
Introduction

The MLR2-SCADA (SCADA stands for Supervisory Control and Data Acquisition) consists of a CPM2 module and a SCADA line card module. Its function is to transport alarm data from a local (satellite) central station to the master central station reliably. This is done using linked modems (like the SG-M1) over leased phone lines. This system is specifically intended for use with a point to point 300 baud Schedule 3A data line (Canada), but can be used with any data line.

The MLR2-SCADA multi-line receiver is used at a master central station to receive event data from and remote control one or more remote receivers in distant cities. The MLR2-SCADA includes many features, all designed to make the receiver more powerful and easier to use.

Additional SCADA Line Cards may be added to enable the CPM2 to monitor up to eight SCADA remote stations.

NOTE: For a ULC approved system that uses backup lines, the maximum number of SCADA remote stations is seven.

The MLR2-SCADA's real-time clock and calendar "stamps" all information received with the time and date. All information is displayed on the receiver's LCD screens and may be printed or forwarded to a computer. To ensure security, adjustment of the clock, calendar and other programming is protected by password codes.

Remote (local)

At the remote receiver, programming can be made through the CPM2 for each line card, to choose where data will be sent.

Line Card Options:

- Printer Only
- Com Port 1 & Printer
- Com Port 2 & Printer, etc.

This allows for one or more digital dialer phone lines or SCADA compatible multiplex networks to be local while others are treated as extensions of the master receiver. The master central station can reach outlying areas without incurring long distance charges, while the remote receiver can provide services locally, such as monitoring municipal buildings.

All Local Receiver Call and ESC mode commands entered locally, and all local receiver troubles and restores are sent to the master receiver. The same commands can be sent by remote control from the master receiver. In this way, the master central station has the same information and records and controllability for the local receiver operation as it would for a standard receiver in the master central station.

CPM2

The CPM2 Central Processing Module oversees operation of the receiver. Along with its built-in keypad and LCD message screen, the CPM2 features both a printer and computer interface.

The CPM2 features a 128-event nonvolatile memory buffer. The buffer may be examined on the LCD screen or printed. If the printer or computer is off-line, the CPM2 will retain events in the buffer and will automatically send the events to the computer or printer when communications are restored.

SCADA

The main function of each SCADA line card is to receive and store alarm data from the local (satellite) receivers and report their alarms to the CPM2.

Each SCADA module contains 2 line cards. In the event of a failure to communicate with the CPM2, each line card is capable of functioning independently by manual interaction with the central station operator. Each line card has its own

unique identification code which allows it to be identified by the CPM2. Each line card in a module can store 256 different printer alarm messages and 256 automation computer alarm messages in memory.

Principal Features

The SCADA line card has many options which are fully programmable by sending commands from the CPM2 or by using the SCADA line card push buttons.

1. Stores up to 256 printer alarm messages and 256 computer alarm messages for subsequent display during CPM2 trouble period.
2. Multiple alarms are sent to the computer and printer via CPM2 with minimal delay.
3. Automatically goes to stand-alone mode in case the CPM2 is removed for program updating.
4. Built-in watchdog timer continually monitors line card microprocessor operation.
5. "Cold boot" option, to set the receiver's configuration to standard default programming.
6. Built-in storage for one current and one backup system configuration.
7. Big Liquid Crystal Display (LCD), with contrast easily adjusted.
8. Built-in network troubleshooting mode, to examine the overall network or individual transmitter responses.
9. The data output to the printer/computer can be examined on the Liquid Crystal Display.
10. Built-in buzzer is automatically silent if a successful communication with the CPM2 occurs as normal, or if the "mute buzzer" option is selected.

Power and Supervision

The MLR2-SCADA requires 16VAC, 40VA for installations of up to 6 lines and 75VA for installations of more than 6 lines, from a 115V or 230 VAC 50/60 Hz transformer. The receiver is equipped with 12V rechargeable standby battery connections and an automatic battery charger.

The standby battery voltage and connections are supervised. The Line Cards are also continuously supervised to ensure uninterrupted communication with the CPM2. Any trouble conditions are reported on the LCD screens and may be sent to the printer and the computer.

The printer is supervised for loss of power, off-line, paper out and other trouble conditions. The communication link to the computer through the RS232 port can be monitored by the supervisory "heartbeat" test transmissions.

Compatibility

Central station automation software packages such as:

- ABM
- CSM
- SIMS
- ALARMSOFT
- MAS
- SIS
- APROPOS
- MICRO KEY
- SMS

support the Sur-Gard interface. The receiver also provides a basic communication protocol similar to the RADIONICS 6500 interface for other software packages that have yet to be updated to include the Sur-Gard interface.

CPM2 Outputs

The CPM2 features some switched-negative outputs. One output labelled "OPTION" has a corresponding LED on the CPM2 front panel; the factory default programming slowly flashes the OPTION LED when the "OPTION" output is activated. Switched negative outputs are also provided for the Acknowledge and Trouble LEDs.

Section 1: Quick Start

1.1 Receiver Setup and Operation Without Programming

Unpacking

Carefully unpack the receiver and inspect for shipping damage. If there is any apparent damage, notify the carrier immediately.

Introduction to Operation

Refer to the following sections of this manual for an overview of the operation of the SCADA Receiver Line Card and the CPM2 Central Processing Module:

- Sections 3-6: SCADA Operating Mode
 - Features
 - Installation
 - Controls and Display
- Section 7: CPM2
 - General Information
 - Controls and Display
 - Cold Start-up

If the receiver is to be used with a computer and central station automation software, refer to section 7.10 "MLR2-SCADA Computer Interface" on page 23.

1.2 Bench Testing

It is suggested that the receiver be tested before actual installation. Becoming familiar with the connections and setup of the unit on the work bench will make final installation more straightforward.

The following items are required:

- 16VAC transformer, 40VA to 75VA
- 1 modified telephone cable, 1 25-pin cable (see diagram)

Power Up

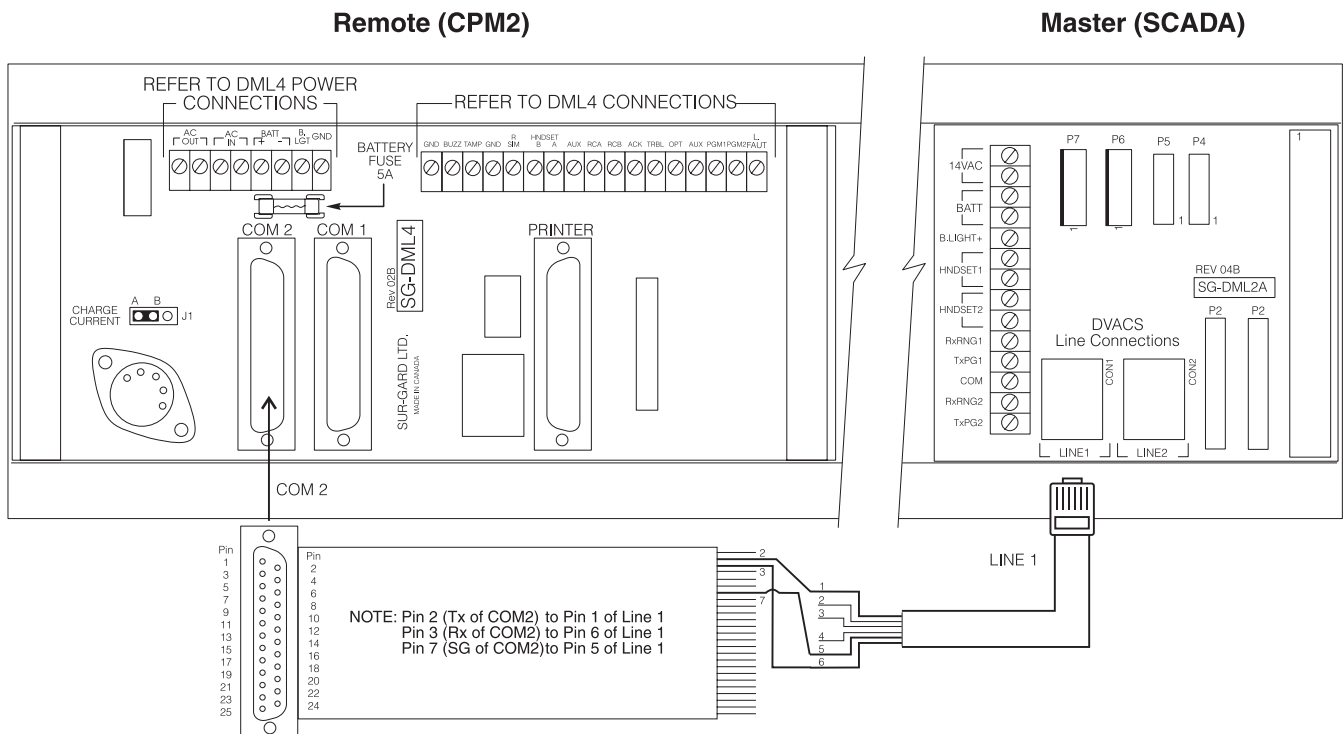
When power is applied, the receiver will beep and will indicate one or more trouble conditions on the LCD message screen. Press the flashing [ACK] button to silence the buzzer. If there is no computer or printer connected, a trouble message will be displayed on the CPM2 LCD and the "ACK" light will flash. Press the [ACK] button to silence the CPM2 buzzer.

Operation with Default Program

Without any changes to the factory default programming, the receiver operates as follows:

- The master ID password is "CAFE".
- If a computer is not connected, press the [ACK] button on the CPM2 module to silence the buzzer. The time and date of the Acknowledgment will be printed.

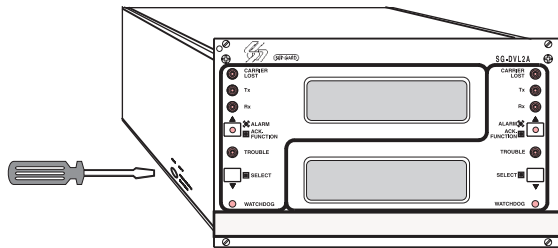
Fig. 1: Direct Connect Testing Wiring Diagram



Section 2: SG-SCADA Cold Boot and Changing the Line Card Number

NOTE: Each time you change (update) the Program Version, by replacing the Program EPROM, the “COLD BOOT” operation should be performed. Otherwise, the operating system will not work properly.

Each line card has a program enable switch situated on the circuit board solder side, accessible when the module is partially slid out of the card cage (a small flat blade screwdriver is required to operate this switch).



This switch is used in the procedure to load the default system configuration from EPROM and install it in the working locations in non volatile RAM. When the line card is powered up and the program switch is enabled, the following message will be displayed:

```
SYST COLD BOOT
ACK:Yes  SEL:No
```

To do a “cold boot”, press the [ACK] button. The line card will load the default configuration data. The following message will be displayed for 3 seconds.

```
SYST COLD BOOT
SYST COLD BOOT
```

After 3 seconds, or if [SELECT] is pressed, the following message will be displayed:

```
Change LCARD nbr
FF
```

WARNING: If [SELECT] is pressed after a SCADA Cold Boot was performed, the line card number will be set at “FF” by default.

Press [ACK] or [SELECT] to scroll the line card number up or down. The allowed range is 01 to 0E for a maximum 14 line cards polled by one CPM.

Press both [ACK] and [SELECT] to get out this mode and the display will show:

```
Please Turn Off
PROGRAM SWITCH
```

This message will be displayed until the corrective action is taken, and meanwhile the line card is in a “FROZEN” mode and does not function normally to receive alarms. You must slide out the module and switch the “program enable” to the OFF position and reinsert the module in the card cage.

Section 3: Installation

3.1 Mounting the Receiver

- Install the MLR2-SCADA in a closed 19" rack or cabinet with a locking rear access door. Cover all unused spaces with blank metal plates. The LCD screens on the receiver are designed to be viewed below eye level. If the unit must be mounted where the screens are above eye level, angle the unit downwards to improve visibility. The following items can be supplied for a complete installation:

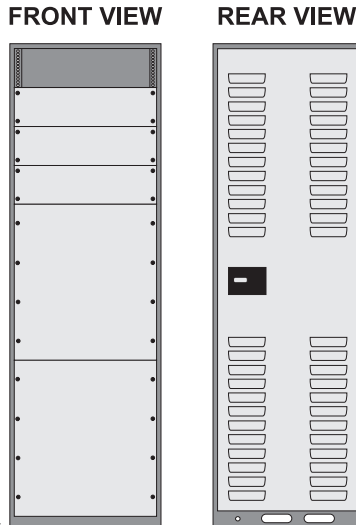
3.1.1 Stand-up Unit (61.25" tall up to 14 lines)

Part # MLR2A-CL

Part

- Rack
- Door with lock and ventilation
- Blank plates 21" (2)
- Blank plate 5.25" (3)
- Screws
- Washers
- Clipnuts
- FROST 16V 75VA transformer (RTFR7516)
- AC Utility Box
- AC Cable Clamps (2)
- 8' Battery Cables
- 18 gauge 3-conductor AC Cable

NOTE: If 14 lines are not used, cover each unused location with a blank plate



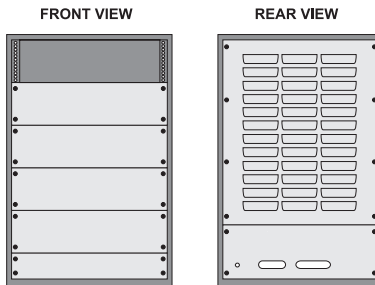
3.1.2 Desk-mount Unit (28" tall up to 14 lines)

Part # MLR2A-CM

Part

- Rack
- Louvred door back plate
- Blank Plate 1.75"
- Back Plate 7"
- Blank Plates 5.25 (4)
- Screws
- Washers
- Clipnuts
- 16V 75VA Transformer
- AC Utility Box
- AC Cable Clamp for 3/8" cable N/A
- 8' Battery Cable
- 18 gauge 3-conductor AC Cable

NOTE: If 14 lines are not used, cover each unused location with a blank plate



3.2 Printer Connections

The following printers can be used with MLR2-SCADA (ULC Listed):

- Star DP8340** Sur-Gard part # DCDP8340 (The SG-1220P power supply should be used)
- The SG-1220P** (Sur-Gard part number XP1220) is a 12V 2A power supply housed in a metal case with a tamper switch. It requires one 12Vdc sealed rechargeable battery (6 to 25 Ah rating) and one 16Vac 40VA Class 2 wire-in transformer (Frost FTC4016 or equivalent).

Connect the parallel printer to the MLR2-SCADA printer output port using a parallel printer cable.

IMPORTANT: Do not use a printer cable which has only 1 common ground wire.

3.2.1 Tested Printers

All printers that are ULC listed should be compatible with the MLR2-SCADA. The table below is a list of printers that have been tested with the MLR2-SCADA.

NOTE: 80-column mode is not supported for SCADA installation.

Model	Column Width	DIP Switch Settings							
		1	2	3	4	5	6	7	8
Citizen 180D	40/80	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Epson LQ-570+	40/80	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Okidata ML 182 Turbo	40/80	off	off	off	off	on	off	on	off
Okidata ML 182 Plus	40/80	off	off	off	off	on	off	on	off
Okidata ML 184 Turbo	40/80	on	off	off	off	on	off	on	off
Panasonic KX-P1150	40/80	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Star NX-1000	40/80	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Star DP8340	40	on	on	on	on	on	on	on	on

3.3 Computer Connections

- Connect the computer to the MLR2-SCADA RS-232 port using a serial cable to COM1. **IMPORTANT:** Do not use a null modem cable.

Receiver RS-232 25 pin connector	Computer RS-232 25 pin connector	Computer RS-232 9pin connector
1	1	
2	2	3
3	3	2
7	7	5

3.4 SCADA Line Connections

- With 6-pin modular cables, connect each line module output to its corresponding F1/F2 subset.

3.5 Grounding

- For maximum resistance to static and electrical noise, the 19" rack frame should be connected to earth ground through the AC utility box.

3.6 Power Supply

- Ensure that all electrical connections are made correctly. After verifying all connections, connect the RED and BLACK leads to a 12Vdc sealed rechargeable battery. Be sure to observe polarity when connecting the battery. When the battery is connected, test the system under battery power only.
- If a separate DC input is used to power the LCD backlighting during AC power failures, connect it to the BLGT terminal. It must be a listed Fire-Protective Signalling System power supply rated 12Vdc. Connect the positive lead from the DC supply to the BLGT terminal; connect the negative lead from the DC supply to the GND terminal.

CAUTION: Connecting a positive (+) terminal to a negative (-) terminal may cause a fire and possibly serious personal harm.

- For 24 hour standby, 12V 17.5Ah rechargeable battery should be used for 6 line configuration, and 12V 38Ah rechargeable battery should be used for 14 line configuration.

3.7 Battery Charging Current

The maximum battery charging current is factory set at 1A.

3.8 Removing and Installing System Components

Note that the receiver does not have to be powered down when components are removed or installed.

3.8.1 To Remove the CPM2 Module

The CPM2 charges the battery and provides low battery voltage disconnect; removing the CPM2 module will disconnect the battery and shut down the entire system if AC power is not available. If the CPM2 must be removed during an AC power failure, first connect a temporary battery (protected with a 5A fuse and reasonably charged) to the +BATT and GND terminals of the DML2A before removing the CPM2.

Remove the 4 retaining screws on the front panel of the module. Slowly pull the module out of the metal cabinet.

After the CPM2 is replaced, remove the temporary battery so that the CPM2 can properly maintain the main battery.

3.8.2 To Remove a Line Card Module

Remove the 4 retaining screws from the front panel of the module. Slowly pull the module out of the metal cabinet.

3.8.3 To Install a Line Card Module

Adding a Line Card Module to the MLR2-SCADA requires the addition of an MLRX Expansion Card Cage. Each MLRX can hold two modules. The MLRX is shipped with power and communications bus cables.

3.9 Installation Checklist

Complete	Operation
<input type="checkbox"/>	MLR2-SCADA installed in 19" Rack Mount Cabinet
<input type="checkbox"/>	19" Rack Mount Cabinet connected to earth ground
<input type="checkbox"/>	SG-1220B Printer Power Supply installed (with transformer and battery) if DP8340 printer is used
<input type="checkbox"/>	6-pin modular cable(s) connected to MLR2-SCADA and SCADA line
<input type="checkbox"/>	Parallel Printer Cable connected to MLR2-SCADA Parallel Printer Port
<input type="checkbox"/>	Parallel Printer power connected
<input type="checkbox"/>	Computer connected to MLR2-SCADA COM1 port using serial cable
<input type="checkbox"/>	CPM2 Cold Start-up completed

Fig 2: SCADA Connections (Not ULC-approved)

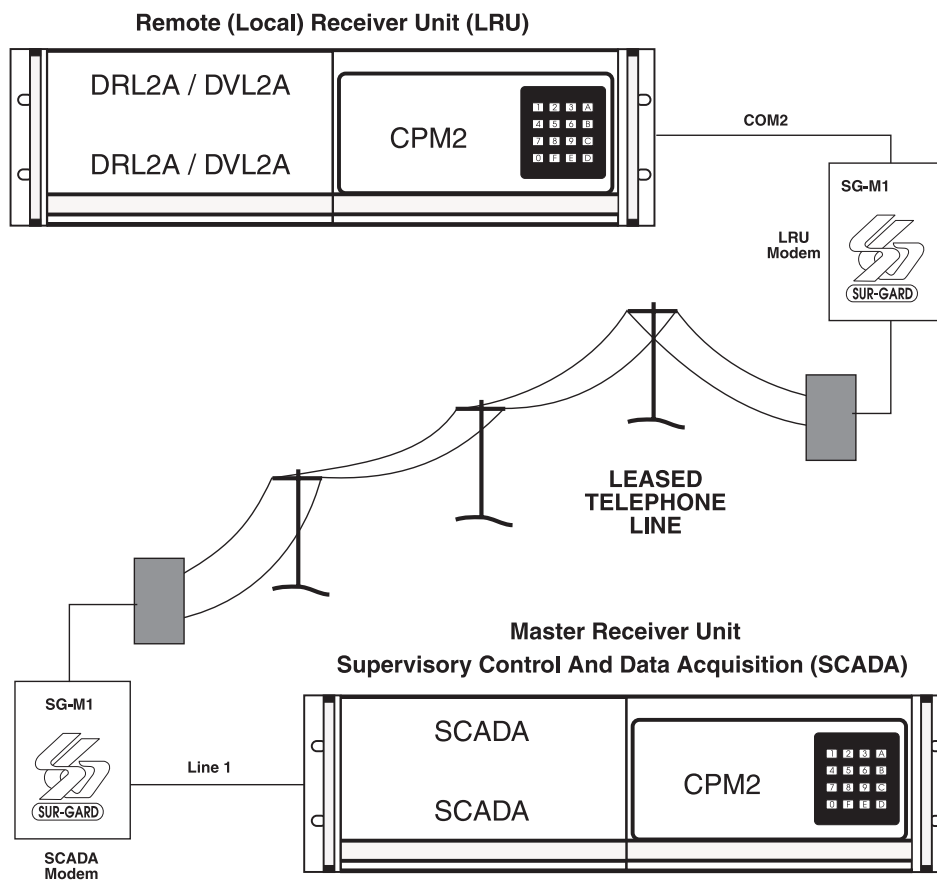


Fig. 3: Typical SCADA-LRU Connection

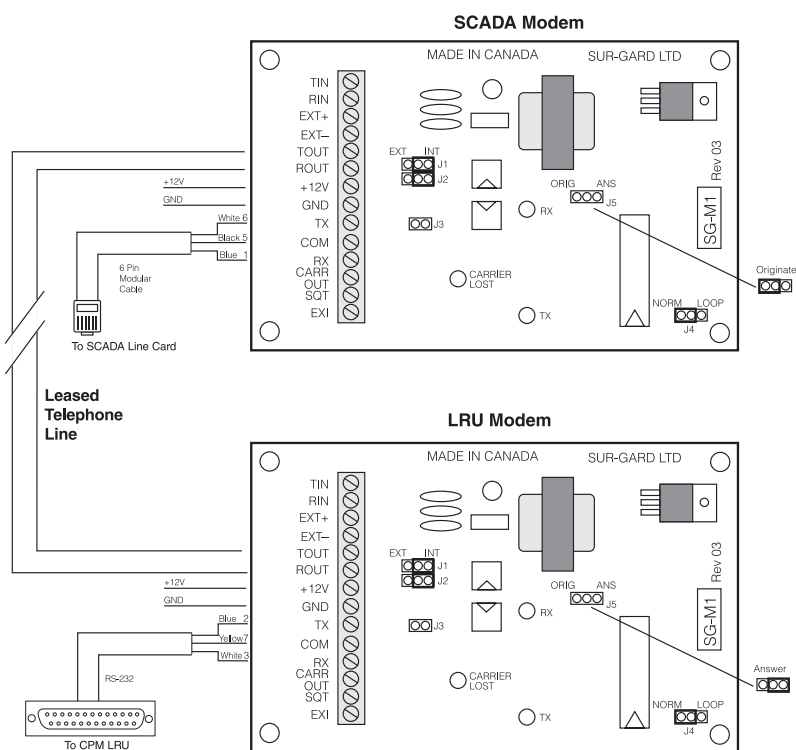


Fig. 4: Sur-Gard Network
Maximum Configuration (Not ULC Approved)

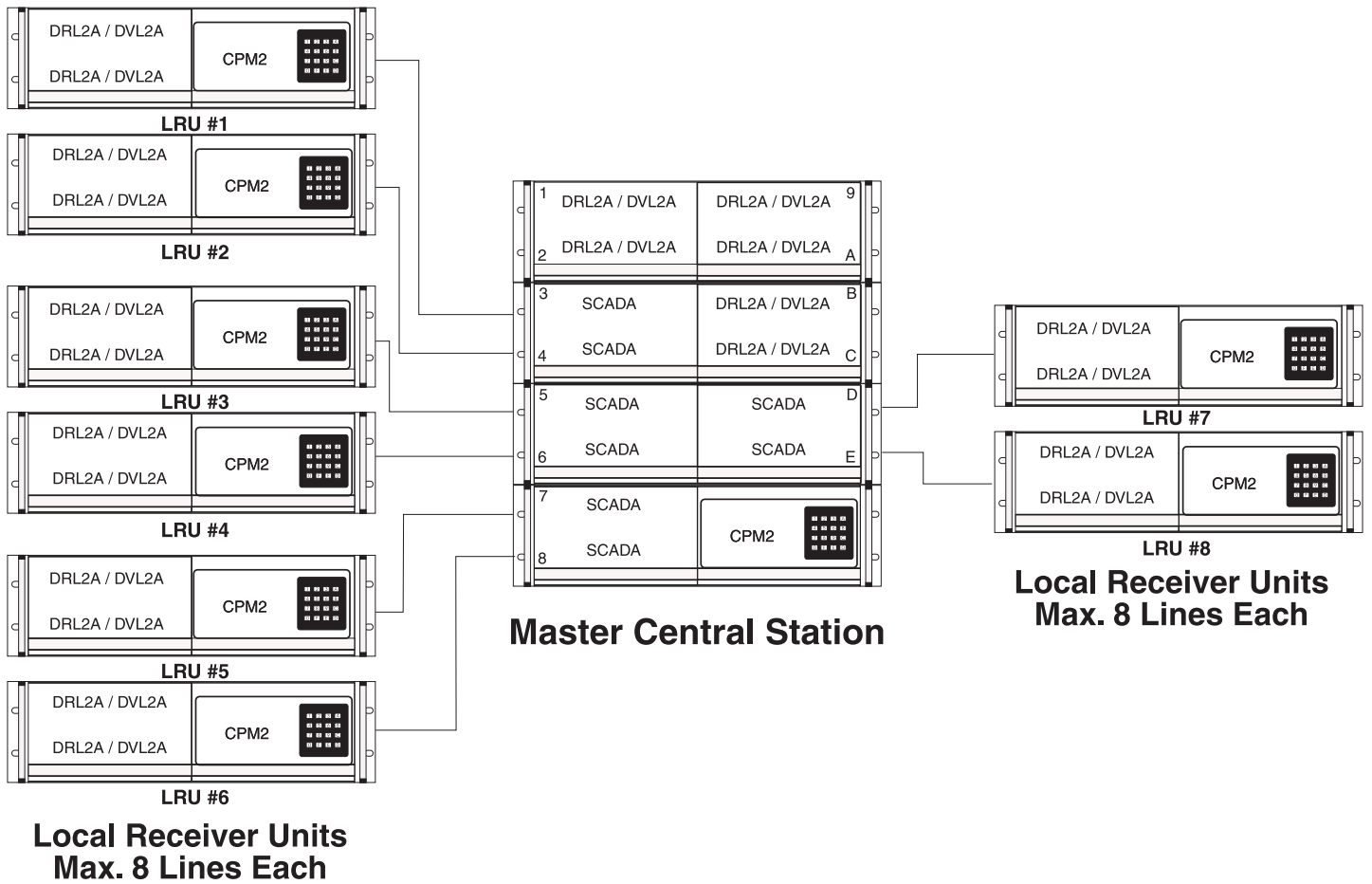


Fig. 5: SCADA Network with Redundancy Backup
(ULC Approved)

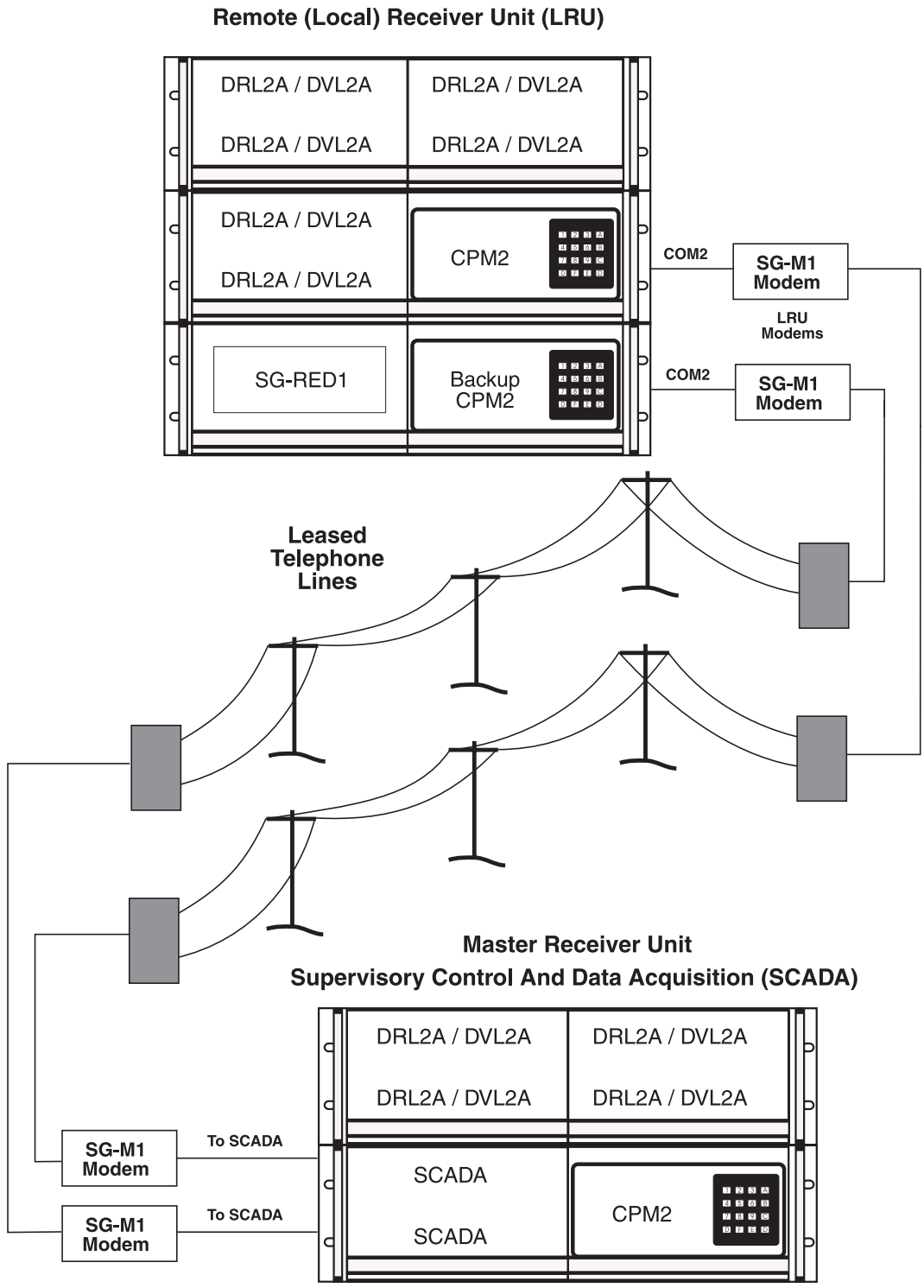


Fig. 6: Sur-Gard SCADA Network Maximum Configuration
(ULC Approved)

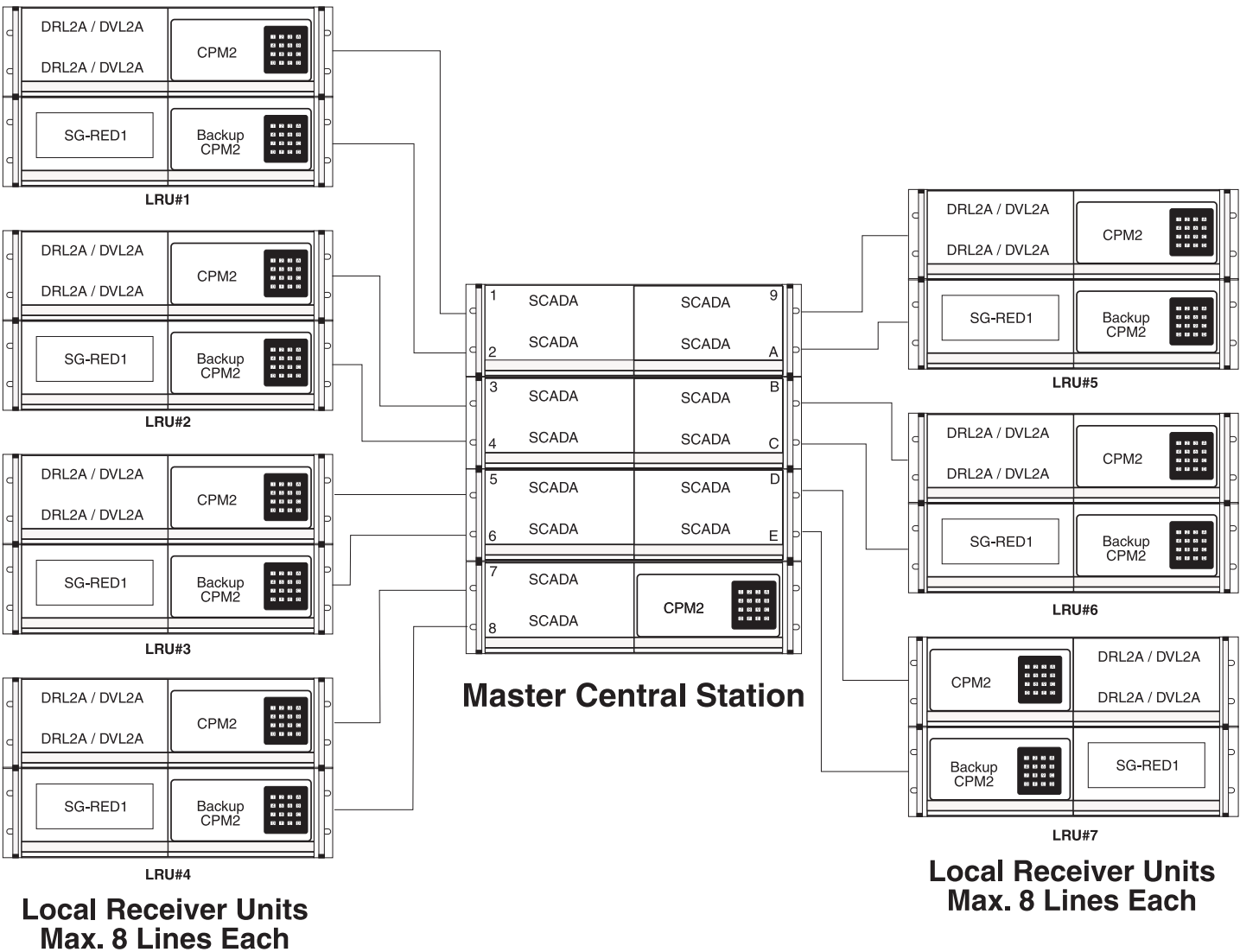


Fig. 7: MLR2-SCADA Backplane Connection Diagram

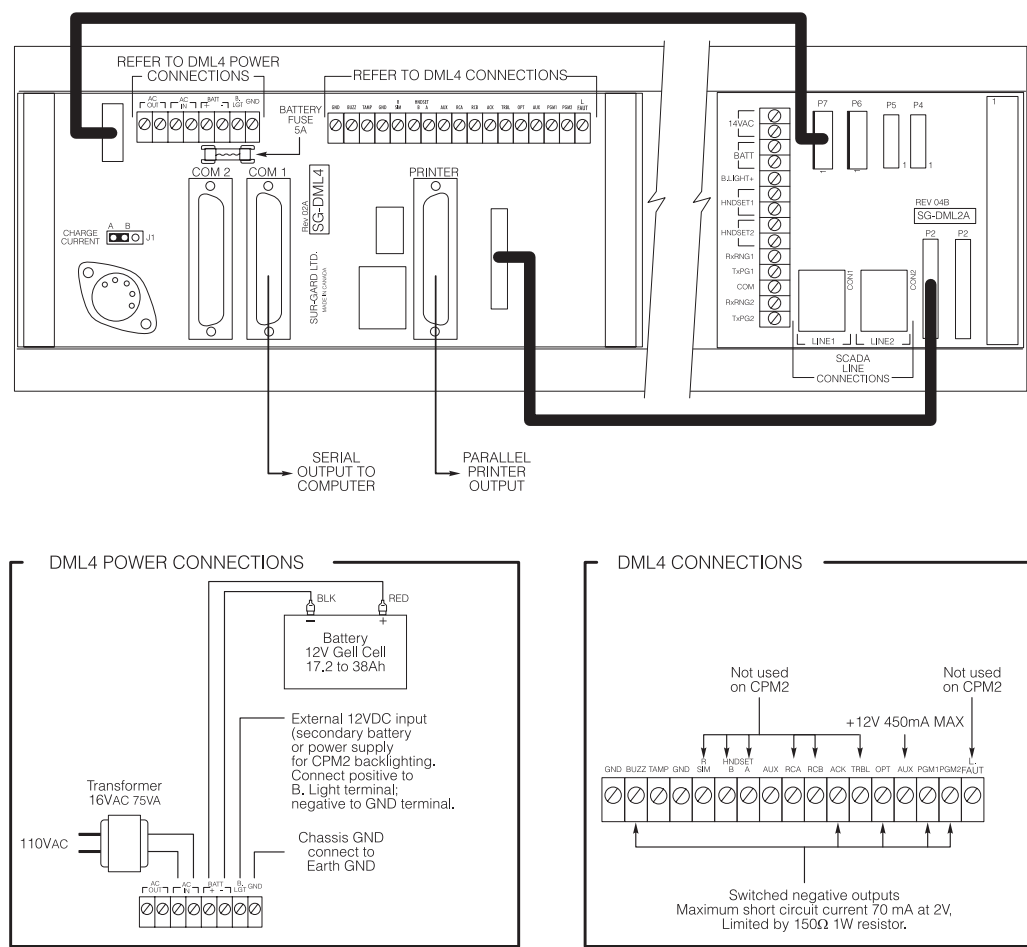
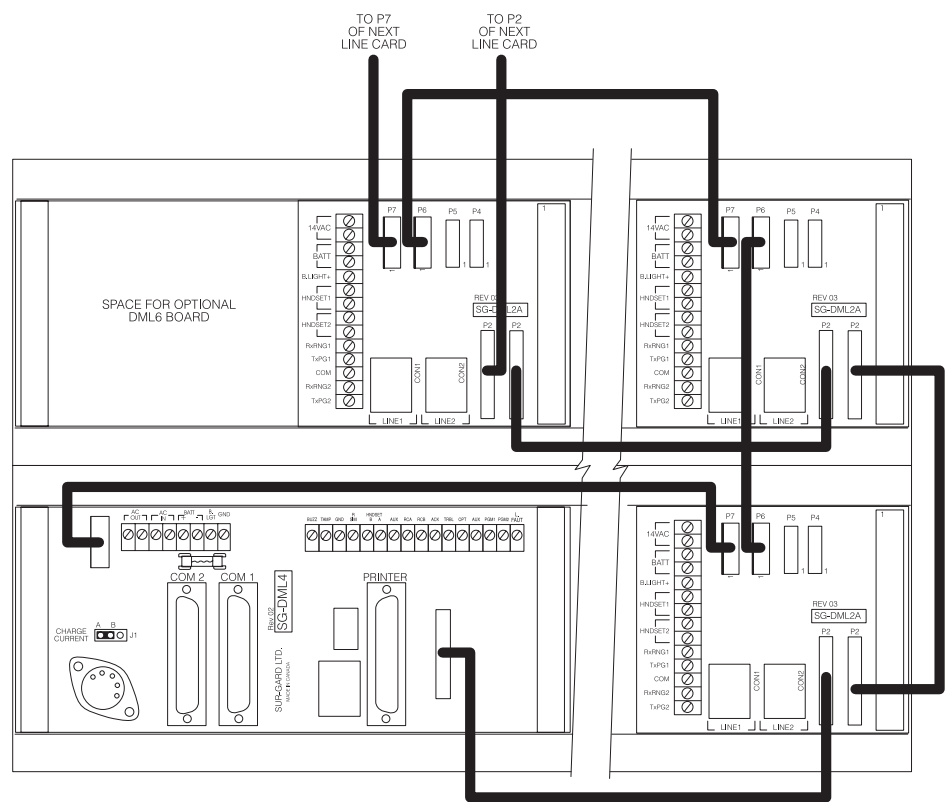
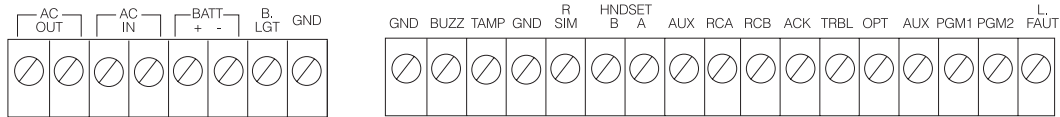


Fig. 8: Connections for DML2A Line Card Expansion

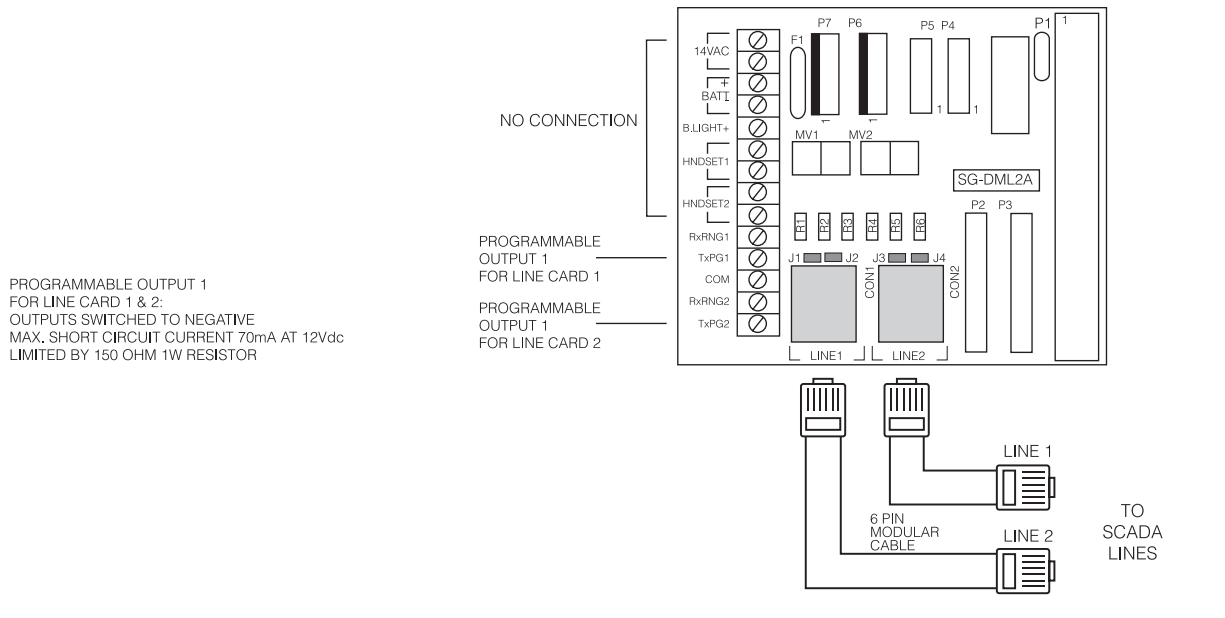


DML4 Connections



AC IN	16V _{AC} power input	HNDSET A	Not used
AC OUT	16V _{AC} filtered power output	AUX	Fused 12V output
BATT	12V battery	RCA	Not Used
B.LGT	Backlight Power Terminal: connect as secondary 12V power supply to illuminate the LCD screens	RCB	Not Used
GND	Ground	ACK	Acknowledge Output: this 12V output follows the "Acknowledge" light
BUZZ	Buzzer Output: this 12V output follows the internal buzzer	TRBL	Not used
TAMP	UPS Low Battery Supervisory	OPT	Option Output: this 12V output follows the "Option" light
R SIM	UPS AC Failure Supervisory	PGM1	Output 1 (used for RED1 installation)
HNDSET B	Not used	PGM2	Output 2 (not used)

DML2A Connections



- 14V_{AC}** May be used as an external AC output.
- BATT** May be used as an external 12V power source. Do not connect a battery to these terminals.
- B. LIGHT** Backlight power input terminal. Connect a secondary 12V power source to illuminate the LCD screens. A secondary power supply is not required if a 12V supply has already been connected to the DML4 B LGT terminal.

3.10 Redundancy Module (RED1)

The SG-RED1 is a hot redundancy switching module which enables all line card information to be switched automatically from the main CPM2 to standby CPM2.

The RED1 module supervises the master CPM2 for proper operation of the system through the PGM1 output. The PGM1 terminal constantly transmits a pulse to the RED1 (approx. 200ms on and 50ms off) module for supervisory. If a problem occurs with the CPM2 (communication trouble with the line cards) the PGM1 terminal will stay high. The RED1 will automatically switch to the backup CPM2 (also supervised through the PGM1 terminal).

For ULC installations of a SCADA network, the RED1 module is required for redundancy backup. The SCADA setup requires the addition of another leased line for the standby CPM2 and a separate SCADA line card at the master station.

Connections (see figure 9):

1. Connect pin 1 of the keyboard connector to the "FLAG" terminal of the RED1 module.
2. Connect pin 3 of the keyboard connector to the "FLT IN" terminal of the RED1 module.
3. Connect "PGM1" of the master DML4 to the "MAST" terminal of the RED1 module.
4. Connect "PGM1" of the standby DML4 to the "STN BY" terminal of the RED1 module.
5. Connect the appropriate ribbon cable and power cable from the master and standby DML4 to the RED1 module.

CPM2 software version 2.3U is required for the standby CPM2.

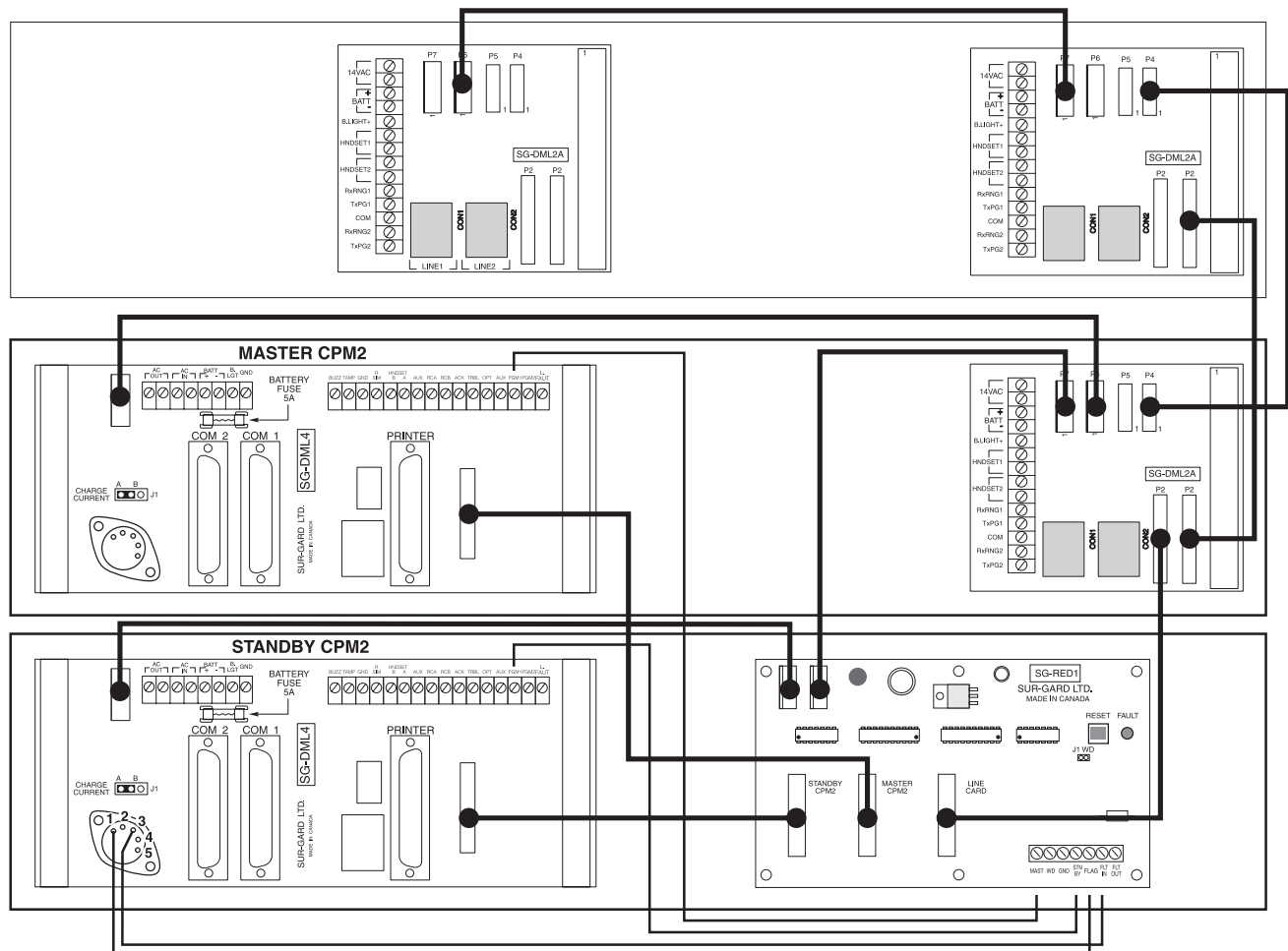
SCADA (Remote) Setup

Program option [10]: COM2 Format of the main CPM2 as [2] for SCADA connection through COM2 with Redundancy Backup.

Power up:

1. Press the reset button. The RED1 should initialize and the master should poll the attached line cards.
2. For a quick test, pull out the master CPM2. The backup CPM2 should then take over.

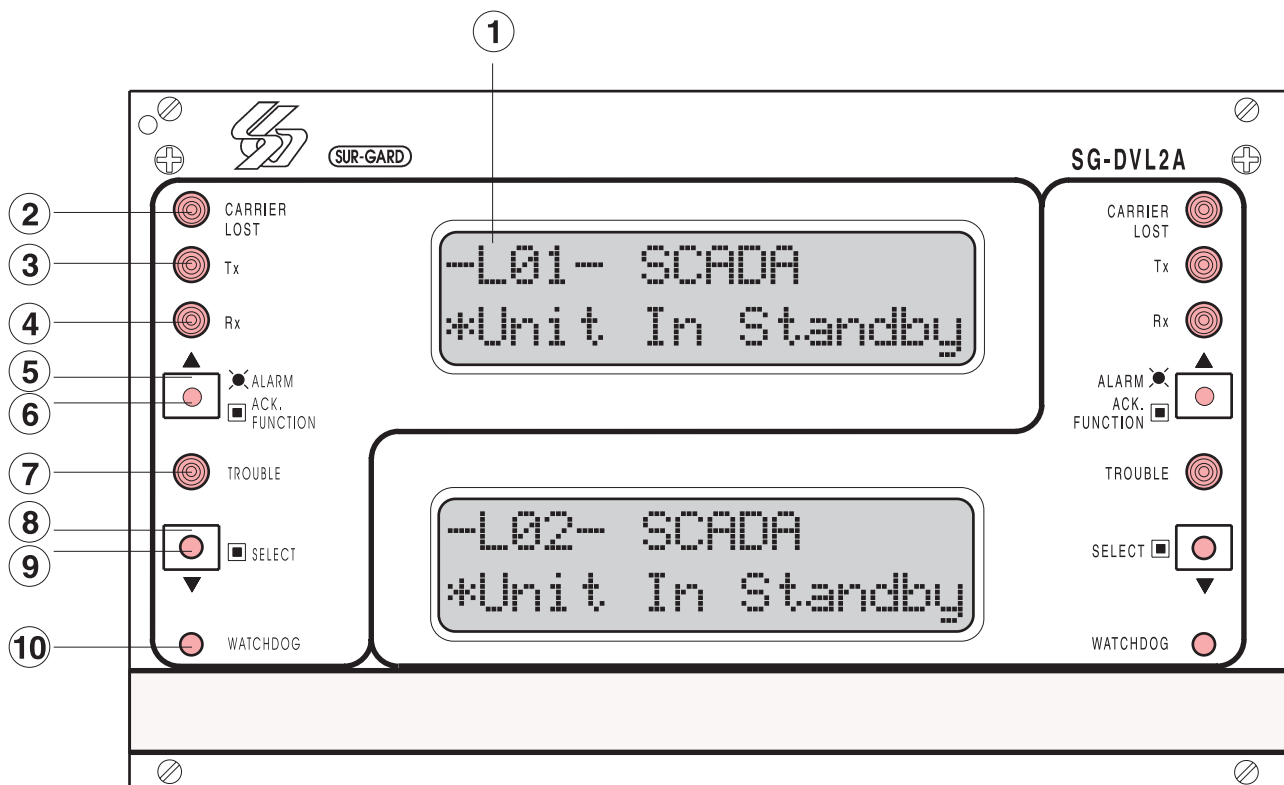
Fig. 9: SG-RED1 Input Output Connections



Section 4: SCADA Compatible Line Card

4.1 Switches and LEDs on the SG-SCADA

Each module of SG-DVL2A SCADA has 2 line cards. The LEDs and push button switches on the left side and also the upper LCD, are for line card #1. The LEDs and push button switches on the right side, also the lower LCD, are for line card #2.



1. **Liquid Crystal Display** is backlit to help reading in low light level.
2. **CARRIER LOST**: This LED turns on when there is no valid carrier detected from the phone line.
3. **TX**: This LED monitors the outgoing message transmitted over the phone line.
4. **RX**: This LED monitors the incoming message received on the phone line.
5. **ACK/FUNCTION button**: Press this button to acknowledge an alarm in urgent mode (CPM is in failure). In the normal mode, this button provides access to the line card menu.
6. **ALARM LED**: The alarm LED is situated inside the ACK button. It will flash if an alarm is received and it turns off when the alarm is successfully sent to the master CPM.
7. **TROUBLE LED**: Turns on when the line card is shut down by the operator or when the telephone line is cut. Turns off when the situation returns to normal.
8. **Select button**: In the normal mode, press SELECT has no effect at all. But in the line card menu mode, this button is used to select the menu. Once a menu is selected, the SELECT button acts to go down to the next item.
9. **Led**: Not used.
10. **WATCHDOG LED**: Flashing every 4 seconds to monitor the line card operating system.

Section 5: SG-SCADA Operating Mode

5.1 System in Standby Mode

When the line card is installed in the rack and power up occurs, the following message is shown on the LCD for 3 seconds:

```
*SG-SCADA*
*MAY-30-97 V1.3
```

It shows the date and the program version. Next, the line card monitors the telephone line, CPM and depending on the system status, the following priorities will be warned:

- Line fault.
- Line card shut down
- CPM2 failure, display FIFO message
- Keep last alarm message.
- Standby mode.

5.1.1 Line Fault

The SG-DVL2A SCADA detects continuously the heartbeat or the data transaction from the LRU local receiver unit. If no transaction occurs within 2 minutes, the following message will be on the LCD:

```
-L01- SCADA
<<-Line Fault->>
```

For the printer: L01-0000-20 Line Fault 15:01-18/06/92.

For the computer: 1001 0000 A 20.

All examples in this text are given with the line card as #1 attached to LRU and the LRU local receiver unit as #1. The principle message for the printer: Lrl-aaaa-yy xxxxxxxxxx hh:mm-dd/mm/yy and for the computer: 10rl aaaa x yy. Where r=LRU local receiver number and l=line card number attached to LRU.

5.1.2 Shutdown of Line Card Communication with CPM2

If the operator wishes to temporarily have a line card not answer CPM2 polling, they will send a command from the CPM2 keypad to shut off this line card. The shutdown command is normally only used for testing. Within this mode, the line card has to keep the alarm messages in its buffer. It can contain 256 messages in the memory. The trouble LED will turn on and the shutdown message is displayed on the LCD:

```
LnCard Shutdown!
Please Restore
```

5.1.3 CPM2 error, display alarm messages

The third priority is CPM2 error. In this situation, the SG-SCADA cannot detect the CPM2 polling. If no alarm remains in the buffer, the line card will display:

```
<<-CPM2 Error!->>
Please Restore
```

If some alarm messages cannot be sent to the CPM2 due to CPM2 error, the unit will display the oldest message which has not been manually acknowledged. The buzzer will beep and the alarm LED will flash to alert the operator. While this CPM2 error trouble condition exists, a manual acknowledge, by pressing the individual acknowledge button on the line card, is required to acknowledge the alarm in the queue and silence the line card buzzer. If several alarms have been received that cannot be sent to the CPM2, they will have to be acknowledged one by one until all have

been processed and the buzzer is silenced. The printer alarm and the RS-232 messages for the computer are kept in memory until the buffer becomes full after storing 256. Once the buffer has been filled, the oldest messages will be overwritten by the newest. Once the CPM2 Error condition is corrected, the unsent printer and RS-232 alarm messages in the buffer will be sent to the CPM2. An arbitrary example:

```
L01 -001- Fire!
AlmZn01 002
```

The number 002 in the bottom right corner of the display shows the number of alarm messages in the buffer which have not been acknowledged by the operator.

5.1.4 Keep Last Alarm Message

The SG-SCADA has a user programmable option to keep the last alarm message on the display until the next signal is received (Option #04). This is the fourth priority. For example:

```
L01 -001- FrTr1
AlmZn01 002
```

002 is the last alarm message number in the memory buffer.

5.1.5 Standby Mode

The last and lowest priority in the warning message modes is the standby mode. This mode occurs only if none of the 4 above modes is in effect. In this mode, it displays:

```
-L01- SCADA
*Unit In Standby
```

5.2. Line Card Menu Mode

When the unit is in standby mode, pressing [ACK] will display on the LCD:

```
Dsp PRINTER alm
ACK:menu SEL:sel
```

Continuing to press [ACK] will scan from one menu item to the next. Pressing [SELECT] (SEL is the abbreviation for the Select button.) allows you to select the menu item. Once selected, pressing both [ACK] and [SELECT] will exit from the menu. However, it also exits the menu if no key is pressed for 30 seconds. The principle menu items are:

- Display the printer alarm buffer.
- Display the computer alarm buffer.
- Display the whole alarm buffer (printer and computer alarm messages)
- Display the line card configuration.
- Display the program version.
- Display the line card number.
- Adjust LCD contrast.

5.2.1 Display The Printer Alarm Messages

```
Dsp PRINTER alm
ACK:menu SEL:sel
```

Pressing [SELECT], while at the "display printer alarm buffer" menu, will display the most recent alarm message on the LCD. Use [SELECT] now to move back to the previous messages or [ACK] to advance the messages.

```
L01 -001- FrTr1
AlmZn01
```

5.2.2 Display The Computer Alarm Buffer

```
Dsp COMPUTER alm
ACK:menu SEL:sel
```

Pressing <SEL>, while in "display computer alarm" menu, will display the RS-232's alarm buffer.

```
$1011 0001 A 08$
```

5.2.3 Display the whole alarm buffer

```
Dsp WHOLE buffer
ACK:menu SEL:sel
```

Pressing <SEL>, while in "display whole alarm buffer" menu, will display the printer and RS-232's alarm buffer depending the order of messages received.

```
L11 -001- Burgl
AlmZn08
```

or

```
$1011 0001 A 08$
```

5.2.4 Display the system configuration

```
Dsp CONFIG syst.
ACK:menu SEL:sel
```

Pressing <SEL>, while in "display line card configuration" menu, will display the system configuration buffer. Use <ACK> to advance or <SEL> to move back messages.

```
L01 CFG      00
Reserved:    000
```

5.2.5 Display Program Version Number

```
Dsp PROGRAM vers
ACK:menu SEL:sel
```

Pressing [SELECT], while at the "display program version number" menu, will display the date and program version number.

```
*SG-SCADA*
*May-30-97 V1.30
```

Press both [ACK] and [SELECT] to get out this mode.

5.2.6. Adjust LCD display contrast

```
Adjust CONTRAST
ACK:menu SEL:sel
```

Pressing [SELECT], while at the "adjust LCD contrast" menu, will display the current LCD contrast setting. Press [ACK] to increase or [SELECT] to reduce the display contrast. The display will show the contrast level on the second line.

```
Adjust CONTRAST
■■■■■■■■■■
```

Press both [ACK] and [SELECT] to get out this mode.

5.3 System Cold Boot

Each line card of SG-SCADA has a program enable switch situated on the circuit board solder side, accessible when the module is partially slid out of the card cage. (a small flat blade screwdriver is required to operate the switch). This switch is used to load the default system configuration from ROM and install it in the working locations in non volatile RAM. When the line card is powered up and the program switch is enabled, the message will be displayed:

```
SYST COLD BOOT
ACK:yes CAN:no
```

If operator wishes to do a cold boot, press <ACK> button. The line card will load the configuration data from ROM and install it in RAM. The following message will be displayed for 3 seconds:

```
SYST COLD BOOT
SYST COLD BOOT
```

After 3 second, or if <SEL> is pressed, the message

```
Please Turn Off
PROGRAM SWITCH
```

will displayed until the corrective action is taken, and meanwhile the line card is in a "FROZEN" mode and does not function normally to receive alarms. You must move out the module and switch "program enable" to the OFF position and reinsert the module in the rack.

5.3.1 Change the line card number

```
Change LCARD nbr
ACK:menu SEL:sel
```

Pressing <SEL>, while in "change the line card number" menu, will display the line card number. Press <ACK> or <SEL> to increment the line card number. The allowed range is 01 to 0F for a maximum 15 line cards attached to one CPM. Press both <ACK> and <SEL> to exit this mode.

```
Change LCARD nbr
FF
```

Section 6: SG-SCADA Programmable Features

6.1 Programming the Remote Receiver Number

This is achieved the same way as with the Master receiver, in the <Escape> utility mode, system option [23]. Please note the receiver number programmed on the CPM2 will be used for internal trouble only, and that the receiver number for the alarm messages must be programmed in each line card attached to this CPM2. Please refer to the MLR2-DG manual for more information on changing the line card receiver number and programming the equivalent line number options.

6.1.1 The SCADA Telecommands

The remote CPM2 receiver is also able to receive and execute a 32 character (max.) message from the master receiver SCADA for telecommands. The present command from the CPM2 to a line card has the following form:

- Press and hold the [C] button on the CPM2 until the CPM2 displays the following message:

Enter Password

The default password is "CAFE". Enter the password using the CPM2 keypad.

- When the password is entered, the CPM2 will display this message:

LCard:_ Comd:_
Op:_ Cd:_ Sc:_

LCard:01 Comd:F7
Op:36 Cd:01 Sc:_

The command format of the master receiver CPM2 operating system allows for directing commands to a particular line card of a specific remote receiver:

LCard:_ Comd:_
Op:_ Cd:_ Sc:_

Lc: SCADA line card number, which corresponds to a particular remote receiver

Comd: Command

Op: Option number of the remote line

Cd: New code for the remote line

Sc: Remote receiver line card number from 01 to 0E.

The master CPM2 will route this command to the SCADA number "Lc". The SCADA will route it to the CPM2 of the remote receiver. The remote CPM2 will route it to the line card number "Sc" attached to it. If the master CPM2 is to send the command only to a line card of a remote receiver, (shut off the line card 01 attached to remote CPM2 for example). the Op and Cd should have no data entered, or fill them with null characters "FF" if the command requires a data to be entered for "Sc".

6.2 Line Card Configuration Command: LC-F7-OP-CD

The command F7 is used to change certain configuration parameters in the line card. The format is "LC-F7-OP-CD" where LC is the line card number, OP is the option number and CD is the code or value (data) being programmed for this OP option number.

Example:

Changing the line card #01, Option #02 "Debug option", data "000" to data "001"

- Press the "C" button on the CPM to access the command mode.

Enter PASS-ID

The CPM's factory default Pass-id code is "C-A-F-E".

- Once the valid Pass-ID code is entered, the display will show:

Lcard:_ Comd:_
Op:_ Cd:_ Sc:_

- Enter the desired changes:

Enter **Line Card #** (01) Enter **Command #** (F7)

Lcard:01 Comd:F7
Op:02 Cd:01 Sc:_

Enter **Option #** (02) Enter **Data #** (01)

- Press [ESCAPE] to save the change to the line card configuration.

- To view the new change, press the [ACK] button on the SG-DVL2A until the following message is displayed:

Dsp CONFIG syst.
ACK:menu SEL:sel

- Press [SELECT] to view the system configuration. The display will show the first option #00:

L01 CFG 00
RESERVED: 000

- Use the [ACK] button to advance or [SELECT] to scroll backwards through the option numbers. When you reach the option #02, the display will now show:

L01 CFG 02
DEBUG OPT: 001

The SG-SCADA has some options which can be changed easily by the operator using the CPM commands:

COMMANDS ACCEPTED FROM THE CPM

- Configuration command F7
- Dump internal buffer command FA
- Line card shut down command FB
- Line card reactivate command FC
- Erase internal buffer command FE

6.3 Setting the line card configuration command: F7-OP-CD

The command F7 is used to change certain configuration parameters in the line card. The format is "F7-OP-CD" where OP is the option number and CD is the data code corresponding to the address OP.

Config Msg Stand. Command Meaning

RESERVED:	000		
MUTE BUZER:	000	F7-01-XX	Mute buzzer option.
DEBUG OPT :	000	F7-02-XX	Debug the protocol.
BUS ERROR :	000	F7-03-XX	Common bus error.
LINE NUMB.:	000	F7-04-XX	Line number
RCVER NUMB:	000	F7-05-XX	Receiver number
EQUIV LINE:	000	F7-06-XX	Equivalent line

Option [01]: Mute buzzer

A value different from 00 at this address will shut down the buzzer. However, the alarm LED continues flashing if an alarm occurred. A value of 00 or 01 must be programmed.

Option [02]: Debug option

This address permits the installer to verify the data received by the line card over the phone line. In the normal mode and if this option is selected, the heartbeat data will be displayed on the LCD: [J06. If an alarm message is received from the LRU, the line card will display the whole message, for example [L11 -012- Burgl AlmZn08]xx, where xx=checksum. A value of 00 or 01 must be programmed at this location.

Option [03]: Bus error

This location is accessed by the line card to indicate the performance of the internal communication between the line card and the CPM. It should be 00, but if a bad communication occurred, this value will be increased by one each time up to a maximum of 255 and then reset to 0. Bad communication may happen if, for example, you set 2 or more line cards as the same number.

Option [04]: Line Card Number

The Line Card number is a unique ID code for the SG-SCADA. Since the CPM can be linked to a maximum of 14 line cards, it is very important to keep a unique ID code for each of the SG-SCADA line cards. A hexadecimal number, from "01" to "0E", can be used for this option. The default is set to FF so as not to conflict when the line card is first installed.

Option [05]: Receiver Number

The receiver number is used for sending signals to the central station software. This number should be the same as other DVL2/DVL2A or DRL2/DRL2A line cards connected to the same CPM module. Refer to your central station automation software manual, and check the numbers already used for any other receivers, to select this number. The default is 01.

Option [06]: Equivalent Line

This option is used to simulate a physical line card number, and/or to get the receiver number printed with the line number. Information printed and/or sent to computer will indicate that the information was received on the line number programmed at this option. The receiver number does not change. Program 00 at option [1C] or a number from 01 to 0E.

Printer and Serial Messages sent from the SCADA:

The message for a printer on a standard receiver is:

L0I-1234-66 xxxxxxxxxx hh:mm-DD/MM/YY

L01-1234-66 Auxil 15:04-12/04/96

Where 0I = 00 to 0E, to denote the number of up to 14 line cards. Thus, the r is always 0 and the I=1 to E. However, with SCADA, we can use the equivalent line options on each line to get the local receiver number which is attached to SCADA printed and "I" (a number from 1 to E) for line card numbers attached to the local CPM2 receiver. An example:

L14-1234-331 Alarm 15:04-12/04/96

The local CPM2 receiver number 1 received a message from its line card number 4. The message is an alarm on zone #31 of account number 1234.

The message for the serial is:

1014ssssss1234sAs66

(1RRLssssssAAAAsXsYY)

The RR is 01 for the local CPM2 receiver and the line card is number 4.

6.4 Dump internal buffer command FA

The command FA is used to dump the internal line card buffer to the printer or to the computer. The quantity of messages to be printed is entered as a HEX number. Example: 20 gives 32 messages, 30 gives 48 messages and so on.

6.4.1 Dump alarm printer messages to printer:

LC-FA-01-XX

Dump the XX number of printer alarm messages from the line card to the CPM's printer. XX should be a number from 01 to FE in hex. for a maximum 254 messages. The result will look like:

L11*-012- Burgl AlmZn01 08:24-19/06/92

L11*1234-02 Panic----- 09:34-19/06/92

etc..

A "*" is inserted after L11 to distinguish the alarm message and the dump command messages.

6.4.2 Dump alarm computer messages to printer:

LC-FA-02-XX

Dump the XX number of computer alarm messages from the line card to the CPM's printer. XX should be a number from 01 to FE in hex. for a maximum 254 messages. The result will look like:

L01 COM 1011 0012 A 01 08:24-19/06/92

L01 COM 1011 1234 A 02 09:34-19/06/92

etc..

6.4.3 Dump alarm comp. messages to computer:

LC-FA-03-XX

Dump the XX number of computer alarm messages from the line card to the CPM's RS-232. XX should be a number from 01 to FE in hex. for a maximum 254 messages.

6.4.4 Dump the line card configuration:

LC-FA-04-04

Dump the line card configuration to the printer, see line card configuration table in section 1.0: Configuration command LC_F7_OP_CD for more detail.

6.5 Halt Line Card Communication with the CPM (Shutdown): LC-FB-XX-XX

Where XX = don't care. You can press [ESCAPE] after entering "FB". This command will shut down the line card number entered in the LCard position of this command. The CPM will advise the line card shut down to the printer and to the computer. The following warning message will be displayed on the line card LCD:

LnCard Shutdown!
Please Restore

6.6 Line Card Reactivate Command: LC-FC-XX-XX

Where XX = don't care. This command will re-establish the line card in communication with CPM.

6.7 Access to Line Card Internal Buffer Command: LC-FE-XX-XX

The "FE" command is used to access the line card internal buffers, as described below:

6.7.1 Erase alarm printer/computer/error buffer command: LC-FE-00-00

Be sure that you have a copy of the alarm buffer for printer and computer before sending this command. It will erase the 256 printer alarms and the 256 computer alarms and the error buffer, in the line card memory. It also erases the bus error and the communication error buffers.

6.7.2 Erase bus error and communication error buffer command: LC-FE-01-01

This command will reset the bus error counter and clear the communication error buffer in the line card. You can also erase the bus error with the command LC-F7-12-00.

6.7.3 Software reset command: LC-FE-02-02

This command will stop the watch dog timer output, to force the line card to do a reset.

6.7.4 Save current to backup configuration command: LC-FE-03-03

When you change the parameters in the configuration field, it effects immediately the line card processing. This is the current or active configuration. Once you are satisfied with the results, you can send this command to store the current configuration to the backup configuration. This backup might be used in the future in case temporary changes were made and then you want to reload your standards, using the command below.

6.7.5 Load the backup and install it in the active configuration command: LC-FE-04-04

If you wish to try different program configurations, this command can be used afterwards to return the line card to your original operation.

6.8 Command Description for Line Card

- F7 : Access the line card configuration (see SG-SCADA Programmable Features section 4.0 for more details).
- FA : Dump to printer command (see SG-SCADA Programmable Features section 5.0 for more details).
- FB : Shut down a line card (see SG-SCADA Programmable Features section 5.0 for more details).
- FC : Reactivate a line card (see SG-SCADA Programmable Features section 5.0 for more details).
- FE : Access to line card internal buffer (see SG-SCADA SCADA Programmable Features section 4.0 for more details).

Section 7: SG-CPM2 Central Processing Module

The CPM2 is the central processing module that monitors the DVL2A SCADA, DVACS, or Digital Line Cards and forwards the information from the Line Cards to the computer and printer. The CPM2 is capable of monitoring a maximum of 14 lines.

7.1 General Information

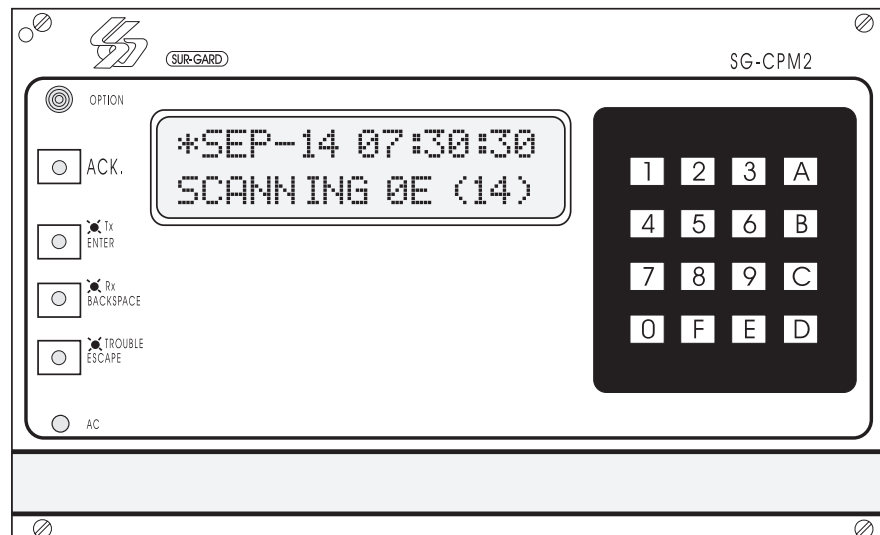
The CPM2 16-bit micro-controller and real-time assembly language program running at 16MHz allow the system to quickly and efficiently execute several tasks at the same time. The use of a unique menu display system enhances the system's ease of use for the operator and makes the system configuration and programming simple and efficient. Several diagnostics modes are available to assist the operator in troubleshooting and maintenance.

7.2 Features

- Multi-tasking allows the receiver to perform functions that might otherwise be delayed by a slow computer acknowledgment response
- Fast internal communication results in practically no delay in transfer of information between the Line Card and the CPM2. The CPM2 is capable of polling 14 Line Cards in 1 second
- 128-event printer alarm message buffer
- 128-event computer alarm message buffer
- LCD contrast easily adjusted

- Ability to individually examine each Line Card message
- "Cold boot" option allows easy installation of default configuration
- Built-in diagnostic "debug" mode allows each Line Card to be monitored individually
- Serial Port COM1 features LED indicators for Transmit (Tx) and Receive (Rx) functions
- Available COM1 baud rates: 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200 or 38400
- COM1 Data bits: 7, 8 or 9
- COM1 Parity: Even, odd or none
- COM 1 Stop Bits: fixed at 1
- Built-in Serial Communication Diagnostic Mode for COM1. The technician can test the communication with the central station computer and monitor what is being transmitted to and received from the computer
- Two programmable outputs, one with front panel LED indicator
- Buzzer mute option for system testing
- System menu for easy programming and diagnostics
- Software Version 2.3 supports SCADA Line Cards for networks of receivers

7.3 CPM2 Controls



Liquid Crystal Display (LCD): 2-line LCD with 16 characters per line; backlit for easy reading in low level light

"Option" light: Indicates the state of the "Option" programmable output. Flashing 2 seconds ON, 2 seconds OFF, with the standard program.

[ACK] button: Used to manually acknowledge an alarm event when a computer is not connected to the receiver or when the UL Receiver Option is enabled. Press the [ACK] button to turn the "ACK" light OFF and silence the buzzer. The [ACK] button is also used in the Configuration Mode to select menu items.

"ACK" light: Flashes when a message is received from the Line Card and COM1 is disabled or disconnected

[Enter] button: Executes a command or scrolls the display to the next message.

"TX" light: Monitors the COM1 transmission signal

[Backspace] button: Used to erase errors or move the cursor back one character; also used to scroll the display back to the previous message.

"RX" light: Monitors the signal received from the computer connected to COM1.

[Escape] button: Used to save changes and exit a mode; also used for other functions when indicated on the display screen.

"TROUBLE" light: Illuminates when a trouble condition is present (not used).

"AC" light: Indicates that AC power is present.

7.4 CPM2 Operating Mode

CPM2 Cold Start-up

The "cold boot" should be performed to install the default system software.

Follow the procedure described here to perform a "cold boot" of the CPM2.

1. Remove the CPM2 from the card cage
2. Turn the "PROG EN" (Program Enable) switch ON. The Program Enable switch is located on the left side of the CPM2 unit; use a small screwdriver to turn the switch ON by turning it clockwise.
3. Reinstall the CPM2 in the card cage, but do not fasten the mounting screws. The CPM2 should power up and this message will be displayed:

```
SYST COLD BOOT?  
Ent=Yes Bsp=No
```

4. Press the [Enter] button to perform the "cold boot". This message will be displayed:

```
SYST COLD BOOT  
Executing!
```

After approximately 1 second, this message will be displayed:

```
Please Turn Off  
Program Switch!
```

The CPM2 will remain in an inoperative mode until the Program Enable switch is turned OFF.

5. Pull the CPM2 part way out of the card cage
6. Use a small screwdriver to turn the Program Enable switch OFF by turning it counterclockwise.
7. Reinstall the CPM2 in the card cage and secure the faceplate screws

The CPM2 is now ready for operation. Set the clock and calendar and configure the CPM2.

7.5 CPM2 in Stand-By Mode

When the CPM2 is in Stand-By mode, a message similar to this will be displayed:

```
*FEB-23 07:30:45  
Scanning 0E (14)
```

This indicates that the system is ready to receive data from the Line Cards and input from the numeric keypad and push buttons.

7.6 CPM2 Configuration Mode

The Configuration Mode allows programming of the various features and options available on the CPM2. To enter the Configuration Mode, press the [Escape] button; this message will be displayed:

```
Enter MASTER-ID  
*****
```

Enter the Master Access Code using the keypad; the default Master Access Code is "CAFE". When the access code is entered, the screen will display the first option in the Options Menu:

```
01:Sys Date/Time  
Ent:+ Bs:- Ack:S
```

Press the [Enter] button to display the next menu item, or press the [Backspace] button to display the previous menu item; press the [ACK] button to select the menu item presently displayed on the screen.

7.7 Configuration Options

The CPM2 features 23 configuration options:

- | | |
|----|------------------------|
| 01 | System Date and Time |
| 02 | System Passwords |
| 03 | Number of Line Cards |
| 04 | Printer Select |
| 05 | COM1 Configuration |
| 06 | COM1 Format |
| 07 | Acknowledge Wait Delay |
| 08 | Heartbeat Select |
| 09 | COM2 Configuration |
| 10 | COM2 Format |
| 11 | Contrast Adjust |
| 12 | UL Receiver Option |
| 13 | Erase Memory |
| 14 | Mute Buzzer |
| 15 | Keep Last Message |
| 16 | Debug ComPort |
| 17 | Test 9v/12v Batt |
| 18 | Debug Line Card |
| 19 | Program Version |
| 20 | Monitor Battery |
| 21 | Year / Second |
| 22 | Force Reset |
| 23 | Change Receiver Number |
| 24 | Com 1/2 Control |
| 25 | Printer Control |
| 26 | Printer Test |
| 27 | Printer Width |
| 28 | Tamper Input |

Option 01: Setting the Clock

Option [01] allows the CPM2 date and time to be set. Press the [ACK] button when the "01: Sys Date/Time" message is displayed; this message will be displayed:

```
(D/M/Y) 23/02/93  
(H:M:S) 07:30:45
```

Enter the date and time using the numbers 0 through 9 only. Press the [Enter] button to move the cursor one character to the right; press the [Backspace] button to move the cursor one space to the left.

When the date and time are entered, press the [Escape] button; when the [Escape] button is pressed, the next Configuration Option will be displayed on the screen.

Note that if "0" or a number greater than "12" is programmed for the month, the screen will display the word "Nul" in place of the month while in the Stand-By mode. "Nul" will also be displayed for the time if the time has not been programmed properly.

Option 02: Changing System Passwords

Option [02] allows the CPM2 passwords to be changed or erased. Press the [ACK] button when the "02: Sys Passwords" message is displayed; this message will be displayed:

PassID#0: xxxx
Operator: S.G.

Sixteen 4-digit passwords are available for use on the CPM2. Password 0 is the Master Password, and Passwords 1 through F may be assigned to individual operators. Two letters, representing the initials of the operator, may be assigned to each Password to help in identifying the operator.

When this option is entered, a cursor will appear beneath the first character in the 4-digit Password. Enter a new Password using the 0 through 9 and the A through F keys.

To enter the operator's initials, use the [0] and [1] keys to scroll forward or backward through the alphabet. When the desired letter is displayed, press the [Enter] button; the cursor will move to the next character. To move the cursor to the previous character, press the [Backspace] button.

When the Password and initials have been entered, press the [Escape] button; the next Password will be displayed. When all Passwords have been programmed, the display will advance to the next Configuration Option.

Option 03: Change the Number of Line Cards

Option [03] is used to set the number of Line Cards polled by the CPM2. Press the [ACK] button when the "03: Numb of Lcard" message is displayed; this message will be displayed:

#LnCard Attached
E Change to: x

Enter a number from 1 to E to indicate how many Line Cards, from 1 to 14, are to be polled by the CPM2. When the new number is entered, press the [Enter], [Backspace], or [Escape] button; the screen will then display the next Configuration Option.

Option 04: Select Printer Function

Option [04] determines how the printer connected to the CPM2 will operate. Press the [ACK] button when the "04: PrinterSelect" message is displayed; this message will be displayed:

Prnter Config As:
Bkup:0 Enable:1

Enter a digit from 0 through 1 for both "Bkup" and "Enable" according to the chart below:

Bkup	Enable	Printer Operation
0	0	Bypass printer
0	1	Enable printer (default setting)
1	0	Enable printer only if COM1 is in failure

If "Bkup" is programmed as "1", messages will only be sent to the printer if an acknowledge signal is not received from COM1.

When using the Star 8340 printer, the CPM2 is able to print in both red and black. If an IBM-compatible printer is selected, the CPM2 will print in black only.

When programming is complete, press the [Escape] button; when the [Escape] button is pressed, the next Configuration Option will be displayed on the screen.

Option 05: COM1 Configuration

Option [05] determines the baud rate, data bits and parity to be used on COM1. Press the [ACK] button when the "05: Com#1 Config." message is displayed; this message will be displayed:

Com#1 Config As:
Br:12 Da:7 Pa:2

Br: Baud Rate	Enter...	for baud rate
	11	110
	15	150
	03	300
	12	1200
	24	2400
	48	4800
	96	9600
	19	19200
	38	38400

Da: Data Bits Enter a number from 7 through 9 to indicate 7, 8, or 9 data bits.

Pa: Parity	Enter	for parity
	0	no parity
	1	odd parity
	2	even parity

Note that the stop bit is fixed at 1.

When programming is complete, press the [Escape] button; when the [Escape] button is pressed, the next Configuration Option will be displayed on the screen.

Option 06: COM1 Communication Format

Option [06] determines the communication format to be used on COM1. Press the [ACK] button when the "06: Com#1 Format" message is displayed; this message will be displayed:

Com#1 Format is:
1 Change to: x

Enter a number from 0 to 4 to select one of the following:

- | | |
|---|--------------------------------------------|
| 0 | COM1 disabled |
| 1 | Sur-Gard format (default setting) |
| 2 | Sur-Gard format with common event code "A" |
| 3 | Sur-Gard format with header 01 Hex. |
| 4 | Sur-Gard Clock Signal format |

When programming is complete, press the [Enter], [Backspace], or [Escape] button; when a button is pressed, the next Configuration Option will be displayed on the screen.

Option 07: Wait Time for Acknowledge on COM1

Option [07] determines the acknowledge wait time, in seconds, to be used for COM1. Press the [ACK] button when the "07: ACK Wait Time" message is displayed. This message will be displayed:

<ACK> Wait Delay
4.0S Chg to:x.xS

Enter a decimal number from 4.0 to 9.9. Use the [Enter] and [Backspace] buttons to move the cursor forward or backward when editing the acknowledge time.

When programming is complete, press the [Escape] button. When the [Escape] button is pressed, the next Configuration Option will be displayed on the screen.

When the <ACK> wait time is programmed as "0.0", the CPM2 will not require a "06H" (ACK) from the computer.

NOTE: It is strongly recommended not to change the default (4.0 sec.) unless recommended to by a Sur-Gard representative technician.

Option 08: Heartbeat Time for COM1

Option [08] determines at what time interval, in seconds, the supervisory "heartbeat" transmission will be sent to COM1. The "heartbeat" transmission is used to ensure that

communications through COM1 are functioning normally. Press the [ACK] button when the "08: Heartbeat Sel" message is displayed. The following message will be displayed:

Heartbeat Select
30S Chg to:XXSec

Enter a decimal number from 01 through 99 to determine the time interval between heartbeat transmissions. Program this option as "00" to disable the heartbeat transmission.

Use the [Enter] and [Backspace] buttons to move the cursor forward or backward when editing the heartbeat time.

When programming is complete, press the [Escape] button; when the [Escape] button is pressed, the next Configuration Option will be displayed on the screen.

Option 09: COM2 Configuration

Option [09] determines the baud rate, data bits and parity to be used on COM2. Press the [ACK] button when the "05: Com#1 Config." message is displayed; this message will be displayed:

Com#2 Config As:
Bd:03 Da:8 Pa:2

Bd: Baud Rate Enter... for baud rate

11	110
15	150
03	300
12	1200

Da: Data Bits Enter a number from 7 through 9 to indicate 7, 8, or 9 data bits.

Pa: Parity Enter for parity

0	no parity
1	odd parity
2	even parity

Note that the stop bit is fixed at 1.

When programming is complete, press the [Escape] button; when the [Escape] button is pressed, the next Configuration Option will be displayed on the screen.

Option 10: COM2 Communication Format

Option [10] determines the application to be used on COM2. Press the [ACK] button when the "10: Com#2 Format" message is displayed; this message will be displayed:

Com#2 Format is:
0 Change to x

Enter a number from 0 to 2 to select one of the following:

0	PC Computer Programming Software capability (default setting) See page 30.
1	SCADA connection through Com#2 enable
2	SCADA connection through COM2 with redundancy backup enable

Heartbeat

To supervise the link to the remote receiver during periods of no event traffic. The heartbeat or null message should be sent by the CPM2 (remote receiver) every 10 seconds on its COM2 port. The protocol is: LF [] <CR>

The SCADA in the master receiver will periodically verify the heartbeat coming from the remote CPM2 to keep track of its presence/absence. It also replies to the CPM2's heartbeat by sending any telecommands which the operator may have entered for that remote system. The heartbeat

period will be reset to 0 at each alarm transaction, to minimize the number of unnecessary transmissions. The telecommand transaction will be sent using the standard message protocol from the CPM2 to SCADA. An <ACK> or <NAK> will be sent from the CPM2 SCADA to denote the reception of the telecommand.

Reply <ACK>

When the SCADA line card in the master receiver receives a valid information packet with checksum from the remote receiver, it will reply with an <ACK> 06 hex to denote the successful communication. If the master SCADA receiver failed to communicate an <ACK>, the remote receiver will once again transmit the information packet within a 200msec time period. The remote receiver will attempt to send the information packet 4 times before providing a local trouble message that the SCADA is disconnected. The protocol is: LF [<ack>|<data>|<data>...] <sum> <CR>

Option 11: Adjust LCD Contrast

Option [11] allows the contrast of the message display screen to be adjusted. Press the [ACK] button when the "11: Contrast Adj" message is displayed. The following message will be displayed:

Contrast Level
■■■■■■■

Press the [Enter] button to increase the contrast; press the [Backspace] button to reduce the contrast.

When the display contrast is adjusted to the desired level, press the [Escape] button; when the [Escape] button is pressed, the next Configuration Option will be displayed on the screen.

Option 12: UL Receiver Option

To have the MLR2-SCADA operate in compliance with UL-Listed Central Station requirements, press the [ACK] button when the "12: UL Receiver" message is displayed. This message will be displayed:

UL Requirement:
0 Change to:x

When Option [12] is programmed as "1", the CPM2 will operate according to the following UL864 requirements:

- 1 All signals are sent to the computer and/or the printer if connected.
- 2 The CPM2 retains alarm messages received from the Line Cards and the CPM2 supervisory signal on the LCD display, and activates the buzzer to alert the operator. The display will also indicate if additional signals are waiting to be displayed and acknowledged.
- 3 The operator must press the [ACK] button to acknowledge the signal manually. The CPM2 will scroll to the next message if there are more messages to display.
- 4 The CPM2 returns to the Standby Mode when all signals have been manually acknowledged.

When Option [12] is programmed as "00", functions described above will be bypassed. The default setting for Option 12 is "00".

Option 13: Erase Alarm Message Buffer

NOTE: Under normal operating conditions, the buffer should not be erased.

Option [13] is used to erase the CPM2 alarm message buffer. Press the [ACK] button when the "13: Erase Memory" message is displayed. The following message will be displayed:

Erase all MEMORY
ent=Y bs=N esc=X

Press the [Backspace] or [Escape] buttons to cancel this option without erasing the CPM2 buffer. To erase the buffer, press the [Enter] button. When the [Enter] button is pressed, this message will be displayed:

Are You Sure?
ent=Y bs=N esc=X

Again, press the [Backspace] or [Escape] buttons to cancel this option without erasing the CPM2 buffer. To erase the buffer, press the [Enter] button. When the [Enter] button is pressed, all printer and computer messages will be erased. Ensure that a printed record of the alarm messages is made before erasing the buffer.

Option 14: Mute Buzzer

A tone will sound when the CPM2 receives an alarm and is unable to forward the alarm message to COM1. The tone may be silenced by programming Option [14] as "1". Press the [ACK] button when the "14: Mute Buzzer" message is displayed. The following message will be displayed:

Mute Buzzer: 1/0
0 Change to:X

When programmed as "1", the buzzer will not sound when an alarm is received and cannot be forwarded to COM1. When programmed as "0", the buzzer will sound when an alarm is received and cannot be forwarded to COM1. The default setting is "0".

NOTE: Option 14 will have no effect on the buzzer if the UL Receiver Option is enabled.

Option 15: Display Last Message

When an alarm is received, the alarm message will be displayed on the screen until the message is forwarded to the computer and printer. When the message is sent to the computer and printer, the Stand-By Mode message will be displayed.

The most recent alarm message may be retained on the screen until the next alarm message is received. To retain the most recent alarm message, program Option [15] as "1". Press the [ACK] button when the "15: Keep Lst Msg" message is displayed. The following message will be displayed:

Keep Lst Msg:1/0
0 Change to:X

To have the Stand-By Mode message displayed after an alarm is received and sent to the computer or printer, program Option [15] as "0". The default setting is "0". When "0" or "1" has been entered, press the [Enter] key.

Option 16: ComPort Diagnostics

The CPM2 features a diagnostics mode that allows the operator to view all data being communicated through COM1 (or COM2) on the display screen. To use this feature, press the [ACK] button when the "16: Debug ComPort" message is displayed. This message will be displayed:

Debug ComPort1,2
0 Change to:x

Enter "1" and press the [Enter] button to enable the diagnostics feature on COM1 (or "2" for COM2). All data being sent through COM1 will now be displayed on the screen. A typical transmission is shown here:

1RRL AAAAsX
YY N 06

- N represents the number of times the CPM2 tries to re-send the message to COM1; this value should be "1" during normal communication
 - 06 represents the acknowledge received from COM1
- To disable the diagnostics feature, program Option 16 as "0". The diagnostics mode should only be enabled to test and review the information being sent to COM1. The diagnostics feature should be disabled during normal receiver operation.

Option 17: Test 9V/12V Battery

Some earlier CPM2 units provide 9V battery for memory storage while present CPM2 units use different technology for this purpose.

If the unit uses 9V battery, the battery voltage should be supervised by enabling this option. Press [ACK] button when the "17:Test 9V Batt." message is displayed. The following message will be displayed:

9V/12V Batt: 0-3
3 Change to:x

- | | |
|---|-------------------------------------------|
| 0 | Do not supervise the 12V and 9V batteries |
| 1 | Supervise 9V only |
| 2 | Supervise 12V only |
| 3 | Supervise both batteries |

Option 18: Line Card Diagnostics

The CPM2 features a diagnostics mode that allows the operator for view all data being communicated between the CPM2 and the Line Cards. To enable this feature, press the [ACK] button when the "18: Debug LnCard#" message is displayed. Enter a hexadecimal number from "1" through "E" to monitor Line Card 01 through 14, or enter "F" to monitor all Line Cards connected to the CPM2.

Stand-By communications between the Line Card and the CPM2 will be displayed with messages similar to this:

01 FE

- 01 represents the Line Card number
- FE represents the response from line number 1 to the normal CPM2

Alarm messages transmitted by the Line Cards will be displayed with messages similar to this:

L01-1234-C01
OpenGrp

NOTE: When diagnostic modes are enabled, messages will be displayed according to the following priority:

- UL message - Acknowledge required
- COM1 Diagnostic messages
- Line Card Diagnostic messages
- "Retain last message" displays
- Internal Troubles messages
- Stand-By Mode message

Refer to "Message Priorities" for more information.

Option 19: Display Software Version

To display the software version presently installed in the CPM2, press the [ACK] button when the "19: Program Vers#" message is displayed. A message similar to this will be displayed:

SG-CPM2 RECEIVER
***May-97 V2.30**

Receiver Number:
01 Chg to:xx

Option 20: Battery Monitor

To view the present voltage of the 12V general backup batteries, press the [ACK] button when the "20: Monitor Batt." message is displayed. A message similar to this will be displayed:

Battery Monitor:
12V:13.9 Volt

If the 12V battery is disconnected, approximately 11.2V will be indicated for that battery.

NOTE: If option 17 is at 03, a message similar to this will be displayed:

Battery Monitor:
9V:08.8 12V:13.9

Option 21: Alarm Messages Print Year or Seconds

Alarm messages may be programmed to include either the year in their dates, or the seconds in their times. To program Option [21], press the [ACK] button when the "21: Year/Second" message is displayed. This message will be displayed:

Year/Second:0/3
0 Change to:X

Program Option [21] as "1" to include the year in the alarm message date. Alarm messages will be printed as follows:

L01-1234-05 Alarm 21:24-24/11/94

Note that the time (21:24) is represented with just hours and minutes, and that the year is added to the date (24/11/94). Program Option [21] as "0" to include the seconds in the alarm message time. Alarm messages will be printed as follows:

L01-1234-05 Alarm 21:24:30-24/11

Note that the time (21:24:30) now includes hours, minutes and seconds. The date (24/11) only indicates the day and the month.

System option [21] provides the following choices for the printer time and date format:

- 0 hh:mm:ss-DD/MM
- 1 hh:mm-DD/MM/YY
- 2 hh:mm:ss-MM/YY
- 3 hh:mm-MM/DD/YY

NOTE: This option will affect COM1 when COM1 is programmed with communication format 4.

Option 22: System Reset

To reset the CPM2 program, press the [ACK] button when the "22: Force Reset" message is displayed; this message will be displayed:

Force Sys Reset
Ent=Yes Bsp=No

Press the [Backspace] button to cancel the option without resetting the CPM2. To reset the CPM2, press the [Enter] button.

The reset will take approximately 8 seconds to complete. Press the [Backspace] or [Escape] buttons to move to the next Configuration Option.

Option 23: Change Receiver Number

The receiver number is used to identify the receiver when communicating to COM1 and printer to report internal troubles. To change the receiver number, press the [ACK] button when the "23: Chg Receiver#" message is displayed. This message will be displayed:

Enter a new receiver number using the hexadecimal numbers "01" to "FE". When a new number is entered, press the [Enter] button.

Note that when Option [23] is programmed, the display will return to Option [01].

Option 24: COM1/2 Control

For the alarm output choices, a number corresponding to each of the line cards from one to fourteen is indicated on the LCD at 14 positions from left to right as follows:

24: COM1/2 Control
Ent: + Bs: - Ack:S

123456789ABCDE :
44444444444444

Press Enter or Backspace to move the cursor over the digit corresponding to the line card you wish to change. Enter the new digit. The CPM2 will display the change on the LCD, and the cursor will move to the next digit. Change another digit, as above, if desired, or exit and save the changes by pressing <Escape>.

The numbers which can be programmed are:

0: no route at all - no printer output, no computer output (not recommended).

1: send computer alarm messages only to the Com#1 (local computer) only.

2: send computer alarm messages only to Master central through Com #2 for transmission to the SCADA of the master receiver only.

3: send computer alarm messages to Com #1 (local computer) and next to Com #2 for SCADA.

4: send computer alarm messages to Com #1 and Com #2, and send printer alarm messages to Com #2.

Option 25: Printer Control

The remote receiver SCADA CPM2 sends data to the local printer in the normal way, which can be enabled/disabled for each line at option [25] as follows:

25: Prtner Control:
Ent: + Bs:- Ack:S

123456789ABCDE :
11111111111111

Programming "1" will enable the local printer report for this specific line. "0" will disable the local printer for this specific line.

NOTE: When the receiver routes the data to the serial port Com #2, it needs to insert the checksum calculation and support the protocol described in more detail in Appendix E.

Option 26: Printer Test

When this option is enabled, a test signal will be sent to the printer at 05:00 and 17:00 hrs. This option is set to "0" (OFF) by default. Press [ACK] when "26: Printer Test" is displayed. The following message will then be displayed:

Printer Test: 1/0
0 Change to:

Enter "1" and press the [Enter] button to enable the test feature. The CPM2 will send a test signal to the printer at the scheduled time.

Printer message: L10 Printer Test 17:00:00 - 12/05

Option 27: Printer Width

NOTE: The 80-column mode is not supported with SCADA installation.

This option will set the printer width to either 40 or 80-columns. Press [ACK] when the message "27: Printer Width" is displayed. The following message will then be displayed:

```
40/80 Column: 0/1
0 Change to:
```

Press "1" and then [Enter] to enable the 80-column width feature.

Option 28: Tamper Input

To view the Tamper Input / UPS Low Battery supervisory, press the [ACK] button until "28: Tamper Input" is displayed. Press [ACK], the following message will then be displayed:

```
UPS/<ACK> : 0/1
0 Change to:
```

When this option is set to "0", the tamp terminal when shorted to ground will send a UPS Low Battery supervisory to the computer and activate the buzzer and ACK LED. The buzzer will shut off when the [ACK] button is pressed, or the UPS Low Battery is restored. When the option is set to "1", the tamp terminal can be used as a remote [ACK] button when shorted to ground. The default setting is "0".

7.8 Message Priorities

When in Stand-By Mode, the CPM2 will display warning and other operational messages according to the following priority:

- 1 UL Requirement Message
- 2 COM1/COM2 Diagnostics
- 3 Line Card Diagnostics
- 4 "Retain last message" displays
- 5 Printer Error
- 6 COM1 Absent
- 7 12V Battery Low
- 8 9V Battery Low
- 9 AC Failure
- 10 Stand-By Mode message

7.8.1 UL Requirement Message

When Option [12] is programmed as "01", the "ACK" button must be pressed to acknowledge each incoming alarm manually and to silence the internal buzzer.

7.8.2 COM1 Diagnostics

If both Option [16] and Option [06] are enabled, the screen will display the data being communicated through COM1. Refer to Option [16] for information.

7.8.3 Line Card Diagnostics

If Option [18] is enabled, the screen will display that data exchanged between the CPM2 and the selected Line Card. Refer to Option [18] for more information.

7.8.4 "Retain Last Message" Displays

If Option [15] is enabled, the latest printer message will be retained on the display screen. Refer to Option [15] for more information.

7.8.5 Printer Error

If Option [04] is enabled and there is a printer trouble (for example, printer off-line, paper out, and so on), a message similar to this will be displayed:

```
*Feb-23 07:30:45
<Printer ERROR!>
```

7.8.6 COM1 Absent

If Option 06 is enabled and COM1 is absent (for example, disconnects, off-line, or fails to send acknowledge signal), a message similar to this will be displayed:

```
*Feb-23 07:30:45
<<Com#1 ABSENT>>
```

7.8.7 12V Battery Low

If the 12V back-up battery is disconnected or its voltage is low, a message similar to this will be displayed:

```
*Feb-23 07:30:45
12V Battery LOW!
```

7.8.8 AC Failure

If AC power is removed from the CPM2, this message will be displayed:

```
*Feb-23 07:30:45
<AC Power LOST!>
```

7.8.9 Stand-By Mode Message

During normal standby operation, this message will be displayed:

```
*Feb-23 07:30:45
Scanning 0E (14)
```

7.9 CPM2 Utility Modes

When the CPM2 is in the Stand-By Mode, the following functions may be accessed by pressing the [A] through [F] keys:

- [A] Send Computer Messages to Printer
- [B] Operator Log-On
- [C] System Command Mode
- [D] Send Printer Messages to the Printer
- [E] Examine Printer Messages on Display Screen
- [F] Examine Computer Messages on Display Screen

[A] Send Computer Messages to Printer

This mode is used to send the computer messages from the buffer to the printer. When the [A] key is pressed, this message will be displayed:

```
Dump COM Msg->PRT
Lcard#:F Ent:EXE
```

Enter a hexadecimal number to print the following:

Enter...	to Print
"0"	CPM2 internal supervisory signals (if any)
"F"	Computer messages for all Line Cards and CPM2 internal supervisory signals
"1-E"	Computer messages for specified Line Card

Example: If "0" is entered, the following will be printed:

```
Dump Computer Alarm Buffer
1011 ..... 0000 . R .. 06 12:37:31 - 12/10 106
1011 ..... 0000 . A .. 01 12:38:22 - 12/10 106
```

- "106" indicates the message was successfully sent to the computer and the computer has responded correctly with an [06] acknowledge.

[B] Operator Log-On

Different operators may "log-on" to the system by entering this mode. When an operator logs on, a message similar to this one will be printed: "Operator on duty S.G. 11:03-21/12/92"

The operator's initials (if programmed) and the time and date will be printed. If the Star 8340 printer is being used, this message will be printed in red.

To log on, press the [B] key, and then enter a 4-digit Password. If a valid password is entered, a log-on message will be printed. If an invalid password is entered, the CPM2 will sound a tone to indicate that the code was entered incorrectly.

Refer to CPM2 Option [02] for information on programming operator Passwords and initials.

[C] System Command Mode

The System Command Mode is used to send commands to the Line Cards through the CPM2. To enter this mode, press [C] and then enter an Operator Password. When the Password is entered, this message will be displayed:

```
LCard:__ Comd:__  
Op:__ Cd:__ Sc:__
```

- LCard: Enter a 2-digit hexadecimal number from 01 to 0E to indicate which Line Card is to be affected.
- Comd: Enter one of the Line Card Commands described in the SCADA Line Card Menu Mode section of this manual
- Op: and Cd: "Op" and "Cd" are used to indicate parameters that may be required within certain commands. For example, when using the F7 Line Card programming command "Op" and "Cd" are used to indicate the Option number and the new code programmed for that option.
- Sc: "Sc" is used with SCADA applications.

Enter digits using the keypad; when a digit is entered, the cursor will move one character to the right. Press the [Backspace] button to delete the character presently indicated by the cursor and move the cursor 1 character to the left. When a command has been entered, press the [Escape] button to send the command to the Line Card.

If more than one command is to be sent, press the [ACK] button to send the command presently displayed on the screen. Another command may now be entered.

[D] Send Printer Messages to the Printer

With the CPM2 in the Stand-By Mode, press the [D] key to send printer messages in the buffer to the printer. When the [D] key is pressed, this message will be displayed:

```
Dump PRT Msg->PRT  
LCard#:F ent:EXE
```

Enter a hexadecimal number to print the following:

Enter... to print

- "0" CPM2 internal trouble messages (if any)
- "1" to "E" Print messages for specified Line Card
- "F" Print messages for all Line Cards

If an error is made in entering the number, simply reenter the desired number again on the keypad.

Press the [Backspace] or [Escape] button to cancel this function and return to the Stand-By Mode. Or, press the [Enter] button to print the indicated messages. When the [Enter] button is pressed, the CPM2 will print the printer messages, starting

with the oldest message first. The messages will be printed in red if the Star DP8340 printer is being used.

If the CPM2 receives new alarms from the Line Card while buffer is being printed, the new alarms will be sent to the printer when the buffer printout is completed.

[E] Examine Printer Messages on Display Screen

With the CPM2 in the Stand-By Mode, press the [E] key to review printer messages on the display screen. When the [E] key is pressed, this message will be displayed:

```
Exam PRINTER msg  
LCard#:F ent:EXE
```

Enter a hexadecimal number to view the following:

Enter... to view

- "0" CPM2 internal trouble messages (if any)
- "1" to "E" Messages for specified Line Card
- "F" Messages for all Line Cards

If an error is made in entering the number, simply reenter the desired number again on the keypad.

Press the [Backspace] or [Escape] button to cancel this function and return to the Stand-By Mode. Or, press the [Enter] button to view the indicated messages.

When the [Enter] button is pressed, the CPM2 will display the printer messages, starting with the most recent message. When [Enter] is pressed, a message similar to this will be displayed:

```
L01-1234-05  
Alarm xx
```

- xx indicates the number (in hexadecimal) of printer messages in the Line Card buffer.

Press the [Enter] button to scroll through the messages; the messages will be displayed in order from the most recent to the oldest. Press the [Backspace] button to scroll from the oldest message to the most recent.

When finished viewing the messages, press the [Escape] button.

[F] Examine Computer Messages on Display Screen

With the CPM2 in the Stand-By Mode, press the [F] key to review computer messages on the display screen. When the [F] key is pressed, this message will be displayed:

```
Examine COM1 msg  
LCard#:F ent:EXE
```

Enter a hexadecimal number to view the following:

Enter... to view

- "0" CPM2 internal trouble messages (if any)
- "1" to "E" Computer messages for specified Line Card
- "F" Computer messages for all Line Cards

If an error is made in entering the number, simply reenter the desired number again on the keypad.

Press the [Backspace] or [Escape] button to cancel this function and return to the Stand-By Mode. Or, press the [Enter] button to view the indicated messages. When the [Enter] button is pressed, the CPM2 will display the computer messages, starting with the most recent message. When [Enter] is pressed, a message similar to this will be displayed:

```
1011.....0000.A  
..03 1.06 xx
```

- xx indicates the number (in hexadecimal) of computer messages in the Line Card buffer.

Press the [Enter] button to scroll through the messages; the messages will be displayed in order from the most recent to the oldest. Press the [Backspace] button to scroll from the oldest message to the most recent. When finished viewing the messages, press the [Escape] button.

7.10 MLR2-SCADA Computer Interface

The CPM2 is able to send alarm messages to a computer connected to the COM1 serial port. This section describes the communication procedures, and the communication formats available for use.

Overview of Communication

When the CPM2 receives data from a Line Card, it forwards the data to COM1 and awaits an acknowledgment signal from the computer. If a NAK signal is received from the computer, the CPM2 will make 4 attempts to send the data. If all four attempts fail, CPM2 buzzer will sound and the CPM2 will retain the alarms in its internal buffer until communications are restored. This routing provides reliable and supervised communication between the CPM2 and the Line Cards.

The CPM2 also monitors the connection to the computer by sending a supervisory "heartbeat" signal through COM1 every 30 seconds. If the "heartbeat" transmission determines that the computer is off-line or disconnected, a message similar to this will be sent to the printer:

Com#1 Absent!! 09:45-21/09/92

Note that the message indicates the time and date that communications through COM1 were determined to be interrupted.

When COM1 communications are reestablished, a message similar to this one will be printed:

Com#1 Restored 09:50-21/09/92

Note that the message indicates the time and date that communications through COM1 were determined to be reestablished.

The "heartbeat" feature may be disabled if this feature is not compatible with the central station automation software being used on the computer.

CPM2 COM1 Status Report Messages

The CPM2 will send the following messages to COM1 to report internal status conditions. CPM2 will use an Account Code of "0000" to indicate that it is reporting an internal condition. The line number is fixed to be "0".

Sent to COM1	Event
0000 A 00:	Indicate Operator activity
0000 A 01:	Printer Error
0000 R 02:	Printer Restored
0000 A 03:	12V Battery Low
0000 R 04:	12V Battery Restored
0000 A 05:	COM#1 Absent
0000 R 06:	COM#1 Restored
0000 A 07:	UPS Low Battery
0000 R 08:	UPS Low Batt Restr
0000 A 11:	9V Batt. Low
0000 R 12:	9V Batt. Restr
0000 A 13:	COM2 Absent
0000 R 14:	COM2 Restored
0000 A 15:	AC Failure
0000 R 16:	AC Restored
0000 A 17:	UPS AC Fail
0000 R 18:	UPS AC Restored
0000 T 19:	CPM2 Master Fail
0000 A C1 to CE:	Internal communication error
NOTE: Trouble can be caused by bad backplane connections or RAM failure. Coldboot may be necessary.	
0000 A D0:	CPM2 Reset
0000 A F1 to FE:	Line Card 01 to 0E Absent
0000 R E1 to EE:	Line Card 01 to 0E Restored
The following messages will be sent to COM1 to report status changes on the Line Cards. Again, the Account Code of "0000" indicates that an internal event is being reported. The line number varies depending on which line card is reporting.	
Sent to COM1	Event
0000 A 20:	Line Fault on Line Card
0000 R 30:	Line Restored on Line Card
0000 P 0X:	Audio on line X
0000 A D1 to DE:	Line Card 01 to 0E Reset
xxxx A 0A	Account xxxx not responding (DVACS)
xxxx R 0A	Account xxxx back on-line (DVACS)

Section 8: Communication Protocol with Central Station Computer

8.1 Protocols

The Sur-Gard MLR2-SCADA receiver sends the following protocol to report signals to the central station computer via the RS-232 port.

8.1.1 Data Byte Protocol:

The Sur-Gard receiver uses 1200 baud rate, 1 start bit, 7 data bits, 1 even parity bit, and 1 stop bit structure, to transmit and receive signals. The above protocol can be programmed on the receiver by the central station operator to enable different configurations.

8.1.2 Acknowledgment of the Signal:

The Sur-Gard receiver requires an acknowledge signal [ACK] from the computer software within a certain programmable time for each message sent. The waiting period for the [ACK] can be adjusted up to 10 seconds. Failure to receive the [ACK] will result in the retransmission of the same signal three more times before giving up. In case of communication failure with the computer, the Sur-Gard receiver can store up to 256 messages in its Static RAM memory. When communication is resumed, these messages will be automatically sent to the computer.

8.1.3 Basic Signal Protocol:

1RRLssssAAAAAAsXGYYY[DC4]

Where, 1 : Protocol number.
RR : Receiver number.
L : Line number.
s : Space Character.
AAAAAA : Account Code, usually 3 digits with 3 leading spaces.
X : Event Code. See Table below.
G : O/C by Area Number (1-F), or Space.
YYY : Zone Number or User Number.
[DC4] : Terminator, 14 Hex.

EVENT CODE TABLE

0	Automatic Test	A	Alarm
1	Fire Alarm	B	Bypass
2	Panic Alarm	C	Arming by User #
3	Burglary Alarm	F	Auxiliary
4	Arming by User #	H	Unbypass
5	Disarming by User #	O	Disarming by User #
6	Service	R	Restore
7	Medical Emergency	T	Trouble
8	Message	Z	Common Event Code
9	Restore	20(H)	Common Event Code
			Space Character

The "Space" character (20 Hex) can be used in case the automation software package combines the event code with the zone code, conflicting with the existing account code data base.

When the O/C signals are transmitted by Groups with the user number included, the "G" code, currently from 1-F, will be in effect to show the Group number, including the preceding Event Code O or C, as well as the User number at the "YYY" position. The computer may then redirect this signal when necessary.

Example: The panel 012 is partially armed on Group #1 and Group #2 by user #128. The Sur-Gard receiver will send following messages to the computer:

1RRLsssssss012sC1128[DC4]

1RRLsssssss012sC2128[DC4]

The computer software could probably redirect these signals to a programmable subaccount, in which an o/c schedule for users can be available.

The user report codes on Sur-Gard receiver can be decimal or hexadecimal digits.

8.1.4 Supervisory Heartbeat Signal Protocol:

1011ssssssssss@s[DC4]

Where, s : Space Character.
@ : Supervisory Signal.
[DC4] : Terminator, 14 Hex.

This signal is used to supervise the communication between the receiver and the computer. It is sent to the computer about every 30 seconds, programmable on the receiver. The computer should acknowledge this signal with an [ACK]. It is recommended to have this signal running.

8.1.5 Clock Signal Protocol:

1RRLssssAAAAAAsXGYYYHH:MM:SS-dd/mm[DC4]

3RRLssssAAAAAAXXYYYYHH:MM:SS-dd/mm[DC4]

Where, HH : Hour.
MM : Minute.
SS : Second.
dd : Day.
mm : Month.

And the other codes are of the same definition as in the previous signal protocols. The supervisory heartbeat signal can also be used along with this protocol, but the structure remains unchanged.

Ask Sur-Gard Technical Support for an information sheet when using the MLR2-SCADA with one of the following software packages:

- SIMS II
- SIMS CSM
- SIS
- M.A.S.
- Microkey Central-1
- ABM
- Alarm Soft
- Apropos STA

NOTE: Please refer to the MLR2-DG or MLR2-DV manuals for a complete protocol description.

8.2 CPM2 EPROM Programming

Most of the CPM2 options can be changed in the RAM accessed by the system's configuration. However, some less important features are installed in the EPROM. The following features are located in the CPM2 standard EPROM and programmed to the following default settings:

ROM Address	Default	Function
6500H	05H	Printer strobe pulse width Default = 5 μ s (microseconds)
6501-6502	3E80	Delay time \times 0.25ms to resend message to COM1 if heartbeat is not selected. Default = 16000 \times 1ms = 16 s delay
6505-6506	0100H	Test Line Card 01 at 01:00
6507-6508	0115H	Test Line Card 02 at 01:15
6509-650A	0130H	Test Line Card 03 at 01:30
650B-650C	0145H	Test Line Card 04 at 01:45
650D-650E	0200H	Test Line Card 05 at 02:00
650F-6510	0215H	Test Line Card 06 at 02:15
6511-6512	0230H	Test Line Card 07 at 02:30
6513-6514	0245H	Test Line Card 08 at 02:45
6515-6516	0300H	Test Line Card 09 at 03:00
6517-6518	0315H	Test Line Card 0A at 03:15
6519-651A	0330H	Test Line Card 0B at 03:30
651B-651C	0345H	Test Line Card 0C at 03:45
651D-651E	0400H	Test Line Card 0D at 04:00
651F-6520	0415H	Test Line Card 0E at 04:15

Changes are rarely required, but these features may be changed to suit particular needs. To make changes to the EPROM programming, first insert a standard CPM2 EPROM into an EPROM programming unit. Follow the instructions provided with the EPROM programmer to select addresses and modify data. Ensure that the correct addresses are being programmed, and verify the existing data in the address before making changes.

Section 9: Troubleshooting

Problem: The receiver does not transmit; the Tx LED is "OFF".

Solution: Check if the cable to the modem is installed correctly. You need a SG-DML2A board in the rear of the card cage. If you don't have a SG-DML2A, order one from your distributor.

Problem: The system configuration was changed to some undesired setting.

Solution: You need to load your backup configuration. See SG-SCADA Programmable Features, section 6.7.5 for more information. If you haven't saved your configuration, then you must perform a "COLD BOOT" operation, to reset to the default system configuration. See the Cold Boot section for more information.

Problem: Information to the CPM printer is missed.

Solution: Verify that you have 2 or more line cards set as the same line card ID number, or check that Option #08 is set to "01".

Problem: The line card does a reset every 8 seconds.

Solution: You should do a cold boot. See Cold Boot section for more details.

Problem: No communication with the central station computer on COM1

Solution: Ensure that the cable connected to COM1 is an RS232 cable; it should not be a null-modem type.

Check the baud rate for COM1 (CPM2 Configuration Option 05)

Check the COM1 communication format (CPM2 Configuration Option 06)

Check the computer software setup

Enable COM1 Diagnostics with CPM2 Configuration Option 16 and examine the communications on the display screen.

Problem: Bad communication with central station computer.

Solution: The central station software is too slow to provide the acknowledgment signal for the CPM2. Contact the software manufacturer for a software upgrade.

Increase the acknowledge wait time with CPM2 Configuration Option 07.

Check COM1 baud rate and communication format using CPM2 Configuration Options 05 and 06

Ensure that the COM1 connection is secure

Problem: CPM2 displays the COM1 debugging mode and the Master Code is not valid

Solution: The CPM2 needs to be re-booted. Refer to the Cold Boot section of this manual

Problem: The Line Card displays "<<CPM ERROR>>" and/or alarms are not transmitted to the computer and printer

Solution: Ensure that the Line Card number is not out of the range of the CPM2 scanning

Ensure that the flat cables connected between the DML4 and the Line Cards are connected correctly; ensure that the contact between the connectors is secure.

Appendix A: Decimal - Hex - Binary Conversion Chart

DEC	HEX	BINARY	DEC	HEX	BINARY	DEC	HEX	BINARY	DEC	HEX	BINARY
000	00	0000 0000	064	40	0100 0000	128	80	1000 0000	192	C0	1100 0000
001	01	0000 0001	065	41	0100 0001	129	81	1000 0001	193	C1	1100 0001
002	02	0000 0010	066	42	0100 0010	130	82	1000 0010	194	C2	1100 0010
003	03	0000 0011	067	43	0100 0011	131	83	1000 0011	195	C3	1100 0011
004	04	0000 0100	068	44	0100 0100	132	84	1000 0100	196	C4	1100 0100
005	05	0000 0101	069	45	0100 0101	133	85	1000 0101	197	C5	1100 0101
006	06	0000 0110	070	46	0100 0110	134	86	1000 0110	198	C6	1100 0110
007	07	0000 0111	071	47	0100 0111	135	87	1000 0111	199	C7	1100 0111
008	08	0000 1000	072	48	0100 1000	136	88	1000 1000	200	C8	1100 1000
009	09	0000 1001	073	49	0100 1001	137	89	1000 1001	201	C9	1100 1001
010	0A	0000 1010	074	4A	0100 1010	138	8A	1000 1010	202	CA	1100 1010
011	0B	0000 1011	075	4B	0100 1011	139	8B	1000 1011	203	CB	1100 1011
012	0C	0000 1100	076	4C	0100 1100	140	8C	1000 1100	204	CC	1100 1100
013	0D	0000 1101	077	4D	0100 1101	141	8D	1000 1101	205	CD	1100 1101
014	0E	0000 1110	078	4E	0100 1110	142	8E	1000 1110	206	CE	1100 1110
015	0F	0000 1111	079	4F	0100 1111	143	8F	1000 1111	207	CF	1100 1111
016	10	0001 0000	080	50	0101 0000	144	90	1001 0000	208	D0	1101 0000
017	11	0001 0001	081	51	0101 0001	145	91	1001 0001	209	D1	1101 0001
018	12	0001 0010	082	52	0101 0010	146	92	1001 0010	210	D2	1101 0010
019	13	0001 0011	083	53	0101 0011	147	93	1001 0011	211	D3	1101 0011
020	14	0001 0100	084	54	0101 0100	148	94	1001 0100	212	D4	1101 0100
021	15	0001 0101	085	55	0101 0101	149	95	1001 0101	213	D5	1101 0101
022	16	0001 0110	086	56	0101 0110	150	96	1001 0110	214	D6	1101 0110
023	17	0001 0111	087	57	0101 0111	151	97	1001 0111	215	D7	1101 0111
024	18	0001 1000	088	58	0101 1000	152	98	1001 1000	216	D8	1101 1000
025	19	0001 1001	089	59	0101 1001	153	99	1001 1001	217	D9	1101 1001
026	1A	0001 1010	090	5A	0101 1010	154	9A	1001 1010	218	DA	1101 1010
027	1B	0001 1011	091	5B	0101 1011	155	9B	1001 1011	219	DB	1101 1011
028	1C	0001 1100	092	5C	0101 1100	156	9C	1001 1100	220	DC	1101 1100
029	1D	0001 1101	093	5D	0101 1101	157	9D	1001 1101	221	DD	1101 1101
030	1E	0001 1110	094	5E	0101 1110	158	9E	1001 1110	222	DE	1101 1110
031	1F	0001 1111	095	5F	0101 1111	159	9F	1001 1111	223	DF	1101 1111
032	20	0010 0000	096	60	0110 0000	160	A0	1010 0000	224	E0	1110 0000
033	21	0010 0001	097	61	0110 0001	161	A1	1010 0001	225	E1	1110 0001
034	22	0010 0010	098	62	0110 0010	162	A2	1010 0010	226	E2	1110 0010
035	23	0010 0011	099	63	0110 0011	163	A3	1010 0011	227	E3	1110 0011
036	24	0010 0100	100	64	0110 0100	164	A4	1010 0100	228	E4	1110 0100
037	25	0010 0101	101	65	0110 0101	165	A5	1010 0101	229	E5	1110 0101
038	26	0010 0110	102	66	0110 0110	166	A6	1010 0110	230	E6	1110 0110
039	27	0010 0111	103	67	0110 0111	167	A7	1010 0111	231	E7	1110 0111
040	28	0010 1000	104	68	0110 1000	168	A8	1010 1000	232	E8	1110 1000
041	29	0010 1001	105	69	0110 1001	169	A9	1010 1001	233	E9	1110 1001
042	2A	0010 1010	106	6A	0110 1010	170	AA	1010 1010	234	EA	1110 1010
043	2B	0010 1011	107	6B	0110 1011	171	AB	1010 1011	235	EB	1110 1011
044	2C	0010 1100	108	6C	0110 1100	172	AC	1010 1100	236	EC	1110 1100
045	2D	0010 1101	109	6D	0110 1101	173	AD	1010 1101	237	ED	1110 1101
046	2E	0010 1110	110	6E	0110 1110	174	AE	1010 1110	238	EE	1110 1110
047	2F	0010 1111	111	6F	0110 1111	175	AF	1010 1111	239	EF	1110 1111
048	30	0011 0000	112	70	0111 0000	176	B0	1011 0000	240	F0	1111 0000
049	31	0011 0001	113	71	0111 0001	177	B1	1011 0001	241	F1	1111 0001
050	32	0011 0010	114	72	0111 0010	178	B2	1011 0010	242	F2	1111 0010
051	33	0011 0011	115	73	0111 0011	179	B3	1011 0011	243	F3	1111 0011
052	34	0011 0100	116	74	0111 0100	180	B4	1011 0100	244	F4	1111 0100
053	35	0011 0101	117	75	0111 0101	181	B5	1011 0101	245	F5	1111 0101
054	36	0011 0110	118	76	0111 0110	182	B6	1011 0110	246	F6	1111 0110
055	37	0011 0111	119	77	0111 0111	183	B7	1011 0111	247	F7	1111 0111
056	38	0011 1000	120	78	0111 1000	184	B8	1011 1000	248	F8	1111 1000
057	39	0011 1001	121	79	0111 1001	185	B9	1011 1001	249	F9	1111 1001
058	3A	0011 1010	122	7A	0111 1010	186	BA	1011 1010	250	FA	1111 1010
059	3B	0011 1011	123	7B	0111 1011	187	BB	1011 1011	251	FB	1111 1011
060	3C	0011 1100	124	7C	0111 1100	188	BC	1011 1100	252	FC	1111 1100
061	3D	0011 1101	125	7D	0111 1101	189	BD	1011 1101	253	FD	1111 1101
062	3E	0011 1110	126	7E	0111 1110	190	BE	1011 1110	254	FE	1111 1110
063	3F	0011 1111	127	7F	0111 1111	191	BF	1011 1111	255	FF	1111 1111

Line Card Configuration Command: F7-Option#-(Hex)

Option# (Decimal)	Description (Decimal)	Default (Hexadecimal)	User Change	User Change
00	Reserved	000	<div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>
01	Mute Buzzer	000	<div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>
02	Debug Opt	000	<div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>
03	Bus Error	000	<div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>
04	Line	00F	<div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>
05	Rvr	000	<div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>
06	Equiv	000	<div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>

CPM2 Utility Modes

Press [ACK] when "Ack" light flashes to Acknowledge event

- [A] Send Computer Messages to Printer
- [B] Operator Log-On
- [C] System Command Mode
- [D] Send Printer Messages to the Printer
- [E] Examine Printer Messages on Display Screen
- [F] Examine Computer Messages on Display Screen

CPM2 Configuration Mode

Press the [Escape] button when the system is in Stand-By Mode and enter the Master Password.

Press the [Enter] button to display the next menu item; press the [Backspace] button to display the previous menu item.

Press the [ACK] button to select the menu item presented shown on the display screen.

Menu Item	Function	Default
01	Set Date and Time	00:00:00 00-00-00 (random)
02	System Passwords	CAFE
03	Number of Line Cards	E
04	Printer Select	Backup=0; Enable=1
05	COM1 Configuration	Baud: 1200, Data: 7 bits, Parity: 2
06	COM1 Format	1
07	ACK Wait Delay	4.0 seconds
08	Heartbeat Select	30 seconds
09	COM2 Configuration	Baud: 300, Data: 8 bits, Parity: 2
10	COM2 Format	0
11	Contrast Adjust	
12	UL Receiver Option	0
13	Erase Memory	
14	Mute Buzzer	0
15	Keep Last Message	0
16	Debug COMPort	0
17	Test 9V/12V Battery	3
18	Line Card Diagnostics	0
19	Display Program Version	Version 2.30
20	Monitor Battery	
21	Select Year/Seconds	0
22	Force Reset	
23	Change Receiver Number	01
24	COM1/2 Control	44444444444444
25	Printer Control	11111111111111
26	Printer Test	0
27	Printer Width	0
28	Tamper Input	0

Line Card Command Descriptions

- [F7] Line Card Configuration
- [FA] Print Line Card Buffer
- [FB] Shutdown Line Card Communication with CPM2
- [FC] Reactivate Line Card Communication with CPM2
- [FE] Line Card Buffer Functions

MLR2 Receiver Programming Software

The MLR2 can be programmed through the serial port #2 on the CPM2 from a computer, with the DOS-based MLR2 programming software. This method of programming is more user friendly, faster and each installation configuration can then be saved on disk. For more information or ordering, please contact your distributor.

Quick Start

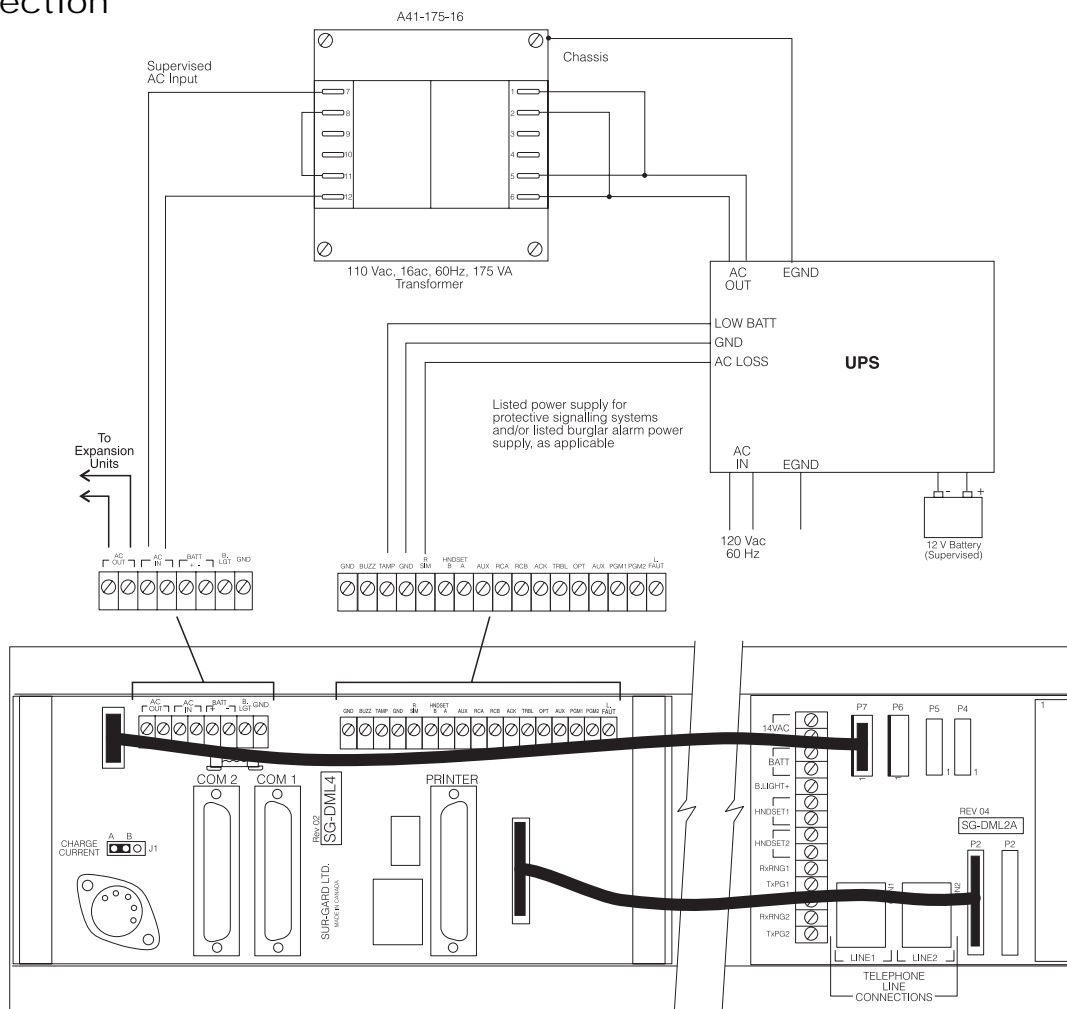
The following steps must be taken so as to utilize the receiver PC software :

- Update the CPM2 firmware to version 2.10 or later if necessary (Cold Boot).
- Manually set the CPM2 COM2 to 300 baud, 8 data bits, even parity and 1 stop bit (Default).
- Manually set the CPM2 COM2 format to 0 (zero) (Default).
- Make sure the CPM2 and computer are well connected (COM2).
- Insert the diskette in Drive A and type A:INSTALL <ENTER>.
- Hit any key when prompted by the Sur-Gard Logo.
- Choose File-New and press <ENTER> to create a new data file.
- Choose the Setup function to select the COM port.
- Choose the Edit/View-CPM2 function to edit and program the CPM2 options.
- Choose the Edit/View-Line function to define type of line cards that need to be programmed.
- When in the Line Card Selection window choose the Edit function to edit and program the line card options.
- Repeat the previous step for every card installed in the receiver.
- Close the Line Card Selection window by pressing Alt-C and exit by pressing Alt-X.

NOTE: The software manual may be accessed through the Help menu.

NOTE: The new options available on the CPM2 v2.3 cannot be programmed from the MLR2 programming software. If the programming software is utilized for CPM2 programming, the new options MUST be programmed manually. The programming software can still be used to program the line cards. A new version of the programming software will be available on our web site at www.sur-gard.com during the fall of 1997.

UPS Connection



Appendix D: ASCII Character Chart

ASCII with library on printer (Option 30)	Hex	Corresponding ASCII Character
	20	Space
B0	30	0
B1	31	1
B2	32	2
B3	33	3
B4	34	4
B5	35	5
B6	36	6
B7	37	7
B8	38	8
B9	39	9
C1	41	A
C2	42	B
C3	43	C
C4	44	D
C5	45	E
C6	46	F
C7	47	G
C8	48	H
C9	49	I
CA	4A	J
CB	4B	K
CC	4C	L
CD	4D	M
CE	4E	N
CF	4F	O
D0	50	P
D1	51	Q
D2	52	R
D3	53	S
D4	54	T
D5	55	U
D6	56	V
D7	57	W
D8	58	X
D9	59	Y
DA	5A	Z
DC	5C	\

Appendix E: SG-M1 Modem Module

Introduction

The SG-M1 is a low speed modem module for bidirectional data transmission over a telephone line.

The SG-M1 include a carrier lost, incoming data (Rx) and outgoing data (Tx) indicators. With an option jumper the SG-M1 can be operated in originate or answer mode.

Telephone Line Interface

VF 2-wire - Line impedance 600 ohms

Protection

Protection device protects the circuit against peak overvoltage at the telephone line input terminals.

Terminal Interface

DC 2-wire, half duplex current only, RS-232 half duplex, mark hold, originate or answer mode jumper (J5) selection.

Transmitter

Input data format serial binary, asynchronous, data rate up to 300 baud, output impedance 600 ohm +/-10%, modulation phase continuous FSK, transmit level -9 dBm +/-1dB, frequency +/-5 Hz accuracy.

Receiver

Operating range 0 to -38 dBm, receiver data clamp mark hold, data clamp timing. Unclamped when carrier detect is on, clamped when receive signal drops below carrier detect threshold. Delay is less than 10 msec for complete loss of signal. Distortion 10% peak maximum over the range 9 to -36 dBm for a start stop fox message.

Ambient Temperature: operating 0°C to +55°C

Power Requirement

12V_{DC} to 24V_{DC} Max. +/-10%, 25mA @ 12V

LED Indicators

Carrier loss Turn ON when the line is cut or the carrier is lost.

RX Flashes on incoming data.

TX Flashes when unit transmit data.

Option Jumpers

J1, J2 = EXT/INT

External/Internal serial interface power. When the SG-M1 is powered at 12V_{DC}, use the 24V_{DC} Power supply in transmitter to power serial interface via EXT+ and EXT-. Select J1 and J2 to "EXT" position.

J3 = Leave open

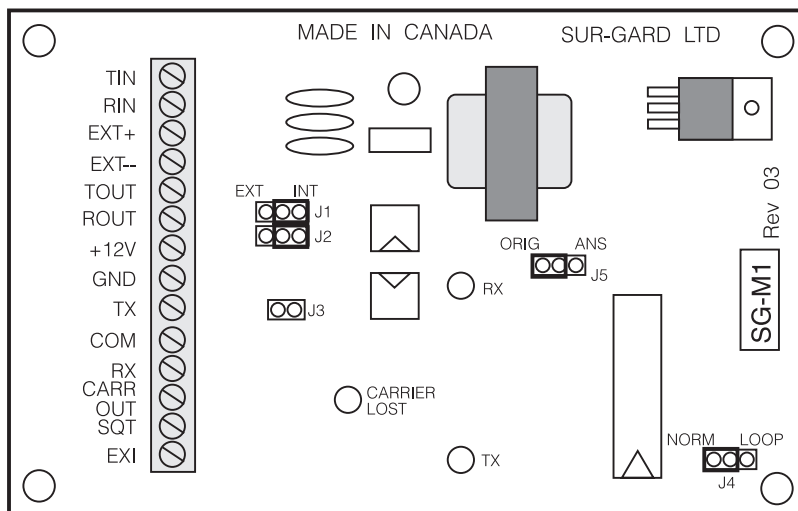
Use for factory test only.

J4 = NORM/LOOP

Leave in normal position, the loop back position is used for factory test only.

J5 = ORIG/ANS

Originate and answer mode select. The SG-M1 which initiates the call must be in originate mode, the other modem must be in answer mode.



Appendix F: Technical Information and Specifications

Speed

- 300 baud
- 1 start bit
- 8 data bits
- 1 even parity bit
- 1 stop bit

Protocol

The ASCII and LF, data, separator [, sum, CR will be used. LF=10 for start of message "SOM", CR=13 for end of message "EOM", |=124 for text separator, [=91: start of text "SOT" and |=93: end of text "EOT".

LF [<data>] <sum> <CR>

Checksum <sum>

The checksum field is 2 ASCII characters derived from the column parity of the incoming packet. The packet checksum is calculated the same way for both CPM2 and DLV2A SCADA. The column parity is calculated by the exclusive ORing of all characters from [, up to and including the ETX] character. The resulting value is then converted into two ASCII characters. The basic steps are:

- Start with a value of 00 in the temporary register.
- Begin with the [character, exclusive OR each character with the content of the temporary register until the <CR> terminator is reached. Do NOT add the <CR>.
- Add 64 to the value of the most significant 4 bits (or shift right 4 times and OR with 40 hex). The result is the first character in the checksum field.
- Add 64 to the value of the least significant 4 bits (or AND with 0F hex and OR with 40 hex).

LIMITED WARRANTY

Sur-Gard Ltd. warrants that for a period of sixty months from the date of purchase, the product shall be free of defects in materials and workmanship under normal use and that in fulfillment of any breach of such warranty, Sur-Gard Ltd. shall, at its option, repair or replace the defective equipment upon return of the equipment to its repair depot. This warranty applies only to defects in parts and workmanship and not to damage incurred in shipping or handling, or damage due to causes beyond the control of Sur-Gard Ltd., such as lightning, excessive voltage, mechanical shock, water damage, or damage arising out of abuse, alteration or improper application of the equipment.

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WARNING

Sur-Gard Ltd. recommends that the entire system be completely tested on a regular basis. However, despite frequent testing, and due to, but not limited to, criminal tampering or electrical disruption, it is possible for this product to fail to perform as expected.

How to Contact Us:

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For information about additional products, please call our sales number: 1-800-418-7618, or e-mail us at sales@sur-gard.com.

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Visit our new Sur-Gard WWW site. You will be able to search the Sur-Gard technical information database and read information about new products. You will also be able to send us your questions. Our World Wide Web address is <http://www.sur-gard.com>.

Products

The MLR2-SCADA central station receiver was designed to suit your needs. If you ever have a suggestion about the MLR2-SCADA or about any one of our products, please contact us. We genuinely appreciate your comments. Write to:

Sur-Gard Security Systems Ltd.
Receiver Product Manager
401 Magnetic Drive, Units #24
Downsview, Ontario, Canada
M3J 3H9

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MLR2-SCADA

Version 1.3

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