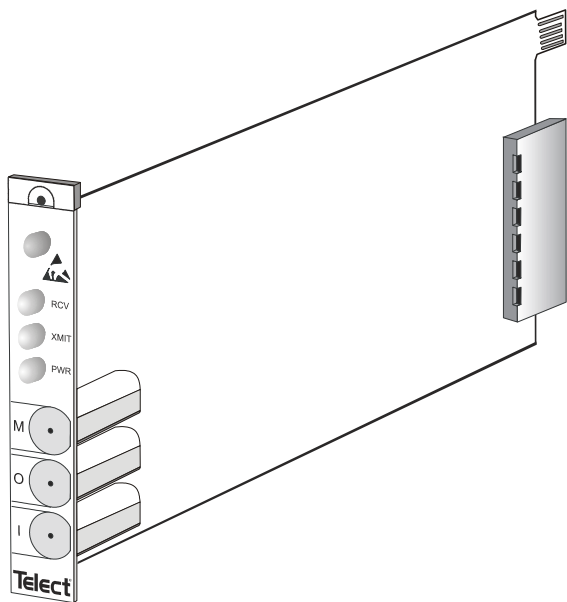


**Telect**<sup>®</sup>  
CONNECTING THE FUTURE<sup>®</sup>



**BCS II SIMPLEX REPEATER  
USER MANUAL**

117209-1 A0

710-3201-0002 BCS II Simplex Repeater User Manual  
Document Number 117209A0  
Copyright© Telect, Inc., 2001, All Rights Reserved.

Telect® and Connecting the Future® are registered trademarks of Telect, Inc.,  
1730 N. Madson St., Liberty Lake, Washington 99019

***Technical Support:***

By e-mail: [getinfo@telect.com](mailto:getinfo@telect.com)

By phone: 888-821-4856 or 509-921-6161

***Note:***

Telect assumes no liability from the application or use of these products. Neither does Telect convey any license under its patent rights nor the patent rights of others. This document and the products described herein are subject to change without notice.

***FCC Compliance:***

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

# Contents

## 1 Descriptions

|                               |     |
|-------------------------------|-----|
| BCS II Simplex Repeater ..... | 1-1 |
| Features .....                | 1-1 |
| Specifications .....          | 1-1 |
| Electrical.....               | 1-1 |
| Power.....                    | 1-1 |
| DS3 Input .....               | 1-2 |
| DS3 Output.....               | 1-2 |
| E3 Input .....                | 1-2 |
| E3 Output .....               | 1-2 |
| STS-1 Input .....             | 1-3 |
| STS-1 Output.....             | 1-3 |
| Alarms .....                  | 1-3 |
| Environmental .....           | 1-4 |
| Dimensions.....               | 1-4 |
| Schematic .....               | 1-5 |
| System-Level Application..... | 1-6 |

## 2 Installation

|                                   |     |
|-----------------------------------|-----|
| Installation Considerations ..... | 2-1 |
| Location and Space .....          | 2-2 |
| Tools and Equipment .....         | 2-2 |
| Power.....                        | 2-2 |
| Technical Support .....           | 2-2 |
| Inspection .....                  | 2-2 |
| Installing the Repeater.....      | 2-3 |

### **3 Operation**

|                  |     |
|------------------|-----|
| Monitoring ..... | 3-1 |
| Loopbacks .....  | 3-1 |
| Patching .....   | 3-2 |

### **4 Service**

|                                    |     |
|------------------------------------|-----|
| Owner Maintenance .....            | 4-1 |
| Replacing the Tracer Lamp LED..... | 4-1 |
| In Case Of Difficulty .....        | 4-2 |
| Technical Support.....             | 4-2 |
| In-Warranty Service.....           | 4-2 |
| Out-Of-Warranty Service .....      | 4-3 |
| Repacking For Shipment .....       | 4-3 |

## BCS II SIMPLEX REPEATER

---

The Broadband Connectivity System II (BCS II) Simplex Repeater (part # 710-3201-0002) regenerates DS3, E3, and STS-1 signals to allow increased separation of network elements and provides full DSX functionality. The module installs in any vertical BCS II chassis or in the Vector chassis and is always installed in pairs.

### Features

- Full signal regeneration to equal level point on each circuit
- Mini-WECO monitor and I/O jacks
- Alarm and tracer lamp LEDs
- Full DSX functionality, including patching, monitoring and loop-backs

## SPECIFICATIONS

---

### Electrical

**Monitor Level:** 20 dB  $\pm$  1.5 dB below signal level

**Return Loss:**  $\leq$  -24 dB at DS3 signal rate

**Impedance:** 75 $\Omega$  (+/- 5%)

### Power

**Battery Input:** A and B redundant, -42 to -58 Vdc

**Input Current:** 35 mA nominal @ 48V

**Internal Fuse:** 1/4 amp, not field replaceable

## DS3 Input

**Data Rate:** 44.736 Mb/s  $\pm$  100 ppm

**Data Format:** Bipolar with B3ZS coding

**Jitter Tolerance:** Meets requirements of Telcordia GR-499-CORE, Issue 1, December, 1995

**Equalization:** Selectable normal or high sensitivity receive equalization, based on receive cable length

## DS3 Output

**Data Rate:** Same as input signal, transmit clock is recovered from input signal. Under AOS condition (no valid input): 44.736 Mb/s  $\pm$  100 ppm

**Data Format:** Bipolar with B3ZS coding, input bipolar violations are transparent to output

**Pulse Shape:** Complies with Telcordia GR-499-CORE, Issue 1, December, 1995. Pulse plate complies with ANSI T1.404 pulse template

**LBO:** Selectable DSX Level or DS3 High Output

## E3 Input

**Data Rate:** 34.368 Mb/s  $\pm$  100 ppm

**Data Format:** AMI with HDB3 coding

**Jitter Tolerance:** Meets ITU-T G.832, 1993 requirements

**Equalization:** Selectable normal or high sensitivity receive equalization, based on receive cable length

## E3 Output

**Data Rate:** Same as input signal, transmit clock is recovered from input signal

**Data Format:** AMI with HDB3 coding

**Pulse Shape:** Complies with ITU-T G.703

**LBO:** Fixed transmit level

## STS-1 Input

**Data Rate:** 51.84 Mb/s  $\pm$  100 ppm

**Data Format:** Bipolar with B3ZS coding

**Jitter Tolerance:** Meets Telcordia GR-499-CORE, Issue 1, December, 1995 requirements

**Equalization:** Selectable normal or high sensitivity receive equalization, based on receive cable length

## STS-1 Output

**Data Rate:** Same as input signal, transmit clock is recovered from input signal

**Data Format:** Bipolar with B3ZS coding

**Pulse Shape:** Complies with Telcordia GR-CORE-253

**LBO:** Selectable DSX Level or STS-1 High Output

## Alarms

Relay contacts rated for 2 amps maximum.

| ALARM OUTPUTS, LEDs                                      | CONDITION  |
|--|--|
| RCV LED GREEN / XMIT LED GREEN / ALARM CONTACTS OPEN     | NORMAL: VALID INPUT SIGNAL   |
| RCV LED RED / XMIT LED AMBER / MAJ ALARM CONTACT CLOSED  | LOSS OF VALID INPUT SIGNAL / ALL ONES SIGNAL AUTOMATICALLY TRANSMITTED |
| XMIT LED RED / MAJ ALARM CONTACT CLOSED                  | TRANSMITTER FAILURE  |
| ALL FRONT PANEL LEDs OFF / PWR FAIL ALARM CONTACT CLOSED | FAILURE OF INTERNAL POWER CONVERTER OR LOSS OF BOTH BATTERY INPUTS     |

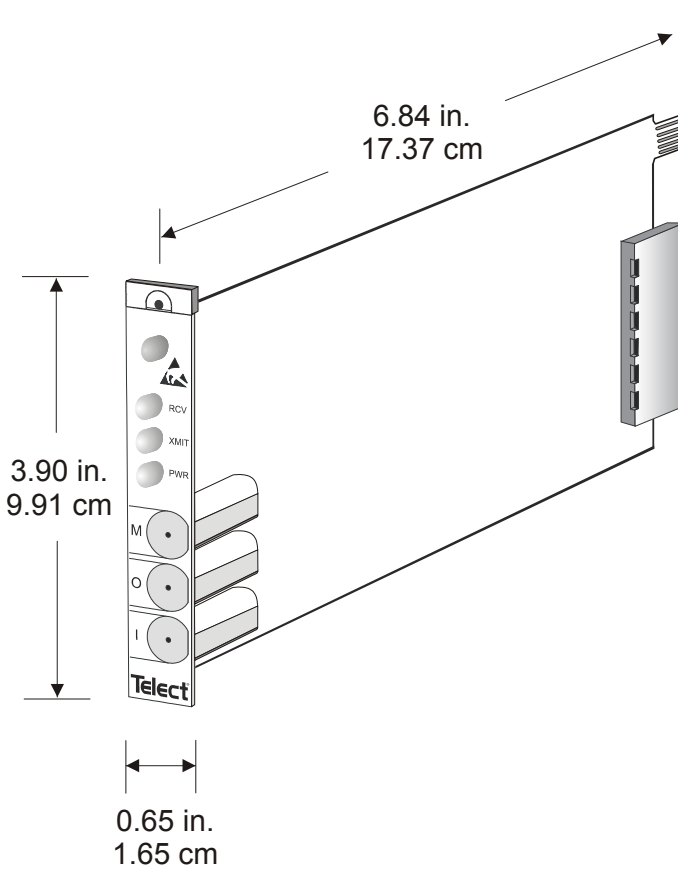
## Environmental

**Humidity:** 95% relative humidity, noncondensing

**Temperature:** Operational from 0-50°C

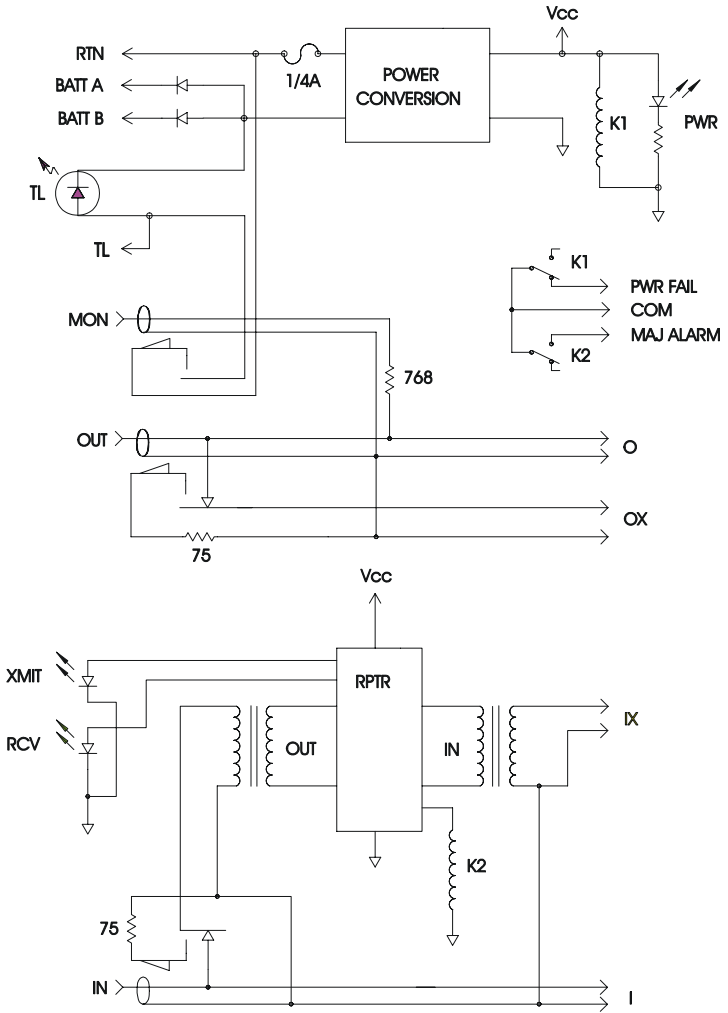
**Heat Dissipation:** 5.7 BTUs/hour

## Dimensions





### Schematic

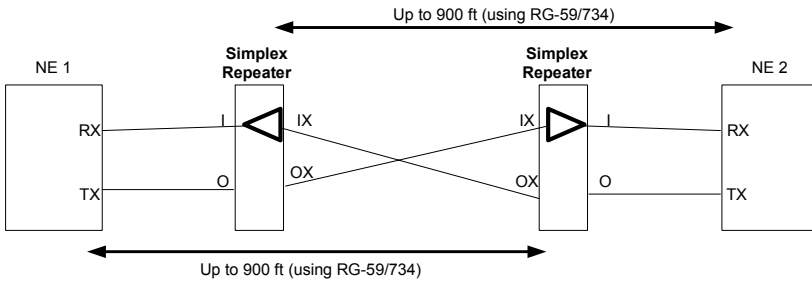


## System-Level Application

The simplex repeater regenerates DS3, E3, and STS-1 signals to equal level point over a distance of up to 900 ft (using RG-59/734 cable). **Two repeaters are required to regenerate both the send and receive signals and complete the cross-connect.**

The repeater regenerates the signal that appears on the IX port and transmits it out the I port for a length dependent upon the type of cable used. See the installation section to set the module jumpers based on cable length.

The OX and O ports are passive; therefore, a second repeater is required to regenerate and transmit the signal in the other direction. Each network element can be located up to 900 ft from the far end repeater's IX port.



**INSTALLATION CONSIDERATIONS**

---

**CAUTION**

**CAUTION!** This product must be installed and maintained only by qualified technicians.

**VORSICHT!** Nur von qualifizierten Technikern installiert werden und instand gehalten werden.

**PRECAUCIÓN!** Ser instalado y ser mantenido solamente por los técnicos autorizados.

**ATTENTION!** Ce produit doit être installé et entretenu uniquement par des techniciens qualifiés.

---

**ALERT**

**ALERT!** These instructions presume you have verified that the Telect equipment being installed is compatible with the rest of the system, including power, ground, circuit protection, signal characteristics, equipment from other vendors, and local codes or ordinances.

---

**ALERT**

**ALERT!** This repeater module contains static-sensitive components. To prevent equipment damage, wear a properly connected grounding strap while handling the module and store it in its original anti-static bag when not in use.

---

## Location and Space

The BCS II Simplex Repeater module occupies one slot in any vertical BCS II chassis or in the Vector chassis. Do not install more than five repeater modules in a BCS II chassis. The Vector Chassis can be fully populated with repeaters. **You must install two repeaters to complete the cross-connect, one repeater for each network element.**

## Tools and Equipment

No special tools or equipment are required. Wear a grounding strap during installation.

## Power

–42 Vdc to –58 Vdc power reaches the module through the backplane connector on the chassis. Power to the backplane connector block is delivered from the power distribution panel using 16–22 AWG wire. See the chassis user manual for additional information on power transmission. Because the repeater is an active product, Telect recommends using a dual feed power source.

## Technical Support (USA)

By e-mail: [getinfo@telect.com](mailto:getinfo@telect.com)

By phone: 888-821-4856 or 509-921-6161

## INSPECTION

---

Compare the contents of the shipping container with the packing list. Call Telect if you are missing anything.

*NOTE*

*Telect is not liable for shipping damage.*

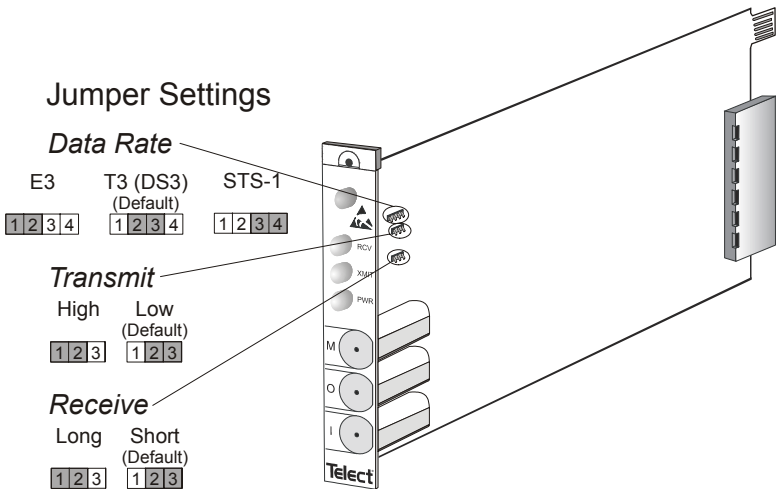
*If the shipping container is damaged, keep it for the carrier's inspection. Notify the carrier and call Telect's Customer Service Department:*

*1-800-551-4567 or 1-509-926-6000*

*Keep the container until you have checked equipment operation. If you experience any kind of problem, call Telect's Customer Service Department. Use the original, undamaged container if you are instructed to return the product to Telect.*

## INSTALLING THE REPEATER

1. Identify the two network elements you wish to cross-connect.
2. Plan placement of the two repeater modules in relay racks, ensuring:
  - ◇ the distance between the network element and the repeater is correct for the system, cables in use and office procedures. This can be up to 450 feet.
  - ◇ the two repeater modules will not be more than 900 feet apart.
3. While wearing a grounding strap, remove the repeaters from their anti-static bags, touching the module edges only.
4. Set the jumpers on each module for the appropriate data rate, as shown below (factory setting is T3).
5. Set the jumpers for the transmit and receive distances, as shown below (factory settings are Low and Short). See the tables on the next page to determine the settings appropriate for the type of cable being used.



### NOTE

*Transmit and Receive settings are for distance from repeater to network element (or next repeater) only.*

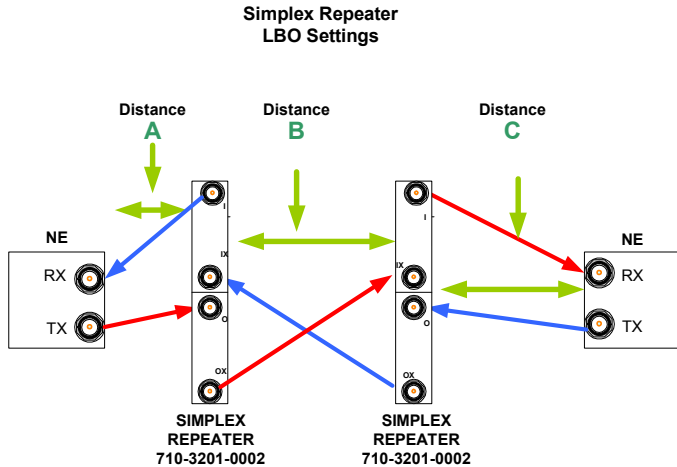
**Transmit Settings by Cable Type**

| <b>Cable</b> | <b>Repeater to NE distance (feet)</b> | <b>Setting</b> |
|--------------|---------------------------------------|----------------|
| 720          | 0-124                                 | Low            |
|              | 124-255                               | High           |
| 728          | 0-212                                 | Low            |
|              | 212-425                               | High           |
| 734          | 0-224                                 | Low            |
|              | 224-450                               | High           |
| 735          | 0-112                                 | Low            |
|              | 112-225                               | High           |
| RG-59        | 0-224                                 | Low            |
|              | 224-450                               | High           |

**Receive Settings by Cable Type**

| <b>Cable</b> | <b>Cross-connect distance (feet)</b> | <b>Setting</b> |
|--------------|--------------------------------------|----------------|
| 720          | 0-124                                | Short          |
|              | 124-255                              | Long           |
| 728          | 0-212                                | Short          |
|              | 212-425                              | Long           |
| 734          | 0-224                                | Short          |
|              | 224-450                              | Long           |
| 735          | 0-112                                | Short          |
|              | 112-225                              | Long           |
| RG-59        | 0-224                                | Short          |
|              | 224-450                              | Long           |

6. Slide each module into the appropriate chassis slot and press it firmly into the backplane connector.
7. Secure each module with the included screw.
8. Follow the diagram below to connect two network elements.



Each network element can be located up to 900ft. from the far end repeaters IX port. (using RG-59/734)

| CABLE | Repeater to NE distance (feet) | FIGURE Distance | Transmit LBO Setting | Repeater to Repeater distance (feet) | FIGURE Distance | Receive LBO Setting |
|-------|--------------------------------|-----------------|----------------------|--------------------------------------|-----------------|---------------------|
| 720   | 0-124                          | A or C          | SHORT                | 0-124                                | B               | SHORT               |
|       | 124-255                        | A or C          | LONG                 | 124-255                              | B               | LONG                |
| 728   | 0-212                          | A or C          | SHORT                | 0-212                                | B               | SHORT               |
|       | 212-425                        | A or C          | LONG                 | 212-425                              | B               | LONG                |
| 734   | 0-224                          | A or C          | SHORT                | 0-224                                | B               | SHORT               |
|       | 224-450                        | A or C          | LONG                 | 224-450                              | B               | LONG                |
| 735   | 0-112                          | A or C          | SHORT                | 0-112                                | B               | SHORT               |
|       | 112-225                        | A or C          | LONG                 | 112-225                              | B               | LONG                |
| RG-59 | 0-224                          | A or C          | SHORT                | 0-224                                | B               | SHORT               |
|       | 224-450                        | A or C          | LONG                 | 224-450                              | B               | LONG                |

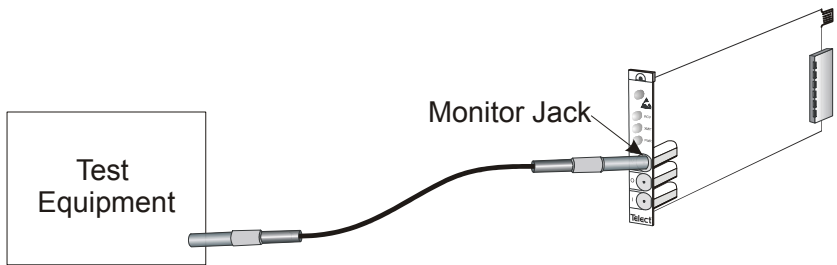
9. Install backplane tracer lamp wire between the two repeaters and verify both tracer lamp LEDs light.
10. Install designation strips and label them using office standards.
11. Test circuits per office standards.





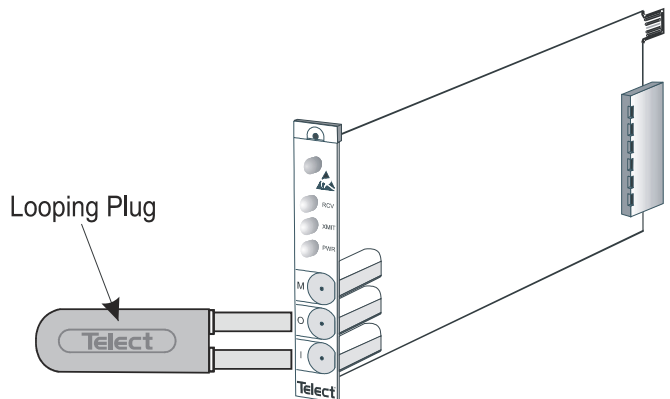
## MONITORING

You can perform non-intrusive signal monitoring by connecting your test equipment to the front monitor jack (labeled M).



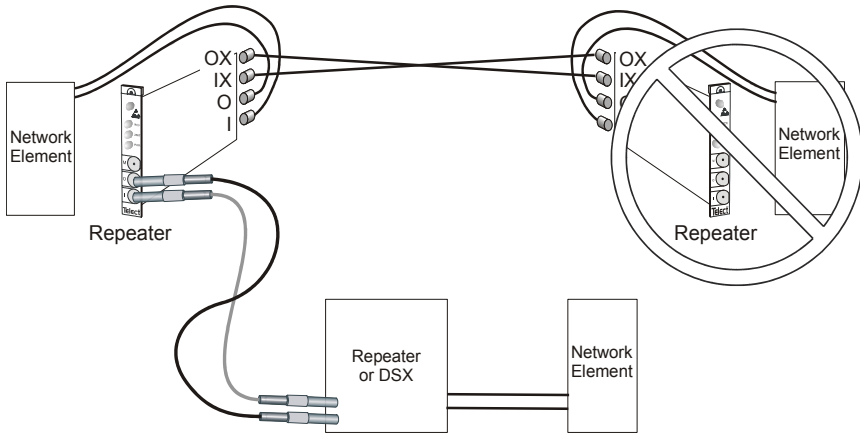
## LOOPBACKS

To temporarily loop the repeater's OUT port to its IN port, fully insert a mini-WECO looping plug into the I/O jacks.



## PATCHING

You can establish temporary patches using the I/O jacks on the front faceplate, as shown below. This operation is intrusive and will interrupt the cross-connect, routing the signals through the patch cords.



**CAUTION**

**CAUTION!** This product must be installed and maintained only by qualified technicians.

**VORSICHT!** Nur von qualifizierten Technikern installiert werden und instand gehalten werden.

**PRECAUCIÓN!** Ser instalado y ser mantenido solamente por los técnicos autorizados.

**ATTENTION!** Ce produit doit être installé et entretenu uniquement par des techniciens qualifiés.

## OWNER MAINTENANCE

Telect's BCS II Simplex Repeater module does not need preventive maintenance. The only part you can replace is the tracer lamp LED.

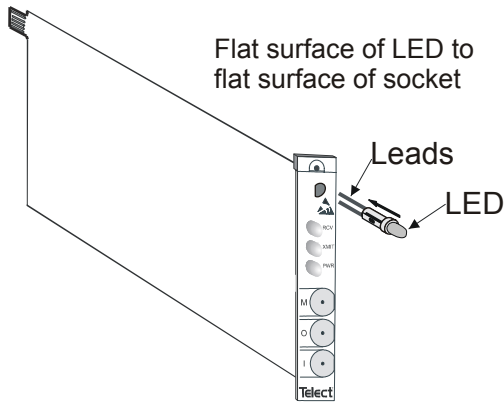
### Replacing the Tracer Lamp LED

1. Pull the defective LED straight out with your fingers.
2. Align the replacement LED with the LED socket in the faceplate. Notice that the socket is keyed, and the LED enters only one way.

**ALERT**

**ALERT!** Do not bend the LED's two metal leads.

3. Gently insert the LED into the socket, as shown on the next page. If you encounter resistance, do not force the LED into position. Move it until it slides easily into the jack module.



4. When the LED snaps into place, the installation is complete.
5. To test the new LED, insert a plug into the "M" (monitor) jack. The LED flashes for about 30 seconds, then lights steadily.

## IN CASE OF DIFFICULTY

If problems occur after initial installation, check all cable connections and the installation instructions in Chapter 2.

## Technical Support

By e-mail: [getinfo@telect.com](mailto:getinfo@telect.com)

By phone: 888-821-4856 or 509-921-6161

## IN-WARRANTY SERVICE

Contact your Telect equipment distributor, or call a Telect Customer Service Representative:

1-800-551-4567

1-509-926-6000

Telect will repair or replace defective products within the limits of the warranty. See "Repacking for Shipment" in this section.

### NOTE

*Call a Customer Service Representative for a Return Material Authorization (RMA) before returning any equipment.*

## OUT-OF-WARRANTY SERVICE

---

The procedure for out-of-warranty service is the same as for in-warranty service, except that Telect charges a processing fee, and you must submit a Purchase Order along with a Return Material Authorization (RMA) before returning equipment. Call a Customer Service Representative for help getting these forms.

The processing fee guarantees a repair estimate and is credited against actual material and labor costs.

## REPACKING FOR SHIPMENT

---

1. Tag the equipment with owner's name, address, and telephone number, together with a detailed description of the problem.
2. Use the original shipping container if possible. If you do not have it, package the equipment in a way to prevent shipping damage. Include the RMA inside the container and legibly print the RMA number on the outside of the package, near the shipping address.
3. Insure the package.

*NOTE*

*Telect is not liable for shipping damage.*





Telect, Inc.  
1730 N. Madson St.  
P.O. Box 665, Liberty Lake, WA 99019  
509-926-6000, 800-551-4567, Fax 509-926-8915  
E-mail: [getinfo@telect.com](mailto:getinfo@telect.com) Internet: <http://www.telect.com>