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EUROCARD

AES/EBU Analogue to Digital Converter

Type AAC-3390

Designed and manufactured in Australia

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

AAC-3390

AES/EBU Analogue to Digital Converter

Instruction Manual

Note: This manual applies to units SN 9911001 and above.

Table of Contents

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.

Description.

The IRT AAC-3390 is an analogue audio to AES/EBU digital audio signal converter, and converts standard stereo analogue audio signals to the AES3-1992 and SMPTE-276 AES digital audio standard. The input signals are a stereo pair of balanced audio at the standard +4dBu line up level. The outputs are three serial digital audio signals, one unbalanced BNC connection on the front panel for monitoring and two from the rear panel assembly which can be 110 ohms balanced line when using the ZAC-3391 rear panel assembly, or 75 ohms unbalanced BNC connections when using the ZAC-3390 rear panel assembly.

A further input is provided for a reference AES input signal to lock the signal from the AAC-3390 to a station reference. The reference input can be either 110 ohms terminating balanced line or 75 ohms terminating unbalanced line, both connections are provided on the rear panel assembly with the selection of the input type by links on the AAC-3390 main circuit board.

Front panel LED indicators are provided for DC voltage present, presence of input audio levels above –30dBu, lock to external AES reference and overflow at 0dBFS corresponding to the +24dBu full scale input audio input level.

The AAC-3390 is designed to fit the IRT range of eurocard mounting frames, including the 12 slot FR-700 and 2 slot FRU-1030 rack mounting frames.

Circuit Description.

Balanced operational amplifier circuits U1A/B and U2A/B are used to provide the correct input level to U3 a CS5335 analogue to digital converter. The dc bias for the input amplifiers is supplied by buffer amplifiers U1C and U2C with inputs from the reference bias of the CS5335, this provides the correct bias to the CS5335 for best signal linearity and total harmonic distortion of the converted signal.

Differential input amplifiers U1D and U2D drive comparator circuits U12A and U12B whose outputs change at the threshold set by RV3. The output signals are applied to comparator circuits U12C and U12D which apply power to LED indicators LD3 and LD4 when the input audio signal level exceeds the level required to trip U12A and U12B, this provides front panel indication of the presence of the input analogue audio input signal.

The analogue to digital converter U3 generates the required digital signals for sampling and for transporting the signal to the CS8402 EAS/EBU digital audio interface transmitter from a 12.288 MHz reference master clock. The internal master clock oscillator is a crystal locked oscillator Q1 buffered by Q2 and U10. U9 is used as a switch to select the internal reference or external reference master clock depending on the setting of LK6 and the presence of an external reference to U15, the CS8412 AES/EBU receiver. U5 is used to switch the serial data clock and left/right clock between internally generated clock signals and the external references from U15 depending on the setting of LK6 and the presence of an external reference input to U15. U7 provides the power on reset signal required to initialise the CS5335 A/D converter, a reset is applied on power on and whenever a change in the state of the reference select line at LK6 occurs. The reference select line is the inverse of the error flag from U15. Thus with links LK6 and LK15 **open** applying an external reference to the rear panel reference connector will initialise the CS5335 into the slave mode with the clock signals locked to the external reference. Removing the signal will initialise the CS5335 into the master mode with the internal clock reference used. Should the unit be required to operate only on internal reference both LK6 and LK15 must be **closed**, this will prevent the application of any external reference signal. Signals from U11 the CS8402 transmitter are coupled to output driver U16 for the rear panel feeds and to J1 the front panel monitor connector.

U4A detects any over-range signals from U3 to provide an indication on the front panel with LED LD2.

The AAC-3390 external AES reference input circuit is a linking arrangement (SW1,SW2) to select either the balanced or unbalanced input from the rear panel input connector, the connections are marked on the circuit board at SW1, SW2. The signal is then coupled to U15 a CS8412 which is used to provide external referenced master clock, serial data clock and left/right clock.

The power supply comprises two bridge rectifiers whose rectified outputs are paralleled (positive and negative respectively) to provide redundancy. The inputs to these rectifiers are two independent feeds of 28 Vac (centre tap grounded). A DC-DC converter module is used to provide the required 5 volts supply for the digital circuits. The DC indicator LED on the front panel is used to indicate presence of the power supply voltages. Regulators are used to provide the +/- 12 volts supplies for the analogue circuits comprising operational amplifiers U1,U2 and U12.

AAC-3390 Specifications

Inputs

Analogue inputs

Number	2 channels – one stereo pair.
Type	>30K Ω balanced analogue audio.
Input coupling	AC
Input level setting	+24dBu for 0 dB full scale digital signal.
Input connector	Removable screw terminal block.

Reference input

Type	1 x 110 Ω balanced terminating. or 1 x 75 Ω unbalancedterminating. selected by links on module PCB.
Format	AES3-1992 standard.
Input level	200 mVp-p minimum.
Input cable length	>500m Belden (8281) >200m 110 Ω (AES digital high quality shielded pair).

Outputs

AES/EBU

Rear panel type ZAC-3390	2 x 75 Ω unbalanced >1Vp-p.
or	
Rear panel type ZAC-3391	2 x 110 Ω balanced >3Vp-p.
Front panel monitoring	1 x 75 Ω unbalanced >1Vp-p.
Format	AES3-1992 standard.

Performance

Sample rate	48 KHz internal rate, or as set by external reference.
Output signal rise and fall times	<20 ns.
Frequency response	+/-0.05 dB 20 Hz to 20 KHz.
THD + N	-95dB, 20Hz – 20 KHz @ -4 dBFS.
Inter-channel crosstalk	-100 dB (20 Hz – 20 KHz).
Linearity	+/-0.5 dB at –90 dBFS.
Power requirement per unit	14V-0-14Vac 3.5 VA.

Connectors

Unbalanced	BNC.
Balanced	Removable screw terminal blocks.
Operating temperature range	0 - 50° C ambient
Mechanical	6 HP x 3 U x 220 mm IRT Eurocard Suitable for mounting in IRT 19" rack chassis types FR-700 & FRU-1030.
Finish: Front panel	Grey powder coat, silk-screened black lettering & red IRT logo
Rear assembly	Detachable silk-screened PCB with direct mount connectors to Eurocard and external signals
Standard accessories	Operation manual
Optional accessories	TME-6 module extender card

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

Installation

Pre-installation:

Handling:

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

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

Power:

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

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

Earthing:

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

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

Installation in frame or chassis:

See details in separate manual for selected frame type.

Signal connections to the rear panel assembly.

Input signal connections are made to the two removable screw terminal blocks at SK1 and SK2.

The audio inputs are bridging > 30 Kohms, if a 600 ohm termination is required close LK1 and LK2 with a wire link soldered at the LK1 and LK2 positions on the rear panel.

Output signal connections are made to connectors SK3 and SK4 on the selected rear panel of the AAC-3390.

Use rear panel ZAC-3390 for two unbalanced 75 ohms BNC output circuits or rear panel ZAC-3391 for two balanced 100 ohms output circuits.

The reference input signal can be either at SK5 a 75 ohms unbalanced terminating input or at SK6 a 110 ohms balanced terminating input, the **input selection** is done by links **SW1,SW2 on the module pcb** near pin 32 of the board connector. Move the links provided to the 75 or 110 positions marked on the board as required. The reference input signal will then be connected to the appropriate input connector on the rear panel.

The presence of AES signal at the output of the ZAC-3390 can be monitored using the front panel monitoring BNC socket provided.

Selection of internal or external clock reference.

For **fixed internal** clock reference **close** links LK6 and LK15 on the module main circuit board.

For a clock reference selectable between the internal clock and the external clock **open** links LK6 and LK15 on the module main circuit board. In this mode of operation the AAC-3390 will lock to a external reference applied to the external reference input selected by SW1 and SW2, **whenever this reference is present** and **revert to the internal crystal clock reference if the external reference is removed.**

NOTE: It is important for the operation of the AAC-3390 that links LK6 and LK15 by **both open or closed together never individually**.

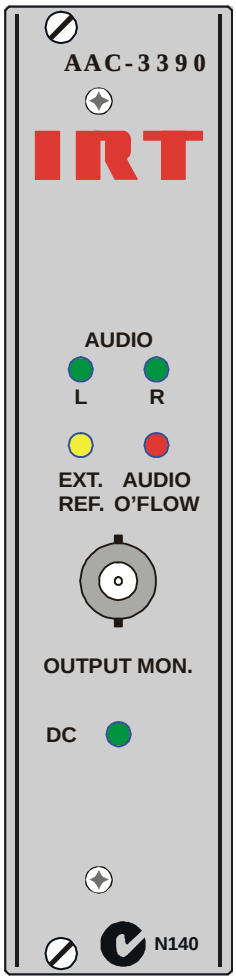
RV3 on the main circuit board sets the threshold for the audio presence indicator leds on the front panel. The factory setting is for a –30 dBu analogue input signal.

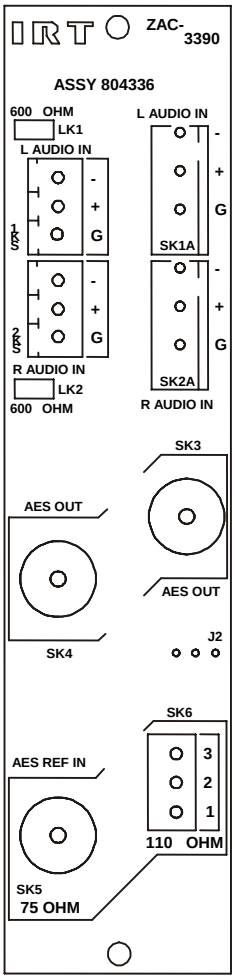
Diagrams are provided giving details of the circuits of the AAC-3390.

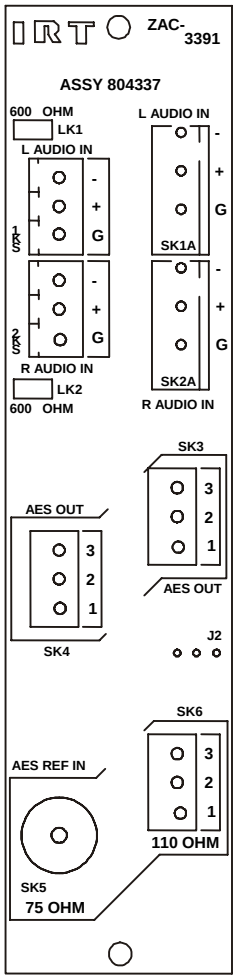
NOTE: If it is necessary to remove a component from the circuit board during maintenance **IT IS ESSENTIAL TO ADD SOME SOLDER TO THE COMPONENT SOLDER JOINTS BEFORE REMOVAL IS ATTEMPTED**. This will add some solder flux to the joint and allow the heat from the iron to flow quickly into the joint and prevent localised overheating and damage to the circuit board.
Rear assemblies may be removed for maintenance. Make sure that extraction force is applied equally and steadily at the top and bottom of the rear assembly. SHOULD THIS NOT BE DONE THERE IS A GOOD CHANCE THAT YOU WILL BEND THE MODULE CONNECTOR PINS making it very difficult to re-install the rear assembly.

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

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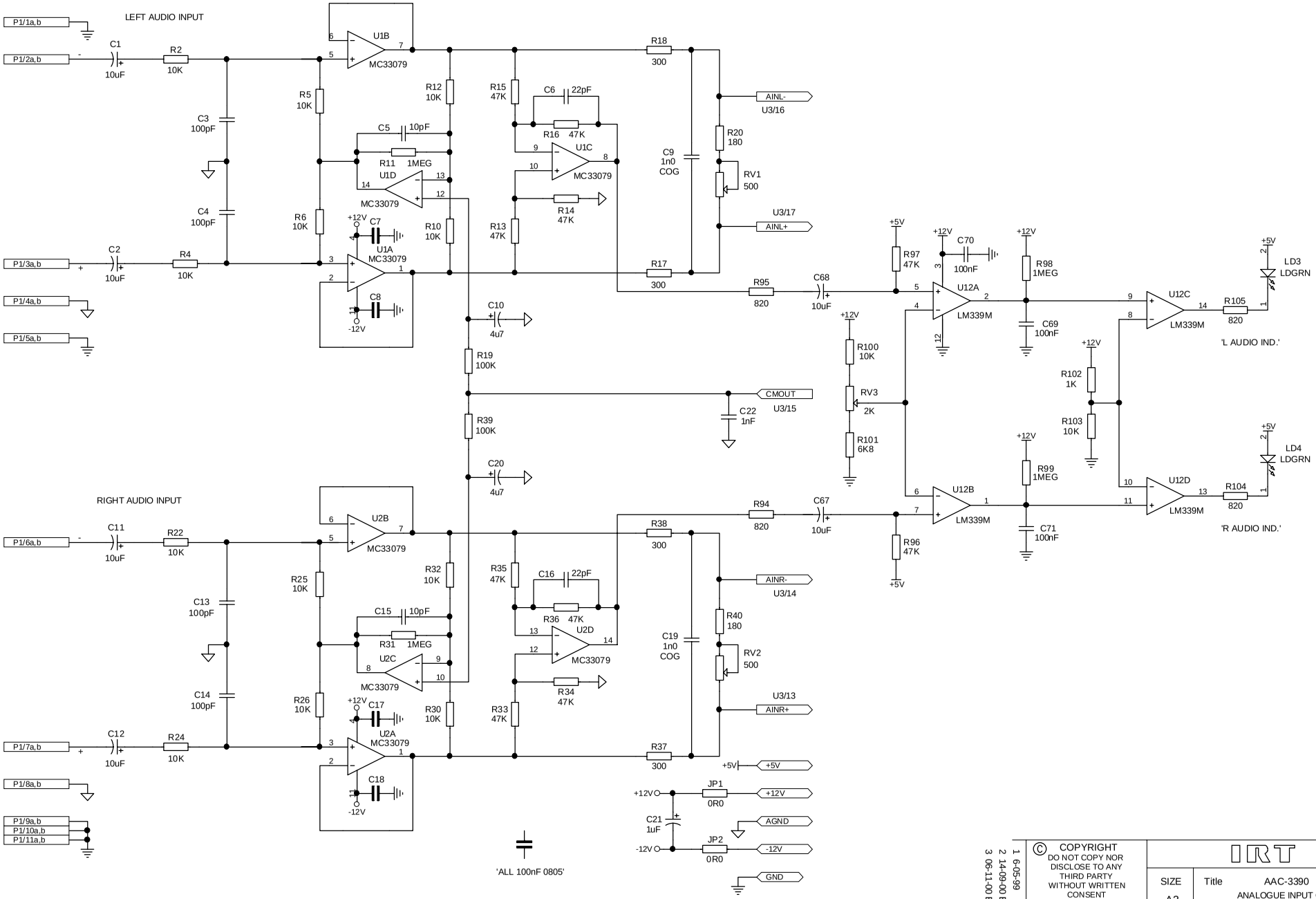
804331	5	AAC-3390 ZAC3390/91 rear panel assemblies



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2	14-09-00 ECR1128
3	06-11-00 ECR1141

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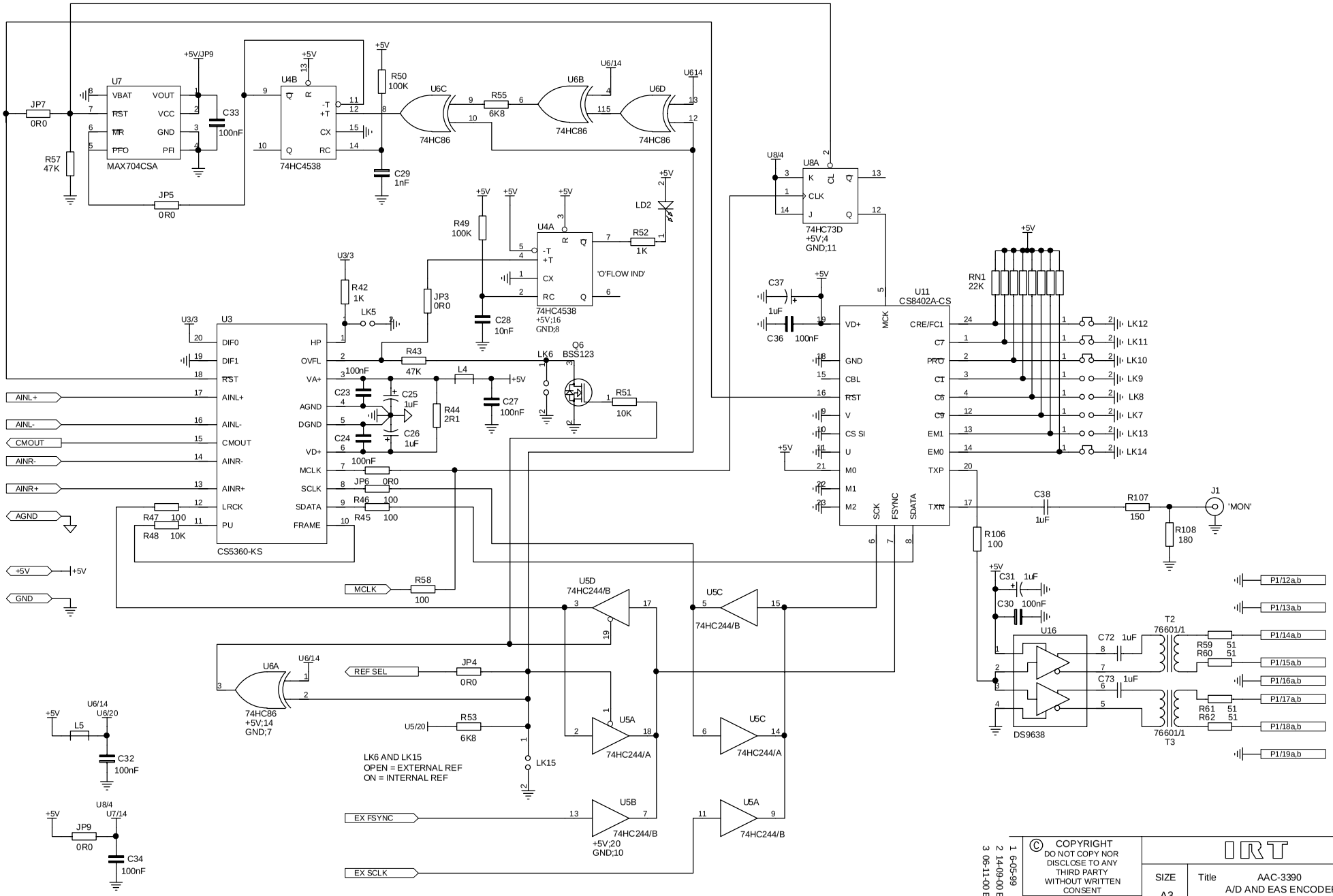
SIZE A3	Title AAC-3390 ANALOGUE INPUT CCT OF AES/EBU ENCODER	
DRAWN K.N.		
CHECKED	SCALE N.T.S.	Drawing No. 804331
ENG. APP.		Sheet 1 of 5
Revision: 3	IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064	
Date: 1-Feb-2001		



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IRT

SIZE A3	Title AAC-3390 A/D AND EAS ENCODER OF AES/EBU ENCODER	
DRAWN K.N.		
CHECKED	SCALE N.T.S.	Drawing No. 804331 — Sheet 2 of 5
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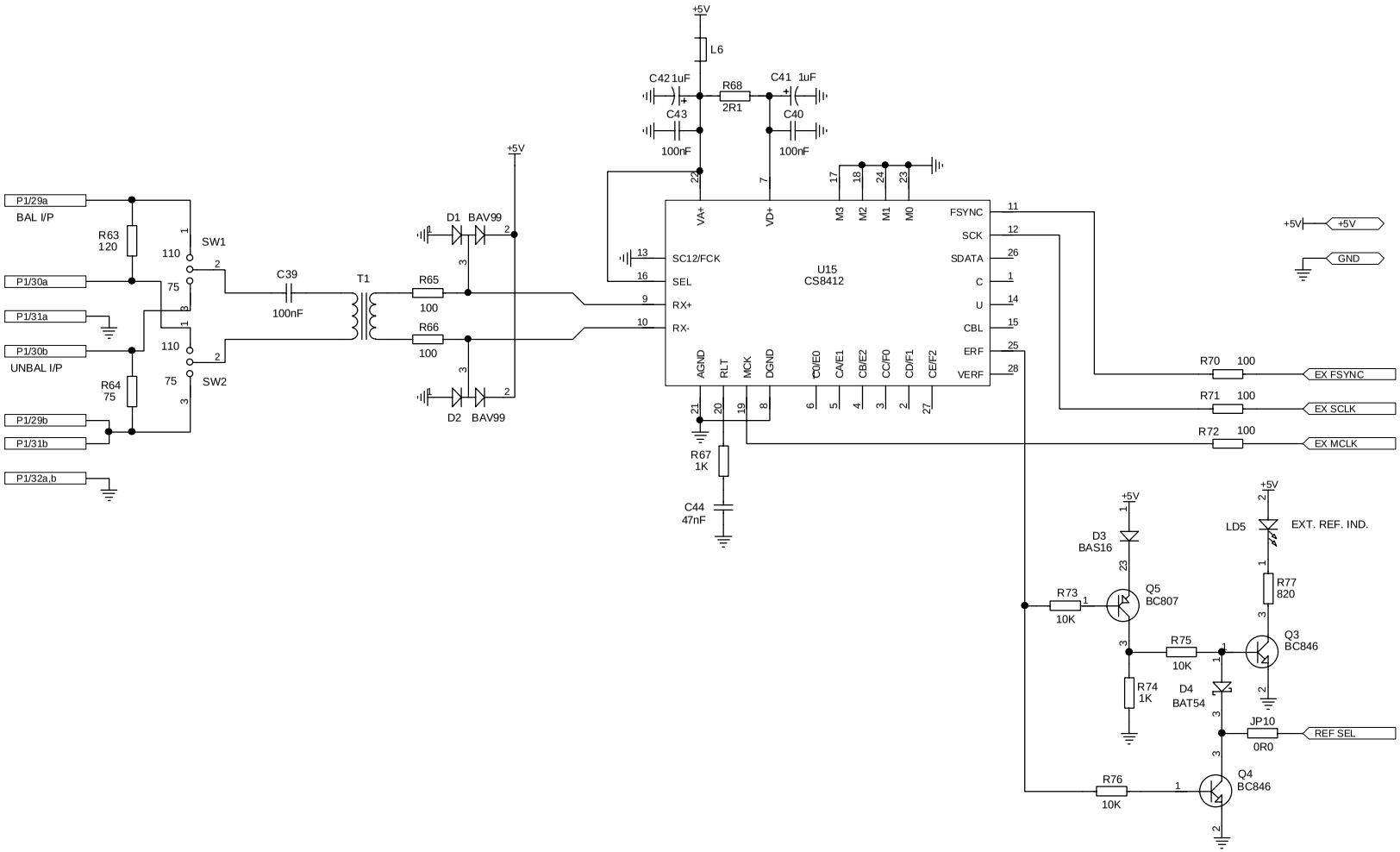
Date: 1-Feb-2001		



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3	06-11-00 ECR1141

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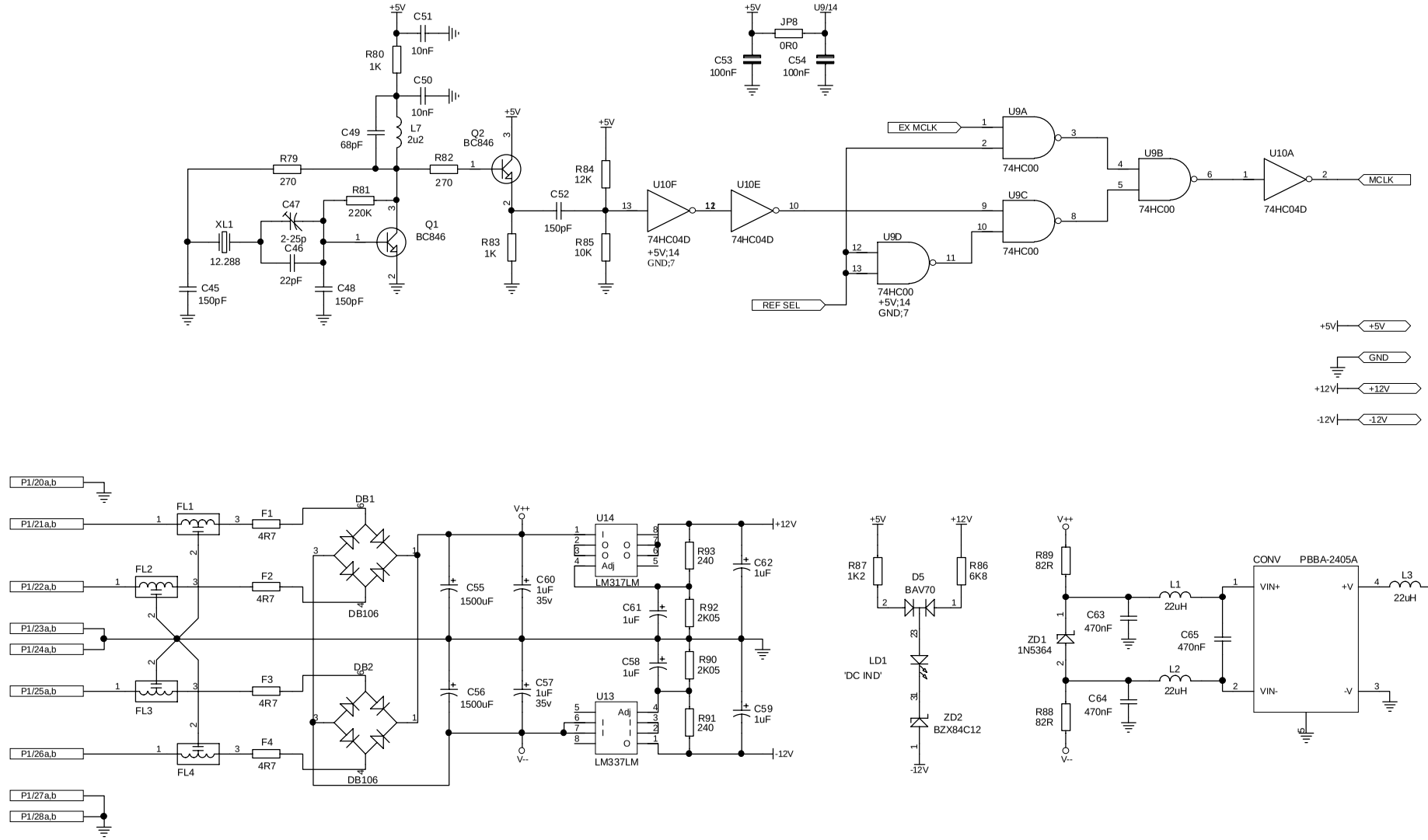
SIZE A3	Title AAC-3390 REFERENCE INPUT OF AES/EBU ENCODER	
DRAWN K.N.		
CHECKED	SCALE N.T.S.	Drawing No. 804331 — Sheet 3 of 5
ENG. APP.		
Revision: 3	IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064	
Date: 1-Feb-2001		



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SIZE A3	Title AAC-3390 PSU AND MASTER CLOCK OF AES/EBU ENCODER	
DRAWN K.N.		
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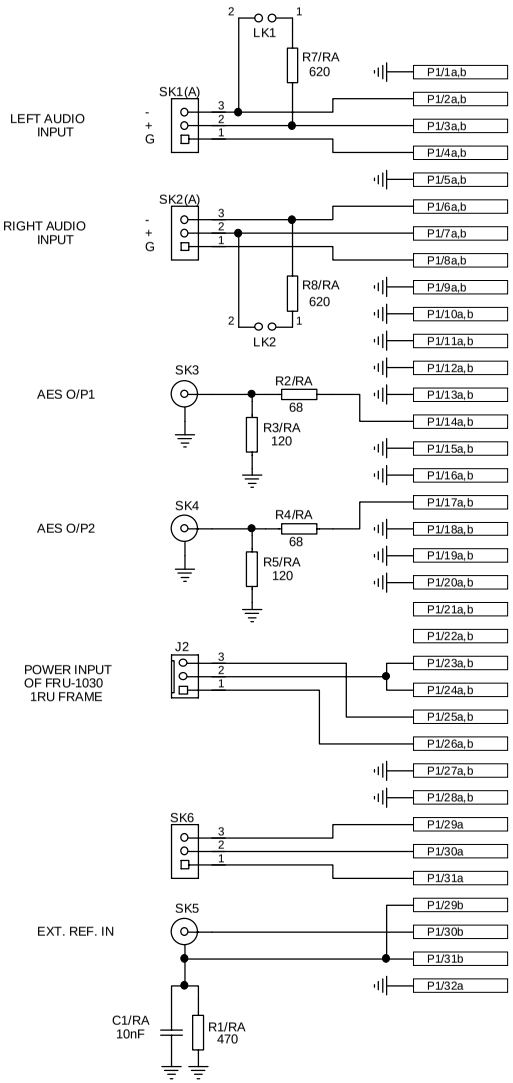
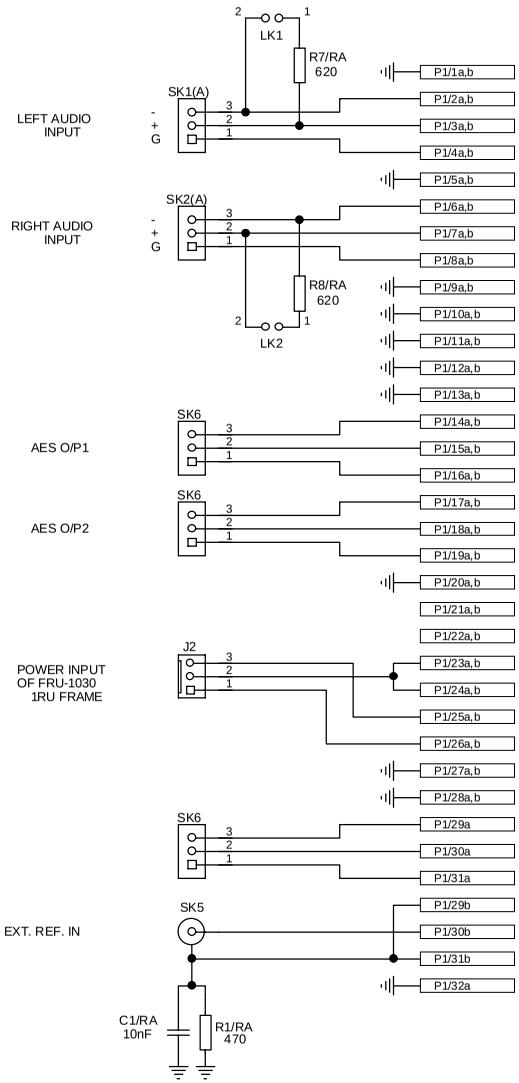
ZAC-3390 REAR PANEL



ZAC-3391 REAR PANEL



NOTE: SK1 AND SK2 ARE COMPRESSION TERMINAL PLUG AND SOCKETS.

SK1A AND SK2A ARE KRONE INSULATION DISPLACEMENT CONNECTORS, FITTED AS AN ALTERNATIVE TO SK1,SK2 IF REQUIRED.

LK1 AND LK2 TO BE CLOSED FOR INPUT TERMINATION

1 6-05-99
2 14-09-00 ECR1128
3 06-11-00 ECR1141

IRT

SIZE A3	Title ZAC-3390/91 REAR ASSEMBLIES OF AES/EBU ENCODER	
DRAWN K.N.		
CHECKED	SCALE N.T.S.	Drawing No. 804331	Sheet 5 of 5
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