

360-22 Automatic Protection Switch Kit

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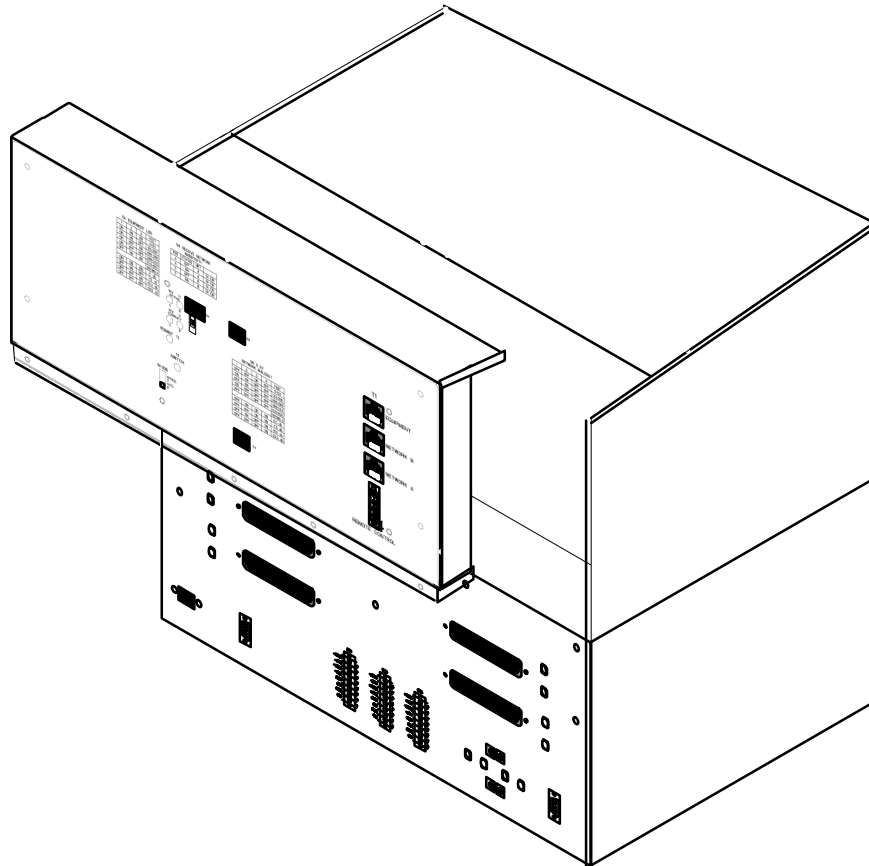


Figure 1. The back of the 360-22 showing how the APS kit is installed

1. GENERAL

1.1 Document Purpose

This document provides a general description of the Charles Industries 360-22 T1 Automatic Protection Switch Line Unit Kit. The part number for this kit is 97-001122. The kit is shown in Figure 1.

1.2 Equipment Function

The 97-001122 is a T1 Automatic Protection Switch Kit which replaces the upper rear cover of the 360-22 multiplexer. It provides cost effective self-healing networking in the event of out of frame, excessive BPV error rate, or loss of signal for any reason including cable cuts, equipment failures or signal degradation. The T1 APS, upon receiving T1 information on the equipment T1 line, provides identical T1 information transmitted on duplicate T1 lines. The receiving APS analyzes the two incoming network T1 lines, and provides the best available T1 line to the equipment T1 connection.

1.3 Equipment Location/Mounting

Replaces the upper rear cover of the 360-22 multiplexer.

1.4 Equipment Features

Features of the 97-001122-B include:

- Single kit for two T1s in, one T1 out.
- Line status monitoring.
- Mounted inside the equipment. Does not use any additional real estate.
- Operates in 360-22 with 24 VDC or 48 VDC applied.
- Automatic detection of SF/ESF framing.
- Individual build out controls for the T1 Network Lines.
- Network side repeaterless up to 6000 feet.
- Metallic bypass.
- Individual switch selectable transceiver sensitivity.
- T1 equalization of equipment line with LIU (0–655 feet) and CSU levels (0, –7.5, –15, and –22 dB).
- Local and remote switching.
- Local manual override.
- Automatic detection of AMI or B8ZS line coding.
- Obtains 48 VDC from 360-22 shelf.

1.5 Front Panel

Descriptions of each LED and switch on the front panel of the unit are shown in Table 1.

Table 1. Front Panel LED and Switch Description

Indicator	Type	Description
RCV T1 Active A	Green LED	When the LED is lit (green), the A T1 line is selected.
RCV T1 Active B	Green LED	When the LED is lit (green), the B T1 line is selected.
RCV T1 Corrupt A	Red LED	When the LED is lit (red), the A facility has become faulty due to loss of signal (LOS), out of frame (OOF), or the BPV error rate (BER) threshold has been exceeded.
RCV T1 Corrupt B	Red LED	When the LED is lit (red), the B facility has become faulty due to loss of signal (LOS), out of frame (OOF), or the BPV error rate (BER) threshold has been exceeded.
EQMNT T1	Red LED	The T1 from the equipment side has failed when the LED is lit (red).
T1 SWITCH	Pushbutton	Manual T1 pushbutton. Allows T1 switching every 2 seconds in <i>auto</i> mode.
MODE	Switch (slide)	Mode Selection: Bypass — Engages metallic bypass. Powers off the unit. Network A — Manual override. Network A side selected. Auto — Selection criteria is used. Network B — Manual override. Network B side selected.

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 front panel or located elsewhere on the equipment. Each time a major engineering design change is made on the equipment, the issue number is advanced by 1 and imprinted on subsequent units manufactured. Therefore, be sure to include both the model number and its issue number when making inquiries about the equipment.

2.3 Static Concerns

Each module is shipped in static-protective packaging to prevent electrostatic charges from damaging static-sensitive devices. Use approved static-preventive measures, such as static-conductive wrist straps and a static-dissipative mat, 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 protective 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 a static-conductive wrist strap and a static-dissipative mat) at all times whenever touching units outside of their original, shipped static-protective packaging.**
- **Do not ship or store units near strong electrostatic, electromagnetic, or magnetic fields.**
- **Use static-protective packaging for shipping or storage.**

3. APPLICATION GUIDELINES

Can be used with any equipment requiring T1 reliability.

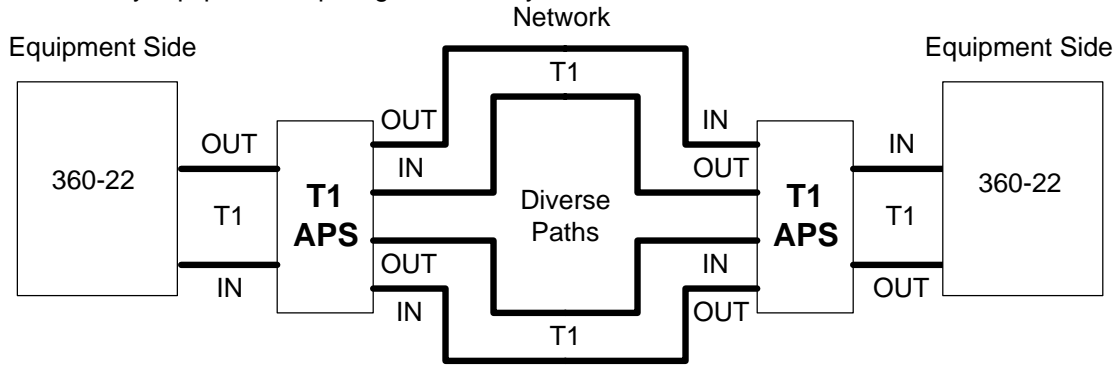


Figure 2. Typical APS Application

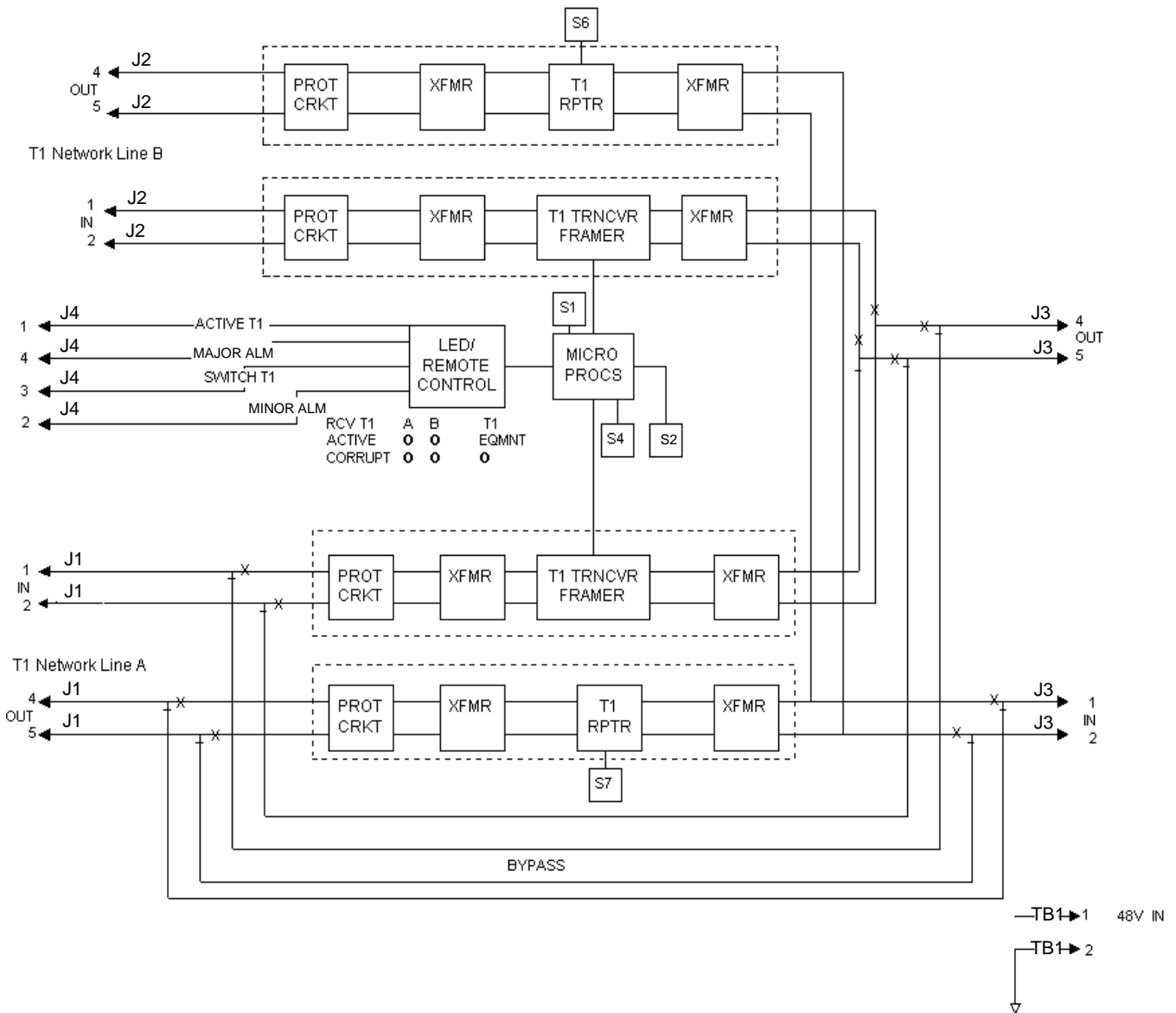


Figure 3. 97-001122-B Block Diagram

4. CIRCUIT DESCRIPTION

4.1 BER Selection vs. Detection Time

BPV is set at $10E^{-6}$, which takes approximately 7 seconds of detection time.

4.2 Remote Control

When connector J4 (pin 3) is momentarily externally grounded, the unit will switch between the two received Network T1 lines if the *mode* switch is in the AUTO position. In order for a switch to occur again, another ground needs to be applied after a 2-second interval.

See Table 2 for remote control status.

Table 2. Remote Status

Conditions				Remote Control Connector Outputs		
MODE Switch	Equipment T1	Network A T1	Network B T1	J4-2	J4-4	J4-1
Auto	OK	OK selected	OK	Open	Open	Open
Auto	OK	OK	OK selected	Open	Open	Ground
Auto	OK	OK selected	Not OK	Ground	Open	Open
Auto	OK	Not OK	OK selected	Ground	Open	Ground
Auto	OK	Not OK	Not OK	Open	Ground	Open
Auto	Not OK	OK selected	OK	Open	Ground	Open
Auto	Not OK	OK	OK selected	Open	Ground	Ground
A	OK	OK selected	OK	Ground	Open	Open
B	OK	OK	OK selected	Ground	Open	Ground
BYPS	OK	OK	OK	Open	Ground	Open

5. MOUNTING

The 97-001122-B Automatic Protection Switch Kit is designed for use in the Charles Industries 360-22 Multiplexer. If the kit is ordered separately, remove the upper rear panel, connect pin 10 of J17 (on the 360-22) to -48V of TB1 and pin 1 of J17 (on the 360-22) to the ground (+GND) of TB1. Then mount to the 360-22 (see Figure 1).

6. INSTALLER CONNECTIONS/OPTIONS

6.1 Power

Use the following steps to connect the power source:

Step	Action
1.	Connect the -48V connection of TB1 to pin 10 of J17 on 360-22 backplane.
2.	Connect the +GND connection of TB1 to pin 1 of J17 on 360-22 backplane.

6.2 Connecting the T1 Cable

Connect the T1 cable included with the kit from the RJ45 T1 equipment connector to the DB15 T1 network (J32) connector (see Table 3 and Figure 4).

Table 3. DB15 Cable Connection

RJ48	PIN #	D-SUB 15	PIN #
Green	2	Green	1
Yellow	1	Yellow	9
Black	5	Black	3
Red	4	Red	11
	7		NC
	8		NC

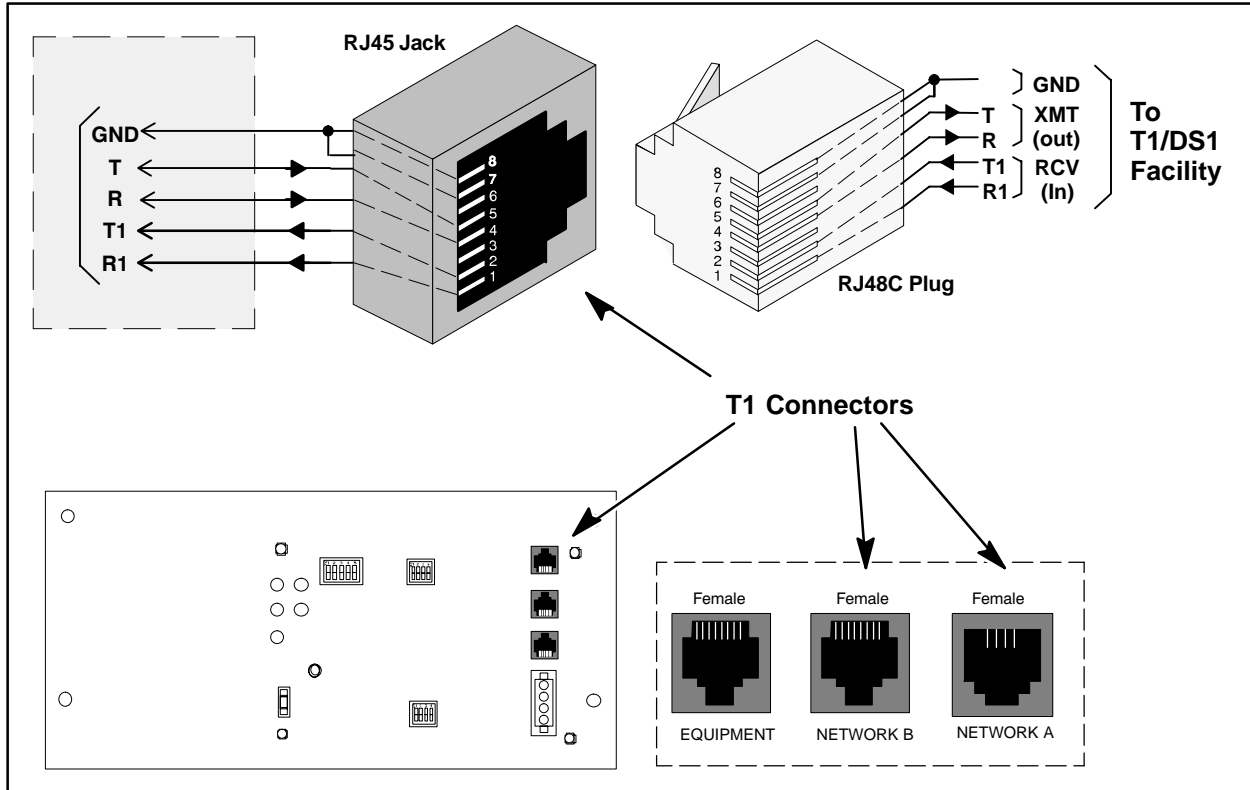


Figure 4. T1/DS1 Connections for T1 Equipment and T1 Network

6.3 Connecting the Remote Control Cable

If you are using Remote Control, connect the four conductor remote control cable assembly included with the kit to the remote control connector (see Figure 5 for connection location).

6.4 Mid Board Switches

S4 — Line Build Out/Equalization for transmit equipment lines (pos. 1–3) (see Table 4). Receive Network sensitivity selection on 30 or 36 dB (pos. 4 & 5) (see Table 5).

S6/S7 — Line Build Out/Equalization for transmit network lines (see Table 6).

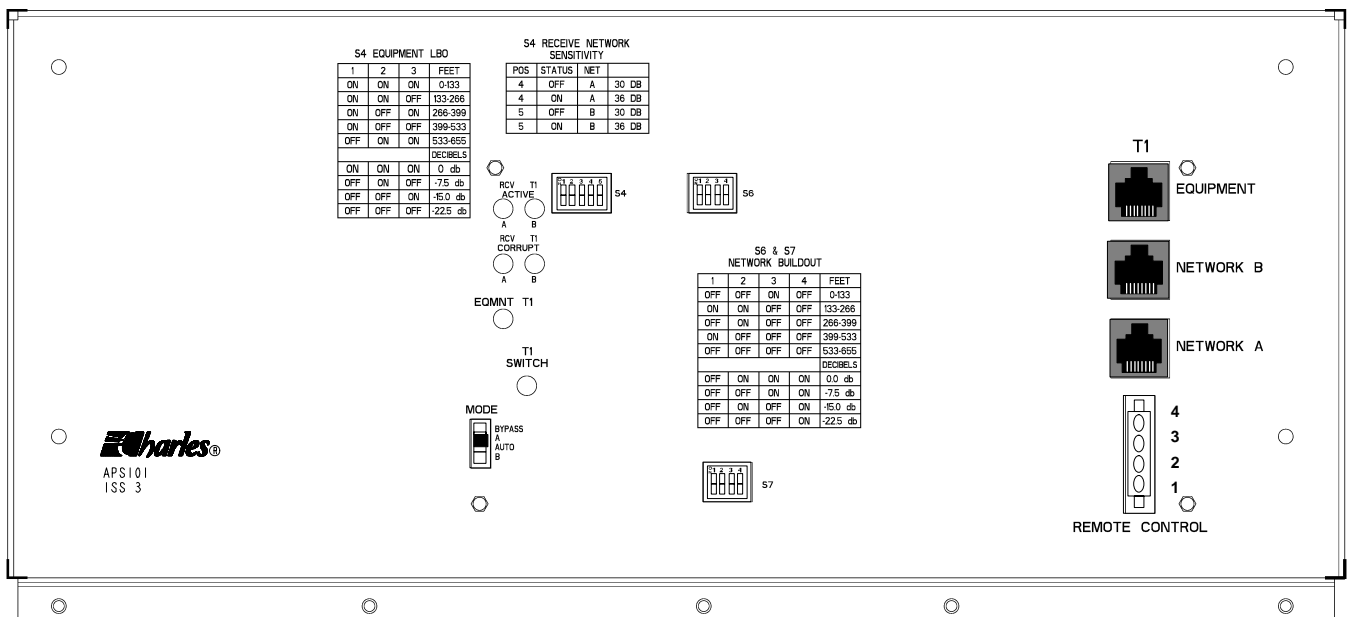


Figure 5. Switch Locations

Table 4. S4 Positions (Part 1)

S4 POSITIONS (Pre-equalizing) to Equipment T1 Output			CABLE FEET
S4-1 (L2)	S4-2 (L1)	S4-3 (L0)	
ON	ON	ON	0–133
ON	ON	OFF	133–266
ON	OFF	ON	266–399
ON	OFF	OFF	399–533
OFF	ON	ON	533–655
S4 POSITIONS (Pad)			DECIBELS
OFF	ON	OFF	–7.5
OFF	OFF	ON	–15.0
OFF	OFF	OFF	–22.5

Table 5. S4 Positions (Part 2) from Network T1 Input

POSITION	STATUS	NETWORK	DECIBELS
S4-4 (A)	OFF	A	30
	ON	A	36
S4-5 (B)	OFF	B	30
	ON	B	36

Table 6. S6 (Network B) & S7 (Network A) Positions

S6 & S7 POSITIONS (Pre-equalizing) to Network T1 Outputs				CABLE FEET
1	2	3	4	
OFF	OFF	ON	OFF	0–133
ON	ON	OFF	OFF	133–266
OFF	ON	OFF	OFF	266–399
ON	OFF	OFF	OFF	399–533
OFF	OFF	OFF	OFF	533–655
S6 & S7 POSITIONS (Pad)				DECIBELS
OFF	ON	ON	ON	0.0
OFF	OFF	ON	ON	–7.5
OFF	ON	OFF	ON	–15.0
OFF	OFF	OFF	ON	–22.5

7. TESTING

Use the following table to determine the status of the APS101 during testing:

Step	Action	Response
1.	Move the MODE switch to AUTO and disconnect all three T1 connections from the APS101.	The Receive T1 Corrupt A and B LEDs are ON. The EQMNT T1 LED is ON.
2.	Reconnect the T1 equipment to the APS101.	The EQMNT T1 LED goes OFF.
3.	Reconnect the Network B T1 signal to the APS101.	The Receive T1 Corrupt B LED goes OFF and the Receive T1 Active B LED goes ON.
4.	Reconnect the Network A T1 signal to the APS101.	The Receive T1 Corrupt A LED goes OFF.
5.	Remove the Network B T1 signal from the APS101.	The Receive T1 Corrupt B LED goes ON, the Receive T1 Active A LED goes ON, and the Receive T1 Active B LED goes OFF.
6.	Reconnect the Network B T1 signal to the APS101.	The Receive T1 Corrupt B LED goes OFF.

8. TECHNICAL ASSISTANCE

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)

9. WARRANTY & CUSTOMER SERVICE

9.1 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)

9.2 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.

9.3 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.

9.4 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
503 N.E. 15th St., P.O. Box 339
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.

10. SPECIFICATIONS

The specifications of the unit are listed below.

10.1 Electrical

- (a) *T1 Network Transmit Signal*: 6 volt peak to peak with DSX-1 or CSU line build-outs.
- (b) *T1 Equipment Transmit Signal*: 6 volt peak to peak with DSX-1 or CSU line build-outs.
- (c) *T1 Network Receive Sensitivity*: Switch selectable 30 or 36 dB of gain.
- (d) *T1 Switching*: Within 10 milliseconds after loss of signal (LOS) or out of frame (OOF) condition. BPV error rate (BER) switching threshold at approximately 7 seconds.
- (e) *Current Draw*: 65 milliamps at 49 VDC.
- (f) *Operating Voltage*: -42 to -56 VDC.
- (g) *Port Impedances*: 100 Ohms nominal at 772 kilohertz.
- (h) *Input Bit Rate*: 1.544 Mbits per second.

10.2 0 to 6000 Specification

FCC 68.308 Option B and ANSI T1.403,95.

10.3 Agency Compliance Requirements

The kit meets UL1950 and FCC Part 15.

(a) EMI Requirements

The kit meets FCC Part 15 Class A and Bellcore GR-1089-CORE EMI requirements.

The kit meets all the requirements of this document when subjected to ESD tests specified GR-1089-CORE, section 2.

(b) T1 Signal Requirements

The kit meets Bellcore 62411, ANSI 403

(c) Interface Requirements

The kit shall meet Bellcore 1089, UL 1950 and FCC Part 68.

10.4 Physical

See Table 7 for the physical characteristics of the unit.

Table 7. Physical Specifications

Feature	U.S.	Metric
Height	7.75 inches	19.69 centimeters
Width	17 inches	43.18 centimeters
Depth	3 inches	7.62 centimeters
Weight	3 pounds	1.36 kilograms
Temperature	32° to 122° F	0° to 50° C
Humidity	To 95% (non-condensing)	

