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(Preliminary)

OPERATORS MANUAL

for the

VA-500/520/522
VA-551/570/572
VA-531/581

FIBRE OPTIC TRANSMISSION SYSTEM

1. GENERAL INFORMATION

The system is made up of single slot Eurocard modules designed to fit into the FR-700, FR-748 or the FR-722 chassis.

Each system consists of the following :

- VA-500 1300 nm laser transmitter (Single mode)
- VA-551 1300 nm PIN receiver
- VA-520 Vid/Aud Combiner & PSU
- VA-570 Vid/Aud Splitter & PSU
- VA-522 Dual Channel Audio Modulator .
- VA-572 Dual Channel Audio Demodulator.

Features:

All input and output signals (electronic and optical) are routed via rear assemblies attached to the modules.

Normal input to the transmitter is 1 Vp-p video. A monitor point on the front panel of the VA-520 presents a video signal of 1 Vp-p for signal monitoring and gain adjustment. (Note that the Audio sub-carrier of 100 mV p-p is also present at this monitor point.)The VA-500 transmitter also provides back porch clamping to ensure a high quality video signal at the optical transducer input.

The VA-570also provides video monitoring and gain adjustment at the front panel.

Audio modules provide audio input and output monitoring as well audio gain adjustment.

2.Specifications for the VA-500 Series

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

General:

Input power	28 Vac CT supplied from PT-700 (dual) or FR-722 (single)
Temperature range	0 - 50° C ambient
Mechanical	Suitable for mounting in IRT 19" rack chassis types FR-700, & FR-722 with input output and power connections on the rear panel
Dimensions	6 HP x 3U x 220 mm IRT Eurocard

Connectors:

Video input / output	BNC
Audio input / output	Screw terminal: PIN 1 - PIN 2 + PIN 3 GND
Power input	Connections dependent on power supply type.
Optical input / output	DIN 47256

The following performance data is for optical path losses specified under 12dB and with pre- emphasis and de-emphasis connected. Low Pass filters are inserted. Optimum system performance is achieved after a 15 Minute warm up period. Input is to the rear assembly **RB-520 VID IN**. Output is from the rear assembly **RB-570 VID. OUT**.

Video:- (at a video input level of 1V p-p.)

Insertion Gain	<±0.2 dB
Noise	
To CCIR Rec. 567-1	
Continuous random noise	<-63 dB RMS
Periodic noise	
Power supply hum	
(including harmonics)	<-45 dB
1 KHz to 5.5 MHz	<-60 dB
Overall gain	<Unity ±3 dB
Frequency Response	Adjustable from the VA-520 and 570 front panel ±0.1 dB to 5 MHz ±0.5 dB to 10 MHz (no Audio)
Differential Gain at 4.43 MHz	<1.0%
Differential Phase at 4.43 MHz	<1.0%
Pulse to Bar K-factor	<=0.5%K
Luminance/Chrominance Inequality	
Delay	<20 ns
Gain	<2%

VA-520 video input characteristics:

Input Impedance:	75 Ω
Input Signal:	1Vp-p Video, synch negative..
Input common mode rejection	>40 dB

VA-570 video output characteristics:

Output Impedance	75 Ω
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Vid. Mon. Output characteristics:

The outputs on both the VA-520 and VA-570 have a source impedance of 75 Ω . They are for signal monitoring and level adjustment purposes only. The VID. Mon. output on the VA-520 should be set at 1.0 Vp-p by adjusting the Video Gain control.

Audio:-

Input is to the rear assembly **RB-522 SK 3 and 4** balanced input.

Output is from rear assembly **RB-572 SK 3 and 4** balanced output

Frequency response	+0.15/-0.75 dB (30 Hz to 15 KHz)
Total harmonic distortion measured @:	
+17 dBm <4 KHz	
+14 dBm =>4 KHz	
30 Hz to 7.5 KHz	<0.2 %
Intelligible crosstalk ratio	>80 dB
Gain difference between channels:	
30 Hz to 10 KHz	<0.2 dB
10 KHz to 14 KHz	<0.4 dB
14 KHz to 15 KHz	<0.8 dB
Phase difference between channels:	
30 Hz to 4 KHz	<3.75°
14 KHz	<7.5°
15 KHz	<10°
Noise	<-52 dBm
Audio input impedance	600 Ω, balanced
Nominal input level	+8 dBm
Input gain range	±3 dB
Input common mode	>50 dB
Audio output impedance	approx. 40 Ω, balanced (aligned for load impedances of 600 Ω or greater.)
Nominal output level	+8 dBm
Output gain range	±3 dB

Optical input/output:-

Laser Wavelength 1300 nm

Launch Power

-10 dBm (Single mode cable)

Path Loss:

With PINAPD (VA-551)

Up to 12 dB path attenuation allowable to meet published specification.

3. Operational Adjustments:

VA-520

Input Gain.

The video input level has been factory aligned assuming that **1 Vp-p** video is present at the input to the **VA-520**. The signal level to the **VA-500** or **VA-502** must be properly set for the video channel noise and linearity specifications to be met. Therefore if the video level into the **VA-520** is different, the **VA-520** gain should be adjusted so that the **VID. MON.** output is **1 Vp-p**.

Cable Equalisation.

If a long run of cable is used to feed the input to the transmitter then the **EQ.** should be adjusted to give a properly equalised video signal at the **VID. MON.** output on the **VA-520**

VA-570

Output Gain: The **GAIN** on the **VA-570** front panel should be adjusted so that the video signal at the **Vid. MON.** output is **1 Vp-p**.

AUDIO

As previously stated, the VA-500 Series can provide two channels of audio (VA-522, VA-572).

Input Level.

The audio input gain on the front panel of the **VA-522** module has been set for optimum performance and should not be adjusted. An audio level of +8 dBu will give an output level of -31 dBm into 600 Ω at the **AUDIO LEVEL MON.** points on the **VA-522** module.

Output Level

Audio Level adjustment can be performed, if necessary, using the **GAIN** adjustment on the **VA-572** module. The output level present at the **AUDIO LEVEL MON.** is the same as the output of the module but is unbalanced.

4. Monitor Point and Indicators

There are a number of indicators on the VA-500 Series that can aid fault detection:

ALL Modules

DC GREEN LED indicates the presence of $\pm 12V$ on each module as appropriate.

VA-500

LASER ALARM RED LED indicates that the Laser output power is greater than -7 dBm or less than -13 dBm

VA-551

RX LOSS RED LED indicates that the received carrier level is not present or below the range of the AGC.

VID. FAIL RED LED indicates the absence of video on the demodulator output.

ADJUSTMENTS

Unless specified these adjustments are not field adjustable.

VA-500

- | | |
|-----|--------------------------|
| C5 | Video frequency response |
| C24 | Video frequency response |
| C34 | Video frequency response |
| C51 | Video carrier frequency |

- | | |
|-----|-----------------------|
| RV3 | Video gain preset |
| RV4 | Modulator DC offset |
| RV5 | Modulator linearity |
| RV6 | 2nd harmonic null |
| RV7 | Laser drive. |
| RV8 | Modulator temperature |
| RV9 | Laser output power |

- | | | | |
|-----|---------------------------------------|---------------|----------------|
| LK1 | Pre-emphasis on/off - normally linked | | |
| LK2 | Video clamp on/off | Clamped : | link out |
| | | Not clamped : | link installed |

VA-520

- | | | |
|-----|------------------------------|--------------------------|
| RV1 | Input common mode adjustment | |
| RV2 | Input cable equalisation | (Front Panel Adjustment) |
| RV3 | Video Output level | (Front Panel Adjustment) |

- C5,7,9 Cable equaliser adjustment
C11 Video frequency response

Grounding P1/16a,b will remove the Video Low Pass Filter.

VA-522

- | | | |
|-----|----------------------------|--------------------------|
| RV1 | AFC adjustment | |
| RV2 | Sub-carrier level | |
| RV3 | Audio deviation pre-set | |
| RV4 | Audio common mode null | |
| RV5 | Audio pre-emphasis adjust. | |
| RV6 | Audio frequency response | |
| RV8 | Audio level | (Front Panel Adjustment) |

- | | |
|-----|--------------------------------|
| L2 | AFC adjustment |
| C4 | Audio sub-carrier frequency |
| C42 | Sub-carrier pass filter tuning |

VA-551

- | | |
|-----|------------------|
| RV1 | AGC set |
| RV2 | Vid gain pre-set |

VA-570

- RV1 Video output level (Front Panel Adjustment)
RV2 APD Avalanche set

Grounding P1/16a,b will remove the Video Low Pass Filter.

VA-572

RV1 De-emphasis adjust

RV3 Audio output DC offset

RV5 Audio output level (CH1) (Front Panel Adjustment)

RV6 Audio output level (CH2) (Front Panel Adjustment)

L1,2,3 Audio bandpass filter adjustments

L4,5 Audio de-modulator linearity

LK3 De-emphasis on/off Normally installed.

VA-531 DATA MODULATOR & VA-581 DATA DEMODULATOR.

The VA-531 Data Modulator and VA-581 Data Demodulator are a pair of Eurocard modules which offer the facility to transfer data in one direction over a link made up out of VA-500 Series Fibre Optic Video equipment.

They operate by frequency shift keying a sub-carrier, which can then be slotted above the video signal similar to the method used for FM sub-carrier Audio channels.

With the standard operating frequency and filters the data transfer rate for asynchronous operation is a maximum of 64kbit. For synchronous operation the data rate is exactly 192kbit.

Two interfaces are provided, one conforming to the "RS-232" standard and the other to the "RS-422" standard. The RS-232 input and output is via a 9 pin D connector and the RS-422 input and output is via a 15 pin D connector. Selection of the active signal input on the VA-531 Data Modulator is done by an internal link. In the asynchronous mode both the outputs from the VA-581 Data Demodulator are simultaneously available.

The special case of the synchronous 192Kbit mode is only available via the RS-422 connectors. In this mode the user provides data and clock and the VA-531 uses a Manchester code modulator to encode the transmitted signals. At the VA-581 a phase locked loop tuned to 4 x 192Kbit is used to extract the clock and data and make them available at the output.

SET-UP

RS-232 Mode.

VA-531

Data is applied to pin 3 of SK2.

Link 1 is set to 'A'

VA-581

Data is available on pin 2 of SK2

RS-422 Asynchronous Mode

VA-531

Data is applied to pin 4 (A) and pin 11 (B) of PL1.

Link 1 is set to 'B'.

VA-581

Data is available on pin 4 (A) and pin 11 (B) of PL1

LK3 is set to 'DIRECT'.

RS-422 Synchronous Mode

VA-531

Data is applied to pin 4 (A) and pin 11 (B) of PL1.

Link 1 is set to 'C'.

Clock is applied to pin 6 (A) and pin 13 (B) of PL1.

VA-581

Data is available on pin 4 (A) and pin 11 (B) of PL1

LK3 is set to 'RECLOCKED'.

Clock is available on pin 6 (A) and pin 13 (B) of PL1

'Data Present' is available on pin 5 (A) and pin 12 (B) of PL1.

Note : At startup, as a consequence of the Manchester encoding used, the Data output from the demodulator may be inverted until such time as the first 1>0 or 0>1 transition occurs in the input data stream.

ADJUSTMENTS

VA-531

RV1 sets the sub-carrier deviation.

(Nominally 800KHz)

C5 sets the sub-carrier centre frequency.

(Nominally 11.7MHz)

RV2 sets the sub-carrier output level.

(Nominally 100mV P-P but for Maxpro 240mV P-P)

VA-581

RV1 sets the input level to the data demodulator chip (Nominally 30mV at U2 pin 15)

L6 sets the centre frequency of the demodulator circuit.

RV2 sets U7A period to 4.7uS.

The operating frequency can be changed by adjustment of C5 in the VA-531 and L6 in the VA-581 and the selection of the appropriate filters in both units.

DRAWINGS LIST

803647.1 VA-500/VA-551/VA-522/VA-572 Assemblies
803647.2 VA-500/VA-551/VA-522/VA-572 Interconnections

803503 VA-500 Optical Transmitter (Laser) 1300 nm
803527 RB-500 Rear Assembly

803512 VA-520 Vid/Aud Combiner & PSU
803525 RB-520 Rear Assembly

803790 VA-522 Dual Channel Audio Modulator
803529 RB-522 Rear Assembly

803508 VA-551 Optical Receiver (PIN) 1300 nm
803636 RB-550 Rear Assembly

803631 VA-570 Vid/Aud Splitter & PSU
803531 RB-570 Rear Assembly

803793 VA-572 Dual Channel Audio Demodulator
803638 RB-572 Rear Assembly

803591 VA-531 Data Modulator.
803598 VA-581 Data Demodulator.

803360 PT-700 Power Supply

VA-500 OPTICAL TRANSMITTER 1300nm

PCB ASSEMBLY 803503

RB-500 REAR ASSEMBLY

VA-551 OPTICAL RECEIVER 1300nm PIN

PCB ASSEMBLY 803508

803379 BB DEMODULATOR

RB-550 REAR ASSEMBLY

VA-520 VID/AUD COMBINER

PCB ASSEMBLY 803512

RB-520 REAR ASSEMBLY

VA-570 VID/AUD SPLITTER

PCB ASSEMBLY 803631

RB-570 REAR ASSEMBLY

VA-522 DUAL AUDIO MODULATOR

PCB ASSEMBLY 803642

RB-522 REAR ASSEMBLY

VA-572 DUAL AUDIO DE-MODULATOR

PCB ASSEMBLY 803643

803103 AUDIO LO PASS FILTER

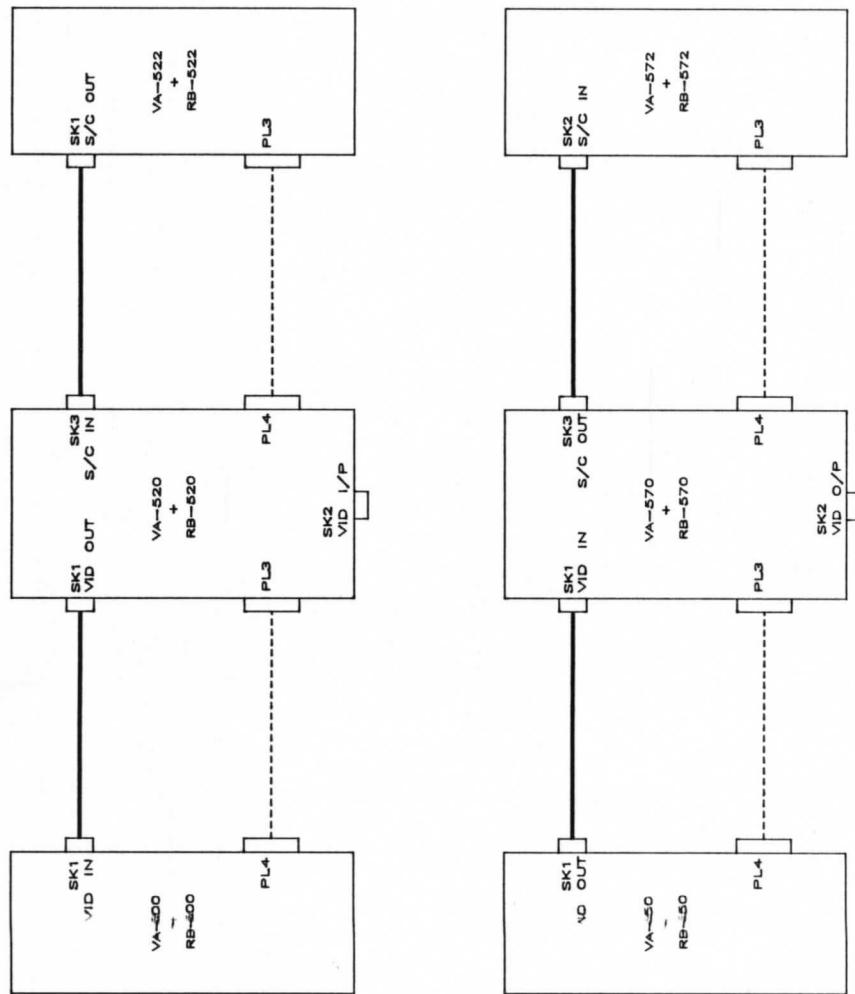
803103 AUDIO LO PASS FILTER

RB-572 REAR ASSEMBLY

803112 VIDEO LO PASS FILTER

803112 VIDEO LO PASS FILTER

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CA-SVID
 BNC-BNC CABLE
 CA-SPWR
 6 CONDUCTOR IDC CABLE

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SMCC INDUCTORS ARE BETTER HERE

SK1/RB-500 VIDEO IN

COAX LINK

RED LASER ALARM

BASEBAND AND LASER MODULE

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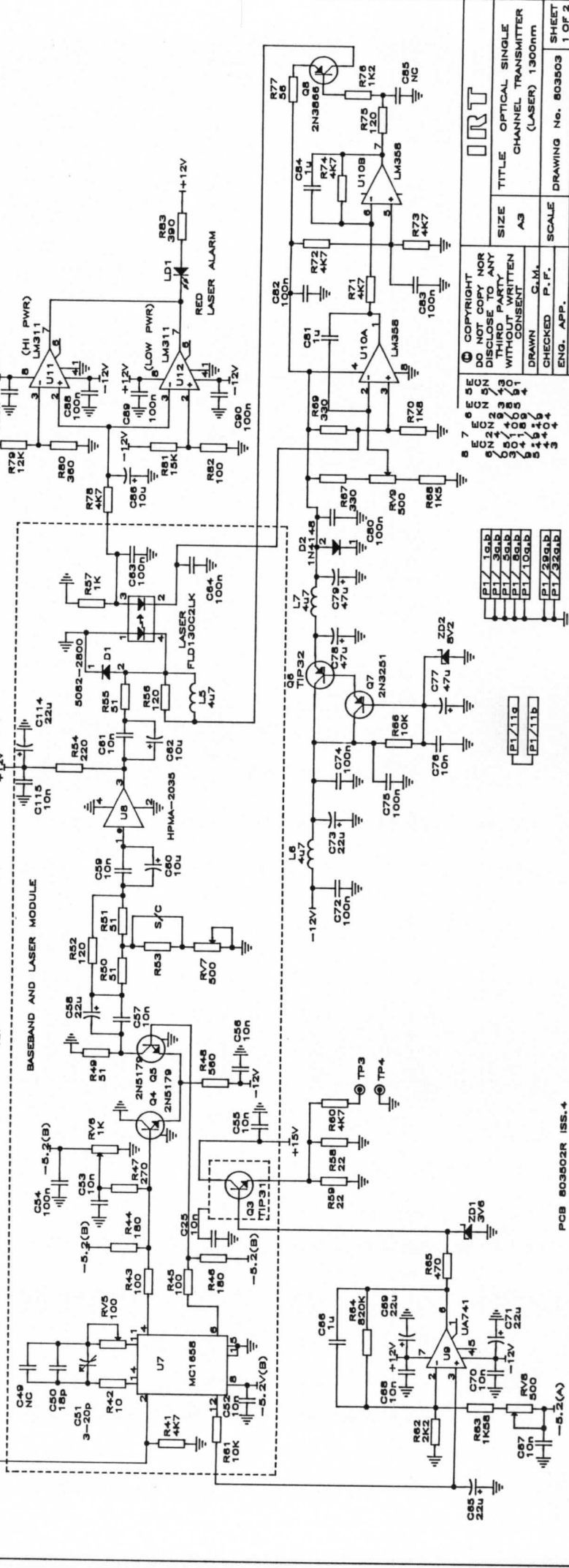
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Diagram of a 10-bit shift register. It consists of two 5-bit sections. The top section has inputs A1, A2, A3, A4, A5 and outputs Q1, Q2, Q3, Q4, Q5. The bottom section has inputs B1, B2, B3, B4, B5 and outputs Q6, Q7, Q8, Q9, Q10. All outputs are connected to a common bus leading to a 10-bit data bus.

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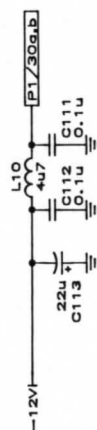
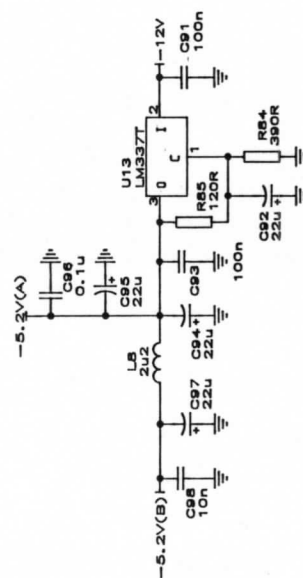
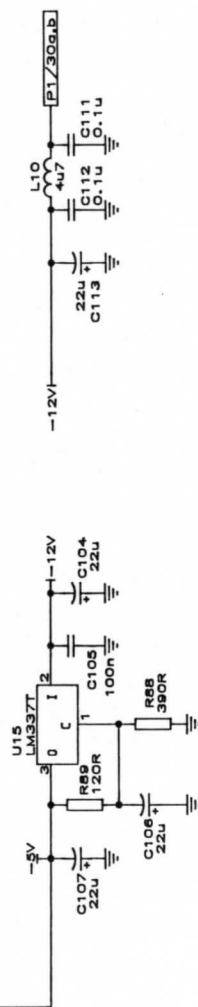
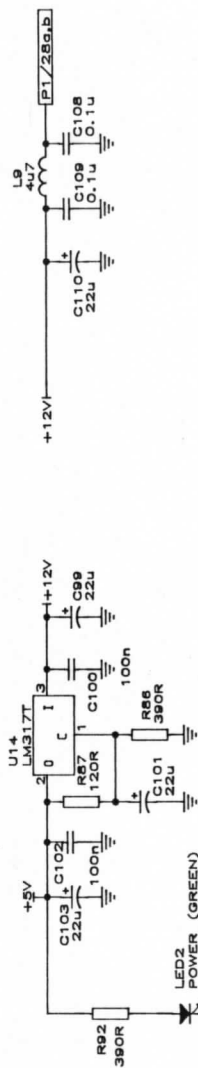
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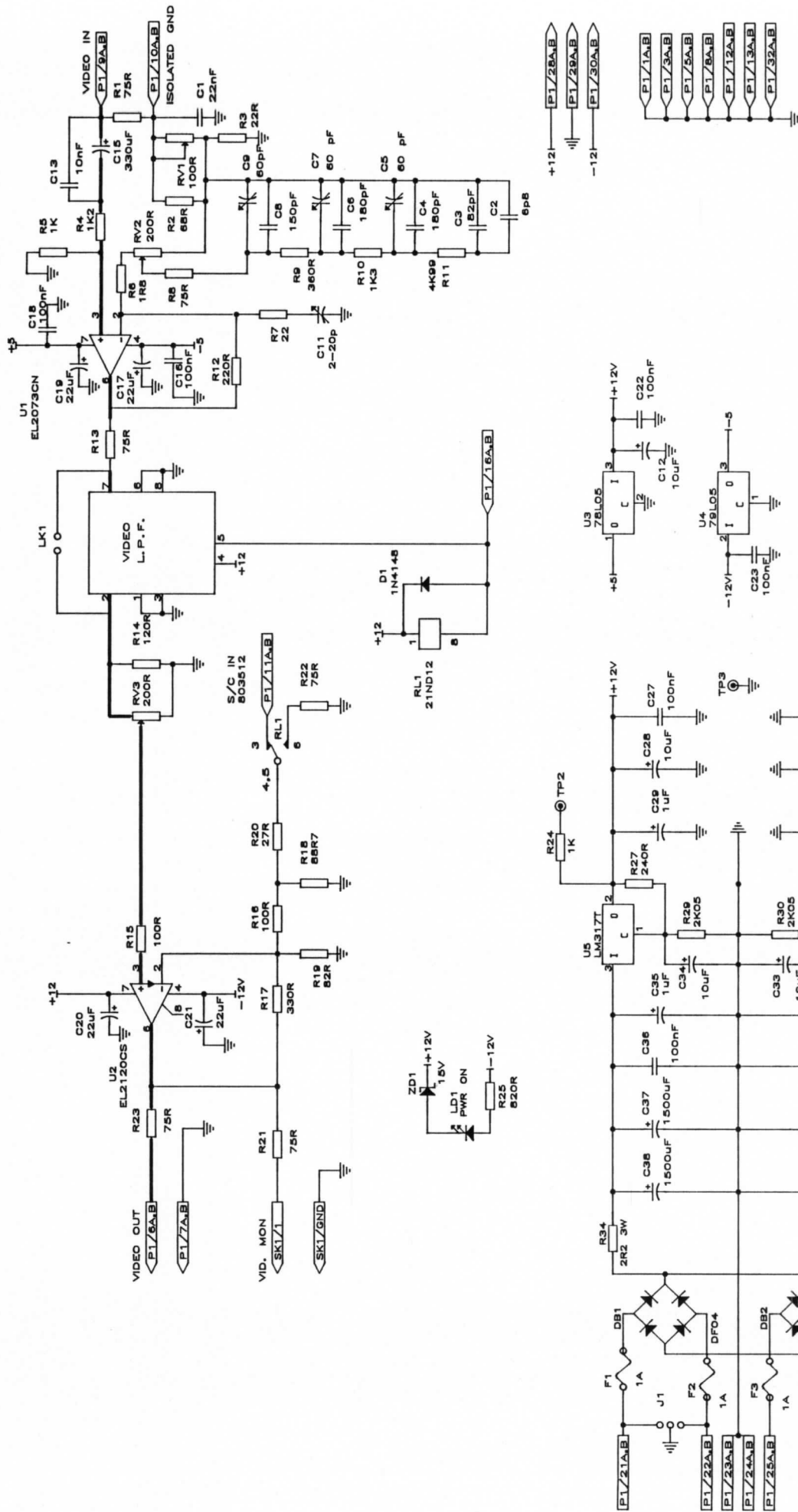
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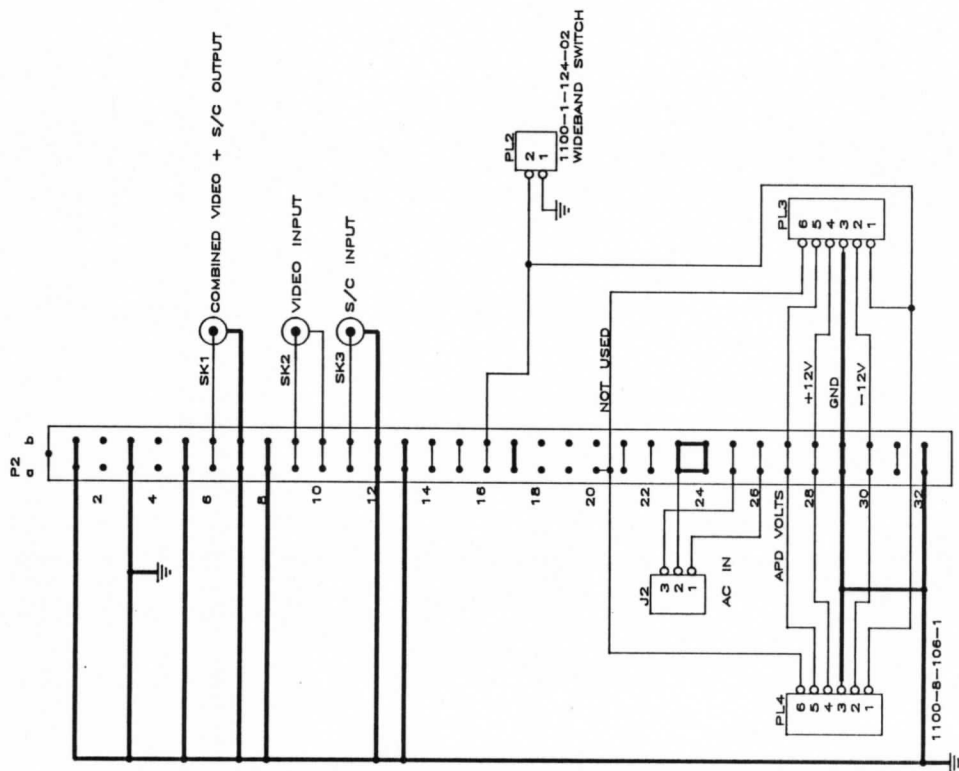
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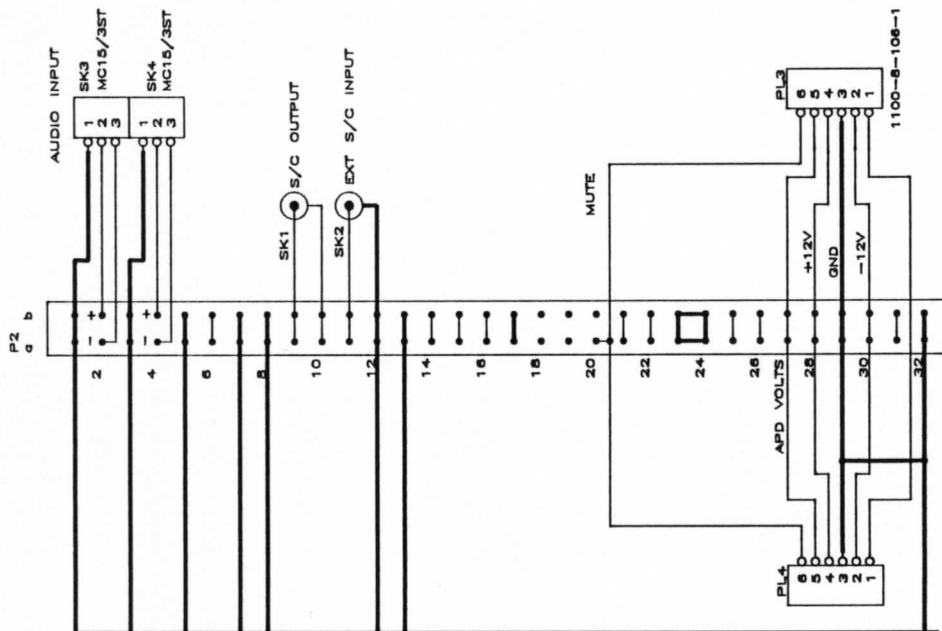


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IRT
VA-520
AUDIO/VIDEO COMBINER,
& POWER SUPPLY
DRAWING No. 803512
SCALE
SHEET 1 OF 1
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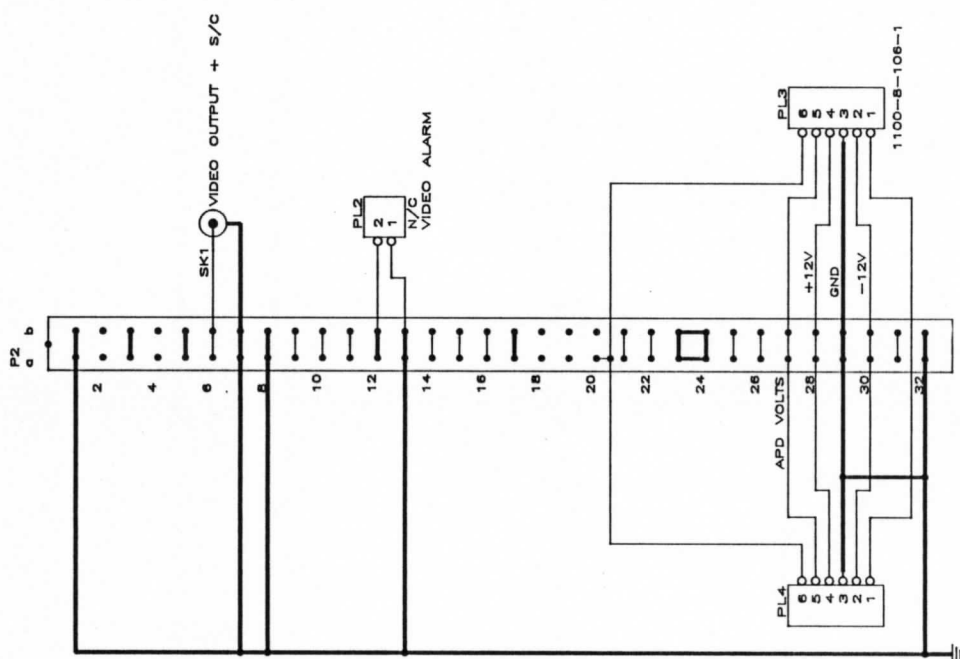


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SIZE	TITLE	DRAWING No.	SHEET
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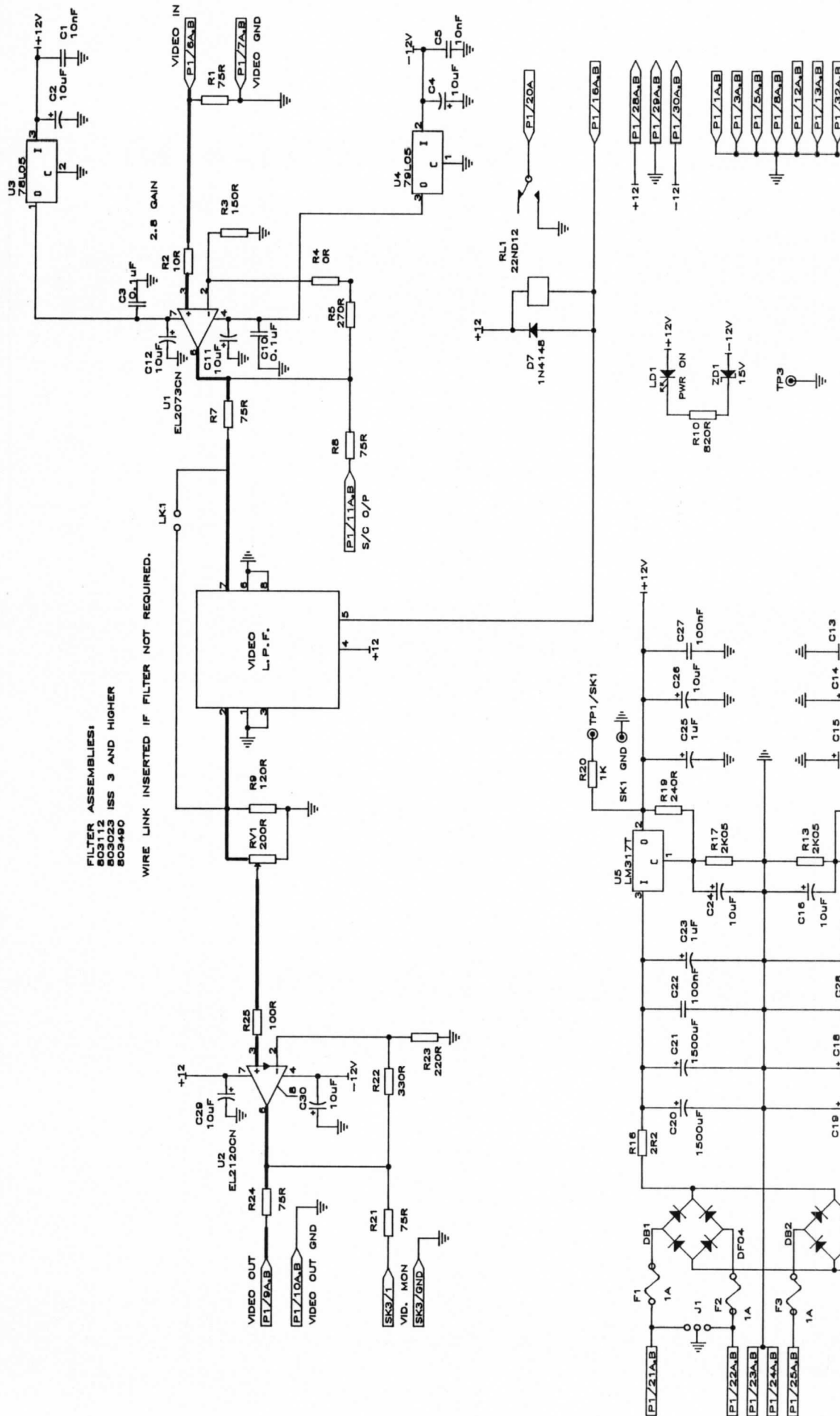
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SIZE A3	TITLE RB-550 REAR ASSEMBLY FOR VA-550 OPTICAL RECEIVER	DRAWING No. 603636	SHEET 1 OF 1
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FILTER ASSEMBLIES:
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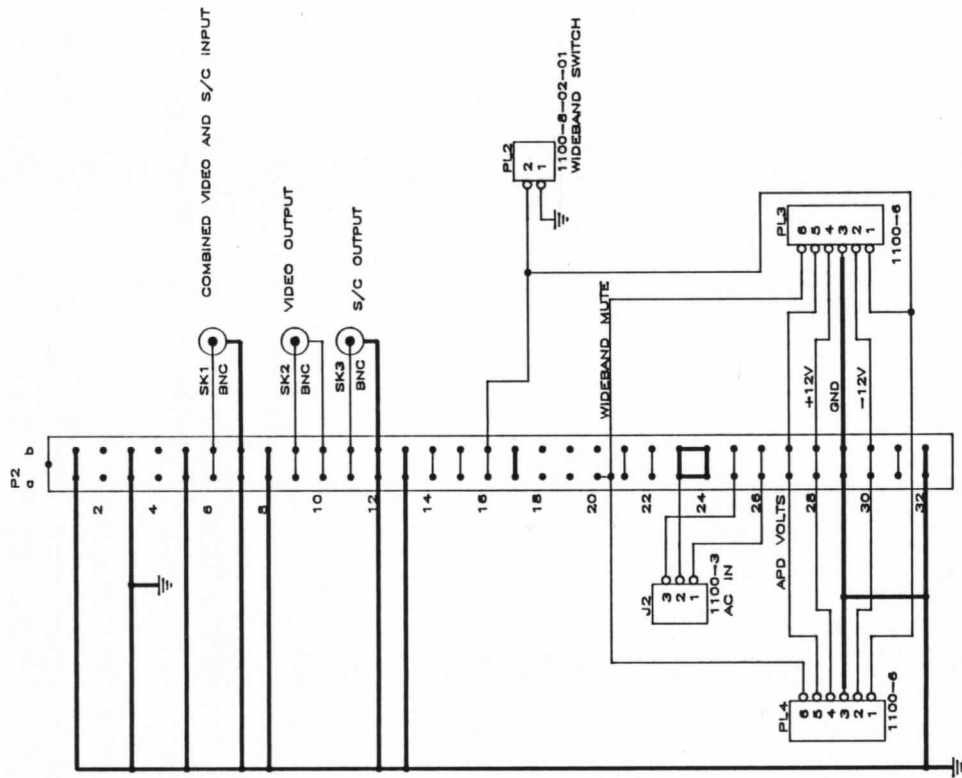
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IRT

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DRAWN	PF	SCALE	DRAWING No. 803631
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SHEET		SHEET	
1 OF 1		1 OF 1	

PCB 803632 ISS 2
FRONT PANEL 8036315 EV803516
REAR ASSY 803631 PCB 803530 ISS 2



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DRAWN PF		SIZE A3	
CHECKED		SCALE	
ENG. APP.		PS/SPLITTER	
CONTRACT No.		DRAWING No. 803631	
		SHEET 1 OF 1	
		IRT Electronics Pty. Ltd. ARTARMON NSW AUSTRALIA 2084	

IRT

AUDIO MON. CH2

EXT. SUB-CARRIER
OUT

CHANNEL 2
AUDIO O/P 2

COMPONENTS
HAVE "A"
SUFFIX

100mV
PER CHANNEL

S/C 1 IN

MUTE IN

P1/20a

IRT

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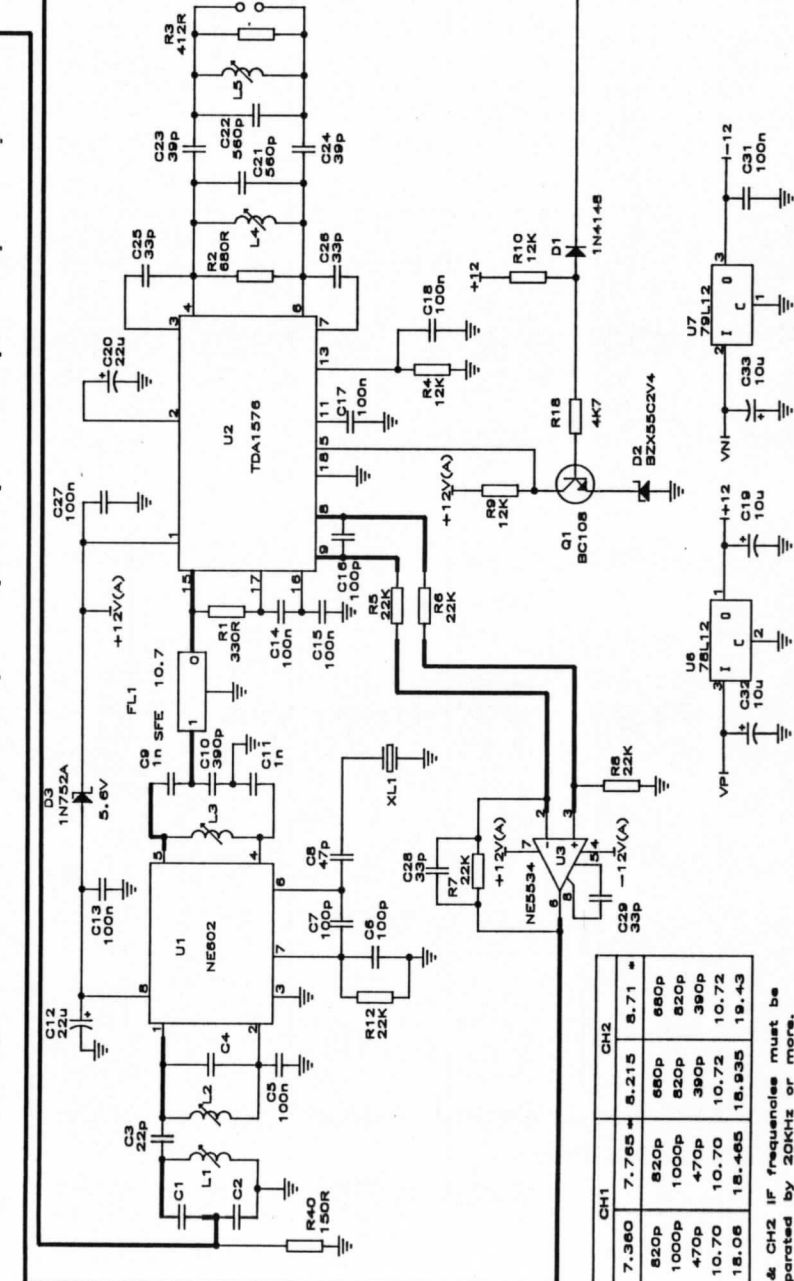
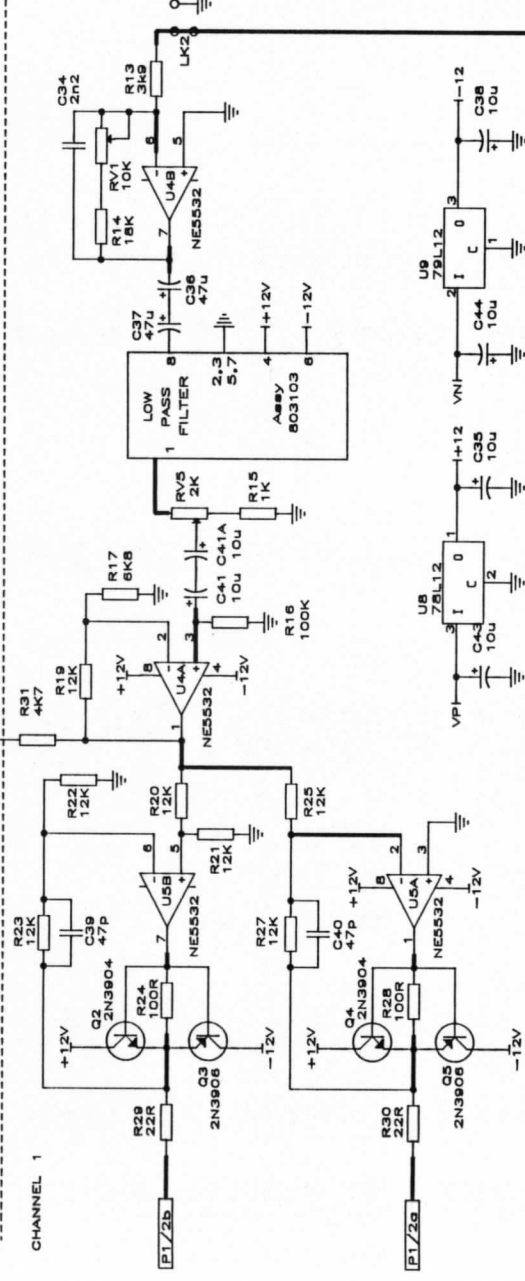
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CHANNEL 1

SK1

AUDIO MON. CH1



	CH1	CH2
C1	7.360	7.765
C2	820p	820p
C3	1000p	820p
C4	470p	820p
FL1	10.70	10.72
XL1	18.06	18.485
		18.935
		19.43

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

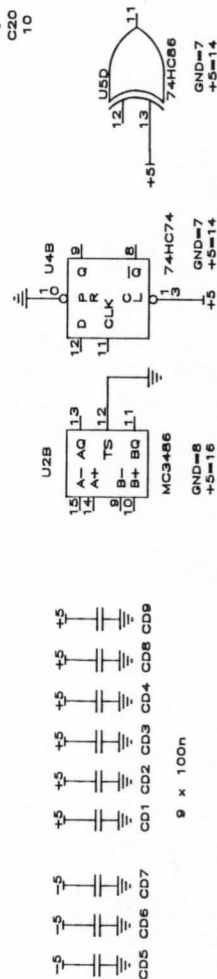
Standard 2 channel frequencies.

PCB 803794R

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

Standard 2 channel frequencies.

PCB 803794R

PCB 803592

VALUES CHANGE WITH FREQUENCY

BAND PASS FILTER ASSEMBLY 803622

SK3
RF
1.1g/b
1.2g/b
1.3g/b
1.4g/b
1.5g/b
1.6g/b
1.7g/b
1.8g/b

SK2
RS232
1, 4, 6, 9

U1 EL2044
U2 TDA1576
U3 LM311
U4 LT1081
U5 MC3487
U6 74HC4046
U7A 74HC4538
U7B 74HC4536
U9 18CV8
U10 7812
U11 7805
U12 7812
U13 7812
U14 7812
U15 7812
U16 7812
U17 7812
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U99 7812
U100 7812

PL1
RS422
11 19g
4 19b
5 18b
12 18g
1.8 15g/b

SK3
RF
1.1g/b
1.2g/b
1.3g/b
1.4g/b
1.5g/b
1.6g/b
1.7g/b
1.8g/b

SK2
RS232
1, 4, 6, 9

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U100 7812

PL1
RS422
11 19g
4 19b
5 18b
12 18g
1.8 15g/b

SK3
RF
1.1g/b
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1.3g/b
1.4g/b
1.5g/b
1.6g/b
1.7g/b
1.8g/b

SK2
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1, 4, 6, 9

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PL1
RS422
11 19g
4 19b
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12 18g
1.8 15g/b

SK3
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1.1g/b
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SK2
RS232
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