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IRT Eurocard

Type AMS-4170T
2 x 2 relay switcher
for SDI, G.703 or analogue video
&
AES, RS422 or stereo audio signals

Designed and manufactured in Australia

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

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Instruction Book

Table of Contents

This instruction book applies to units later than S/N 0504001.

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.

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AMS-4170T
2 x 2 relay switcher
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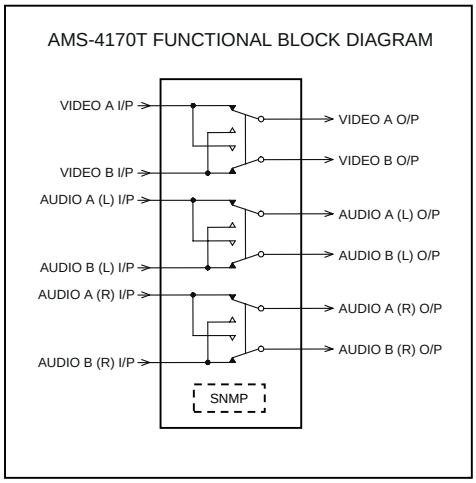
General Description



The AMS-4170T consists of one “video” and two “balanced audio” switches. Each switch is arranged as a changeover set with two inputs and two outputs. No terminations are provided on the board allowing the switcher to be used in a wide variety of applications and with signals of various types and impedances.

The “video” path uses enhanced performance relays to provide switching capabilities for high-speed data signals up to 270 Mb/s and may be used with analogue video, SDI, MPEG or RF signals. When used with SDI and high-speed data signals all cable lengths should be kept to a minimum. For best performance the outputs should be connected to inputs with automatic cable equalisation.

The “audio” path may be used for balanced or unbalanced audio or control signals (RS232, RS422, RS485 etc).

The AMS-4170T is ideally suited to applications where a simple choice between two inputs or outputs is required and may be easily driven by audio, video or other detector circuits for automatic path selection.

Each switch is equipped with its own transistor driver circuit, which may be bypassed for direct operation of the relay if desired. Links allow any of the three driver circuits to operate more than one of the sets of relays.

Front panel LED indicators are used to indicate the status of each relay circuit.

Front panel switches allow a choice of local or remote control operation.

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

The AMS-4170T is designed to fit IRT’s standard Eurocard frames as well as IRT’s 4000 series frame for use with IRT’s SNMP system and may be used alongside any other of IRT’s analogue or digital Eurocards.

Standard features:

- **One video and two balanced audio changeover switches in one package.**
- **Video path suitable for SDI (270 Mb/s), analogue video, MPEG data streams @ 2, 8, 34, 45, 144 Mb/s.**
- **Audio path suitable for 2 balanced audio or data signals or 4 unbalanced audio or data signals.**
- **Married or independent operation**
- **Default path on power fail.**
- **Local or remote control.**
- **Optional plug in SNMP monitoring and control module.**
- **Front panel LED status indicators.**

Technical Specifications
IRT Eurocard module
Type AMS-4170T

Video:

Video crosstalk between channels	< -70 dB to 10 MHz. < -60 dB 10 MHz to 100 MHz. < -50 dB 100 MHz to 300 MHz. (With measured channel input terminated by 75 Ω.)

Audio:

Audio Crosstalk	Between channels with measured channel input terminated by 600 Ohms. Less than -90 dB (20 Hz - 20 KHz).

Control:

Inputs	Ground active control to TTL level interface circuit, or if interface circuit bypassed, to the relay coil with the common of the coil circuit connected to +12 Volts.

Connectors:

Audio:	3 pin plug in screw termination sockets.
Control:	4 pin plug in screw termination socket.

Other:

Relay contact rating		24 Vdc - 1 A 100 Vac - 0.3 A
Power requirements:		28 Vac CT (14-0-14) or ± 16 Vdc
Power consumption		1 VA.
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 background, 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 with matching connectors for control inputs.
Optional accessories		SNMP plug-in module for use with 4000 series frame fitted with SNMP “Agent”.

Configuration

Transistor drive to relays:
The AMS-4170T comes standard with links LK2, 4 & 6 installed. This allows TTL logic to directly drive the relays via transistor drive circuits. It is not necessary to use TTL logic to drive the transistor drive circuits, however, grounding on the control port is all that is needed.

Direct drive to relays:
Provision has been made for bypassing the transistor relay drivers if required. This may be desirable in situations where switching is to be initiated by alarm circuits with relay outputs.

The relay driver circuit can be bypassed as follows:

1. Remove links LK 2, 4 & 6.
2. Hard wire shorting links in positions LK 3, 5 & 7.

Ensure that only one link is installed of each pair so that the circuit is set for either TTL or direct operation, but not both.

Relay grouping:
Each video and audio channel is equipped with its own driver circuit. However each circuit is capable of driving all three sets of relays if required. Links LK 8, 9 & 10 provide a means of inter-connecting the relay sets so that only one or two control inputs are required.
Some useful configurations are:

Unison operation: All three circuits switch from one control signal.

1. Remove links LK 2, 4 & 6.
2. Connect links LK 8, 9 & 10.
3. Control is via SK 5 pin 1 to ground (SK 5 pin 4).

In order for the front panel switches to work as intended, AMS-4170T should be run in unison operation.

Separate video & stereo audio operation:

1. One control signal for video, and separate control signal for stereo audio.
2. Connect LK 9 & 10.
3. Control for video is via SK 5 pin 1.
4. Control for stereo audio is via either SK 5 pin 2, or SK 5 pin 3.

If controlling video and audio separately the front panel switches will only work on the video part of the circuit.

Input termination:
No terminations are provided on the module so that the switcher can function in changeover mode. For 2 x 1 switcher applications the following terminations should be installed.

Video:

Output A only is used and should be terminated at connected equipment.
Output B should be terminated in 75 Ohms (or 50 Ohms if being used for 50 Ohm RF signals) using a BNC termination plug.

Audio:

Outputs A only are used and should be terminated at connected equipment.
Output B may be terminated if desired by connecting termination resistors to the connector on the rear assembly of the module. The resistor values should be chosen to match the characteristic impedance of the rest of the connected audio system. For example for balanced 600 Ohms, two 300 Ohm resistors should be used.
In most modern audio systems a low output impedance of approximately 40 Ohms and input impedances of greater than 10 kOhms are used. If this is the case no termination of the unused audio output is required.

Operation

See *Configuration* section for relevant link settings.

Control connections:

Control connections are via SK 5 plug in screw terminating connector located on the rear assembly.
Connecting the appropriate control input to ground will cause the relays to operate and the output state to cross over as follows:

Control	Input		Output
High (or O/C*)	A	↔	A
	B	↔	B
Low (Gnd)	A	↔	B
	B	↔	A

Control input connector SK 5 pin configuration is as follows:

Pin	Description
1	Video control
2	Left audio control
3	Right audio control
4	Gnd.

Note: * O/C = Open Circuit.

Front Panel Switches:

The AMS-4170T has two front panel switches – a local/remote switch and an activate/de-activate switch.

With the local/remote switch set to 'remote', the AMS-4170T behaves, and is controlled, as described above.

With the local/remote switch set to 'local', control connection via SK 5 on the rear assembly is bypassed. Control is via the front panel activate/de-activate switch. Note that to fully function in the local mode, the AMS-4170T needs to be run in unison operation as described in the *Configuration* section.

Note: SNMP control is disabled if the local/remote switch is set to local.

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.

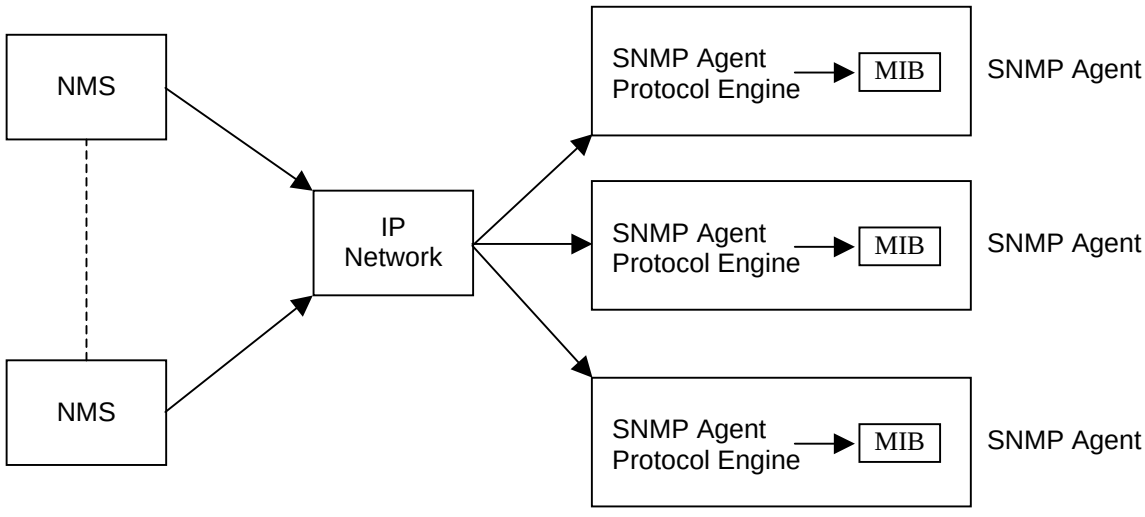
An *NMS* polls, or communicates with, an *agent*. An *agent* is a network management software module that resides in a *managed device*. An *agent* has local knowledge of management information and translates that information into a form compatible with SNMP. The *agent*, therefore, acts as an interface 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

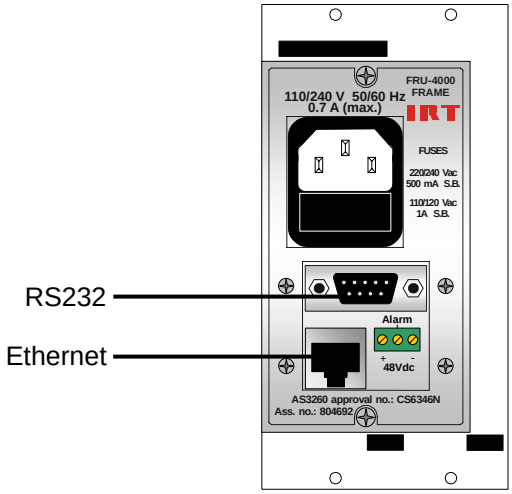
IRT Electronics currently employs SNMPv1 with its 4000 series frame. The frame acts as an *agent* when fitted with a CDM-4000 module. This module has its own designated slot next to the power supply so as to not affect the number of modules that the frame will take. Communication between the *NMS*, the 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.

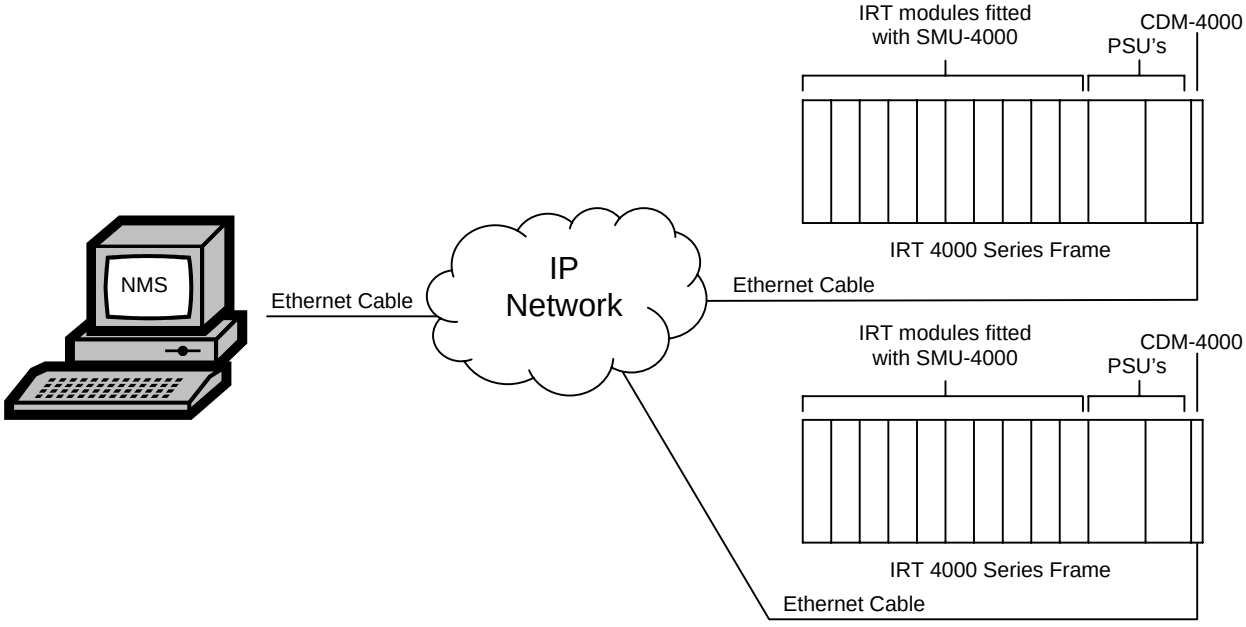
Frame parameters, such as Name, Address and Location, are set via an RS232 interface, a D9 connector on the rear of the frame below the mains inlet. A software terminal emulator, such as Tera Term or HyperTerminal, is used for setting and reading the parameters of the frame.

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

AMS-4170T SNMP Functions:

With the AMS-4170T 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, the AMS-4170T can be interrogated and controlled by an SNMP Network Management System (NMS).

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

The current state of the Video switch state;
The current state of the Left Audio switch state;
The current state of the Right Audio switch state;
The current state of the front panel switches (relevant to AMS-4170T only),
Note: SNMP control is disabled if the local/remote switch is set to local;
A change of state to the Video switch (when changeover initiated by the Video TTL control circuitry);
A change of state to the Left Audio switch (when changeover initiated by the Left Audio TTL control circuitry);
A change of state to the Right Audio switch (when changeover initiated by the Right Audio TTL control circuitry);
Whether "Trap" function is enabled; and
Trap automatically sent, if enabled, on change of switch state.

Installation

Installation in frame or chassis:

See details in separate manual for selected frame type.

See also *Configuration* section.

Video connections:

Video signal connections are made to BNC coaxial connectors. No termination of inputs is provided on the module. When switched to the output the input load impedance is that of the load connected to the output. If AMS-4170T is being used for a 2x1 switch application, second output should be terminated with a BNC terminator of correct termination resistance to match source impedance, usually 75 Ohm.

Audio connections:

Audio signal connections are made to plug in balanced screw terminating connectors. No termination of inputs is provided on the module. When switched to the output the input load impedance is that of the load connected to the output.

Control connections:

Control connections are via SK 5 plug in screw terminating connector located on the rear assembly.
Connecting the appropriate control input to ground will cause the relays to operate and the output state to cross over as follows:

Control	Input		Output
High (or O/C*)	A	↔	A
	B	↔	B
Low (Gnd)	A	↔	B
	B	↔	A

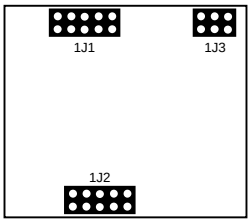
Control input connector SK 5 pin configuration is as follows:

Pin	Description
1	Video control
2	Left audio control
3	Right audio control
4	Gnd.

Note: * O/C = Open Circuit.

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.

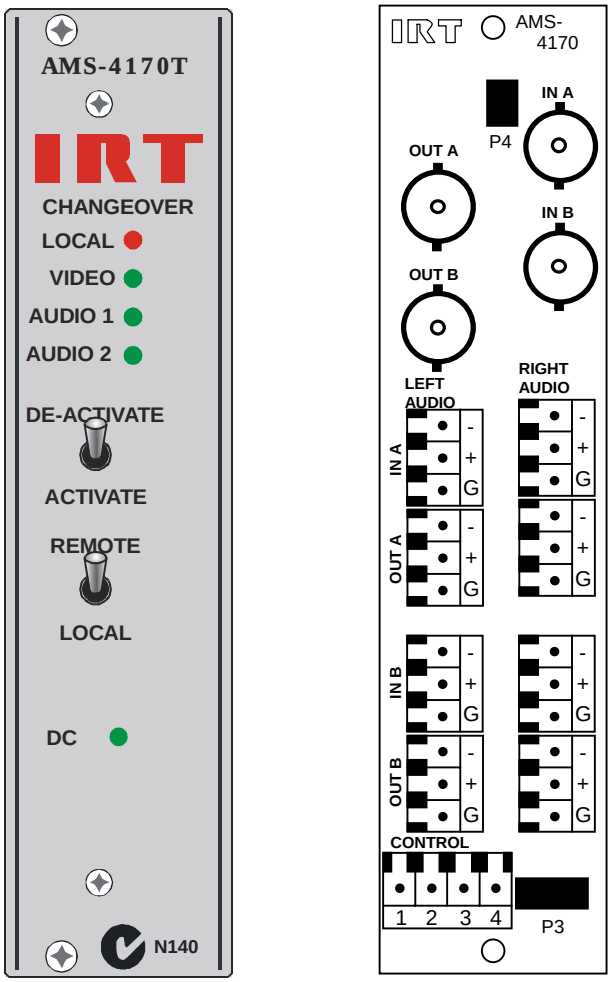
Note that installation will generally be done by IRT Electronics at the time of ordering.

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 relative positions of connectors, indicators and controls only.



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.

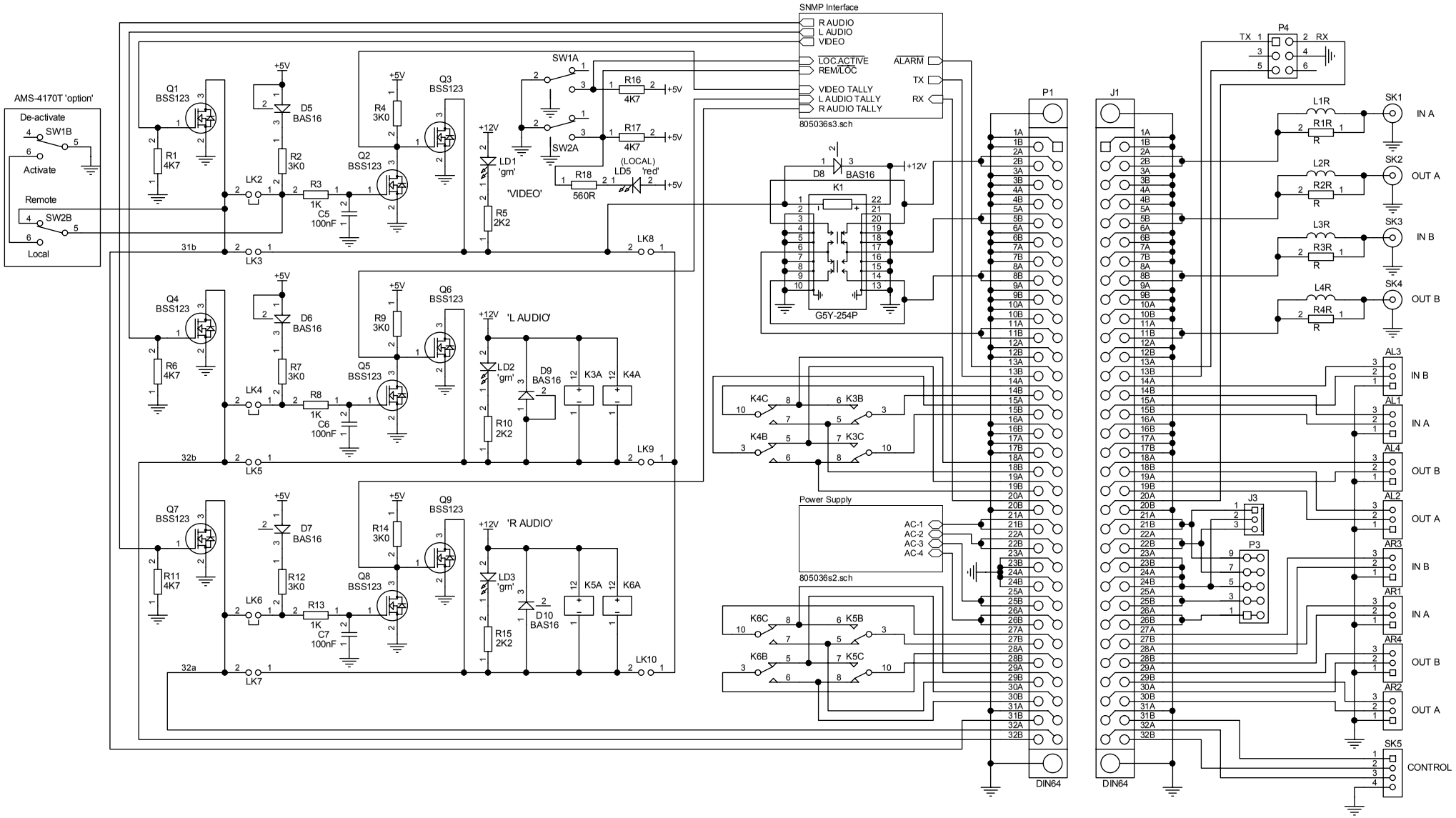
The equipment should be returned **to the agent who originally supplied the equipment or, where this is not possible**, to IRT direct as follows.

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 Index

Drawing #	Sheet #	Description
805036	1	AMS-4170 main circuit schematic.
805036	2	AMS-4170 power supply schematic.
805036	3	AMS-4170 SNMP interface.



AMS-4170T option provides front panel local control of relay switching.

ON board links must be set as follows:

LK8, LK9 & LK10 are all 'IN' circuit so that all relays switch at the same time.

LK3, LK5 & LK7 are all 'OUT' of circuit so that the transistor drive circuit is used to control the relays.

LK2, LK4 & LK6 are all 'OUT' of circuit and LK2 is connected as shown for the 'T' option.

VIDEO XTALK @ 10MHz > 70dB
VIDEO XTALK @ 270MHz > 50dB
AUDIO XTALK @ 15KHz > 85dB
DC Itot MAX = 115mA

PC805037

IRT

1 2-03-2005	SIZE A3	Title AMS-4170 FOUR PORT RELAY SWITCHER VIDEO + STEREO AUDIO
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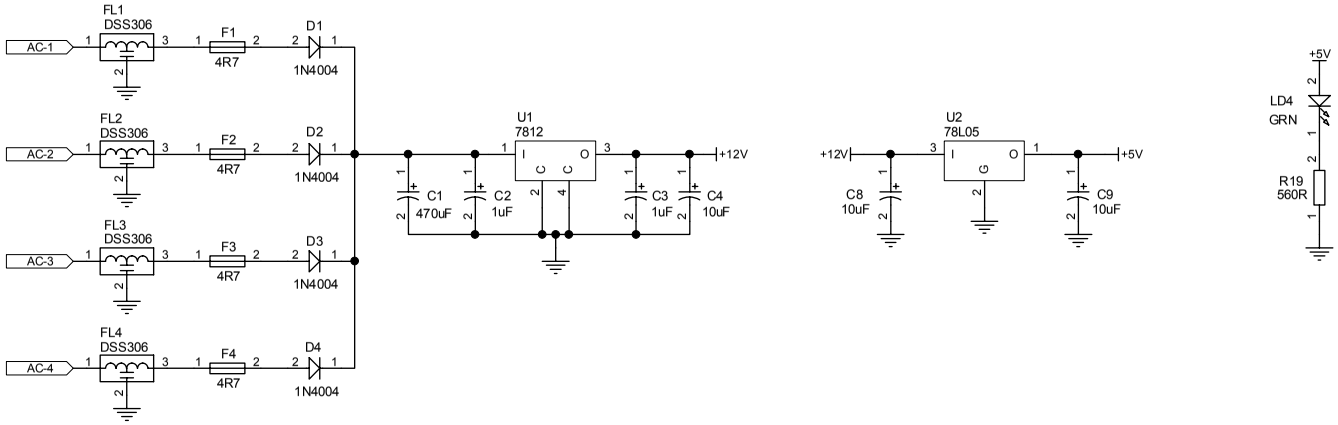
ENG. APP.		
Revision: 1	IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064	
Date: 12-Aug-2005		



1 2-03-2005	© COPYRIGHT DO NOT COPY NOR DISCLOSE TO ANY THIRD PARTY WITHOUT WRITTEN CONSENT	IRT	
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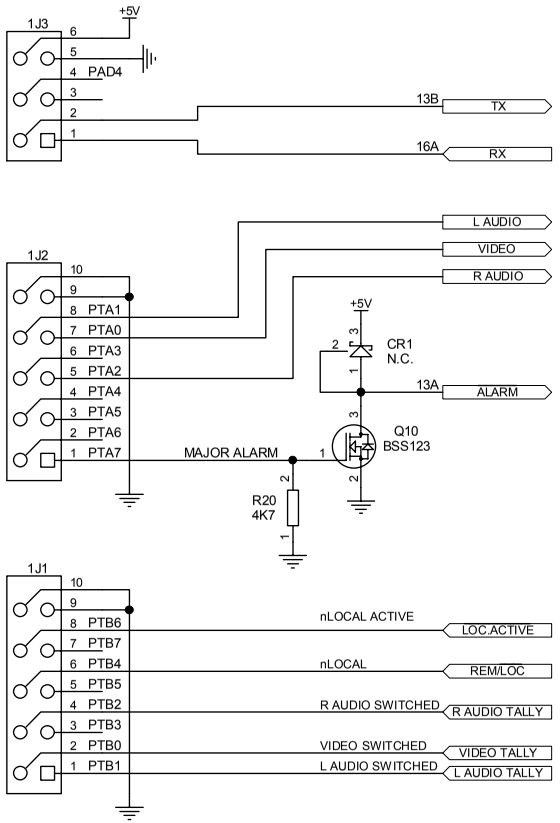
	CHECKED	SCALE N.T.S.	Drawing No. 805036 — Sheet 2 of 3
	ENG. APP.		
	Revision: 1	IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064	
	Date: 12-Aug-2005		

SMU-4000
SNMP CPU Sub-Module
ASSEMBLY 804857



D10 WILL PULL ALARM LOW ON POWER LOSS
THROUGH 5V PULL-UP IN NETWORK CARD IN FRAME

1 2-03-2005		IRT	
		SIZE A3	Title AMS-4170 SNMP interface
	DRAWN K.N.		
	CHECKED	SCALE N.T.S.	Drawing No. 805036 — Sheet 3 of 3
	ENG. APP.		
	Revision: 1	IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064	
	Date: 12-Aug-2005		