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 3000 Series
Switchers & Controllers

Including Switcher Types

AVS-3010 & 3011 5 x 1 Video switchers
AAS-3020 & 3021 5 x 1 Stereo audio switchers
DDS-3030 & 3031 5 x 1 RS-422 switcher
DVS-3040 & 3041 5 x 1 Serial digital switchers

& Controllers

CP-700 5 x 1 Remote control panel
CPS-3050 5 x 1 Local control panel
CDC-3060 Logic control module
CPS-9000 & 9001 5 x 1 Remote control panels

& Tally Panel

TPS-3010 5 x LED tally panel

Designed and manufactured in Australia
IRT can be found on the Internet at:
http://www.irtelectronics.com

IRT Eurocard 3000 Series
Switchers & Controllers

Instruction Book

Table of Contents

This instruction book applies to units later than S/N 9500000.

General description

The 3000 series switchers are a family of "smart" switchers in Eurocard format, which may be linked and configured by the user to cover a wide range of switching and monitoring functions.

By combining modules, the user is able to easily assemble switchers ranging from a basic 5 x 1 to the equivalent of a small router, encompassing analogue and digital signals in multiple levels. These may be controlled with multiple local or remote control panels or under computer control.

The devices in the range may be classified into two groups, one being the *Switcher Group* and the other the *Control Group.*

The **Switcher Group** comprises:

AVS-3010	5 x 1 Video switcher
AVS-3011	5 x 1 Video switcher
AAS-3020	5 x 1 Stereo audio switcher
AAS-3021	5 x 1 Stereo audio switcher
DDS-3030	5 x 1 RS-422/RS-485 switcher
DDS-3031	5 x 1 RS-422/RS-485 switcher
DVS-3040	5 x 1 Serial digital switcher
DVS-3041	5 x 1 Serial digital switcher

The **Control Group** comprises:

CP-700	5 x 1 Remote control panel
CPS-3050	5 x 1 Local control panel
CDC-3060	Logic control module
CDC-3061	Priority control module
CDC-3062	Priority control module
CPS-9000	5 x 1 Remote control panel
CPS-9001	5 x 1 Remote control panel
CPS-1050	10 x 1 Remote control panel
CPS-1052	20 button remote control panel

The AVS-3011, AAS-3021, DDS-3031, DVS-3041 and CPS-9001 supersede the AVS-3010, AAS-3020, DDS-3030, DVS-3040 and CPS-9000 respectively. Details of both types are shown for those combining the new versions with the older types in existing systems.

Modules in the switcher group are normally supplied in slave format, but may optionally be fitted with, a CPS-3050 local control panel.
Alternatively, a tally panel (TPS-3010) may be fitted to the front of any switcher to give visual switcher status information where the switcher is remotely controlled.

On board links allow several switchers to be joined for 10 x1, 15 x 1 or 20 x 1 operation. Additionally, the switchers may be slaved to operate in conjunction with other 3000 series switchers for multilevel analogue video, stereo audio, digital video and RS422 or similar control signals.
This makes the switchers ideally suited to situations where a mixture of analogue and digital signals is present.

Control options include local or remote pushbuttons or RS232 serial control. Multiple control panels are permissible and each panel reflects the current switcher tally status. The control panel types CPS-1050 and CPS-1052 and the priority controller types CDC-3061 & CDC-3062 are described in separate manuals.

The modules may be mounted in standard IRT Eurocard frames alongside other IRT Eurocard modules for distribution and signal conditioning.

Frame and PSU combinations are available in both 1 RU and 3 RU sizes for two to twelve modules.
Power supply options include AC and DC inputs over a wide range of voltages. Redundant power supplies on board are supported by dual redundant supplies in the 3 RU frame and PSU combinations.

Features:

- May be cascaded to 20 x 1.
- Multiple levels available through combining modules in series under common control.
- Internal or external sync.
- Local and / or remote control options with multiple control panels.
- RS232 & sequential control options.
- May be mounted in same frame as other IRT Eurocards including VDA's, ADA's, detectors and processors.

Features of individual modules:

TPS-3010: Local tally panel. Fits any switcher in the series. Equipped with 5 tally LED's. Provides visual indication of switcher status when switcher is remotely controlled.

AVS-3010: Analogue video switch with looping inputs. Internal vertical interval switching or external synchronisation for use in RGB, YUV & YC applications.
AVS-3011: As for AVS-3010, but with wire per crosspoint input patching and improved static immunity.

AAS-3020: Stereo analogue audio switch with looping inputs.
AAS-3021: As for AAS-3021, but with wire per crosspoint input patching and improved static immunity.

DDS-3030: RS422 / RS485 Serial bi-directional data switch. Only the selected bi-directional path is active at any time with unselected data outputs reverting to tri-state. This allows switchers to be used in multiple combinations (subject to logical conflicts).
DDS-3031: As for DDS-3031, but with wire per crosspoint input patching and improved static immunity.

DVS-3040: Serial digital switch. Primarily designed for 270 Mbit serial digital video with input equalisation to 50 metres. As no re-clocking is provided on this model, it may also be used for a variety of serial digital signals over a wide range of data rates.
DVS-3041: As for DVS-3040, but with automatic input equalisation to over 200 metres, automatic muting of unused inputs, wire per crosspoint input patching and improved static immunity.

CPS-3050: Local control switch panel. Fits any of the switchers in the series. Equipped with 5 push buttons with tally LED's and inserts for labels. In addition to providing local control and tally for the switcher to which it is fitted this panel allows the switcher to act as a master for controlling other switchers.

CDC-3061: Priority logic control module. Integrates the functions of video detectors, priority encoder, local control and remote interface for controlling 3000 series switchers in PIE and other path switching applications. May be used with either video or audio or both types of signals. Allows control of a traditional Main - Standby - Local arrangement.

CDC-3062: Priority logic control module. Similar to the CDC-3061, but with three levels of detection and encoding for Main - Reserve - Standby - Local operation and greater remote control tally and interfacing flexibility.

CPS-9000: Remote control panel. Controls one or more switchers in the series. Equipped with 5 push buttons with tally LED's and inserts for labels. Equipped with on board addressing to designate which bank of 5 is controlled thus allowing formation of 10 x 1 and larger switchers. Multiple panels may be used with tally to each panel.
May also be used as a switch data encoder for use with the CDC-3060 for remote control over serial data links or for interfacing to external control systems.
CPS-9001: As for CPS-9000, but with improved static immunity. Wire per crosspoint connector provided for external interfacing.

CPS-1050: Remote control panel - 1 RU. Controls one or more switchers in the series. Equipped with 10 push buttons with tally LED's and inserts for labels. Controls two 3000 series switchers for 10 x 1 operation. Multiple panels may be used with tally to each panel. Wire per crosspoint and tally connectors are provided for external interfacing.

CPS-1052: Remote control panel - 1 RU. Controls one or more switchers in the series. Equipped with two banks of 10 push buttons with tally LED's and inserts for labels. Controls four 3000 series switchers for 20 x 1 operation or for 10 x 1 audio breakaway or as two separate 10 x 1 switchers. Multiple panels may be used with tally to each panel. Wire per crosspoint and tally connectors are provided for external interfacing.

CDC-3060: Logic control module. Performs a variety of functions according to the users (link selectable) choice. May be used directly or in conjunction with local or remote control switch panels.

RS232 control address bits allow one computer serial port to control up to four CDC-3060's with different addresses. Current output status is indicated on the return RS232 line for tally purposes.

Sequential (cyclic) control. Switches between selected range of inputs with manual interrupt and user selectable timing.

The RS232 and sequential functions are non-exclusive allowing sequential control via RS232 if required.

For serial remote control without a computer, the CDC-3060 is set up with a remote panel to encode pushbutton data to RS232 for reception by another CDC-3060, which decodes the data and returns tally to the originating remote panel.

Applications:

- Path switching in transmission systems.
- Input switching in edit suites.
- Master control switching in small systems.
- PIE path and monitoring switching with automatic / manual control.
- YUV & RGB synchronised switching.
- Simultaneous digital path and analogue monitoring switching.
- Computer controlled switching.
- Remote site switching and monitoring via modem.
- Automatic sequential switching with override for path monitoring.

Technical specifications

AVS-3010 & 3011: 5 x 1 analogue video switchers.

Video inputs:

Number	5.
Type	DC coupled.
Impedance	Loop through.
Connectors	BNC.

Video outputs:

Type	DC coupled.
Number	1.
Impedance	75 Ω.
Connectors	BNC.

Performance:

Switching	During vertical interval. Timing may be derived from either the current output signal or synchronised to another switcher.
Gain	Unity (adjustable by internal pre-set).
Frequency response	±0.1 dB to 20 MHz. ±0.5 dB to 30 MHz.
Differential gain	<0.1% at 4.43 MHz.
Differential phase	<0.1° at 4.43 MHz.
Crosstalk between inputs	>65 dB at 4.43 MHz. >60 dB at 10 MHz.
Power consumption	<100 mA.

AAS-3020 & 3021: 5 x 1 analogue stereo audio switchers.

Audio inputs:

Number	5 x 2 (5 stereo).
Type	Tranformerless, bridging DC coupled.
Impedance	> 10 KΩ.
Connectors	Plugable screw block connectors.
Max. input level	+24 dBu.
Input CMR	> 40 dB @ 55 Hz.

Audio outputs:

Type	Transformerless, balanced DC coupled.
Number	1 x 2 (left and right).
Impedance	< 44 Ω.
Connectors	Plugable screw block connectors.
Max. output level	+24 dBu into 600 Ω.
DC on output	< ±20 mV.

Performance:

Switching	Within 25 ms. Timing may be synchronised to another switcher.
Gain	±3 dB (adjustable by internal pre-set).
Frequency response	±0.5 dB for 20 Hz to 20 KHz.
Harmonic distortion	< 0.01% 20 Hz to 20 KHz at +20 dBu output.
Noise	-90 dB, Ref. +20 dBu 20 Hz to 20 KHz.
Crosstalk left/right	-70 dB @ 15 KHz with measured input terminated.
Phase left/right	±0.2° to 20 KHz.
Power consumption	<200 mA (+ 24 dBu, outputs loaded in 600 Ω).

DDS-3030 & 3031: 5 x 1 RS422 / RS485 bi-directional serial data switcher.

Data inputs:

Number	6. (One selected path active - other 4 'don't care'.)
Type	RS422 / RS485.
Impedance	>10 KΩ. Terminated with optional 330 Ω resistor.
Connectors	Plug in 5 pin screw terminal block.
Threshold level	200 mV differential for a common mode of -7 to +12 V.

Data outputs:

Type	RS422 / RS485.
Number	6. (One selected path active - other 4 tri-state.)
Connectors	Plug in 5 pin screw terminal block.
Level	5 V unloaded (differential). >2 V (50 Ω load) (differential).

Performance:

Switching	Within 25 ms. Timing may be synchronised to another switcher.
Maximum data rate	>2 Mbps.
Power consumption	<80 mA.

DVS-3040 & 3041: 5 x 1 serial digital video switchers.

Video inputs:

Number		5.
Type	DVS-3040	Automatic equalisation to 50 metres on each input.
	DVS-3041	Automatic equalisation to >200 metres on each input. Automatic muting of inputs with no signal.
Impedance		75 Ω.
Connectors		BNC.

Video outputs:

Type	1 x 800 mV ±10% into 75 Ω. 1 x ECL monitoring output.
Connectors	BNC.

Performance:

Switching	Timing is either free running at ≈25 ms or may be synchronised to another switcher.
Return loss	>15 dB 5 MHz to 270 MHz.
DC offset	0 V ±0.5 V.
Rise time	between 0.75 and 1.5 ns.
Power consumption	<180 mA.

CDC-3060: programmed data controller for 3000 series switchers.

RS232 input / output:

Number	1.
Type	9600 baud. (8 bit word, no parity, 1 stop)
Connectors	9 pin 'D'.
Format	8 bit data word comprising: 1 command bit 2 address bits 5 crosspoint number bits - BCD encoded.

Switcher control input/output:

Type	5 bit BCD coded parallel TTL level.
Number	1.
Connector	Plug in 10 pin HE14 dual IDC.

Performance:

Switching	Determined by type of switchers connected.
Power consumption	<50 mA.

CP-700: 5 x 1 remote pushbutton panel for wire per crosspoint switchers.

Type	Momentary action with removable clear cap for legend insert. Red LED indicator in one corner.
Number	5
Control connector	9 pin 'D'.
Switching	Dumb contact to ground only. Performance is entirely dependent on connected switchers.
Power consumption	Approximately 10 mA per active LED derived from connected switcher if tally enabled.
Dimensions	128 mm x 30 mm front panel
Depth	30 mm clearance including connectors.
Mechanical	May be mounted in a standard IRT Eurocard frame if required, but does not connect to motherboard.
Mounting hole - with front panel	114 mm x 28 mm.
Mounting hole - switches only	81 mm x 17 mm.

CPS-9000 & 9001: 5 x 1 remote pushbutton panel for 3000 series switchers.

Type	Momentary action with removable clear cap for legend insert. Red LED indicator in one corner.
Number	5

Control inputs/outputs:

Type	5 bit BCD coded parallel TTL level.
Number	1 "input" & 1 "output".
Connectors	Plug in 10 pin HE14 dual IDC.
Switching	Determined by type of switchers connected; but not more than 25 ms. Timing of connected switchers may be synchronised to a master switcher.
Power consumption	Derived from connected switcher. Up to 4 x CP-9000 or 9001's may be connected to one switcher (or CDC-3060) without exceeding power rating specified for switcher.
Dimensions	128 mm x 30 mm front panel.
Depth	60 mm front panel to end of PCB. 80 mm clearance including connectors.
Mechanical	May be mounted in a standard IRT Eurocard frame if required, but does not connect to motherboard.
Mounting hole - with front panel	114 mm x 28 mm.
Mounting hole - switches only	81 mm x 17 mm.

Common specifications

(Common to all modules in series except control panels.)

Control inputs/outputs:

Type	5 bit BCD coded parallel TTL level (or individual grounding contacts – AVS-3011, AAS-3021, DDS-3031 and DVS-3041 only).
Number	1 “input” & 1 “output”.
Connectors	Plug in 10 pin HE14 dual IDC.

Power requirements:

28 Vac CT (14-0-14) or ± 16 Vdc.

General:

Temperature range		0 - 50° C ambient
Mechanical		Suitable for mounting in IRT 19" rack chassis types FRU-3000, FRU-3001 & FRU-1030 with input output and power connections on the rear panel
Finish:	Front panel	Grey enamel, silk-screened 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 including matching connectors for control inputs & outputs.

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

Accessories available:-

FRU-3000 Eurocard module mounting frame	Provides mounting for up to 12 IRT Eurocards and one PSU-3000 Dual AC power supply side by side in 134 mm of standard rack space (3 Rack Units).
FRU-3001 Eurocard module mounting frame	Provides mounting for up to 10 IRT Eurocards and two PSU-3001 Dual AC power supply side by side in 134 mm of standard rack space (3 Rack Units).
FRU-1030 1 RU chassis / PSU	The FRU-1030 can be fitted with either one or two Eurocards in a horizontal side by side format. A single AC power supply with switched multi-voltage input selector is included to power the cards. Fitted with Eurocard guide rails for easy maintenance.
TME-6 Eurocard extender board.	
Control connector assembly tool	For ease of making interconnecting leads between modules or to remote control panels. A range of tools is available from Farnell Components and RS Components for connecting ribbon cable to the HE14 IDC type remote control connectors.

Circuit description

The 3000 series of switchers and controllers share a common logic control system. This system is therefore described separately and applies to all modules in the group unless otherwise indicated.

The power supply system is similar in each module and is therefore described separately.

Power supplies:

CPS-9000 & CPS-9001: The CPS-9000 / 9001 does not have its own power supply, but uses either +10 Vdc or +12 Vdc power from the first connected switcher through the remote control logic connectors PL 4 and PL 5.

Pins 1A on both connectors are joined and are the power supply pins for the panel. This is to allow the power supply to continue to the next control panel where more than one panel is required.

The +12 Vdc input (the only supply required) is reduced to +5 Vdc by a three terminal regulator.

A number of 10 µF and 100 nF tantalum tag capacitors are located at key points in the circuit to suppress interference on the DC rails. Should any of these fail they should be replaced by high quality tantalum tag capacitors of at least 16 Vdc rating.

Other modules: Input power to other modules may be fed by a number of means.

1. One or two 14 - 0 - 14 Vac supplies via connections on the 64 pin DIN rear connector of the module. (Used when module is mounted in FRU-3000 chassis fitted with on PSU-3000 or FRU-3001 chassis fitted with two PSU-3001's.)
2. Two ±16 Vdc supplies via connections on the 64 pin DIN rear connector of the module. (Used when module is mounted in FRU-3001 chassis fitted with one or two PT-748A PSU's.)
3. One 14 - 0 - 14 Vac supply and one ±16 Vdc supply via connections on the 64 pin DIN rear connector of the module. (Used when module is mounted in a FRU-3001 chassis fitted with 1 x PSU-3001 PSU and 1 x PT-748A PSU.)
4. A single 14 - 0 - 14 Vac supply connected to the 3 pin male connector on the module side of the rear assembly. (Used when module is mounted in FRU-1030 chassis.)

The input power is isolated by fusible resistors F 1 to F 4. Should these fail, they should be only replaced by a similar type of the same value or protection of the common power supply will be compromised.

If an AC supply is provided, the isolated AC is full wave rectified by diodes D 1 to D4 and D5 to D 8 to provide a raw DC voltage of approximately 20 V at filter capacitors C 17 and C 18. The actual voltage will vary depending on the type of frame, loading of PSU by other modules and the local mains supply voltage.

If a DC supply is provided, the isolated DC passes through the diodes D 1 to D4 and D5 to D 8, which provide protection against accidental reverse polarity connection of the DC supply. Where a DC supply is used, the input voltage must be at least ±15 Vdc under all conditions to ensure sufficient margin for the proper operation of the following voltage regulators and losses in the input fusible resistors and diodes.

AVS-3010 & AVS-3011: (See diagrams 803614 & 804070 sheet 1.)
The raw DC power is fed to three terminal regulator IC's which provide ±10 Vdc rails for the video circuits. The +10 Vdc is also supplied to the remote logic connector PL 4 pin 1 via a current limiting resistor R 25 for use by control panels.
The +10 Vdc rail is further connected to another three terminal regulator to provide the +5 Vdc required by the logic control circuits.
A number of 10 µF tantalum tag capacitors are located at key points in the circuit to suppress interference on the DC rails. Should any of these fail they should be replaced by high quality tantalum tag capacitors of at least 16 Vdc rating.

AAS-3020 & AAS-3021: (See diagrams 803754 & 804115 sheet 2.)
The raw DC power is fed to three terminal regulator IC's which provide ±12 Vdc rails for the audio circuits. The +12 Vdc is also supplied to the remote logic connector PL 4 pin 1 via a current limiting resistor R 34 for use by control panels.
The 12 Vdc rails are further connected to two more three terminal regulator to provide the ±5 Vdc. The +5 Vdc is required by the logic control circuits and ±5 Vdc for the audio matrix switching IC's.
A number of 10 μF tantalum tag capacitors are located at key points in the circuit to suppress interference on the DC rails. Should any of these fail they should be replaced by high quality tantalum tag capacitors of at least 16 Vdc rating.

DDS-3030 & DDS-3031: (See diagrams 803763 & 804200 sheet 1.)
The raw DC power is fed to a three terminal regulator IC, which provides a +12 Vdc rail the remote logic connector PL 4 pin 1 via a current limiting resistor R 23 for use by control panels.
The remainder of the circuit requires a +5 Vdc rail and to decrease power consumption a switch mode power supply is used. This is fed from the raw ± DC power via series ballast resistors R 7 & R 8 and a filter network comprising inductors L 1 & L 2 and capacitors B 8, 9, 10 & 11.
This prevents any interference generated by the action of the switch mode regulator from passing back to the power input rails and thus to other modules. Power is drawn equally from the two DC rails in order to ensure that a balanced current is drawn from the main supply.
A Zener diode ZD 1 is connected between the +ve and -ve supplies following R 7 & R 8 to ensure that the maximum input voltage of the switch mode regulator is not exceeded when a higher than normal raw DC voltage is presented at the output of the rectifiers.
A number of 10 μF tantalum tag capacitors are located at key points in the circuit to suppress interference on the DC rails. Should any of these fail they should be replaced by high quality tantalum tag capacitors of at least 16 Vdc rating.

DVS-3040 & DVS 3041: (See diagrams 803662 & 804110 sheet 1.)
The same configuration is used as for the DDS-3030. Some component designations may differ -- see circuit diagram for details.

CDC-3060: (See diagram 803798 sheet 1.)
This module requires only a low current +5 Vdc supply for the logic circuit and +12 Vdc for supplying remote control panels. The description as given in *Other modules* applies except that the components for generating the -ve DC are omitted. Diodes D 17, 18, 19 & 20 provide full wave rectified DC to filter capacitor C 9 and thence to a +12 V three terminal regulator U 4 and also, via a ballast resistor R 2, to a +5 V three terminal regulator U 3.

Power indicator LED's:
Modules have a green LED on the front panel to indicate presence of DC power in the module. This LED is supplied from the +5 Vdc regulated supply rail.

Modules with local control buttons (CPS-3050) or local tally panel (TPS-3010) are not fitted with LD 1 -- DC power indicator LED.

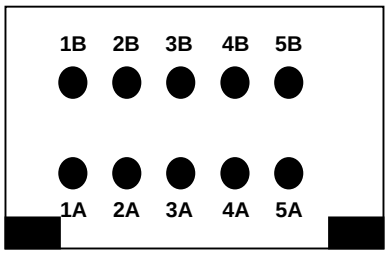
Switching Logic:

Control logic for each switcher module is performed by a Programmable Logic Array (PLA) which has been programmed for the required operations. This component will only function correctly when loaded with the correct program and is therefore only available through IRT.

Each module of the switcher group has two control connectors on its rear assembly.
They are labelled PL 4 and PL 5. For descriptive purposes, PL 4 is called the "input" connector and PL 5 the "output" connector.

The pins on these connectors have the following functions:

	PL 4	PL 5
1A	+12 Vdc	NC
1B	Ground	Ground
2A	Data 4	Data 4
2B	Data 3	Data 3
3A	Data 2	Data 2
3B	Data 1	Data 1
4A	Data 0	Data 0
4B	*Switch pulse in*	*Switch pulse out*
5A	*Busy out*	*Busy in*
5B	*Unlatch in*	*Unlatch out*



The CPS-9000 / 9001 remote control panel also has PL 4 and PL 5 but Pins 1A on both connectors are joined and are the power supply pins for the panel. This is to allow the power supply to continue to the next control panel where more than one panel is required. This is necessary, as the CPS-9000 / 9001 does not have its own power supply, but derives its power from the first connected switcher.

The CDC-3060 logic control module only has a PL 4.

The 5 bit codes on Pins 2A to 4A represent the input selected. This code is in BCD (Binary Coded Decimal) where the Data 0 to 3 represent the binary numbers 0 to 9 (Inputs 1 to 10 if Data 4 is 0 or Inputs 11 to 20 if Data 4 is 1).

The *unlatch out* signal is asserted by a switcher if any of its front panel switches is operated or if its *unlatch in* signal is asserted. The presence of an *unlatch in* signal causes any switcher to release control of the data lines (if it had control of them).
A switcher signals that it has control of the data lines by asserting *busy out*. *Busy out* also ripples *busy in*.

The operation of a push-button ripples unlatch to modules farther down the chain, causing any of them with control of the bus to release it, and in so doing clear the *busy* line.
As soon as the requesting module sees its *busy in* line clear, it takes control of the bus and asserts its *busy out*. The *busy out* signal then ripples up the chain causing any other modules release control (if they had it).

Sync path:

The switchers may be operated in either a local or remote sync mode in order to allow simultaneous switching of different signals in multilevel applications.
This implies that the matrix will not switch until a sync pulse is received. When this is not provided externally, a local sync needs to be provided.

The AVS-3010 / 3011 provides this sync from the video's vertical pulse (see *AVS-3010 sync path* for details).

All other modules generate a local sync by means of a free running oscillator followed by a monostable (AAS-3020, AAS-3021, DDS-3030 & DDS-3031 -- U 10, DVS-3040 & DVS-3041 -- U 8). This provides pulses approximately every 25 ms.

The "localsync" signal is passed to the PLA via link LK 4, which allows a choice of internal or external sync to the switcher logic. The chosen sync is echoed to "vertout" which is available on the PL 5 remote connector for slaving other switchers. See *Configuration* section for details.

Signal path:

AVS-3010 & AVS-3011: Analogue video.
Video path: (See diagrams 803614 & 804070 sheet 2)
The incoming video signal on each of inputs 1 - 5 is connected to two BNC connectors on the rear assembly to provide a loop through capability. One of these terminals must be terminated in 75 Ω either via a termination plug or via other equipment.
Inputs 1 - 5 are terminated in 10 KΩ in order to reduce noise from unused inputs.
Cascade input PL3 (SMA connector) is terminated in 75Ω.

The inputs are then supplied to a pair of 4 x 1 video switch matrix IC's U 1 & U 2 which are configured to operate as a single 8 x 1 matrix. The two unused inputs are terminated in 75Ω to reduce noise.
The matrix is addressed by data lines a 0, a 1, a 2 & /a 2 produced by the PLA logic controller. This allows selection of either no output or output from one only of the four inputs to each of U 1 & U 2. Thus when U 2 is active no output is selected from U 1 and vice versa.

The outputs of the two halves of the matrix are mixed and then proceed to the output via U 3 which acts as a buffer amplifier with gain (RV 1) and frequency compensation (C 8).

The output BNC connector is fed via a series resistor R 10, which provides the correct 75 Ω output source impedance.

It should be noted that the video signal is DC coupled throughout.

Sync path: (See diagrams 803614 & 804070 sheets 1 & 2.)
The video output signal of U 3 buffer amplifier is AC coupled to an integrated sync detector IC U4 which provides a vertical output sync pulse from the video signal.

If no vertical pulse is detected within approximately 25 ms U 4 will generate a pseudo vertical pulse. Thus, a sync pulse will be provided even when an input is selected which has no sync. As this default period is longer than the normal interval between vertical pulses the true vertical sync will prevail whenever it is present.

The output of the sync detector is passed through two monostable s which provide an adjustable delay (RV 2) such that the output sync, "localvert", is positioned to initiate switching on line 9 of the video signal.

The "localvert" signal is passed to the PLA via link LK 4, which allows a choice of internal or external sync to the switcher logic. The chosen sync is echoed to "vertout" which is available on the PL 5 remote connector for slaving other switchers. See *Configuration* section for details.

AAS-3020 & AAS-3021: Analogue audio. (See diagrams 803754 & 804115 sheet 1.)
The audio signals for Left & Right channels are processed by identical circuits; the Left on the main PCB and the Right on a sub-board mounted over the Left channel section of the main PCB.

Balanced inputs 1 - 5 are terminated with resistors R 1 to R 20 resulting in an input impedance greater than 10 KΩ. The signal is then buffered by amplifiers U 1 to U 5 and switched by analogue switch matrix IC's U 6 & U7.

The matrix is addressed by data lines A & B, and enable lines CE 1 & CE 2 produced by the PLA logic controller. This allows selection of either no output or output from one only of the input pairs to each of U 6 & U 7. Thus when U 6 is active no output is selected from U 7 and vice versa.

The outputs of U 6 & U 7 are coupled in a low impedance mixing bus, which is available via J 4 for expanded operation. See *configuration* section for details.

The mixing bus for the +ve and -ve signals is then buffered by U 8 with gain adjustment set by RV 1.
The balanced output connector is fed via series resistors R 26 & R 27, which provide an approximate 22 Ω output source impedance.

Note that the audio signal is DC coupled throughout.

DDS-3030 & DDS-3031: RS422/RS485 data. (See diagrams 803763 & 804200 sheet 1)
The RS422/RS485 data lines are bi-directional, consisting of a send and receive pair. Thus, it is not strictly correct to speak of inputs and outputs for this switcher. The switcher in essence connects a common transmit / receive pair to one of five other receive / transmit pairs. For simplicity and commonality with other switchers in the series the common transmit / receive pair (SK 6 on the rear assembly) will be referred to as the output and the remaining five transmit / receive pairs as inputs 1 - 5.

The best termination impedance for RS422/RS485 signals depends on many factors including data rate, cable type and length. The DDS-3030 & DDS-3031 have 300 Ω termination resistors on all receive lines which are connected via a wire link to allow users to change the impedance if required.

The transmit and receive pairs for each input and the output connect to a line amplifier / receiver (U 1 to U 6) which has an enable facility for each pair.

All “input” receive lines are connected in common to the “output” transmit amplifier.
The “output” receive line is connected to all “input”: transmit amplifiers.

The data signal lines A, B & C from the PLA controller are decoded by U 8 and hex inverter U 7 provides the correct enable signals to each amplifier / receiver.

When an amplifier or receiver is not enabled it reverts to a “tri-state” output and so outputs can be connected in common. This capability is used internally for the receive lines from the “inputs” and externally on the transmit lines when configuring switchers larger than 5 x 1. See *configuration* section for details.

DVS-3040 & DVS-3041: Digital video. (See diagrams 803662 & 804110 sheet 1.)
Each incoming video line is terminated in 75 Ω and is AC coupled to an automatic cable equaliser IC (U 1 to U 5).
The DVS-3041 equaliser is capable of recognising a complete loss of input signal and will mute its output when this occurs. This overcomes the problem of the equaliser output providing maximum gain to noise only signals, which would otherwise cause crosstalk in the adjacent channels and produce "sparkles" in the picture.
The inputs are then switched using U 6 under control of three data lines (A, B & C) from the control PLA.

Output IC U 7 provides amplification with the 75 Ω output impedance being set by the combination of the IC’s output source impedance R 18 & R20.
A second 75 Ω output is provided by U 7 for monitoring or expansion purposes.

When a DVS-3040 / 3041* is to be used for inputs greater than 1-5 two optional connectors PL 1 and PL 2 are installed on its motherboard. In addition, R 21 is moved to its alternative position so that expansion output PL 1 provides a DC coupled output.

When a DVS-3041 (post serial number 0203001) is to be used for inputs greater than 1-5, see circuit diagram for modification instructions. Maximum expansion to 10x1 only recommended.

The expansion input PL 2 is taken direct to the switching matrix as it does not require equalisation due to the short distance between modules.
Note that this is a re-entrant form of switching and consequently there will be a slight increase jitter and delay.

CDC-3060: Controller.
All operation is under the direction of a microprocessor, which is loaded with a control program during manufacture. This part can only be obtained through IRT. For more information on this module, see *configuration* section.

* denotes serial numbers pre 0203001.

Internal adjustments

The following adjustable circuit elements are factory set and should not be adjusted unless a component has been changed. They are not 'operational' controls. Before adjusting any of these controls allow time for the module to reach temperature stability.

AVS-3010 & AVS-3011:

C 8	Frequency response.
RV 1	Video gain.
RV 2	Vertical interval switching point delay adjust. Set to line 9.

AAS-3020 & AAS-3021:

RV 1	Main board	Audio gain -- Right channel.
RV 1	Sub-board	Audio gain -- Left channel.

DDS-3030 & DDS-3031:

No adjustments.

DVS-3040 & DVS-3041:

RV 1	Output gain.

CP-700:

No adjustments.

CPS-3050:

No adjustments.

CPS-9000 & CPS-9001:

No adjustments.

TPS-3010:

No adjustments.

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.

Configuration

Interconnecting modules:

From the description given under *circuit description -- control circuit* the following rules for daisy chaining the modules can be deduced:

I. Modules are looped by joining PL 5 (data out) on one module to PL 4 (data in) on the next.

II. A CPS-9000 or CPS-9001 remote control panel must be powered by either:
(a) Connecting its PL 5 to PL 4 on a powered module (i.e. one of the switcher group or a CDC-3060 logic control module).
or
(b) Connecting its PL 5 to PL 4 on another CPS-9000 that is configured as in (a).

III. If a CDC-3060 logic control module is used it must be the last link in the chain. I.e.. PL 4 of the CDC-3060 connects to PL 5 of the last switcher.

Switch pulses - internal & external sync.:

Each of the switcher group has a free running switch pulse generator for executing a crosspoint change. The period is approximately 25 ms. Uniquely, the AVS-3010/3011 5 x 1 video switcher can synchronise its switch pulse generator so that transitions will occur in the vertical interval of the video signal that is currently selected.

When a switcher group module is configured as *Inputs 1-5* (using LK's 1 & 2), it uses its own switch pulses. If configured for any other input range (e.g. *Inputs 6-10*), it defaults to using the switch pulses incoming on its PL 4 connector -- *switch pulse in*, and also passes these on to *switch pulse out* on its PL 5.

When multiple AVS-3010/3011's are used as YUV switchers, you have a case where all are configured as *Inputs 1-5* but only the switcher for Y can be synchronised. (The others have no recognisable syncs.) By changing LK 4 on the U and V switchers they can be forced to use the incoming switch pulses from the Y switcher.

As the switch pulse signal is sent from the AVS-3010/3011 1 - 5 switcher only on its PL 5 connector, this must be the first switcher connected to the chain.
Therefore, for YUV and YC signals the switchers may be connected in that order, but for RGB the connection order should be GBR if synchronised switching is to occur.

Power on reset:

Power on reset is needed so that at power on only one switcher or control panel drives the buss. LK 3 on each of the *Switcher Group* or the CPS-9000 / 9001 remote control panel is used to select which unit is in control at power on.

If LK 3B is **not** installed and the switcher/control panel is configured to be for *Inputs 1-5* then at power on that unit will take control of the buss and select input 1.

In the case of a multi-level set up, such as a 5 x 1 video with a 5 x 1 audio as a slave, all the slaves should have LK 3B installed.

LK 3 has another function. If LK 3A is **not** installed then any CPS-3050 switcher panel installed on the front of the module will act as tally only -- the operation of any of its buttons will have no effect. This also applies to the CPS-9000 / 9001 remote control panel.

DDS-3030 & DDS-3031 5 x 1 RS-422 switcher: -- input impedance.

The rear assembly for this module provides input termination resistors on each input line. Note that this includes the "output" as this switcher is bi-directional. These 300 Ω resistors (R 1 to R 6) are connected via a wire link (TL 1 to TL 6 respectively) which may be cut if a different input impedance is required.

To obtain the input impedance required a resistor should be fitted across the input terminals (marked "R") of the plug-in screw connector block and the wire link cut.

It is recommended that this method be used in preference to replacing the surface mount resistors on the rear assembly PCB as doing so is likely to cause damage to the PCB.

Switcher set ups larger than 5 x 1

10 x 1, 15 x 1 and 20 x 1 switchers can be made up of multiple switchers.

In order to achieve this connections have to be made between modules for both control and signal purposes. In addition, links on each module need to be configured to set the address range for the module.

These three operations are dealt with separately below.

Control side:

LK 1 and LK 2 on the switchers are used to assign the group of inputs that a module will switch.

NOTE: Always have one at least one switcher configured as *'Inputs 1-5'* otherwise there will be no switch pulses and consequently no switching action at all.

Connector PL 5 (data out) on switcher 1 - 5 connects to PL 4 (data in) on switcher 6 - 10 and so on.

Cables may be wired using the connectors provided or may be ordered from IRT using the following part numbers:

GDW-3010 150 mm cable for joining adjacent modules in 3 RU frame.
GDW-3011 300 mm cable for joining modules in 1 RU frames.

Signal side:

AVS-3010 & AVS-3011 5 x 1 Analogue video switchers:

When the data buss value is outside the range of inputs for which the module is configured the module selects PL 3 (SMA connector) on its rear assembly as its input. Therefore, the module with the highest input range should have its output connector linked to PL 3 of the module with the next lower input range.

This is accomplished using a short BNC to SMA linking cable. A 150 mm cable of this type may be ordered from IRT; this is of sufficient length to join together two adjacent modules fitted to a 3 RU frame. Please use part number GVW-3010.

Thus, the output from the 1 - 5 switcher will be the only output left unconnected to another switcher and is the switched output for the complete switcher.

Note that this is a re-entrant form of switching. For example inputs in the range 16 - 20 on a 20 x 1 configuration actually pass through four active modules, consequently being subjected to a slight increase in distortion and (being DC coupled switchers) DC offset.

Positions PL 1 and PL 2 on the main board are not used.

When the data buss value is outside the range of inputs for which the module is configured the module places its signal busses in a high impedance state. J 4L (on the motherboard) and J 4R (on the sub-board) are signal buss extender connectors. Therefore, by paralleling all the J 4L connectors on a group of switchers, and all the J 4R connectors, size expansion is achieved.

Note that the J 4 connectors and matching plugs are not normally supplied with the switchers.

To order please use the following part numbers:

J4 connector	1100-12-103-02
Matching plug	1300-103-426

Figure 8 shielded cable or two shielded cables of small diameter should be used for the link.

For a 15 x 1 or 20 x 1 configuration it will be necessary to connect two wires into each connector on modules 2 and 3 respectively to extend the link as only one connector is provided on each module for each channel.

For consistency with other switchers in the series, it is recommended that the output from the 1 - 5 switcher be taken as the output for the complete switcher.

3 RU frames installation: As these connections are made between the main module boards extreme care should be taken when inserting or removing these boards to ensure that they move in and out of the frame as a group.

To assist in this regard a small linking plate is available which loops over the front panel retaining screws as an indicator of the modules in the group. These are available in 2, 3 and 4 module widths. To order please use part number PC803845 and indicate the number of modules to be linked.

For example:

3 only PC803845/ 4 would be an order for links for 3 only 20 x 1 (4 modules) switchers

In order to be able to slide the modules in and out of the frame it is necessary to route the inter-board wiring through the small gap between the boards rear connector and the top slider rail.

DVS-3040 & DVS-3011 5x 1 Serial digital switcher:

When a DVS-3040/3041* is to be used for inputs greater than 1-5 two optional connectors PL 1 and PL 2 are installed on its motherboard. In addition, R 21 is moved to its alternative position.

When the data buss value is outside the range of inputs for which the module is configured the module selects PL 2 (Expn In) on its motherboard as its input. Therefore, the module with the highest input range should have its PL 1 (Expn Out) connector linked to PL 2 of the module with the next lower input range.

Thus, the output from the 1 - 5 switcher will be output for the complete switcher. Outputs from the 6 - 10, 11 - 15 or 16 - 20 switchers will only provide outputs of 6 - 20, 11 - 20 and 16 - 20 respectively. When an input outside this range is selected, no output will result. It is therefore recommended that these outputs not be used.

Note that this is a re-entrant form of switching. For example, inputs in the range 16 - 20 on a 20 x 1 configuration actually pass through four active modules, consequently being subjected to a slight increase in jitter and delay.

When a DVS-3041 (post serial number 0203001) is to be used for inputs greater than 1-5, see circuit diagram for modification instructions. Maximum expansion to 10x1 only recommended.

* denotes serial numbers pre 0203001.

3 RU frames installation: See note above under AAS-3020/3021.

DDS-3030 & DDS-3031 5 x 1 RS-422 switcher:

When the data buss value is outside the range of inputs for which the module is configured all its 6 outputs are placed in the high impedance state. Therefore, signal expansion is achieved by paralleling SK 6 on every module.

Note that TL 6 on every module but one should be cut to prevent double termination of the receive line.

CDC-3060 Logic control module:

The CDC-3060 may be used either as a stand-alone controller for a switcher (comprising one or more modules) or as an interface between the switcher and RS232 serial data control signals.

RS232 link control: A CDC-3060 Logic control module is used to enable remote control of a switcher or group of switchers over an RS232 link.

One CDC-3060 logic control module is required to be connected to the switcher(s) via its PL 4 control connector. This CDC-3060 should be configured to *switcher program*.

The remote end of the RS232 link can be implemented with another CDC-3060 logic control module in conjunction with one or more CPS-9000 remote control panels. This CDC-3060 should be configured to *control panel program*.

Alternately a computer or other intelligent logic can be use to generate the necessary RS232 control codes. See *RS232 control codes & connector*.

General setup:

Operation of the CDC-3060 is determined by a number of on board links. Before installing the board, these should be carefully checked according to the following operating configuration guidelines.

Summary of links:

LK 1 Reserved
LK 2 Reserved
LK 3 Reserved
LK 4 Program type b 0
LK 5 Program type b 1
LK 6 Address b 0
LK 7 Address b 1
LK 8 Loop LED enable

Program:

The CDC-3060 has a microprocessor on board which can have four different operating programs loaded. Program selection is by links LK 4 (b 0) and LK 5 (b 1) as follows:

Program	LK 5 -- b 1	LK 4 -- b 0
Switcher	OUT	OUT
Control Panel	OUT	IN
PR 3	IN	OUT
PR 4	IN	IN

PR 3 & PR 4 are currently reserved for future use.

Switcher program: The switcher program is used where the controller is to be connected to a switcher or group of switchers to actuate their function. In this mode the CDC-3060 may receive RS232 information and decode this to operate the switcher or it may itself generate a sequence of switcher control codes for cyclic operation.

In this case PL 4 (data in/out) on the CDC-3060 rear assembly is connected to PL 5 (data out) on the last switcher to be controlled.

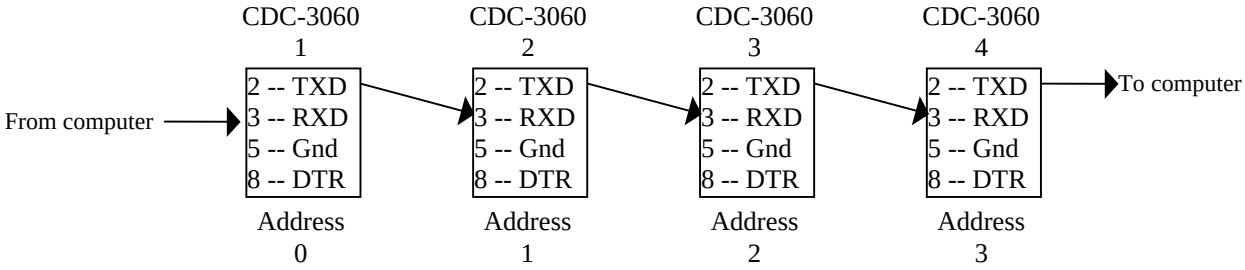
Control panel program: This program is used when the CDC-3060 is required to generate RS232 incoming data from remote control panels or switchers.

In this case PL 4 (data in/out) on the CDC-3060 rear assembly is connected to PL 5 (data out) on the last switcher or control panel in the chain.

Addressing: The CDC-3060 may be set to one of four addresses, thus allowing up to four CDC-3060's to be controlled by one RS232 signal.

To use this facility the RS232 signal is looped from the DB 9 connector on one controller to the DB 9 connector on the next.
The connectors should be wired so that:

The TXD line of the first CDC-3060 connects to the RXD line of the second CDC-3060 and so on.
The RXD line of the first CDC-3060 connects to the TXD line of the computer.
The TXD line of the last CDC-3060 connects to the RXD line of the computer.
The DTR line is not connected between any CDC-3060's.
The Gnd line is not connected between any CDC-3060's.



Note that the TXD & RXD references apply to the device itself NOT the connected equipment.

Addressing is accomplished using links LK 6 and LK 7 as follows:

Address	LK 7 -- b 1	LK 6 -- b 0
3	OUT	OUT
2	OUT	IN
1	IN	OUT
0	IN	IN

Cyclic control: In addition to the remote control capability, the local CDC-3060 logic control module also provides a "cycle inputs" function.. This may be activated locally or via the RS232 interface.

In either case the controller must be pre-set with the start and end switcher crosspoint numbers and the time required to hold each input before stepping to the next in sequence.

For example, the settings required may be: *Start* at input 2
End at input 7
Step every 5 seconds.

These settings are made using DIP switches SW 2, SW 1 and SW 3 respectively.

Logically the *Start* setting should be less than the *End* setting. If *Start* is greater than or equal to *End* then the switcher will switch to *Start* and hold that input without cycling.

In the following tables 0 represents *closed* and 1 represents *open* as marked on the switch assemblies.

Switches SW 2 -- *Start* and SW 1 -- *End*:

Switch number	Input number																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
6 - 8	Not used																			
5 (b 4)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
4 (b 3)	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1
3 (b 2)	0	0	0	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	0	0
2 (b 1)	0	0	1	1	0	0	1	1	0	0	0	0	1	1	0	0	1	1	0	0
1 (b 0)	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1

Switch SW 3 -- *Step* time:

Switch number	Step duration. (Each unit ≈ 1.31 seconds)																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
6 - 8	Not used																			
5 (b 4)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
4 (b 3)	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1
3 (b 2)	0	0	0	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	0	0
2 (b 1)	0	0	1	1	0	0	1	1	0	0	0	0	1	1	0	0	1	1	0	0
1 (b 0)	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1

Data LED enable: An LED (LD 2) is provided on the front panel which when enabled by inserting link LK 8 will indicate that the RS232 control loop is connected and running.

RS232 Control codes & connector: When control of the CDC-3060 is via a computer or other RS232 source the following protocol must be used.

Protocol RS232 -- 2 wire format.
Type 9600 baud. (8 bit data word, no parity, 1 stop.)
Format 8 bit data word comprising:
1 command bit (MSB)
2 address bits
5 crosspoint number bits - BCD encoded.

Command bit: 0 = Poll switcher for tally status.
1 = Activate crosspoint. Switchers will switch to indicated input.
Note that only one crosspoint can be active at any time. Activating a crosspoint will cancel all other crosspoints.

Address bits: If the RS232 address bits are an exact match for those on the CDC-3060 then the CDC-3060 will execute the command to activate the crosspoint or respond with the switcher tally status depending on the state of the *command bit*.

If the RS232 address bits do not match those on the CDC-3060 then the CDC-3060 will ignore the instruction as far as any attached switcher is concerned and will repeat the instruction on its TXD line for forwarding to any other CDC-3060's connected. See *Addressing* for connection details.

Crosspoint number bits: These are binary coded decimal (BCD) format and correspond to the switcher input number minus one. I.e.. Crosspoint 0 = Input 1.
Bits 0 to 3 encode decimal 0 to 9 as standard binary numbers.
Bit 4 encodes the decade. I.e. 0 to 9 or 10 to 19.

Thus, the maximum allowable size for a switcher is 20 inputs (crosspoints 0 to 19).

Bit Number	Input number																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
4	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
3	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1
2	0	0	0	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	0	0
1	0	0	1	1	0	0	1	1	0	0	0	0	1	1	0	0	1	1	0	0
0 (LSB)	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1

Special codes:

Hex	Decimal	Binary	Action
1F	31	11111	Initiate cyclic program

RS232 Connector: The DB 9 connector on the rear assembly of the CDC-3060 is wired as follows:

Pin s1, 4, 6 & 9	Internal loop	
Pin 2	TXD	I.e. output of CDC-3060.
Pin 3	RXD	I.e.. input to CDC-3060.
Pin 5	GND	
Pin 8	DTR	I.e. out from CDC-3060.

Link Settings:

The following link settings apply to all switchers and controllers except as noted.
See separate section for links CDC-3060.

Links LK 1 & LK 2: These set the crosspoint range of the switcher or control panel as follows:

Inputs	LK 1	LK 2
1 - 5		
6 - 10	IN	
11 - 15		IN
16 - 20	IN	IN

Link LK 3: Local / remote control selection. If the switchers on the front of this unit are to be active, then install LK 3A, otherwise install LK 3B.

Link LK 4: AVS-3010/3011 only. Internal / external sync select.
LK 4A: Always use incoming switch pulses.
LK 4B: Normal selection of switch pulses.

Wire per crosspoint operation

In most cases, the BCD encoded remote control system offers the most satisfactory way of controlling one or more switchers. There are however, situations where it is necessary to provide a wire per crosspoint access for control and / or a line per crosspoint tally system.
Both of these facilities may be made available on the 3000 series in a number of ways.

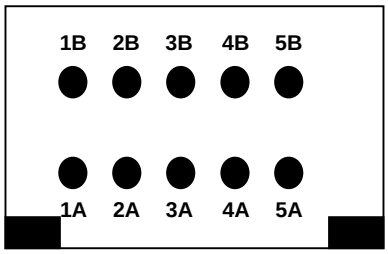
3011 Series:

The AVS-3011, AAS-3021, DDS-3031 and DVS-3041 supersede the earlier models and provide an on board patching area for changing the switcher from BCD to WPX input using the PL 4 & PL 5 connectors.
To change to WPX mode the WPX links should be installed on the PCB where indicated on the PCB overlay and all of the "Universal" links should be removed or cut.

A momentary contact closure to ground on the relevant control input will now cause the switcher to operate in the same way as it would had the switch on the local control panel type CPS-3050 been depressed.

Pin connections are as follows:

	PL 4	PL 5
1A	+12 Vdc out.	N/C.
1B	Ground.	Ground.
2A	Switch 5 contact.	Switch 5 contact.
2B	Switch 4 contact.	Switch 4 contact.
3A	Switch 3 contact.	Switch 3 contact.
3B	Switch 2 contact.	Switch 2 contact.
4A	Switch 1 contact.	Switch 1 contact.
4B	N/C.	Vert. out
5A	N/C.	N/C.
5B	N/C.	N/C.



No complicated logic is required of a remote control to the switcher in this configuration and the CP-700 five-button remote control connector may be used to operate the switcher or a custom switch panel may be fabricated.
If the CP-700 is used to operate the switcher the LED's for tally will be inoperative and the + Volts connection on the CP-700 should not be connected.

The primary disadvantage of this method is that no tally is available on the switch lines.

3010 series:

The 3000 series switchers initially provided WPX control by:

1. Direct connection to the switch contact and LED connections provided for use with a local control panel.
2. Connection by external BCD encoding.

These are described below.

Each switcher and the remote control panel is equipped with a 12 way in line connector at the front of the board for connecting to the switch panel. This connector carries signals for each switch contact and the LED tally indication from the switch control logic.

Switch control lines are normally held high by 10 KΩ resistors in a resistor array. The switch action momentarily grounds this control line and this is the action that should be mimicked by an external control. Link LK 3 which determines the start-up defaults should be set to the ‘A’ position as the remote panel takes the place of the local switches. This will also connect the local earth reference to pin one of the multi-way connector for access by the remote switches.

It is recommended that the 12-way connector be connected to a 15 pin ‘D’ connector (either normal or high density) and wired pin for pin leaving 3 pins unconnected. The ‘D’ connector may be mounted directly on the rear of the frame (in the case of the FR-722 or FR-722A) or on a blank rear plate covering an empty module space (in the case of the FR-700 or FR-748A).

The matching 12-pin connector for the switcher is a Harwin part number M20-9821206 (top entry) or M20-9891206 (side entry). These should be available through your local Harwin stockist. If the 12-pin version is unavailable, a 20-pin type may be cut down to size. These are available through Farnell Components.

Pin numbering is as follows:

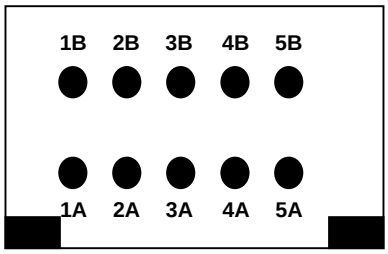
Pin	Signal
1.	GND reference (LK 3A connected)
2.	Switch 1 contact
3.	Tally out 1
4.	Switch 2 contact
5.	Tally out 2
6.	Switch 3 contact
7.	Tally out 3
8.	Switch 4 contact
9.	Tally out 4
10.	Switch 5 contact
11.	Tally out 5
12.	+5 Vdc 560 Ω sourced feed for tally LED's.

Tally lines are pulled low when active and an indicating LED may be directly connected between the pin 12 current source and the tally line for each crosspoint.

Where it is not convenient to connect directly to a switcher in the above manner, the same procedure may be followed using a CPS-9000 remote control panel connected to the switchers using the standard encoded remote control cables. In this case, the switch panel for the CPS-9000 should be removed and the wire per crosspoint control connected in its place. Hence, the CPS-9000 will act as a wire per crosspoint to BCD encoder for the connected switches. The CPS-9000 may be built into other equipment or fitted with a blank front panel and mounted in a standard Eurocard frame.

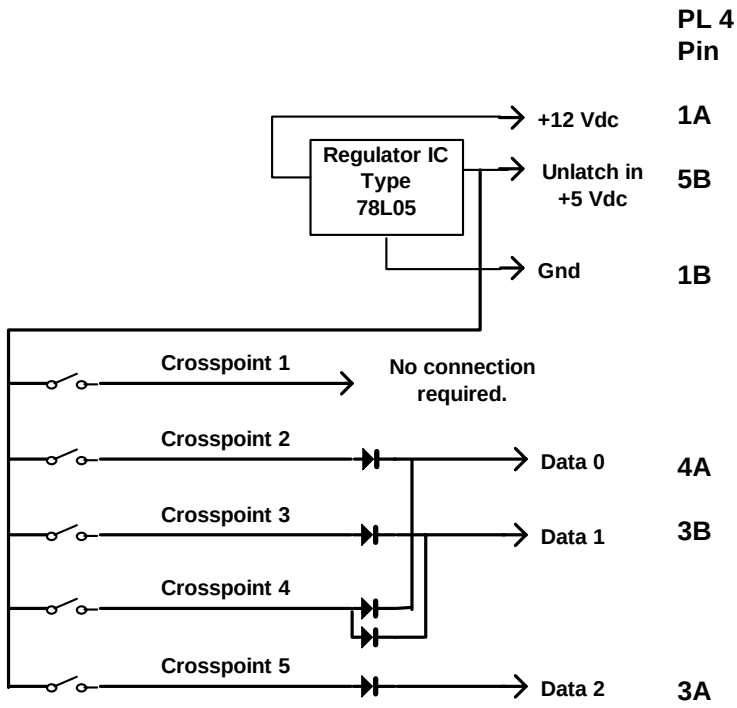
The CPS-9001 remote control panel may be used in a similar fashion to the CPS-9000. However, if remote wire-per-crosspoint control is required without tally, this may be accomplished without accessing the front panel connector. A special connector is provided on the CPS-9001 for remote wire-per-crosspoint input. This is connected directly to the switch panel wiring.
Connections are as follows:

	PL 6
1A	N/C.
1B	Ground.
2A	Switch 5 contact.
2B	Switch 4 contact.
3A	Switch 3 contact.
3B	Switch 2 contact.
4A	Switch 1 contact.
4B	N/C.
5A	N/C.
5B	N/C.



External BCD encoding:

The switching logic for the 3000 series is a binary sequence as explained under *Switching Logic*. Where wire per crosspoint style operation is required, the following simple method may be used to externally encode wire per crosspoint signals into the BCD format required by the switcher input.



All diodes type 1N4148 or equivalent.

Note that with this method, the *Unlatch In* signal is always present and therefore the switcher will not latch to momentary contact closures. The switches or relays must hold the contact as long as that crosspoint is required.

When no input is crosspoint is selected crosspoint 1 will be active and so any delay between releasing one crosspoint and activating another will result in the switcher attempting to switch to input 1.

This will have varying effects according to the type of switcher and so caution is advised.

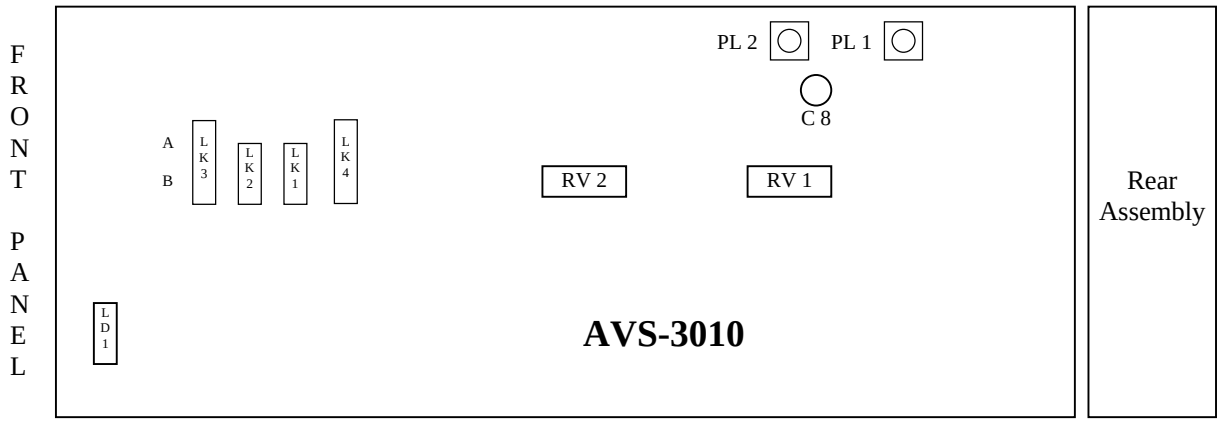
Analogue video. Because switching normally takes place only in sync with the vertical interval, the last crosspoint activated before the switching point will be the one chosen. Thus for example; a delay of 1 ms between selections will result in a 95% probability of correct switching and a 5% probability of one field of input 1 being switched between the two selections.

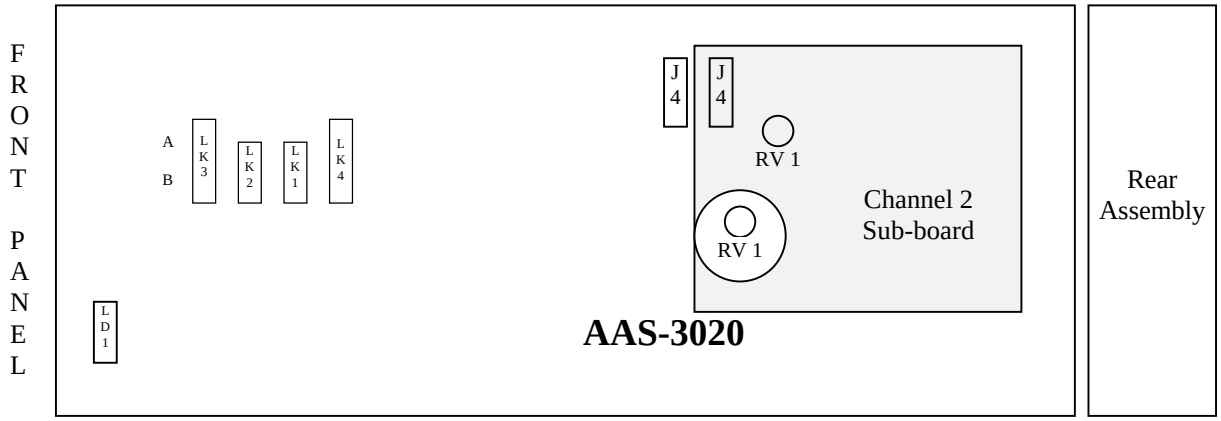
Other types. Switching is under the control of an oscillator with pulses approximately every 25 ms. Thus the probability for a 1 ms delay would be 96% for correct switching and 4% for a 25 ms "bite" of the signal on input 1 being inserted.
For audio signals, this would be heard as a "click".
For digital video signals the result would be a "flash" and
For RS422 signals the result will be determined by the type of equipment connected and could result in almost any effect ranging from none to catastrophic. Particular care should therefore be exercised with these signals.

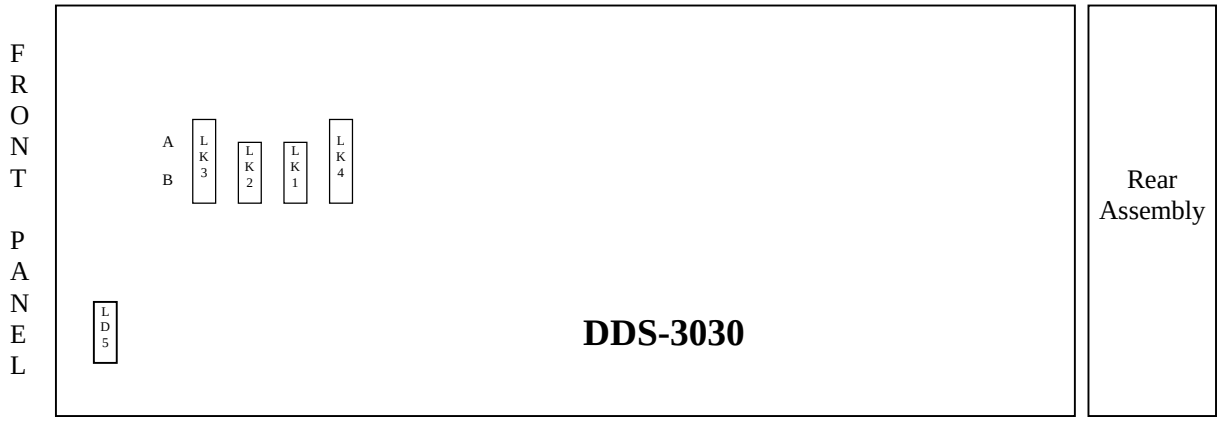
Location of links & user settings

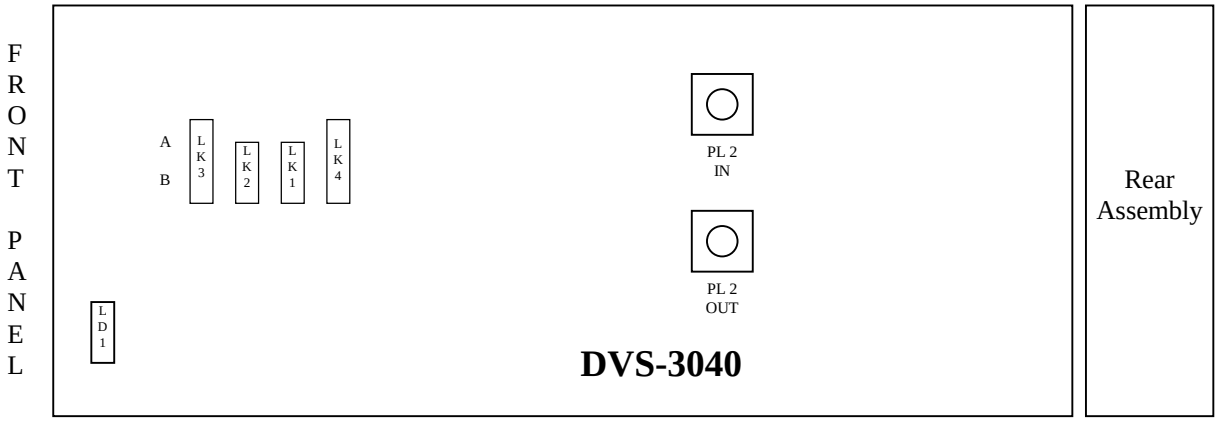
The following location diagrams are not to scale and are intended only to assist in finding the location of links and other settings, which may need to be changed by the user during *Configuration*.

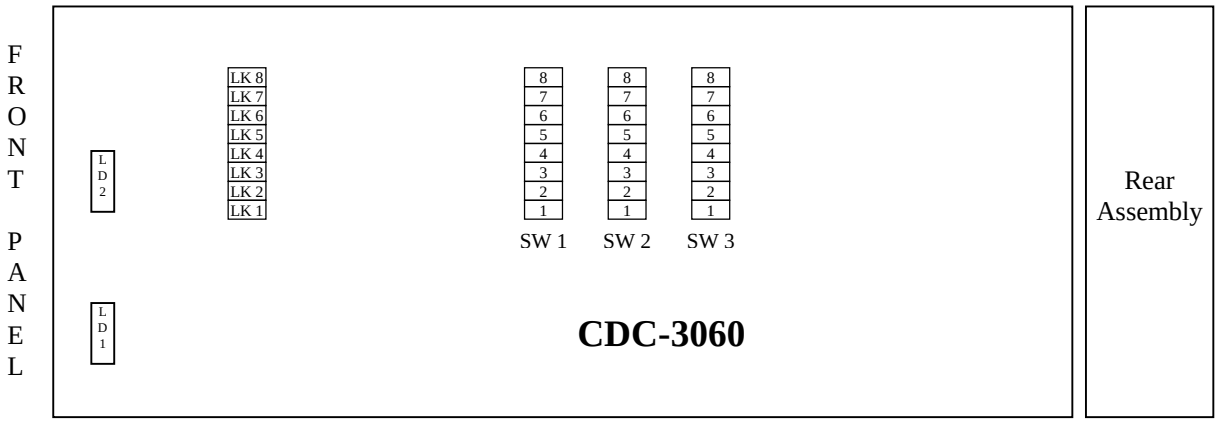
Note: AVS-3010 PL 1 & PL 2 positions on board are deliberately unfilled and are not required by users.

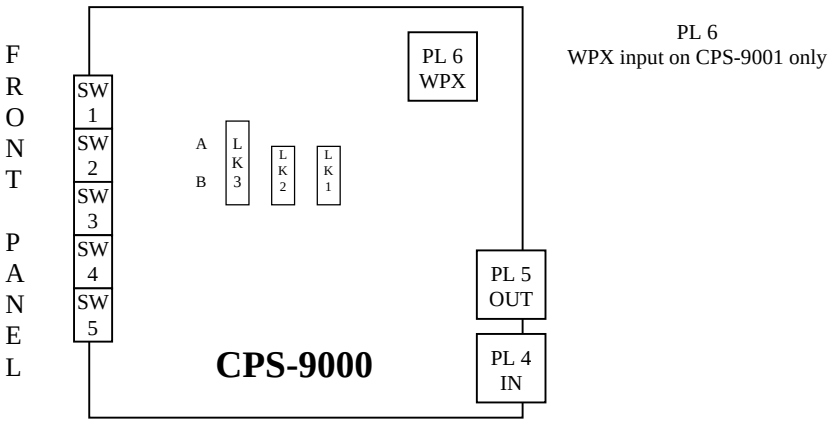







FRONT PANEL
A
B
LK 3
LK 2
LK 1
LK 4
PL 2 IN
PL 2 OUT
LD 1
DVS-3040
Rear Assembly


FRONT PANEL
LD 2
LD 1
LK 8
LK 7
LK 6
LK 5
LK 4
LK 3
LK 2
LK 1
8 7 6 5 4 3 2 1
SW 1
SW 2
SW 3
CDC-3060
Rear Assembly


FRONT PANEL
SW 1
SW 2
SW 3
SW 4
SW 5
A
B
LK 3
LK 2
LK 1
PL 6 WPX
PL 5 OUT
PL 4 IN
CPS-9000
PL 6
WPX input on CPS-9001 only

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

Installation in frame or chassis:

See details in separate manual for selected frame type.
Before installing in frame, make any required link changes as detailed in the *Configuration* section.

AVS-3010 & AVS-3011: Analogue Video Connections:

If input termination is required then 75 Ω termination BNC plugs should be fitted to the loop through input sockets.

AAS-3020 & AAS-3021: Audio Connections:

If input termination is required then termination resistors should be fitted to the input sockets.
Follow the polarity markings on the rear assembly or incorrect phasing will result.

DDS-3030 & DDS-3031: RS422 / RS485 Data Connections:

If a change in the input termination is required, consult the configuration section for details.
Follow the connection markings on the rear assembly carefully or incorrect operation will result.
As this switcher is bi-directional, extreme care must be taken in its application for configurations greater than 5 x 1 or conflicts will result.

DVS-3040 & DVS-3041: Digital Video Connections:

Input termination is fitted and should not be altered. No loop through facility is available. For applications requiring multiple destinations, a distribution amplifier such as the DVA-3002 should be used.

CPS-3050 -- Local control:

All switchers are sold with a plain front panel with DC power LED and printed with the switcher type number and IRT logo. The CPS-3050 provides the necessary components to add control buttons and tally to the front panel.

Before fitting the CPS-3050, the original front panel and LD 1, LED DC indicator, must be removed.

The CPS-3050 PCB should then be pressed carefully into place making sure that the pins on the CPS-3050 plug mate correctly with the socket on the main module PCB.
The front plate is then fitted using the screws and spacers provided.

For local switching, to take effect link LK 3 must be placed in the “A” position. See *Configuration* for details.

TPS-3010 -- Local tally panel:

All switchers are sold with a plain front panel with DC power LED and printed with the switcher type number and IRT logo.
The TPS-3010 provides the necessary components to add tally LED indicators to the front panel. This is desirable when switchers are controlled only by remote connections that are distant from the switcher. This panel is especially useful when switchers are controlled via the CDC-3060 controller from a remote location using RS232 connections.
The TPS-3010 provides confidence that a slave switcher has responded to the master command and can therefore greatly assist in finding faults in inter-module wiring.

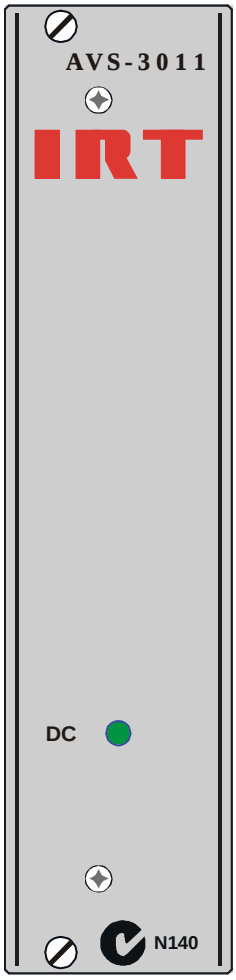
Before fitting the TPS-3010, the original front panel and LD 1, LED DC indicator, must be removed.

The TPS-3010 PCB should then be pressed carefully into place making sure that the pins on the TPS-3010 plug mate correctly with the socket on the main module PCB.
The front plate is then fitted using the screws and spacers provided.

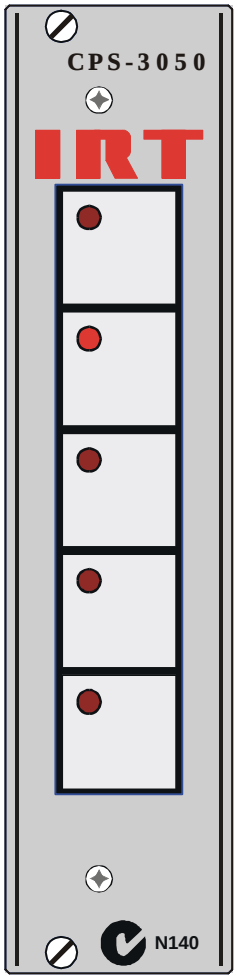
Front panel layouts

The following, front panel drawings are not to scale. They are intended to show approximate relative positions of controls only.

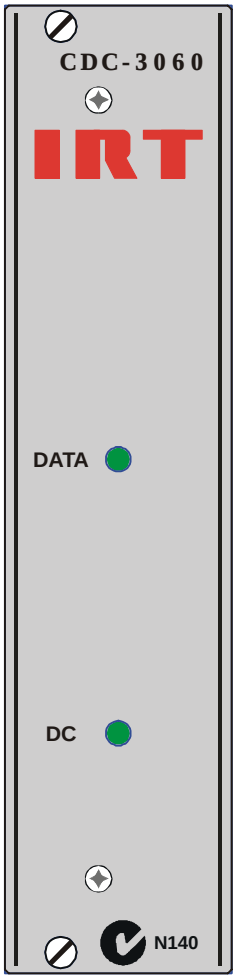
Front panel layouts:
AVS-3010 & 3011
AAS-3020 & 3021
DDS-3030 & 3031
DVS-3040 & 3041



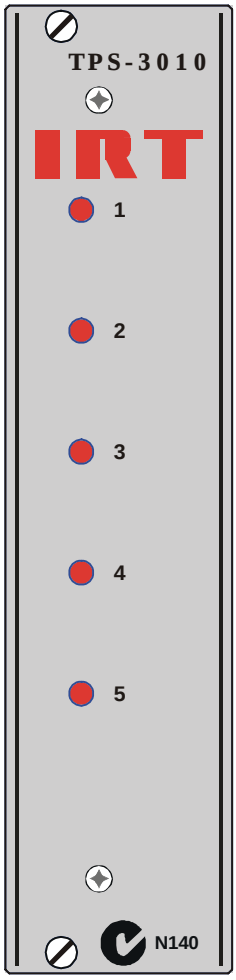
Front panel layouts:
CP-700
CPS-3050
CPS-9000



Front panel layout:
CDC-3060



Front panel layout:
TPS-3010

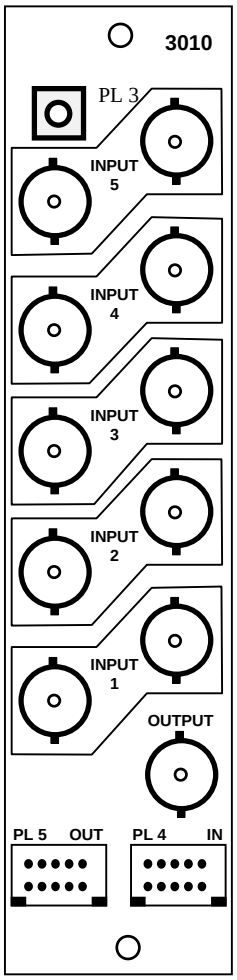


Rear connection diagrams

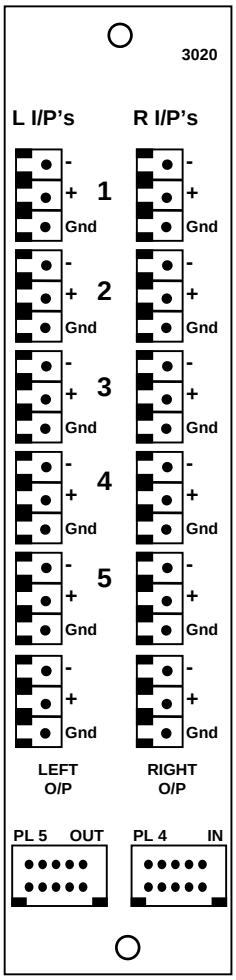
The following rear assembly drawings are not to scale and are intended to show connection order only.

DDS-3030: Input to switcher = “R” -- Output = “T”.

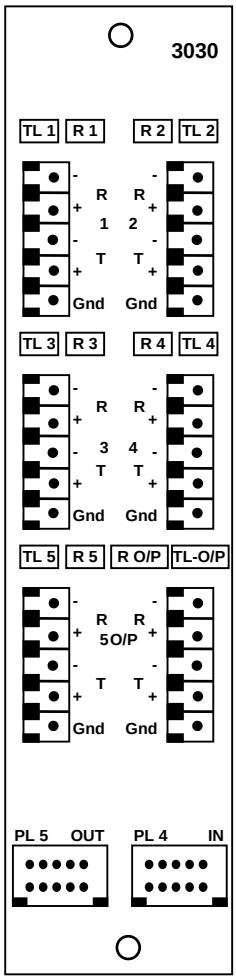
AVS-3010 & 3011



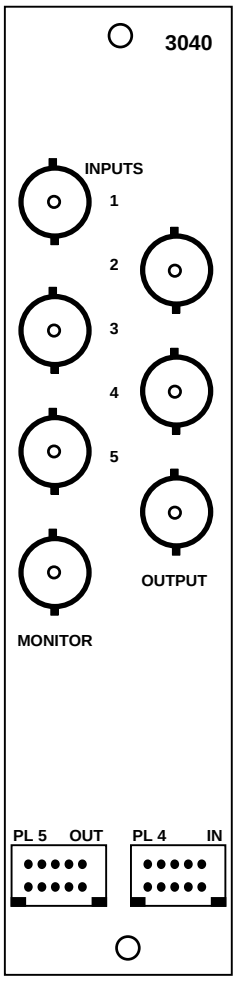
AAS-3020 & 3021



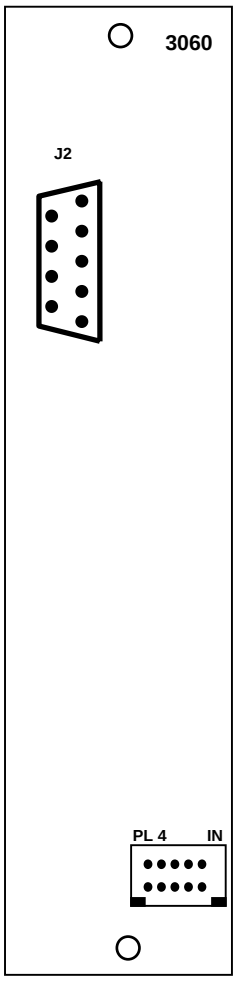
DDS-3030 & 3031



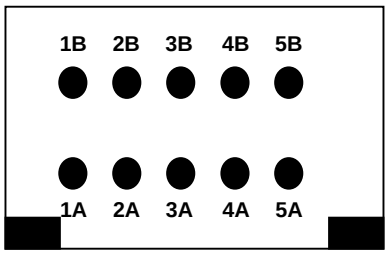
DVS-3040 & 3041



CDC-3060



PL4 & PL5 Pin Positions



Operation

CDC-3060: Cyclic control.

The CDC-3060 will perform automatic cycling of inputs of selected switchers on demand. This can be performed at any time and will continue until a stop command is given by local, remote or RS232 control.

The first and last inputs between which the switcher will cycle are set by switches on the CDC-3060. See *Configuration* section for details.

To **Start** cycling: Press any button on a local or remote control panel for more than 2 seconds.
or
Send code 1F via RS232 link.

If the button pressed is outside the range set for cycling then the switcher will switch to that input when the button is pressed and when released after two seconds will progress to *Start* input and continue cycling from that point.

To **Stop** cycling: Press any button on a local or remote control panel for less than 2 seconds.
or
Send any valid switch code via RS232 link.

If two CDC-3060's are connected to form an RS232 link, the CDC-3060 configured for the switcher program will be the unit, which sets the *Start*, *End* and *Step* for cycling operation.

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.

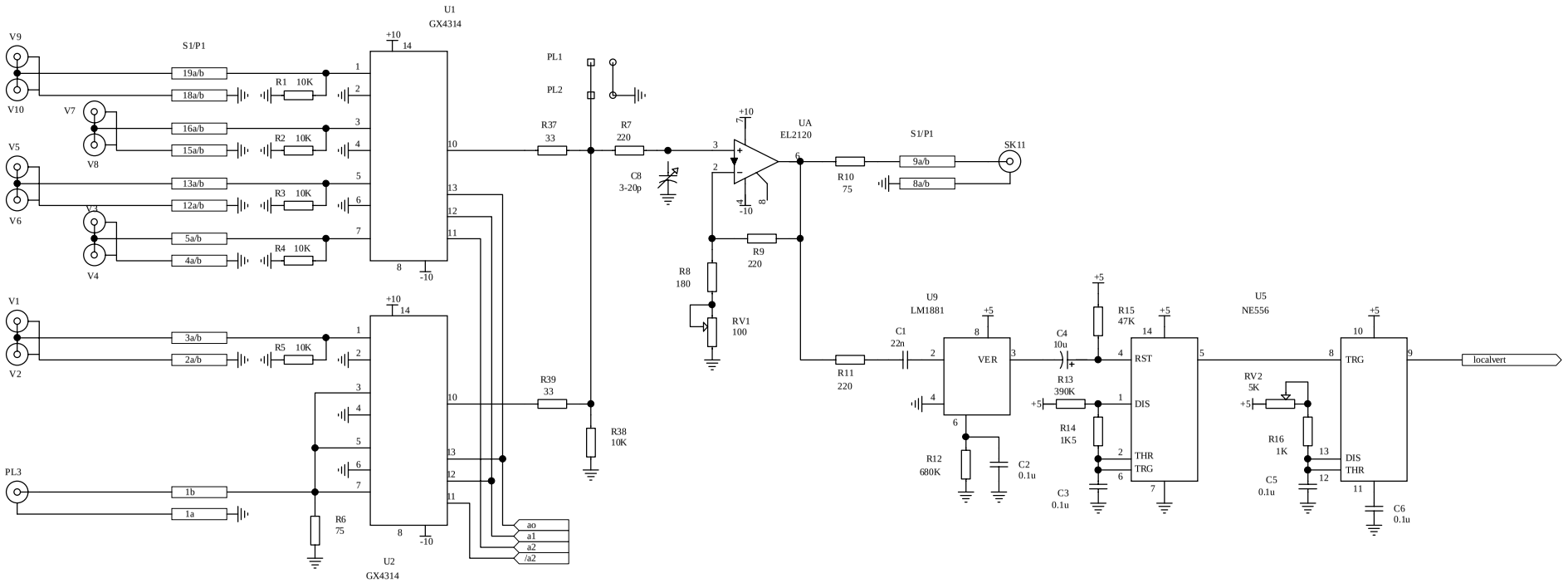
The equipment should be returned **to the agent who originally supplied the equipment** or, where this is not possible, to IRT direct as follows.

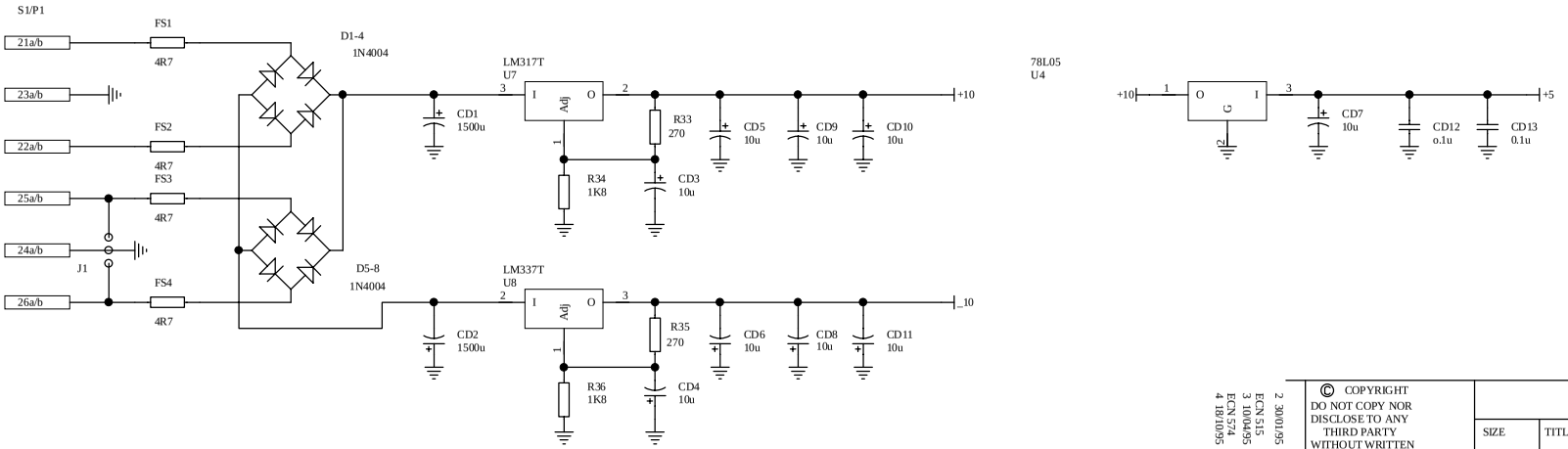
Equipment Service
IRT Electronics Pty Ltd
26 Hotham Parade
ARTARMON
N.S.W. 2064
AUSTRALIA

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

Drawing index

Drawing #	Sheet #	Description
803614	1	AVS-3010 video circuit schematic.
803614	2	AVS-3010 control circuit schematic.
804070	1	AVS-3011 video circuit schematic.
804070	2	AVS-3011 control circuit schematic.
803754	1	AAS-3020 audio circuit schematic.
803754	2	AAS-3020 control circuit schematic.
804115	1	AAS-3021 audio circuit schematic.
804115	2	AAS-3021 control circuit schematic.
803763	1	DDS-3030 data circuit schematic.
803763	2	DDS-3030 control circuit schematic.
804200	1	DDS-3031 data circuit schematic.
804200	2	DDS-3031 control circuit schematic.
803662	1	DVS-3040 digital signal circuit schematic.
803662	2	DVS-3040 control circuit schematic.
804110	1	DVS-3041 digital signal circuit schematic.
804110	2	DVS-3041 control circuit schematic.
803618		CPS-3050 local control panel schematic.
803798	1	CDC-3060 circuit schematic.
803771	1	CPS-9000 circuit schematic.
803740	1	CP-700 circuit schematic.
803286	1	CP-600 dimensional drawing front panel for CPS-9000 & CPS-9001.
804194	1	CPS-9001 circuit schematic.





2 30/01/95 ECN 515
3 10/04/95 ECN 574
4 18/10/95

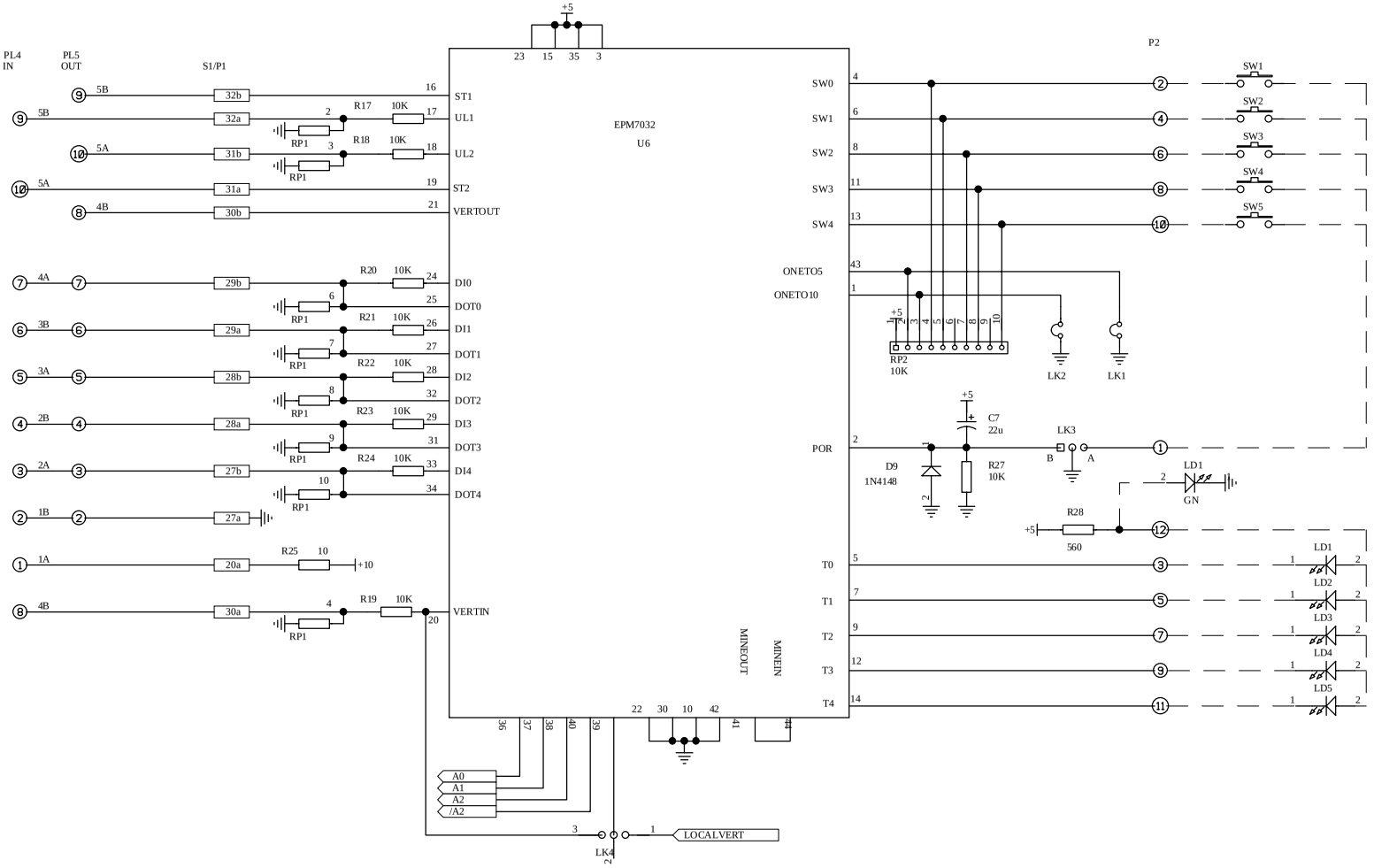
DRAWN RBB
CHECKED
ENG. APP.
CONTRACT No.

IRT

SIZE
TITLE AVS-3010
5X1 VIDEO SWITCHER
SCALE
DRAWING No. 803614
SHEET 1 OF 2

IRT Electronics Pty. Ltd.
ARTARMON NSW AUSTRALIA 2064

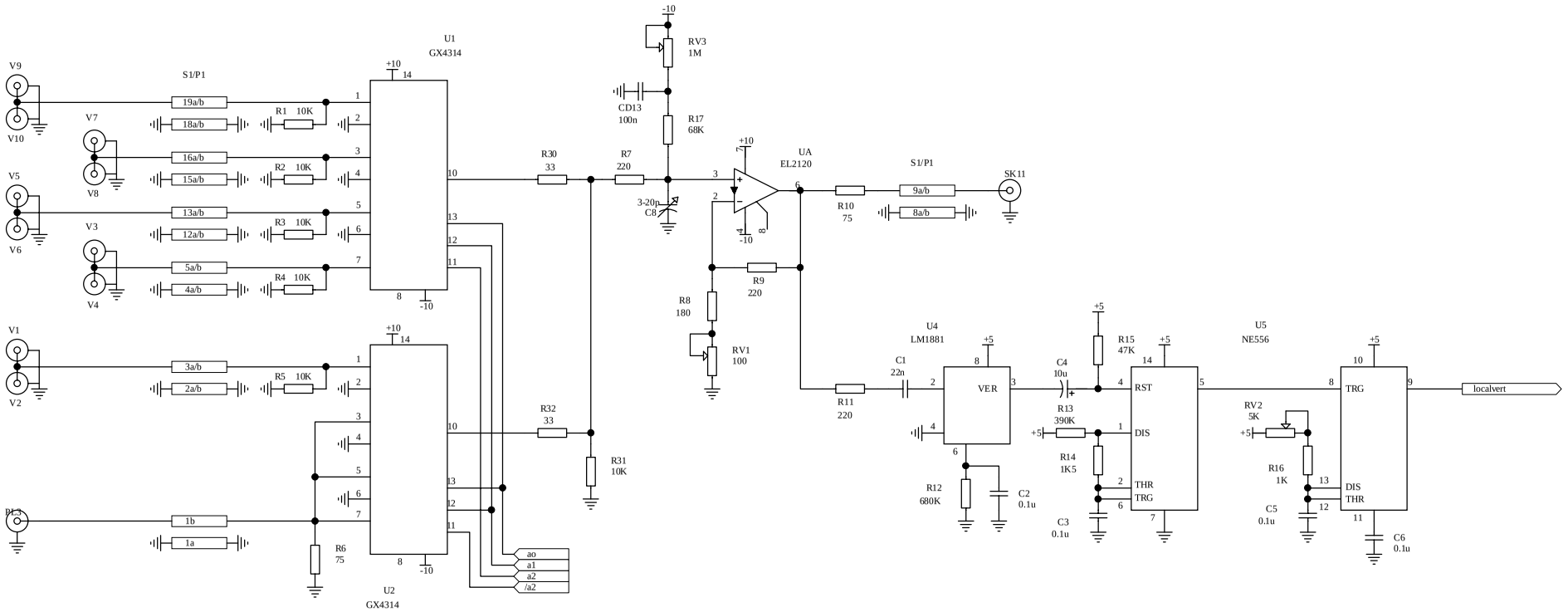
PC803615R

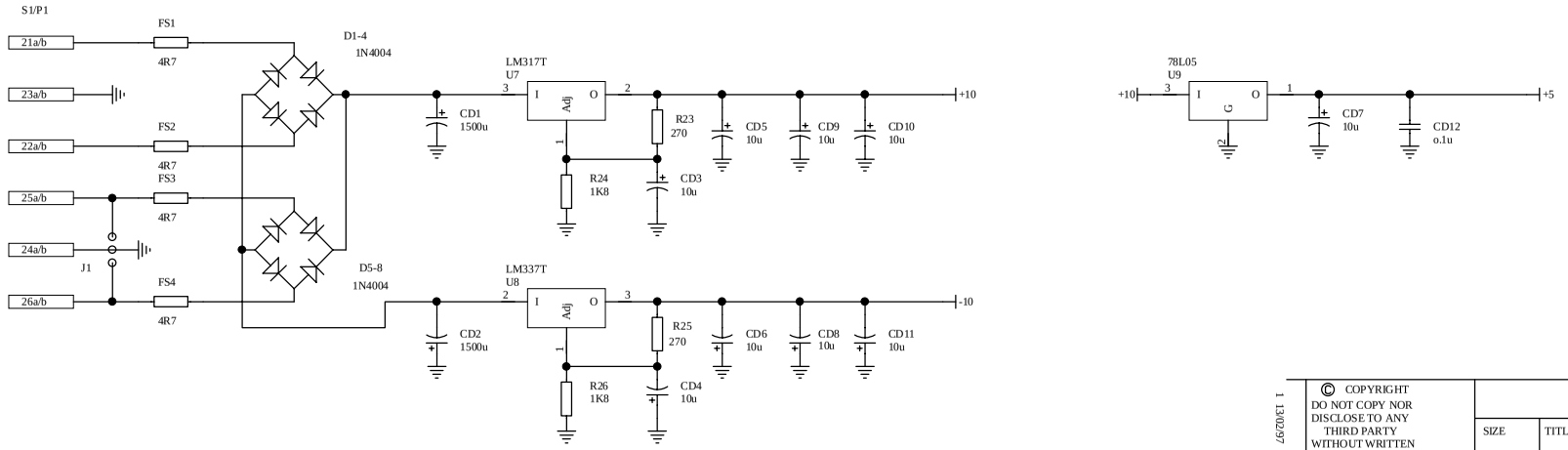


2	30/01/94
ECN 515	
3	10/04/95
ECN555	
4	18.08.95

IRT

SIZE	TITLE AVS-3010 5X1 VIDEO SWITCHER	
DRAWN RBB		
CHECKED	SCALE	DRAWING No. 803614
ENG. APP.		SHEET 2 OF 2
CONTRACT No.	IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064	

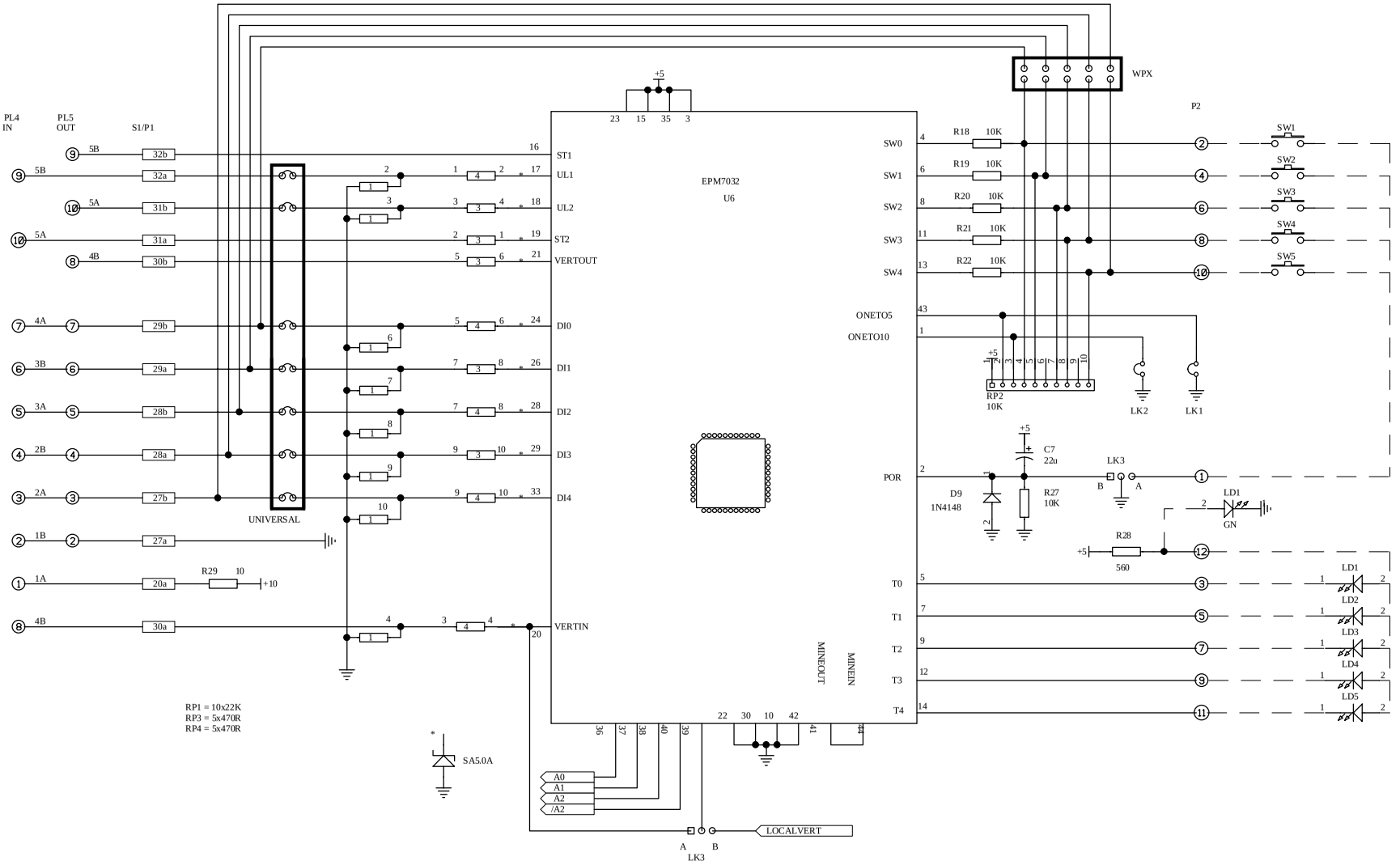




DRAWN RBB	SIZE	TITLE AVS-3011 5X1 VIDEO SWITCHER
CHECKED	SCALE	DRAWING No. 804070
ENG. APP.		SHEET 1 OF 2
CONTRACT No.		IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064

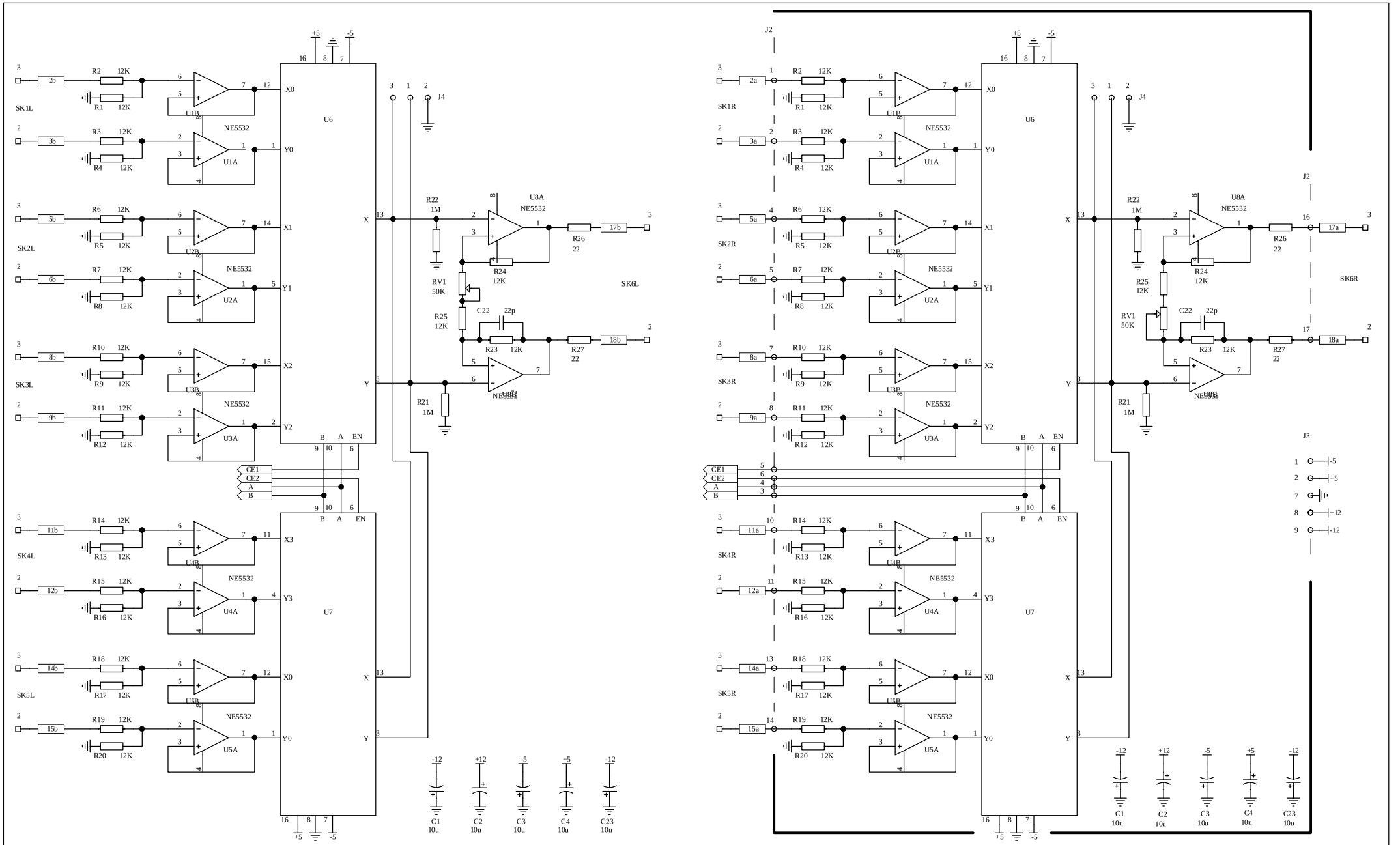
1 13/02/97

PC804071



DRAWN	RBB	SIZE	TITLE AVS-3011 5X1 VIDEO SWITCHER
CHECKED		SCALE	DRAWING No. 804070
ENG. APP.			SHEET 2 OF 2
CONTRACT No.		IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064	

1 13/02/97



PCB 803755R

DRAWN

CHECKED

ENG. APP.

CONTRACT No.

3 10/10/94 ECN 495

4 15-02-95

IRT

SIZE

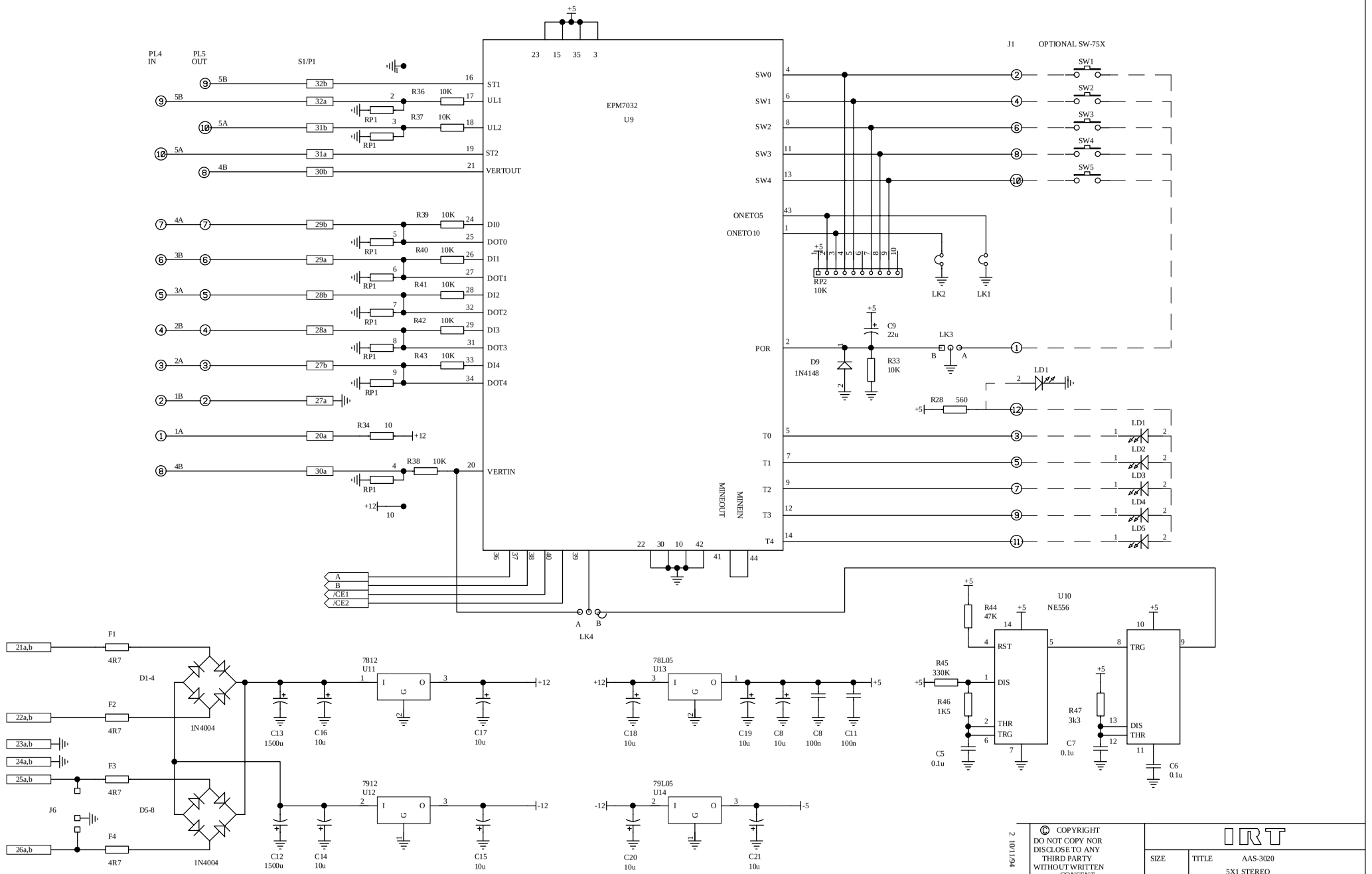
TITLE AAS-3020
5x1 STEREO
AUDIO SWITCHER

SCALE

DRAWING No. 803754

SHEET 1 OF 2

IRT Electronics Pty. Ltd.
ARTARMON NSW AUSTRALIA 2064



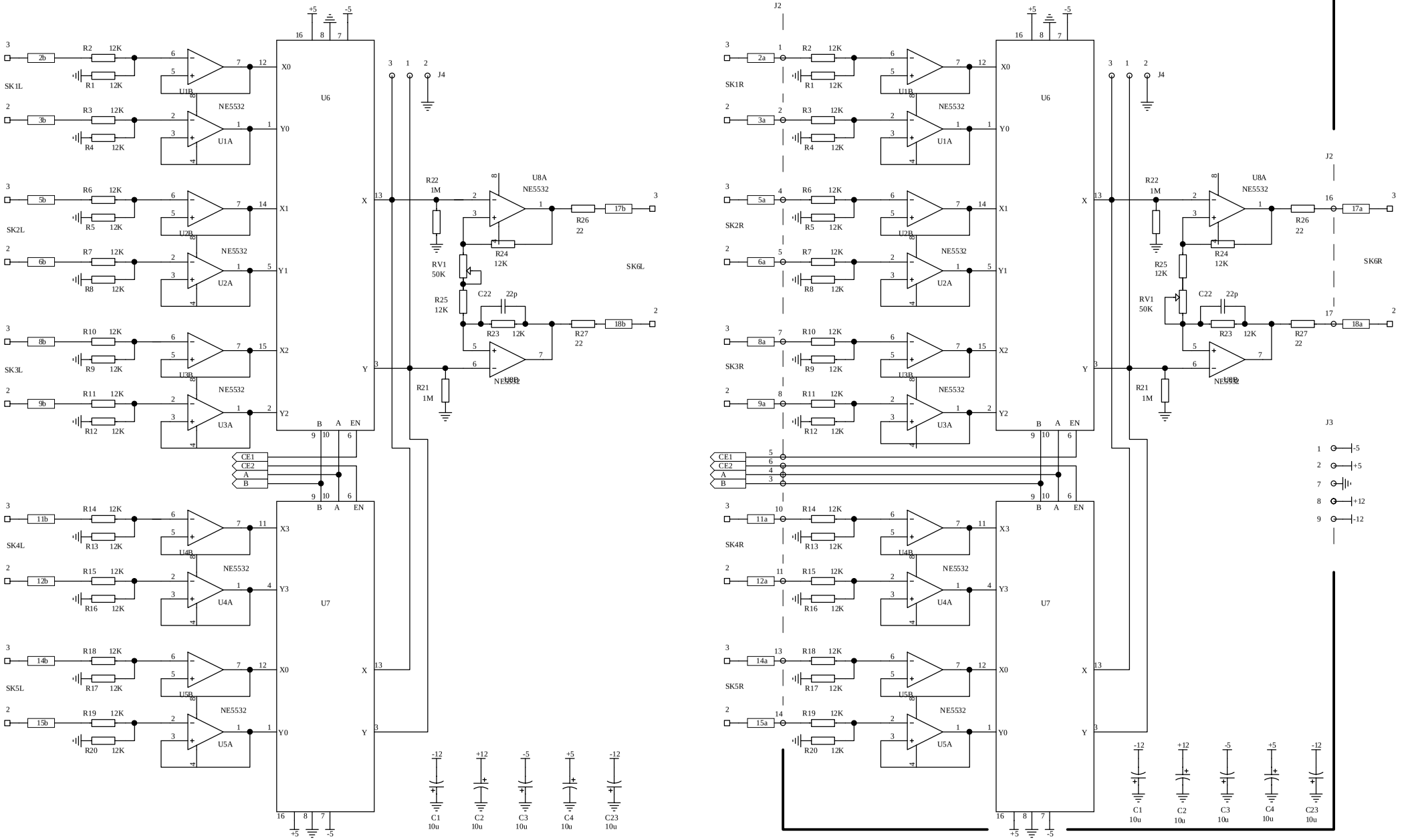
DRAWN	RBB	
CHECKED		
ENG. APP.		
CONTRACT No.		

IRT

SIZE	TITLE AAS-3020 5X1 STEREO AUDIO SWITCHER	
SCALE	DRAWING No. 803754	SHEET 2 OF 2

IRT Electronics Pty. Ltd.
ARTARMON NSW AUSTRALIA 2064

2 10/11/94



PCB 803755R

DRAWN

CHECKED

ENG. APP.

CONTRACT No.

1 18/07/97

IRT

SIZE

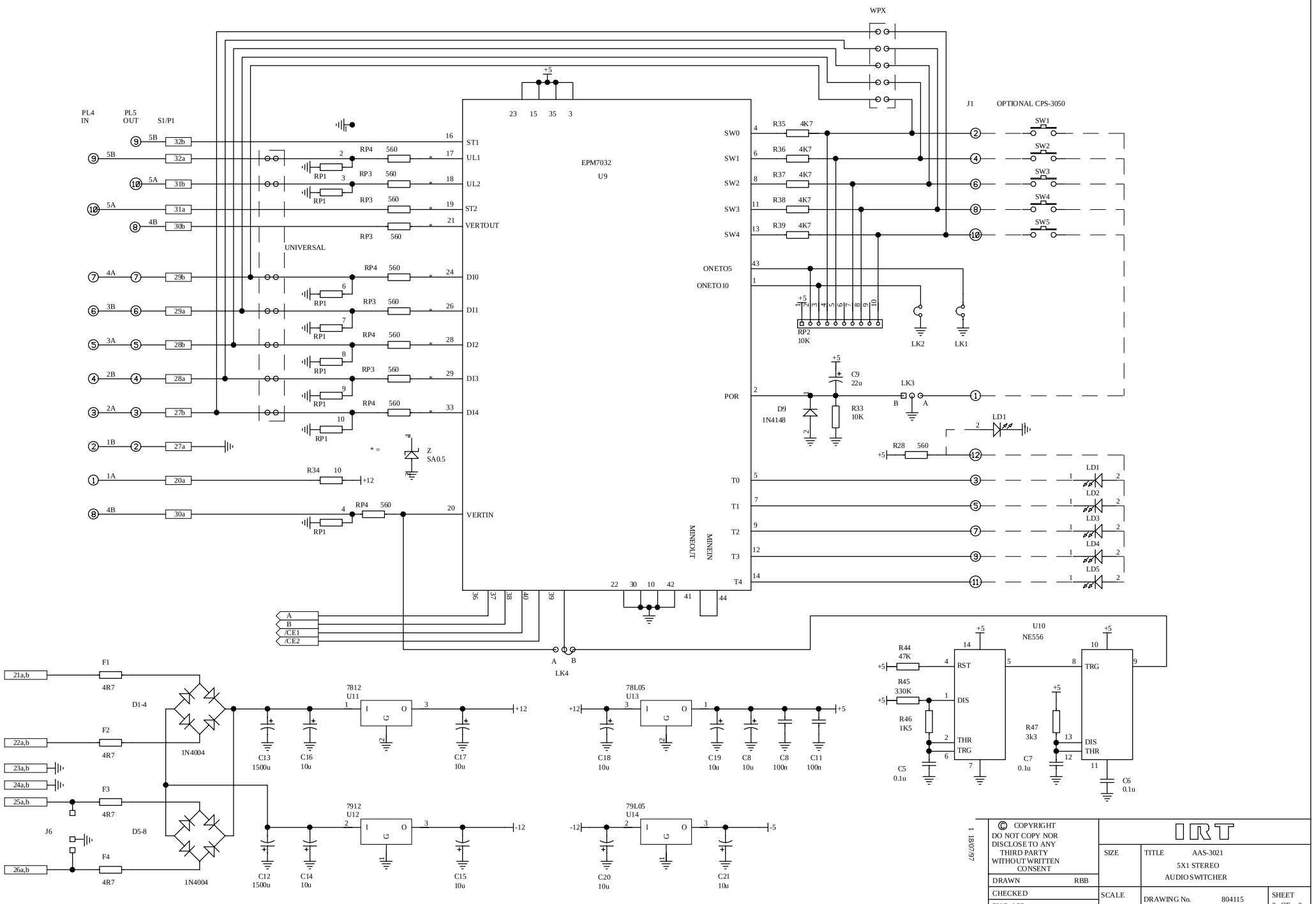
TITLE AAS-3021
5x1 STEREO
AUDIO SWITCHER

SCALE

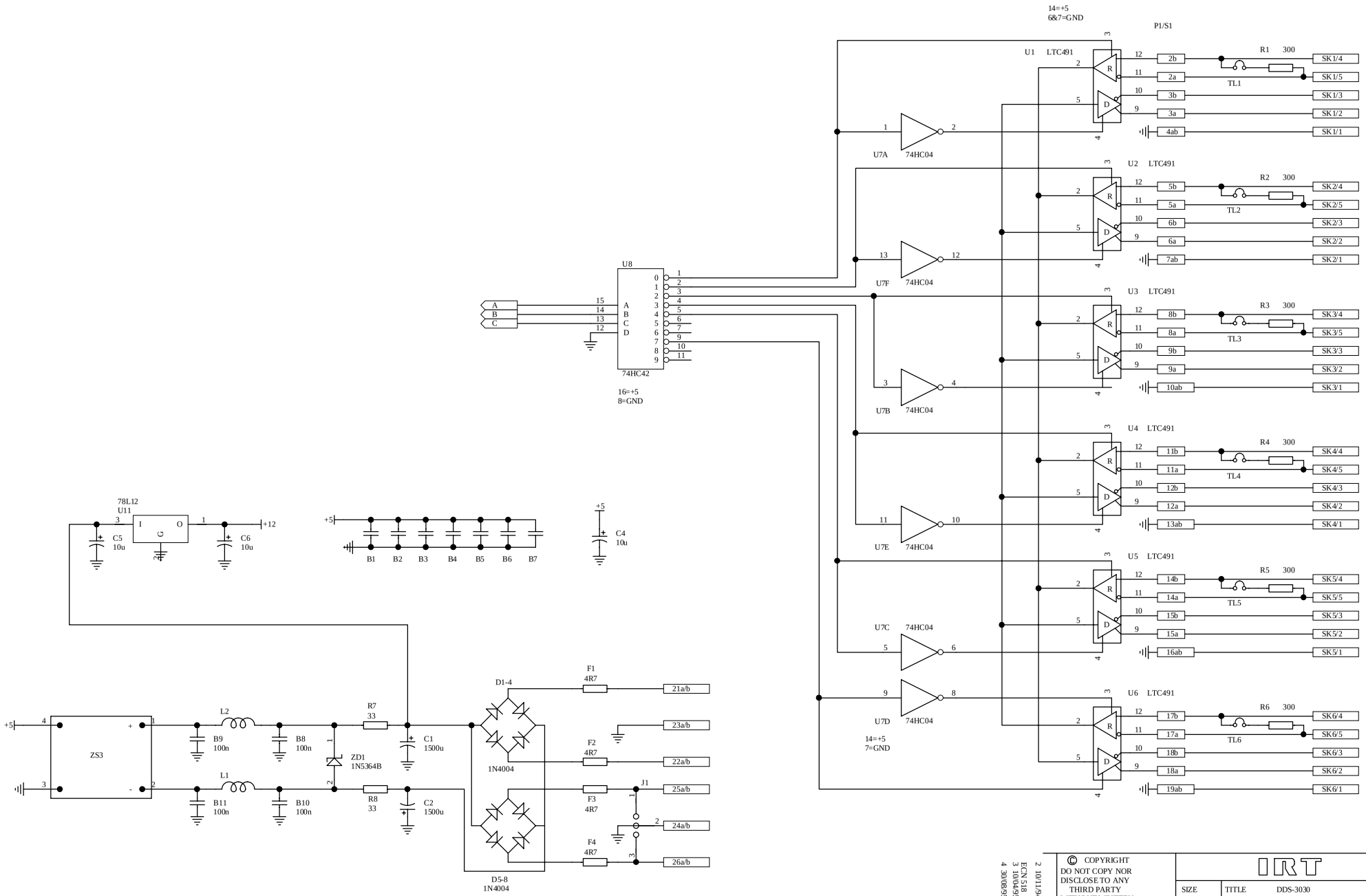
DRAWING No. 804115

SHEET 1 OF 2

IRT Electronics Pty. Ltd.
ARTARMON NSW AUSTRALIA 2064



1	18/07/97		
DRAWN	RBB	SIZE	TITLE AAS-3021 5X1 STEREO AUDIO SWITCHER
CHECKED		SCALE	DRAWING No. 804115
ENG. APP.			SHEET 2 OF 2
CONTRACT No.		IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064	



2	10/11/94
ECN 518	
3	10/04/95
4	30/08/95

DRAWN

CHECKED

ENG. APP.

CONTRACT No.

IRT

SIZE

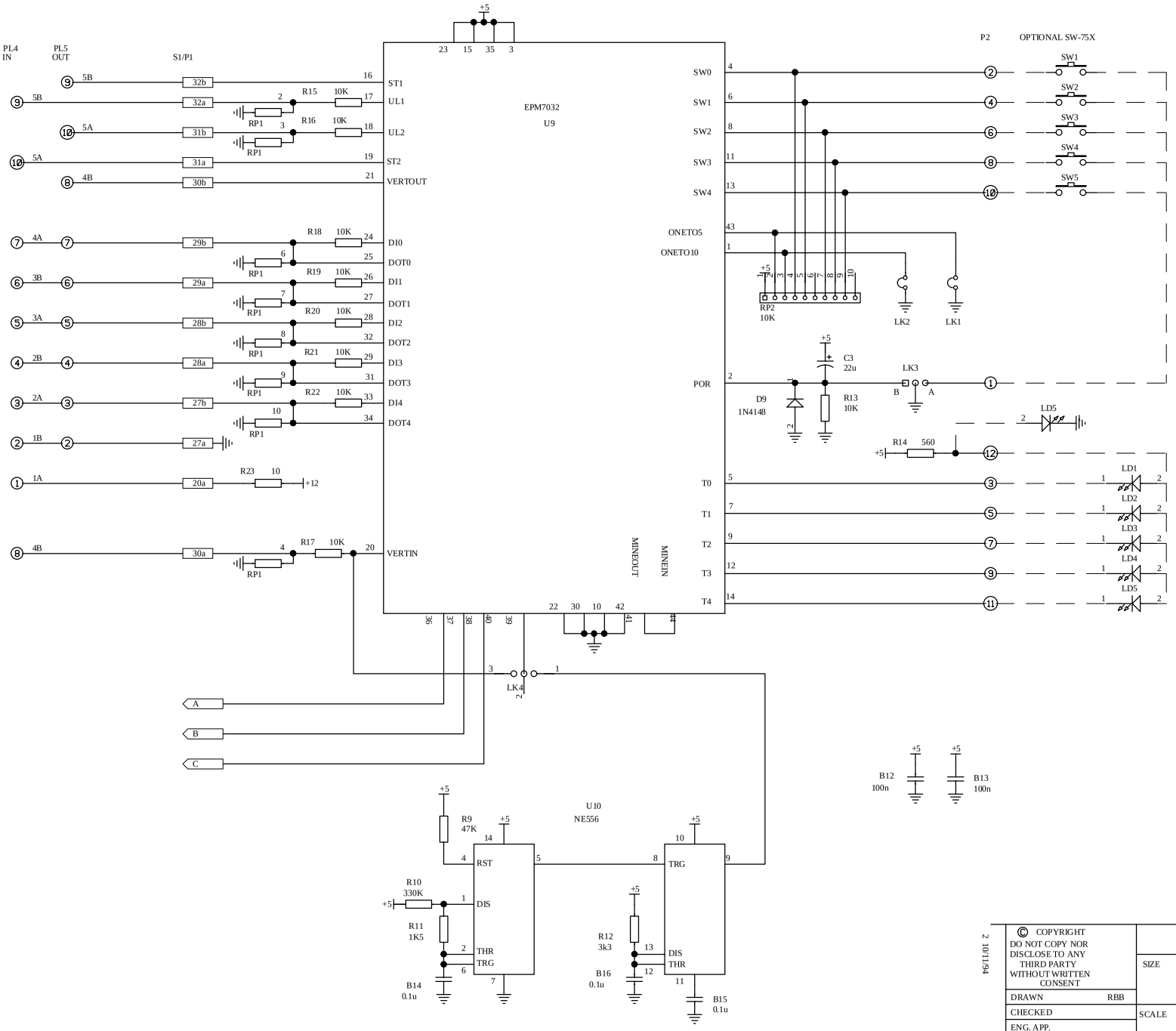
TITLE DDS-3030
5x1 RS-422
SWITCHER

SCALE

DRAWING No. 803763

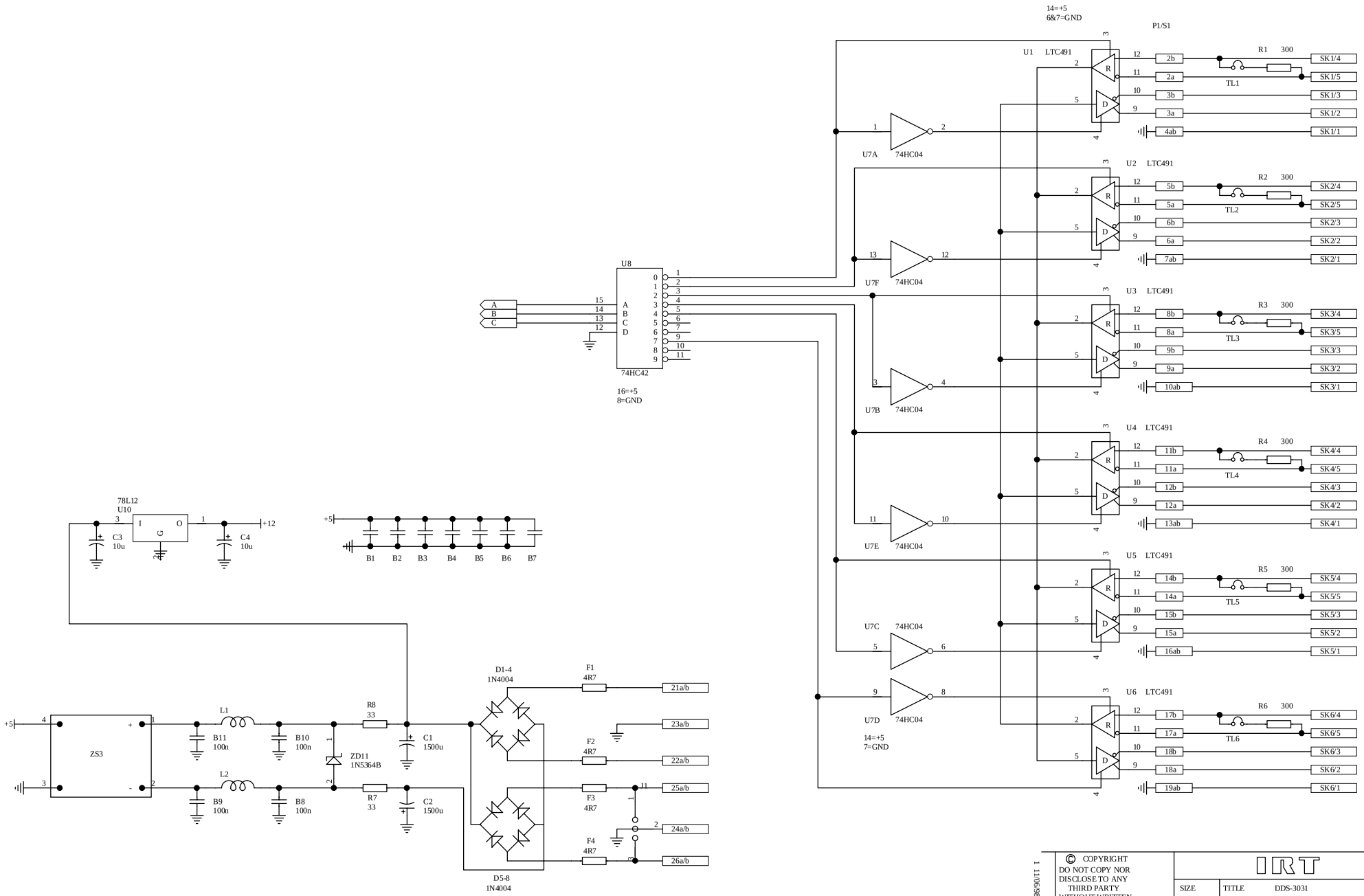
SHEET 1 OF 2

IRT Electronics Pty. Ltd.
ARTARMON NSW AUSTRALIA 2064



© COPYRIGHT DO NOT COPY NOR DISCLOSE TO ANY THIRD PARTY WITHOUT WRITTEN CONSENT	IRT	
DRAWN RBB	SIZE	TITLE DDS-3030 5X1 RS-422 SWITCHER
CHECKED	SCALE	DRAWING No. 803763
ENG. APP.		SHEET 2 OF 2
CONTRACT No.	IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064	

2 10/11/94



DRAWN

CHECKED

ENG. APP.

CONTRACT No.

IRT

SIZE

TITLE DDS-3031
5x1 RS-422
SWITCHER

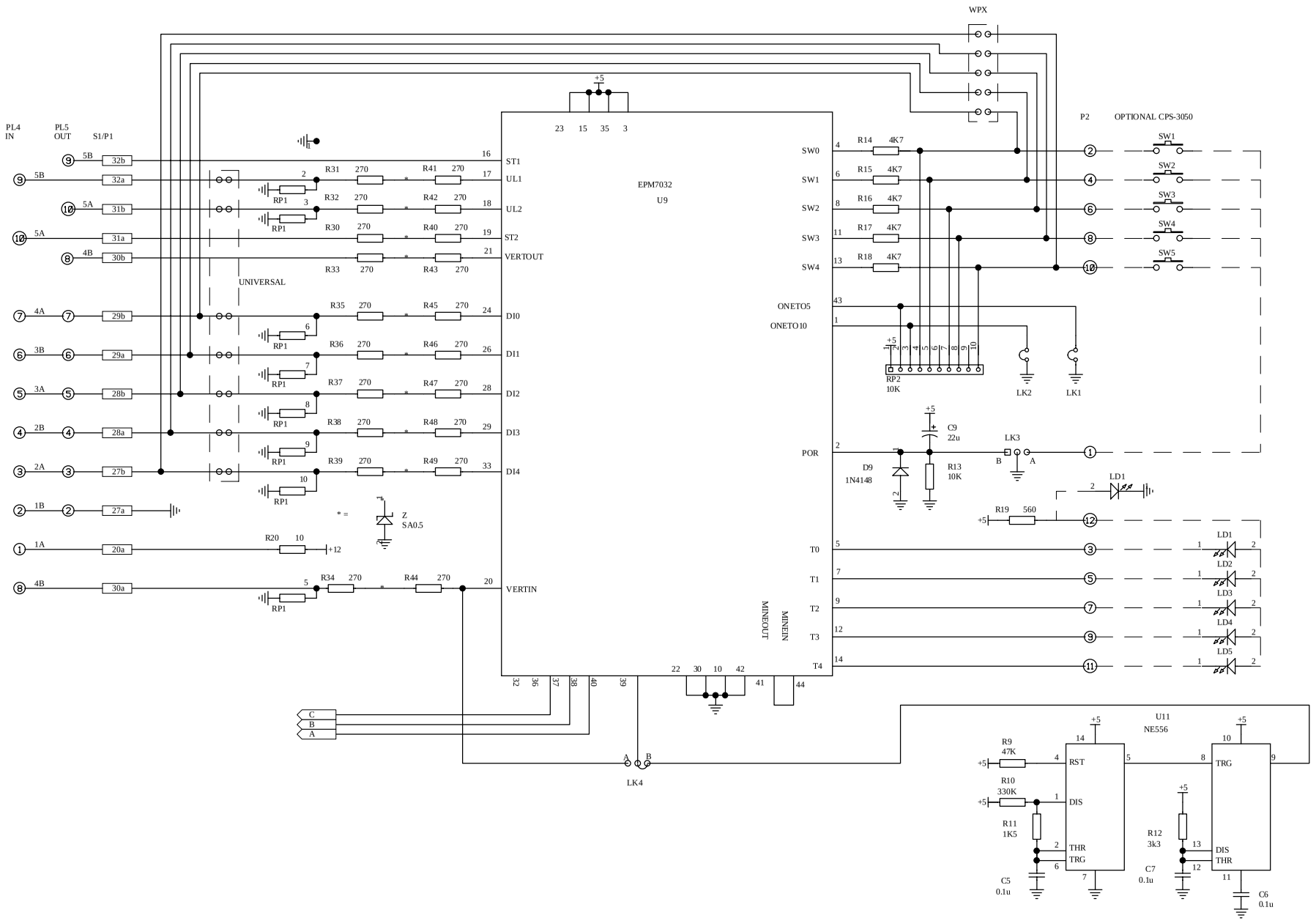
SCALE

DRAWING No. 804200

SHEET 1 OF 2

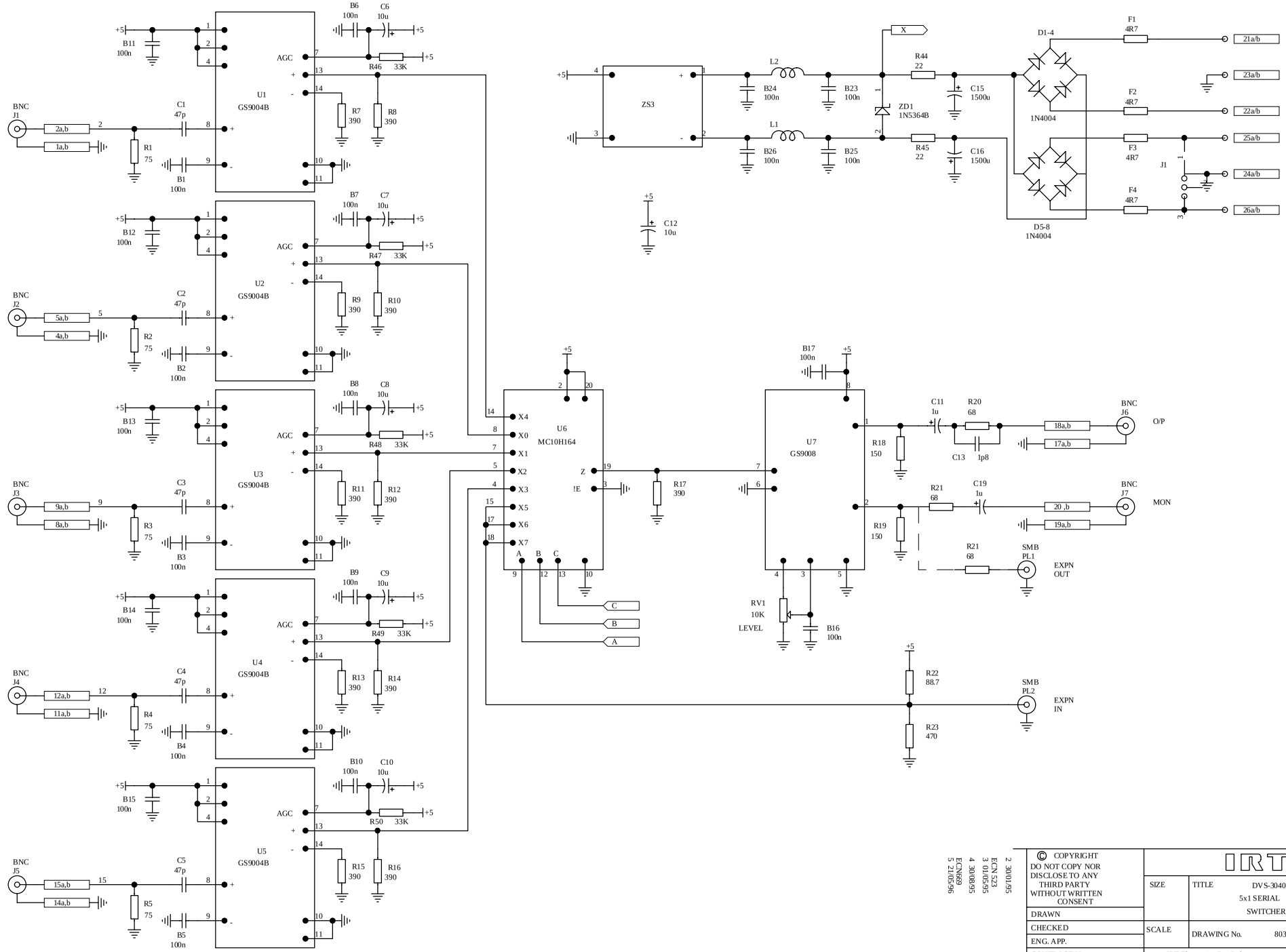
IRT Electronics Pty. Ltd.
ARTARMON NSW AUSTRALIA 2064

1 11/06/98



DRAWN	RBB	SIZE	TITLE DDS-3031 5X1 RS422 SWITCHER
CHECKED		SCALE	DRAWING No. 804200
ENG. APP.			SHEET 2 OF 2
CONTRACT No.		IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064	

11/06/98



PC803663R

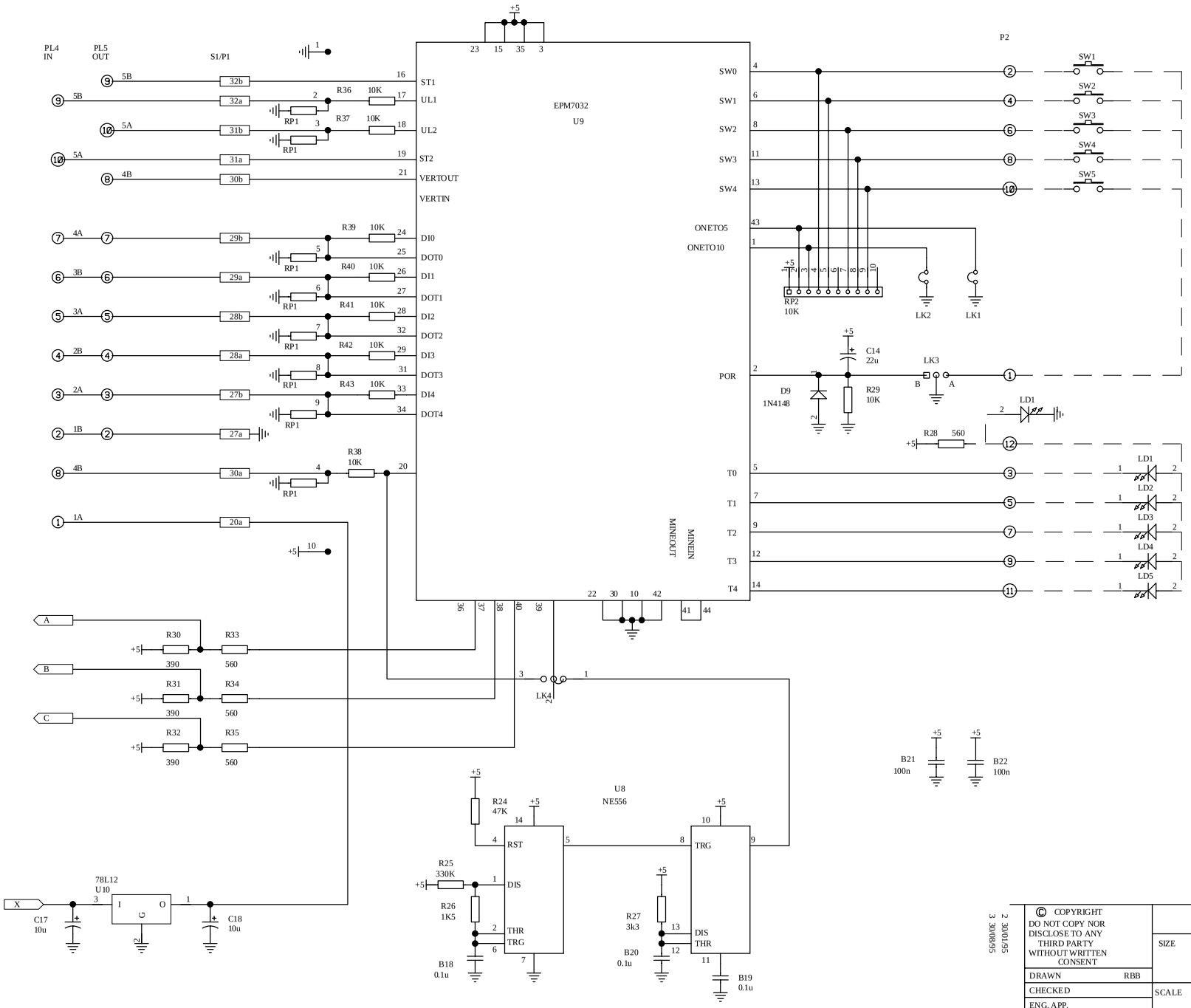
DRAWN	
CHECKED	
ENG. APP.	
CONTRACT No.	

IRT

SIZE	TITLE DVS-3040 5x1 SERIAL SWITCHER	
SCALE	DRAWING No. 803662	SHEET 1 OF 2

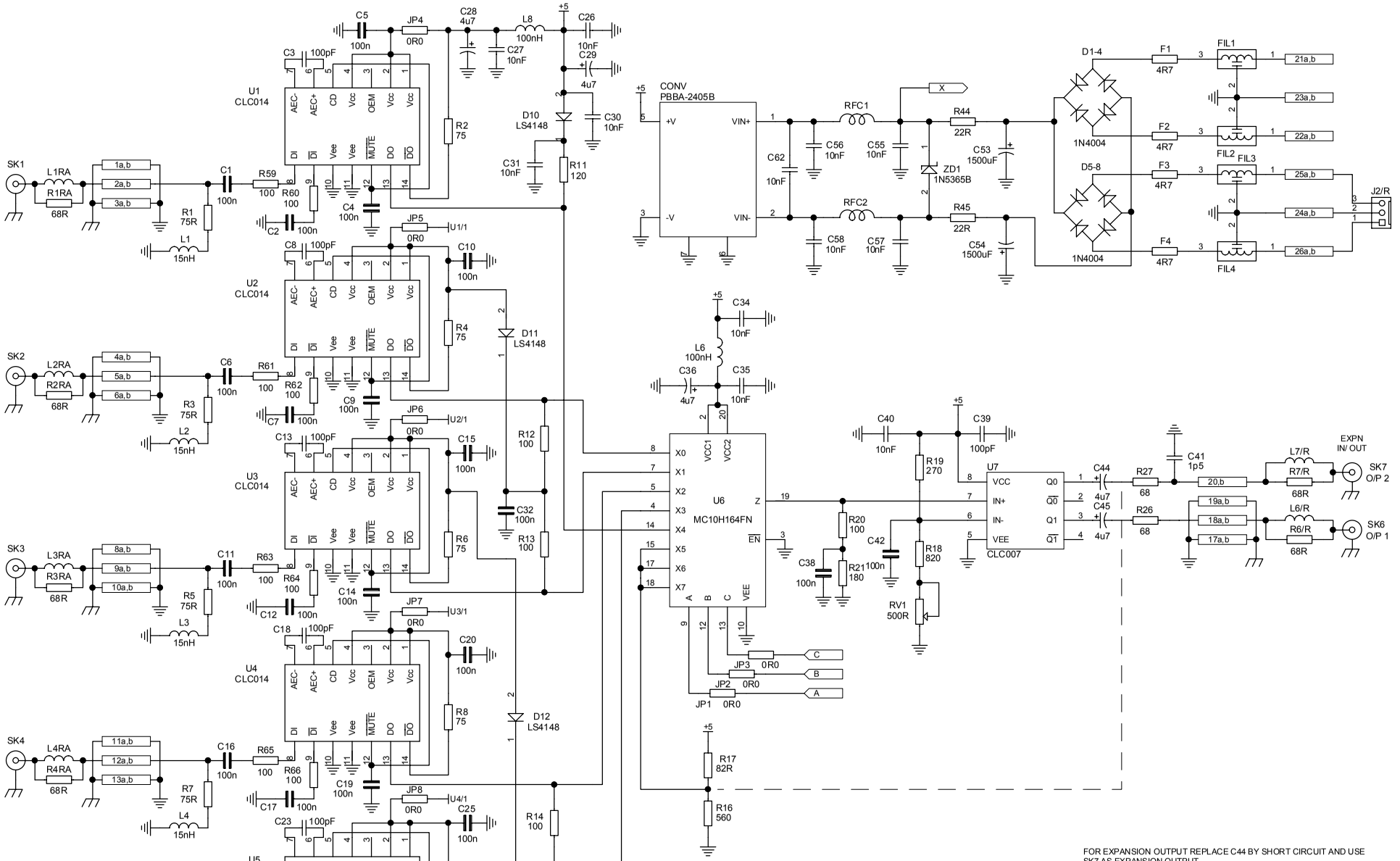
IRT Electronics Pty. Ltd.
ARTARMON NSW AUSTRALIA 2064

2	30/01/95
ECN 523	
3	01/05/95
4	30/08/95
ECN669	
5	21/05/96



© COPYRIGHT DO NOT COPY NOR DISCLOSE TO ANY THIRD PARTY WITHOUT WRITTEN CONSENT		IRT	
DRAWN RBB	SIZE	TITLE DVS-3040 5X1 SERIAL SWITCHER	
CHECKED	SCALE	DRAWING No. 803662	SHEET 2 OF 2
ENG. APP.			
CONTRACT No.		IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064	

3 30/08/95
2 30/01/95



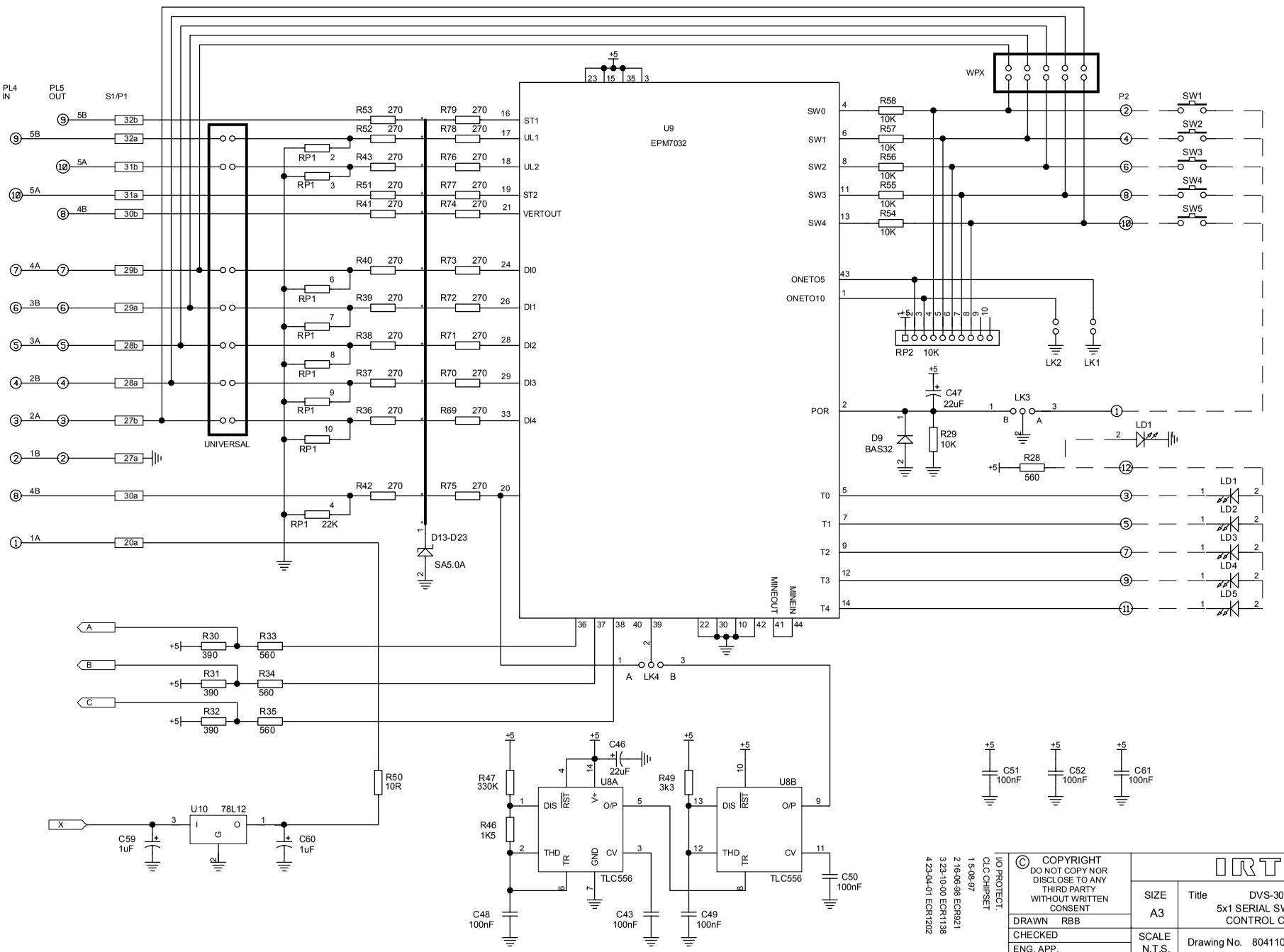
FOR EXPANSION OUTPUT REPLACE C44 BY SHORT CIRCUIT AND USE SK7 AS EXPANSION OUTPUT.

FOR EXPANSION INPUT REMOVE C44, REPLACE R27 WITH 0R0 AND WIRE COAX FROM R27 TO R17. USE SK7 AS EXPANSION INPUT.

CLC CHIPSET
1 5/08/97
2 16-06-98 ECR921
3 23-10-00 ECR1138
4 23-04-01 ECR1202

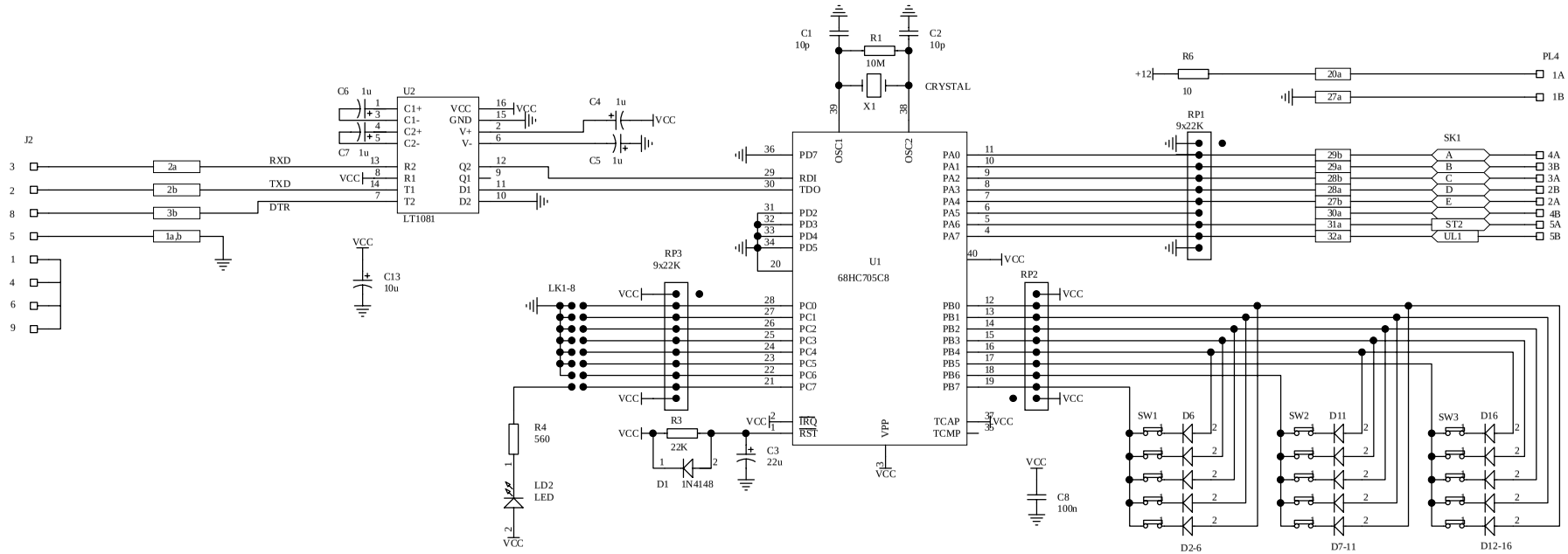
DRAWN RBB	SIZE A3	Title DVS-3041 5x1 SERIAL SWITCHER	
CHECKED	SCALE N.T.S.	Drawing No. 804110	Sheet 1 of 2
ENG. APP.			
Revision: 4		IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064	
Date: 8-Jul-2002			

PCB 804123 ISS.6



4 23-04-01 ECR1202
3 23-10-00 ECR1138
2 16-06-98 ECR921
1 5-08-97
I/O PROTECT.
CLC CHIPSET

DRAWN RBB	SIZE A3	Title DVS-3041 5x1 SERIAL SWITCHER CONTROL CIRCUIT	
CHECKED	SCALE N.T.S.	Drawing No. 804110	Sheet 2 of 2
ENG. APP.			
Revision: 4		IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064	
Date: 8-Jul-2002			



LK1	LK2	LK3	LK4	LK5	LK6	LK7	LK8
			PROG TYPE	*	ADDRESS		LOOP LAMP

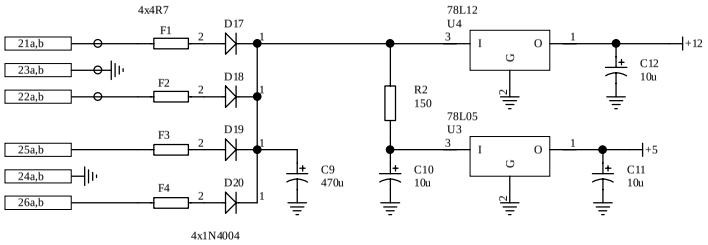
* LK5 OUT, LK4 OUT = SWITCHER PROGRAM
LK5 OUT, LK4 IN = CONTROL PANEL PROGRAM

LK5 OUT, LK4 IN = RESERVED
LK5 OUT, LK4 OUT = RESERVED

DATA WORD ASSIGNMENT

7	6	5	4	3	2	1	0
CMND	ADDRESS	XPOINT NUMBER					

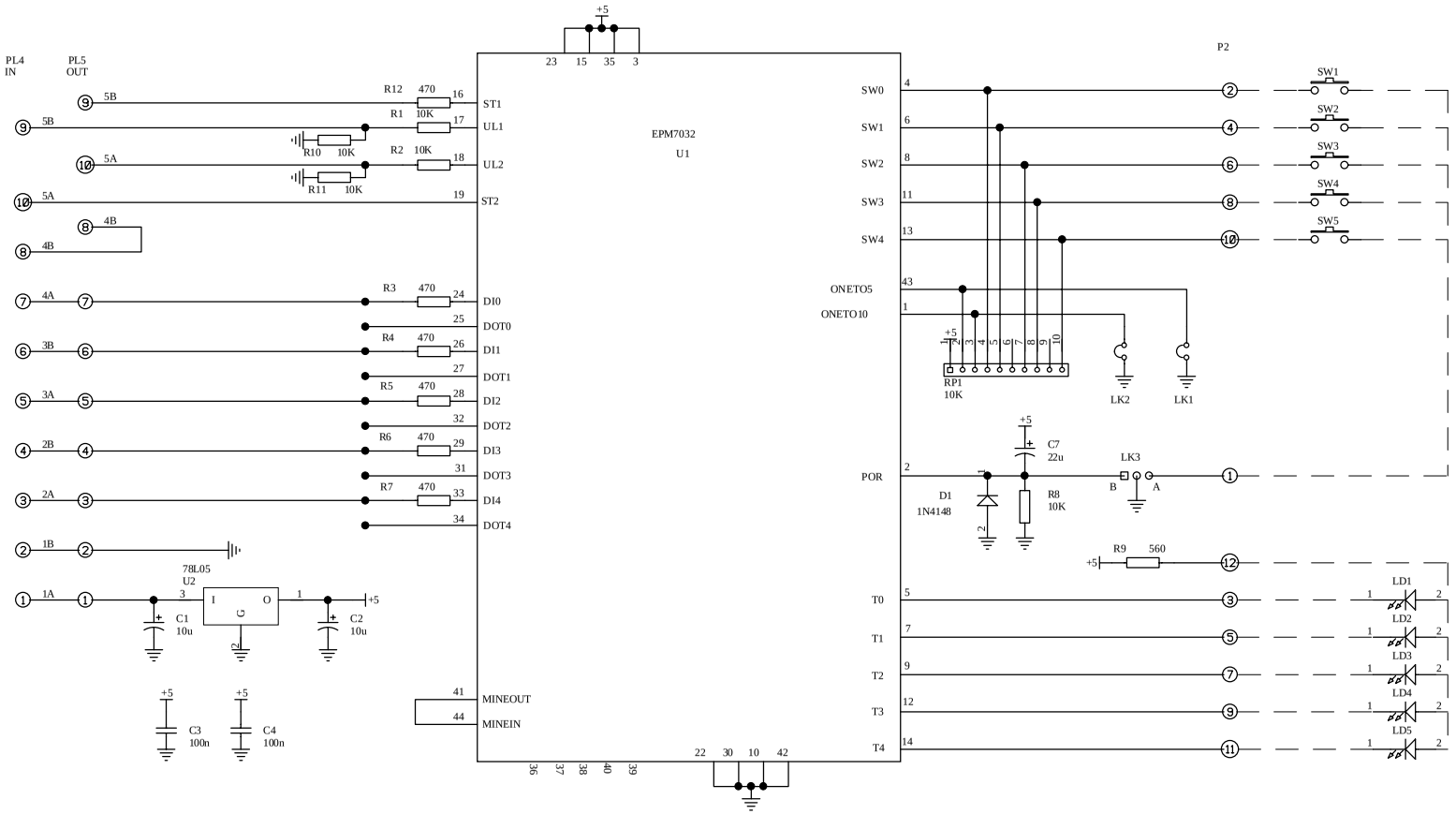
DATA = 9600 BAUD, 8 BITS, NO PARITY, 1 STOP



PC 803799

© COPYRIGHT DO NOT COPY NOR DISCLOSE TO ANY THIRD PARTY WITHOUT WRITTEN CONSENT	IRT	
DRAWN	SIZE	TITLE: CDC-3060 SERIAL CONTROL
CHECKED	SCALE	DRAWING No. 803798
ENG. APP.		SHEET 1 OF 1
CONTRACT No.	IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064	

1 17/02/95
2 04/04/95
ECN 548
3 24/07/95
4 28/08/95



PCB 803772 & PCB 803773

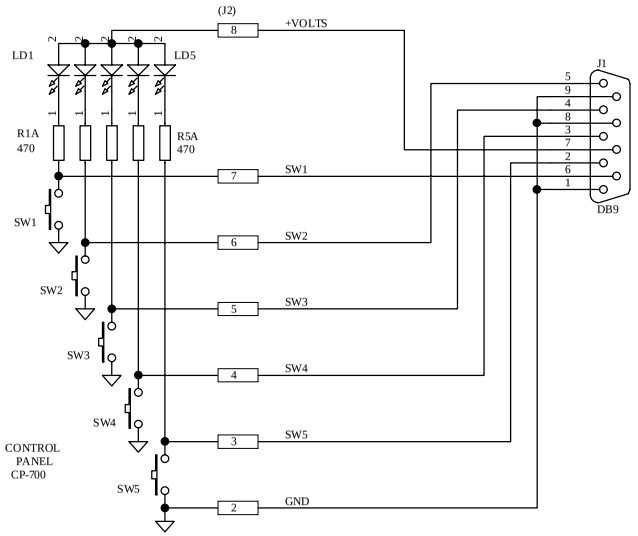
4 02/12/96 ECR777
3 30/08/95
2 16/5/1994

DRAWN RBB
CHECKED
ENG. APP.
CONTRACT No.

IRT

SIZE
TITLE CPS-9000
REMOTE CONTROL PANEL
SCALE
DRAWING No. 803771
SHEET 1 OF 1

IRT Electronics Pty. Ltd.
ARTARMON NSW AUSTRALIA 2064



1 3/8/1994

DRAWN K.N.
CHECKED C.N.
ENG. APP.
CONTRACT No.

IRT

SIZE

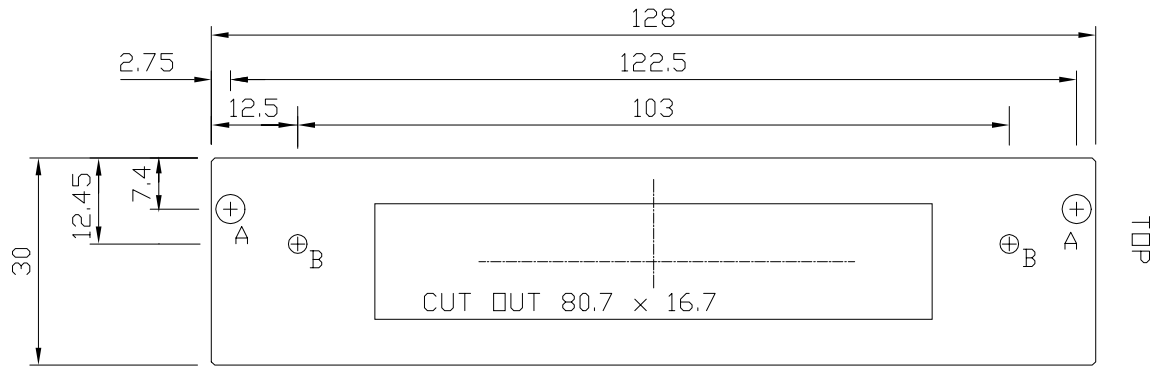
TITLE
CP-700
5x1 SWITCHER

SCALE

DRAWING No. 803740

SHEET
1 OF 1

IRT Electronics Pty. Ltd.
ARTARMON NSW AUSTRALIA 2064



MATERIAL : 1.6mm MILD STEEL

FINISH : PAINT APO GREY SATIN 40% GLOSS, POWDER COAT LESS THAN 55 MICRONS.

2 HOLES 'A' 4.1mm DIAM

2 HOLES 'B' 2.7mm DIAM

CHAMFER CORNERS 0.5mm.

ISS 6 : CHANGED 2.7mm HOLES TO 4.1
CHANGED FINISH

ISS 7 : CHANGED 2 4.1mm HOLES TO 2.7mm.

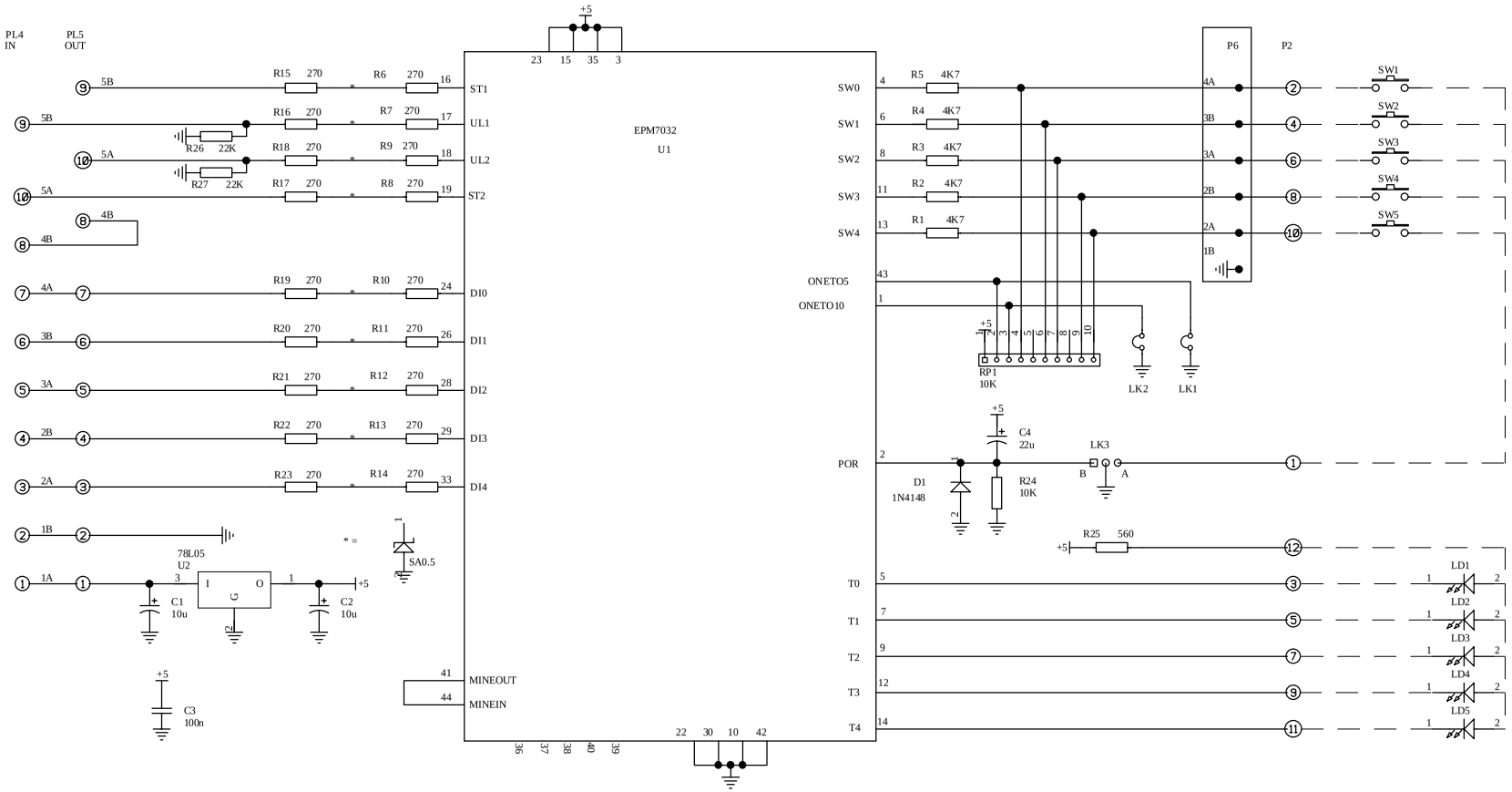
7 19/02/97 ECN 801
6 15/01/96 ECN 609
5 21/11/95 ECN 377
4 29/7/94

DRAWN RBB
CHECKED
ENG. APP.
CONTRACT No.

IRT

SIZE
TITLE CP-600 FRONT PANEL MECHANICAL
SCALE
DRAWING No. 803286
SHEET 1 OF 1

IRT Electronics Pty. Ltd.
ARTARMON NSW AUSTRALIA 2064



© COPYRIGHT DO NOT COPY NOR DISCLOSE TO ANY THIRD PARTY WITHOUT WRITTEN CONSENT		IRT	
DRAWN RBB	SIZE	TITLE CPS-9001 REMOTE CONTROL PANEL	
CHECKED	SCALE	DRAWING No. 804194	SHEET 1 OF 1
ENG. APP.			
CONTRACT No.		IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064	

1 03/06/98

PCB 803772 & PCB 803773