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IRT Eurocard

Types
AAT-3140
Audio subcarrier modulator
&
AAR-3140
Audio subcarrier de-modulator

Telstra Serial Items
352/108 & 109

(This handbook Serial Item 352/110)

Designed and manufactured in Australia

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

IRT Eurocard

Types
AAT-3140
Audio subcarrier modulator
&
AAR-3140
Audio subcarrier de-modulator

Instruction Book

Table of Contents

This instruction book applies to units later than S/N 9605000.

AAT-3140 & AAR-3140 Dual Channel Audio Subcarrier System

General Description

The AAT-3140 is an IRT Eurocard dual channel audio modulator and the AAR-3140 is the matching de-modulator. The audio input to the AAT-3140 is balanced high impedance and the output of the AAR-3140 is balanced low impedance.

Whilst primarily intended to function as part of an IRT fibre optic system they may also be used for other applications where it is desired to include audio modulated subcarriers in the video signal.

The AAT-3140 generates a subcarrier frequency for each channel, which is modulated by the incoming audio signal. The AAR-3140 detects two selected subcarrier frequencies and de-modulates them to obtain the audio signal for each channel.

The modules must be supported by an audio / video combiner (or splitter at the receiver end) and Low Pass Filter. These may be on a separate module (see AVF-3125) or as an integral part of a microwave or fibre optic video transmitter / receiver (see AVT-3070/AVR-3070).

Various audio subcarrier frequencies are available including 7.5 MHz & 8.3 MHz (Telstra specified) or 7.36 MHz (Ch. 1), 7.765 MHz (Ch. 2), 8.215 MHz (Ch. 3) & 8.71 MHz (Ch. 4) (CCIR recommended).

A suffix is added to the product number to indicate the subcarrier frequencies used. A "T" suffix indicates Telstra's specification. Standard frequencies are indicated by their number in the sequence. For example the first module supplied would normally be an AAT-3140/24, indicating frequencies of 7.765 and 8.71 MHz.

Standard features:

- Two high quality audio channels in a single module.
- Suitable for use with fibre optic and microwave links.
- Modules may be linked using active subcarrier loop through connection.

Equipment provided:

Standard:	**AAT-3140:**	AAT-3140 Dual audio modulator module. Rear assembly for AAT-3140.
	AAR-3140:	AAR-3140 Dual audio modulator module. Rear assembly for AAR-3140.
	Optional:	GVW-3011 BNC-BNC 150 mm cable for connecting subcarrier to adjacent module in 3 RU frames. GVW-3012 BNC-BNC 300 mm cable for connecting subcarrier to adjacent module in 1 RU frames. GDW-3140 6 pin IDC-IDC 150 mm cable for linking AAR-3140 to adjacent module for audio muting function in 3 RU frames. GDW-3141 6 pin IDC-IDC 300 mm cable for linking AAR-3140 to adjacent module for audio muting function in 1 RU frames.

Technical Specifications
IRT Eurocard modules
Types AAT-3140 / AAR-3140

AAT-3140
Inputs:
Audio

Number	2 (Left and Right)
Type	Tranformerless, bridging.
Impedance	> 10KΩ balanced (600 Ω available by link on AAT-3140T.)
Nominal input level	+4 dBu
Maximum input level	+14 dBu
Input CMR	> 50 dB 20 Hz to 20 kHz
Input gain range	±3 dB

External subcarrier

Number	1
Type	DC coupled
Impedance	75 Ω.
Nominal input level	100 mVp-p per channel.

Subcarrier output:

Type	DC coupled.
Number	1
Impedance	75 Ω.
Nominal output level	100 mVp-p per channel.
Frequency (factory set according to application)	Two of the following (one per channel).
Telecom spec:	7.5 MHz & 8.3 MHz.
CCIR recommended:	7.765 MHz & 8.710 MHz or 7.360 MHz & 8.215 MHz

AAR-3140
Subcarrier Input:

Type	AC coupled.
Number	1
Impedance	75 Ω.
Nominal input level	100 mVp-p per channel.
Frequency (factory set according to application)	Two of the following (one per channel).
Telecom spec:	7.5 MHz & 8.3 MHz.
CCIR recommended:	7.765 MHz & 8.710 MHz or 7.360 MHz & 8.215 MHz

Outputs:

Audio

Type	Transformerless, balanced.
Number	2 (Left and Right)
Impedance	< 40 Ω.
Nominal output level	+4 dBu
DC on Output	< ±20 mV.
Output gain range	±3 dB

External subcarrier

Number	1
Type	DC coupled
Impedance	75 Ω.
Nominal input level	100 mVp-p per channel.

AAT-3140 to AAR-3140 link performance:

Frequency response	+0.15/-0.75 dB (30 Hz to 15 kHz)
Total harmonic distortion measured @: +13 dBm <4 kHz & +10 dBm =>4 kHz	
30 Hz to 7.5 kHz	<0.2 %
Intelligible crosstalk ratio	>80 dB
Phase difference between channels:	
30 Hz to 4 KHz	<3.75°
15 KHz	<10°
S/N ratio: WRT maximum level (+14 dBu)	>69 dB

Connectors:

Standard modules	Plugable screw block connectors
Matching plug	Phoenix type MC1.5/3-ST-3.81 3 pin plug (2 x supplied with module.)
"T" modules	Krone IDC.

Power Requirements:

	28 Vac CT (14-0-14) or ± 16V DC
Power consumption	<5 VA

Other:

Temperature range	0 - 50° C ambient
Mechanical	Suitable for mounting in IRT 19" rack chassis types with input, output and power connections on the rear panel
Finish: Front panel	Grey background, black lettering & red IRT logo
Rear assembly	Detachable silk-screened PCB with direct mount connectors to Eurocard and external signals
Dimensions	6 HP x 3 U x 220 mm IRT Eurocard
Standard accessories	Rear connector assembly with plugable compression screw terminals. Matching connectors for audio inputs & outputs are supplied.
Optional accessories	Instruction manual TME-6 module extender card

Technical Description

IRT Eurocard
Audio Modulators & Demodulators.

The AAT-3140 is an IRT Eurocard dual channel audio modulator and the AAR-3140 is the matching de-modulator. The audio input to the AAT-3140 is balanced high impedance and the output of the AAR-3140 is balanced low impedance.

Whilst primarily intended to function as part of an IRT fibre optic system they may also be used for other applications such as microwave links where it is desired to include audio modulated subcarriers in the video signal.

The AAT-3140 generates a subcarrier frequency for each channel, which is modulated by the incoming audio signal. The AAR-3140 detects a particular subcarrier frequency and de-modulates it to obtain the audio signal for each channel.

The modules perform only the modulation / de-modulation functions and must be supported by an audio / video combiner (or splitter at the receiver end) and Low Pass Filter. These may be on a separate module (VA-520 / VA-570) or as an integral part of a fibre optic video transmitter / receiver (AVT-3070 / AVR-3070, AVR-3071).

The audio subcarriers for the audio channels are generated by varactor modulators operating at the required subcarrier frequencies. The frequency of the subcarriers is set by changing component values in the subcarrier generator and it is recommended that no attempt be made to alter these in the field.

The audio from the input is emphasised prior to modulating the subcarriers. Stability of these modulators is of paramount importance to ensure that maximum deviation can be achieved and to simplify insertion and extraction from the video without video degradation.

Various audio subcarrier frequencies are available including 7.5 MHz & 8.3 MHz (Telstra specified) or 7.36 MHz (Ch. 1), 7.765 MHz (Ch. 2), 8.215 MHz (Ch. 3) & 8.71 MHz (Ch. 4)(CCIR recommended).

Frequencies are normally allocated in the following order:

Telstra:	7.500 MHz & 8.300 MHz	AAT-3140T	&	AAR-3140T.
1st module:	7.765 MHz & 8.710 MHz	AAT-3140/24	&	AAR-3140/24.
2nd module:	7.360 MHz & 8.215 MHz	AAT-3140/13	&	AAR-3140/13.

Input Level.
The audio input gain on the front panel of the AAT-3140 module has been set for optimum performance and should not be adjusted.

The AUDIO LEVEL MON. points on the AAT-3140 module are set up during factory testing to give an output level of:

-31 dBm into 600 Ω
or
-25 dBu into a high impedance

for an audio input level of +4 dBu.

If a different nominal audio input level is required the AUDIO LEVEL MON points will be set up to give the above output levels for the specified nominal input level.

Output Level
Audio level adjustment can be performed, if necessary, using the GAIN adjustment on the AAR-3140 module. The output level present at the AUDIO LEVEL MON. is the same as the output of the module but is unbalanced.

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.

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.

Internal Adjustments

The following adjustable components 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.

AAT-3140:
Designations are the same for both channels, but with a “dot” prefix for channel two.

RV 1 AFC adjustment
RV 2 Subcarrier gain
RV 3 Front panel input gain
RV 4 Pre-set gain
RV 5 Pre-emphasis
RV 6 Low frequency compensation

LK 1	Enable AFC (out) / disable AFC (in).	Normally out.
LK 2	Pre-emphasis enable (in) / disable (out).	Normally in.
LK 3	Channel 1 subcarrier output enable (in) / disable (out).	Normally in.
LK 4	Channel 2 subcarrier output enable (in) / disable (out).	Normally in.
LK 5	External sub-carrier input enable (in) / disable (out).	Normally in.

SK 1 Front panel monitoring point.

L 1 Subcarrier frequency set
L 2 Subcarrier AFC lock

C 15 Output subcarrier bandpass filter.

AAR-3140:
Designations are the same for both channels, but with a “dot” prefix for channel two.

RV 1 De-emphasis
RV 5 Front panel audio output level

LK 1	Factory alignment only	Normally out.
LK 2	Audio output enable (in) / disable (out).	Normally in.

SK 1 Front panel monitoring point.

L 1 Subcarrier bandpass centre frequency
L 2 Subcarrier bandpass centre frequency
L 3 Subcarrier centre frequency
L 4 Subcarrier distortion
L 5 Subcarrier distortion

Installation

Installation in frame or chassis:

See details in separate Frames & PSU's manual for selected frame type.

Audio connections:

For single channel operation connect audio to SK 3 on both rear assemblies.
For stereo connect the Left channel to the SK 3 and the Right channel to SK 4.

If input termination is required then termination resistors should be fitted to the input sockets.

For stereo operation it is important to observe the polarity markings on the rear assembly or phasing errors will result.

Note: AAT-3140 is designed as a high impedance input device. If 600Ω input impedance is required, add external 620Ω resistor across pins 1 & 2 on both connectors Sk3 & Sk4 on the rear assembly. AAR-3140 is designed as a low impedance output device. It is not possible to add external components to make this a 600Ω device, as the unit does not have enough gain adjustment to compensate for 600Ω operation.

Subcarrier connections:

AAT-3140:
The SC OUT BNC provides the audio modulated sub-carriers to either the next subcarrier modulator input or to the video combiner SC input on the VA-520, AVT-3070 or AVT-3072.

AAR-3140:
The SC IN BNC accepts the audio modulated sub-carriers from either the previous subcarrier modulator output or from the video splitter SC output on the VA-570, AVR-3070 or AVR-3072.

A short BNC-BNC cable is available as an accessory for this purpose. It is of sufficient length to connect adjacent modules in a 3 RU frame. If other frames are used or if the module is to connect to another location a BNC-BNC cable of high quality will need to be fabricated to a suitable length.

Auxiliary connections: (PL 3 & PL 4)

These connectors are included for compatibility with earlier 500 series Eurocards, which required external DC supplies.

No connection is necessary when the AAT-3140 is used with 3000 series transmitters.

Pin designations: (For compatibility only.)

1	Not used	Not used
2	-12 Vdc	Not used
3	Gnd	Not used
4	+12 Vdc	Not used
5	APD power supply	Not used
6	Mute	AAR-3140 only.

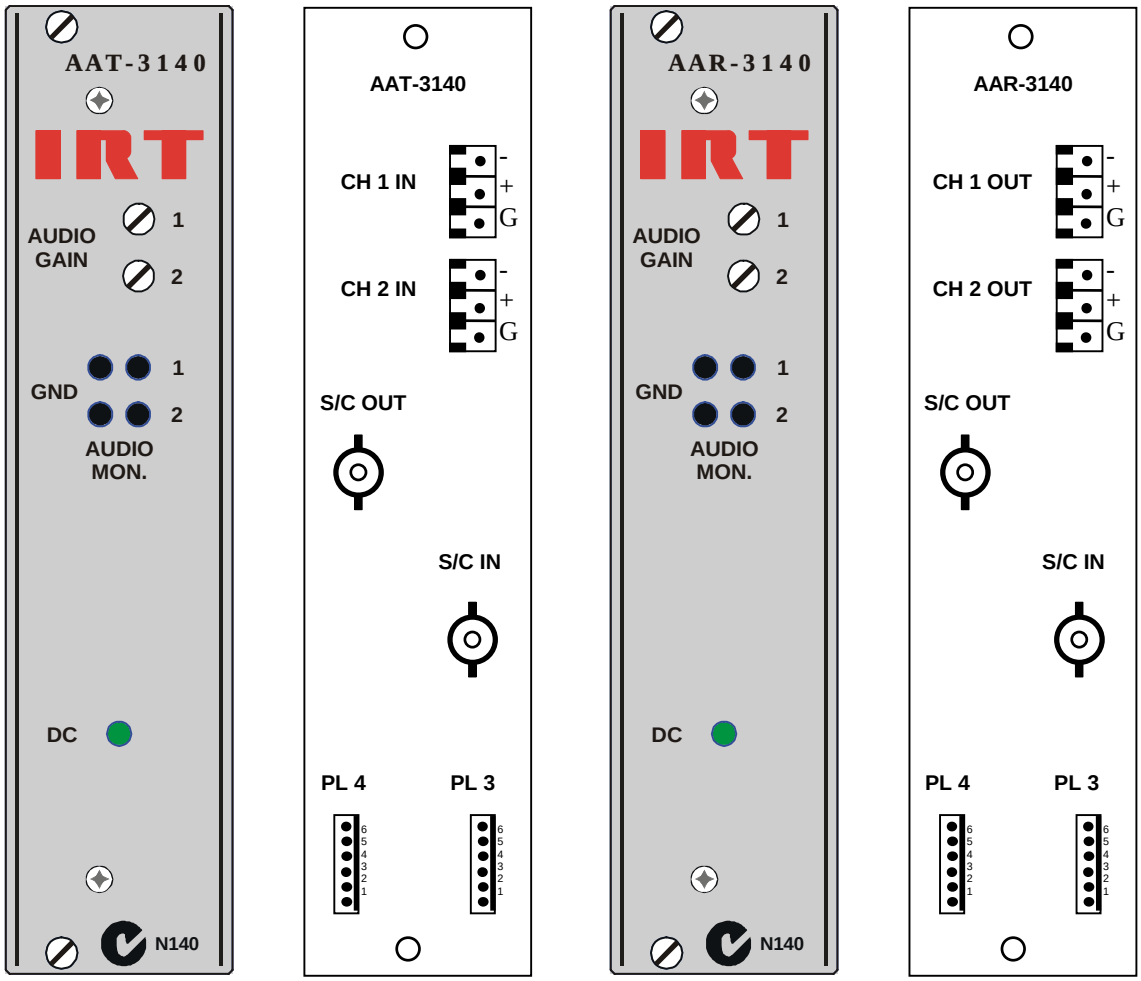
Muting function:

The AAR-3140 has an external muting input to allow for audio muting on loss of video at the receiver. If it is desired for this to function, pin 6 of PL 3 / PL 4 should be connected to the corresponding connector on the receiver.

For external control, a contact closure between pins 3 (Gnd) & 6 (Mute) will mute the audio outputs of the AAR-3140.

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.



Note:

The S/C in and out connectors on the rear assemblies are *Subcarrier In* and *Subcarrier Out* connectors for cascading audio channels and linking to fibre optic modules.

Connection of audio signals to these connectors will result in no audio being passed through the system and in interference to any video signal with which the subcarriers may be mixed.

Audio signal connections should only be made to the three pin plug-in connectors marked CH 1 and CH 2.

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

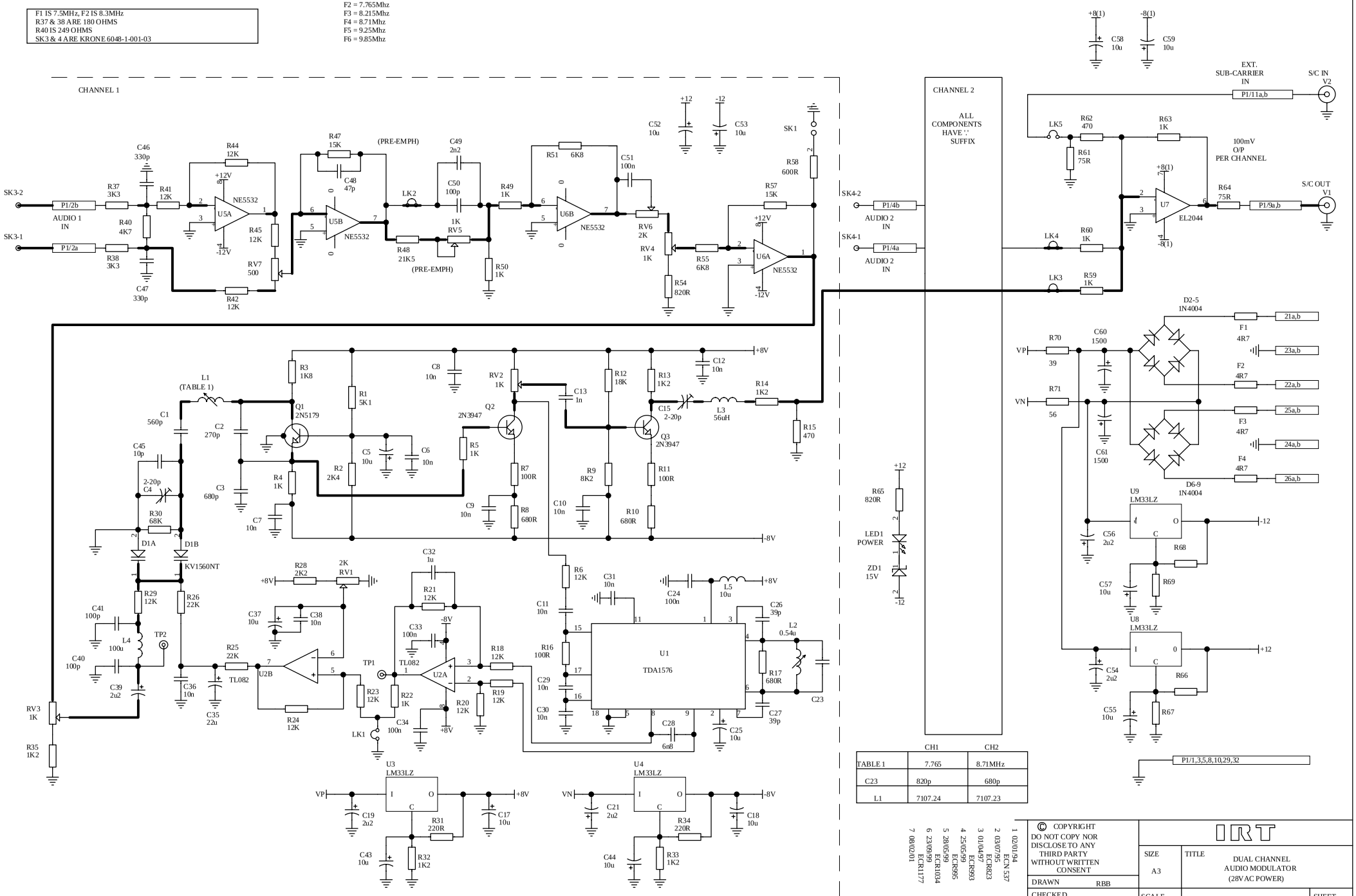
Drawing Index

Drawing #	Sheet #	Description
803790	1	AAT-3140 main circuit diagram
803793	1	AAR-3140 main circuit diagram PCB 803794
803854	1	AAR-3140 main circuit diagram PCB 803853

FOR AAT-3140T :

F1 IS 7.5MHz, F2 IS 8.3MHz
R37 & 38 ARE 180 OHMS
R40 IS 249 OHMS
SK3 & 4 ARE KRONE 6048-1-001-03

F1 = 7.36Mhz
F2 = 7.765Mhz
F3 = 8.215Mhz
F4 = 8.71Mhz
F5 = 9.25Mhz
F6 = 9.85Mhz



	CH1	CH2
TABLE 1	7.765	8.71MHz
C23	820p	680p
L1	7107.24	7107.23

1	02/01/94	ECN 537
2	03/07/95	ECR823
3	01/04/97	ECR993
4	25/05/99	ECR995
5	28/05/99	ECR1034
6	23/09/99	ECR1177
7	08/02/01	

DRAWN RBB
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ENG. APP.
CONTRACT No.

IRT

SIZE A3

TITLE DUAL CHANNEL AUDIO MODULATOR (28VAC POWER)

SCALE

DRAWING No. 803790

SHEET 1 OF 1

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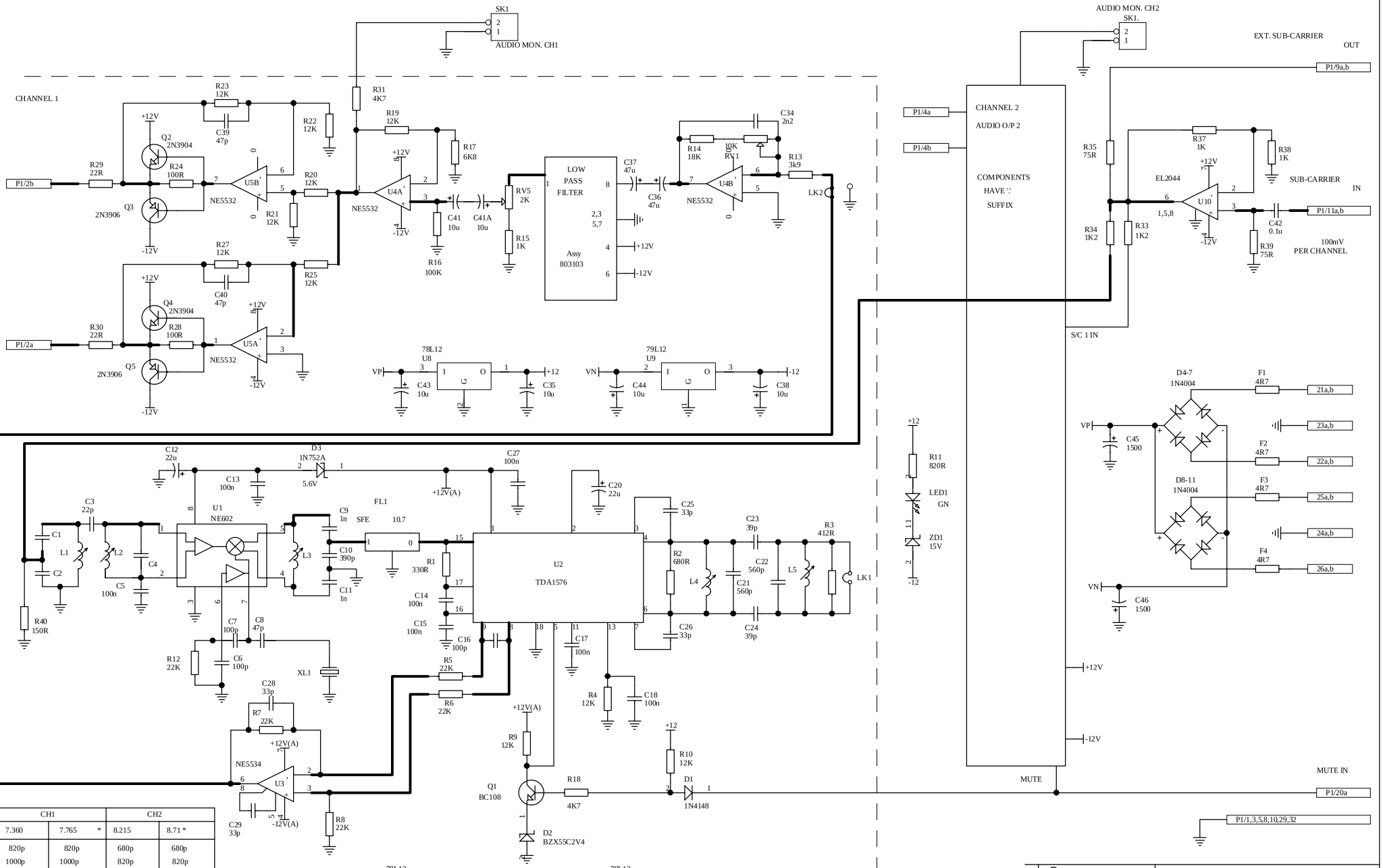
ARTARMON NSW AUSTRALIA 2064

PCB 803791



	CH1		CH2	
	7.360	7.765 *	8.215	8.71 *
C1	820p	820p	680p	680p
C2	1000p	1000p	820p	820p
C4	470p	470p	390p	390p
FL1	10.70	10.70	10.72	10.72
XL1	18.06	18.465	18.935	19.43

CH1 & CH2 IF frequencies must be separated by 20KHz or more.

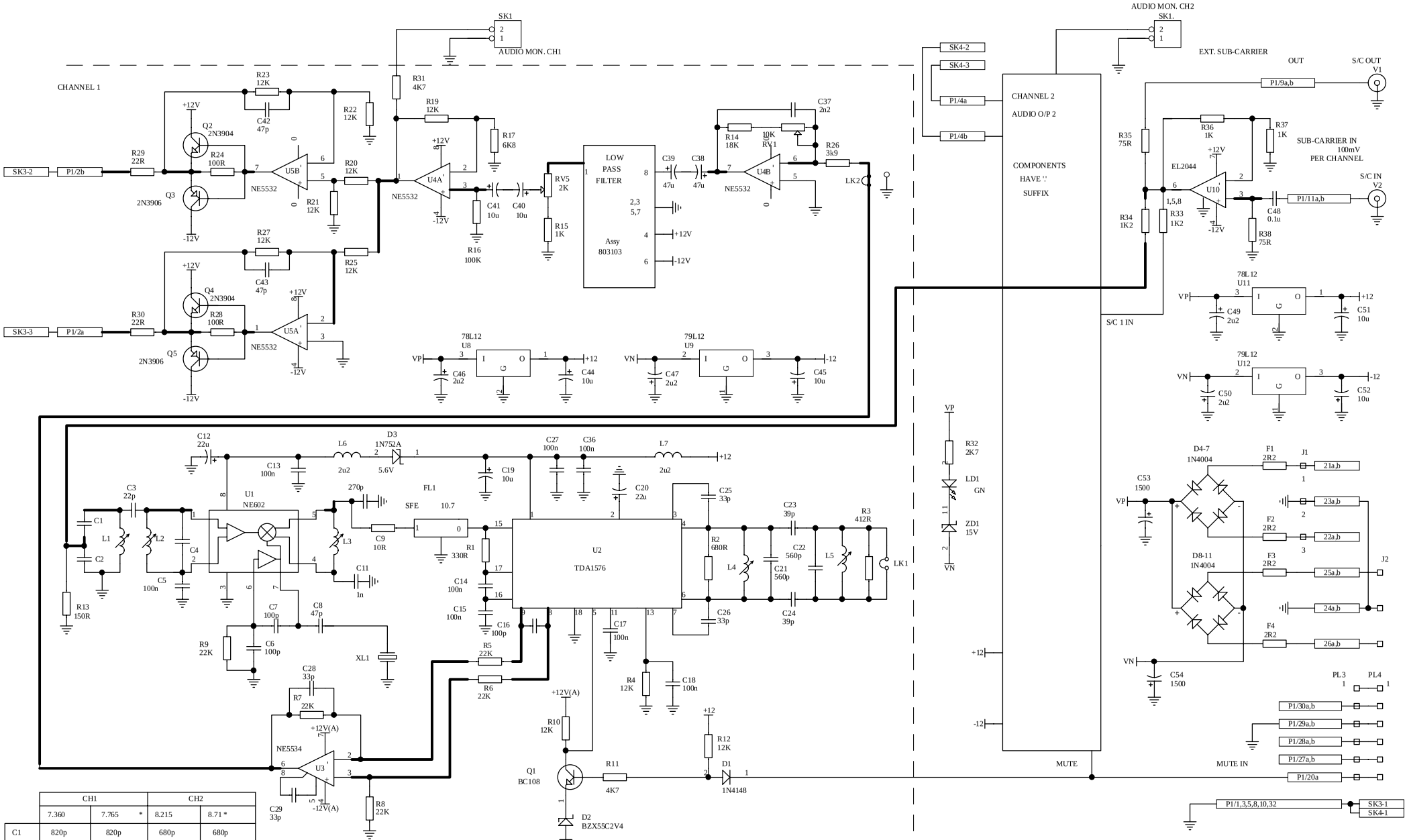
* Standard 2 channel frequencies.

PCB 803794R

IRT

SIZE A3	TITLE	DUAL CHANNEL AUDIO DEMODULATOR 28VAC VERSION	
DRAWN RBB			
CHECKED PF			
ENG. APP.			
SCALE	DRAWING No. 803793		SHEET 1 OF 1
CONTRACT No.	IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2064		

1 30/01/95
2 13/07/95 ECN 540



	CH1		CH2	
	7.360	7.765 *	8.215	8.71 *
C1	820p	820p	680p	680p
C2	1000p	1000p	820p	820p
C4	470p	470p	390p	390p
FL1	10.70	10.70	10.70	10.70
XL1	18.06	18.465	18.915	19.41

* Standard 2 channel frequencies.

FOR AAR-3140T FREQUENCIES ARE
7.5 & 8.3 MHz AND CHANGE SK3 & 4
TO KRONE 6048-1-001-03

PCB 803853R ISS 6

6 09/12/99 ECR1056
5 28/05/99 ECR994
4 01/04/97 ECR827
3 06/08/96
2 30/07/96
1 10/08/95

DRAWN RBB
CHECKED RK
ENG. APP.
CONTRACT No.

IRT

SIZE A3

TITLE DUAL CHANNEL AUDIO DEMODULATOR

SCALE

DRAWING No. 803854

SHEET 1 OF 1

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