I R T Electronics Pty Ltd A.B.N. 35 000 832 575
26 Hotham Parade, ARTARMON N.S.W. 2064 AUSTRALIA
National: Phone: (02) 9439 3744 Fax: (02) 9439 7439
International: +61 2 9439 3744 +61 2 9439 7439
Email: sales@irtelectronics.com
Web: www.irtelectronics.com

IRT Eurocard

Type MDD-3490

MPEG 2 Transport Stream Monitor

Designed and manufactured in Australia

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

IRT Eurocard

Type MDD-3490

MPEG 2 Transport Stream Monitor

Instruction Book

Table of Contents

This instruction book applies to units later than S/N 0106001.

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.

IRT Eurocard
Type MDD-3490
MPEG 2 Transport Stream Monitor

General Description

The primary function of the MDD-3490 is to raise an alarm if its input MPEG Transport Stream fails. Its secondary function is to raise an alarm if the Transport Stream is not the correct stream as identified by its Stream Id. Thirdly it can raise an alarm if a particular Program Number is missing from the stream, and in addition monitors a number of the parameters of first priority measurements of ETR 290.

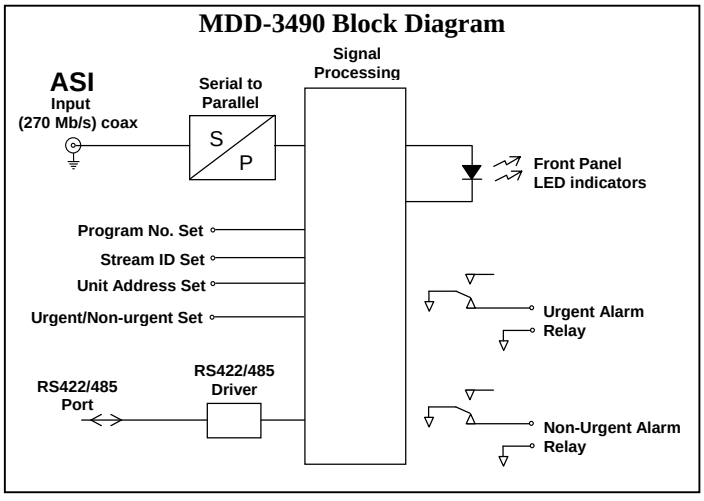
There are 6 green status LEDs named PAT, SID, PMT, PGM, PCR and TX. The first five should be illuminated in the presence of a valid Transport Stream. CNT is an amber LED and lights on a Continuity Count error. ASI is red and indicates a failure of the Transport Stream. The TX led blinks whenever a message is sent on the RS 422 output line.

There are two relays whose contacts are available on the rear assembly. They are labelled Urgent and Non-Urgent. If the Urgent relay operates then the red URG led on the front panel will light. If the Non-Urgent relay operates then the amber led NON will light. Each of the relays can be selected (by dip switches) to operate on any or all of the error states of the seven status LEDs.

In the absence of any received RS 422 signals, the MDD-3490 transmits a message at 9600 Baud every 400 ms that contains the Stream ID of the connected transport stream and the state of the seven status LEDs. Receipt of any message from a host stops this action for sixteen seconds unless the message is addressed to this module, in which case it answers with the status message immediately. The module can be set to respond to any one of sixteen addresses. The interface may be used in either RS 422 four wire or RS 485 two wire modes.

Standard features:

- **Raises an alarm if its input MPEG stream fails.**
- **Raises an alarm if the ASI Transport Stream is not the correct stream as indicated by its stream ID.**
- **Raises an alarm if a particular Program Number is missing from the stream.**
- **Monitors a number of the parameters of first priority measurements of ETR290.**
- **Front panel alarm LEDs and rear panel urgent and non-urgent relays.**
- **RS422/485 serial monitoring port.**



Technical Specifications

IRT Eurocard module
Type MDD-3490

Input: 1 x ASI-C
- Impedance: 75Ω.
- Level: 800 mVp-p.
- Connector: BNC.

Alarm Outputs: 1 x contact closure to ground for an Urgent alarm
1 x contact closure to ground for a Non-Urgent alarm.

Monitor Output: RS-422/RS-485 port.

Front Panel Indicators:
- PAT - Program Association Table (Present)
- PMT - Program Map Table (Present)
- PCR - Program Clock Reference (Present)
- SID - Stream ID (Correct)
- PGM - Program Number (Present)
- TX - Transmit (Signal being sent over RS-422/485 line)
- ASI - ASI (Failure of input ASI signal)
- CNT - Continuity Count (Error)
- URG - Urgent Alarm status
- N.URG - Non Urgent Alarm Status

Power Requirements: 28 Vac CT (14-0-14) or ± 16 Vdc.
Power consumption: <3.5 VA.

Other:

Temperature range: 0 - 50° C ambient.

Mechanical: Suitable for mounting in IRT 19" rack chassis with input, output and power connections on the rear panel.

Finish:
- Front panel: Grey with black lettering & red IRT logo.
- Rear assembly: Detachable silk-screened PCB with direct mount connectors to Eurocard and external signals.

Dimensions: 6 HP x 3 U x 220 mm IRT Eurocard.

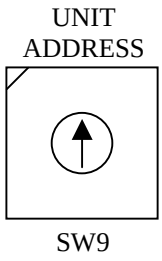
Supplied accessories: Rear connector assembly.

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

Configuration

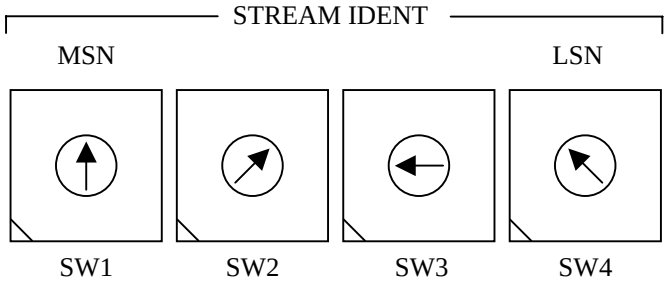
Card Address:

Up to 16 MDD-3490's can be monitored via an RS-422/RS-485 interface which is accessed via plugs PL4 and PL5 on the rear assembly. An individual unit address for the card is set on SW9, which is a 16 position rotary switch.



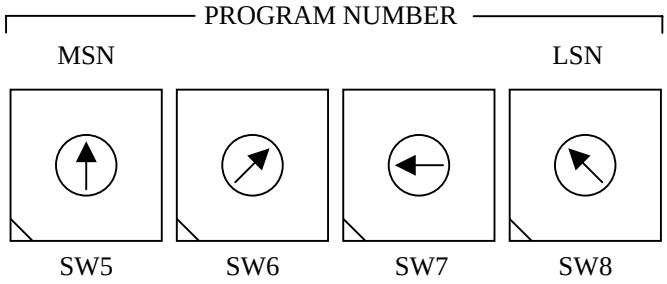
Stream Ident (SID):

Switches SW1 to SW4 are 16 position rotary switches used for setting the Stream Id which will be compared to that of the Transport Stream. If the MPEG stream's identification number matches the settings of SW1 to SW4, the SID LED is lit. An incorrect match can cause a non-urgent alarm if SW10-7 is set, or an urgent alarm if SW11-7 is set.



Program Number (PGM):

Switches SW5 to SW8 are 16 position rotary switches used for setting the Program Number which will be compared to the one in the Transport Stream. If a Program Number in the MPEG stream matches the setting of SW5 to SW8, the PGM LED is lit. An absence for more than 0.5 seconds of a matching Program Number in the stream can cause a non-urgent alarm if SW10-5 is set, or an urgent alarm if SW11-5 is set.



Urgent / Non-urgent Alarm settings:

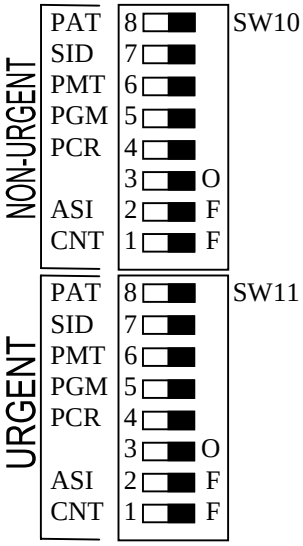
Switches SW10 and SW11 are 8 way Dual-In-Line (DIL) switches used for selecting the conditions that will cause the Urgent and Non-urgent alarms to occur.

On SW10, operation of the switches associated with PAT, SID, PMT, PGM and PCR will cause a Non-urgent alarm when the associated LED extinguishes. In the case of ASI and CNT, operation of their associated switches will cause a Non-urgent alarm when the LEDs turn on.

SW11 is used in a like manner for the Urgent Alarm.
It is possible to set a condition to raise both an Urgent and Non-urgent alarm.
An alarm condition (or loss of power) causes a ground to appear on the appropriate Rear assembly pin.

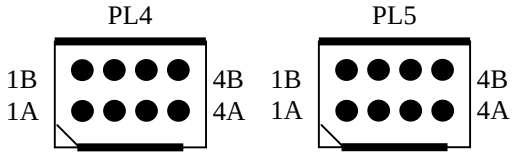
SW10 & SW11 fault conditions:

Position	8	PAT - Program Association Table (Missing)
	7	SID - Stream ID (Incorrect)
	6	PMT - Program Map Table (Missing)
	5	PGM - Program Number (Missing)
	4	PCR - Program Clock Reference (Missing)
	3	Not Used
	2	ASI - ASI (Loss of or faulty)
	1	CNT - Continuity Count (Error)



Remote Monitoring RS-422/RS-485 Link Settings and Connections:

The MDD-3490 is capable of remote monitoring via either an RS-422 or RS-485 interface via either PL4 or PL5 on the rear assembly. PL4 and PL5 are HE14 8 pin connectors and are connected in parallel.



For connections to the RS-422 or RS-485 line, wire pins from PL4 to a DB9 Female connector as follows:

PL4	DB9F	
2A	2	
2B	7	
3A	8	
3B	3	
	4	Ground
	6	Ground

The MDD-3490 is a Tributary as defined in the IRT Module Communication System Specification section.

LK5 should be omitted to operate in the recommended Full Duplex mode. LK4 and 5 allow the use of optional 220Ω terminations on the transmit and receive pairs.

In the absence of any received RS 422 signals, the MDD-3490 transmits a message at 9600 Baud every 400 ms that contain the state of the seven status LEDs and the Stream ID of the connected transport stream. Receipt of any message from a host stops this action for sixteen seconds unless the message is addressed to this module, in which case it answers with the status message immediately. The module can be set to respond to any of sixteen addresses.

The "device defined message" (see the IRT Module Communication System Specification section) sent from an MDD-3490 consists of three bytes.
Byte 1 is the Status byte.
Byte 2 is the received StreamID MSByte.
Byte 3 is the received StreamID LSByte.

For Byte 1 if the Bit is set (a one) then the following applies;-

Bit 0	PAT OK
1	SID OK
2	PMT OK
3	PGM OK
4	PCR OK
5	Not Used
6	ASI OK
7	CNT OK

The only Command that is understood by an MDD-3490 is the one byte "device defined message" hex 80, which is interpreted as "send status".

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 Inputs:

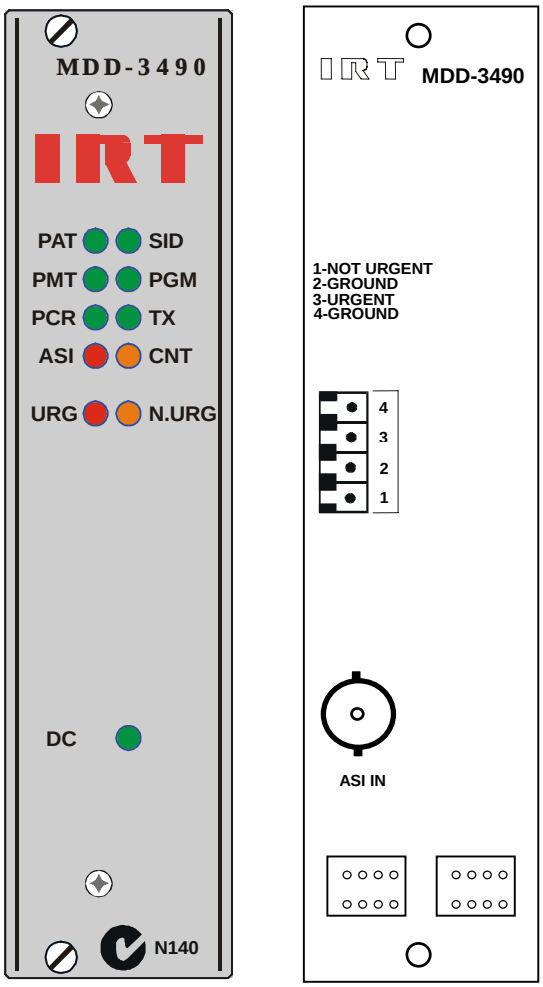
An ASI signal to be monitored is connected to the BNC connector on the rear of the rear connector assembly. For configuration of the MDD-3490 to match selected operating alarm states, see the configuration section of this manual.

Alarm Outputs:

Two relay alarm outputs, non-urgent and urgent, are via PL1, a 4 pole Phoenix style screw terminal block, on the rear connector assembly. Pin 1 switches to ground when a non-urgent alarm status has been raised. Pin 3 switches to ground when an urgent alarm status has been raised. Pins 2 and 4 are grounds. Front panel LEDs also light up when either of these alarm states has been raised.

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.



Technical Description

An MPEG2 (ASI) signal to be monitored is passed via a BNC connector, SK2, mounted on the rear connector assembly to U1, which is an automatic cable equaliser chip. This equalised signal is passed to a serial to parallel converter chip U2 and then to the input data lines of U5 where the signal is monitored for various errors and comparison to set states. XTAL1 provides a 27 MHz reference clock for the processor and the serial/parallel converter. U3 provides a power on reset for the microprocessor. U4 provides some of the code used by the microprocessor.

EPROM U6, in conjunction with the microprocessor U5, provides the driving signals to operate the LED driver, U14, and the non-urgent and urgent relay drivers, Q1 and Q2. Switches SW10 and SW11 in conjunction with U12 and U13 set non-urgent and urgent states. When an alarm condition is set as non-urgent or urgent and a fault occurs, relay RL1 switches to ground for non-urgent status and relay RL2 switches to ground for urgent status.

Switches SW1 to SW4, in conjunction with U8 and U9, set the Stream ID to be compared with the input MPEG2 signal. Switches SW5 to SW8, in conjunction with U10 and U11, set the Program number to be compared with the input MPEG2 signal. While the input MPEG2 signal compares favourably with the switch settings SW1-SW4 or SW5-SW8, the relevant front panel LEDs illuminate to indicate presence of stream ID and program number.

Switch SW9 sets the unit address as one of sixteen possible addresses. This is set for RS-422 or RS-485 monitoring purposes allowing up to sixteen cards to be monitored over the same line. U15 and U16 are RS-422/RS-485 drivers and receivers. Relevant state is set by links LK4, LK5 and LK6. U7 provides the clock for the timing of the RS-422 / RS-485 signals.

Power for this card is provided by either 14-0-14 Vac or ±16 Vdc sources. These power sources pass through a full wave bridge rectifier before feeding an on board DC/DC converter, which supplies the operating voltage +5 Vdc for the card.

ETR290 Conformance Table

ASI 1.1 TS_sync_loss

Loss of synchronisation

1.2 Sync_byte_error

There were consecutive missing Packet Sync bytes (0x47).

PAT 1.3 PAT_error

PID 0x0000 occurred at least once in the last 0.5 seconds, and.
All packets with PID 0x0000 had a table_id of 0x00, and.
Scrambling_control_field was 00 for PID 0x0000.

CNT 1.4 Continuity_count_error

The Continuity counter for the PAT packet did not increase by one.
The Continuity counter for the PMT packet did not increase by one.
The Continuity counter for the PCR packet did not increase by one.

PMT 1.5 PMT_error

A PMT packet for the preset Program Number occurred at least once in the last 0.5 seconds, and
The PMT packet had 00 in its Scrambling_control_field , and
The PMT packet had a Table_id of 0x02.

PCR 2.3 PCR-error

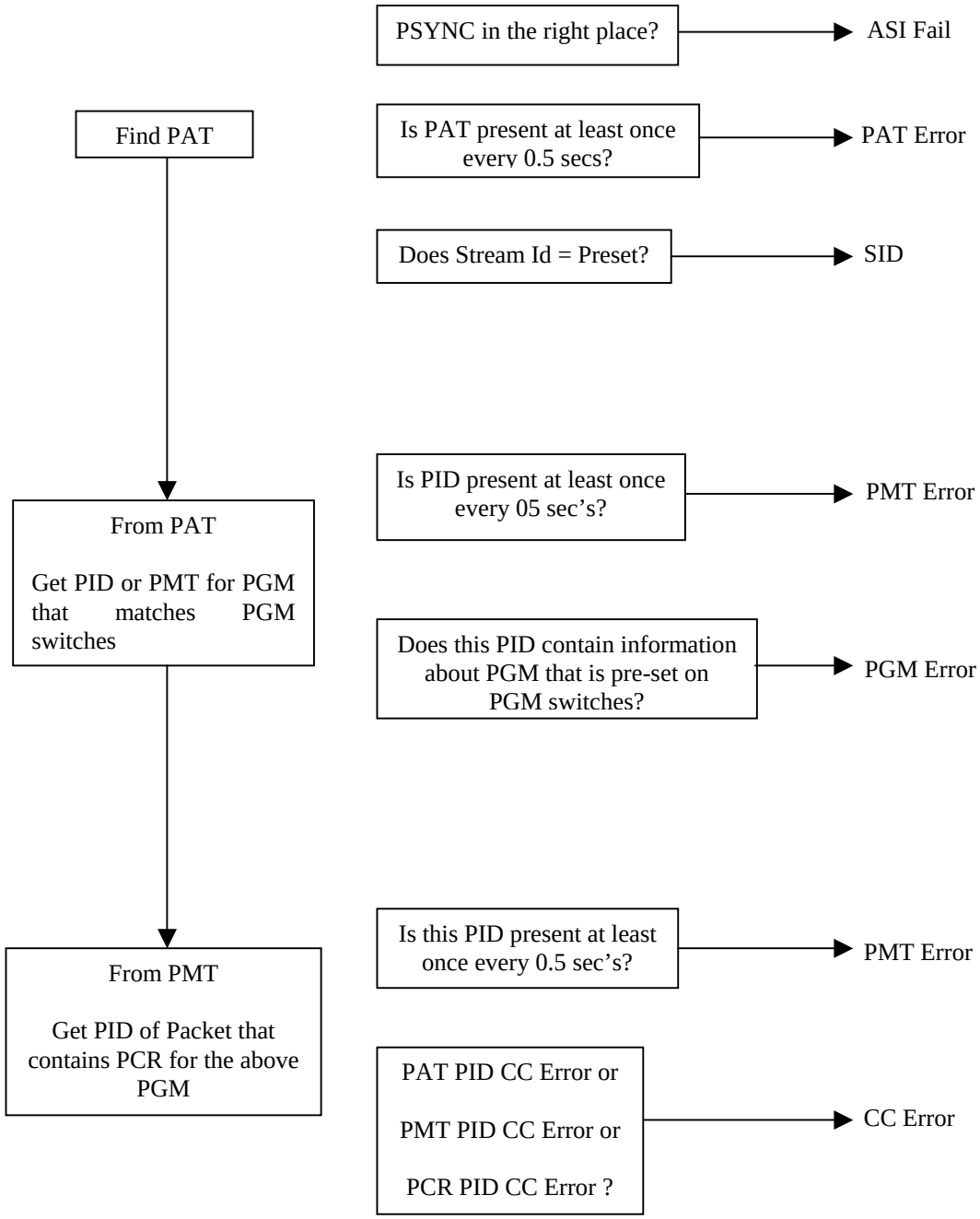
A PCR packet for the preset Program Number occurred at least once in the last 0.5 seconds.

PGM

The referenced PMT packet did contain the preset Program Number.

SID

The Stream_id of the TS equals that that is preset on the TS_ID switches.



PAT	Program Association Table
PSYNC	Packet Sync
PID	Packet Identification
PMT	Program Map Table
PGM	Program
PCR	Program Clock Reference
CC	Continuity Counter

IRT Module Communication System Specification

Each interface system contains one bus controller which supervises all tributaries in the system.

A tributary transfers messages to and from an operational device via the interface system as specified in the interface system protocol. A tributary communicates messages through the interface bus only via the bus controller.

The basic message path utilises asynchronous, bit serial/word serial transmission via a balanced wire pair. A full-duplex four-wire communications channel to RS485 standard is utilised.

The interface bus may be utilised as either :-

A point to point bus connecting one tributary to a bus controller.

A multi point bus connecting multiple tributaries to a single bus controller.

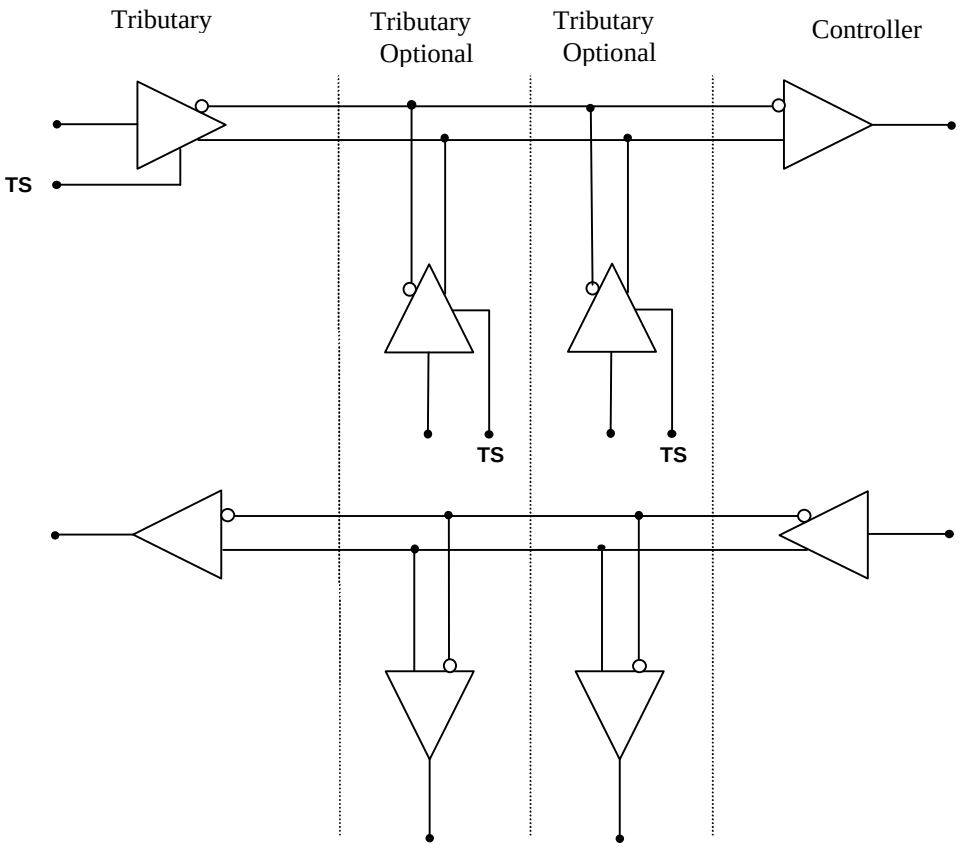
The data word and BREAK character utilized by the interface system shall be as follows:

The standard serial data word includes an eight-bit data byte; the complete serial data word consists of one start bit (SPACE), eight data bits (ONE BYTE), and one stop bit (MARK). The least significant bit is transmitted first. A BREAK character, comprising 17-21 bits SPACE followed by a subsequent return to the MARK condition for a minimum of three bits, is utilized to synchronize all devices connected to the interface bus. A SPACE in excess of 21 bits shall be treated as an ERROR condition.

Following a BREAK character is the message block containing the following ;-

-- byte 1 Address of the tributary
-- byte 2: byte count of bytes 2 through (n + 1) (0 = 256 bytes).
-- bytes 3 through n: (256 bytes maximum) - device defined message.
-- byte n + 1: checksum of such value that the hexadecimal sum of bytes 2 to (n + 1) = 0 MOD 256.

Full Duplex



The interface connector shall be a 9-pin D-subminature female (DE-9S).

BUS CONTROLLER

TRIBUTARY

FG FRAME GROUND
TA TRANSMIT “A”
TB TRANSMIT “B”
TC TRANSMIT SIGNAL COMMON
RA RECEIVE “A”
RB RECEIVE “B”
RC RECEIVE SIGNAL COMMON
SP SPARE

A≤B “MARK” STATE
A≥B “SPACE” STATE

DDS-1100	8x4 G703 Switcher
TPD-1120	RAGU 1/2 Alarm
DVA-3005	6 O/P SDI Reclock EDH DA
MDD-3490	MPEG TS Monitor

DDS 1100	$80	Row 1	Set xpoint to value in next byte
	$81	Row 2	Set xpoint to value in next byte
	$82	Row 3	Set xpoint to value in next byte
	$83	Row 4	Set xpoint to value in next byte
*	$4x		Report xpoints
*	-		Sending Status

TPD-1120	$80	Report Alarms
	$81	Report Acknowledged Alarms
	$82	Report History
	$83	Report ARAs
	$84	Do Alarm Test
	$85	Do ARA Test
	$86	Reset History
	$87	Acknowledge Alarms
	$40	Sending Alarms
	$41	Sending Acknowledged Alarms
	$42	Sending History
	$43	Sending ARAs

MDD-3490	$80	Report Status
*	-	Sending Status

DVA-3005

HDL-9200
Commands

$90	Select Auto
$91	Select Manual
$92	Select Talk
$93	Select Listen
$94	Select Enable
$95	Select Isolate
$96	Select SystemA
$97	Select SystemB
$98	Reset
$99	Report Status

Break – Address – Count(03) – Command - Csum

Report

Byte1	SysupTime B3
Byte2	SysupTime B2
Byte3	SysupTime B1
Byte4	SysupTime B0
Byte5	PortM
Byte6	PortP
Byte7	PortA

Break – Address – Count(09) – B1 – B2 – B3 – B4 – B5 – B6 – B7 – Csum

*** = Violation of Rules**

In the Action Word (byte 1 of the "device defined message") :-

A Command word is 10xxxxxx (where xxxxxx is the command).

A Report word is 01xxxxxx (where xxxxxx is the Command being reported)

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.

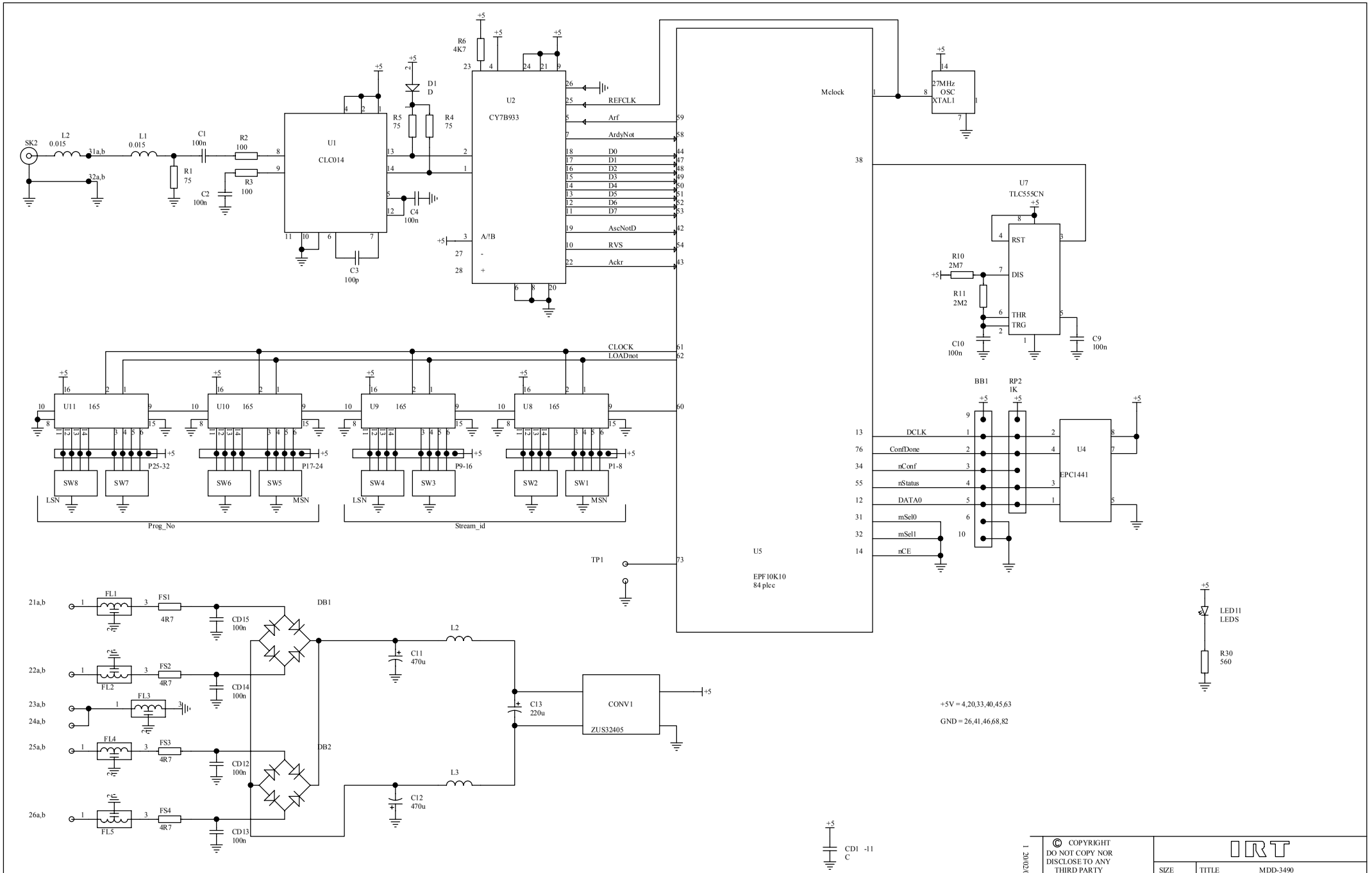
The equipment should be returned **to the agent who originally supplied the equipment or, where this is not possible**, to IRT direct as follows.

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

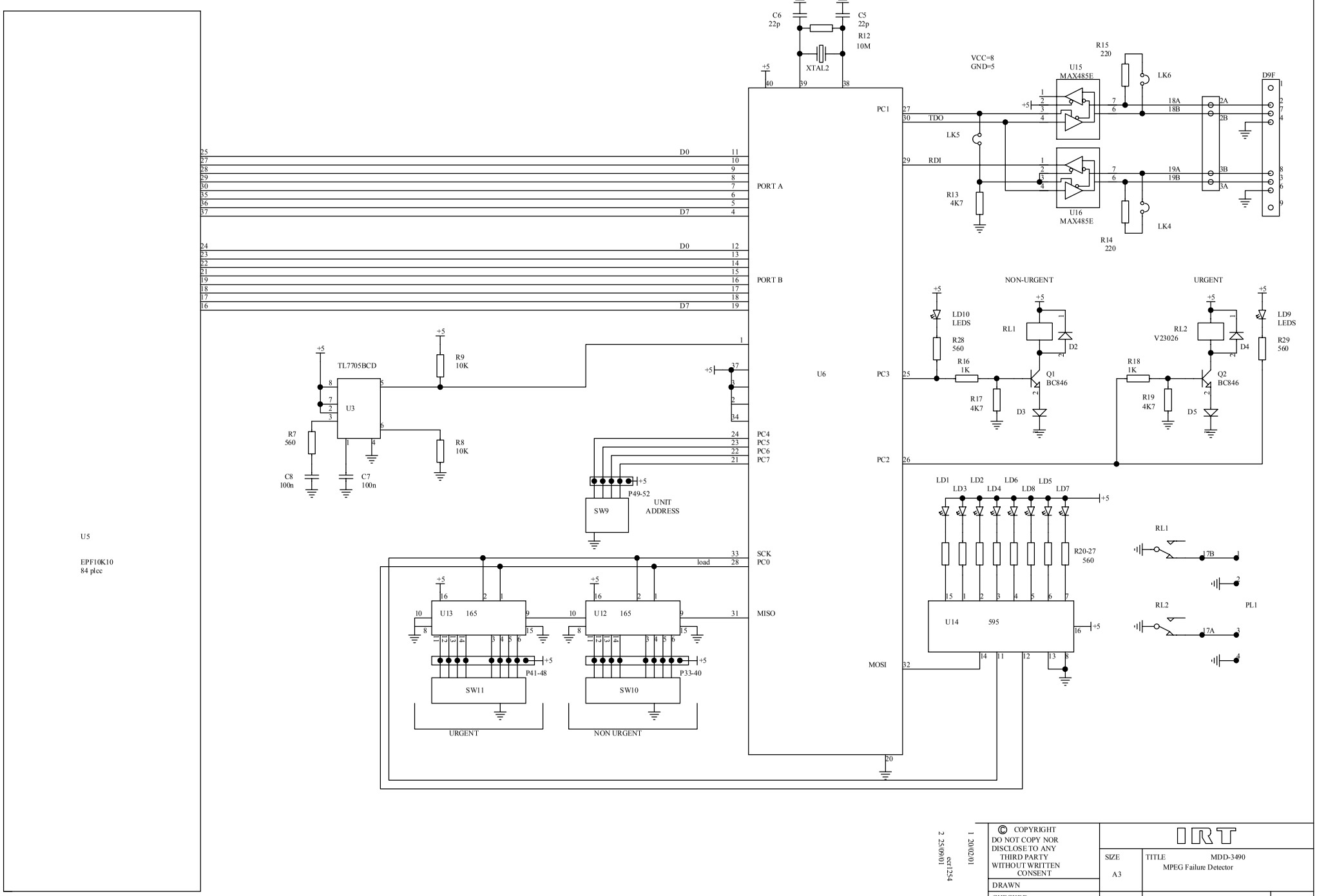
Drawing List Index

Drawing #	Sheet #	Description
804433	1	MDD-3490 circuit diagram - sheet 1.
804433	2	MDD-3490 circuit diagram - sheet 2.



DRAWN		IRT	
CHECKED	SIZE A3	TITLE MDD-3490 MPEG TS MONITOR	
ENG. APP.	SCALE	DRAWING No. 804433	SHEET 1 OF 2
CONTRACT No.	IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064		

10/20/01 1



1	20/02/01
2	25/09/01 ocr1254

DRAWN

CHECKED

ENG. APP.

CONTRACT No.

IRT

SIZE A3

TITLE MDD-3490
MPEG Failure Detector

SCALE

DRAWING No. 804433

SHEET 2 OF 2

IRT Electronics Pty. Ltd.
ARTARMON NSW AUSTRALIA 2064