired test pair number. Press the [Enter] key to accept the choice and return to the Auto Menu.

FED Connection

Before proceeding with an Auto test using a FED, the FED must be connected at the end of the pair under test.

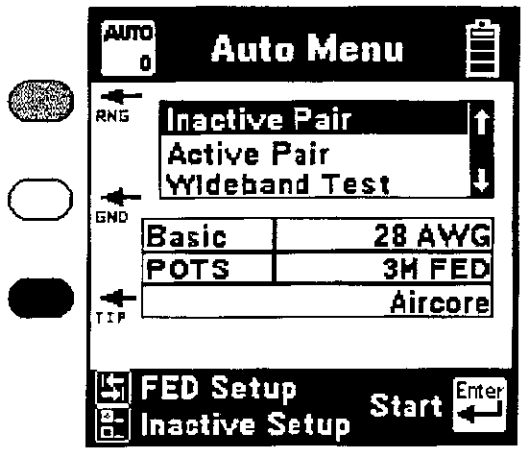
The 3M FED supports both Inactive (voiceband) and Wideband Auto tests. At the far end of the cable, connect the black control lead to the tip conductor of the test pair, the red control lead to the ring conductor and the green lead to ground. Press the On/Off pushbutton twice on the 3M FED to transmit an ID tone on the Control pair. This can be used to identify the pair at the other end. If an ID tone is not needed, the 3M FED can be left off since it will be remotely powered up during the Auto test. Refer to the 3M FED Instruction Manual for more information.

The CTC Smart Strap™ Model C1100 supports Inactive Pair testing only and requires a separate, good control pair. A Wideband Module Model C1110W is also required for Wideband Auto test. At the far end of the cable, connect the Control Pair (Pair 0) T and R terminals to the separate control pair in the cable. Connect the test pair tip conductor to the T terminal of pair 1 or higher on the Smart Strap module and the test pair ring conductor to the R terminal of the same pair. Connect the Ground

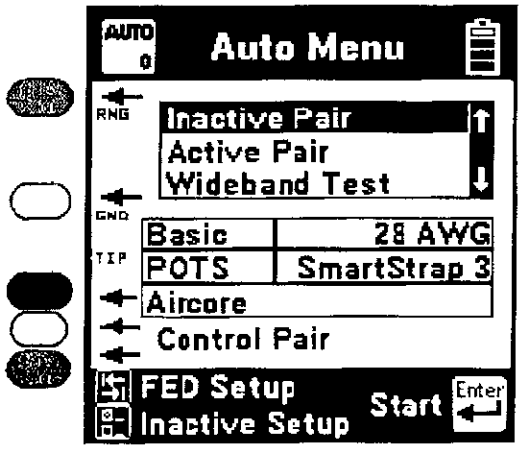
terminal to ground. Turn on the Smart Strap. Refer to the CTC Smart Strap™ Operator's Manual for more information.

Inactive Pair (with FED)

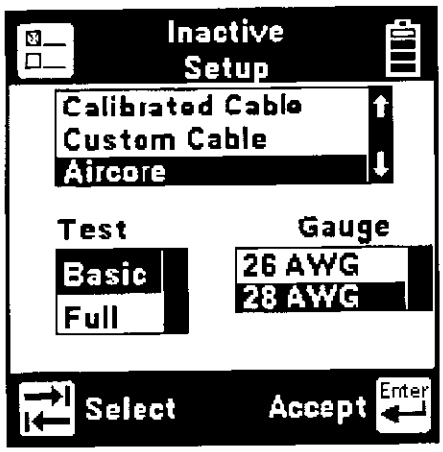
The Inactive Pair screen displays the type of test (Basic or Full), the type of service (POTS), the wire gauge, the FED type and the cable type.



If the CTC Smart Strap has been selected for the FED, two additional test leads that are used to control the Smart Strap will be shown on the screen.

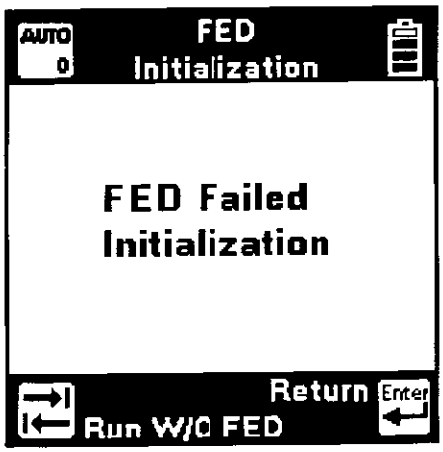


Use the [Tab] key to change the FED setup. Press the [Setup] key to change the Inactive pair parameters.



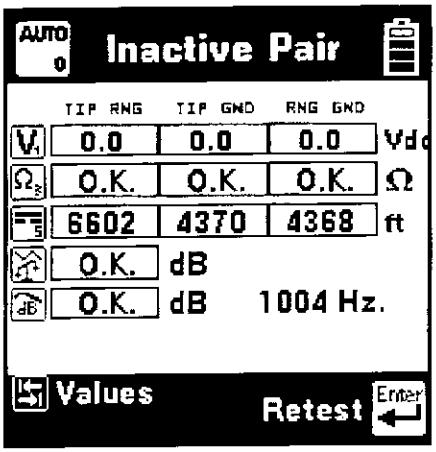
Use the [Tab] key to select the cable type, test type or wire gauge for editing. Use the [Up] and [Down] keys to highlight the desired cable type, test type or wire gauge. Press [Enter] to accept the changes and return to the previous screen. Use the [Backup] key to return without making changes.

At the Auto Menu screen connect the red test lead to one conductor of the pair, the black test lead to the other conductor and the green test lead to ground. If the CTC Smart Strap™ is being used as a FED, also connect the yellow test lead to one conductor of the control pair and the blue test lead to the other conductor. Make certain that the FED is connected to the pair under test at the far end. Press the [Enter] key to start the Auto test. The 965DSP performs a test to determine if it can communicate with the FED. If this test fails, the following warning screen will appear.

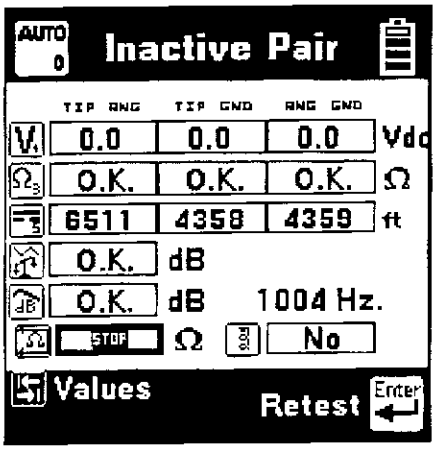


Check the test lead hookup for the 965DSP and the FED. The Auto test can be run with the FED connected directly to the 965DSP to determine if the cable hookup is causing the problem. Press the [Enter] key to return to the Auto Menu screen.

If the initialization process is successful, the Inactive Pair results screen will appear.

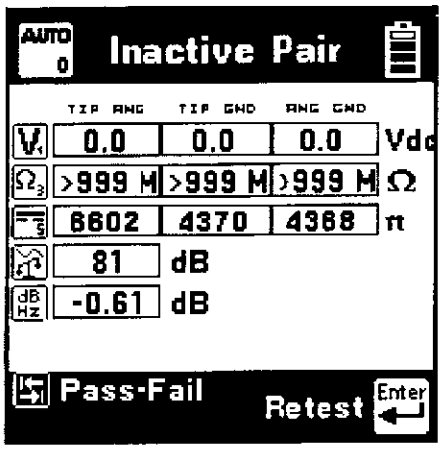


Inactive Pair - Basic Test

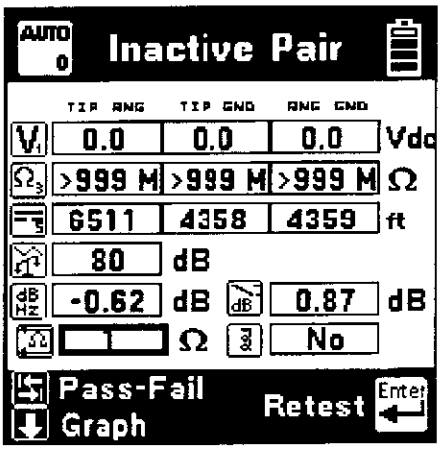


Inactive Pair - Full Test

The test result values or pass/fail status will be displayed for each test. Press the [Enter] key to repeat the test. Press the [Tab] key to view all test values for all tests.

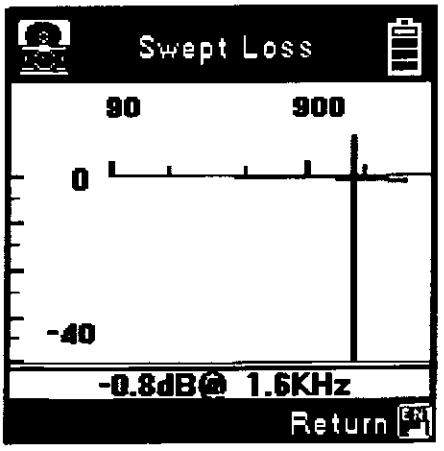


Inactive Pair - Basic Test



Inactive Pair - Full Test

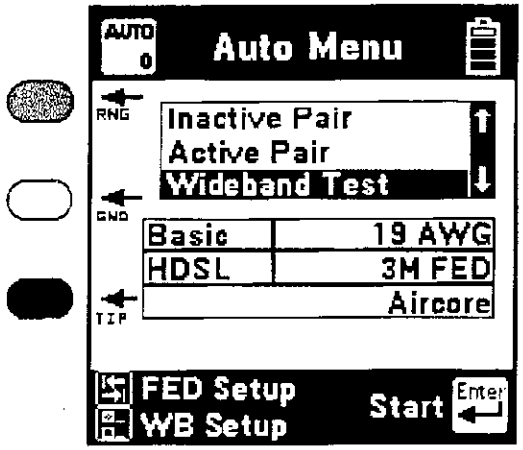
Press the [Tab] key to return to the pass/fail screen or [Enter] to retest. To view the graph of the voice-band sweep loss results, press the [Down] key.



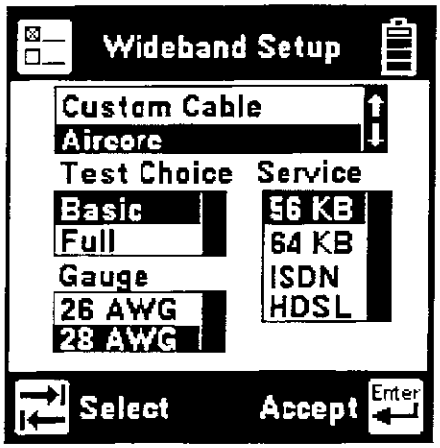
Press [Enter] to return to the previous screen.

Wideband Pair (with FED)

The Wideband Test screen displays the type of test (Basic or Full), the type of service (56 KB, 64 KB, ISDN, HDSL, T1, E1, ADSL), the wire gauge, the FED type and the cable type. If the CTC Smart Strap™ has been selected for the FED, two additional test leads that are used to control the Smart Strap will be shown on the screen.



Use the [Tab] key to change the FED setup. Press the [Setup] key to change the Wideband Test parameters



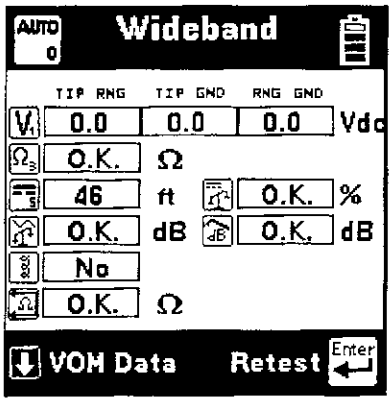
Use the [Tab] key to select the cable type, test type, wire gauge, or type of service for editing. Use the [Up] and [Down] keys to highlight the desired cable type, test type, wire gauge or service. Press [Enter] to accept the changes and return to the previous screen. Use the [Backup] key to return without making changes.

At the Auto Menu screen connect the red test lead to ring of the pair, the black test lead to the tip and the green test lead to ground. If the CTC Smart Strap™ is being used as a FED, also connect the yellow test lead to one conductor of the control pair and the blue test lead to the other conductor. Make certain that the FED is connected to the pair under test at the far end. Press the [Enter] key to start the Auto test. The 965DSP performs a test to determine if it can communicate with the FED. If this test fails, the following warning screen will appear.

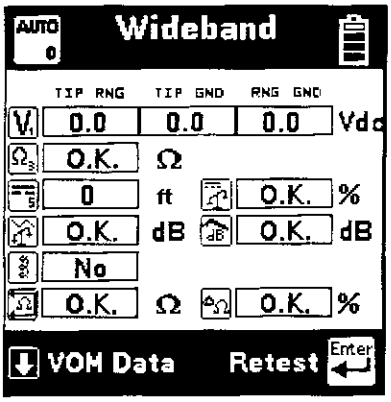
If the green test lead is not properly connected the following screen will be displayed.

Check the test lead hookup for the 965DSP and the FED. The Auto test can be run with the FED connected directly to the 965DSP to determine if the cable hookup is causing the problem. Press the [Enter] key to return to the Auto Menu screen.

If the initialization is successful, the Wideband results screen will appear.



Wideband - Basic Test

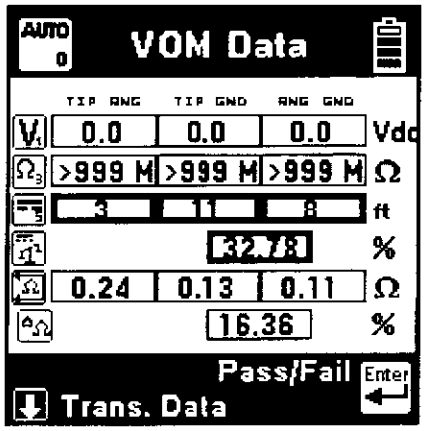


Wideband - Full Test

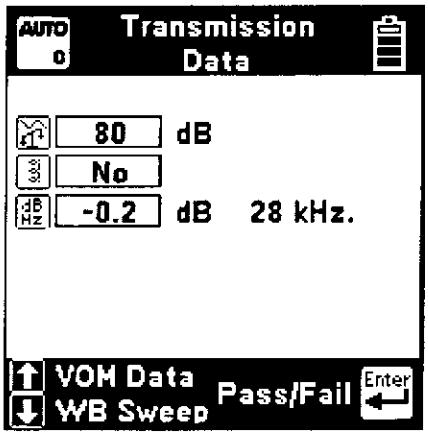
The Wideband - Full Test includes a resistive balance test (using special resistance) that requires a different test lead connection. When this part of the Auto test is reached, the user will be requested to swap the black and green test leads or to skip this test.

To run this test after the leads have been swapped, press the [Enter] key. To skip this test (and not change the test lead connection), press the [Tab] key. If the resistive balance test is run, be sure to properly reconnect the 965DSP test leads to the original hookup when the test is complete.

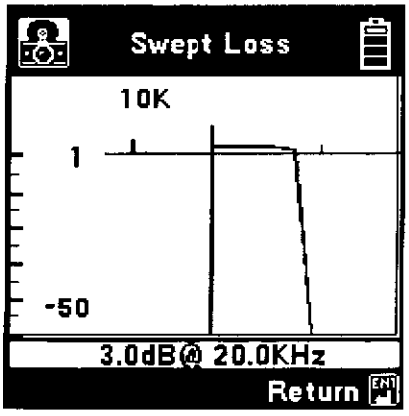
The test result values or pass/fail status will be displayed for each test. Press the [Enter] key to repeat the test. Press the [Down] key to view all test values for all tests.



Press [Enter] to return to the Pass/Fail screen or the [Down] key to display the Transmission Data screen.



Press [Enter] to return to the Pass/Fail screen, the [Up] key to return to the VOM Data screen or the [Down] key to display the Wideband Swept Loss screen.



Press [Enter] to return to the previous screen.

Auto Test Configurations

The following tables list the tests performed of the Inactive Pair, Active Pair and Wideband Tests.

Test	Basic	Full	Pass/Fail
Vdc	Yes	Yes	No
Ohms	Yes	Yes	Yes
Opens	Yes	Yes	No
Long. Balance	Yes	Yes	Yes
Load Coil	No	Yes	No

Inactive Pair Tests without FED

Test	Basic	Full	Pass/Fail
Vdc	Yes	Yes	No
Ohms	Yes	Yes	Yes
Opens	Yes	Yes	No
Long. Balance	Yes	Yes	Yes
Voiceband Sweep	No	Yes	Yes
Single Tone Loss	Yes	No	Yes
Loop Resistance	No	Yes	Yes
Load Coil	No	Yes	No

Inactive Pair Tests with FED

Test	Pass/Fail
Vdc	No
Loop Current	Yes
Loss	Yes
Noise	Yes
Power Influence	Yes
Long. Balance	Yes

Active Pair Tests (without FED)

Test	Basic	Full	Pass/Fail
Vdc	Yes	Yes	No
Ohms	Yes	Yes	Yes
Opens	Yes	Yes	Yes
Capacitive Balance	Yes	Yes	Yes
Long. Balance	Yes	Yes	Yes
Sweep Loss	No	Yes	Yes
Single Tone Loss	Yes	No	Yes
Loop Resistance	Yes	No	Yes
Loop Ohms	No	Yes	Yes
Resistive Balance	No	Yes	Yes
Load Coil	Yes	Yes	No

Wideband Test (with FED)

Service Type	Single Freq. (KHz)	Sweep Freq. (kHz)
POTS	1004 (Hz)	404, 804, 1004, 1204, 1404, 1604,1804, 2004, 2804, 3004 (Hz)
56 kB	28	20, 28, 32, 40, 48, 82
64 kB	32	20, 28, 32, 40, 48, 82
ISDN	40	20, 28, 32, 40, 48, 60,70,82
HDSL	196	20, 30, 50, 70, 90, 110, 130, 196, 400*
T1*	772	200, 400, 500, 700, 772, 1024
E1*	1024	200, 400, 500, 700, 772, 1024
ADSL*	138 1100	20, 30, 50, 69, 90, 110, 138, 276, 400, 600, 800,1000, 1100

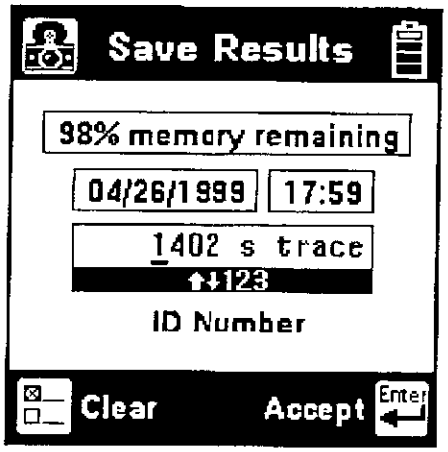
Inactive & Wideband Loss Frequencies

**Note: Tests for these service types are not available on some of the older versions of the 965DSP. Upgrades are available thru 3M Telecom Repair Service.*

Auto Test Save:

You can save all of the results of an Auto test. After an Auto test has completed, press the [Save] key (camera icon) to save the trace.

The 965DSP will display the Save Results screen as follows:



The date and the time come from the 965DSP "system clock." See the "Set Clock" section on page 11 for further information on setting the clock, and also for information on the format of the date and time.

Use the blue keys to enter an alphanumeric ID. The ID may have up to twelve digits. Because there are not enough keys for all twenty-six letters, each of the number keys (except "1") also functions as letter keys for ID entry. Whether a number or letter is entered depends on how many times the key is pressed. As an example, if the Ohms key is pressed once, the number "3" will be displayed. If the same key is pressed twice, the letter "d" will be display, three times for the letter "e" and four times for the letter "f". When the desired number or letter is displayed, either press the key for the next number or letter, or the [Right] key if the same key is going to be pressed again. This will cause the previously entered character to move to the left making room for the next one. Continue entering numbers or letters in this manner until all have been entered. If you enter more than 12 characters, the first entered character will be discarded. To change or delete any of the characters that have been entered, use the [Right] or [Left] key to move the cursor under the letter to be changed or deleted. To delete the character, press the [Down] key. To change the character, press the key of the new character once (for a number) or several times (for a letter). Once the ID has been entered, press the [Enter] key to save the current TDR trace information.

A total of 100 results for TDR can be saved. The percentage of remaining memory for results storage is shown in the box at the top of the screen.

Auto Test Results Screen Symbol Definitions

 - DC Volts measurement results

 - Ohms measurement results

 - Opens measurement results

 - Longitudinal balance measurement result

 - Load coil present (No) or distance to first load coil

 - Loop current measurement result

 - Single frequency loss measurement result

 - Metallic noise measurement result

 - Power influence measurement result

 - Balance measurement result (longitudinal or noise)

 - Noise balance measurement result (Power influence - Noise)

 - Loop ohms measurement result

 - Capacitive balance measurement result

 - Loss or slope measurement result(s) (single frequency or sweep)

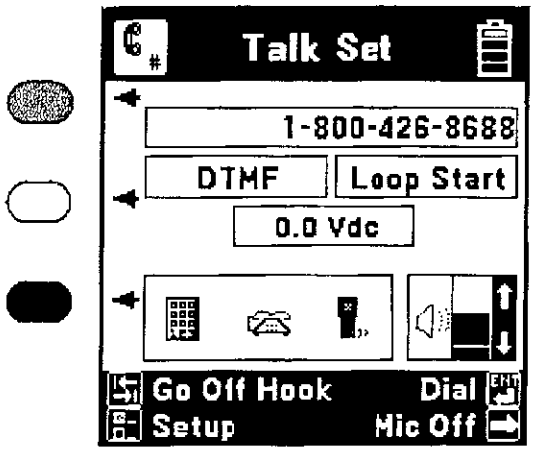
 - Resistive balance measurement result

 - Voice-band frequency slope measurement result

Talk Set

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

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



This screen displays the last number dialed, the DC voltage on the line, and the signal format for dialing. The blue keys become number keys in the Talk Set. Use the [Setup] key to change the Dial or Start mode, or to select and edit a stored phone number (see Talk Set Setup p. 96).

Use the [Tab] key to switch between on-hook and off-hook.

Use the [Enter] key to dial the number in the display. You may also manually enter numbers and they will be sent out on the line. You may also get a stored number from memory (see Talk Set Setup p. 95) and then send it.

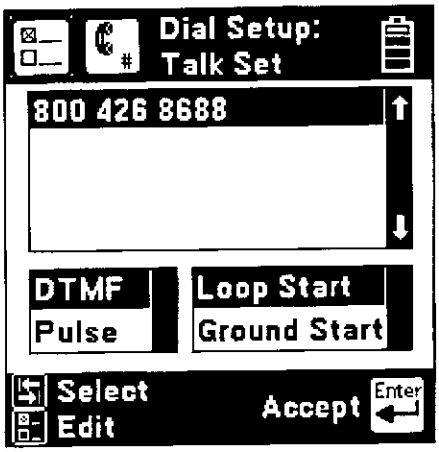
Note: pulse dial can only be used "on-hook."

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

Use the [Backup] key to exit the Talk Set before going to another function.

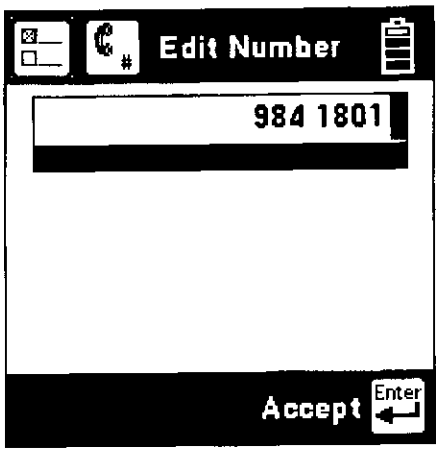
Talk Set Setup

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



Use the [Tab] key to highlight a desired menu. Use the [Up] and [Down] arrow keys to move to a desired telephone number, select the dial mode (DTMF or Pulse), or the start mode (Loop or Ground). 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 uses a Nickel Metal Hydride (NiMH) 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 pack in the battery compartment, then 3) replace the door and tighten the screws.

Caution: Battery may explode, leak or catch fire if exposed to high temperatures or fire. Recycle or dispose of properly. To prevent injuries or burns, do not allow metal objects to contact or short circuit the battery terminals.

Note: NiMH batteries may be recycled.

Charging:

The battery pack must be charged on a regular basis. You can typically use the 965DSP for up to 12 hours between charges. The time between charges may be reduced if you use the backlight frequently or if you work in very cold weather. Charging time is 2.5 hours minimum.

Level of Charge:

The battery icon in the upper right of all screens indicates the battery charge. Four black bars in the icon indicate full charge. Zero black bars indicate the battery pack is **very low** and should be charged immediately. Charging efficiency is best with a temperature between 50° F (10° C) and 86° F (30° C).

Note: ***Do not charge the batteries at temperatures below 32° F (0° C) or above 104° F (40° C).***

AC charger:

Use the AC charger to charge the NiMH battery pack. Plug the AC cord into the AC charger and into a power outlet. Plug the DC cord into 965DSP. Make sure that the key on the plug fits properly into the slot in the connector. The AC charger is meant for charging the NiMH battery pack only. **Do not use the AC charger to power the 965DSP during normal operations.**

DC Charger:

Use the Cigarette Lighter Adapter to charge the NIMH battery pack from a vehicle's battery. This adapter is meant for charging the NIHM battery pack only and should not be used to power the 965DSP during normal operations.

IR Port:

The IR Port on the top of the 965DSP is used for downloading new software enhancements or uploading Auto Test results or TDR traces to a PC or printer. A seperate IR adaptor cable is available as an option for either application.

Battery Holder:

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

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

Note: The battery holder has protection against accidental charging of alkaline batteries.

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

Test Leads:

The 965DSP 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 Blue/Yellow lead pair is used with some TDR modes (not in the 965DSP-B), and the Yellow lead is used with RFL. The shorting "strap" that comes with the 965DSP 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
NiMH Battery Pack	80-6108-6473-0
Red/Black Test Lead*	80-6108-6435-9
Blue/Yellow Test Lead*	80-6108-6436-7
Green Test Lead *	80-6108-6437-5
Red/Black Test Lead**	80-6108-6395-5
Blue/Yellow Test Lead**	80-6108-6397-1
Green Test Lead**	80-6108-6399-7
Ground Strap, alligator	80-6109-3830-2
Ground Strap, banana	80-6109-3833-6
AC Adapter, 110/220 V	80-6109-9059-2
Cig Lighter Adapter	80-6109-3281-8
Carrying Case	80-6108-6392-2
KM Test Box	80-6109-9320-8
Far End Device	80-6110-2035-7
PC IR Adapter	80-6109-9197-0
Printer IR Adapter	80-6110-2044-9
Seiko DRU-414 Printer Pkg	80-6110-2045-6

* *1.5 m alligator clip*
** *1.5 m banana plug*

Repair:

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

Symptom	Cause	Solution
Unit does not turn on	Discharged battery pack.	Charge battery pack.
	NiMH battery pack old.	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.	Charge battery pack.
	Test lead broken.	Replace test lead.
	Improper connections.	Check connections.
No results	Test lead broken.	Replace test lead.
	Improper connections.	See on-screen hookups.
Resistance <999 MΩ when test leads open.	Test leads dirty.	Clean test leads.
Error messages during Self-Calibration.	Test Leads not shorted properly when prompted.	Check connections.
	Test leads broken.	Check test leads.

If the above solutions do not fix the problem, the 965DSP 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 (in the US or Canada), or call your local 3M representative in other countries for further details on repair service.

Upgrade:

To upgrade the 3M™ Dynatel™ 965DSP-B to a 965DSP with full TDR capability, please contact 3M Telecom Repair Service.

Specifications:

Size:	4.6x10.3x3"	(11.7x26x7.6 cm)
Weight:	4.3 lbs	(2 kg)
Operating Temp:	0 to 140°F	(-18 to 60°C)
Storage Temp:	-40 to 165°F	(-40 to 75°C)

Function	Range	Accuracy
DC Voltage:	0 to 99.9 V	1% ± 0.5 V
	100 to 300 V	3%
AC Voltage:	0 to 99.9 V	1% ± 0.5 V
	100 to 250 V	3%
Current:	0 to 59.9 mA	1% ± 0.3 mA
	60 to 110 mA	2%
Resistance:	0 to 9999 Ω	1% ± 5 Ω
(with CO voltage)	0 to 9999 Ω	1% ± 50 Ω
	10 K to 99.9 KΩ	1%
	100 K to 9.9 M Ω	3%
	10 M to 99 MΩ	5%
	100M to 990 MΩ	10%
Load Coils:	0 to 5	± 1
Special Resistance:		
Loop resistance:	0 to 99.9 Ω	0.1% ± 0.01Ω
	100 to 999.9 Ω	0.2% ± 0.01Ω
	1000 to 7000 Ω	1% ± 0.01Ω
Res. Difference:	0 to 99.99 Ω	1% Loop Res ± 0.01Ω
Ground Resistance:		
	5 to 500 Ω	1% ± 1Ω
K-Test:		
Loop Resistance:	0 to 7 kΩ	
Fault Ratio:	(Fault Res_1) > twice (Fault Res_2)	
Resistance to Fault:	0 to 3.5 kΩ	5%
Opens:	0 to 3000 ft	1% ± 3 ft
	(0 to 1000 m)	*(1% ± 1 m)*
	3000 to 10,000 ft	3%
	(1 Km to 3 Km)	*(3%)*
	10,000 to 50,000 ft	5%
	(3 Km to 15 Km)	*(5%)*
	50,000 to 100,000 ft	10%
	(15 Km to 30 Km)	*(10%)*
Precision Tone:	200 to 20KHz,	2 %
	-20 to +1 dB, 600 Ω	1 dB
Wideband Tone:	20K to 1200KHz	
	0 dBm, 135 Ω	1 dB
ID Tone:	200 to 1000Hz, Fixed level	
RFL:		
Fault size:	0 to 20 MΩ	
Loop resistance:	0 to 7000 Ω	
Resistance to Fault:	0 to 99 Ω	0.1% of RTS ± 0.01 Ω
	100 to 999 Ω	0.2% of RTS ± 0.01 Ω
	1000 to 7000 Ω	1% of RTS ± 0.01 Ω

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

Function	Range	Accuracy
Loss:	-40 to +10 dBm, 600 Ω	0.5 dB
	200 to 3000 Hz	2 Hz
	3 kHz to 10 kHz	10 Hz
	10 kHz to 20 kHz	20 Hz
Wideband Loss:	-50 to +2 dBm	2 dB
	20k to 1200kHz, 135 Ω	1 %
Noise Metallic:	0 to 50 dBrnc *(-90 to -40 dBm0p)*	2 dB
Power Influence:	40 to 100 dBrnc *(-50 to 10 dBm0p)*	2 dB
Longitudinal Balance:		
	0 to 85 dB	---
	0 to 70 dB	2 dB
TDR (Not in the 965DSP-B):		
Range:	3 to 30000 ft *(1 to 10000 m)*	0.6% of range
Velocity:	0.5 to 1.00 (75 to 150 m/µs)	
Pulse Width:	5 nS, 34 nS, 235 nS, 1600 nS	
ISDN (2B1Q):		
Status:	Active or Inactive	
Block Errors:	Near- and Far-end	+/- 1 error
(Note: Block Errors in US and Canada only):		
Auto:	(Same as individual functions)	

Note: All specifications are based on information believed to be reliable, but the accuracy or completeness thereof is not guaranteed. Specifications for this product are subject to change without notice.

Generally Accepted Criteria of Plain Old Telephone Service (POTS) service (US and Canada):

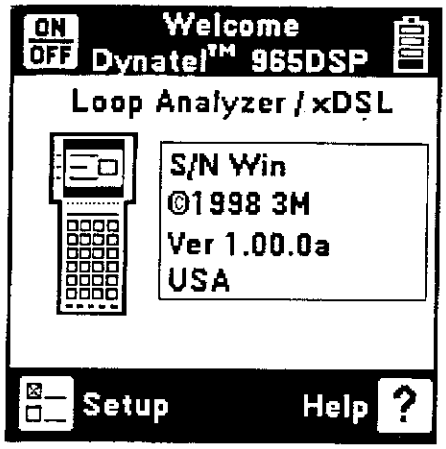
Parameter	Acceptable	Marginal	Unacceptable	
Current	> 23	20 to 23	< 20	mA
Loss	< 8.5	--	> 8.5	dBm
Balance	> 60	50 to 60	< 50	dBm
Noise	< 20	20 to 30	> 30	dBrnC
	<-70	-70 to -60	>-60	dBm0p
Power Influence	< 80	80 to 90	> 90	dBrnC
	<-10	-10 to 0	> 0	dBm0p
Ground Resistance *				
	< 25	--	> 25	Ohms
Insulation Res.				
	> 3M	3k to 3M	< 3k	Ohms
Longitudinal Balance				
	>59	50 to 59	< 50	dB

** Note: Ground Resistance can not be measured on "floating tip" or "floating A" switches such as the AT&T #5ESS.*

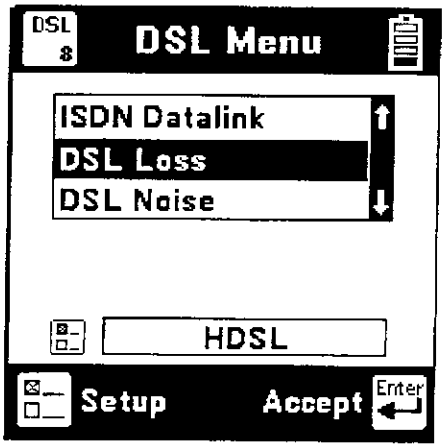
Appendix

965DSP/xDSL Subscriber Loop Analyzer

You can order the 965DSP Subscriber Loop Analyzer with special functions for qualifying and testing Digital Subscriber Line (DSL) services. If you have these features, the welcome screen that you see when you turn on the 965DSP indicates the xDSL option.



Press the DSL key to display the DSL test menu.

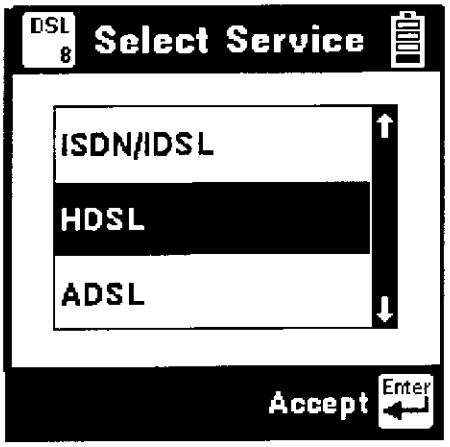


Press the [Up] or [Down] keys to move to a test.
Press the [Enter] key to accept the choice.

For DSL loss and DSL noise measurements, you first need to select the type of DSL service that you want to test. This automatically selects the appropriate line termination impedance and noise weighting filter for the selected service. Parameters for the different services are indicated in the table below.

Service	Termination	Filter	Frequency Range
ISDN/IDSL	135	E	1kHz – 50kHz
HDSL	135	F	4.9kHz – 245kHz
ADSL	100	G	20kHz – 1.1MHz

Press the [Setup] key to choose a DSL service.



Use the [Up] and [Down] keys to highlight the desired service. Press [Enter] to select the service and return to the previous screen.

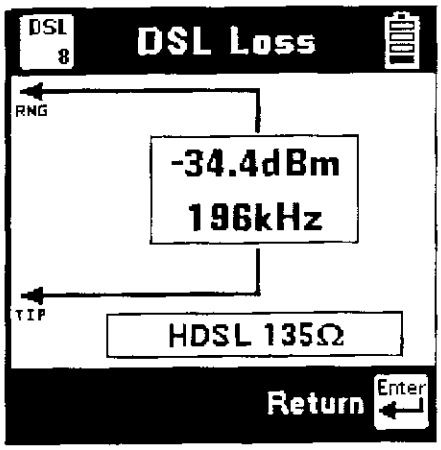
DSL Test Menu

ISDN Datalink

Refer to page 58 earlier in this manual for a complete description of this function.

DSL Loss

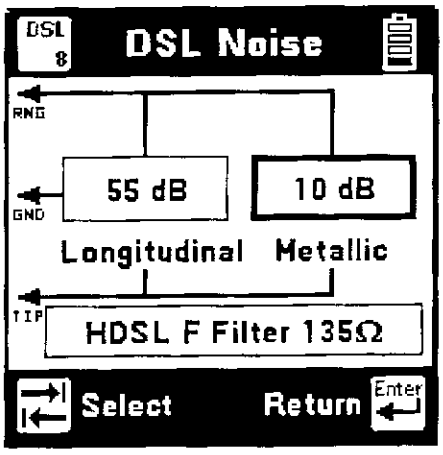
Use this function to measure loss from the far-end to near-end using a tone between 20kHz and 1.2MHz. You must use a separate instrument to generate the tone at the far-end.



The screen displays the signal level in dBm, the frequency of the tone in kHz, the selected service type, and the line terminating impedance. Press [Enter] to return to the DSL menu.

DSL Noise

Use this function to measure the wideband metallic and longitudinal noise on a pair. Connect the Red and Black test leads to the pair and the Green lead to ground.



Press the [Tab] key to move between the metallic noise power measurement across the pair and the longitudinal noise power of the conductors to ground. The highlighted reading is 'live' and continuously updated.

The screen displays the noise power (referenced to -90dBm), the selected service type, the noise weighting filter, and the metallic terminating impedance.

Proper Operation

The 965DSP/xDSL Subscriber Loop Analyzer measures extremely low noise levels and requires proper handling of the test leads to ensure consistent measurements. Extend the test leads away from the 965DSP when conducting DSL tests, and make sure that the Red and Black leads are kept as close together as possible to minimize RF noise pickup.

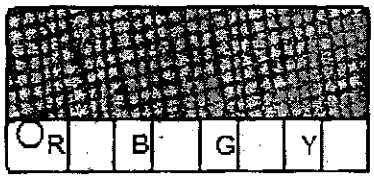
Do not attempt to conduct DSL noise or loss measurements while the external DC charger is connected.

xDSL Measurement Specifications

Function	Range	Accuracy
DSL Loss (100/135)	-75 to +5 dBm 20KHz to 1200KHz	1 dB
DSL Noise		
Noise Weighting Filters		
E Filter (ISDN/IDSL)	1KHz to 50KHz	
F Filter (HDSL)	4.9KHz to 245KHz	
G Filter (ADSL)	20KHz to 1.1MHz	
Metallic (100/135)		
E Filter (ISDN/IDSL)	10 to 90dBrn	2dB
F Filter (HDSL)	20 to 90dBrn	2dB
G Filter (ADSL)	30 to 90dBrn	2dB
Longitudinal		
E Filter (ISDN/IDSL)	40 to 120dBrn	2dB
F Filter (HDSL)	50 to 120dBrn	2dB
G Filter (ADSL)	60 to 120dBrn	2dB

Self-Test Board

A self-test board is included with the 965DSP to verify the performance of Opens and RFL. This is particularly important if operating conditions (shock, temperature, etc.) have changed and you want to check the function accuracy.



Check Opens performance: To verify Opens, connect the Red test lead to the "R" terminal, and the Black test lead to the "B" terminal. Press the [Opens] key on the 965DSP. You should see the following readings for different types of cable (US and Canada).

Measurement		Type of Cable (US and Canada)		
		Capac.	Aircore	Jelly-filled
Black to Red or Black to Green	MIN	9.35 nF	395 ft *(120 m)*	350 ft *(107 m)*
	MAX	.011 uF	450 ft *(137 m)*	400 ft *(122 m)*
Red to Black	MIN	9.35 nF	595 ft *(181 m)*	595 ft *(181 m)*
	MAX	.011 uF	680 ft *(207 m)*	680 ft *(207 m)*

Check RFL performance: To verify RFL, connect the Red test lead to "R," the Black test lead to the "B," the Green lead to "G," and the Yellow lead to "Y."

Press the [RFL] key on the 965DSP. Press the [SETUP] key, enter 70° F (21° C) for temperature. Press the [ENTER] key to accept. Select Separate Pair hookup, then continue. You should see the following readings for different wire gauges (US and Canada).

AWG	DTS		DTF		DSTF	
	min	max	min	max	min	max
19	11910 *(3630*	12290 ft *3747 m)*	1170 *(357*	1230 ft *375 m)*	10730 *3271*	11070 ft *3375 m)*
22	5986 *(1825*	6171 ft *1881 m)*	592 *(180*	613 ft *187 m)*	5393 *1644*	5559 ft *1695 m)*
24	3755 *(1145*	3871 ft *1180 m)*	371 *(109*	385 ft *117 m)*	3383 *1031*	3488 ft *1063 m)*
25	2970 *(905*	3063 ft *934 m)*	293 *(89*	305 ft *93 m)*	2676 *816*	2759 ft *841 m)*
26	2347 *(716*	2420 ft *738 m)*	232 *(71*	240 ft *73 m)*	2114 *645*	2180 ft *665 m)*
28	1479 *(451*	1526 ft *465 m)*	146 *(44*	152 ft *46 m)*	1332 *406*	1375 ft *419 m)*
Ohms	99.3	102.5 Ω	9.8	10.2 Ω	89.5	92.3 Ω

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:

All instruments are warranted for 12 months after date of shipment from the Seller to the original purchaser.

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.

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.

Warranty Exclusions: The foregoing express warranty is made in lieu of all other product warranties, express and implied, including fitness and merchantability. The express warranty will not apply to defects or damage due to accidents, neglect, misuse, alterations, operator error, or failure to properly maintain, clean, or repair products.

Limit of Liability: In no event will 3M or Seller be responsible or liable for special, incidental, or consequential losses or damages, whether based in tort or contract. Fulfillment of 3M's warranty obligations will be Customer's exclusive remedy and 3M's and Seller's limit of liability for any breach of warranty or otherwise.

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.

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