3192-7F Mod 1 SmartSpan™ T1 Powering Office Repeater with Addressable Bidirectional Loopback (W/ALB)

CLEI™ Code: T1R5KXTGAA

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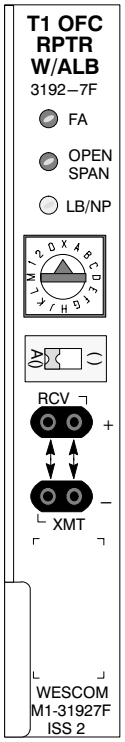

Figure 1. 3192-7F Mod 1 Front Panel

1. GENERAL

1.1 Document Purpose

This practice provides general, installation, and testing information for the Charles Industries 3192-7F Mod 1 SmartSpan™ T1 Powering Office Repeater with Addressable Bidirectional Loopback (W/ALB), depicted in Figure 1. For additional information on the SmartSpan System, refer to practice Section CS2–70F–100.

1.2 Document Status

This document is reprinted to provide a general editorial update.

1.3 Equipment Function/Description

The 3192-7F Mod 1, which is part of the SmartSpan System, provides regeneration, a span power supply, and addressable signal loopback. The 3192-7F Mod 1 version is a slightly modified 3192-7F that is now backward compatible with long T1 spans using more than 8–13 standard 239 line repeaters.

1.4 SmartSpan Description

Repeatered T1 metallic facilities in the distribution loop carry some of today's highest valued traffic. Superior error performance, low outage times, and reliable operation are demanded by today's sophisticated end user. The Charles Industries SmartSpan System brings a new level of maintenance and diagnostic capabilities to the metallic spans. Analog fault locating techniques, fault locating pairs, and filters are no longer required. All SmartSpan network elements feature individually-addressable bidirectional loopback, allowing the test center or a craftsperson at a customer's location to quickly and accurately sectionalize T1 facility problems. Addressing information is carried on an inband basis at the T1 rate, allowing access from any point in the network. The SmartSpan System consists of T1 Line Repeaters (CS270F) packaged in standard 239-type mechanics and T1 Powering Repeaters for mounting in AT&T 220 mechanics (3423-7F) and in Charles Industries STS-3192 mechanics (3192-7F).

1.5 Equipment Mounting

The 3192-7F Mod 1 is an STS 3192-type plug-in module that mounts in a 3192-type mounting shelf.

1.6 Equipment Features

The 3192-7F Mod 1 includes the following features:

- STS 3192-type mechanics
- Auto Power Loop (APL) feature lets the office and test center know if an open circuit occurs between the 3192-7F and the first smart line repeater
- Bidirectional signal loopback allows one person testing from the field, office, or test center
- Automatic Span Power Regulator (ASPR)
- Switch selectable –130 or +/–130 V span powering
- Accommodates 60 mA spans
- Bidirectional span power operation
- Switch selectable span power or no power to span/customer interface
- Receive regeneration with wide range ALBO to accommodate 0 to 35 dB cable loss
- Switch selectable transmit side LBO
- Integral per-circuit fusing with front panel fuse alarm (FA) LED and alarm lead output
- Front-panel-mounted pin jacks to monitor span voltages and current
- Front-panel-mounted LED indicators showing loopback and APL status (OPEN SPAN)

- Lightning and power cross protection per GR-1089-CORE
- Meets TR-TSY-000499 jitter requirements

2. INSPECTION

2.1 Inspect for Damages

Inspect the equipment thoroughly upon delivery. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company.

2.2 Equipment Identification

Charles Industries equipment is identified by a model and issue number imprinted on the equipment front panel. Each time a major engineering design change is made, the issue number is advanced by one and imprinted on subsequent units manufactured. Thus, be sure to include both the model number and its issue number when making inquiries.

2.3 Static Concerns

Each unit is shipped in static-protective packaging to prevent electrostatic charges from damaging static-sensitive devices. Use approved static-preventive measures when handling modules outside of their protective packaging. A module intended for future use should be tested as soon as possible and returned to its original packaging for storage.

STATIC-SENSITIVE

This equipment contains static-sensitive electronic devices. To prevent electrostatic charges from damaging static-sensitive units:

Use approved static-preventive measures (such as static-conductive wrist straps and static-dissipative mats) at all times whenever touching units outside of their original, shipped, protective packaging.

Do not ship or store units near strong electrostatic, electromagnetic, or magnetic fields.

Always use the original static-protective packaging for shipping or storage.

3. OPTIONS

The 3192-7F Mod 1 SmartSpan T1 Powering Office Repeater with Addressable Bidirectional Loopback (W/ALB) is designed for simple, quick installation and provisioning with slide and DIP switches and a front-panel-mounted rotary switch to condition the module for the required operation. Option locations are shown in Figure 2.

3.1 Switch S1 (4.5, 7.5, 15 XMT LBO)

Switch S1 options the T1 facility pad for a 0.0, 4.5, 7.5, 12.0, 15.0, 19.5, 22.5, and 27.0 dB loss on the transmit side. Condition switch S1 (3 sections) for the desired amount of loss.

3.2 Switch S2 (DSX Pre-equalizer)

Switch S2 provides switch selectable DSX pre-equalization for up to 655 feet of 22 gauge cable. Refer to the chart provided in Figure 3. Condition switch S2 for the desired pre-equalization range.

3.3 Switch S4 (–130, +/–130)

To provide only –130V to the span, set switch S4 to position –130. To provide +/–130 volts for longer spans, set switch S4 to the +/–130 position.

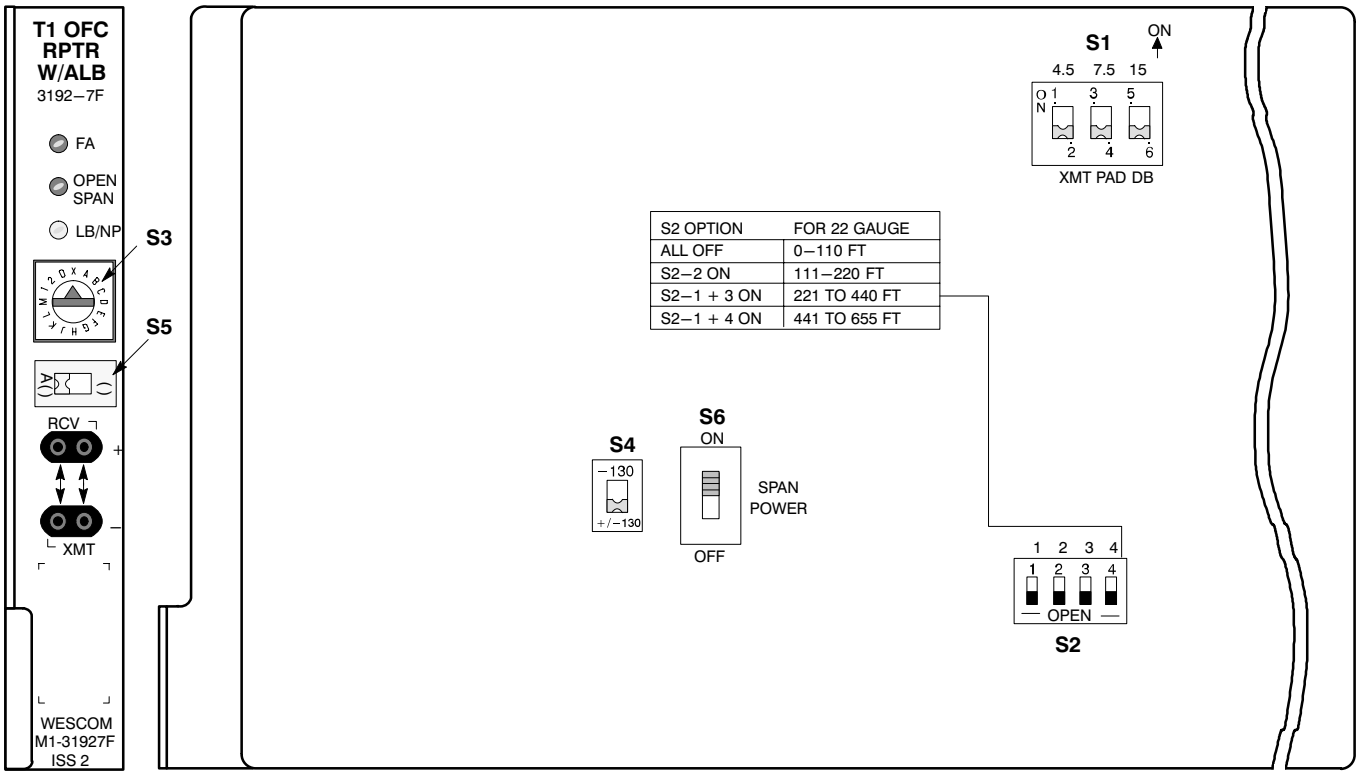

Figure 2. 3192-7F Front Panel Option Locations

Table 1. 3192-7F Front Panel Function Description and Option Summary

Item	Description	Function
FA (fuse alarm)	Red LED	Indicates that the internal fuse on the 3192-7F has opened. The fuse is not field replaceable.
Open Span	Red LED	Indicates that the unit has detected a field side open condition between the office and the first smart line repeater.
LB/NP	Amber LED	Continuous: Indicates loopback transmission. Flash: Indicates that no address has been assigned (non-provisioned).
S1	XMT PAD DB	Provides transmit side LBO loss settings of 0.0, 4.5, 7.5, 12.0, 15.0, 19.5, 22.5 and 27.0 dB.
S2	DSX pre-equalizer	Provides DSX pre-equalization for up to 655 feet of 22 gauge cable. See above.
S4	–130 or +/–130	Selects –130V or +/–130V for span powering.
S6	Span power On/Off	Allows power to span (on) or removes all power from span (off).
Voltage and Current Test Pins		Used for measuring span current and voltage.

Note: Note: For S3 and S5, see Figure 4.

3.4 Front-Panel-Mounted Rotary Switch S3 & Slide Switch S5 (Repeater Address Code)

Use S3 and S5 to assign the repeater address. All SmartSpan System repeaters use the same protocol and addressing conventions. SmartSpan provides for a total of 30 addresses, which is more than sufficient for all distribution loop applications. The addresses can be associated with the office repeater or line repeater locations. With S5 in the ( ) position, S3 provides 15 addressable positions (A through M, 0, 1, and 2), plus position X. Placing S5 in the A( ) position provides another 15 addressable positions (AA through AM, A0, A1, and A2), plus posi-

tion X. Addresses A through M and AA through AM correspond to traditional fault locate filter numbering. Addresses 0, 1, 2, A0, A1, and A2 can be used for office repeater locations. It is suggested that the first repeater be assigned address A, the second be assigned address B, etc. Referring to Figure 3, set front panel switches S3 and S5 for the unit's desired unique address. To disable the loopback code detector, place switch S3 in the X position. S3 in the X position will cause the LB/NP LED to flash.

Note: Switch S5 has no effect when the switch S3 is in the X position.

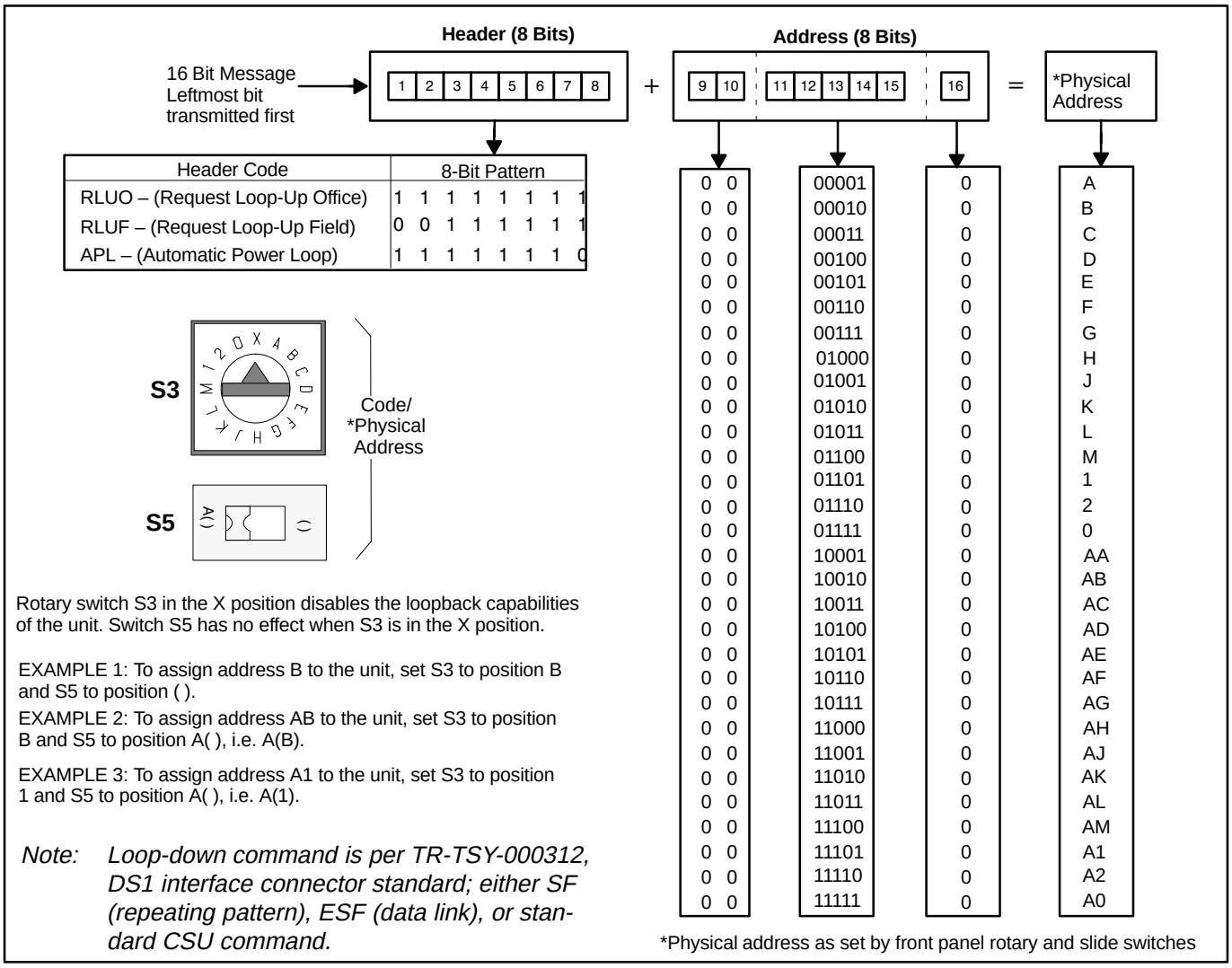

Figure 3. Message Bit Sequence and Assignment

3.4.1. Address/Code Sequences

The SmartSpan System uses 16-bit message code sequences for loopback activation and APL (Automatic Power Loop) messages. These sequences are sent as repeating patterns in the T1 payload. Each 16-bit sequence consists of two parts of 8 bits each: Header and Address. There are three different *header codes* as listed below:

- **RLUO** (Request Loop-Up Office)
- **RLUF** (Request Loop-Up Field)
- **APL** (Automatic Power Loop)

Each header name (RLUO, RLUF and APL) corresponds to a specific 8-bit pattern, as shown in Figure 4. Likewise, the address field (ADD) consists of an 8-bit sequence and has 30 possible address combinations whose specific bit allocations are shown in Figure 4. The following are message name examples:

- **RLUO/ADD** (**R**equest **L**oop-**U**p **O**ffice/**ADD**ress)
- **RLUF/ADD (R**equest **L**oop-**U**p **F**ield/**ADD**ress)
- **APL** (**A**utomatic **P**ower **L**oop)

3.5 Switch S6 (Span Power On/Off)

To provide 60 mA power to repeatered spans, place this switch in the ON position. To remove power from Span/ Customer Interface side, place S6 in the OFF position.

CAUTION

Shock hazard! Voltages up to 260 VDC may be present on the span line. Always exercise caution when wiring a live circuit or when performing maintenance.

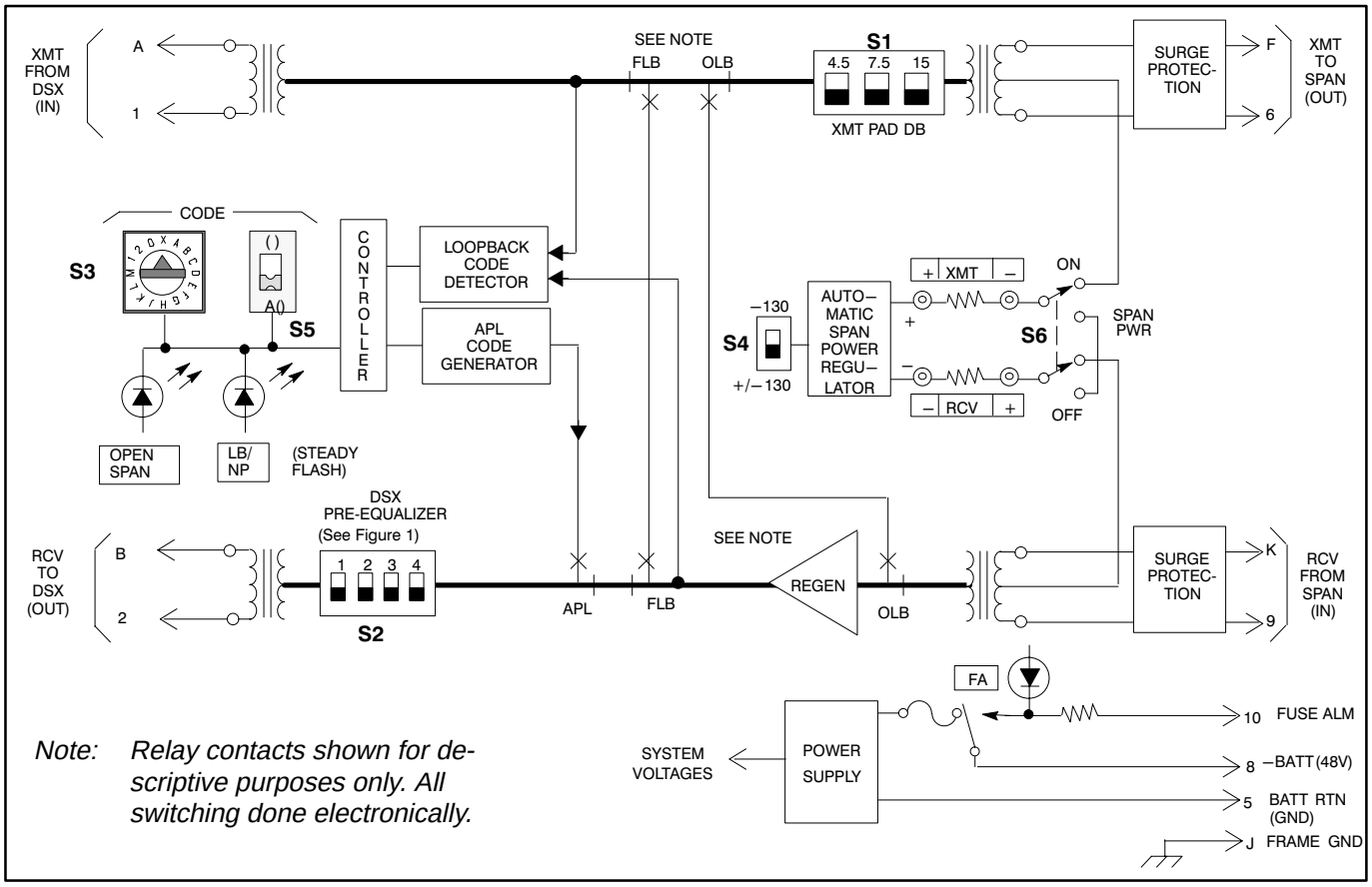

Figure 4. 3192-7F Block Diagram

4. MOUNTING

After optioning the unit, mount it in an STS 3192-type mounting shelf.

CAUTION

Installation and removal of modules should be done with care. Do not force a module into place. If excessive resistance is encountered while installing a module, remove the module and check the card guides and connector to verify proper alignment and remove any foreign material.

5. TESTING & TECHNICAL ASSISTANCE

5.1 Testing

Use the following procedure to test the unit. This basic test is performed with the unit powered up on a live T1 span.

CAUTION

If live customer traffic is present on the span, this test will interrupt the customer traffic.

Step	Action	Verification
1.	Perform an office side loop-up function on the tested repeater by sending the following 16 bit repeating pattern: 11111111 00 NNNNN 0 (where NNNNN is the address of the repeater being tested). Leftmost bit transmitted first.	After 5-8 seconds the tested repeater loops-up & returns the 11111111 00 NNNNN 0 repeating pattern. The 3192- 7F LB/NP LED lights (or CS270F NP/SLB LED lights).
2.	Remove the repeating pattern. Normally the unit will time out after 20 minutes and return to the idle state. The 20-minute time period can be extended indefinitely by sending the loop-up request again as in Step 1, before the 20-minute time out ends. At this time, bit patterns and stress testing can be done.	
3.	Loop-down the unit by sending a standard DS1 Interface Connector Loop-down command in either SF (11100 repeating pattern) or ESF (1111111 0 010010 0 in the ESF data link). Standard TR-TSY-000312 criteria apply for these commands. A standard CSU loop-down command (100 repeating pattern) can also be sent to loop-down the unit.	LB/NP extinguishes (or CS270F NP/SLB LED extinguishes).
4.	Perform a field side loop-up function on the tested repeater by sending the following 16 bit repeating pattern: 00111111 00 NNNNN 0 (where NNNNN is the address of the repeater being tested). Leftmost bit transmitted first.	After 5-8 sec. the tested repeater loops-up and returns the 00111111 00 NNNNN 0 repeating pattern. LB/NP LED lights (or CS270F NP/SLB lights).
5.	Repeat Step 2.	
6.	Repeat Step 3.	LB/NP LED (or NP/SLB LED on CS270F) extinguishes.
7.	This concludes the test.	

Note: If unframed repeating pattern: 11111110 00 NNNNN 0 is received at the office side of the 3192-7F, then this indicates that either the 3192-7F or CS270F repeater has detected a field side open and has automatically switched to LOOP SX power. The 3192-7F OPEN SPAN LED or CS270F PLB LED will light. The NNNNN is the address of the CS270F repeater before which the open occurred.

6. TECHNICAL ASSISTANCE

6.1 Technical Assistance — U.S.

If technical assistance is required, contact Charles Industries' Technical Services Center at:

847–806–8500
847–806–8556 (FAX)
800–607–8500
techserv@charlesindustries.com (e-mail)

6.2 Technical Assistance — Canada

Canadian customers contact:

905–821–7673 (Main Office)
905–821–3280 (FAX)

7. WARRANTY & CUSTOMER SERVICE

7.1 Warranty

Charles Industries, Ltd. offers an industry-leading, 5-year warranty on products manufactured by Charles Industries. Contact your local Sales Representative at the address or telephone numbers below for warranty details. The warranty provisions are subject to change without notice. The terms and conditions applicable to any specific sale of product shall be defined in the resulting sales contract.

Charles Industries, Ltd.
5600 Apollo Drive
Rolling Meadows, Illinois 60008–4049
847–806–6300 (Main Office)
847–806–6231 (FAX)

7.2 Field Repairs (In-Warranty Units)

Field repairs involving the replacement of components within a unit are not recommended and may void the warranty and compatibility with any applicable regulatory or agency requirements. If a unit needs repair, contact Charles Industries, Ltd. for replacement or repair instructions, or follow the *Repair Service Procedure* below.

7.3 Advanced Replacement Service (In-Warranty Units)

Charles Industries, Ltd. offers an "advanced replacement" service if a replacement unit is required as soon as possible. With this service, the unit will be shipped in the fastest manner consistent with the urgency of the situation. In most cases, there are no charges for in-warranty repairs, except for the transportation charges of the unit and for a testing and handling charge for units returned with no trouble found. Upon receipt of the advanced replacement unit, return the out-of-service unit in the carton in which the replacement was shipped, using the pre-addressed shipping label provided. Call your customer service representative at the telephone number above for more details.

7.4 Standard Repair and Replacement Service (Both In-Warranty and Out-Of-Warranty Units)

Charles Industries, Ltd. offers a standard repair or exchange service for units either in- or out-of-warranty. With this service, units may be shipped to Charles Industries for either repair and quality testing or exchanged for a replacement unit, as determined by Charles Industries. Follow the *Repair Service Procedure* below to return units and to secure a repair or replacement. A handling charge applies for equipment returned with no trouble found. To obtain more details of this service and a schedule of prices, contact the CI Service Center at 217–932–5288 (FAX 217–932–2943).

Repair Service Procedure

1. Prepare, complete, and enclose a purchase order in the box with the equipment to be returned.

2. Include the following information:

– Company name and address
– Contact name and phone number
– Inventory of equipment being shipped
– Particulars as to the nature of the failure
– Return shipping address

3. Ship the equipment, purchase order, and above-listed information, transportation prepaid, to the service center address shown below.

   CI Service Center
   Route 40 East
   Casey, IL 62420–2054

4. Most repaired or replaced units will be returned within 30 or 45 days, depending on the product type and availability of repair parts. Repaired units are warranted for either 90 days from the date of repair or for the remaining unexpired portion of the original warranty, whichever is longer.

8. SPECIFICATIONS

8.1 Electrical

The electrical characteristics of the unit are as follows:

(a) OFFICE REPEATER TYPE: Passive transmit; regenerative receive.

(b) LINE SIGNAL TYPE: Bipolar at 1.544 Mbps +/–200 bps.

(c) REPEATER LINE SIGNAL PULSE AMPLITUDE: 6V base-to-peak.

(d) REPEATER LINE SIGNAL PULSE WIDTH: 324 +/–30 nsec.

(e) REPEATER LINE SIGNAL PULSE OVER SHOOT: 10 to 30 percent of pulse height, 20 percent nominal.

(f) REPEATER LINE SIGNAL PULSE RISE AND FALL TIME: 100 nsec maximum.

(g) PORT IMPEDANCE: 100 ohms nominal at 772 kHz.

(h) RECEIVE LINE BUILD-OUT: Automatic, 0.0 to 35 dB.

(i) AC LONGITUDINAL IMMUNITY: 1000 mA peak-to-peak.

(j) SURGE PROTECTION: Per GR-1089-CORE

(k) JITTER REQUIREMENTS: Meets TR-TSY-000499

(l) MAXIMUM PLUG-IN INPUT CURRENT AND HEAT RELEASE: See Table 2.

Table 2. Maximum Input Current & Heat Release

Application	Loop Simplex Resistance	Maximum Plug-in Input Current @ –42.5 volts	Maximum Plug-in Heat Release
Repeaterless	500 ohms	0.100 amps	2.4 watts
CSA	800 ohms	0.135 amps	2.8 watts
130 volt limit	2160 ohms	0.250 amps	2.7 watts
260 volt limit	4300 ohms	0.490 amps	5.1 watts

8.2 Physical

The physical characteristics of the unit are shown in Table 3.

Table 3. Physical Specifications

Feature	U.S.	Metric
Height	4.75 inches	12.1 centimeters
Width	0.625 inch	1.6 centimeters
Depth	10.5 inches	26.7 centimeters
Weight	9.5 ounces	269.3 grams
Temperature	–40 to +149° F	–40 to +65° C
Humidity	to 95% (no condensation)