

6003 2Wire Automatic Ringdown Module

CLEI* Code: LCPAT103

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1. General

- 1.1 The 6003 2Wire Automatic Ringdown Module provides automatic ringdown (ARD) service between two stations or PBX trunks. The 6003 causes ringing to be applied to one end of a circuit in response to a station off-hook or PBX trunk seizure at the opposite end. One module per circuit provides ARD service in both directions. Once initiated, ringing continues until the called party answers or until the calling party goes back on-hook.
- 1.2 All normal 2wire signaling and battery feed functions for loop status detection, ringing application, ring tripping, and audible ringback are implemented by the 6003 through standard loop signaling techniques.
- 1.3 The 6003 may be switch optioned for loop start or ground start operation in either or both directions. Seizure of the circuit, which causes the 6003 to apply ringing toward the opposite end of the circuit, is accomplished in the loop start mode by the detection of loop current resulting from an off-hook telephone instrument. In the ground start mode, seizure is accomplished by the detection of ground on the ring conductor of the subscriber loop.
- 1.4 Interrupted ringing may be provided by the 6003 through use of the optional 9903 Ringing Interrupter Subassembly or a Tellabs 8103 Interrupted Ringing Generator. The 9903 plugs into receptacles on the printed circuit card of the 6003 to provide a nominal 2-second-on/4-second-off cycle. The 6003 accommodates ring trip during either the silent or ringing interval.
- 1.5 The signaling range of the 6003 is 3000 ohms maximum loop length at -48VDC operation, or 1500 ohms at -24VDC.
- 1.6 Optional 600- or 900-ohm impedance matching toward the facility on each side of the 6003 may be independently switch selected.
- 1.7 Grounded or battery biased ringing may be used with the 6003.
- 1.8 The 6003 provides lamp and buzzer control leads that may be used with multiline key telephone station sets. A sleeve lead may also be provided through use of the lamp leads; see paragraphs 2.9 and 2.10, and Table 3-1 later in this practice.

- 1.9 The 6003's front panel incorporates an LED busy lamp and tip and ring test points providing access to the circuit on both sides of the module.
- 1.10 The 6003 mounts in one position of the Tellabs Type-10 Mounting Shelf, variations of which provide for relay rack or apparatus case installation. In relay rack applications, up to 12 modules mount vertically across 6 inches in a 19-inch rack, and up to 14 modules can be accommodated across a 23-inch rack in the same vertical space.

Reason for Change

- 1.11 This practice has been revised to remove references to the 6004 Module, which has been discontinued.

2. Applications

- 2.1 The 6003 may be connected to 2wire metallic facilities to provide bidirectional ARD service. The 6003 is used on metallic facilities connecting two stations or two trunks (refer to Figure 2-1).

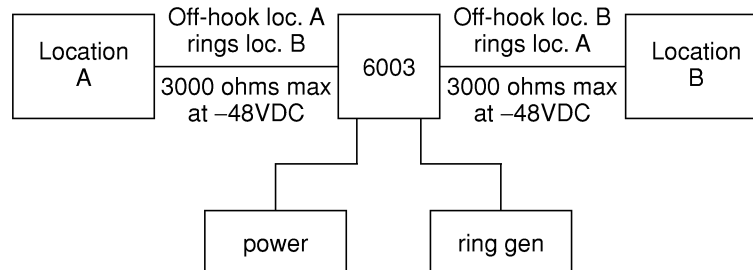


Figure 2-1 6003 Interconnects Two Lines or Trunks

- 2.2 Switch options provided on the 6003 accommodate either loop start or ground start operation. The loop start mode is normally used with telephone stations, while the ground start mode is used on trunks. Two separate and independent loop start/ground start switches allow line A on one side of the 6003 to be optioned independently from line B on the other side of the module. A ground start trunk on one side of the module may, therefore, be interfaced for 2-way ringdown service with a loop start line.
- 2.3 1-way ringdown service can be implemented through use of the loop start/ground start switches. If two lines using loop start operation are interfaced by a 6003, optioning one side of the module for the ground start mode forces the line on that side to a receive-only status. This mode of operation might typically be used on a ringdown circuit to a computer. To prevent the computer from originating a call when it opens the loop to release a call, then closes the loop again, the side of the 6003 facing the computer is optioned for ground start. Optioned this way, the module will not recognize the computer's loop closure, nor will the circuit be seized by the computer.
- 2.4 Maximum signaling range of the 6003 is 3000 ohms when powered by a -48VDC source and 1500 ohms with a -24VDC source, based on a 16mA current requirement. Because the telset may require 23mA of current, transmission range of the 6003 is somewhat lower: 2100 ohms with a -48VDC source and 1000 ohms with a -24VDC source. Circuit resistance calculations must include the telset's internal resistance, typically 200 ohms, and that of the module (400 ohms).
- 2.5 Either a continuous or an interrupted external ringing generator may be used with the 6003. If continuous ringing is the only available source and an interrupted ring is desired, the 6003 may be equipped with the optional 2-second-on/4-second-off 9903 Subassembly.

Note: When the Tellabs 8103 is used, the 9903 Subassembly must NOT be used.

- 2.6 Some form of ringing bias must be used with the 6003 to accommodate the ring trip function. The ring generator connected to the 6003 may be biased in one of several ways; refer to paragraph 3.11 later in this practice. Biasing voltage is supplied by a DC voltage connected in series with the AC ringing source. The ringing supply bias voltage determines the maximum ring trip range, which is the limiting factor in ringing, toward the station. With 24VDC bias, maximum range is 1500 ohms, and with 48VDC bias, maximum range is 3000 ohms.
- 2.7 In the ground start mode of operation, the ringing generator bias lead (pin 11) may not be biased negatively, as this affects a negative bias on the tip lead of the called station during ringing. The operation of the associated PBX trunk circuit may require that the tip lead be at ground or positive potential to allow the operation of the incoming call circuitry and, therefore, a negatively biased ringing generator, or a positive voltage connected to the ringing generator bias lead, is required to allow both module and trunk circuitry to function properly.
- 2.8 To accommodate various lengths and types of cable, the 6003 may be switch optioned for either 600- or 900-ohm impedance matching. Each side of the module is optioned independently, allowing the interface of variously composed cable facilities. The 600-ohm impedance matching option is normally chosen to interface non-loaded cable, short loops, and station apparatus. The 900-ohm option is used to interface loaded cable facilities.
- 2.9 The 6003 provides lamp and buzzer control leads that may be used with multiline key telephone station sets. These control leads externally connect to the standard key telephone set's lamp interrupter, lamp, and buzzer supply. Where buzzer ringing is used instead of standard loop ringing, certain wiring and option changes must be accommodated; refer to paragraph 3.12 later in this practice.
- 2.10 A sleeve lead may be provided, when required, toward the external switching equipment through use of the module's key telephone unit (KTU) lamp leads, as described in Table 3-1 in Section 3.

3. Installation

Inspection

- 3.1 Visually inspect the equipment upon its arrival to locate possible shipping damage. If damage is found, immediately file a claim with the carrier. If the equipment is stored, re-inspect it prior to installation.

Mounting

- 3.2 The 6003 mounts in one position of the Tellabs Type-10 Mounting Shelf, which is available in configurations for both relay rack and apparatus case installation. The 6003 plugs physically and electrically into a 56-pin connector at the rear of the shelf.

Connections

- 3.3 Before making any connections to the shelf, ensure that power is off and all modules are removed. Modules should be placed only after wiring is completed.
- 3.4 All connections are made via wire wrap at the 56-pin connector at the rear of the mounting shelf position.
- 3.5 Table 3-1 lists external connections to the 6003. Pin numbers are found on the body of the 56-pin connector.

Connect	To Pin	Connect	To Pin
Line A tip (TA)	51	Ring generator interrupted	53
Line A ring (RA)	33	Ring generator ring trip bias (ring gen)	11
Line B tip (TB)	41	KTU buzzer supply	36
Line B ring (RB)	49	KTU buzzer	34
Ground (GND)	17	KTU lamp flash (LF)*	32
Battery (–BATT) (–22 to –56VDC filtered input)	35	KTU lamp line A (L1A)*	26
Ring supply machine start (MST)	37	KTU lamp line B (L1B)*	1
Ring generator continuous	45	KTU lamp battery (LB)*	24

*To provide a sleeve lead, connect ground to pins 32 and 24 and the sleeve lead to pins 1 and 26.

Table 3-1 External Connections to the 6003

Caution: An accidental reversal of the input power polarity to modules equipped with a 9903 Subassembly may damage the subassembly.

Options

3.6 Several switch options are provided on the 6003 to condition it for specific applications. The module should be correctly optioned before being plugged into place. Figure 3-1 illustrates the position and labeling of the option switches.

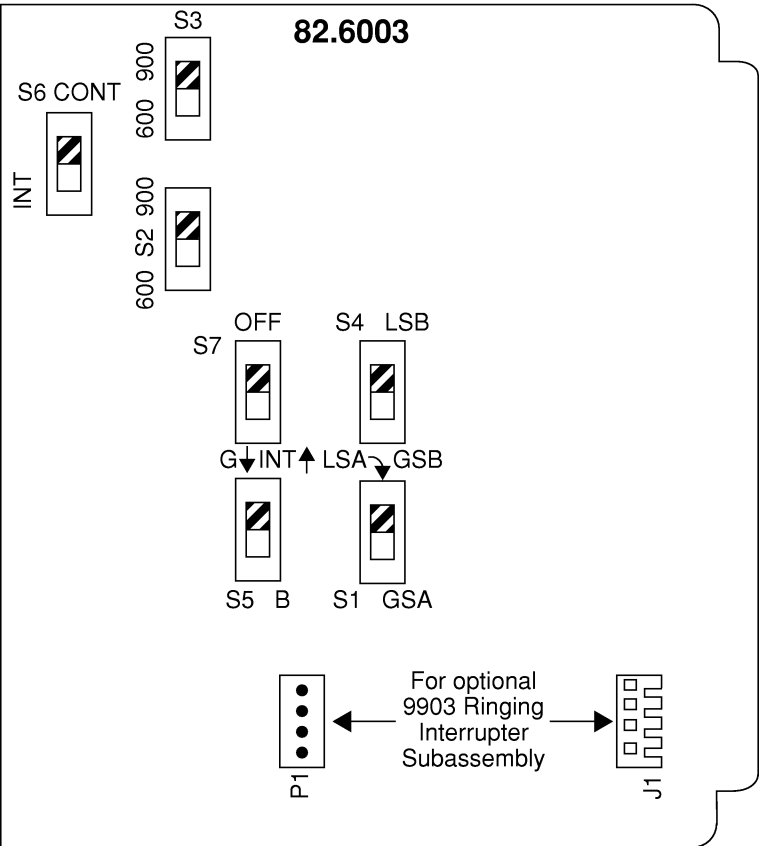


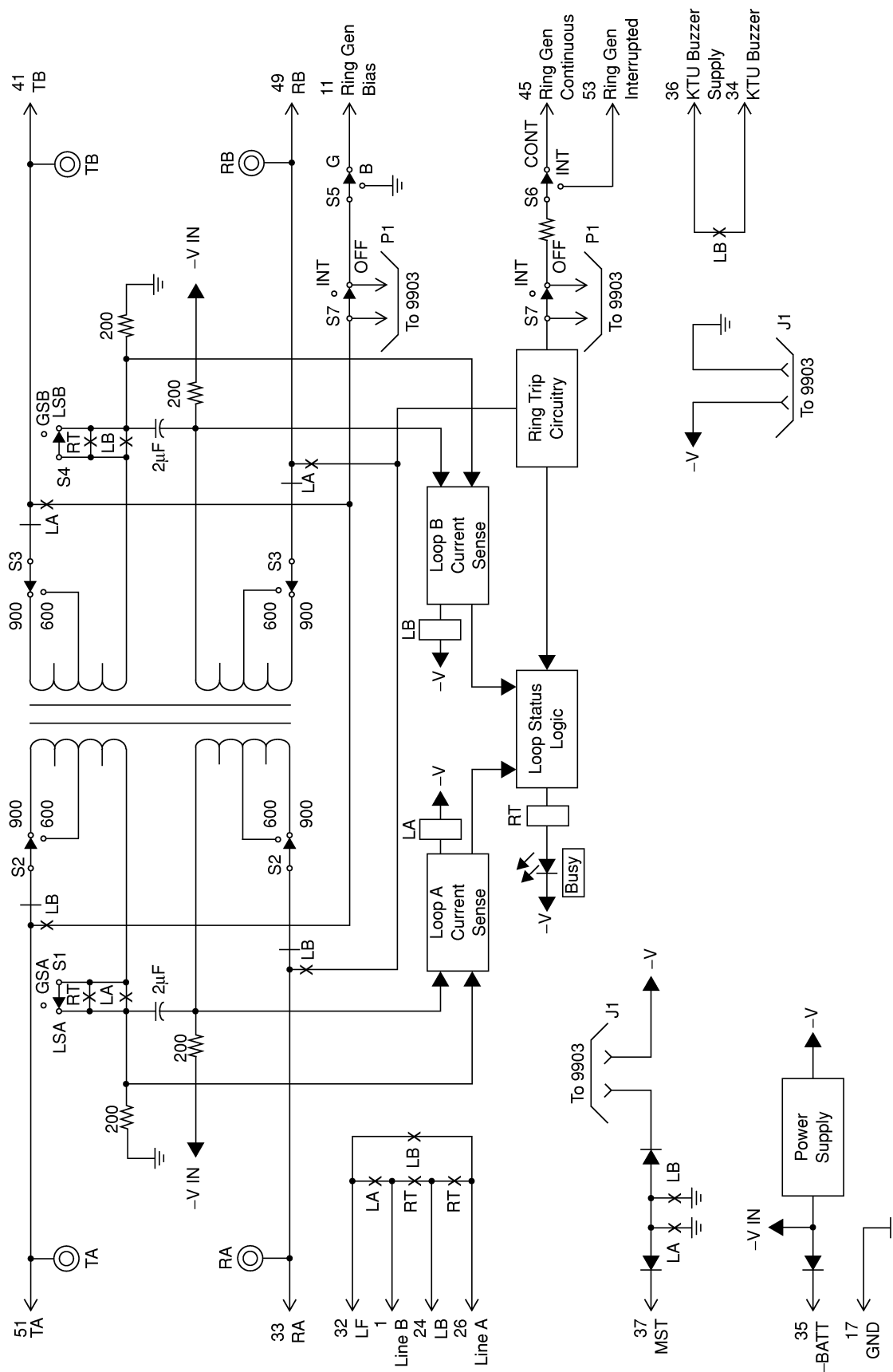
Figure 3-1 Option Switch Locations

- 3.7 Either 600- or 900-ohm impedance matching to each of the two facilities is affected through use of switch S2 for line A and switch S3 for line B. The 600- and 900-ohm positions are labeled on the printed circuit board. If the 6003 is connected to a gain device, that side of the module must be optioned to match the impedance of the gain device.
- 3.8 Loop start or ground start operation is selected by switch S1 for line A and switch S4 for line B. Loop start and ground start modes of operation on line A and line B are independent – i.e., one line can be optional for loop start and the other for ground start, or both can be optioned for loop start, etc. S1 and S4 are labeled LS and GS on the printed circuit board.
- 3.9 Use with continuous or interrupted external ringing supply is affected through switch S6, marked on the module as CONT or INT.
- 3.10 The 6003 is conditioned for use with the optional 9903 Subassembly by setting switch S7 to the INT position and installing the 9903 in the sockets provided on the printed circuit board. The 9903 plugs into the 6003 by two 4-pin connectors. When the 9903 is not in use, S7 must be set to the OFF position.
- 3.11 If a grounded ring generator is used, set S5 to the G position. If a battery biased ring generator is used, set S5 to the B position. If either side is optioned for ground start operation, S5 must be set to the G position.
- 3.12 When a buzzer, rather than standard ringing, in an associated telset is required, the ring generator connection (pin 45) must be connected to battery (pin 35), S5 must be set to the B position, and S6 must be set to CONT.

4. Circuit Description

- 4.1 Functional entities referenced in this section are depicted in the Block Diagram later in this practice, Section 5. It may be helpful to refer to that diagram while reading this section.
- 4.2 When the 6003 is idle, all relays are released and the two facilities interfaced by the module are coupled together by a repeat coil for voice transmission. Seizure of one of the subscriber loops initiates ringing of the second subscriber loop. Ring trip is accomplished by a loop seizure of the second subscriber loop. Abandoned calls caused by the originating station returning to an on-hook condition during an unanswered call terminate the ringing mode of operation. Re-ring may be accomplished after both stations return to an on-hook status. The release of one station on an answered call will not cause an automatic re-ring of the on-hook station.
- 4.3 In the loop start mode, a call originated from station A is initiated by line A loop current and is sensed by Loop A Current Sense Circuitry. The Loop A Current Sense Circuitry operates LA Relay, causing the ring generator to be connected via the Ring Trip Circuitry to line B. When station B answers by placing the instrument off-hook, loop current is caused to flow in loop B. The loop current is sensed by the Ring Trip Circuitry, which causes the RT Relay to operate. The operation of the RT Relay releases the LA Relay, which removes ring voltage from line B, and causes the front panel LED of the 6003 to light. The ringing of station A is similar to that described above, except the LB Relay, instead of the LA Relay, is involved.
- 4.4 Ground start operation is similar to loop start operation, except that seizure of line A is initiated by a ground on the ring lead, which causes LA Relay to operate. The operation of LA Relay connects the tip lead of both lines A and B to ground and supplies ringing to line B. Ring trip and the operation of RT Relay are identical to the same functions in loop start operation. The operated RT Relay maintains the ground on the tip lead of lines A and B.
- 4.5 Ringback tone is provided by the ringing current flow through the repeat coil. Additionally, the MST lead, which initiates the 9903 Subassembly when used, is grounded during the ringing of either station.
- 4.6 The internal voltage regulator in the 6003 consists of a series regulator with zener diode reference.

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6. Specifications

General

Loop Range Limitation (either line)	<ul style="list-style-type: none"> • –24VDC operation: 1500 ohms • –48VDC operation: 3000 ohms
Ringing Supply Voltage	• 85 to 130VAC, 16 to 67Hz (battery connected or ground connected ring generator)
Ring Trip Range (either superimposed or grounded ring generator)	<ul style="list-style-type: none"> • 24VDC bias: 1500 ohms • 48VDC bias: 3000 ohms
Ringing Interruption (using Tellabs 9903 Ringing Interrupter Subassembly)	• 2 seconds ringing, 4 seconds silent (starts in ringing state; trips ringing in either ringing or silent state)
Minimum Facility Leakage Resistance	• 20 kilohms
Frequency Response	• 300 to 3400Hz + 0.4dB, –1.2dB re 1004
Insertion Loss	• 0.8dB, maximum
Echo Return Loss	• 23dB, minimum
Power Requirements	<ul style="list-style-type: none"> • –22 to –56VDC, 18mA idle • 45mA operated, talking, 60mA operated, maximum
Longitudinal Balance	• 60dB, minimum
Longitudinal Environment	• 60VAC rms line induction (measured with module removed, and tip and ring connected together to ground through a 500-ohm resistor)

Physical

Operating Environment	• +20° to +130° F (–7° to +54° C), humidity to 95% (no condensation)
Dimensions	<ul style="list-style-type: none"> • 5.58 inches (14.17cm) high • 1.42 inches (3.61cm) wide • 5.96 inches (15.14cm) deep
Weight	<ul style="list-style-type: none"> • 6003: 20 ounces (567 grams) • 9903: 1 ounce (28 grams)
Mounting	• Relay rack or apparatus case via one position of Tellabs Type-10 Mounting Shelf

7. Testing, Technical Assistance, Repair and Return

- 7.1 Table 7-1 will assist in the testing or troubleshooting of the 6003 and will aid in the localization of trouble to this specific equipment. If the equipment seems to be defective, substitute new equipment (if possible) and conduct testing again. If further technical assistance is required, refer to paragraph 7.2 for phone numbers. If the substitute operates correctly, the original should be considered defective and returned to Tellabs for repair or replacement; see paragraph 7.3. We strongly recommend that no internal (component-level) testing or repairs be attempted on the equipment; unauthorized testing or repairs may void its warranty. Also, if the equipment is part of a registered system, unauthorized repairs will result in non-compliance with Parts 15 and/or 68 of the FCC Rules and Regulations.

Test	Procedure	Normal Conditions	If Normal Conditions Are Not Met, Verify:
Circuit Idle (loop start)	With circuit idle, access test points TA and RA and TB and RB with VOM on 50 or 250VDC scale	<ul style="list-style-type: none"> • Busy lamp out • Minimum 48VDC local talk battery on TA and RA • Minimum 48VDC local talk battery on TB and RB, with TB positive 	<ul style="list-style-type: none"> • Local power • Wiring • Switch S4 in LS position • No excessive cable leakage • No ground on ring conductor • No open switching cable pairs • Switching equipment operating properly • Replace module and retest
Circuit Idle (ground start)	With circuit idle, place VOM set to 50 or 250VDC scale across test point RA and ground, and across test point RB and ground	<ul style="list-style-type: none"> • Busy lamp out • -48VDC on line A ring (RA) • -48VDC on line B ring (RB) 	<ul style="list-style-type: none"> • Local power • Wiring • Switch S4 in GS position • No ground on tip conductors • No open or ground on ring conductors • No excessive cable leakage • No open switching cable pairs • Switching equipment operational • Replace module and retest
Ringing (LS or GS)	While accessing front panel test points with VOM set to 250VAC scale, create off-hook condition line A to test line B ringing, and vice versa	<ul style="list-style-type: none"> • Busy lamp out • Ringing of station follows immediately; other station off-hook • 65VAC, minimum, ringing voltage 	<ul style="list-style-type: none"> • Switches S5, S6, and S7 set correctly • Local power and other external conditions as per idle tests above • Replace module and retest (see Note below)
Ring Trip	With VOM set to 250VAC scale across TB and RB, ring line B by placing line A off-hook; answer by going off-hook at distant station B during both ringing and silent interval; repeat procedure, line B to line A	<ul style="list-style-type: none"> • Ring trip verified by removal of ringing voltage from called station line within 100ms of going off-hook • Busy lamp lights when called station answers 	<ul style="list-style-type: none"> • Stations within specified loop resistance limits • Ringing generator properly biased • Replace module and retest
Talking	Using test telset across TA and RA, converse with station B; repeat procedure, opposite direction	Normal conversation possible between stations	<ul style="list-style-type: none"> • Option switches correct • Replace module and retest
Call release	Starting with completed call, place stations back on-hook	<ul style="list-style-type: none"> • Busy lamp out when both stations returned to on-hook • No re-ring occurs after only one station returned to on-hook 	<ul style="list-style-type: none"> • Option switches correct • Longitudinal voltages (tip or ring to ground) less than 10VAC • No excessive cable leakage • Replace module and retest
Note: If the loop between the module and the station has excessive leakage resistance, or if capacitance in excess of 5 μ F exists between tip and ring, or from ring to ground, pre-trip may occur. This will be evidenced by a short burst of ringing during each ringing cycle. If this symptom occurs, the abnormal loop condition should be corrected.			

Table 7-1 Testing Guide Checklist

Technical Assistance

7.2 Contact Tellabs Technical Assistance as follows:

Location	Telephone	FAX
Tellabs International, Inc., Sucursal Buenos Aires, Argentina	+541.393.0764, .0892, or .0835	+541.393.0732
Tellabs Pty Ltd., Milsons Point NSW, Sydney, Australia	+61.2.9966.1043	+61.2.9966.1038
Tellabs Comm. Canada Ltd., Mississauga, Ontario, Canada	905/858-2058	905/858-0418
Tellabs International, Inc., Beijing, China	+86.10.501.1873	+86.10.501.1871
Tellabs International, Santa Fe de Bogota, Colombia	+571.623.3162 or .3216	+571.623.3047
Tellabs International, Inc., Dubai, U.A.E.	+971.4.373250	+971.4.376526
Tellabs U.K. Ltd., Bucks, England	+44.1494.555800	+44.1494.555801
Martis Oy, Espoo, Finland	+358.0.502.771	+358.0.502.7815
Tellabs SAS, France	+33.1.345.20838	+33.1.309.60170
Tellabs GmbH, Munich, Germany	+49.89.54.90.05.+ext. or 0 (switchboard)	+49.89.54.90.05.44
Tellabs H.K. Ltd., Hong Kong	+852.2866.2983	+852.2866.2965
Tellabs GmbH Rep. Office, Budapest, Hungary	+36.1.2681220	+36.1.2681222
Tellabs International, Inc., Bangalore, India	+91.80.6610826	+91.80.6615908
Tellabs, Ltd., County Clare, Ireland	+353.61.471433	+353.61.471000/472004
Tellabs de Mexico	525.282.1107, .1432, .1050, or .0981	525.282.0218
Tellabs Singapore Pte, Ltd., Singapore	+65.736.2855	+65.736.1231
Tellabs International, Inc., Seoul, South Korea	+82.2.589.0667 or .0668	+82.2.589.0669
Tellabs Southern Europe s.a., Barcelona, Spain	+34.3.414.70.16	+34.3.414.69.25
Tellabs AB, Stockholm, Sweden	+46.8.678.4040	+46.8.678.4041
Tellabs International, Inc., Bangkok, Thailand	+662.262.9065	+662.661.1141
USA and Puerto Rico	(800) 443-5555*	708/512-7097
*All other Caribbean and South American locations, or if the toll-free number is busy, telephone 708/969-8800		

Repair and Return

7.3 If equipment needs repair, contact Tellabs' Product Services Department with the equipment's model and issue numbers and warranty date code. You will be issued a Material Return Authorization (MRA) number and instructions on how and where to return the equipment.

Location	Telephone	FAX
Martis Oy, Espoo, Finland	+358.0.502.771	+358.0.502.7815
Tellabs Comm. Canada Ltd., Mississauga, Ontario, Canada	905/858-2058	905/858-0418
Tellabs, Ltd., County Clare, Ireland	+353.61.471433	+353.61.471000/472004
Tellabs Operations, Inc., Lisle, IL USA	(800) 443-5555 (USA and Puerto Rico only) 708/969-8800 (other International)	708/512-7097 (both)

- 7.4 Repair service includes an attempt to remove any permanent markings made by customers on Tellabs equipment. If equipment must be marked, it should be done with nonpermanent materials and in a manner consistent with the correct handling of electrostatically sensitive devices.

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