tellabs
technical manual
76-819011
rev A

practice section 819011

9011 Pulse/Trunk Link Repeater and Dual Pulse Corrector

contents

1. general

1.01 The 9011 Pulse/Trunk Link Repeater and Dual Pulse Corrector consists of a printed circuit module incorporating two independent circuits: an integral pulse corrector and provision for a second pulse corrector (9901 Pulse Corrector subassembly), each with associated circuitry. As such, the 9011 may be used as a Single Pulse Corrector, or, with the addition of the 9901 subassembly, as a Dual Pulse Corrector. The module may also be used as a Pulse Link Repeater or as a Trunk Link Repeater. Slide switches on the printed circuit board portion of the 9011 accommodate any of the above applications.

1.02 When used as a Single Pulse Corrector, the 9011 provides E-lead-in/E-lead-out correction of dial pulses transmitted at an 8-14pps (pulse per second) rate. Both integral and optional pulse correctors of the 9011 are "full" precision correctors; that is, they reshape both make and break portions of the dial pulse. Input dial pulses at 8-12pps, with 30 to 70% break, are corrected to 58±2% break. Dial pulses input at 14pps, with 40-65% break, are corrected to 57±3% break.

1.03 When supplied with the optional 9901 Pulse Corrector subassembly, the 9011 may be used as a Dual Pulse Corrector, providing one-way pulse correction for two independent signaling circuits, or two-way correction for a single circuit. In the latter case, E-lead inputs result in E-lead outputs and M-lead inputs result in M-lead outputs.

1.04 When optioned for use as a Pulse Link Repeater, the 9011 converts E-lead inputs to M-lead outputs. If the optional 9901 Pulse Corrector subassembly is supplied in this application, bi-directional dial pulse correction is provided to the circuit. If only one-way pulse correction is required, the 9011 may be provided without the 9901 subassembly, and the 9901 connector pins must be bypass strapped as described in paragraph 3.07.

1.05 When optioned for use as a Trunk Link Repeater, the 9011 converts M-lead inputs to E-lead outputs. As in Pulse Link Repeater applications, the 9901 Pulse Corrector subassembly may be used to provide bi-directional dial pulse correction, or if only one-way correction is needed, the 9901 is excluded and its connector pins bypass strapped.

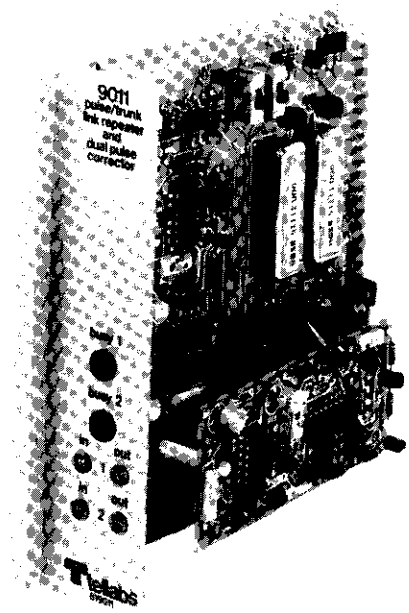


figure 1. 9011 module with 9901 subassembly

1.06 Front panel busy lamps on the 9011 glow red to indicate a busy condition of either circuit. The 9011's front panel also incorporates input and output test point access to each circuit.

1.07 Two, fixed 23dB, 600 ohm attenuators are provided for (+7dBm receive and −16dBm transmit) 4wire transmission level coordination. Access to these attenuators is brought out to the card connector, allowing their use through optional wiring.

1.08 The 9901 Pulse Corrector subassembly mounts in "piggyback" fashion to the host 9011 module. Mounting is accomplished by a four-pin connector and a snap-in plastic retainer.

1.09 M-lead output current limiting circuitry protects the 9011 from overload conditions.

1.10 Internal regulation circuitry allows the 9011 to operate on −22 to −56Vdc input power.

1.11 As a Tellabs Type 10 module, the 9011 may be relay rack or apparatus case mounted via the Type 10 Shelf. In relay rack applications, up to 12 modules may be mounted across 6" vertical space in a 19" rack. A 23" rack will accommodate up to 14 modules across the same 6" vertical space.

2. application

2.01 The 9011 Pulse/Trunk Link Repeater and Dual Pulse Corrector module provides E and M-lead signaling state conditioning and pulse correction, or pulse correction alone, to an E and M signaling facility. When applied as either a Pulse Link Repeater or a Trunk Link Repeater, the 9011 converts E and M-lead states and provides pulse correction at the back-to-back interface point of the two E and M facilities. The distance between the back-to-back E and M signaling or channel units interconnected by the 9011 is the normal maximum (approximately 100 ohms) for the extension of E and M leads. When used only for its Pulse Correction capability, the 9011 may be located at either intermediate or terminal points in the signaling facility.

2.02 The 9011 may be applied to 2wire or 4wire E and M signaling links. In 2wire applications, transmission leads bypass the 9011, and only the E and M-leads are affected by the module. In most 4wire applications, both transmission leads and E and M-leads are connected through the module. Fixed 23dB pads in the 9011 attenuate 4wire transmission levels (see paragraph 2.07). The 4wire transmission leads may optionally be wired to bypass the 9011 module if 23dB attenuation is not required.

2.03 Either of the two circuits of the 9011 (incorporating the integral or optional dial pulse correction circuitry) may be (independently) switch optioned for E-lead input to E-lead output, M-lead input to M-lead output, E-lead input conversion to M-lead output, or M-lead input conversion to E-lead output. The way in which these switches are optioned determines the application of the 9011 as a Pulse Corrector, a Pulse Link Repeater, or a Trunk Link Repeater.

2.04 When applied as a Dual Pulse Corrector, the 9011 is used to condition dial pulses in a two-way-dial E and M channel. In this mode of application, E-lead inputs derive E-lead outputs and M-lead inputs derive M-lead outputs. When the optional 9901 Pulse Corrector subassembly is not utilized, the 9011 module may also be applied as a simple, one-way, E-lead pulse corrector. See figure 2.

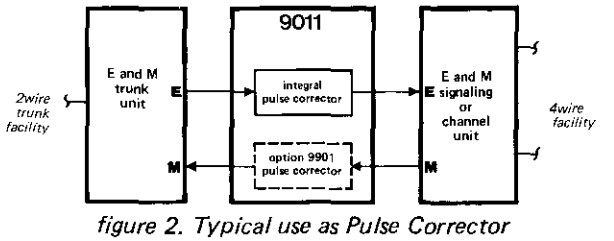


figure 2. Typical use as Pulse Corrector

2.05 In Pulse Link Repeater applications, the 9011 allows back-to-back connection of two E and M circuits characterized by the E and M signaling scheme normally encountered in the back-to-back interface of two E and M signaling channels. As such, the 9011 provides the bi-directional E-lead input to M-lead output conversion required at this point in the circuit. See figure 3. Two-way pulse correction is normally supplied in this application, but the 9011 may also be supplied without the 9901 to provide one-way correction, in which case, strapping of the 9901 receptacle is required.

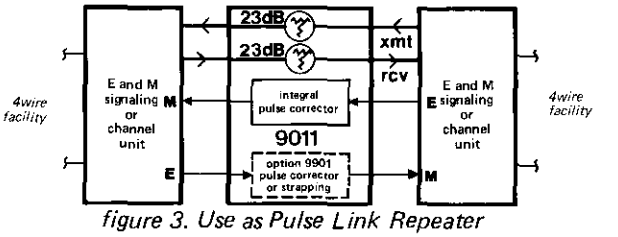


figure 3. Use as Pulse Link Repeater

2.06 In Trunk Link Repeater applications, the 9011 allows back-to-back connection of two E and M signaling circuits characterized by the E and M signaling scheme normally encountered at the back-to-back interface of two trunk circuits. As such, the 9011 provides the bi-directional M-lead input to E-lead output conversion required at this point in the circuit. See figure 4. Two-way pulse correction is normally supplied in this application, but the 9011 may also be used without the 9901 to provide one-way correction, in which case, strapping is required at the 9901 receptacle.

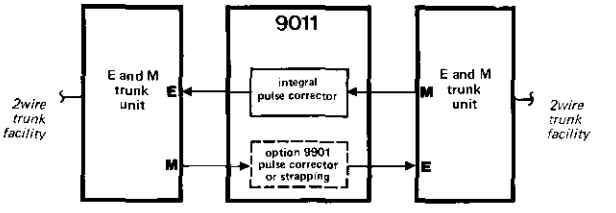


figure 4. Use as Trunk Link Repeater

2.07 Two, fixed 23dB, 600 ohm attenuators, integral to the 4wire transmission path through the 9011, provide proper 4wire transmission levels (+7dBm receive and −16dBm transmit) for the back-to-back interface of two 4wire carrier signaling or channel units. Wiring may be provided to bypass these 23dB pads in applications in which they are not required.

3. installation

inspection

3.01 The 9011 module should be visually inspected upon arrival in order to find possible damage incurred during shipment. If damage is noted, a claim should immediately be filed with the shipper. If stored, the module should be visually inspected again prior to installation.

mounting

3.02 Each 9011 module 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 module plugs physically and electrically into a 56-pin connector at the rear of the Type 10 Shelf.

installer connections

3.03 Before making any connections to the Mounting Shelf, make sure that power is **off** and modules are **removed.** Module(s) should be put into place only **after** wiring has been completed.

3.04 The following, table 1, lists connections to the 9011 module. All connections are made via wire wrap at the 56-pin connector at the rear of the modules' mounting shelf position. Pin numbers are found on the body of the 56-pin connector.

connect	to pin
battery (−22 to −56Vdc input)	35
ground input	17
input, circuit 1	47
output, circuit 1	33
circuit 1, battery	41
circuit 1, ground	39
input, circuit 2	37
output, circuit 2	31
circuit 2, battery	45
circiut 2, ground	43
If 23dB attenuation is required in each circuit to interface 4wire transmission levels, the following connections are made.	
TT (transmit Tip input)	55
TR (transmit Ring input)	49
TT1 (transmit Tip output)	51
TR1 (transmit Ring output)	53
RT (receive Tip output)	5
RR (receive Ring output)	15
RT1 (receive Tip input)	7
RR1 (receive Ring input)	13

table 1. Connections to the 9011 module

CAUTION: Because the 9011 module incorporates two mercury-wetted relays, this module should always be held in an upright position and tapped gently on a hard surface before installation. The module should then be kept in an upright position until installation to be sure that the mercury is in its proper place within the relays.

3.05 In less common modes of application, pins 41, 39, 45 and 43 may not be connected to their respective battery and ground designations as shown in table 1, above. They may instead be utilized as relay contact opens or closures. Pins 41 and 39 are, respectively normally closed and normally open contacts, with pin 33 as a common. Pins 45 and 43 are, respectively, normally closed and normally open, with pin 31 as a common. See the Block Diagram, section 5, for clarification.

option selection

3.06 Four slide switches, S1 through S4, are used to adapt the module for its various E-lead and M-lead input and output states. Each switch may be set to position "E" or position "M", as labeled on the printed circuit board adjacent to the switch. See figure 5. The input mode (E or M) to circuit 1 is selected by switch S1 and the output mode by switch S2. Circuit 2 input mode is selected by switch S3 and its output mode by switch S4. Select the input and output modes required by your application. (For example, if the 9011 is to be used in a standard Pulse Link Repeater application, set input switches S1 and S3 to position E and output switches S2 and S4 to position M.) Refer to paragraphs 2.04 through 2.06 for an explanation of standard application input and output modes.

3.07 In two-way applications not requiring the optional 9901 Pulse Corrector, insert a short jumper wire between positions 2 and 3 of the 4-pin receptacle on the 9011 module (see figure 5).

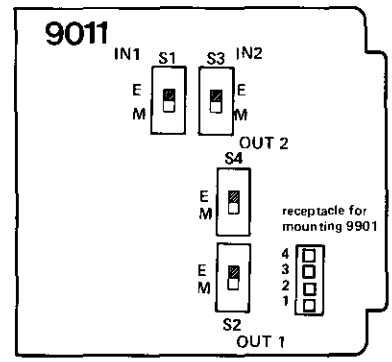


figure 5. Switch locations on the 9011 module

4. circuit description

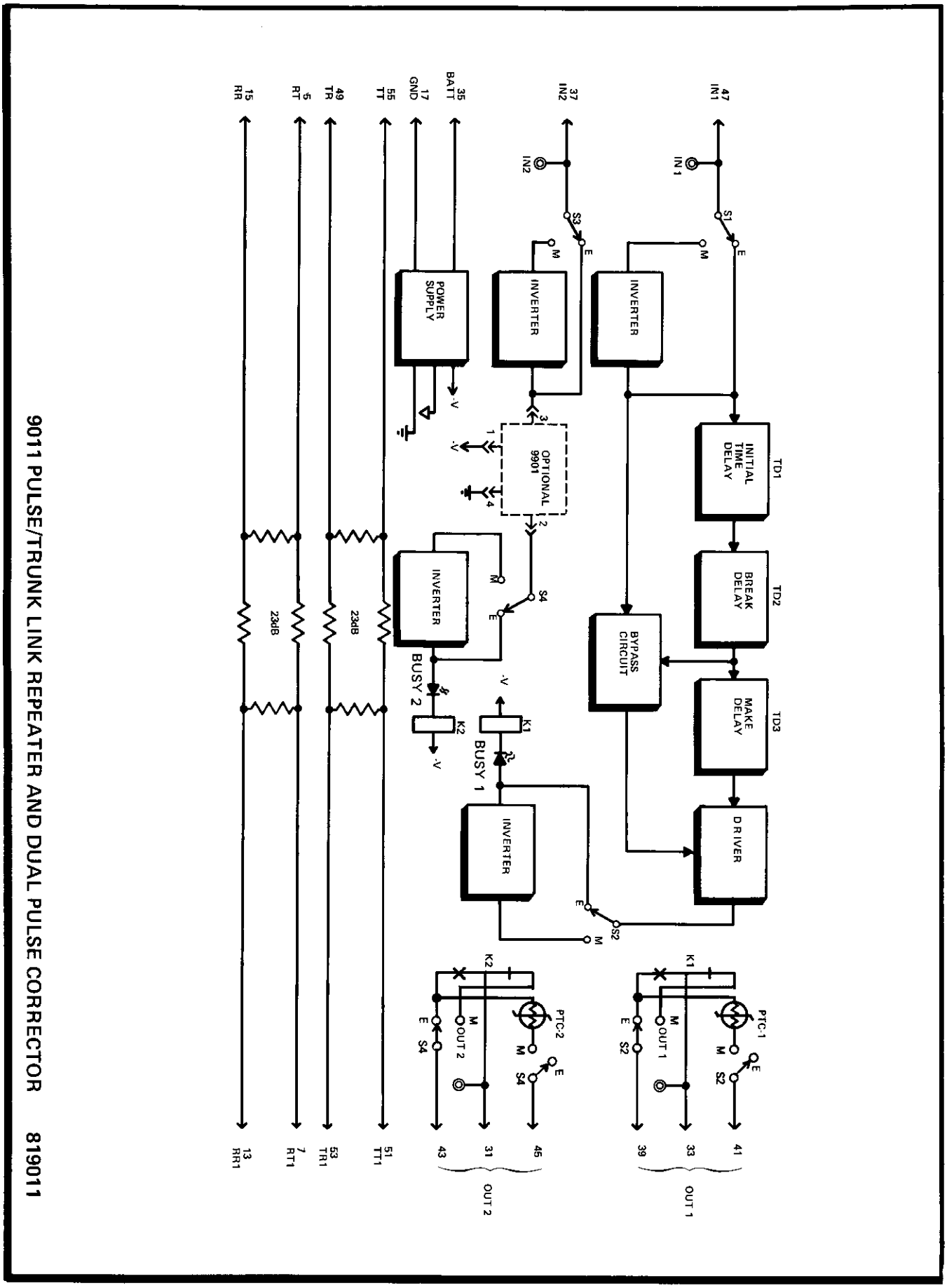
4.01 (This description may be followed on the Block Diagram, Section 5 of this Practice.) The 9011 Pulse/Trunk Link Repeater and Dual Pulse Corrector circuitry consists of two full pulse corrector circuits (one integral and one optional), each preceded by an INVERTER. Switch options allow the INVERTER in each channel to be used or bypassed, thus providing the various E and M input and output states required for the module's multiple applications.

4.02 Integral and optional pulse correctors incorporate identical circuitry, as described in paragraph 4.03.

4.03 Dial pulse correction is provided through use of three time-delay circuits — TD1, TD2 and TD3. Time delay circuit TD1 provides an initial time delay of approximately 15ms, so that signals of less than 15ms duration do not activate the pulse correction circuitry. When the input of either corrector is seized by the application of a ground of more than 15ms duration, the dc BYPASS CKT is activated, causing the DRIVER circuit to turn on, providing a ground to the output. At the beginning of the first break interval, TD2 is set and holds the DC BYPASS CKT activated, maintaining the ground output. After TD2 completes timing, a third time delay circuit, TD3, is activated, providing a signal that causes an open to appear at the output. The open output condition remains until TD3 completes its timing cycle. TD3 is a variable timing circuit, and if TD2 is reset by the next input break pulse before TD3 completes its timing interval, that timing interval will be shortened. The resetting of TD2 and TD3 before expiration of their natural timing intervals accommodates pulsing rates of greater than 10pps.

4.04 Fixed, 23dB, 600 ohm T-pads provide attenuation, if required, in the 4wire transmission leads of each channel.

4.05 Internal voltage regulation provided by the POWER SUPPLY is derived from a series regulator with zener diode reference.



9011 PULSE/TRUNK LINK REPEATER AND DUAL PULSE CORRECTOR 819011

5. BLOCK DIAGRAM

6. specifications

signaling states
M-lead: on-hook, ground; off-hook, resistance battery
E-lead: on-hook, open; off-hook, ground

M-lead output current limiting
120mA (limits M-lead output to 5mA upon activation. Resets automatically upon removal of overload)

pulsing range
8 to 14pps

pulse correction
input 8 to 12pps, 30-70% break, is corrected to 58±2% break
input 14pps, 40-65% break, is corrected to 57±3% break

pulse corrector input states
ground (make) and open (break)

pulse corrector output states
ground (make) and open (break) (100mA maximum current, 50Vdc maximum)

input to output delay
10ms minimum; 15ms nominal

4wire attenuation wiring option
600 ohms, 20dB ERL minimum, 23dB±0.5dB

input power
−22 to −56Vdc, 60mA nominal, plus M-lead output current (55mA nominal if provided without 9901 Pulse Corrector subassembly)

output capability (E-lead)
500mA non-inductive
100mA inductive 60Vdc

output capability (M-lead)
100mA maximum resistive battery

operating environment
20° to 130°F (−7° to 54°C), humidity to 95%, no condensation

weight
12 ounces (.34kg)

dimensions
5.58" high (14.17cm)
1.42" wide (3.61cm)
5.96" deep (15.14cm)

mounting
one position Tellabs Type 10 Shelf or one position Wescom Type 400 Shelf

7. testing and troubleshooting

7.01 This Troubleshooting Guide may be used to assist in the installation, testing or troubleshooting of the 9011 Pulse/Trunk Link Repeater and Dual Pulse Corrector module. The Guide is intended as an aid in the localization of trouble to a specific module. If a module is suspected of being defective, a new module should be substituted, and the test conducted again. If the substitute module operates correctly, the original module should be considered defective and returned to Tellabs for repair or replacement. It is strongly recommended that no "internal" testing or repair be attempted on the 9011 module. Unauthorized testing or repair may void the 9011's warranty.

7.02 For testing purposes, the 9901 Pulse Corrector subassembly may be dealt with as a separate entity from the 9011 module. If only circuit 2 in the module malfunctions, fault might be in the 9901 subassembly. Substitute another subassembly and retest. If operation is then normal, consider the subassembly defective and return it to Tellabs for replacement or repair as per 7.03 – 7.05 below.

7.03 If a 9011 is diagnosed as defective, the situation may be remedied by either "replacement" or "repair and return". Because it is the more expedient method, the "replacement" procedure should be followed whenever time is a critical factor (i.e.; service outages, etc.).

replacement

7.04 If a defective 9011 is encountered, notify Tellabs directly, via telephone, letter or twx. Notification should include all relevent information, including the 8X9011 part number (from which we can determine the Issue of the 9011 in question). Upon notification, we shall ship a replacement 9011 to you. If the Warranty date of the 9011 has not elapsed, the replacement module will be shipped at no charge. Package the defective 9011 in the replacement module's carton; sign the packing list included with the replacement 9011 and enclose it with the defective module (this is your return authorization); affix the preaddressed label(s) provided with the replacement module to the carton(s) being returned; and ship the equipment prepaid to Tellabs.

repair and return

7.05 Return the defective 9011, shipment prepaid, to Tellabs. Enclose an explanation of the module's malfunction. Follow your company's standard procedure with respect to administrative paperwork. Tellabs will repair the module and ship it back to you. If the module is in Warranty, no invoice will be issued.

7.06 If a situation arises that is not covered in the Troubleshooting Guide, contact Tellabs Customer Service for further assistance.

Testing Guide Checklist on page 6.

Testing Guide Checklist

TEST	TEST PROCEDURE	NORMAL RESULT	IF NORMAL CONDITIONS NOT MET, VERIFY
Pulse Correction	Input dial pulses at 10pps, 50% break at ckt 1 input test point. Measure result at output test point. Repeat at 30% break and 70% break. Repeat procedure for ckt 2, if equipped with 9901 Pulse Corrector subassembly.	Measure dial pulses at 10pps, 58±2% break ☐.	Option switches ☐. 9901 Pulse Corrector seated properly in connector ☐. Input and output of Test Set and module match ☐. If trouble in only ckt 2, replace 9901 and retest ☐. Replace 9011 and retest ☐.
E and M States	If optioned for Pulse Link Repeater use, input E-lead states to ckt 1; repeat for ckt 2.	Observe M-lead state outputs ☐.	Option switches ☐. Wiring ☐. Replace 9011 and retest ☐.
	If optioned for Trunk Link Repeater use, input M-lead states to ckt 1; repeat for ckt 2.	Observe E-lead state outputs ☐.	Option switches ☐. Wiring ☐. Replace 9011 and retest ☐.
	If optioned for Dual or Single Pulse Corrector use, input E-lead or M-lead states to ckt 1, and to ckt 2 if equipped with 9901 subassembly.	Observe E-lead output if E-lead input ☐. Observe M-lead output if M-lead input ☐.	Option switches ☐. Wiring ☐. Replace 9011 and retest ☐.