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IRT Eurocard

Type DDT-4210 & DDR-4210

270 Mb/s ASI / SDI Fibre Optic Link

DANGER

Invisible LASER radiation-

Avoid direct exposure to beam

| Peak power | 2 mW |
| Wavelength | 1310–1610nm |

Class 1 LASER Product

Designed and manufactured in Australia

IRT can be found on the Internet at:
http://www.irtelectronics.com

IRT Eurocard

Type DDT-4210 & DDR-4210

270 Mb/s ASI / SDI Fibre Optic Link

Instruction Book

Table of Contents

This instruction book applies to units later than S/N 0411001.

Operational Safety:

WARNING

Operation of electronic equipment involves the use of voltages and currents that may be dangerous to human life. Note that under certain conditions dangerous potentials may exist in some circuits when power controls are in the **OFF** position. Maintenance personnel should observe all safety regulations.

Do not make any adjustments inside equipment with power **ON** unless proper precautions are observed. All internal adjustments should only be made by suitably qualified personnel. All operational adjustments are available externally without the need for removing covers or use of extender cards.

Optical Safety

The light emitted from the LASER diode used in this system is invisible and may be harmful to the human eye. Avoid looking directly into the fibre optic cable or connectors or into the collimated beam along their axis when the device is in operation. Operating the LASER diode outside of its maximum ratings may cause device failure or a safety hazard.

DANGER

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IRT Eurocard
Type DDT-4210 & DDR-4210
270 Mb/s ASI / SDI Fibre Optic Link

General Description

The IRT DDT-4210 transmitter and DDR-4210 receiver are modules designed principally for use as a 270 Mb/s SMPTE/EBU serial digital video fibre optic transmission link, using 9/125μm single mode fibre, with optical paths losses up to 31dB.

The transmit / receive system specifications apply to all signal conditions, including the SMPTE 259M pathological test sequence.

In addition, the link may be used for ASI transport streams for use with MPEG compressed video streams or other 270 Mb/s type data.

The DDC series of modules may be used to convert various data formats to ASI for transport over this link. See separate data sheets for details.

The transmitter features automatic input cable equalisation and a choice of plug-in LASER modules of various wavelengths (ordered separately).

LED indicators are provided for digital signal presence, DC power and LASER output power out of range.

The DDR-4210 receiver uses a PIN photodiode detector with signal conditioning and reclocking circuits. The data rate is factory set for 270 Mb/s operation. 360 Mb/s operation is available at time of ordering. Other data rates are also available on request.

Two serial digital outputs are provided. LED indicators are provided for digital signal presence and power.

Relay contact outputs are also provided for external use of alarm signals on both modules.

An optional SNMP (Simple Network Management Protocol) plug-in module is available, for each unit, for remote monitoring when used in conjunction with IRT's 4000 series frame fitted with SNMP capability.

The DDT-4210 and DDR-4210 are Eurocard modules designed to fit IRT's standard Eurocard frames as well as IRT's 4000 series frames for use with IRT's SNMP system and may be used alongside any other of IRT's analogue or digital Eurocards.

Standard features:

- **Transports 270 Mb/s signals, such as ASI, SDI, etc.**
- **Path lengths up to 31dB optical path loss using 9/125μm single mode fibre.**
- **Passes SMPTE 259M 270 Mb/s SDI pathological test sequence.**
- **LED indicators and external alarm contacts.**
- **Fibre, video and alarm connections at rear.**
- **Optional plug-in SNMP monitoring module.**
- **Eliminates ground loop problems.**

Technical Specifications

IRT Eurocard module
Types DDT-4210 & DDR-4210

DDT-4210 - Transmitter

Signal input	SMPTE/EBU 270 Mb/s (includes ASI & SDI). 360 Mb/s data rate available at time of ordering.
	75 Ω >15 dB return loss to 360 MHz.
Cable compensation	Automatic, better than 200 metres at 270 Mb/s for Belden 8281 or equivalent cable.
Connector	BNC on rear panel.

DDR-4210 - Receiver

Video outputs	2 x ASI/SDI, 0.8V ± 10%.
	75Ω >15 dB return loss to 360 MHz.
Receiver reclocking	Factory set for 270 Mb/s operation.
	360 Mb/s data rate available at time of ordering.
	(Other data rates available on request).
Output rise time	<1.0 ns, (700 ps typically).
Residual jitter	<200 ps at 270 Mb/s.
Connectors	BNC on rear panel.

Optical

Optical path loss[*]	5 to 31 dB.
Optical fibre	Designed for use with 9/125μm single mode fibre.
Optical wavelength	See laser sub-board ordering information.
Optical connectors	SC/PC (standard).
DDT-4210 optical output	With LASER sub-board fitted, 0 dBm typically.

Laser sub-board ordering information:

SOO-1300	1310 nm ± 50 nm FP laser (SC/PC) - (standard).
SOO-1300/APC	1310 nm ± 50 nm FP laser (SC/APC).
SOO-1310	1310 nm ± 3 nm DFB laser (SC/PC).
SOO-1510	1510 nm ± 3 nm DFB laser (SC/PC).
SOO-1530	1530 nm ± 3 nm DFB laser (SC/PC).
SOO-1550	1550 nm ± 3 nm DFB laser (SC/PC).
SOO-1570	1570 nm ± 3 nm DFB laser (SC/PC).
DDR-4210 optical input	PIN detector, -5 to -31 dBm input level.

Power requirements:

Voltage	28 Vac CT (14-0-14) or ± 16 Vdc.
Consumption	DDT-4210 2.8 VA, DDR-4210 3.0 VA

Indicators on DDT-4210 and DDR-4210:

Power	LED (green) for +5V.
Serial digital signal present	LED (green) for signal present.
Optical output fail	LED (red) on DDT-4210 panel
Optical input low	LED (yellow) on DDR-4210 panel.

General:

Operating temperature	0 to 50° C ambient.
Mechanical	Suitable for mounting in IRT 19" rack chassis types with input, output and power connections to the rear.
Size	6 HP x 3U Extended Eurocard (220 mm x 100 mm).
Weight	With rear assembly <410 gm for each module.
Front panel	Grey background, black lettering & red IRT logo.
Rear assembly	Detachable silk-screened PCB with direct mount connectors to Eurocard and external signals.
Optional accessories	SMU-4000 SNMP plug in module for use with 4000 series frame fitted with SNMP "Agent".

NOTE: [*]   Optical attenuator recommended for DDR-4210 when optical path loss is less than 5dB (for pathological test signals - live video generally ok from 0dB).

Due to our policy of continuing development these specifications are subject to change without notice.

Configuration

Other than the following link settings, there are no user configurable settings. All other potentiometer and link settings are factory set and should not be moved.

User link settings:

DDT-4210:

LK1   1-2   Signal Loss alarm relay switched to ground on loss of input signal. (Default position).

      2-3   Signal Loss alarm relay switched to ground with input signal present.

LK2   1-2   Laser Fail/Off alarm relay switched to ground when laser is ok and on.

      2-3   Laser Fail/Off alarm relay switched to ground when laser fails or is switched off. (Default position).

LK3   1-2   Power Fail alarm relay switched to ground when +5Vdc power rail fails. (Default position).

      2-3   Power Fail alarm relay switched to ground when +5Vdc power rail ok.

LK4   1-2   Enable Laser - laser is always enabled whether input signal is present or not. (Default position).

      2-3   Auto Laser – laser is enabled only when an input signal is present.

DDR-4210:

LK1   1-2   Signal Loss alarm relay switched to ground on loss of input signal. (Default position).

      2-3   Signal Loss alarm relay switched to ground with input signal present.

LK2   1-2   Optical Input Low alarm relay switched to ground when optical input is ok.

      2-3   Optical Input Low alarm relay switched to ground when getting close to, or exceeding, maximum optical path loss. Set to come on at approximately -28dBm optical input power. (Default position).

LK3   1-2   Power Fail alarm relay switched to ground when +5Vdc power rail fails. (Default position).

      2-3   Power Fail alarm relay switched to ground when +5Vdc power rail ok.

LK4   OUT   Output muted on no signal. (Default position).

LK5   OUT   270Mb/s reclocking (Default position).

      IN   155Mb/s reclocking (for serial numbers later than 0701001 only).

RV3   Sets 'Optical Low' front panel indicator level. (Factory set for approximately –28 dBm optical input power).

Operation

The DDT-4210 and DDR-4210 are set up to operate at **270 Mb/s** and do not require any adjustment prior to use. There are no external controls on the front panel of the units.

A 270 Mb/s type of signal such as ASI or SDI is connected to the 75 Ω BNC connector on the rear assembly of the DDT-4210 fibre optic transmitter. A front panel LED, and a relay alarm accessible by the rear assembly, indicates the presence of a valid 270 Mb/s input signal. Likewise, a front panel LED, and a relay alarm also accessible by the rear assembly, indicates when the laser module either fails or is automatically turned off on loss of input signal. Link settings set whether the laser is permanently enabled or only enabled whilst a valid input signal is present.

With an optical laser sub-board fitted to the transmitter, single mode optical cable is directly connected to the module at the rear of the unit. Likewise the fibre connection at the far end of the fibre optic cable is directly connected to the rear of the receiver.

The system will operate with an optical path loss from 5dB to a maximum of 31dB (for pathological test signals - live video generally ok from 0dB). For path lengths <5dB optical loss, an optical attenuator is recommended. The length of fibre that this corresponds to depends on the fibre loss characteristics at the relevant wavelength of the laser module chosen. For example, if the fibre loss characteristic of the chosen fibre is 0.3dB per kilometre at 1310 nm, say, and assuming 1 dB for various in line connector losses, then the maximum distance that can be run is 100 km ($(31dB-1dB)/0.3dBkm^{-1}$).

The DDR-4210 receiver module accepts an input optical signal with a power level in the range of -5 dBm to -31 dBm. A yellow LED 'Optical Low' indicator on the front panel, and a relay alarm accessible by the rear assembly, indicates when the optical path loss is approaching the maximum 31 dB allowed. The optical low indication is factory set to come on at approximately 28 dB optical path loss. Even though this LED may come on at about 28 dB optical path loss, the unit is still rated to the full 31 dB path loss.

The output of the DDR-4210 receiver is the same signal that was originally inputted to the DDT-4210 transmitter. A front panel LED, and a relay alarm accessible by the rear assembly, indicates the presence of a valid output signal.

SNMP

What Is It?

SNMP stands for Simple Network Management Protocol. It is an application layer protocol for managing IP (Internet Protocol) based systems. SNMP enables system administrators to manage system performance, and to find and solve system problems. SNMP runs over UDP (User Datagram Protocol), which in turn runs over IP.

Three types of SNMP exist: SNMP version 1 (SNMPv1), SNMP version 2 (SNMPv2) and SNMP version 3 (SNMPv3). It is not the intention here to discuss the differences between various versions, only to bring attention to the fact that IRT Electronics modules, fitted with SNMP capability, use SNMPv1.

An SNMP managed network consists of three key components: Network Management Systems (*NMS*), *agents*, and *managed devices*.

An *NMS* is the console through which the network administrator performs network management functions, such as monitoring status (e.g. alarm states) and remote controlling, of a set of managed devices. One or more *NMS*s must exist on any managed network. Generally the *NMS* is a computer running third party SNMP control software. There are a number of third party SNMP software applications currently available on the market.

An *NMS* polls, or communicates with, an *agent*. An *agent* is a network management software module that resides in a *managed device*. An *agent* has local knowledge of management information and translates information into a form compatible with SNMP. The *agent*, therefore, acts as an interface between the *NMS* and the managed devices. The *NMS* sends a request message, and control commands for the managed devices, to the *agent*, which in turn sends a response message, containing information about the *managed devices*, back to the *NMS*.

A *managed device* contains an SNMP *agent* and resides on a managed network. *Managed devices* collect and store management information and make this information available to *NMS*s using SNMP.

Managed device agent variables are organised in a tree structure known as a Management Information Base (*MIB*). Within the *MIB* are parameters pertaining to the *managed device*. An Object Identifier (OID) number within the *MIB* defines the managed device type. This is a unique number specific to the model of *managed device*. Other information relating to the device is also stored, information such as alarm states, controllable settings, etc. The *MIB* tree is organised in such a way that there will be no two *MIB* files with conflicting placements.

Normally an *NMS* polls an *agent* for information relating to the *MIB* in a managed device to be sent back to the *NMS*. When certain conditions are met within the *MIB*, such as major alarm conditions, for example, the *agent* automatically sends what is known as a *trap* to the *NMS* without any prompting from the *NMS*. This allows automatic notification of a predetermined event.

SNMP Block Diagram
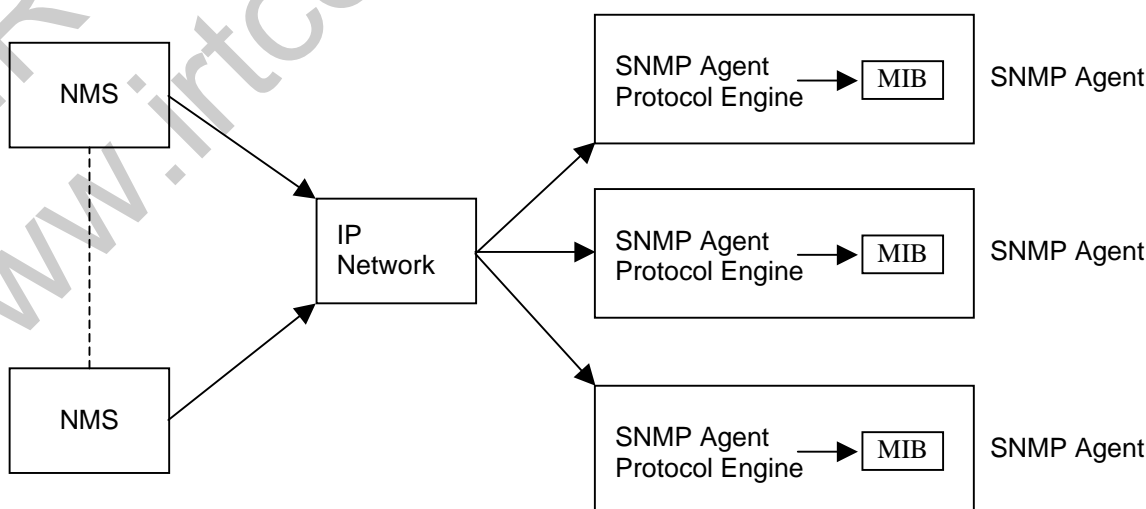
SNMP with IRT Products

IRT Electronics currently employs SNMPv1 with its 4000 series frame. The frame acts as an *agent* when fitted with a CDM-4000 module. This module has its own designated slot next to the power supply so as to not affect the number of modules that the frame will take. Communication between the *NMS*, the frame and its loaded modules are via this CDM-4000 module. Note that the *NMS* software is third party and not supplied by IRT Electronics.

Ethernet connection for SNMP operation is via an RJ45 connector on the rear of the frame, below the mains inlet. Ethernet rate runs at either 10 baseT or 100 baseT.

Frame parameters, such as Name, Address and Location, are set via an RS232 interface, a D9 connector on the rear of the frame below the mains inlet. A software terminal emulator, such as Tera Term or HyperTerminal, is used for setting and reading the parameters of the frame.

IRT modules that are SNMP compatible need a plug-in SMU-4000 module with a program relevant to the module that it is plugged into. Depending on the module, besides the module identification, parameters such as alarm states, inputs and controls etc. are communicated to the CDM-4000 *agent* via a data bus on the rear of the frame. Thus the CDM-4000 collects information on what is loaded within the frame, what positions they occupy, and their current status for communication to the *NMS* when the *NMS* sends a request for information.

In the event of a major alarm from any of the SNMP compatible modules, or power supplies, a *trap* is automatically sent by the CDM-4000 *agent* to the *NMS* without any prompting by the *NMS*. This alerts the operator to any fault conditions that may exist that need immediate attention.
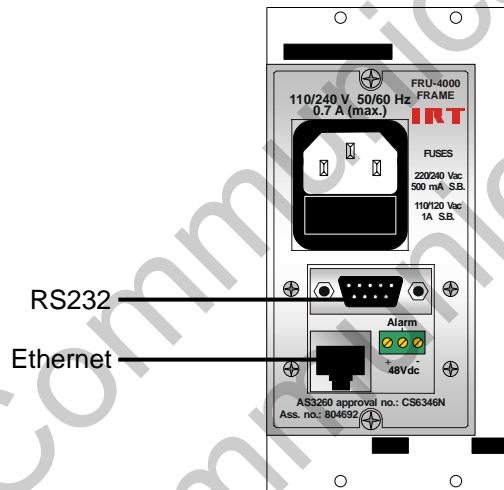
IRT SNMP Connections
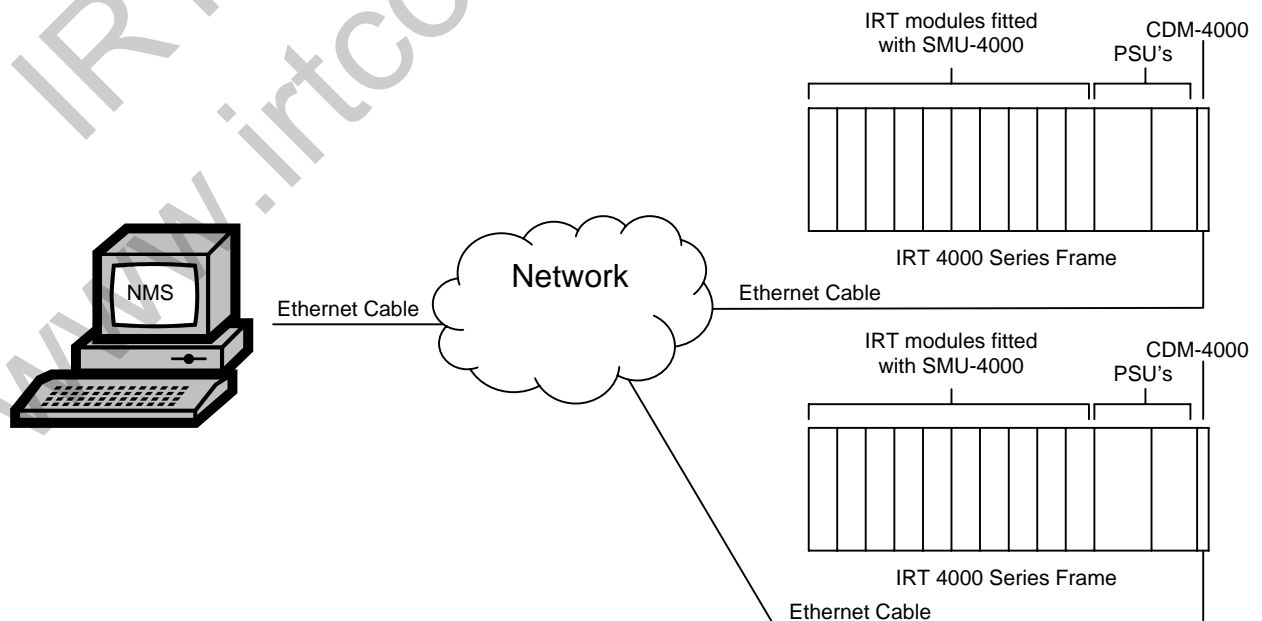
IRT 4000 Series SNMP Setup

DDT-4210 & DDR-4210 SNMP Functions:

With the DDT-4210/DDR-4210 fitted with the optional plug-in SMU-4000 SNMP module, programmed with the firmware to suit and installed in an IRT 4000 series frame with SNMP capability, can be interrogated by an SNMP Network Management System (NMS).

The following SNMP functions are capable of being monitored by an NMS:

DDT-4210:
The current state of the "Urgent" Alarm - Laser Fail;
An indication that an input signal is present;
An indication that there is an output from the Laser;
An indication of the Laser wavelength;
An indication of the light level output;
Whether "Trap" function is enabled;
Trap automatically sent, if enabled, on "Urgent" alarm;
Trap automatically sent, if enabled, if "Urgent" alarm clears; and
Unit reset control.

DDR-4210:
The current state of the "Urgent" Alarm – Optical Input Fail;
An indication that an encoded signal has been detected;
An indication that there is an optical input;
An indication of the light level input;
Whether "Trap" function is enabled;
Trap automatically sent, if enabled, on "Urgent" alarm;
Trap automatically sent, if enabled, if "Urgent" alarm clears; and
Unit reset control.

Light Levels:

DDT-4210:

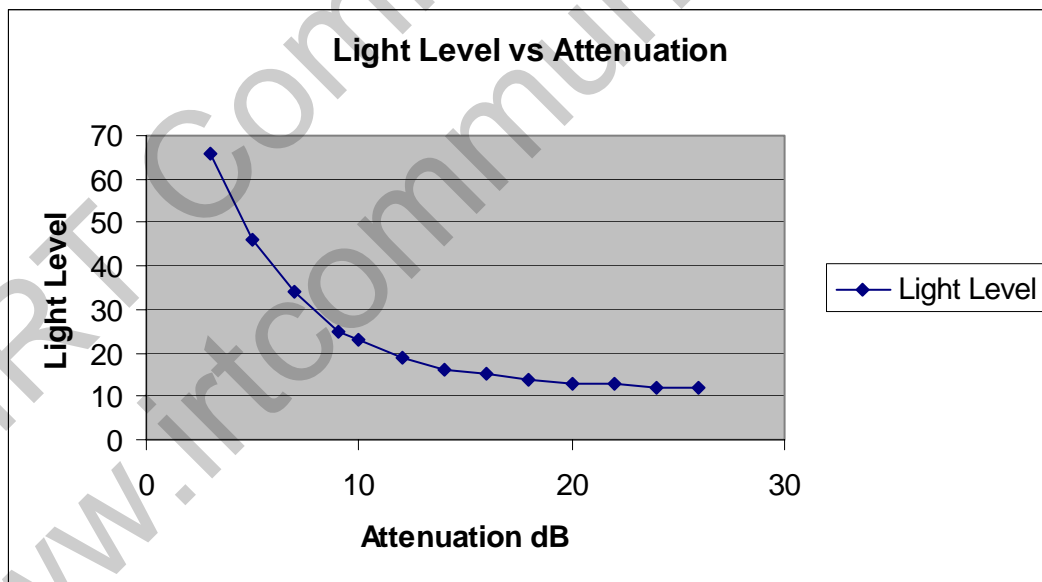| Power dBm	Tx Light Level
1.5	74
1	73
0	71
-1	69
-2	65

DDR-4210:

Attenuation dB	Light Level
3	66
5	46
7	34
9	25
10	23
12	19
14	16
16	15
18	14
20	13
22	13
24	12
26	12
28	12
N/C	12

Light Level vs Attenuation

Installation

Pre-installation:

Handling:

This equipment may contain or be connected to static sensitive devices and proper static free handling precautions should be observed.

Where individual circuit cards are stored, they should be placed in antistatic bags. Proper antistatic procedures should be followed when inserting or removing cards from these bags.

Power:

AC mains supply: Ensure that operating voltage of unit and local supply voltage match and that correct rating fuse is installed for local supply.

DC supply: Ensure that the correct polarity is observed and that DC supply voltage is maintained within the operating range specified.

Earthing:

The earth path is dependent on the type of frame selected. In every case particular care should be taken to ensure that the frame is connected to earth for safety reasons. See frame manual for details.

Signal earth: For safety reasons a connection is made between signal earth and chassis earth. No attempt should be made to break this connection.

Installation in frame or chassis:

See details in separate manual for selected frame type.

Signal connections:

The DDT-4210 and DDR-4210 are set up to operate at **270 Mb/s** and do not require any adjustment prior to use. There are no external controls on the front panel of the units.

Optical connections are made to the panel adapter mounted on a bracket at the rear of the modules. Care must be taken to provide a clean surface on the optical connectors and in inserting the plug on the external fibre to prevent damage to the alignment ferrule of the panel adapter.

The serial digital signal connections are made to the BNC connectors on the rear panel.

The external alarm contact connections are made to the 4 pin parallel wired connectors at the bottom of the rear panel.

The connections are:	DDT-4210	SK2/2A	pin 4	dc power fail
			pin 3	laser fail/laser off
			pin 2	digital signal loss
			pin 1	ground
	DDR-4210	SK5/6	pin 4	dc power fail
			pin 3	optical low
			pin 2	digital signal loss
			pin 1	ground

The presence of the internal DC supply voltage is indicated by the front panel **DC** LED (green).

SMU-4000 Installation

The SMU-4000 plug-in SNMP management controller module can only be fitted to IRT's 4000 series modules that are capable of being SNMP upgradeable. To determine whether a module is SNMP upgradeable, a square section on the main PCB is silk screened and fitted with three multipin sockets – as shown below:
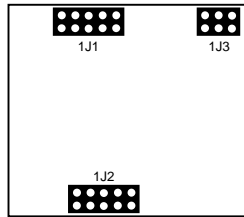
This is where the SMU-4000 plug-in SNMP management controller module is fitted. The three sets of multipins on the underside of the SMU-4000 line up with the three sets of multipin sockets on the main PCB module. Align all pins and then gently press the SMU-4000 all the way down into place.

If the SMU-4000 is not already programmed with the correct firmware to match the module that it is being plugged into, it then needs to be programmed via the pins on the topside of the SMU-4000.

Note that installation will generally be done by IRT Electronics at the time of ordering.

Note also that an SMU-4000 will only be functionally operational when the main module that it is plugged into is fitted into an IRT 4000 series frame fitted with a CDM-4000 SNMP agent and being interrogated by a suitable Network Management System.

Figure 1: SMU-4000 module

Front & rear panel connector diagrams

The following front panel and rear assembly drawings are not to scale and are intended to show connection order and approximate layout only.

DDT-4210
IRT
1310nm
INPUT
LASER
DC
CAUTION
Direct connections to module
N140

IRT SD F.O. TX
P3
SK1
INPUT
SK2A
4
3
2
1
SK2
4
3
2
1
SK2-SK2A
ALARM
CONTACTS
4-POWER
3-OPTICAL
2-SIGNAL
1-GROUND
P2

DDR-4210
IRT
SIGNAL PRESENT
OPTICAL LOW
DC
CAUTION
Direct connections to module
N140

IRT SD F.O. RX
P3
SK1
O/P 1
SK2
O/P 2
SK5
4
3
2
1
SK6
4
3
2
1
SK5-SK6
ALARM
CONTACTS
4-POWER
3-OPTICAL
2-SIGNAL
1-GROUND
P2

Maintenance & storage

Maintenance:

No regular maintenance is required.

Care however should be taken to ensure that all connectors are kept clean and free from contamination of any kind. This is especially important in fibre optic equipment where cleanliness of optical connections is critical to performance.

Storage:

If the equipment is not to be used for an extended period, it is recommended the whole unit be placed in a sealed plastic bag to prevent dust contamination. In areas of high humidity a suitably sized bag of silica gel should be included to deter corrosion.

Where individual circuit cards are stored, they should be placed in antistatic bags. Proper antistatic procedures should be followed when inserting or removing cards from these bags.

Warranty & service

Equipment is covered by a limited warranty period of three years from date of first delivery unless contrary conditions apply under a particular contract of supply. For situations when "**No Fault Found**" for repairs, a minimum charge of 1 hour's labour, at IRT's current labour charge rate, will apply, whether the equipment is within the warranty period or not.

Equipment warranty is limited to faults attributable to defects in original design or manufacture. Warranty on components shall be extended by IRT only to the extent obtainable from the component supplier.

Equipment return:

Before arranging service, ensure that the fault is in the unit to be serviced and not in associated equipment. If possible, confirm this by substitution.

Before returning equipment contact should be made with IRT or your local agent to determine whether the equipment can be serviced in the field or should be returned for repair.

The equipment should be properly packed for return observing antistatic procedures.

The following information should accompany the unit to be returned:

1. A fault report should be included indicating the nature of the fault
2. The operating conditions under which the fault initially occurred.
3. Any additional information, which may be of assistance in fault location and remedy.
4. A contact name and telephone and fax numbers.
5. Details of payment method for items not covered by warranty.
6. Full return address.
7. For situations when "**No Fault Found**" for repairs, a minimum charge of 1 hour's labour will apply, whether the equipment is within the warranty period or not. Contact IRT for current hourly rate.

Please note that all freight charges are the responsibility of the customer.

The equipment should be returned **to the agent who originally supplied the equipment or, where this is not possible**, to IRT direct as follows.

Equipment Service
IRT Electronics Pty Ltd
26 Hotham Parade
ARTARMON
N.S.W.   2064
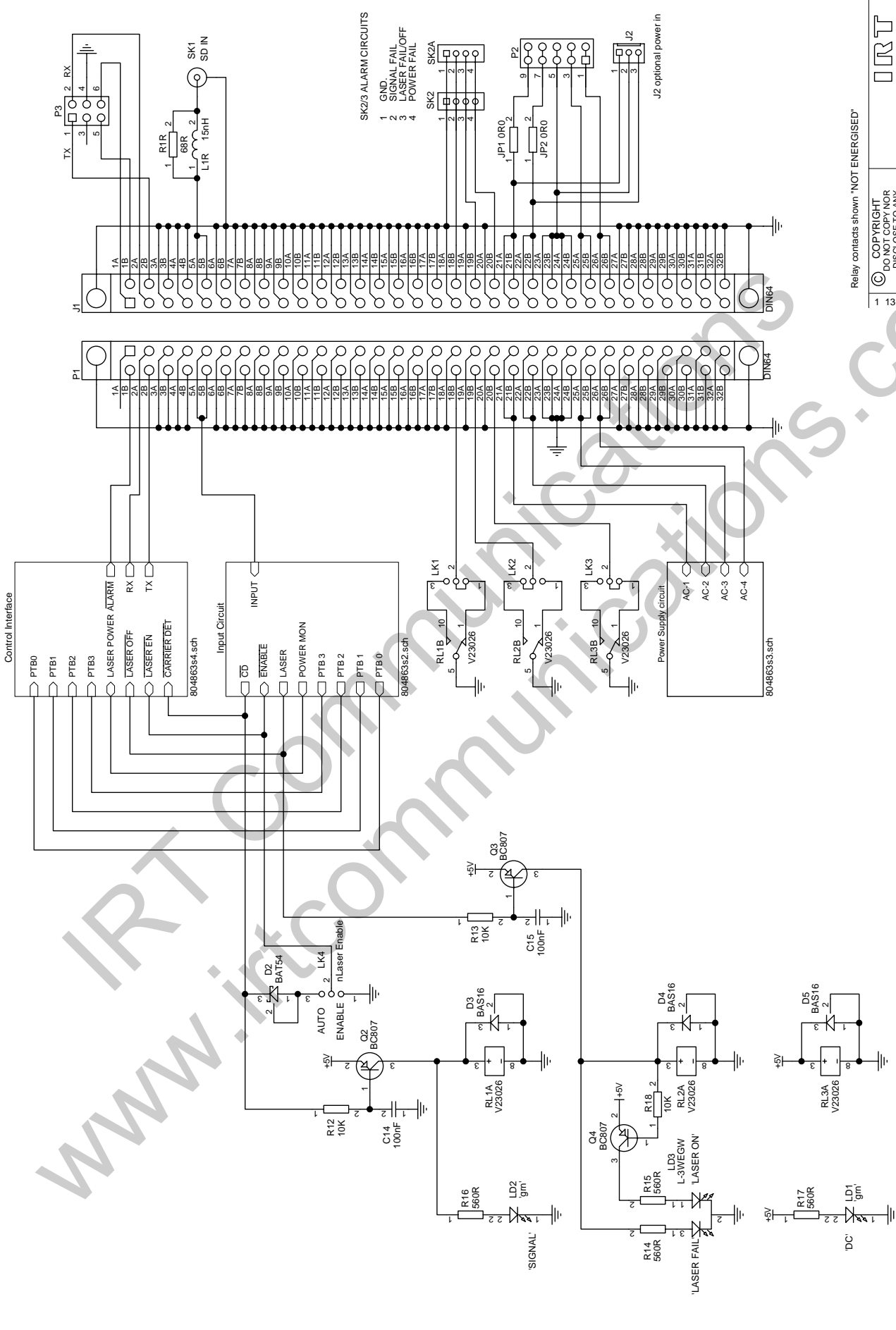AUSTRALIA

Phone: 61 2 9439 3744   Fax: 61 2 9439 7439
Email: service@irtelectronics.com
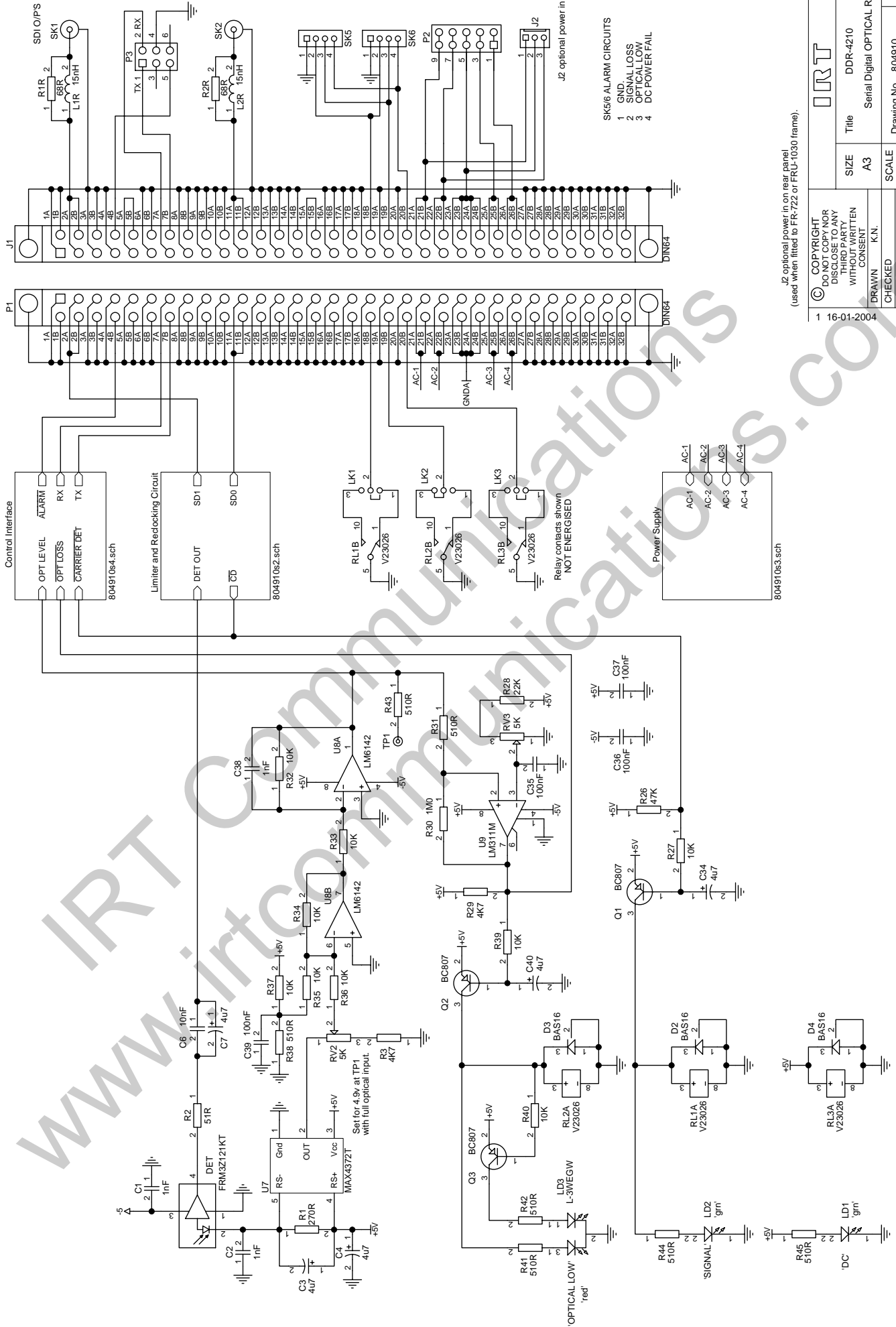
Drawing List Index

P3
RX
TX 1 2 RX
3 4
5 6

SK1
SD IN

R1R 68R
L1R 15nH

SK2/3 ALARM CIRCUITS

SK2A
1 GND.
2 SIGNAL FAIL
3 LASER FAIL/OFF
4 POWER FAIL

SK2

P2
9 7 5 3 1

JP1 0R0
JP2 0R0

J2
J2 optional power in

J1 DIN64
1A 1B 2A 2B 3A 3B 4A 4B 5A 5B 6A 6B 7A 7B 8A 8B 9A 9B 10A 10B 11A 11B 12A 12B 13A 13B 14A 14B 15A 15B 16A 16B 17A 17B 18A 18B 19A 19B 20A 20B 21A 21B 22A 22B 23A 23B 24A 24B 25A 25B 26A 26B 27A 27B 28A 28B 29A 29B 30A 30B 31A 31B 32A 32B

P1 DIN64
1A 1B 2A 2B 3A 3B 4A 4B 5A 5B 6A 6B 7A 7B 8A 8B 9A 9B 10A 10B 11A 11B 12A 12B 13A 13B 14A 14B 15A 15B 16A 16B 17A 17B 18A 18B 19A 19B 20A 20B 21A 21B 22A 22B 23A 23B 24A 24B 25A 25B 26A 26B 27A 27B 28A 28B 29A 29B 30A 30B 31A 31B 32A 32B

Control Interface
PTB0
PTB1
PTB2
PTB3
LASER POWER ALARM
LASER OFF
LASER EN
CARRIER DET
RX
TX
804863s4.sch

Input Circuit
INPUT
CD
ENABLE
LASER
POWER MON
PTB 3
PTB 2
PTB 1
PTB 0
804863s2.sch

LK1
RL1B V23026
LK2
RL2B V23026
LK3
RL3B V23026

Power Supply circuit
AC-1
AC-2
AC-3
AC-4
804863s3.sch

Q3 BC807
+5V
R13 10K
C15 100nF

D2 BAT54
LK4 nLaser Enable
AUTO
ENABLE
Q2 BC807
+5V
R12 10K
C14 100nF

D3 BAS16
RL1A V23026

D4 BAS16
R18 10K
RL2A V23026

D5 BAS16
+5V
RL3A V23026

Q4 BC807
+5V
R15 560R
LD3 L-3WEGW 'LASER ON'
R14 560R 'LASER FAIL'

R16 560R
LD2 'SIGNAL'

+5V
R17 560R
LD1 'DC'

IRT

DDT-4210
Title SERIAL DIGITAL OPTICAL TX
SIZE A3
Drawing No. 804863
Sheet 1 of 4
SCALE N.T.S.
IRT Electronics Pty. Ltd.
ARTARMON NSW AUSTRALIA 2064
DRAWN K.N.
CHECKED
ENG. APP.
Revision: 1
Date: 11-Jan-2005

1 13-10-2003

IRT		
Title	DDR-4210	Sheet
	Serial Digital OPTICAL RX	1 of 4
SIZE	Drawing No. 804910	
A3		
SCALE	DRAWN K.N.	
N.T.S.	CHECKED	
	ENG. APP.	
	Revision: 1	
	Date: 11-Jan-2005	

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ARTARMON NSW AUSTRALIA 2064

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CONSENT

1 16-01-2004

J2 optional power in on rear panel
(used when fitted to FR-722 or FRU-1030 frame).

PCB 804911