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LL2100Um

PRODUCT LL2100  
X.21/ V11 FIBRE EXTENSION SYSTEM  
USER MANUAL  
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# USER MANUAL

## TABLE OF CONTENTS

<b>1. PRODUCT DESCRIPTION .....</b>	<b>2</b>
1.1 GENERAL .....	2
1.2 SPECIAL FEATURES .....	2
1.2.1 ALARM AND INDICATIONS.....	2
<b>2. SYSTEM CONFIGURATION.....</b>	<b>3</b>
2.1 FAMILY TREE AND STOCK CODES.....	3
2.2 MODEL NUMBERS .....	4
2.3 PRODUCT STOCK CODES.....	5
2.4 SPARE PART CODES .....	6
2.5 VERSION HISTORY .....	6
<b>3. PREPARATION FOR USE .....</b>	<b>7</b>
3.1 UNPACKING .....	7
3.2 INSTALLATION.....	7
3.3 COMMISSIONING.....	8
<b>4. OPERATORS INSTRUCTIONS.....</b>	<b>8</b>
<b>5. MAINTENANCE INSTRUCTIONS.....</b>	<b>9</b>
5.1 INSTRUMENTS AND TOOLS REQUIRED .....	9
5.2 FIRST LINE MAINTENANCE.....	9
<b>6. EXPLANATION OF TECHNICAL DIAGRAMS AND SOFTWARE.....</b>	<b>10</b>
6.1 CONNECTING THE UNIT .....	10
6.2 BASIC CIRCUIT OPERATION .....	10
<b>7. PHYSICAL AND ELECTRICAL SPECIFICATION.....</b>	<b>11</b>
7.1 ELECTRICAL: .....	11
7.2 OPTICAL:.....	11
7.3 FUNCTIONS AND CHARACTERISTICS:.....	11
7.4 OPTIC AND FIBRE SPECIFICATIONS.....	11

ANNEXURE 'A'           OPTICAL COMMUNICATIONS SYSTEM BLOCK DIAGRAM.

ANNEXURE 'B'           OPTIC INTERFACE UNIT BLOCK DIAGRAM.

ANNEXURE 'C'           X.21 V11 PLUG AND SOCKET CONNECTIONS.

## 1. PRODUCT DESCRIPTION

### 1.1 GENERAL

The LL2100 is a selectable baud-rate in multiples of 64 or 19.2 KILOBAUD X.21 optical interface unit which is designed to extend a CCITT V11 data and control signal to be communicated between DTE and DCE or DTE and DTE equipment over fibre. The unit is especially designed for SYNC operation at 64 or 19.2 kBaud. The data rate extends to 2048 and 614,4 kBaud. The unit is housed in a small metal enclosure.

### 1.2 SPECIAL FEATURES

The unit is modular in design and thus can be upgraded with different optics or power supplies. The distance over which the system can operate is determined by the fibre interface used. The options are limited to 3,5, 12, 16, 36, 50 and 70 Kilometres. The power supply module is removable and can be interchanged with either 220 VAC, 110 VAC or 48 VDC units. Other voltages can be supplied on request. The unit is compact and can fit two aside on a '19" rack' shelf with a height of 1U. The system uses the latest technology in line driving integrated circuits and is therefore complies fully with the stringent CCITT standards. Baud rate is selectable between multiples of 64 and 19,2 kBaud up to 2048 kBaud.

#### 1.2.1 ALARM AND INDICATIONS

The unit boasts a comprehensive alarm and indication system. The unit has a voltage free alarm output contact which will activate when any part of the link should fail. The alarms and indicators are clearly shown on the front panel.

#### INDICATORS:

Power	- Indicates Power to the System
DTE	- Data Terminal Equipment is selected.
DCE	- Data Communication Equipment is selected.
Traffic in	- Data being Transmitted to optics.
Traffic out	- Data being Received from optics.

#### ALARMS:

TxError	- Transmit Optic Error
RxError	- Receive Optic Error
Receiver error	- Decoder Phase Lock Loop Fail (no signal received from the fibre).
Traffic in clk fail	- Encoder Phase Lock Loop Fail (no clock received in DTE mode)

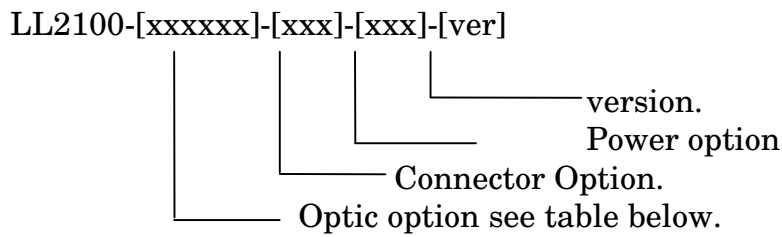
## 2. SYSTEM CONFIGURATION

### 2.1 FAMILY TREE and STOCK CODES.

The following table indicates the make up and various options of the product.

LL2100 sub Unit.	A	B	C	D	E
OPTICS	850sr	1300mr	1300mrs m	1300lr	1300laser
OPTIC CONNECTOR	SMA	ST	FC		
POWER SUPPLY	220 VAC	110 VAC	48 VDC	24 VDC	220/110 VAC
METAL BOX	BU431				
LED DISPLAY CARD	AU416-1				
PROCESSOR CARD	AU437				
Alarm Connector	AU509				
POWER CABLE	220 VAC	110 VAC	48 VDC	24 VDC	

## 2.2 MODEL NUMBERS



LL2100-[xxxxxxx]  
SHELF = 1U high shelf for mounting 2 units.

### OPTIC OPTION

Stock Code	Optic Option	Connector Option	Wavelength	Fibre Mode	Power Budget	Budget Distance
A	850sr	ST or SMA	850nm	Multi-mode	10dB	3,5Km
B	1300mr	ST or SMA	1300nm	Multi-mode	10dB	12Km
C	1300mrs m	ST or FC	1300nm	Multi-mode Single-mode	15dB 12dB	16Km 24Km
D	1300lr	ST or FC	1300nm	Multi-mode Single-mode	28dB 25dB	28Km 50Km
E	1300laser	ST or FC	1300nm	Multi-mode Single-mode	36dB 35dB	36Km 70Km

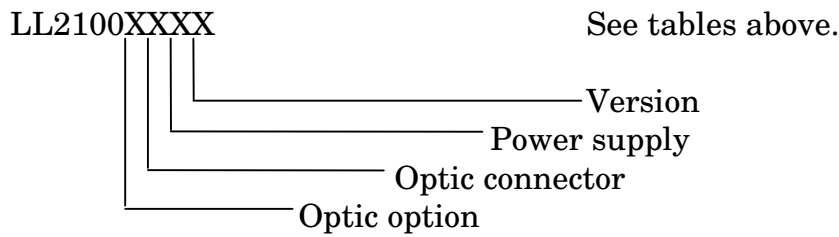
### OPTIC CONNECTOR OPTION

Stock Code	Connector
A	SMA
B	ST
C	FC

### POWER SUPPLY OPTION

Stock Code	Power Supply
A	220 VAC
B	110 VAC
C	48 VDC
D	24 VDC
E	220/110 VAC

2.3 PRODUCT STOCK CODES.



Power Supply Options.

LL2100XXA.....	LL2100-xxxxxxx-xxx-220-A
LL2100XXB.....	LL2100-xxxxxxx-xxx-110-A
LL2100XXC.....	LL2100-xxxxxxx-xxx-48-A

Optic options.

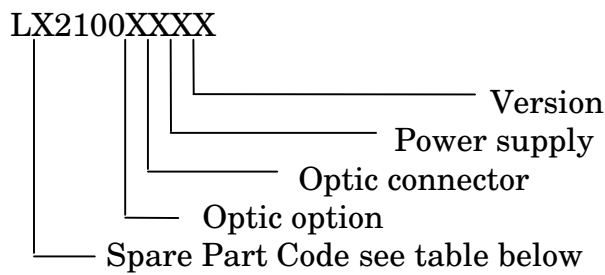
LL2100AXX.....	LL2100-850sr-xx-xxx-A
LL2100BXX.....	LL2100-1300mr-xx-xxx-A
LL2100CXX.....	LL2100-1300mrsm-xx-xxx-A
LL2100DXX.....	LL2100-1300lr-xx-xxx-A
LL2100EXX.....	LL2100-1300laser-xx-xxx-A

OTHER OPTIONS.

LL2100SHELF.....	LL2100-SHELF
LL2100USER.....	LL2100-USER MANUAL.

## 2.4 SPARE PART CODES

Define stock code and add spare part code in second character position.



### SPARE PART OPTION

Spare Part Code	Description
A	POWER SUPPLY CARD
B	PROCESSOR CARD
C	METAL BOX COMPLETE
D	OPTIC CARD
E	ALARM CONNECTOR CARD
F	POWER CABLE

## 2.5 VERSION HISTORY

### LL2100/C - PROTO-TYPE VERSION

STANDARND 64 KILOBAUD X.21 FIBRE EXTENSION SYSTEM  
SELECTABLE FOR DTE or DCE EQUIPMENT

### LL2100/D - PRODUCTION VERSION

STANDARND 64 KILOBAUD X.21 FIBRE EXTENSION SYSTEM  
SELECTABLE FOR DTE or DCE EQUIPMENT

### LL2100/E - PRODUCTION VERSION

UPGRADED SELECTABLE 64 or 19.2 KILOBAUD X.21 FIBRE EXTENSION SYSTEM

### LL2100/F - PRODUCTION VERSION

UPGRADED DIP SWITCH SELECTABLE up to 64-2048 or 19.2-614.4 kBaud.

### LL2100/H - PRODUCTION VERSION

DCE - DCE connection master clock and clock invert functions. Suited for Cisco Routers.

LL2100/I - PRODUCTION VERSION

DCE - DCE connection master clock and clock invert functions. Clock insert. Suited for Cisco Routers.

### 3. PREPARATION FOR USE

#### 3.1 UNPACKING

Check for physical damage caused during transportation. Return any damaged equipment.

#### 3.2 INSTALLATION

Check the voltage supply matches that of the equipment before installation commences. Connect the power cable. The DC. power connections are shown on the rear panel. The equipment has no ON/OFF switch and is therefore active as soon as power is connected.

Ensure that the link loss over the fibre cable is within the power budget of the equipment. See the model number and optic option in chapter 3.0

Connect the data and optic cables. Note the data and optic directions with reference to the system diagram. Annexure 'A'.

Use the piano switch on the front panel to select your choice of Baudrate. i.e either 2048 or 614,4 kBaud.(default) should you require other baud rates please refer to Dip switch selections below.

To configure the unit for DCE or DTE use the piano switch on the front panel. This should light the corresponding led on the front panel. The DCE unit provides a clock and the DTE unit requires an input clock. Two connection options exist.DTE to DCE configuration for BME to Tele-protection Equipment or DCE to DCE in Cisco Router connection configuration.

In addition the dip switches on the front panel cater for clock inversion and clock injection. Clock injection is activated by selecting master on one of the units in a system. Clock inversion is only used in specific cases where the peripheral equipment is not standard.

Once a data signal has been inserted into the *master* unit the 'Traffic in' led should light. The 'Traffic out' led should light on the *slave* unit.

If an alarm extension is required then connect the extension wire to the voltage free alarm contacts at the back of the unit.

Baud rates.

A Dip switch is provided inside the unit allowing different baud rates to be selected. The factory setting is 2048 Baud.

Note all switches must be in the off position. The required baud rate selection is done by selecting the applicable dip switch to the on position.

See page 16 for the dip switch positions.

Dip switch position 6 default.	2048.....614,4
Dip switch position 5	1024.....307,2
Dip switch position 4	512.....153,6
Dip switch position 3	256.....76,8
Dip switch position 2	128.....38,4
Dip switch position 1	64.....19,2

### 3.3 COMMISSIONING

If the link is correctly connected then all alarms will extinguish immediately.

Should you experience problems follow the first line maintenance procedure in chapter 5.0

## 4. OPERATORS INSTRUCTIONS

The unit needs no operator intervention to function. If a fault arises, it is necessary to observe the alarm indications and to perform such procedures as first line maintenance as described in the proceeding chapter.

See maintenance instructions for any other functions.

## 5. MAINTENANCE INSTRUCTIONS

No routine maintenance is required on this equipment.

### 5.1 INSTRUMENTS AND TOOLS REQUIRED

- Trend Tester
- Multimeter
- Optical Power Meter

### 5.2 FIRST LINE MAINTENANCE

When arriving at a suspect link it is always necessary to ensure that the unit has been correctly coupled (refer to block diagrams Annexure 'A') and to note the alarm conditions of the equipment.

First observe the power indicator. If the power indicator is off then check if the supply voltage is correct for that particular power supply. The AC unit has a fuse inside the connector at the rear and an additional fuse inside the unit. The DC unit has a fuse only on the inside. Replace a faulty fuses with those of the correct value only.

Next observe the alarm condition 'TxError'. This will indicate that the transmit optic has failed. Replace the optic card by opening the box and undoing the screw that holds the card in place.

'RxError' indicates that no signal is being received from the optic cable. Check the remote optic transmit power and the local optic receive power level. These should be within the specified limits in chapter 6. Replace the optic card if necessary. It more likely that the Fiber has been damaged or just accidentally unplugged.

'Traffic in clk fail' is derived from the Encoder Phase Lock Loop. It indicates that the unit is not locking onto the incoming X.21 signal i.e. the clock is not present. Check your cable connections.

'Receiver error' derived from the Decoder Phase Lock Loop indicates that the unit is not locking onto the high speed optic receive data signal. This could be due to a poor receive optic signal. Check the receive optic level. Check the Fibre cable it is broken.

If problems still persist and the units are connected correctly then return them to the supplier for repair.

In order to test the link, connect a X21 data tester set to the local unit. At the remote site the data must be externally looped straight back into the unit (TX to RX, Pins 2 to 4 and 9 to 11). Data must be received by the data tester. This will test the data receive, decode, encode and transmit signals of both the local and remote units. The data tester should receive the transmitted information and run with no errors. If all error indicators are off then the link is considered to be operational.

## 6. EXPLANATION OF TECHNICAL DIAGRAMS AND SOFTWARE

### 6.1 CONNECTING THE UNIT

Connect LL2100 as shown in X21 interface (RS422) block diagram Annexure  
'A'  
Using a DB15 plug or socket connector.

### 6.2 BASIC CIRCUIT OPERATION

Refer to block diagram on Annexure 'B'.

The DCE equipment supplies the Master unit with a 64 / 19.2 Kilo Baud RS422 differential Receive Data (A), Clock Receive, and Indication Receive signals. These are converted to TTL signals and then encoded together to produce a single Data Signal. This TTL Data Signal is then converted to an optical signal to be transmitted across fibre optic cable.

The Slave unit converts the optical signal to a Data Signal. This signal is decoded to produce a 64 / 19.2 Kilo Baud TTL Transmit Data and Indication Transmit signals. A Clock Transmit signal is also generated from the optical signal. All these signals are then converted to RS422 differential signals to be used by external DTE equipment.

The DTE then sends information back to the DCE equipment by clocking the data into the Slave unit with the generated clock. The data is then encoded and converted to an optic signal.

At the master unit the optic data is once again decoded and the receive data extracted. The data thus received is no longer in phase with the transmitted data and thus the Master unit incorporates a phase shift system whereby any data received from the DTE equipment is clocked into the DCE equipment with either the original Clock Received or the decoded Clock signal.

## 7. PHYSICAL AND ELECTRICAL SPECIFICATION

### 7.1 ELECTRICAL:

- \*Power Supply (5 Watt) - 115/230 VAC 50/60Hz  
- 48 VDC
- \*Data Standard Options - RS 422 / V11
- \*Connection - 15 pin "D" subminiature plug or socket connector
- \*Maximum distance to user equipment - 100m

### 7.2 OPTICAL:

- \*Connectors - ST (Multi-mode, Single-mode)
- \*Fibre Compatibility - Multi-mode = 50/125 micron  
- Single-mode = 9/125 micron

### 7.3 FUNCTIONS AND CHARACTERISTICS:

- \*Indicators - Power, DTE, DCE, Transmit, Receive,  
TxError, RxError, Encoder Phase Lock Loop Fail  
Decoder Phase Lock Loop Fail
- Selectable - Baud Rate (64 or 19.2 )up to (2048 or 614.40) kBaud.  
- DTE or DCE equipment
- \*Alarm Output - Voltage free alarm output contact.
- \*Physical - Depth: 180mm Height: 42mm  
Width: 202mm Weight: 1.5 Kg  
- There is an optional special shelf available which accommodates 2 units side by side in a 1U high rack.  
- Optional rack mounting or table top use.
- \*Environmental conditions - Temperature: 0 - 40 degrees Celsius  
- Humidity: 0 - 95 % non-condensing

### 7.4 OPTIC AND FIBRE SPECIFICATIONS

Optic Option	Connector Option	Wavelength	Fibre Mode	Power Budget	Budget Distance
850sr	ST or SMA	850 nm	Muti-mode	12 dB	3,5 Km
1300mr	ST or SMA	1300nm	Multi-mode	12 dB	12 Km
1300mrsm	ST	1300nm	Multi-mode Single-mode	16dB 12dB	16 Km 24 Km
1300lr	ST	1300nm	Multi-mode Single-mode	28dB 25 dB	28 Km 50 Km
1300 laser	ST	1300nm	Multi-mode Single-mode	36 dB 35 dB	36 Km 70 Km

ANNEXURE 'A' OPTICAL COMMUNICATIONS SYSTEM BLOCK DIAGRAM.

ANNEXURE 'B' OPTIC INTERFACE UNIT BLOCK DIAGRAM.

ANNEXURE 'C' X.21 V11 PLUG AND SOCKET CONNECTIONS.

ANNEXURE 'D' DIP SWITCH SELECTIONS.