DIT-MCO HT-128 AND HT-128 B

USERS MANUAL

11.01 Software Version

IMPORTANT NOTE

The Users Manual uses the term HT-128 B for all references to the DIT-MCO handheld tester. However, The HT-128 B has 129 test pins versus 128 for the HT-128. Additionally, the HT-128 B includes a flashlight feature. **All other features are equally applicable to both versions of the tester.**

Regulatory Information

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radiofrequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference with radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment OFF and ON, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving HT-128 B.
- Increase the separation between the devices.
- Consult DITMCO for assistance.

Approvals and Certifications

For USA and Canada:

Contains FCC ID: OA3MRF89XAM9A

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For Outside of North America:

This device has been tested and is CE certified and is RoHS compliant.

Battery Pack:

Battery pack has been tested and certified as meeting UN 38.3.

Wireless Transceiver

The off-the-shelf transceiver described above and used on the HT-128 B is not WIFI compatible, does not utilize IP protocol, and will not connect with the internet. The HT-128 B wireless communication protocol is a closed architecture with the instruction set specifically and uniquely developed for use on the HT-128 B.

Caution

The DITMCO HT-128 B is a handheld, wireless harness test instrument designed for use in service and repair centers and manufacturing facilities. The instrument combines the precision of a digital ohm meter with the speed and versatility of an integrated wire harness tester. For user's convenience, the HIT-128 provides an on-board ohm meter (Probe Feature) for taking resistance measurements only. DO NOT ATTEMPT TO USE THE HT-128 B TO MEASURE VOLTAGE OR CURRENT AS DAMAGE WILL OCCUR TO
THE DEVICE AND HARM MAY RESULT TO THE USER. The test contacts located in the rear of the device are Electrostatic Discharge (ESD) sensitive. Therefore, do not touch any contact unless properly grounded. Always install the rear cover when the device is not in use.

DITMCO supplies a battery charger for the internal Lithium-Ion battery pack. USE OF ANY OTHER CHARGER OTHER THAN THE CHARGER SUPPLIED BY DITMCO MAY HARM THE DEVICE AND VOID THE MANUFACTURER'S WARRANTY.

The DITMCO HT-128 B is a precision test instrument and includes a capacitive touch display. Improper handling can damage the display and void the warranty. The HT-128 B includes slide on bumper guard for protection against normal wear and tear. Do not remove the guard during use.

Table of Contents

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Getting Started

How the HT-128 B Works

The HT-128 B is a 128-node wireless low-voltage handheld wiring analyzer. Each analyzer uses a transceiver (915 Mhz or 868 Mhz) for communication between as few as one or as many as eight HT-128 B units. For convenience, the User's Manual typically refers to the communication between the testers as Host/ Remote communication protocol. However, the system's communication architecture allows every HT-128 B within a test network to operate on a *peer-to-peer* basis to direct activities and share information with other testers. For the sake of the User's Manual, the communication architecture will be described as Host/ Remote except when denoted otherwise.

Connection between the HT-128 B and the wire harness is accomplished via an adapter that interfaces into the rear of the HT-128 B and includes the requisite mating connector(s) required to attach to the wire harness under test.

Set-up is accomplished by programming at least one unit, typically referred to as the Host, with a wire list for the targeted wire harness. The program provides basic "from-to" information regarding each wire within the wire The program connects HT-128 B test nodes per the wire list using three main connection criteria – Host to Host, Host to Remote, and Remote to Remote.

Single and Multiple Tester Configurations

9
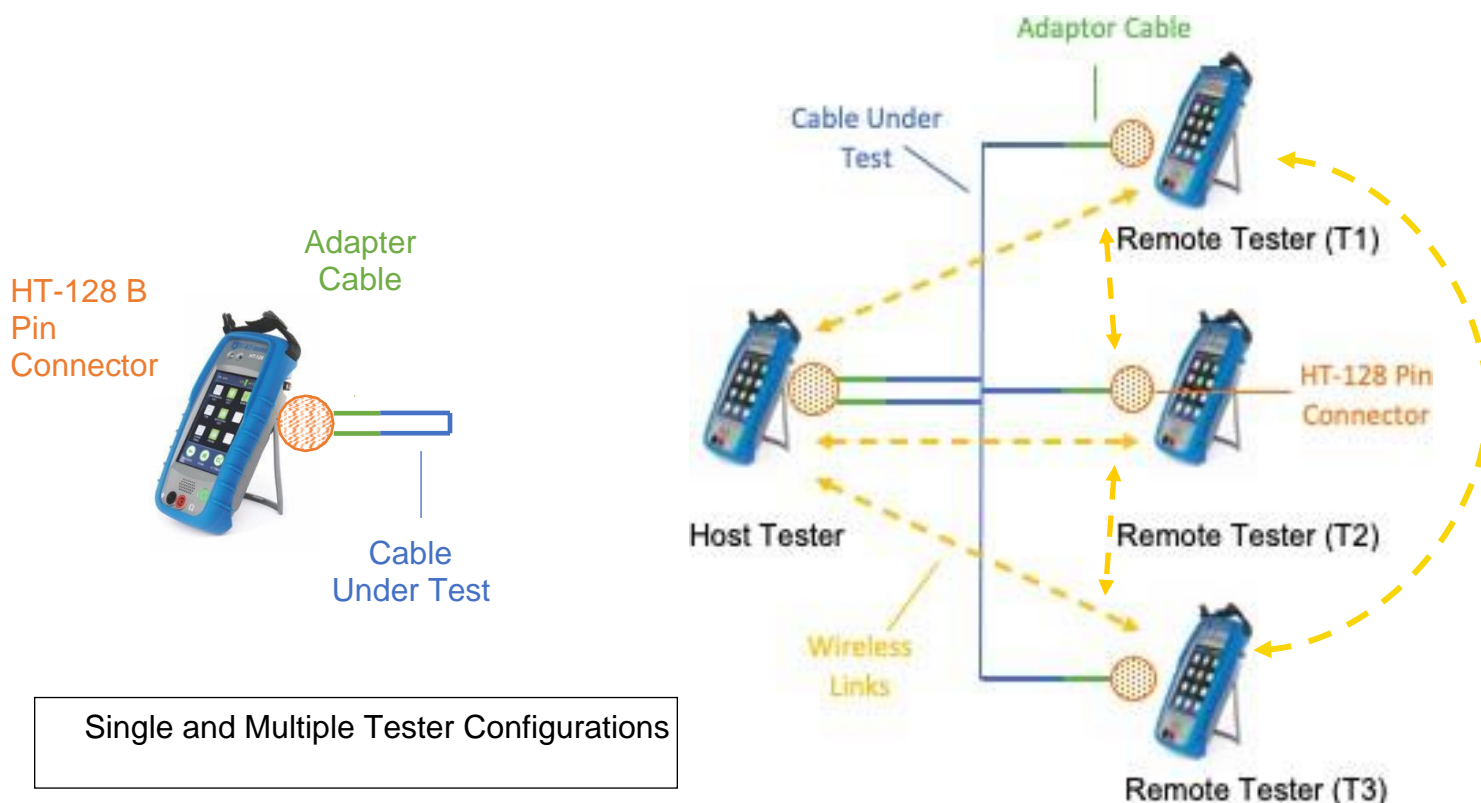
Overview

The DITMCO HT-128 B is a distributed test system capable of single tester and multiple tester configurations for testing multi-conductor wire harnesses. The HT-128 B connects individual testers to each wire harness branch connector rather than relying on a single centralized tester and multiple return cables. This distributed approach allows DITMCO to deliver battery operated, handheld testers that wirelessly link together to achieve the desired wire harness test coverage.

For convenience DITMCO uses the terms Host and Remote to describe the product's testing convention. However, every HT-128 can initiate testing, link to other testers, perform diagnostics and share test results with the user allowing for maximum flexibility in the testing and troubleshooting of cables and wire harnesses.

Initiating a test routine with the HT-128 B requires minimal expertise or training. Simply connect each HT-128 B to its corresponding harness connector using the product's 128-pin connector, select the harness test program, establish radio links between tester(s) for multi-tester test configurations, and begin testing. The testers coordinate test activities with each other using wireless communications. Any tester can be used to initiate testing.

The HT-128 B tests the harness wiring for continuity, mis-wired connections, resistance connections, passive circuit voltage, reversed or missing diodes, and wire isolation failures. After test completion pass/fail status is displayed on all testers. Detailed pass/failure information can be viewed on the designated host tester immediately or requested by the user for viewing on any other tester. A detailed test report is stored on the designated host tester and can be downloaded and viewed using a Windows PC and USB connection. The testers provide the capability to connect DMM-style test leads and measure resistance for troubleshooting and diagnosing harness wiring failures.

HT-128 B testing may be managed by any tester linked to the test environment. The user selected tester initially links with each tester defined in the test program creating the test environment. Once each HT-128 B is linked the Host sends commands to each Remote within the wire list to accomplish testing. The basic instruction set includes tester and un-grounding commands, and measurement commands.

To facilitate testing, the HT-128 B scheme uses the wires within the harness under test to create a return path for measuring resistance. As such, a tester sends commands to ground certain test nodes while un-grounding others to measure resistance or voltage between wires in the wire list and verify connections between wires. Measured values and wire connection information is stored and compared against the program parameters. Any differences detected during testing are categorized as opens, shorts, high or low resistance, mis-wires, diode reversed, diode missing, voltage high, voltage low, and isolation failure.

Faults are displayed on the tester for the user. A complete "ring-out" test report is also created and stored after each test is completed. The test report includes the resistance or voltage values for all wires in the wire list and notates all faults within the test program, if any.

Programming is accomplished via an EXCEL template provided by DITMCO.

Finally, the HT-128 B is capable of being electrically grounded together using the product's probe ground. Electrically tying multiple testers together allows DITMCO to deliver functionality such as IDENTIFY and RING-OUT whereby one or more users dynamically interact between the HT-128 B's and the wire harness-under-test to perform wiring analysis.

Out of the Box

1. Battery Charger Indicator Light – Amber indicates battery is charging using the external charger or USB port, Green indicates the battery external charger or USB is connected and HT-128 is fully charged.
2. Flashlight
3. Touchscreen
4. Probe Inputs – Banana jacks for Resistance measurement and common grounding. Black Banana Jack also serves as the 129th Test point.
5. Power ON/OFF – Press and hold until Light

6. Rechargeable Li+ Battery Pack Compartment
7. BNC Connector – Future feature
8. Standard Interface or In-Line Interface – Interfaces are a DITMCO serviceable items.
9. 128 Position Connector – Mates with D38999/26WJ35PA.

Main Menu Definitions

The main Menu provides multiple utilities and test options for the HT-128 B. Status data is always displayed at the top of the tester in the header field and shortcuts and SETTINGS always appears at the bottom of the display.

The header field includes several status information fields including:

TSN: The Tester Serial Number along with the ADAPTER ID defines the location of the tester during FAULT testing.

FID: Family Identification allows the user to select a specific frequency for a family of testers. This feature is useful in settings where there may be multiple teams testing different cables or wire harnesses. FID prevents testers outside of the family from being seen during ASSIGN TESTER/ADAPTER operation. To select a Family ID touch FID: and a drop-down menu will appear as shown in Figure X. Select a numerical FID number. Repeat the process for every tester in the family.

Battery Indicator: The battery indicator displays the amount of charge left in the battery. During charging a lightning bolt will display over the battery icon indicating the battery pack is in charge mode. A fully charged battery pack will last 10 to 12 hours during normal usage. When the battery charge falls below 20% the Power ON light will begin to blink.

Time: The time is used to time-stamp test reports during FAULT testing. Go to SETTINGS to set the DATE and TIME of the HT-128.

PREVIOUS: Returns the HT-128 B to the previous screen.

HOME: Returns the HT-128 B to the Main Menu

SETTINGS: Displays Test APPs, functions and options not shown in the Main menu. See the SETTINGS section for further information.

The TEST APPS section provides information on how to operate each test mode.
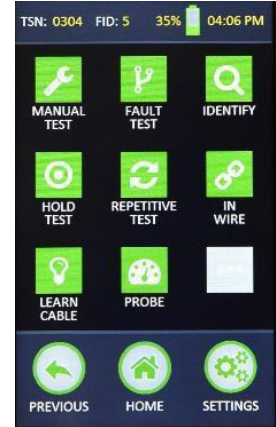
Remote Menu

The Remote Menu may be accessed by the user by pressing the REMOTE MENU icon on the Main Menu. The Remote Menu provides users with additional features as described in the FAULT Testing section of the User's Manual.
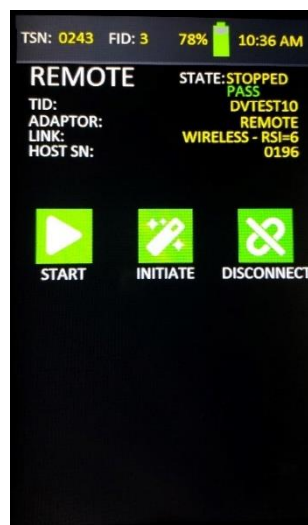
- FULLY CHARGE THE HT-128 B BEFORE USE.
- SEE` "SETTINGS" FOR THE HT-128 B POWER SAVING FEATURES
- REPLACEMENT RECHARGEABLE BATTERY PACKS MAY BE PURCHASED FROM DITMCO INTERNATIONAL
- DO NOT REMOVE THE ADAPTER MODULE
- STANDARD ADAPTER MODULE IS NOT COMPATIBLE WITH IN-LINE FEATURE. OPTIONAL IN-LINE MODULE IS REQUIRED

Technical Specifications

Test Points	129 total: 128 from rear connector + 1 front **red** Banana Jack (expendable up to 8 units, 1032 points)
Test Current/Voltage	6mA max/ 3.3V DC
Voltage Measurements	0 to 3.3V DC$\pm$ 10%
Continuity Threshold	.5 to 10KΩ $\pm$ 2% $\pm$ 0.2Ω
Resistor Measurements	.5 to 10KΩ $\pm$ 2% $\pm$ 0.2Ω
I.R. Threshold	50KΩ to 200KΩ $\pm$ 15%
Diode Test	Polarity Only
Wireless Range	Typically, 150' (915Mhz Low Power FSK modulation transceiver for USA) (868Mhz Low Power FSK modulation for EU)
Battery	Rechargeable Li-ion (Typical usage 10- hours between charges. Can be charged via AC adapter or through USB port.)
Operating Temperature Range	0° to 70° C

Programming

Introduction

The DITMCO HT-128 B Tester programming is accomplished using a custom EXCEL™ spreadsheet on a Microsoft Windows™ based computer. An EXCEL™ template is stored in tester memory initially or can be obtained by contacting DITMCO International. The template can be used to create a new test program or edit an existing test program for a new application. In order to successfully program a harness or cable, the user will need to know the following information:

- The schematic or wiring list of the cable or harness to be tested with associated resistance and isolation thresholds
- Tolerances of any resistors included in the schematic or wiring list
- Forward voltages and polarity for any diodes in the schematic or wiring list
- Resistance and time constant for any inductor in the schematic or wiring list
- Voltages for complex passive circuits
- The ADAPTER ID and wiring list for the adapter cable(s) that will interface between the HT-128 B and the cable or harness under test

Programming Template

An EXCEL™ programming template is stored on the HT-128 B. In order to access the template, power on the HT-128 B and connect the USB port of the device to the USB port of the PC. The HT-128 B files will appear as an "untitled" drive on the PC desktop.

Choose and download file name *HT-128 B Cable Netlist Version 3.0* from the HT-128 B.

Once saved on the PC, the EXCEL™ file can be copied and modified to create the test file for the cable or harness under test. Programming is accomplished by associating test identities with product under test connector identities. DITMCO will provide onsite or online programming training if needed.

IMPORTANT: Once a program has been created, the user should save the program as a generic .csv file on the PC. When this is complete, connect the HT-128 B to the PC via the USB cable, select the .csv file to be saved on the HT-128 B, and copy the file to the "untitled" drive.

A computer may allow users to select and save different formats of a .csv files. UTF-8, MS-DOS and McIntosh versions of .csv files are not compatible for use with the HT-128 B.

Template Overview

HT-128+ CABLE NETLIST												
									10-Aug-22			
CABLE P/N												
TEST ID			User input data in blue shaded cells only.									
CONTINUITY	5	Ohms	Be sure to follow all instructions for entering data.									
ISOLATION	200	Kohms	Blue text is example data and can be deleted or overwritten.									
WIRE	ADAPTOR ID	ADAPTOR PIN	CABLE PIN	CABLE PIN	ADAPTOR PIN	ADAPTOR ID	HIGH LIMIT	LOW LIMIT	RPULLUP	FROM WIRE NAME	TO WIRE NAME	
START OF WIRELIST												
END OF WIRELIST												
NOTES												
	Enter text and graphics here.											

Note: Wire Name is available on software releases 11.00 and above.

Creating or Editing the EXCEL™ Template

The following input fields can be created or edited in the Excel template:

Figure 2: Template Definitions

Data Input Field	Optional or Required	Max. Field Length (No. of Characters)	Definition
CABLE P/N	Optional	15	Alternative Part Number or Reference Number for Cable under Test
DATE	Optional		
TEST ID	Required	12	Alpha-numeric, "-", no other special characters
CONTINUITY	Optional	5	Global continuity resistance threshold in Ohms. Allowable range is .5 to 10,000 Ohms and less than 80% of the Isolation Resistance (RISOL). This value will be used for all wires in the test unless an individual wire value is specified in the UPPER CONTINUITY LIMIT (UCL) column, if the user specifies a Global or specific wire resistance through the Settings feature on the HT-128 B. The HT-128 B requires a value for every wire through either specifying a value in this field, entering a value in the UCL column, use of the Settings menu. This field and the UCL can be used together with the UCL overriding this field for any wire specified.
ISOLATION	Optional	3	Isolation resistance threshold value in Kohms. The allowable range is 50-100KOHMS. This value is a Global value unless the user enters a Global or wire specific value through the HT-128 B Settings menu. The Settings menu overrides any values entered in this field.
SPECIAL FEATURES	OPTIONAL		The user can invoke special programming instructions using spreadsheet fields A8 and B8. See Special Feature section xxx of the User Manual for programming instructions.
ADAPTOR ID	Required	7	The user-defined name assigned to the Adapter.
ADAPTOR PIN	Required	3	The Adapter Pin, corresponds to the HT-128 B Tester pin (1 through 128) plus probe, PRB, that connects to the REF DES for each specified wire.
CABLE PIN	Required	16	Alpha-numeric, "-", no special characters. The user-defined name assigned to each wire in the program. Normally this value references a connector name and a wire number.
UPPER LIMIT	Optional	9	Resistance value in Ohms or Voltage value (0-3.3VDC)
LOWER LIMIT	Optional	9	Resistance value in Ohms or Voltage value (0-3.3VDC)
RPULLUP	Optional		User selects LOW or HIGH

The following features are available for software releases 11.00 and above:

FROM WIRE NAME	Optional	15	Alpha-numeric, "-", no special characters
TO WIRE NAME	Optional	15	Alpha-numeric, "-", no special characters

NOTES – The field to the right of RPULUP is available to users for inputting notes. This field is limited to 60 characters.

This test program illustrates programming methods for the HT-128 B.

WIRE	ADAPTOR ID	ADAPTOR PIN	CABLE PIN	CABLE PIN	ADAPT0R PIN	ADAPTOR ID	UPPER LIMIT	LOWER LIMIT	RPULLUP
HT-128 B CABLE NETLIST									
TEMPLATE VER	3.00								
					3/15/21				
CABLE P/N									
TEST ID	SAMPLE123		User input data in blue shaded cells only.						
CONTINUITY	1	Ohms	Be sure to follow all instructions for entering data.						
ISOLATION	200	Kohms							
START OF WIRELIST									
W1	Host	1	P1-1	P1-40	40	Host			
W2	Host	2	P1-2	J1-2	2	Remote1			
W3	Host	3	P1-3	J1-3	3	Remote1			
W4	Host	4	P1-4	J1-4	4	Remote1			
W5	Host	5	P1-5	J1-5	5	Remote1			
W6	Host	5	P1-5	J1-6	6	Remote1			
W7	Host	5	P1-5	J1-7	7	Remote1			
W8	Host	5	P1-5	J1-8	8	Remote1			
W9	Host	5	P1-5	J1-9	9	Remote1			
W10	Host	10	P1-10	J1-10	10	Remote1			
W11	Remote1	10	J1-10	J1-11	11	Remote1			
W12	Remote1	11	J1-11	J1-12	12	Remote1			
W13	Remote1	12	J1-12	J1-13	13	Remote1			
W14	Remote1	13	J1-13	J1-14	14	Remote1			
D15	Host	15	P1-15+	J1-15-	15	Remote1	0.5		
W16	Host	16	P1-16	J1-16	16	Remote1	345000	255000	
W17	Host	16	P1-16	J1-17	17	Remote1	345000	255000	
W18	Host	16	P1-16	J2-18	18	Remote2	345000	255000	
W19	Remote1	22	J1-22	J1-23	23	Remote1	345000	255000	
W20	Remote1	23	J1-23	J1-24	24	Remote1	345000	255000	
W21	Remote1	24	J1-24	J1-25	25	Remote1	345000	255000	
W22	Host	26	P1-26	P1-26	26	Host			
W23	Host	27	P1-27	P1-27	27	Host			
W24	Host	28	P1-28	P1-28	28	Host			
W25	Remote1	26	J1-26	J2-26	26	Remote2			
W26	Remote1	27	J1-27	J2-27	27	Remote2			
END WIRE LIST									

In test program SAMPLE123, the user created a program including three testers (Host, Remote1, and Remote2) with Host loop back wiring, Host to Remote wiring, Remote to Remote wiring, and Remote loop back wiring. This Section covers specific programming rules and techniques for the HT-128 B.

Some Programming Template illustrations in User's Manual do not include WIRE NAME cells. See **Template Overview** for details.

Adapter ID Assignment

Assigning an HT-128 B as the Host tester can be an arbitrary or strategic choice since each HT-128 B can act as a Host if the test program resides in memory. In program SAMPLE123 (Figure 3) the user created Host, Remote1, and Remote2 as the Adapter ID names. However, Adapter ID names are the user's preference if the names adhere to the convention specified in Figure 2 and are unique for each tester in the test program.

Adapter Pin

The Adapter pin represents the numerical test pin number from the back 128-pin connector plus the black banana jack on the front of the unit. The black banana jack designation in the test template is PRB.

Cable Pins (Reference Designators)

Reference Designators are unique identifiers assigned to each adapter pin. If an adapter pin is repeated in a test program as part of a star or daisy chain topology, then each reference designator for that common adapter pin must be identical.

THE HT-128 USES REFERENCE DESIGNATORS AS PART OF THE ROUTINE TO PARSE EACH WIRE IN THE TEST PROGRAM INTO A NET. **IF A SINGLE ADAPTER PIN, REPEATED IN THE TEST PROGRAM, HAS DIFFERENT REFERENCE DESIGNATOR IDENTITIES, THEN IMPROPER PARSING OF THE NETS WILL OCCUR RESULTING IN ISOLATION FAILURES FOR THAT NET.**

Wire Numbering

Each wire in a Netlist is assigned a wire number, *Wx*, where *x* is a sequential number correlating with the number of lines in the test program. For diodes, *Dx* is used in place of *Wx.*

Duplicate Wiring Connections

The HT-128 B logically links together connected nodes into Nets to avoid programming duplication.

Figure 4: Duplicate Wiring Connections

W5	Host	5	P1-5	J1-5	5	Remote1
W6	Host	5	P1-5	J1-6	6	Remote1

In Figure 4, P1-5 is connected to J1-5 and J1-6; therefore, J1-5 and J1-6 are connected. The HT-128 B automatically links P1-5, J1-5, and J1-6 together into a single test node, so the user does not have to include a line in the test program linking J1-5 to J1-6.

Start/End of Wire List

Figure 5: Start/End of Wire List Commands

START OF WIRELIST						
W1	Host	1	P1-1	P1-40	40	Host
W26	Remote1	27	J1-27	J2-27	27	Remote2
END WIRE LIST						

The HT-128 B reads START OF WIRELIST and END OF WIRELIST statements in the test program in order to execute FAULT testing. If either statement is missing from the test program, the program will not run properly. START of WIRELIST must immediately precede W1 in the test program. END OF WIRELIST must immediately follow *Wx,* where *x* is the last line in the test program.

Minimum Number of Wires

The HT-128 B uses the wires within the cable or wire harness under test to create an electrical return path for testing. To diagnose a specific fault on a wire, the tester requires a minimum of three wires per tester.

Grounds and Shields

The HT-128 B treats grounds and shields in the same manner as any other wire in the netlist. The test program tests each wire, including grounds and shields, against every other wire within the test program to test each fault scenario.

Note: For complex wiring schematics, such as aircraft wiring, programmers need to define ALL ground paths between testers. Unidentified or non-programmed, but connected, grounds or shields can cause isolation failures during testing.

IT IS NOT UNUSUAL FOR USERS TO EMPLOY A SINGLE ADAPTER ACROSS MULTIPLE REFERENCE DESIGNATORS. IF SO, THERE IS THE RISK THAT UNUSED PINS ON THE ADAPTER MIGHT FEED GROUND PATHS INTO UNDEFINED TESTER NODES. IF THIS HAPPENS, THE TESTER WILL REPORT ISOLATION FAILURES DURING FAULT TESTING. TO RESOLVE THE ISSUE THE USER SHOULD DEFNINE THE UKNOWN TEST NODES IN THE TEST PROGRAM.

Isolated Pins

DITMCO recommends including isolated contacts as part of the test program.

Figure 6: Isolated Pins

W22	Host	26	P1-26	P1-26	26	Host
W23	Host	27	P1-27	P1-27	27	Host
W24	Host	28	P1-28	P1-28	28	Host

23

In test program SAMPLE123, P1-26, P1-27, and P1-28 are not connected to any other locations in the wire list. However, there is a chance an operator might mistakenly insert a wire into these locations during manufacturing. By defining an Isolated Node in the test program, the programmer ensures any connections mistakenly made to these locations are captured during FAULT Testing.

Basic Wiring Relationships

Wires can be run in three basic patterns for the HT-128 B.
- Wires that loop back within the same tester
- Wires from Host to Remote
- Wires from Remote to Remote

Figure 7: Loop Back Wiring

W1	Host	1	P1-1	P1-40	40	Host

The "from-to" relationship in *Figure 7* demonstrates a loop back wire from Host P1-1 to Host P1-40. Loop back wires are not limited to the Host but can be present on a Host or Remote.

Figure 8: Host to Remote Wiring

W2	Host	2	P1-2	J1-2	2	Remote1

The "from-to" relationship in *Figure 8* defines the routing of the wire from Host P1-2 to Remote J1-2. The Host is limited to a total of 8 Remote "from-to" relationships within a test program.

Figure 9: Remote to Remote Wiring

W25	Remote1	26	J1-26	J2-26	26	Remote2

The "from-to" relationship in *Figure 9* defines the routing of J1-26 to J2-26 as coming from Remote1 and connecting to Remote2.

Daisy Chains and Star Topologies

Figure 10: Daisy Chains

W10	Host	10	P1-10	J1-10	10	Remote1
W11	Remote1	10	J1-10	J1-11	11	Remote1
W12	Remote1	11	J1-11	J1-12	12	Remote1
W13	Remote1	12	J1-12	J1-13	13	Remote1
W14	Remote1	13	J1-13	J1-14	14	Remote1
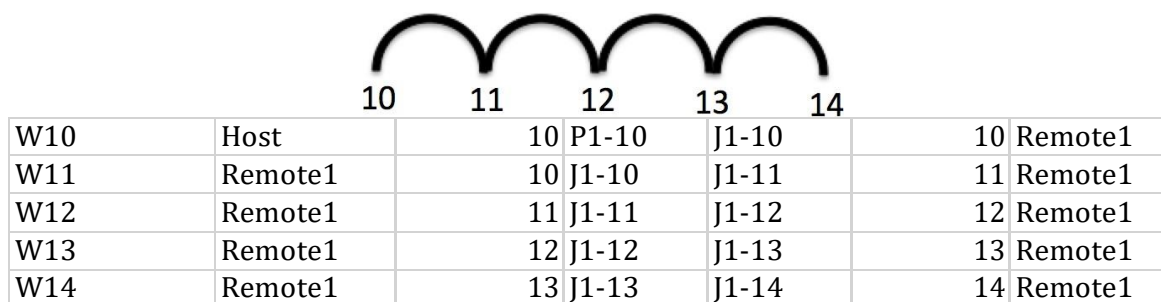
Multiple wires terminating into a common node can be expressed as a Star or Daisy Chain topology. In *Figure 10* Host P1-10 is connected to Remote1 J1-10 through J1-14

using a Daisy Chain programming convention. The HT-128 B automatically creates a single Net for P1-10, J1-10, J1-11, J1-12, J1-13, and J1-14 during FAULT Testing.

Figure 11: Stars
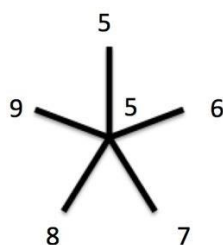
W5	Host	5	P1-5	J1-5	5	Remote1
W6	Host	5	P1-5	J1-6	6	Remote1
W7	Host	5	P1-5	J1-7	7	Remote1
W8	Host	5	P1-5	J1-8	8	Remote1
W9	Host	5	P1-5	J1-9	9	Remote1

In *Figure 11,* Host P1-5 is connected to Remote1 J1-5 through J1-9 in a Star programming convention. The HT-128 B automatically creates a single Net during FAULT Testing that includes P1-5, J1-5, J1-6, J1-7, J1-8, and J1-9.

Figure 12: Multiple Tester Stars

W19	Remote1	22	J1-22	J1-23	23	Remote1	345000	255000
W20	Remote1	23	J1-23	J1-24	24	Remote1	345000	255000
W21	Remote1	24	J1-24	J1-25	25	Remote1	345000	255000

Figure 12 demonstrates a Star topology in a Host, multiple Remote configuration.

Figure 13: Loop Back Daisy Chains

W19	Remote1	22	J1-22	J1-23	23	Remote1	345000	255000
W20	Remote1	23	J1-23	J1-24	24	Remote1	345000	255000
W21	Remote1	24	J1-24	J1-25	25	Remote1	345000	255000

Figure 13 demonstrates a Daisy Chain topology in a loop-back configuration on a single Remote.

Resistors

Figure 14: Resistors

W16	Host	16	P1-16	J1-16	16	Remote1	345000	255000

In *Figure 14,* the user has a 300KOhm, 10% resistor in W16. Since the HT-128 B has a resistance tolerance of 15% for resistance values over 50kOhms, the Upper and Lower Continuity Limits are +/- 45KOhms. Resistors can be programmed into all three HT-128 B wiring relationships.

Diodes

The Diode test allows the HT-128 B to test for presence and polarity of a diode. To set up a diode, the user defines the anode, cathode, and forward voltage for the program line containing the diode.

Note: Dx is used for diodes in place of Wx, where x is the line number in the program.

Figure 15: Diodes

D15	Host	15	P1-15+	J1-15-	15	Remote1	0.5

In *Figure 15,* Host and Remote1 are the user-defined Adapter IDs. Following the schematic-defined polarity, the user adds a + symbol designating the anode and a – symbol designating the cathode at the end of the respective "Ref Des" fields.

The user inserts the Diode Forward Voltage in Ohms into the UPPER CONTINUITY LIMIT field per the diode specification. In *Figure 15*, the Diode Forward Voltage is 0.5 Ohms.

Passive Circuit Voltage Measurements

Theory of Operation

HT-128 B has the ability to programmatically verify passive in-wire electronic components, in addition to wire harness continuity and isolation testing. The tester can verify resistors and diodes and provides the capability for adjustable measurement delay to allow circuits with capacitive and inductance reactance to settle before performing measurement.

The Voltage function provides capability to verify a topology of passive circuit elements by applying a 3.3V stimulus through a program selectable 500 ohm or 15 Kohm Pull-Up resistor at any tester pin, and measure the resulting voltage at the same pin. All other pins are switched to tester common when the voltage is measured.   The measured voltage is then compared with an upper and lower limit defined in the test program.
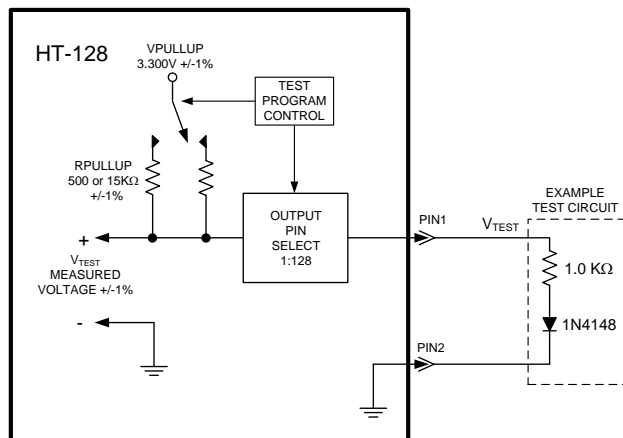
HT128 STIMULUS AND MEASUREMENT SETUP

As an example, a series resistor and diode test circuit will be analyzed and test program created.

Selecting R_{PULLUP} such that V_{TEST} is as close as possible to ½ V_{PULLUP} = 1.65V, ie, half scale for the A/D converter, gives the best measurement accuracy.

R_{PULLUP} is defined as 500 Ω for this example.
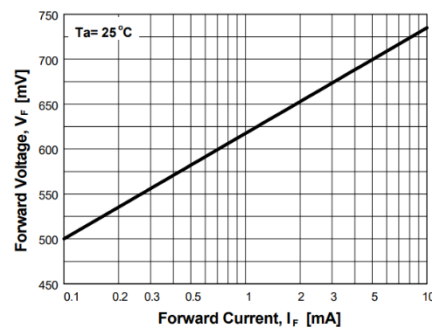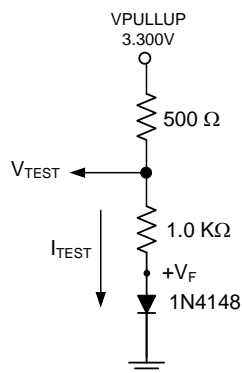
EQUIVALENT CIRCUIT

1N4148 FORWARD VOLTAGE VS CURRENT

Using circuit analysis and the forward voltage graph for the 1N4148 gives:

V_F = 650 mV

I_{TEST} = 1.8 mA

And V_{TEST} = 2.450 V

Creating the test program using the Voltage Test function and set the upper and lower limits +/- 10%:

TEMPLATE VERSION	1.00									
DIT-MCO INTERNATIONAL										
									15-Mar-21	
CABLE P/N	RESISTOR+DIODE									
TEST ID	VOLTAGE TEST		User input data in blue shaded cells only.							
CONTINUITY	2	Ohms	Be sure to follow all instructions for entering data.							
ISOLATION	100	Kohms	Blue text is example data and can be deleted or overwritten.							
WIRE	ADAPTOR ID	ADAPTOR PIN	CABLE PIN	CABLE PIN	ADAPTOR PIN	ADAPTOR ID	HIGH LIMIT	LOW LIMIT	RPULLUP
START OF WIRELIST										
V1	HOST	1	1+	2-	2	HOST	2.695	2.205	LOW
END OF WIRELIST										
NOTES										
	Resistor+diode test example. Single tester configuration.									

TEST PROGRAM

Programming Short Cut

Users may forego circuit analysis by running two test programs on the HT-128 B to generate V_{LOW} and V_{HIGH} values where V_{LOW} represents the Voltage resulting from choosing the 500 Ohm pull up resistor and V_{HIGH} represents the Voltage resulting from choosing the 15 Kohm pull up resistor. The user selects the HT-128 B Measured Voltage resulting from one of the two programs that falls closest to 1.65 VDC. Users can then program the HT-128 B by calculating the HIGH LIMIT and LOW LIMIT from the Measured Voltage and by entering either HIGH or LOW for the RPULLUP value that produced the optimum Measured Voltage.

See below for example programs for determining HIGH LIMIT, LOW LIMIT and RPULLUP:

TEST ID	VLOW								User input data in blue shaded cells only.
CONTINUITY	0.5	Ohms							Be sure to follow all instructions for entering data.
ISOLATION	200	Kohms							

WIRE	ADAPTOR ID	ADAPTOR PIN	CABLE PIN	CABLE PIN	ADAPTOR PIN	ADAPTOR ID	UPPER	LOWER	RPULLUP
START OF WIRELIST									
V1	ADAPTER1	1	P100-1	J100-1	3	ADAPTER2	3.3	0	LOW
W2	ADAPTER2	5	GND	GND	5	ADAPTER2			
END OF WIRELIST									

CABLE P/N									
TEST ID	VHIGH								User input data in blue shaded cells only.
CONTINUITY	0.5	Ohms							Be sure to follow all instructions for entering data.
ISOLATION	200	Kohms							

WIRE	ADAPTOR ID	ADAPTOR PIN	CABLE PIN	CABLE PIN	ADAPTOR PIN	ADAPTOR ID	UPPER	LOWER	RPULLUP
START OF WIRELIST									
V1	ADAPTER1	1	P100-1	J100-1	3	ADAPTER2	3.3	0	HIGH
W2	ADAPTER2	5	GND	GND	5	ADAPTER2			
END OF WIRELIST									

A portion of the HT-128 B test report for the for VLOW is shown below:

Continuity Test Results:
```
--------------------------------------------------------------------------------
Wire                    Measured        UpperThr   LowerThr
--------------------------------------------------------------------------------
P100-1,J100-1              2.40  Volts      3.30              RPLo
GND,GND                   0.2   Ohms
--------------------------------------------------------------------------------
```

A portion of the HT-128 B test results for VHIGH are shown below:

Continuity Test Results:
```
--------------------------------------------------------------------------------
        Wire                  Measured        UpperThr   LowerThr
--------------------------------------------------------------------------------
        P100-1,J100-1           0.65  Volts      3.30              RPHi
          GND,GND               0.2   Ohms
--------------------------------------------------------------------------------
```

Based on the above results the optimum Voltage value is 2.40V. Therefore,

Upper Limit = 2.40V + (2.40V x .10) = **2.64 V**
Lower Limit = 2.40V – (2.40V x .10) = **2.16 V**

RPULLUP = **HIGH**

VOLTAGE TESTING IS NOT MEANT TO SUPPORT ACTIVE VOLTAGE MEASURMENTS SUCH AS POWER SUPPLIES AND OTHER VOLTAGE SOURCES. MEASURING ACTIVE VOLTAGE SOURCES MAY CAUSE DAMAGE TO THE HT-128.

Advanced Programming Features

Advanced Programming Features (APF) allow the user to initiate the programming commands through the EXCEL ™ Programming Template starting in cell A8. Users can employ multiple APFs by inserting additional lines between cell A8 and the beginning of the WIRE header field. There is no specific order in which the APFs must be entered when employing multiple features within a program. However, syntax errors will cause the feature to run improperly.

Nested Test

Nested Test allows users to link two or more HT-128 B test programs together to run as a combined series of tests. For instance, users may have a test scenario in which switches need to be tested in a CLOSED and OPEN state. Nested Test allows users to set up the first HT-128 B test program to test switch(es) and initiate the second program to test switch(es) in the OPEN position.

The HT-128 B Test Report will record the results for both the initial and all subsequent linked tests.

Figure 16: Nested Test Template

HT-128 BCABLE NETLIST	DIT-MCO International							
TEMPLATE VERSION	1				1-Apr-20			
CABLE P/N								
TEST ID	SAMPLE123		User input data in blue shaded cells only.					

CONTINUITY	1	Ohms	Be sure to follow all instructions for entering data.						
ISOLATION	200	Kohms							
NEXT TEST ID	STAGE2TEST								

WIRE	FROM ADAPTOR ID	FROM ADAPTOR PIN	FROM REF. DES.	TO REF. DES.	TO ADAPTOR PIN	TO ADAPTOR ID	UPPER CONTINUITY LIMIT (OHMS)	LOWER CONTINUITY LIMIT (OHMS)	NOTES
START OF WIRELIST									
W1									
END OF WIRELIST									
NOTES									
HT-128 BCABLE NETLIST									
TEMPLATE VERSION						1-Apr-20			
CABLE P/N									
TEST ID	STAGE2TEST		User input data in blue shaded cells only.						
CONTINUITY	1	Ohms	Be sure to follow all instructions for entering data.						
ISOLATION	200	Kohms							
TEST PROMPT	TURN SW1 TO ON POSITION								

WIRE	FROM ADAPTOR ID	FROM ADAPTOR PIN	FROM REF. DES.	TO REF. DES.	TO ADAPTOR PIN	TO ADAPTOR ID	UPPER CONTINUITY LIMIT (OHMS)	LOWER CONTINUITY LIMIT (OHMS)	NOTES
START OF WIRELIST									
W1									
END OF WIRELIST									
NOTES									

In *Figure 16,* test program SAMPLE123 is linked to test program STAGE2TEST by the Nested Test feature. Cell A8 contains the NEXT TEST ID command initiating the feature. Cell B8 directs the tester to initiate STAGE2TEST after SAMPLE123 completes running.

In test program STAGE2TEST cell A8 contains TEST PROMPT, commanding the HT-128 to display the message "TURN SW1 TO ON POSITION," which is contained in cell B8.

To add a third test to the Nested Test routine above, the user can insert an additional row below cell A8 of STAGE2TEST and repeat the NEXT TEST ID command with a third linked program. The third program would contain the TEST PROMPT command.

The TEST PROMPT COMMAND is limited to 30 characters.

See Figure 17 (below) for the HT-128 B test sequence.

Auto Connect

The Auto Connect APF automatically initiates the FAULT test sequence by automatically pairing and running the test program.

Figure 17: Auto Connect

HT-128 B CABLE NETLIST		DIT-MCO International								
TEMPLATE VERSION	1									
					1-Apr-20					
CABLE P/N										
TEST ID	SAMPLE123		User input data in blue shaded cells only.							
CONTINUITY	1	Ohms	Be sure to follow all instructions for entering data.							
ISOLATION	200	Kohms								
AUTOCONNECT_ADAPTER	Host	313								
AUTOCONNECT_ADAPTER	Remote1	189								
AUTOCONNECT_ADAPTER	Remote2	227								
WIRE	FROM ADAPTOR ID	FROM ADAPTOR PIN	FROM REF. DES.	TO REF. DES.	TO ADAPTOR PIN	TO ADAPTOR ID	UPPER CONTINUITY LIMIT (OHMS)	LOWER CONTINUITY LIMIT (OHMS)	NOTES	
START OF WIRELIST										
W1	Host	1	P1-1	P1-40	40	Host				

In *Figure 17,* The AUTOCONNECT_ADAPTER commands are entered into cells starting at A8. Since test program SAMPLE123 contains three ADAPTER IDs, the user must insert additional rows into the template to accommodate three adapters. The ADAPTER ID(s) from the test program are entered into the cells to the right of the AUTOCONNECT_ADAPTER command. Finally, the user enters three TESTER SERIAL NUMBERS (TSN) to the right of the ADAPTER IDs.

The number of AUTOCONNECT_ADAPTER commands must be equal to the number of ADAPTER IDs in the test program, and the ADAPTER IDs must be identical to the ones listed in the test program.

If the user is also implementing the Nested Test feature, then the command follows immediately below the last Nested Test cell. For cases where Nested tests and AUTO CONNECT are used, the AUTO CONNECT commands are only entered into the first Nested Test.

Measurement Delay (for Inductor Testing)

The HT-128 B allows users to test for filtered circuits or inductors. Initially, the user must determine the minimum resistance of the Inductor and the amount of time (in milliseconds) required for the inductor to reach the minimum resistance. Once these values are determined, the user can program this information into the HT-128 B via the test program.

Figure 18: Measurement Delay

HT-128 B CABLE NETLIST		DIT-MCO International							
TEMPLATE VERSION	1								
					1-Apr-20				
CABLE P/N									
TEST ID			User input data in blue shaded cells only.						
CONTINUITY	1	Ohms	Be sure to follow all instructions for entering data.						
ISOLATION	200	Kohms							
MEASUREMENT DELAY	10								

WIRE	FROM ADAPTOR ID	FROM ADAPTOR PIN	FROM REF. DES.	TO REF. DES.	TO ADAPTOR PIN	TO ADAPTOR ID	UPPER CONTINUITY LIMIT (OHMS)	LOWER CONTINUITY LIMIT (OHMS)	NOTES
START OF WIRELIST									
W1	Host	1	P1-1	P1-40	40	Host			
W2	Host	2	P1-2	J1-2	2	Remote1			
W3	Host	3	P1-3	J1-3	3	Remote1	102	98	

Figure 18 shows test program SAMPLE123 with an inductor with a minimum resistance of 100 Ohms with a 2% tolerance and a time to minimum resistance of 10ms.

NOTE: INSERTING A MEASUREMENT DELAY INTO A TEST PROGRAM GLOBALLY DELAYS ALL TESTER MEASUREMENTS. ON SMALL TEST PROGRAMS USERS WILL NOT NOTICE THE INCREASED TEST TIME. HOWEVER, ON LARGE TEST PROGRAM THE TEST TIME MAY BE NOTICEABLE.

Notes

The NOTES command allows users to insert a note into the HT-128 B FAULT Test Report. The note cannot exceed 60 characters. To initiate this feature, the user enters the command NOTES in cell A8. In the adjacent right cell, the user may type a note that will be displayed in the header of the test report. The NOTES file can be used in combination with AUTO CONNECT and NESTED TEST.

Figure 19: Notes

HT-128 B CABLE NETLIST	DIT-MCO International								
TEMPLATE VERSION	1								
					1-Apr-20				
CABLE P/N									
TEST ID	SAMPLE123		User input data in blue shaded cells only.						
CONTINUITY	1	Ohms	Be sure to follow all instructions for entering data.						
ISOLATION	200	Kohms							
NOTES	Results from	Eng. Sample Harness.							
WIRE	FROM ADAPTOR ID	FROM ADAPTOR PIN	FROM REF. DES.	TO REF. DES.	TO ADAPTOR PIN	TO ADAPTOR ID	UPPER CONTINUITY LIMIT (OHMS)	LOWER CONTINUITY LIMIT (OHMS)	NOTES
START OF WIRELIST									
W1	Host	1	P1-1	P1-40	40	Host			

```
DIT-MCO International
HT-128 Wireless Harness Tester
TEST REPORT
04/09/2020 02:05:28 PM

Software Version: 10.23
Test Status:      FAIL
Cable P/N:
Cal: 64992
Connection Type: Wireless
Meas Delay: Disabled
Test ID: SAMPLE123
Test Notes: Results from Eng. Sample Harness.
Template Version: 1.0
Test: FAULT
ISO Test Enabled: Yes

TSN  Adaptor ID
---------------
0112 Host
0243 Remote1
0248 Remote2
---------------
```

Figure 19 shows implementation of the NOTES command into test program SAMPLE123, while *Figure 20* shows the corresponding HT-128 B Test Report.

Test Applications

Test Applications (Apps) provide the user with multiple modes for analyzing and diagnosing wiring. Used together, Test Apps provide the user with the state of a particular wire or net. When a user selects a TEST ID in one TEST App, the HT-128 B automatically loads the TEST ID into all other Test Apps for ease of navigation between APPs.

Fault Test

Fault Test runs a low-voltage wire analysis based on the test program selected by the user. Fault Test analyzes each circuit within the test program to determine if the circuit meets the test criteria defined in the test program. Circuits that do not meet the test criteria are categorized as failures. A complete list and definition for all failures may be found in the Faults section within this section.

See *Figure 21* for the FAULT test main menu. FAULT Test terms are as follows:
- **TID:** Test ID is the test program selected by the user.
- **CONT:** Continuity Threshold is defined by the test program as DEFAULT (DEF) or through the SETTINGS menu as CUSTOM (CUS)
- **ISO:** Isolation Threshold is defined by the test program as DEFAULT (DEF) or through the SETTINGS menu as CUSTOM (CUS)
- **TEST STAT:** Test status displays the current FAULT test states as NOT RUN, RUNNING, PASS, FAIL, or COM ERROR

The HT-128 B stores the user selected TEST ID into memory. If the user powers off and later returns to FAULT test, the last selected TEST ID will be displayed in the TID field.

Once a test program is created and stored on the HT-128 B, the user presses to launch the FAULT test APP and presses to pull up the list of TEST IDs. The user selects the TEST ID by scrolling through the list until the relevant TEST ID appears. Figure 22 shows a list of test program stored on the HT-128 B. Pressing [SAMPLE123] loads the test program into memory and launches the ADAPTER LIST menu as shown in Figure 23.

Figure 21: FAULT Test
Main Menu

Figure 22: TEST ID List

Figure 23: ADAPTER List

IMPORTANT NOTES:
- PRIOR TO ASSIGNING TESTER SERIAL NUMBERS (TSN) TO ADAPTERS AS PART OF THE FAULT TEST ROUTINE, THE USER MUST ENSURE EACH TESTER IS PHYSICALLY PAIRED WITH THE PROPER ADAPTER. FAILURE TO DO SO WILL RESULT IN TEST FAILURES.
- THE NUMBER OF TSN(S) SHOWING UP ON THE **ASSIGN TESTER/ADPTR** MENU MUST BE EQUAL TO OR LARGER THAN THE NUMBER OF UNIQUE **ADAPTER ID(S)** IN THE TEST PROGRAM. IF THE TSN COUNT IS LESS THAN THE NUMBER REQUIRED IN THE TEST PROGRAM, THE **START TEST** BUTTON WILL NOT APPEAR.
- IF THERE ARE MORE TSN(S) THAN REQUIRED FOR THE TEST PROGRAM TO RUN, CONSIDER CREATING A FAMILY ID AS SHOWN IN SECTION ***MAIN SCREEN DEFINITIONS***

The ADAPTER LIST is generated by the HT-128 B from the test program and matches the number of HT-128 B required for running the test program. From the ADAPTER LIST menu press ASSIGN TSTR/ADPTR to launch the ASSIGN TESTER/ADPTR menu as shown in *Figure 24.*

Figure 24: ASSIGN TESTER/ADPTR MENU
The user reads the ADPTR displayed on the menu and pairs the adapter with the TSN that matched the physical hook-up of the cable or wire harness under test. This step is repeated until all adapters are paired with all testers.

The user can also verify the quality of the wireless link from each Remote to the Host during the set-up process. The Relative Signal Strength Indicator (RSI=*x*) is adjacent to the TSN. *X* is a number between 1 and 10 with 10 being the highest quality of wireless link and 1 being the weakest. The HT-128 B may link with an RSI=1, however, there is a likelihood of the link being lost during testing. DITMCO recommends an RSI>4 between the Remote and the Host. If the user, experiences RSI values below 5, the user should reposition the testers to improve the RSI reading. If the low RSI persists, see TROUBLESHOOTING.

Also, once linked the user may view the quality of the wireless signal from the Host to each Remote by viewing each Remote Menu for the RSI=*x* indicator.

Once linked, the START screen (see *Figure 21)* appears on the Host HT-128 B. Pressing START launches the FAULT test routine. During FAULT Testing, the HT-128 B indicates the *% Complete* of the test routine on the Host tester. Test times may vary but testing generally takes 0.2-0.3 seconds per test program node.

Remote Menu
Once START launches, a menu appears on all linked Remote HT-128 B:

The Remote Menu allows users to view the testing status from the Remote after START is launched. Testing is divided into three states: RUNNING, PASS, or FAIL.

START – Allows users to launch a test program AFTER the Host has previously run a test program and when all the testers in still linked together.

INITIATE – Users can query a specific tester within the test environment for a list of TEST ID's and initiate FAULT testing from this selection.

DISCONNECT – Users can terminate a test session by pressing disconnect.

RETRIEVE – Users can select and retrieve the last FAULT Test results from the any tester within the test environment.

Note, Serialization cannot be entered at the Remote using the START or INITIATE feature. If Serialization is turned on at the designated Host by the user, and START or INITIATE is launched at a Remote HT-128 B, the user will have to enter the serial number at the Host HT-128 B before Fault Testing commences.

Pass/Fail

When FAULT Testing is complete, the tester will display PASS or FAIL screen based on the measurements taken during testing compared to the test limits in the test program. Pressing the PASS or FAIL screen will take the user back to the START screen. At this point, the user can press FAULTS or VALUES to further diagnose test failures or view actual measurements from the test.

Fault Definitions

- FAULTS – allows the user to see the specific failure codes and affected wires or nodes in the event of a test failure. *Note: the HT-128 B terminates testing when failures exceed fifty.*
- MISWIRE FAULT – Pin is connected to another net with resistance less than the continuity threshold resistance, *RCONT*. The value of *RCONT* used for the test is the largest value specified for the wire list. (Either the tester operator input value, EXCEL, or tester global value)
- ISOLATION FAULT – Net is connected to another net with greater than the continuity threshold resistance and less than the isolation threshold resistance
- NOT CONNECTED FAULT – The resistance between two pins intended to be connected is greater than the isolation threshold resistance
- HIGH RESISTANCE CONNECTION FAULT – The resistance between two pins intended to be connected is greater than the continuity threshold resistance and less than the isolation threshold resistance
- DIODE REVERSED – The Reverse Voltage is greater than .5VDC and less than 1.0VDC and the Forward Voltage is less than 3.0VDC
- DIODE MISSING – The Forward Voltage is greater than 1.0VDC and the Reverse Voltage is less than 3.0VDC
- HIGH VOLTAGE FAULT– The Voltage is greater than the voltage parameter specified by the program but less than 3.3VDC.
- LOW VOLTAGE FAULT – The Voltage is less than the voltage parameter specified in the program but greater than 0.0VDC.

Figure 25: Fault Failure Codes

FAULT TYPE	DETAIL	RESULT FORMAT
Not Connected	Faulted *Wire* is Identified	NC, <Pin ID>, <Pin ID>
Isolation Fault	Faulted *Node* is Identified	I, <Pin ID>, <Pin ID>
High Resistance Connection	Faulted *Wire* is Identified	HR, <Pin ID>, <Pin ID>

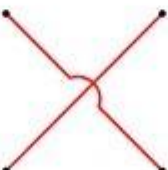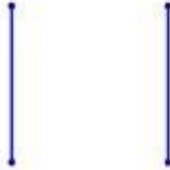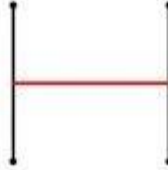| Low Resistance Connection	Faulted *Wire* is Identified	LR, <Pin ID>, <Pin ID>
Mis-wire Fault	Faulted *Node* is Identified	MW, <Pin ID>, <Pin ID>
Diode Reversed	Faulted *Diode* is Identified	DR, <Pin ID>, <Pin ID>
Diode Missing	Faulted *Diode* is Identified	NC, <Pin ID>, <Pin ID>
High Voltage	Faulted *Circuit* is Identified	HV, <Pin ID>, <Pin ID>
Low Voltage	Faulted *Circuit* is Identified	LV, <Pin ID>, <Pin ID>

Figure 26: Test Limits
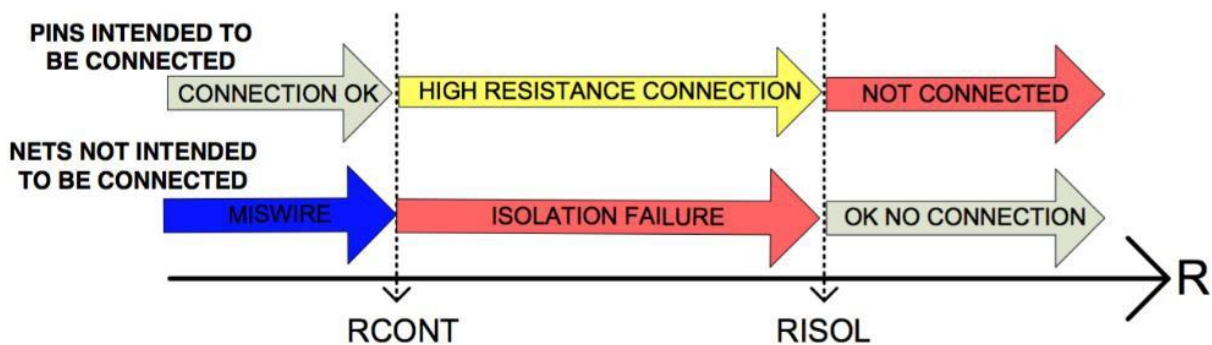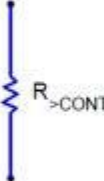
- Values – allows the user to scroll through the continuity and isolation measurements taken during testing. Any resistance value falling outside the test program test limit will be displayed in red.

Typical Fault Definitions and Topologies

The following table illustrates typical faults that occur in testing along with how the HT-128 B reports the Faults. As shown, mis-wired connections lead to multiple fault types being reported by the HT-128 B. When MW, I, and NC faults are reported with respect to a common circuit, DITMCO recommends prioritizing troubleshooting mis-wires since resolving mis-wires often resolves no-connects and isolations errors.

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DEFINITION OF TYPICAL FAULTS

EXPECTED TOPOLOGY	FAULT TOPOLOGY	FAULT REPORTED
		NC (NO CONNECT)
$R_{<CONT}$	R_{HIGH}	HR (HIGH RESISTANCE)
$R_{>CONT}$	R_{LOW}	LR (LOW RESISTANCE)
		MW (MISWIRE) I (ISOLATION) NC (NO CONNECT)
		MW (MISWIRE) I (ISOLATION)

When testing is completed, the test results are stored in memory on the Host tester and can be accessed via a PC and USB connection. The TEST REPORTS section of the User's Manual provides an overview of the elements of the test report.

Space Intentionally Left Blank

Hold Test

HOLD Test allows the user to continuously monitor the resistance or voltage on a user-selected wire. HOLD test requires the same set-up routine as FAULT test. The user presses SET to select the TEST ID. If the user is already wirelessly linked for a specific TEST ID and wants to further analyze the current TEST ID, then TEST ID selection and Remote linking is not required. Once the TEST ID and linking process is complete, the user can press WIRE: SET to scroll through and select a wire in the test program (see *Figure 27).*

Figure 27: HOLD TEST   Figure 28: HOLD PASS   Figure 29: HOLD FAULT

After selecting the wire, the user presses START to begin continuously monitoring the resistance on the selected wire. *Figures 28* and *29* show two HOLD test conditions. During HOLD testing the HT-128 B continuously compares the resistance measurements GREEN bar appears on the screen (see *Figure 28).* If the resistance measurement falls outside the test limit, a RED bar appears on the screen (see *Figure 29).*

HOLD TESTING AS PART OF IN-LINE TESTING'S DYNAMIC MODE IS AVAILABLE FOR ALL WIRES IN THE WIRE LIST EXCEPT THE FIRST COMMUNICATION PAIR.

Manual Test

MANUAL Test allows the user to manually select and test a wire for resistance, voltage, or isolation. MANUAL test requires the same set-up routine as HOLD test. The user presses SET to select the TEST ID. IF the user is already wirelessly linked for a specific TEST ID and wants to further analyze the current TEST ID, then TEST ID selection and

Remote linking is not required. Once the TEST ID and linking process is complete, the user can press WIRE: SET to scroll through and select a wire in the test program (see Figure 30.)
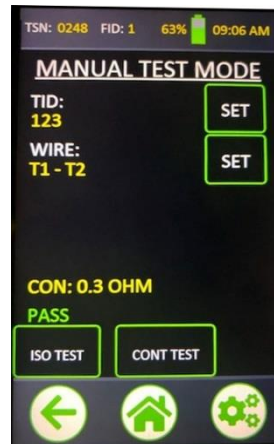

Figure 30: MANUAL Test

After selecting the TEST ID, wire, and completing the linking process the user presses CONT TEST to measure the continuity on the selected wire. The HT-128 B measures continuity and displays the results. Results within the program test limits are displayed in GREEN. Measurements outside of the program test limits are displayed in RED.

The user presses ISO TEST to measure isolation on the selected wire. The HT-128 B measures isolation and displays the results. Measurements within the program test limits are displayed in GREEN while measurements outside the program test limits are displayed in RED.

MANUAL TESTING AS PART OF IN-LINE TESTING'S DYNAMIC MODE IS AVAILABLE FOR ALL WIRES IN THE WIRE LIST EXCEPT THE FIRST COMMUNICATION PAIR.

Repetitive Test

REPETITIVE Test allows the user to cycle the FAULT Test routine to indefinitely or for a defined number of cycles.
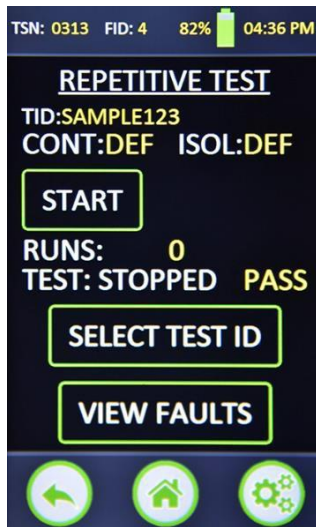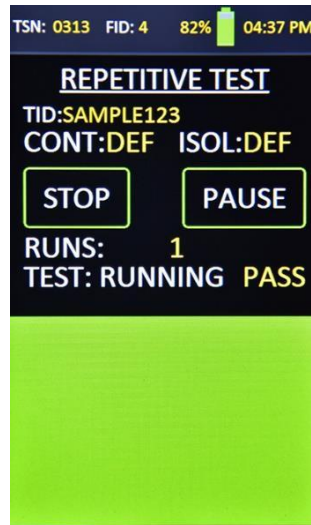
Figure 31: REPETITIVE Test
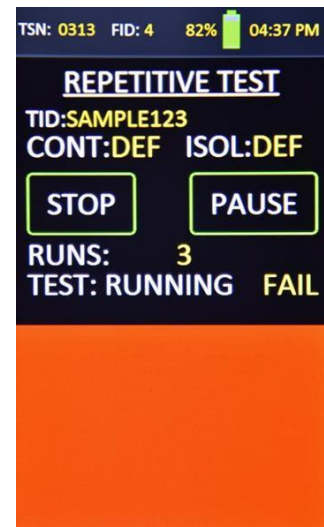

Figure 32: REPETITIVE PASS

Figure 33: REPETITIVE FAULT

REPETITIVE Test requires the same set-up and START routine as FAULT Test. The user may select a set number of cycles to run for REPETIVITE Test by going to SETTINGS and selecting the number of cycles under the REPTETITIVE test header. In SETTINGS, the user may also select RUN TO FAIL, which continues to cycle REPETITIVE Test until a FAULT condition is reached. If the user does not choose the number of cycles or RUN TO FAIL, then REPETITIVE test will run until the user manually stops the test.

The HT-128 B stores the last completed cycle of test results. Users can analyze test results by pressing FAULT or VALUES after terminating the test or by connecting a PC via the USB and reading the test report.

REPETITIVE TEST CYCLES THROUGH THE FAULT TEST ROUTINE BY ANALYZING EACH WIRE IN THE TEST PROGRAM SEQUENTIALLY. BECAUSE OF THIS, EACH WIRE IS ONLY TESTING .2 - .3 SECONDS DURING THE TEST CYCLE.

THE USER MAY DESIGN CUSTOM TEST ROUTINES THAT FOCUS ON A SMALLER NUMBER OF WIRES IN A CABLE OR HARNESS IN ORDER TO BETTER MONITOR A PARTICULAR SET OF WIRES DURING THE TEST ROUTINE.

REPETITIVE TEST ALSO OFFERS THE USER AN EASY MEANS OF MONTITORING THE CONDITION OF A CABLE OR HARNESS DURING ENVIRONMENTAL TESTING.

Identify

IDENTIFY allows users to identify the reference designator of any wire in the test program through the probe feature. IDENTIFY requires a common ground path be established through PROBE GROUND to each tester. To accomplish this, the user must define the ground path used as an interconnect between each HT-128 B. Options include:
- Chassis, frame, or aircraft ground
- Common Harness or cable ground or shield
- Grounding through direct wiring or each HT-128 B PROBE GROUND

Once PROBE GROUND is established, a test probe like seen in Pomona 5325A kit is plugged into the Host tester ground jack. Note, the black banana jack on the Host has two leads – one probe lead and the common ground lead. The user is ready to perform test set-up after establishing PROBE GROUND and connecting the test probe.

IDENTIFY requires the same set-up routine as FAULT test. After selecting the TEST ID and linking the testers, the user presses RUN to commence identification.

See Figure 34 for example of two stackable leads exiting the ground banana jack.

Probing a wire or contact from the cable or harness under test results in the reference designator being displayed on the Host tester. For contacts or wires that are part of a larger Net, the tester will display up to six of the common "from-to" connections.

IDENTIFY scans across the entire Netlist with every probe, which allows the HT-128 B to recognize any shorts/mis-wires connected to the probed contact or wire. Shorts/mis-wires are labeled in RED.

Learn

LEARN allows the HT-128 B to self-learn all the connections within a cable or wire harness and build a test program from the learning process. LEARN requires every HT-128 be attached to the cable or harness prior to initiating the learning process.


Figure 34: Tester 1

Figure 35: Tester 2

PROBE GROUND (see *Figures 34* and *35)* must be connected between all testers prior to initiating the LEARN process.
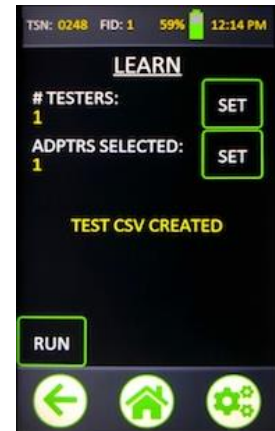
Once physical attachments are completed, the user presses LEARN on one tester within the test group and selects # TESTERS (see *Figure 36)* to assign the number of testers attached to the cable or wire harness under test. The user presses ADAPTRS SELECTED to link each adapter together for learning.
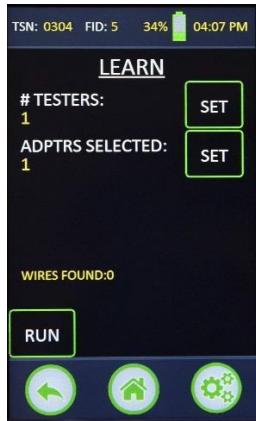
| Figure 36: LEARN Test | Figure 37: LEARN Remote Display | Figure 38: LEARN Test Complete |

After linking is complete, the user presses RUN (see *Figure 36)* to initiate the learning process. The LEARN algorithm analyzes every connection permutation within the linked testers and adds each connection to memory. The HT-128 B displays a *% COMPLT*E indicator to track the LEARN progression.

After completion, the HT-128 B saves the results as a .CSV file in memory under a time and date stamped LEARN file name (see *Figure 38).*

Note: The HT-128 B interprets any connection 5 Ohms or less as a Net for learning purposes. Any connection above 5 Ohms is NOT considered a connection and IS NOT included in the .CSV file.

LEARN FEATURE IS NOT SUPPORTED IN THE IN-LINE DYNAMIC MODE.

In-Line Testing

IN-LINE Testing allows the user to perform testing where wireless communications are not feasible. For IN-LINE testing, wireless transceiver communication is disabled and replaced by a RS-485 wire communication protocol. IN-LINE testing is limited to a single

Host and Remote tester and require the DITMCO IN-LINE adapter in place of the normal plug-in adapter. IN-LINE adapters are suitable for normal wireless testing and are not limited to a single Host or Remote when testing in wireless mode.

IN-LINE testing provides users with optional Auxiliary or Dynamic communication modes. Auxiliary mode requires a separate 2-wire communication cable while Dynamic mode takes advantage of the wires in the cable or harness under test to accomplish communication.

IN-LINE Adapter Design – Dynamic Mode

Wire positions 1 through 8 on the IN-LINE adapter act as both communication and test wires. Dynamic communication mode requires at least 4 of the first 8 wire positions in the Adapter to be connected to each other. Wires in these positions cannot be, spliced to other wires, daisy chains or star topologies.
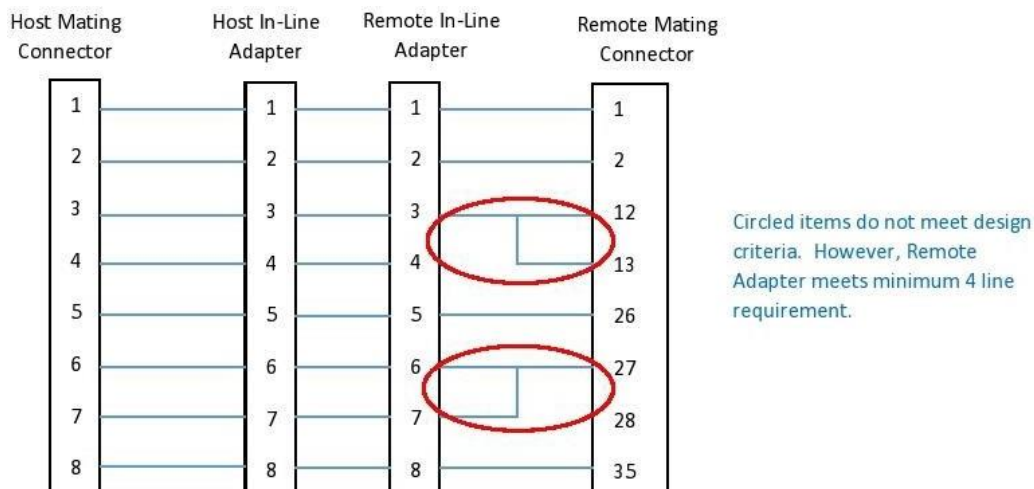
DYNAMIC MODE Operation

In Dynamic mode, the HT-128 B initiates a discovery and handshake routine prior to testing. During this process, the Host tester analyzes the first 8 wire positions between the testers and determines which positions are suitable for RS-485 communication.

Note: If four acceptable communication wires are not available, then handshake will fail, and the test will terminate.

Once four acceptable communication wires are discovered and handshaking is complete, the Host will assign two pairs of communication wires to be used during cable or wire harness testing. The first pair will be used for communication between the Host and Remote during initial testing. After all other wires in the test program have been tested, the HT-128 B Host unit will switch communication from the first pair to the second pair of wires in order to complete cable or wire harness testing of the first pair of wires.

DITMCO recommends initiating the linking process on the Host tester when in DYNAMIC mode. Host tester DYNAMIC entry is performed in the following order:

>INLINE
>OK
>HOST
>DYNAMIC
>START

After initiating the Host tester, repeat the process with the Remote. The User has 600 seconds to begin Remote tester linking once the Host tester has initiated linking. If the time to initiate both testers exceeds 600 seconds, then the Host tester resets back to START.

Auxiliary cables should NOT be connected during DYNAMIC mode testing as doing so may cause LINK issues.

IN-LINE Adapter Design – Auxiliary Mode

Auxiliary Mode does not utilize the wires in the cable or wire harness under test for communication. Rather, a connecter is provided on the IN-LINE adapter for connecting a two-wire cable or wire pair from the Host to the Remote. The two-wire cable provides RS-485 communication throughout testing.

Use Phoenix Contact part number SACC-M 8MS-3CON-M-SW for the mating connector to interface with the IN-LINE adapter. Alpha Wire cable part number 79051 is recommended as the interface cable. Wiring is 1:1.

SEE HOLD, MANUAL TEST AND LEARN SECTIONS OF THE USER'S MANUAL FOR INLINE FEATURE LIMITATIONS. IN-LINE DOES NOT SUPPORT RING-OUT.

IN-LINE TEST CAN ACCOMMODATE COMMUNICATION DISTANCES OF UP TO 5000 FEET BETWEEN THE HOST AND REMOTE TESTER.

General Operation

When the user selects the IN-LINE icon form the main menu, the HT-128 B validates the IN-LINE adapter is installed. If the HT-128 B cannot verify the IN-LINE adapter is installed, the user should remove and reinstall the IN-LINE adapter and repeat the verification process. If the issue persists, contact the DITMCO service representative.

LINKING

During the LINKING process of IN-LINE, the Remote tester sends out polling messages to the Host in order to establish communication. The Host tester "listens" for the polling sequence and then establishes synchronization with the Remote. During this process, the Host tester validates the quality of the communication link and, if in Dynamic Mode, identifies the four wires to be employed for testing. If there are any issues with the RS-485 communication link, testing terminates.

It is not unusual for the Host and Remote tester to be several, if not hundreds, of feet apart during linking. DITMCO recommends the user go to SETTINGS for both testers and set the POWER OFF setting to 1 HOUR instead of the tester's default setting of 10 MINUTES. This action will ensure ample time to set-up each tester before the automatic POWER OFF routine turns off either tester.

AUXILIARY mode may be initiated from the Host or the Remote tester.

Testing

FAULT Testing and other test apps are accomplished in the same manner as wireless testing. Refer to each respective section for test instructions.

Probe

PROBE acts as a DC OHM meter on the HT-128 B. PROBE is designed as a part of the overall capabilities of the HT-128 B tester. PROBE is not intended to measure resistance on energized circuits as doing so may cause damage to the HT-128 B and void the warranty.

PROBE GROUND provides a common ground return path when attached between testers. Apps including LEARN and IDENTIFY require PROBE GROUND in order to properly operate.

The **RED** Probe Jack, designated PRB in the programming template, can act as the 129th test pin.

BUILD SUBPROGRAM

BUILD SUBPROGRAM allows users to create a new Test Program as a subset from an existing Test program on the HT-128 B. After selecting BUILD SUBPROGRAM, the user selects the TEST ID from which the new program will be created. Pressing SET #WIRES SELECTED displays the wire list for original TEST ID selected. Selecting a wire in the wire list highlights the wire text in yellow and adds the wire to the new Test Program. The user can continue selecting wires until all wires for the new program are highlighted.

WHEN RUNNING A SUBPROGRAM EACH TESTER EXPECTS A MINIMUM OF THREE WIRES TO SUPPORT FULL OPERATION.

Once complete with wire selection, the user presses DONE and BUILD PROGRAM. The HT-128 B creates the Test Program and displays the TEST ID as S*hhmmss.*

RING OUT

RING OUT allows the user to perform an HT-128 B directed Ring-out of a cable or wire harness without the use of Adapters. Ring out can be performed with one or two HT-128 B testers.

Prior to testing:

1. **DITMCO recommends enabling SOUND.**

2. **Users must purchase a Dual Probe Adapter for their model of HT-128 B. For two-tester ring-out, the Probe Adapter is only required for the Host end. *Contact DITMCO for pricing and availability.***

Host HT-128 B with Probe Adapter
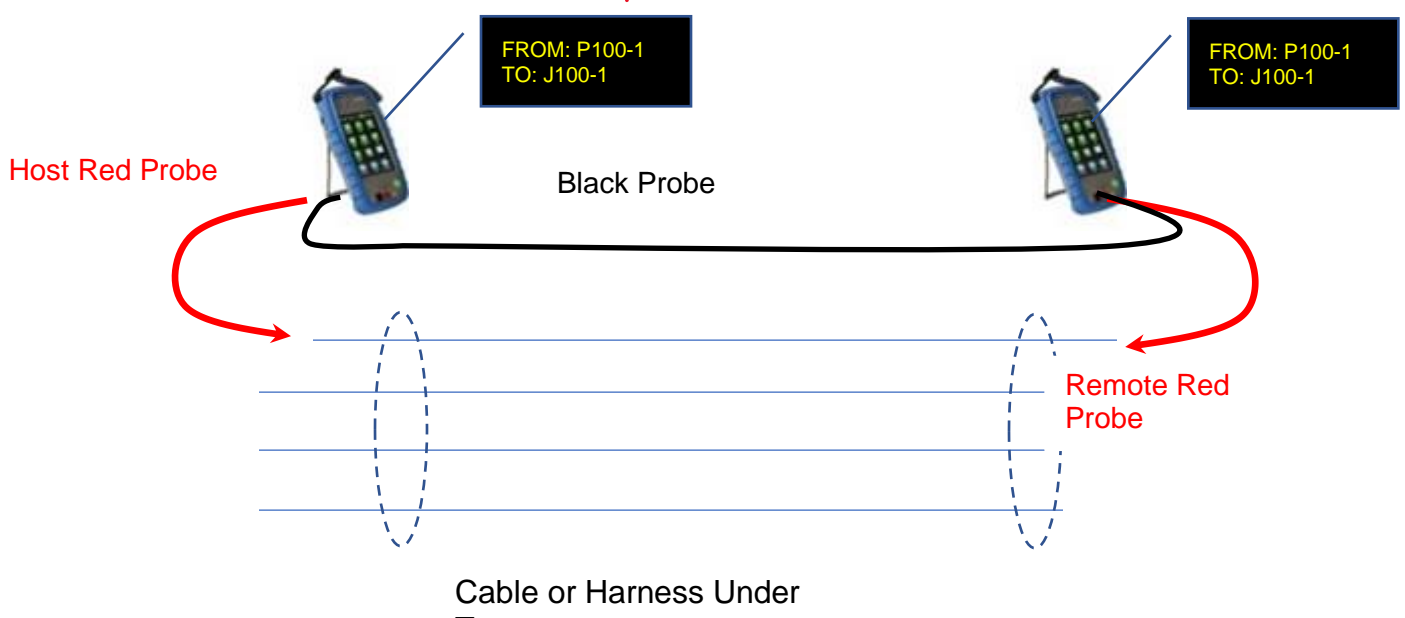
Host Red Probe

Black Probe

FROM: P100-1
TO: J100-1

FROM: P100-1
TO: J100-1

Remote Red Probe

Cable or Harness Under

Figure 39: Ring Out

Auto Mode

Plug Dual Probe Adapter into the Host HT-128 B. Interconnect the black banana jack of the Host with the black banana jack on the face of the Remote HT-128 B. This can be

RING-OUT is designed to be used with one or two HT-128s. The feature will disable the pairing requirements for all but one Remote for test programs containing more than two testers.

accomplished with a dedicated wire or by connecting to an available common grounding circuit. On the Remote attach a stacked probe per Figure 34, Page 42. For the Host, connect a probe to the red jack of the Dual Probe Adapter.

The Host and Remote are now ready for Ring-Out.

The illustration above shows a typical two-tester set-up for Ring-Out. The user selects the TEST ID and sets the MODE to AUTO and presses START.

Each HT-128 B will display the first FROM-TO wire to be probed as well as a RED/GREEN continuity threshold indicator bar.

The Host HT-128 B will automatically sense, display, and save the resistance measured. After sensing a resistance measurement below the continuity threshold, the Host and Remote color bar will indicate GREEN, a tone will sound and each tester will automatically advance to the next FROM-TO pair to be probed.

The program will NOT advance the "From-To" wire until the tone sounds or, if Sound is disabled, 1 second after continuity below the threshold is sensed by the HT-128 B. Removing the probe prematurely will result in the "From-To" wire not advancing.

If a wire resistance falls above the continuity threshold, the Host and Remote color bars will remain red and the Host and Remote HT-128 Bs will not automatically advance to the next wire. The Host user must press ADVANCE ON FAIL and both testers will advance to the next "From-To" wire with the Host saving the faulty resistance value.

After advancing through the wire list, the Host HT-128 B will display PASS/FAIL and save a test report.

Users can also run RING-OUT in a Host-Only mode. In this set-up both the Red and Black Adapter cables are used as probes.   See Below.

Cable or Harness Under Test
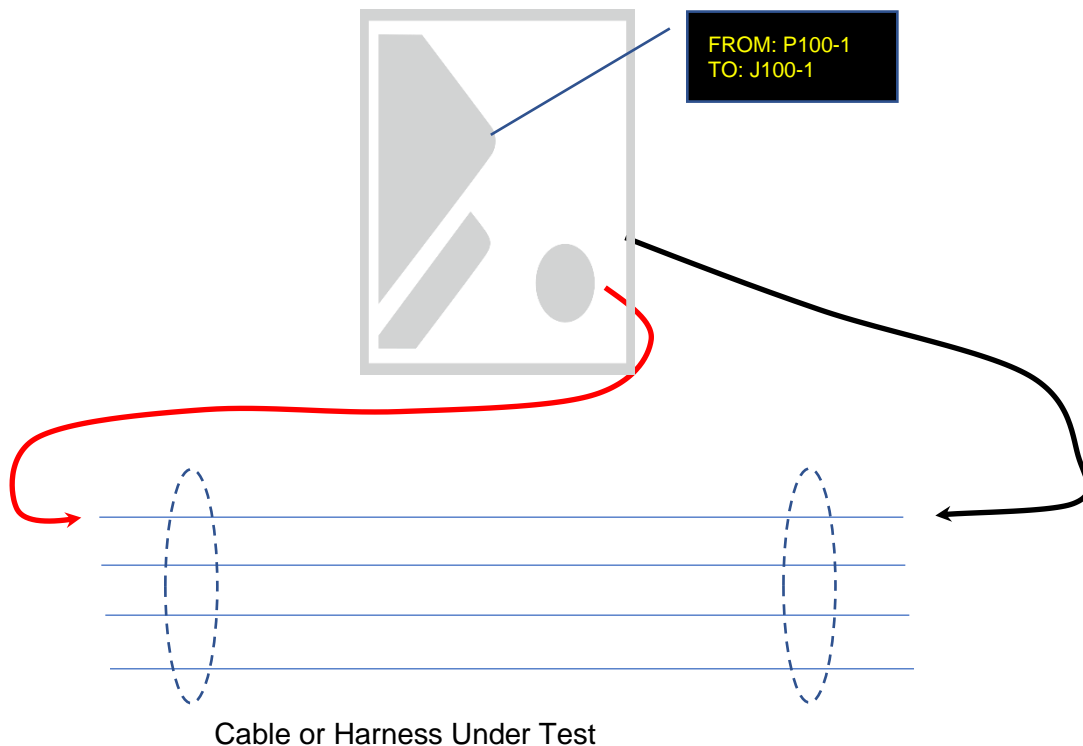
Manual Mode

Manual Mode disables the auto-advance feature and allows the user to manually step through the ring-out process.

After setting up the testers (same as Auto Mode) the user SETS testers to MANUAL, SETS Test ID, and ASSIGNS testers.   For a two-tester scenario, once START is pressed, the Host and Remote HT-128 Bs will display a RED indicator bar and direct the two users to probe the first wire in the test program. While probing the specified wire simultaneously, the Host user can press RETEST. If the wire being probed is below the continuity threshold the indicator bar will turn GREEN and the HT-128 B will record the resistance value of the wire. If the resistance is above the continuity threshold the bar will remain RED and the HT-128 B will record the resistance value.

The users can remove the probes from the wire and the Host user can press NEXT to advance to the next wire in the test program and repeat the process by repeating the following steps:

PROBE – simultaneously probe the specified wire.
RETEST – instructs the HT-128 B to take a measurement of the probed wire.
NEXT – instructs the HT-128 B to proceed to the next wire, or
ADV ON FAIL - instructs the HT-128 B to proceed to next wire when wire exceeds continuity threshold.

DOWNLOAD

DOWNLOAD allows the HT-128 B to wirelessly transfer test programs between testers. When selecting DOWNLOAD, the HT-128 B displays all tester TSN's having a common FID. The user simply selects a TSN and a test program from the list displayed. The HT-128 B will automatically transfer the test program.   TRANSFER COMPLETE! is displayed indicating successful download.

QUICK TEST

QUICK TEST allows users to Initiate hands-free fault testing by simply plugging and unplugging cables or wire harnesses into the test adaptor. QUICK TEST requires users to use the Advance Programming Feature, QUICKTEST_REF, and designate one "from-to" connection from the test program as WREF. An example of a template with the Advanced Programming Feature and WREF is shown below:

TEST ID	DEMOQTST					
CONTINUITY	5	Ohms				
ISOLATION	200	kOhms				
QUICKTEST_REF	WREF					
WIRE	ADAPTOR ID	ADAPTOR PIN	CABLE PIN	CABLE PIN	ADAPTOR PIN	ADAPTOR ID
START OF WIRELIST						
WREF	HOST	1	P1-1	J1-1	2	HOST
W2	HOST	3	P1-2	J1-2	4	HOST
W3	HOST	5	P1-3	J1-3	6	HOST
W4	HOST	7	P1-4	J1-4	8	HOST
W5	HOST	9	P1-5	J1-5	10	HOST
END OF WIRELIST						

Users may select any wire within the test program as WREF. In the example P1-1 to J1-1 is selected as WREF. However, if there is a Fault discovered during QUICK TEST on the WREF line, then the test will not cycle through to the next wire since this line is providing a ground reference for the tester. If any other fault is uncovered by the tester, the display will record the fault and cycle to the next test cycle.

The tester guides the user through the plug/unplug cycle via the following messages and color bar indicators:

WAIT CONN – Tester is waiting for user to connect test adapter to cable-under-test
WAIT DISC – Tester is waiting for user to disconnect test adapter from cable-under-test

Indicator Bar Color

PASS Test

FAIL Test

WAITING on User

GUIDED TEST

GUIDED TEST allows users to perform HT-128 B directed fault testing on terminal blocks, switches, relays, and other non-connectorized locations using the tester's probe feature.
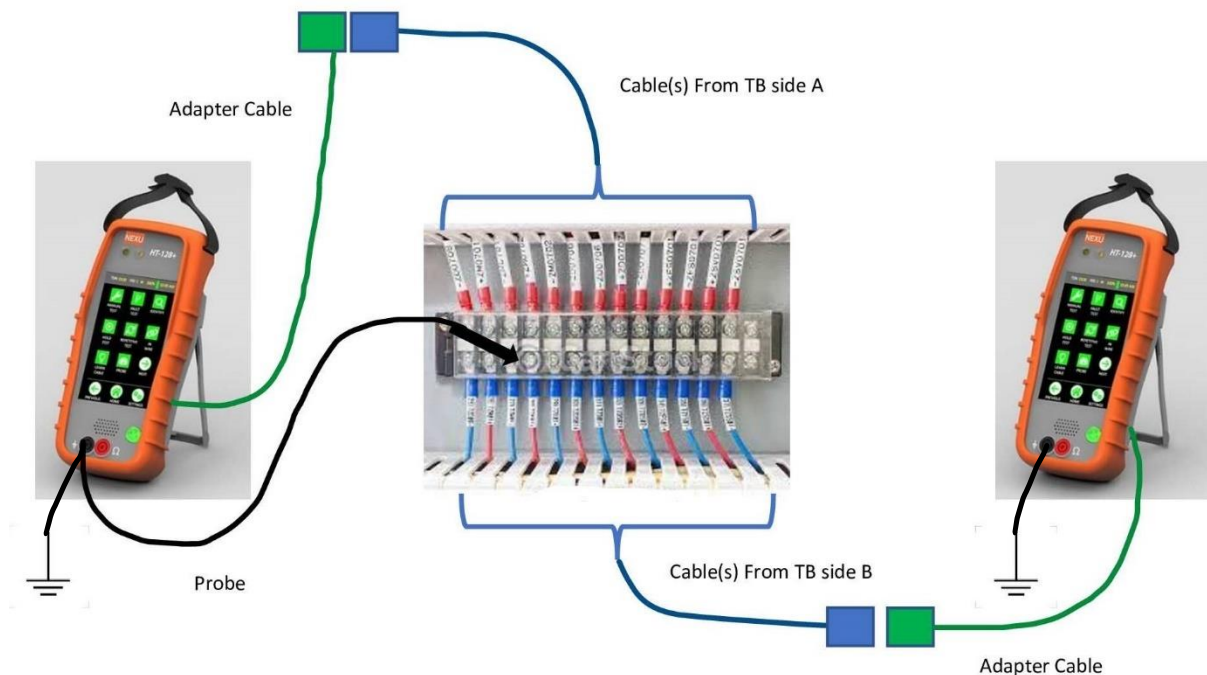
GUIDED TEST ILLUSTRATION

Refer to IDENTIFY section of USERS MANUAL for set-up for Guided Test.   As shown above a probe is installed in the black banana jack of the Host and all testers are attached to a common ground through the black banana jacks.
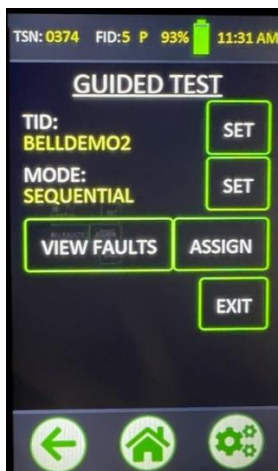
Initiating Testing

TID: Allows user to select the test program

Mode:
Sequential probe follows the "from-to" order of the test program.
Random allows user to probe in any order.

ASSIGN: Links the Host to the Remotes.
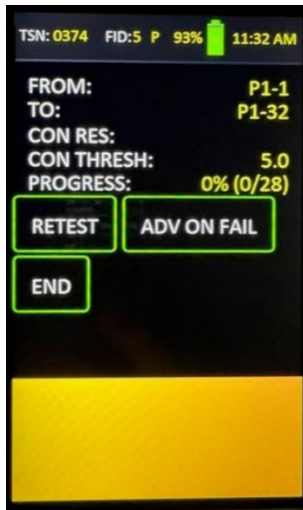
	Testing
TSN: 0374 FID:5 P 93% 11:32 AM FROM: P1-1 TO: P1-32 CON RES: CON THRESH: 5.0 PROGRESS: 0% (0/28) RETEST ADV ON FAIL END	During *Sequential* testing the HT-128 B will direct the user to probe each "from-to" location. During probe the tester will measure the continuity and location of the actual wire. If the wire passes, the tester will advance to the next wire in the wire list. If the wire fails but a wire is sensed, the tester will advance to the next wire automatically. If the failed wire is not sensed, the user can either retest the wire, or advance to the next wire with the tester denoting the failure. During *Random* testing the user may decide the "from-to" to probe while the tester validates the chosen wire. The HT-128 B automatically tracks all wires are probed.

Users may visually track wire testing by viewing the color bar on the Host tester. Also, users may invoke SOUND to enable a tone indicating the probe has sensed a wire.

Test Reports

Test Reports are .txt files generated after the conclusion of each FAULT or REPETITIVE Test and are stored in the Host HT-128 B memory under the TEST ID number with a sequential number appended on the end.

Test Reports may be accessed through the HT-128 B USB connection using a PC (See *Figure 40).* The HT-128 B has limited memory, so DITMCO recommends archiving Test Reports either on a PC or Server periodically. Test Reports are stored in non-volatile memory in order to maintain reports on the HT-128 B when the tester is powered off.

Figure 40: Test Reports Accessed via USB Connection to PC
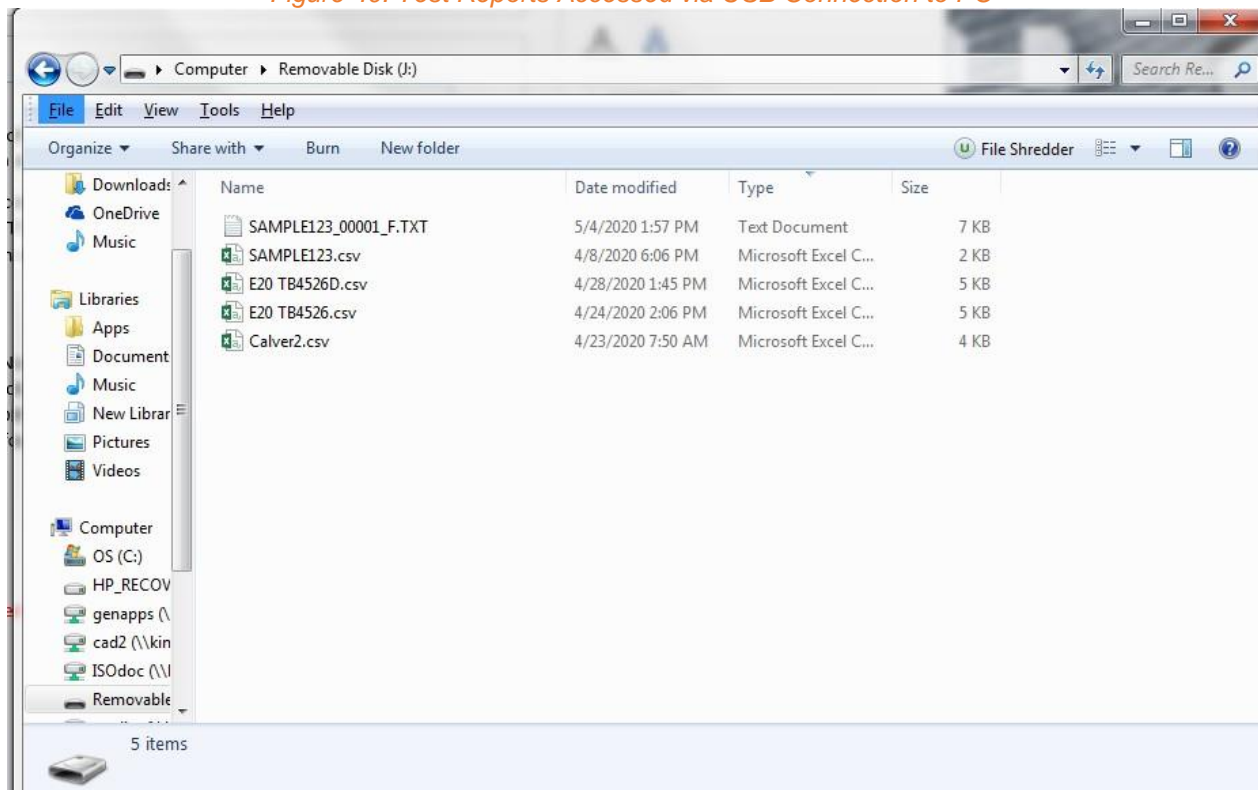
Test Reports are time-stamped and include the TID, TSN, and ADAPTER ID as well as the test limit parameters established by the user. If the user selects OPERATOR within HT-128 B SETTINGS menu, the test operator name is included in the header. Test Reports include the outcome of testing (PASS/FAIL) in the Header field as well as a summary report of any FAULTS found during testing (see *Figure 41).*

Figure 41: Test Report Sample
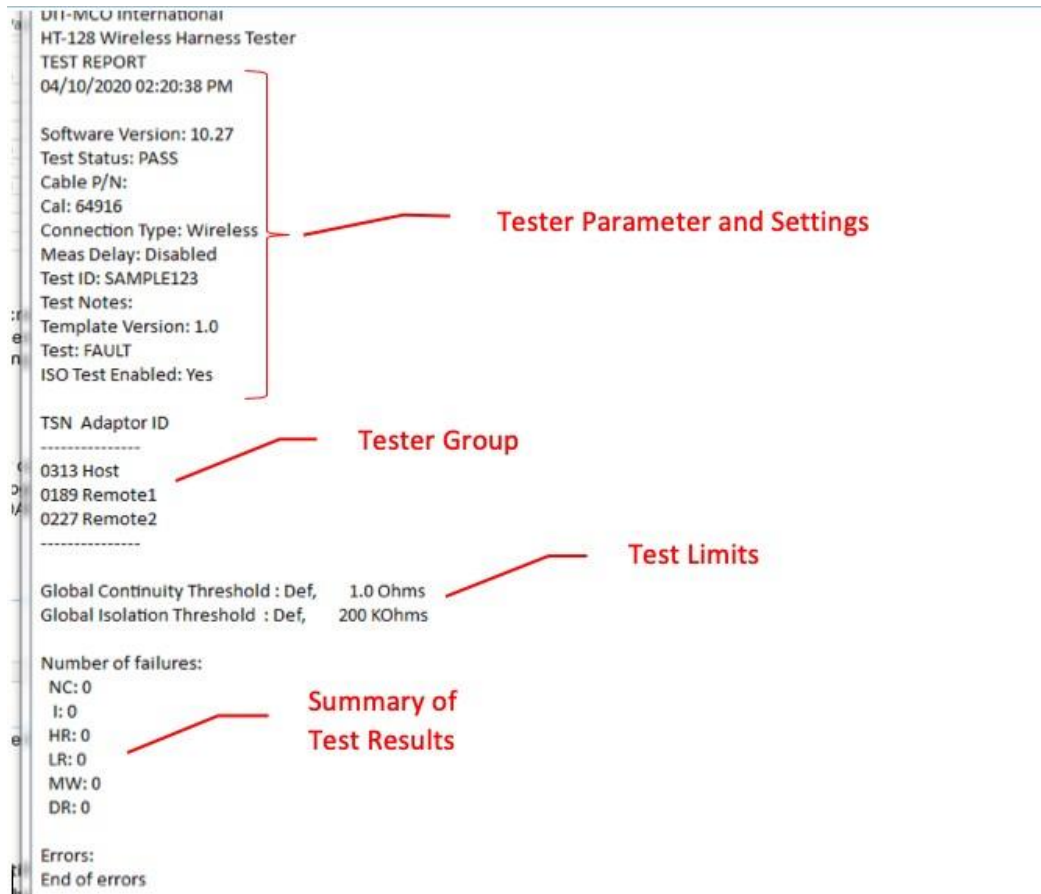
The detailed section of the Test Report includes each Continuity and Isolation measurement taken by the HT-128 B during testing (see *Figures 42* and *43)*. FAULTS are noted in the detailed section of the Test Report with an asterisk (*).

The Test Report detailed section also includes a listing of the Nets generated by the HT-128 B during testing. Each Net is grouped together as a list of nodes (n_1, n_2, n_3…) separated by a comma. The ISO value of each Net is listed to the right of the Net.

Figure 42: Continuity Test Results

Continuity Test Results:

Wire	Measured	UpperThr	LowerThr
P1-1,P1-40	0.3 Ohms		
P1-2,J1-2	0.4 Ohms		
P1-3,J1-3	0.3 Ohms		
P1-4,J1-4	0.5 Ohms		
P1-5,J1-5	0.4 Ohms		
P1-5,J1-6	0.4 Ohms		
P1-5,J1-7	0.4 Ohms		
P1-5,J1-8	0.4 Ohms		
P1-5,J1-9	0.5 Ohms		
P1-10,J1-10	0.4 Ohms		
J1-10,J1-11	0.2 Ohms		
J1-11,J1-12	0.3 Ohms		
J1-12,J1-13	0.2 Ohms		
J1-13,J1-14	0.2 Ohms		
P1-15+,J1-15-	0.67 Volts		
P1-16,J1-16	305840 Ohms	330000	270000
P1-16,J1-17	304900 Ohms	330000	270000
P1-16,J2-18	304484 Ohms	330000	270000
J1-22,J1-23	305735 Ohms	330000	270000
J1-23,J1-24	301297 Ohms	330000	270000
J1-24,J1-25	305317 Ohms	330000	270000
P1-26,P1-26	0.0 Ohms		
P1-27,P1-27	0.0 Ohms		
P1-28,P1-28	0.0 Ohms		
J1-26,J2-26	0.9 Ohms		
J1-27,J2-27	0.8 Ohms		

Diode (P1-15+,J1-15-)

Resistors (P1-16,J1-16 through J1-24,J1-25)

Isolated Pins (P1-26,P1-26 through P1-28,P1-28)

Figure 43: Isolation Test Results

Isolation Test Results:

Wire	Measurement(KOhm)
P1-1,P1-40	900
P1-2,J1-2	900
P1-3,J1-3	900
P1-4,J1-4	900
P1-5,J1-5	900
P1-5,J1-6	
P1-5,J1-7	
P1-5,J1-8	
P1-5,J1-9	
P1-10,J1-10	900
J1-10,J1-11	
J1-11,J1-12	
J1-12,J1-13	
J1-13,J1-14	
P1-15+,J1-15-	900
P1-16,J1-16	900
P1-16,J1-17	
P1-16,J2-18	
J1-22,J1-23	900
J1-23,J1-24	
J1-24,J1-25	
P1-26,P1-26	900

Star Net Topology (P1-5,J1-5 through P1-5,J1-9)

Daisy Chain Net Topology (P1-10,J1-10 through J1-13,J1-14)

The HT-128 B limits the number of failures reported to a maximum of 50 faults. For instance, if the user mistakenly assigns testers to the wrong adapters, then the number of faults generated from such a mistake may easily run into the hundreds when testing large wiring harnesses. To limit the Fault test time in such circumstances, while also providing sufficient test fault information to the user, the HT-128 B lists the first fifty faults encountered.

The HT-128 B uses a fault testing hierarchy starting with isolation testing and proceeding to continuity testing and ending with Mis-wire testing. The hierarchy is displayed as a progress indicator line on the Host screen during testing. For test situations with a high quantity of mis-wires it is not unusual for the tester to reach its maximum 50-fault limit in the isolation phase of the testing hierarchy. When this occurs the test report looks similar to the below results.

TSN Adaptor ID

0374 ADPT01

Global Continuity Threshold: Def,   5.0 Ohms
Global Isolation Threshold : Def,   100 KOhms

Number of failures: Results indicate 50 fault
 NC: 0   Isolation error limit reached
  I:50+ ◄─────────   prior to terminating testing.
 HR: 0
 LR: 0   **The "+" sign indicates**
 MW: 0   **more faults are present**
 DR: 0   **but not included in**
 HV: 0   **Report.**
 LV: 0

Analyzing Test Results

Analyzing and interpreting results in the Test Report is aided by using the FAULT Definitions and FAULT Diagram included in the FAULT Testing section of the User's Manual. Additionally, users should compare the parsing results of the Test Report with the actual wire list to ensure the test program and test report reflect the actual wire list. If the Test Report Net parsing does not agree with the actual wire list, review the test program for accuracy.

Space Intentionally Left Blank

Settings

Tester Info

Tester Info provides the user with the hardware and software versions of the tester. DIT-MCO recommends users operate testers at the same level of software to avoid compatibility issues between testers.

Battery Status

Battery status provides information regarding the battery, including charge level and temperature.

Shut Off Time

The HT-128 B comes with the factory default Shut Off time set to 10 minutes. Pressing SHUT OFF TIME allows users to choose between 10 minutes and ALWAYS ON.

DATE/TIME

Users may set date and time using this feature.

Sound

The HT-128 B has an optional sound feature that sounds during Power On/Off as well as after completion of FAULT or REPETITIVE Tests.

Flashlight

THE HT-128 B flashlight is located on the front panel. Users can Power the flashlight On/Off through SETTINGS.

Nomenclature

Nomenclature allows the users two optional settings:

TEST ID or PROGRAM ID – Users may choose the user interface field names for the test program prompts.

WIRE NAME or PIN NAME – Users may choose whether to denote the identity of a "from-to" pair by either the wire name or pin name. The programming template has a field for wire names.   Wires can be identified under a single wire name or as a "from-to" pair.

Test Serialization

Users can enter up to a10-character serial number during FAULT Testing by invoking Test Serialization. Users enable or disable Test Serialization by selecting OFF or ON from the SETTINGS menu. During FAULT testing, an alpha-numeric keyboard appears after selecting START. FAULT Testing automatically initiates after the user enters the serial number. Serial numbers appear in the header of Test Reports when invoked.

Select Operator

Users may assign a test operator to FAULT Testing by enabling SELECT OPERATOR and selecting a person's name from the displayed list. Up to 10 operator names may be entered in the HT-128 B through the DITMCO init.csv file. The init.csv file is available from DITMCO and allows the user to create a list of operator names that can then be downloaded on the HT-128 B via the USB connection. The operator names are viewed and selected through the SELECT OPERATOR file.

Set Folder Name

SET FOLDER NAME allows the user to create a test folder name for HT-128 B Test Reports. Users create the folder name through the SETTINGS menu via an alpha-numeric keyboard. All test files saved on the HT-128 B after folder creation will have the folder name appended to the beginning of the normal test file name. Users may use folder names as a convenient way to locate, manage, and download related files on the HT-128 B.

Disable ISO Test

Users may elect not to perform ISO testing as part of the HT-128 B FAULT test routine by selecting YES from the SETTINGS menu. ISO will remain in the selected state until changed by the operator.

Maintenance/Diagnostics/Measurements (MDM)

MDM is an advanced diagnostic tool that allows users to manually control the multiplexers of the HT-128 B to measure and view continuity, isolation resistance and voltage.

*Note: MDM can be helpful verifying resistances or voltages resident on tester pins that are not part of the test program. **Voltage or resistance found on tester pins that are not part of the test program can adversely affect test results by causing ISO, MW, and HR failures.***

Measurements can be taken from a single tester or across a group of testers. There is no Host or Remote adapter ID convention for MDM as the user manually selects test pins to measure as well as test pins to ground or un-ground.

PIN – user scrolls through Host test pins 1 to 128 to select the pin to be measured

OHMS – sets the HT-128 B to measure resistance in Ohms

VOLT – sets the HT-128 B to measure resistance in Volts

GND – instructs the HT-128 B to ground the test pin

UNGNDALL – instructs all HT-128 Bs to un-ground all test

pins GNDALL – instructs all HT-128 Bs to ground all test

pins UNGND – instructs the HT-128 B to un-ground the test

pin

MEASURE – initiates an instantaneous measurement of the selected test pin

DIT-MCO RECOMMENDS CONTACTING CUSTOMER SUPPORT FOR
SET-UP AND USE OF MDM FEATURES

S/W Upgrade

Software upgrades are periodically released by DITMCO to customers as .UPG files.
To upgrade software:
1. Download the DITMCO HT-128 B to a PC
2. Power On the HT-128 B
3. Connect the HT-128 B to a PC via the USB port
4. Drag the HT-128 B .UPG file from the PC to the DITMCO folder (see *Figure 44*)
5. On the HT-128 B Select SETTINGS, S/W UPGRADES
6. K20APP 10.xx should appear on the HT-128 B display
7. Select UPGRADE

Figure 44: S/W Upgrade on PC
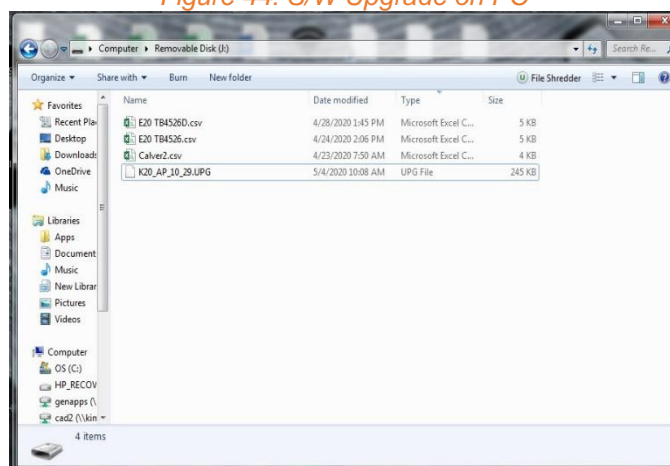
The HT-128 B automatically upgrades to the new revision and then powers off. Power-on the HT-128 B, Select SETTINGS, TESTER INFO, H/W AND S/W VER to verify successful upgrade.

USERS SHOULD ENSURE ALL UNITS BEING DEPLOYED WITHIN A TEST NETWORK ARE AT THE SAME SOFTWARE REVISION. FAILURE TO DO SO CAN CREATE COMPATIBILITY ISSUES BETWEEN TESTERS.

Repetitive Test

Repetitive Test allows users to define the number of cycles to run during testing. Once the number of cycles is defined, the user selects SAVE to complete the setting. The HT-128 saves the cycle count until reset by the user through the SETTINGS menu.

Test Program Utilities

Global Continuity Threshold

Thresholds may be input for the Global Continuity Threshold setting and for Wire Continuity Threshold settings. The Global Continuity Thresholds allows the user to set a custom global continuity threshold resistance value. The Wire Continuity Threshold settings allow the user to set the continuity threshold resistance for the wire selected in the previous screen. The user selects resistance value in either Ohms or KOhms. The value is only set after the user enters a valid value and selects DONE. The valid range for resistance is 0.5 Ohm to 10.0 KOhm. If the user selects resistance values out of this range, VALUE OUT OF RANGE is displayed. If the user selects PREVIOUS before a new valid value is entered, the value reverts to the value when the screen was entered. The threshold value entered is retained only if the TEST ID is resident – even through power cycles. The entered threshold is not retained when a different Test ID is loaded.

Global Isolation Threshold

The Isolation Threshold screen allows the user to set global isolation threshold for a specific test program. SELECT TEST ID can be used to change the test program the GLOBAL THRSHLD setting will apply to. The user cannot set individual wire isolation resistance values. The order of precedence for the global and wire-specific threshold resistance values used for the resident Test ID is:
1. User Input
2. EXCEL spreadsheet values
3. Controller defaults

The threshold values entered are only retained if the Test ID is resident – even through power cycles. The entered thresholds are not retained when a different Test ID is loaded. By selecting GLOBAL THRSHLD, the user may adjust the global isolation threshold resistance value. The user enters resistance value in KOhms. The value is only loaded if the user enters a valid value and selects DONE. The valid range of resistance is 5KOhms-1MOhm. If the user selects PREVIOUS before a new valid value is entered, the value reverts to the value loaded when the screen was entered.

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Adapters

Adapters serve to interconnect from the HT-128 B to the cable or wire harness connector
under test. For the first generation of HT-128 B testers, adapters included a DITMCO 128-node plug-in adapter on one end and a user-defined connector(s) on the opposite end.

There are two basic configurations of Adapters for the HT-128 B+. Universal adapters simply extend the 128 nodes of the HT-128 B+ tester to a user-defined 128 contact connector. The user may deploy universal adapters for a few reasons:
1. To reduce the number of plugging and unplugging cycles on the HT-128 B+
2. To reduce the number of DITMCO adapters required
3. To match a standard interface cable the user may have for other test equipment

If universal adapters are deployed, an additional adapter cable is used to attach from the universal adapter to the cable or wire harness connector(s).

The second type of adapters are cable-under-test adapters that feature a DITMCO 128-node plug-in adapter on one end and cable or wire harness mating connector(s) on the opposite end.

Building Adapters

DITMCO recommends the following practices be considered when building out adapters:
1. Use 24 AWG wire from the HT-128 B+ plug-in adapter to the user-defined connecter. 24 AWG wire will provide more flexibility of the cable bundle and allow for easier soldering of the adapter wires to the DITMCO printed circuit board.
2. Follow IPC/WHMA 610 and 620 guidelines for soldering and assembling all cables connected to the HT-128 B+ for increased reliability and longevity.
3. Wire connections from the plug-in adapter to the user-defined connector on a 1:1, 2:2, 3:3, etc. basis.
4. Consider making a loop-back cable for testing Universal adapters. Loop-back cables allow the user to perform fault tests on the adapter itself.
5. To maximize the utilization of HT-128 B+, the user should consider adapter strategies that consume as many nodes on the HT-128 B+ tester as practical. This may lead to populating cable-under-test adapters with multiple mating connectors.
6. Label all adapters with their respective ADAPTER IDs and label each mating connector with its respective Reference Designator
7. Earlier generations of the HT-128 B+ have a plug-in connector to attach between the tester and the adapter. New models require D38999/26WJ35PN for tester mating.

Calibration

Users may send the HT-128 B+ to DITMCO for periodic calibration verification testing or purchase the DITMCO Calibration Verification Tool. The DITMCO Calibration Verification Tool allows users to verify calibration and proper operation of the HT-128 B+ in accordance with the Technical Specification defined in this manual. The Calibration Verification Tool carries a calibration date of 5 years from the time of purchase and should be replaced after expiration.

Prior to shipment DITMCO tests the Calibration Verification Tool with instruments traceable to the NIST. DITMCO recommends verifying the calibration of the HT-128 B+ annually. If a unit is mis-handled or subject to any abuse, then DITMCO recommends reverification at the time of occurrence.

Importantly, there are no adjustments required for the HT-128 B+ during the calibration verification process. If the HT-128 B+ fails any step in the procedure, the tester must be sent to DITMCO for repair.

Calibration Verification Process

DITMCO pre-loads each HT-128 B+ with a test program named CALVER2 for calibration verification testing. To test the HT-128 B+:

1. Install Calibration Verification Tool into the HT-128 B+ 128-pin connector ensuring the tool and the HT-128 B+ mating connector are fully seated.
2. Select FAULT TEST
3. Select CALVER2
4. Press START
5. Verify the HT-128 B+ passes test. A test report will be generated showing the results of the test. If unit fails test, ensure the tool is properly installed and if not retest. If failure is verified, then contact DITMCO for service.

For addition information refer to ANSI/NCSL Z540-1, and ISO 10012-1.

Troubleshooting

A. Remote TSN does not appear on Host display
1. Ensure all units have the same FID number.
2. The HT-128 B+ wireless transceivers perform best in line-of-sight conditions. Survey test area and remove obstacles that may hinder wireless communication.
3. Avoid placing HT-128 B+ on floor as this may limit or hinder wireless communication.
4. Placing HT-128 B+ closer than 36" may also hinder wireless communication.
5. Verify FID numbers on each tester is the same

B. Remote TSN disappears from Host display or low RSI
1. The HT-128 B+ wireless transceivers perform best in line-of-sight conditions. Survey test area and remove obstacles that may hinder wireless performance.
2. Avoid placing HT-128 B on floor as this may limit or hinder wireless communication.
3. If the test involves more than two HT-128 B testers, consider locating the Host tester centrally within the test group to minimize distance between Host and Remote.
4. Add a Pseudo Host tester to the test group.

C. HT-128 B indicates many failures
1. Verify the Adapters are all connected to the cable or wire harness under test.
2. Verify ADAPTER IDs and TSNs are paired in the correct order.
3. Verify the test program is correct. Common mistakes include:
    a. Assigning an ADAPTER ID to the wrong ADAPTER PIN
    b. Omitting a wiring connection will cause MW and ISO errors and, depending on the extent of the omission, may cause dozens of failures.
    c. Adding a wiring connection not in the physical cable or harness may cause MW and ISO errors
4. In situations where there may be other HT-128 Bs operating in the area, ensure you are not inadvertently paired to HT-128 Bs outside of your test group.
5. Incorrect design or assembly of the Adapter cable will create test failures not related to the cable or wire harness under test.
6. Ensure all connectors are fully mated.

D. COMERR occurs during testing
1. COMERR normally occurs due to wireless signal loss during testing. See above for solutions.

E. Unknown ISO failures occur during testing
1. Isolation failures may occur when undefined nodes or test points are connected to the HT-128 B but are not part of the test program. DITMCO recommends adding Isolated Pins to the test program to capture potential nodes or test points that are not part of the test program and may be causing ISO failures.
2. It is not unusual for common Adapters to be used across multiple test programs. In these situations, the common Adapters have the potential to form connection

with the HT-128 Bs that are not part of the user's test program. For example, an Adapter may connect 100 wires to the HT-128 B, but the test program for a particular cable or harness may only use 60 of the 100 connections. In these cases, the user must ensure the 40 excess HT-128 B connections do not carry voltages or wiring connections that may affect the test program. Ground circuits in complex wiring topologies need to be well understood by the programmer and adapter designer in these circumstances.

F. NO CONNECT or HIGH RESISTANCE FAULTS

1. For plug-in versions of the HT-128 B, DITMCO recommends running a loop-back test on the adapter cable prior to commencing testing. This practice will ensure the Adapter cable to HT-128 B does not have any NC or HR failures.
2. Ensure all connectors are fully mated.

G. HOST TESTER IS NOT DISPLAYING ALL REMOTES

1. Ensure all Testers are set to the same FID
2. Ensure Remote Testers have no obstructions between themselves and the HOST Tester. Whenever possible do not lay testers on floor for testing as this may limit transmission distance and quality.
3. Do not exceed recommended communication distance between Host and Remote Testers. If distance exceeds recommended distance consider changing Host to a different Remote or introduce a Pseudo Host.
4. Reconnect Host to Remotes and ensure RSI>5. If not re-orient Remote or Host.
5. Power cycle the Host Tester.

H. REMOTE SHOWING MAIN MENU AFTER ADAPTER ASSIGNMENT

If the Host loses communication with a Remote during the running of an Application and cannot reestablish communication, then the Remote will automatically default back to the main menu. If this happens see (G). Power cycle Host and Remote Testers.

I. POWER ON/OFF BUTTON IS FLASHING

When battery capacity drops below 25% the HT-128 B Power On/Off button flashes. The user is encouraged to charge the unit as soon as possible. The user may charge the HT-128 B during a test session without affecting the running of the Application.

J. LEARN FEATURE IS NOT WORKING PROPERLY

Ensure Probe Ground is connected between each unit prior to starting LEARN process.

K. TESTERS ARE NOT LINKING DURING DYNAMIC INITIATION

1. Ensure Auxiliary cables is not attached during linking process.

2. Initiate linking process at the Host tester followed by the Remote tester.

L. LEARN FEATURE IS NOT WORKING IN IN-LINE DYNAMIC MODE
The HT-128 B does not support the LEARN feature for In-Line DYNAMIC mode.

M. HT-128 B DOES NOT POWER OFF AFTER UPGRADING SOFTWARE
If the HT-128 B remains ON after upgrade, wait 2-minutes and then power cycle the unit. Afterwards, go to SETTINGS > TESTER INFO > H/W AND S/W VER and verify the software version on the unit matches the upgraded version.

Glossary

Adapter

The Adapter is the intermediate cable that physically attaches the HT-128 B to the cable or wire harness under test.

Auxiliary Mode

Auxiliary Mode is a method of RS-485 communication between single Host and Remote tester utilizing an independent wire pair for communication.

Com Error

Communication Error indicates the wireless link between a Host and Remote HT-128 B tester is lost and not recoverable by the RECONNECTING process

Continuity

The presence of a path for current flow; The HT-128 B expresses the value of continuity in Ohms.

.CSV

The Common Separated Values file is derived from the EXCEL file format and is used by the HT-128 B as the program file format. The HT-128 B does not accept .xls file extensions for programming purposes.

Daisy Chain Topology

Multiple wires sharing a common node. For the HT-128 B the "from" or "to" in the test program does not repeat the common node but links all common wires together in a daisy chain (W1 to W2 to W3…) manner.

Dynamic Mode

Dynamic Mode is a method of RS-485 communication between a single Host and Remote tester utilizing the wires within the cable or wire harness under test to provide communication.

Fault

Any resistance or voltage falling outside the test limits established in the HT-128 B test program.

FID

Family ID assigns a specific operating frequency to two or more HT-128 B assigned the same ID number

Forward Voltage

The amount of voltage required to allow current to flow across a diode. The HT-128 B uses this value as part of the routine analysis of diodes.

Host Tester

The Host is the controlling tester when wirelessly linked to other HT-128 B testers. All communication and test program instructions are directed by the Host during testing. Remote testers communicate only with the Host and not to each other. The HT-128 B requires the test program be loaded in memory on the tester selected as the Host.

Isolated Node

A test point that is not connected to any other test point in the test program

Isolation

The absence of a path for current flow; The HT-128 B expresses the value of isolation in KOhms.

Link

The process of wirelessly assigning a Host HT-128 B tester to a Remote HT-128 B tester during the ASSIGN ADAPTER step of the test app.

Minimum Inductor Resistance

The lowest resistance value reached for an inductor when voltage is applied. The resistance decays for inductors based on a time constant. The HT-128 B uses time in the form of MEASUREMENT DELAY to allow the inductor to reach its minimum resistance.

Net

A Net is a collection of wires terminating to a common node. A Net is composed of at least two nodes.

Netlist

A Netlist is a listing of connections between nodes that comprises a test program.

Node

A node may be referred to as a test point, test pin, or adapter pin in the User's Manual. A wire is defined by two connected nodes and is designated as "from" or "to" within the HT-128 B programming template.

Parse

The HT-128 B analyzes and parses, or sorts, nodes in the test program based on their common connections. Nodes having a common connection are termed Nets.

Passive Circuit Voltage

A passive circuit voltage is voltage measure by the HT-128 B of Net comprised one or more non-active devices such as resistors, diodes, capacitors, coils and inductors.

Peer to Peer Network

Each HT-128 B is capable of communication with every other HT-128 B via a network topology defined within the software. Peer to Peer describes the topology within a test environment permitting any HT-128 B to send and receive commands from any other HT-128 B irrespective of whether a tester is termed a Host or Remote.

Probe Ground

The HT-128 B black banana jack can be used to establish a common ground path between the testers. Probe Ground is used in various test apps as part of the physical connection requirements for the HT-128 B.

Pseudo Host Tester

A Pseudo Host is used to host testing under conditions where the distance between Host and Remote(s) may exceed the operating parameters of the HT-128 B or in situations where the test environment makes wireless communication more difficult. A Pseudo host is created by the user by programming a single isolated pin line in a test program for a Pseudo Host tester. The programming addition adds a Pseudo tester to act as Host for the previously existing test program. The Pseudo Host tester can then be placed in the most optimum location among the tester group in order to enhance signal strength among the testers, increasing the RSI values. The Pseudo Host acts as a wireless controller for the rest of the tester group.

Host and Remote Test Configuration

Host

Remote

Wireless Transmission
Obstacle
(Barrier or Distance)

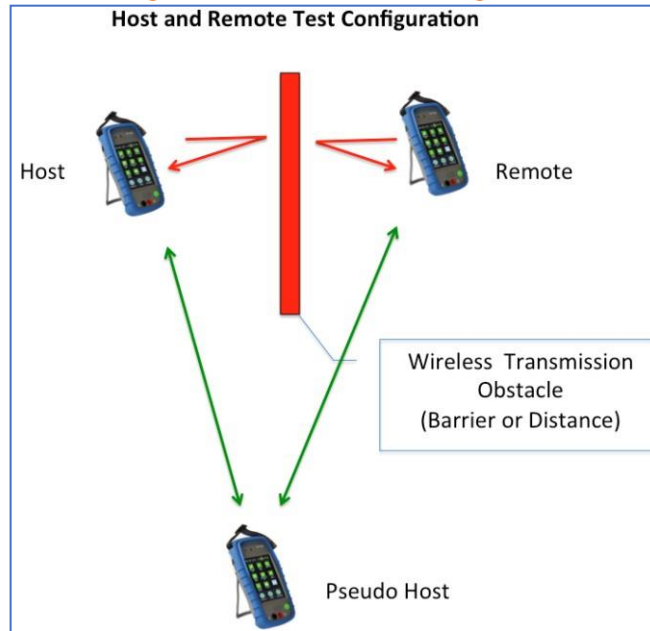Pseudo Host

Figure 45: Pseudo Host Configuration

Figure 45 shows a two-tester configuration with a wireless transmission obstacle placed between the Host and Remote. A Pseudo Host is then added to the test program to alleviate the wireless transmission obstacle. During test set-up, the user selects the PSEUDO tester TSN as the Host with the two units attached to the cable or harness under test becoming Remotes.

Remote Tester

The Remote responds to the Host during the test process. There is no requirement to have the test program loaded on a Remote tester during testing.

Ring-Out

Common industry term used to describe manually verifying the continuity of every wire in a wire list. Ring-Out is normally accomplished using a multimeter and two operators simultaneously probing a wire and recording its resistance.

RPULLUP

The HT-128 B has two precision resistors within the test measurement algorithm to insure wire resistance measurements meet the product specification. The selection of RPULLUP is controlled by the HT-128 B software with the exception of voltage measurement where RPULLUP is a user selectable feature.

RSI

Received Signal Strength indicator is a relative measure of the RF power level received from a specific HT-128 B tester in the program. The higher the RSI the better the RF connection between the two HT-128 B testers.

Star Topology

Multiple wires sharing a common node. For the HT-128 B the "from" or "to" in the test program repeats the common node for each wire number sharing the common node.

Test Environment

Pairing HT-128 B's together during testing creates a test network or test environment. The HT-128 B supports both Host/Remote and Peer to Peer test environments.

TID

Test ID is the name the user assigns to a specific test program in the .csv programming template

TSN

Tester Serial Number

Wiring Diagram

The Wiring Diagram defines the wiring relationship of the cable or wire harness under test. Wire Diagrams may be expressed as a wire list or schematic diagram.

Wireless Frequency

Each HT-128 B uses one of two commercially available transceivers for communication. The wireless frequencies are approved on country-specific terms and conditions. The HT-128 B uses a proprietary communication protocol and IS NOT compatible with other industry standard wireless communication protocols such as Wi-Fi or Bluetooth.