OPTICAL SYSTEMS DESIGN
PTY. LTD A.B.N. 83 003 020 504

OPERATOR MANUAL

OSD390 SERIES

4 CHANNEL VIDEO/AUDIO/DATA

FIBER OPTIC TRANSMISSION SYSTEM

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1 TECHNICAL SUMMARY

1.1 BRIEF DESCRIPTION

The OS0390 system is a compact and flexible multiplexer for video, audio and data.

The OSD390 system is composed of a transmitter and a receiver. Because many applications require a reverse path for control data or synchronisation, the transmitter unit can be provided with a built-in optical receiver and the receiver unit can be provided with a built-in optical transmitter.
Up to 4 video channels can be transmitted in the forward direction.

The transmitter unit can also support 4 audio channels and/or 4 RS422/RS232 data channels, which can be fitted at the factory or by the user.
The reverse path (if fitted) can support up to 4 audio channels, 4 data channels and 1 video channel.

The OSD3911 motherboard is designed to fit the 3RU-high 19" OSD370 chassis, a stand-alone enclosure or a 1RU-high 19" rack enclosure. The OSD3912, OSD3932, OSD3914, OSD3915 and OSD3916 are small daughter boards ("stick cards") which plug into the OSD3911. These daughter boards can be added at a later time.

A fully featured system utilises the same motherboard at each end, i.e. both have an optical transmitter, an optical receiver and audio/data interface circuitry.

Consequently, it is possible in such circumstances to transmit from 1 to 4 video channels in one direction and from 4 to 1 video channels in the other, the main criteria being that the OSD3911 motherboard can only support a mix of five video modulators and/or demodulators with a maximum of 4 of any one type.

1.2 TECHNICAL SPECIFICATION

CHANNEL AVAILABILITY

(specified at time of order)	**Forward Path**	**Reverse Path**
Number of Video channels	one to four	zero, one or two
Number of Audio channels	zero or four	zero or four
Number of Data channels	zero or four	zero or four

ELECTRICAL

	Video	**Audio**
Input/Output Impedance	75Ω	5KΩ/600Ω
Input/Output Level	1 .0Vpp nom.	500mVrms nom. 1 Vrms pk
Bandwidth	10Hz to 6MHz ± 1 dB	30Hz to 15kHz + 1, -3dB
Signal to Noise Ratio *	> 50dB (weighted)	> 55dB (A weighted)
Data Interface	RS232 and/or RS422 (user selectable)	
Data Rate	DC to 20kbps	
Data Bit Error Rate *	$< 1 \times 1\ 0^{-9}$	
Video Connector	BNC	
Audio/Data Connector	44 pin female DB-44 connector	

OPTICAL

	OSD391	**OSD393**
Transmitter wavelength	1310nm	1310nm
Transmitter coupled power	>-10dBm (OSD391LP) >-5dBm (OSD391) >0dBm (OSD391H)	>-10dBm (standard) >-5dBm (optional)
Receiver sensitivity	< -23dBm (if receiver option fitted)	< -23dBm
Optical Connectors	ST standard, FC, SC optional	

PHYSICAL

Operating Temperature	0 to 50°C
Relative Humidity	0 to 95% non-condensing
Card Version	
Power requirements	11 to 15VDC @ 0.6A max, depending on mix of facilities provided
Dimensions	25W x 208D x 100H (one direction of transmission only) 50W x 208D x 100H (both directions of transmission)
Weight	0.2kg
Standalone Version	
Power Requirements	240 V AC @ 20VA, -48VDC power is optional
Dimensions (mm)	215W x 210D x 56H
Weight	2.5kg
1RU Version	
Power Requirements	240 V AC @ 50VA
Dimensions (mm)	480W x 210D x 45H
Weight	3.0 kg
3RU Chassis Version	
Power Requirements	240 V AC @ 120VA
Dimensions (mm)	480W x 220D x 135H
Weight	6.0 kg

* Measured at -23dBm

1.3 PRODUCT OPTIONS

There are various options available for the OSD390 as identified below:

TABLE 1

ITEM	DESCRIPTION
OSD391	Transmitter Option
OSD393	Receiver Option
Option NV	N video signals (N = 1,2,3 or 4)
Option nv	Reverse path video (n = 1 or 2)
Option A	Forward path audio
Option a	Reverse path audio
Option D	Forward path data
Option d	Reverse path data
Option W	Single fibre operation
Option -48	-48V power

1.4 SYSTEM DESCRIPTION

Figure 1 is a block diagram of the unit and Figure 2 shows the transmission frequency plan for the system.

The following briefly outlines the main characteristics of each of the components making up the OSD390.

1.4.1 OSD3911 MOTHERBOARD

The motherboard as the following main sections:

a. Power supply. This is a separate permanently fitted unit which accepts 11 to 18VDC and provides the 5V and ± 9V DC required by circuitry.

b. Laser transmitter. This accepts the signals from the various stick cards and linearly modulates the laser. The laser can be either 1310nm or 1550nm and can be provided at a number of different power levels.

c. Optical receiver. This normally uses a PIN photo diode but can employ an avalanche photo diode (APD) for improved sensitivity. It is followed by a transimpedance amplifier and two stages of automatic gain control (AGC) from which the received RF signal is distributed to the stick cards.

d. Audio input. This consists of 4 audio input amplifiers which are band limited to 16kHz. 75µs pre-emphasis is employed. A gain-adjust trimpot is provided for each channel although it is recommended that this not be adjusted by the user.

e. Audio output. This consists of 4 audio output amplifiers band limited to 16kHz and with 75 µs de-emphasis. Level-adjust trimpots are provided for these outputs.

f. Data interface This has both RS232 and RS422 line receivers and drivers. The inputs to the OSD3914 data transceiver are either RS232 or RS422 and are automatically selected.

g. Stick card connectors. Each stick card with an RF output (i.e. OSD3912 video modulators, OSD3914 data transceiver and OSD3915 audio modulator) is coupled at its output via a relatively high value resistor to a transmission line which is terminated at one end and with laser-driver circuitry at the other end. In a similar manner, the output of the optical receiver is passed to the stick cards with RF inputs (i.e. OSD3932 video demodulator, OSD3914 data transceiver and OSD3916 audio demodulator) via a terminated transmission line.

1.4.2 OSD3912 VIDEO MODULATOR

The OSD3912 stick card is an FM modulator and is available in 4 different operating frequencies:

TABLE 2

Channel No.	Carrier Frequency	Part Number
1	26MHz	OSD3912/1
2	136MHz	OSD3912/2
3	93MHz	OSD3912/3
4	59MHz	OSD3912/4

The modulator stick card accepts a standard 1Vpp video signal, low pass filters it to 7.5MHz (10MHz optional) and pre-emphasises it before modulating the RF carrier. The output of the modulator is band limited and fed to the OSD3911 motherboard via a buffer.

1.4.3 OSD3932 VIDEO DEMODULATOR

This also available at the same 4 frequencies as the OSD3912 video modulator card:

TABLE 3

Channel No.	Carrier Frequency	Part Number
1	26MHz	OSD3932/1
2	136MHz	OSD3932/2
3	93MHz	OSD3932/3
4	59MHz	OSD3932/4

The demodulator stick card performs the inverse functions of the OSD3912.

1.4.4 OSD3914 4-CHANNEL DATA TRANSCEIVER

This utilises a multiplexer/demultiplexer chip which accepts up to 4 data signals in the range DC to 20kbps and outputs these at 1 Mbps in serial form. Its output is band limited and fed to the OSD3911 motherboard via a buffer. It also accepts the return path signal, which it band limits to extract the data signal. This signal is converted to logic levels and is presented to the multiplexer/demultiplexer chip which demultiplexes and outputs the four data signals.

1.4.5 OSD3915 4-CHANNEL AUDIO MODULATOR

This has 4 independent FM modulators centred on 10.7, 9.8, 6.5 and 6.0MHz. Each modulator is centre-frequency controlled by a phase lock loop circuit implemented in a PLD with a 4MHz crystal-controlled reference frequency. The output of each modulator is passed through a ceramic filter in order to eliminate crosstalk and mutual interference before being passed on to the OSD3911 motherboard.

1.4.6 OSD3916 4-CHANNEL AUDIO DEMODULATOR

This has 4 independent FM demodulators each of which has an automatic frequency control (AFC) loop and 2 ceramic filters to ensure stable long term operation

1.5 44-PIN D CONNECTOR PIN ASSIGNMENTS

TABLE 4

SIGNAL	PIN	SIGNAL	PIN
Digital Ground	1, 16,35,6,21		
Audio Ground	26,41,42,43,44		
Audio Input 1	14	RS422 + Input 1	7
Audio Input 2	29	RS422 -Input 1	22
Audio Input 3	15	RS422 + Input 2	8
Audio Input 4	30	RS422 - Input 2	23
Audio Output 1	12	RS422 + Input 3	9
Audio Output 2	27	RS422 - Input 3	24
Audio Output 3	13	RS422 + Input 4	10
Audio Output 4	28	RS422 - Input 4	25
RS232 Input 1	36	RS422 + Output 1	2
RS232 Input 2	37	RS422 - Output 1	17
RS232 Input 3	38	RS422 + Output 2	3
RS232 Input 4	39	RS422 - Output 2	18
RS232 Output 1	31	RS422 + Output 3	4
RS232 Output 2	32	RS422 - Output 3	19
RS232 Output 3	33	RS422 + Output 4	5
RS232 Output 4	34	RS422 - Output 4	20

2. INSTALLATION AND OPERATION

2.1 INTRODUCTION

This section outlines the methods required to install and operate the equipment successfully. It should be studied carefully to avoid damage to the equipment or poor results.

This equipment has been fully tested prior to despatch and is ready for immediate operation. However, it is advisable to check for external transportation damage before operation. If damage is present, return the unit and packing to the supplier immediately.

2.2 FUSE RATINGS

Ensure that an appropriate antisurge fuse is fitted as follows:

TABLE 5

UNIT	POWER SOURCE	FUSE RATING
1RU	240VAC	500mA
STANDALONE	240VAC	500mA
STANDALONE	-48VDC	500mA
OSD370 CHASSIS	240VAC	500mA

2.3 OSD391 1 TO 4 CHANNEL TRANSMITTER

When using the OSD391 for the first time, check that it is in good condition with no visible damage.

Turn the unit on and confirm that the green "Power On" indicator illuminates.
Check that the "Laser Fail" indicator is green and not red. If it is red there may be a problem with the laser or its support circuitry and the unit should not be used.

Connect the video source(s) (cameras, VCR's, video switches, etc) to the BNC input connector(s) via RG59 cable.

Connect the optical cable connector into the optical receptacle on the front escutcheon of the card unit or on the rear of the standalone and 1RU units.
If audio and/or data signals are being transmitted, connect the signals to the unit via the 44 pin D-connectors according to the Table 5 given in Section 1.5.

For the location of headers and trimpots please refer to Figure 3.
Audio input levels can be adjusted by means of trimpots RV6 (Channel 1), RV13 (Channel 2), RV8 (Channel 3) and RV7 (Channel 4). These may be adjusted if the audio source has a substantially different level to that required for the OSD390 (which is about 1 Vrms maximum, 200-400mVrms nominal).
Ideally any such adjustments should be made with a sinewave source at the input and an oscilloscope at the output of the remote end OSD393 receiver. If these are not available adjust the trimpot for maximum output level at the remote end while maintaining an acceptable level of distortion.

Turning the trimpot clockwise increases the level, anticlockwise increases the level.

2.3.1 OSD391 CARD VERSION

The OSD391 card is available either in 5T (25mm) width if it is purely a transmitter or in 10T (50mm) width if it includes a receiver for video, data or audio reverse-path signals.

The card is plugged into any slot (or any adjacent pair for 10T) of the standard OSD370 14 slot chassis.
The safety fuse is provided in the chassis power supply.

2.4 OSD393 1 TO 4 CHANNEL RECEIVER

When using it for the first time, check that it is in good condition with no visible damage.

Turn the unit on and confirm that the green "Power On" indicator illuminates.

Connect the optical cable connector into the optical receptacle on the front escutcheon of the card unit or on the rear of the standalone and 1RU units.
Check that the "Optical Signal" indicator changes colour from red (optical signal is too low) to green (optical signal power O.K.).

The unit can use this indicator function to mute the video outputs when the optical input signal is too low. The 2-pin header LK1 is linked if this function is required.

Connect the external equipment (monitors, video switches, VCR's etc) to the BNC output connectors via RG59 cable.

If audio and/or data signals are being transmitted connect the signals out of the 44 pin D-type connector according to the Table 5 given in section 1.5.
For the location of headers and trimpots please refer to Figure 3.
The audio output levels can be adjusted by means of trimpots RV9 (Channel 1), RV10 (Channel 2), RV12 (Channel 3) and RV11 (Channel 4).
Both RS232 and RS422 outputs are active. Use the one appropriate to your system.

2.4.1 OSD393 CARD VERSION

The OSD393 card is available either in 5T (25mm) width if it is purely a receiver or in 10T (50mm) width if it includes a transmitter for video, data or audio reverse-path signals.
The card is plugged into any slot (or any adjacent pair for 10T) of the standard OSD370 14 slot chassis.
The safety fuse is provided in the chassis power supply.

2.5 OSD391 AND OSD393 REVERSE PATH CHANNELS

If reverse path video, audio or data are fitted, exactly the same considerations above apply.

Remember, the OSD391 and OSD393 are, in fact, functionally the same if a reverse path is included. Both have a laser transmitter and a wideband receiver

2.6 WARNING AND PRECAUTIONS

2.6.1 ELECTROMAGNETIC COMPATIBILITY

WARNING: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures

2.6.2 LASER OPERATION

The single mode versions of the OSD390 are **Class 3A laser products.** Wavelength is 1310 or 1550 nm and power output is ≤+2dBm.

3. MAINTENANCE

3.1 INTRODUCTION

The following section outlines the fault-finding procedures for the equipment.

Please take note of the following:

> Personnel without appropriate technical training should not attempt any maintenance except that outlined below.
>
> If further maintenance is attempted you are warned that every care should be taken to ensure that internal measurements made while the equipment is running are taken carefully. Some components are extremely expensive and can be damaged by failure of any portion of their support circuitry.

3.2 EXTERNAL INSPECTION

Check that the electrical power leads are terminated correctly and that the correct power source is selected.

Check that "Power On" indicators are illuminated. If not, check the fuse within the power inlet module.

Check that the input video signals are connected to the OSD391 and that the OSD393 has been correctly connected to properly terminated external equipment.

Inspect optical connector and clean using lint-free tissue and isopropyl alcohol to remove contamination.

Check that the optical power level out of the transmitter is correct (> -10dBm for OSD391LP, >-5dBm for OSD391 and >0dBm for OSD391H) and that the received power level is greater than -23dBm. Ideally the OSD393 receive power level should be in the range -20 to -10dBm.

3.3 ROUTINE MAINTENANCE

No routine maintenance is required for this equipment.

4. WARRANTY

Optical Systems Design warrants that at the time of shipment, its products are free from defects in material and workmanship and conforms to specifications. Our warranty conditions are outlined below:

4.1 WARRANTY PERIOD

For warranty period, please call your local OSD distributor.

4.2 ALL REPAIRS

Optical Systems Design reserves the right to repair or replace faulty modules/units. Please obtain an Optical Systems Design "Return Material Authorisation" form and number before returning goods.
Goods must be returned in adequate packing material to Optical Systems Design, or its nominated authorised representative, for all repairs.

4.3 WARRANTY REPAIRS

Return shipments to Optical Systems Design shall be at customer's expense and freight back to the customer will be at Optical Systems Design's expense.

4.4 OUT-OF-WARRANTY REPAIRS

Optical Systems Design reserves the right to repair or replace any faulty goods. Freight costs and insurance for both journeys are met by the user. All equipment repaired by Optical Systems Design will have a 3 month warranty from the date of despatch.

4.5 SITE REPAIRS

By agreement site repairs may be undertaken for which out of pocket, accommodation and travel expenses will be charged.

4.3 EXCLUSIONS

This warranty does not apply to defects caused by unauthorised modifications, misuse, abuse or transport damage to the equipment.
All modifications to Optical Systems Design standard products will need written authorisation. All modifications are to be carried out by Optical Systems Design and will be charged at normal repair rates.

Warranty is void if unauthorised removal and/or tampering with serial number and/or repair labels is evident.

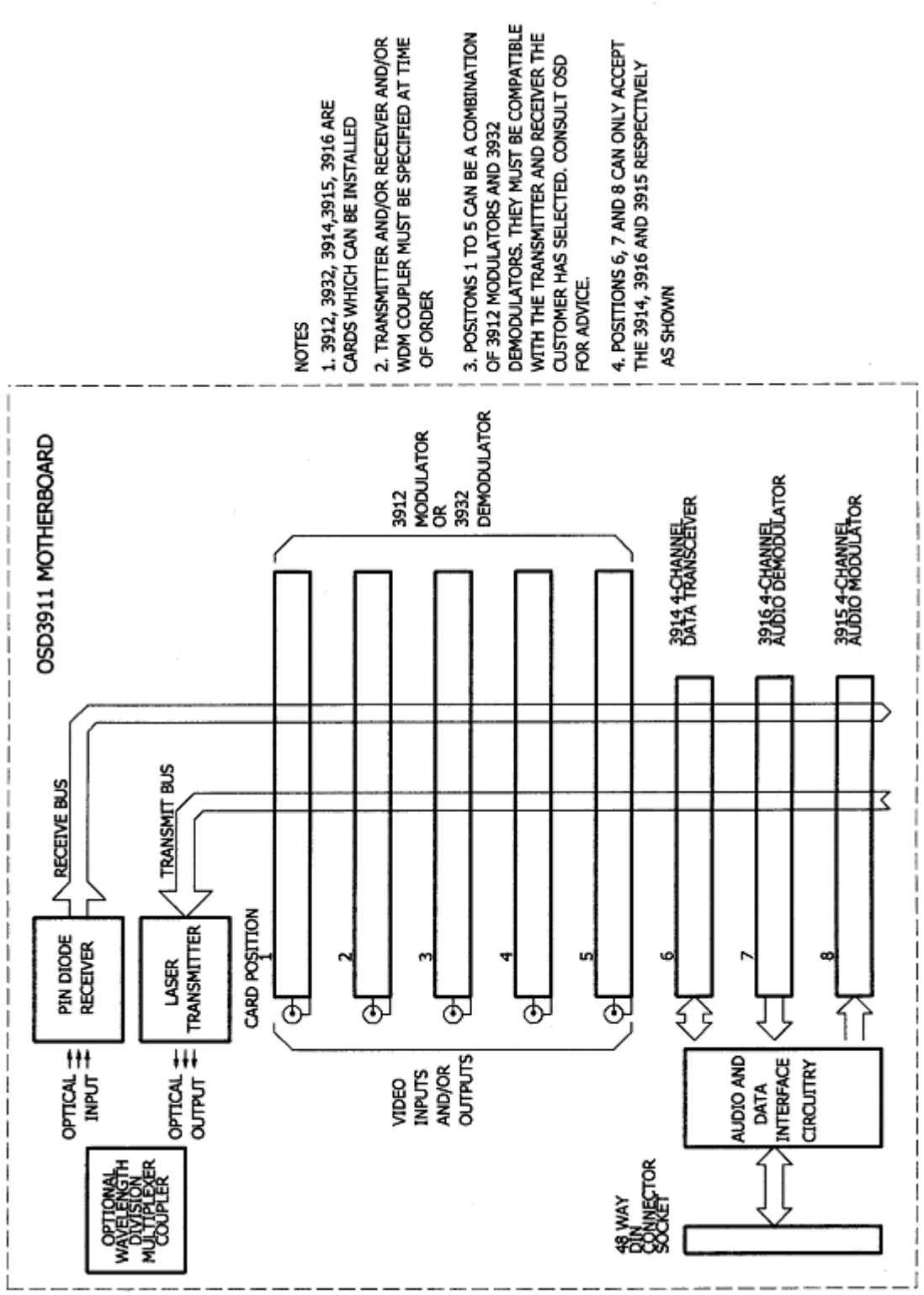

FIGURE 1. OSD390 SYSTEM BLOCK DIAGRAM

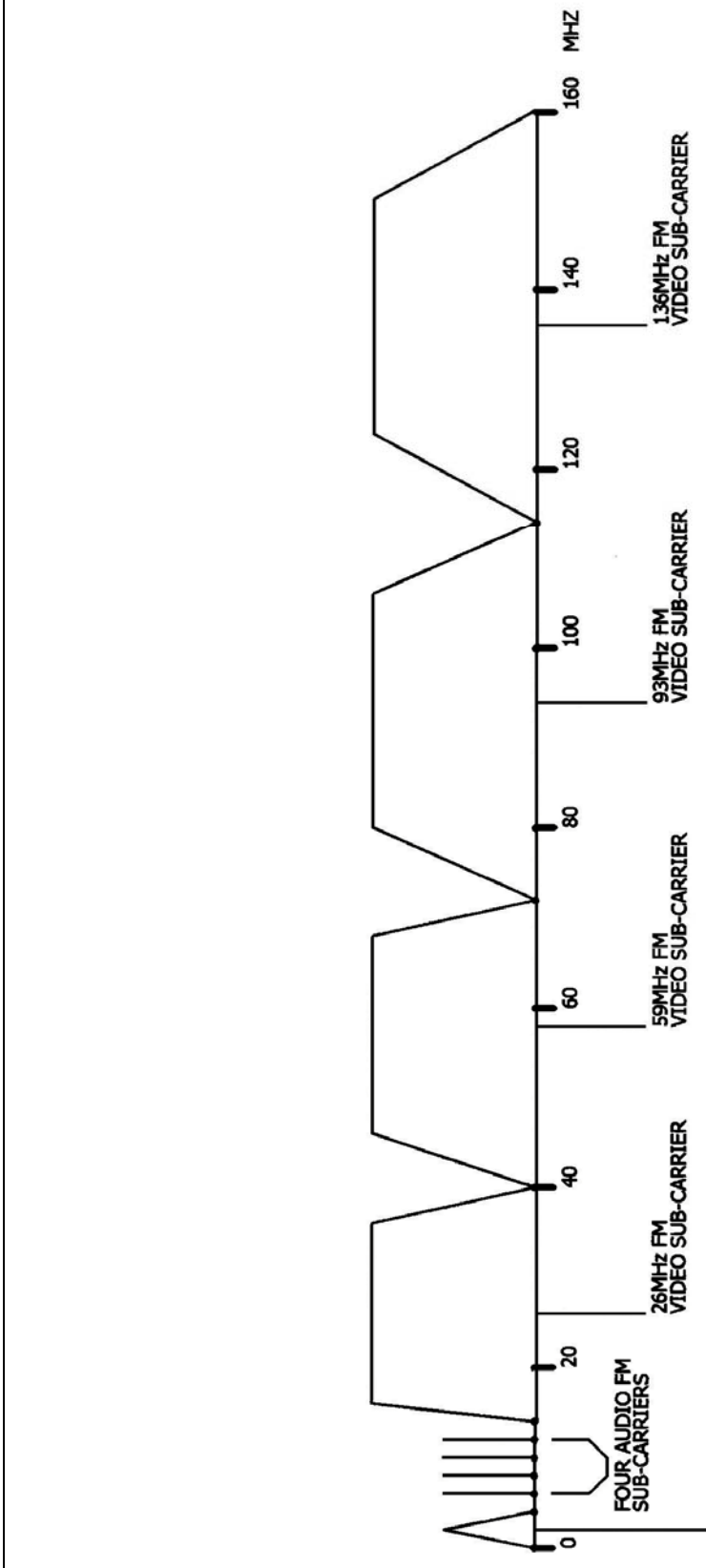

FIGURE 2. OSD390 SYSTEM TRANSMISSION FREQUENCY PLAN

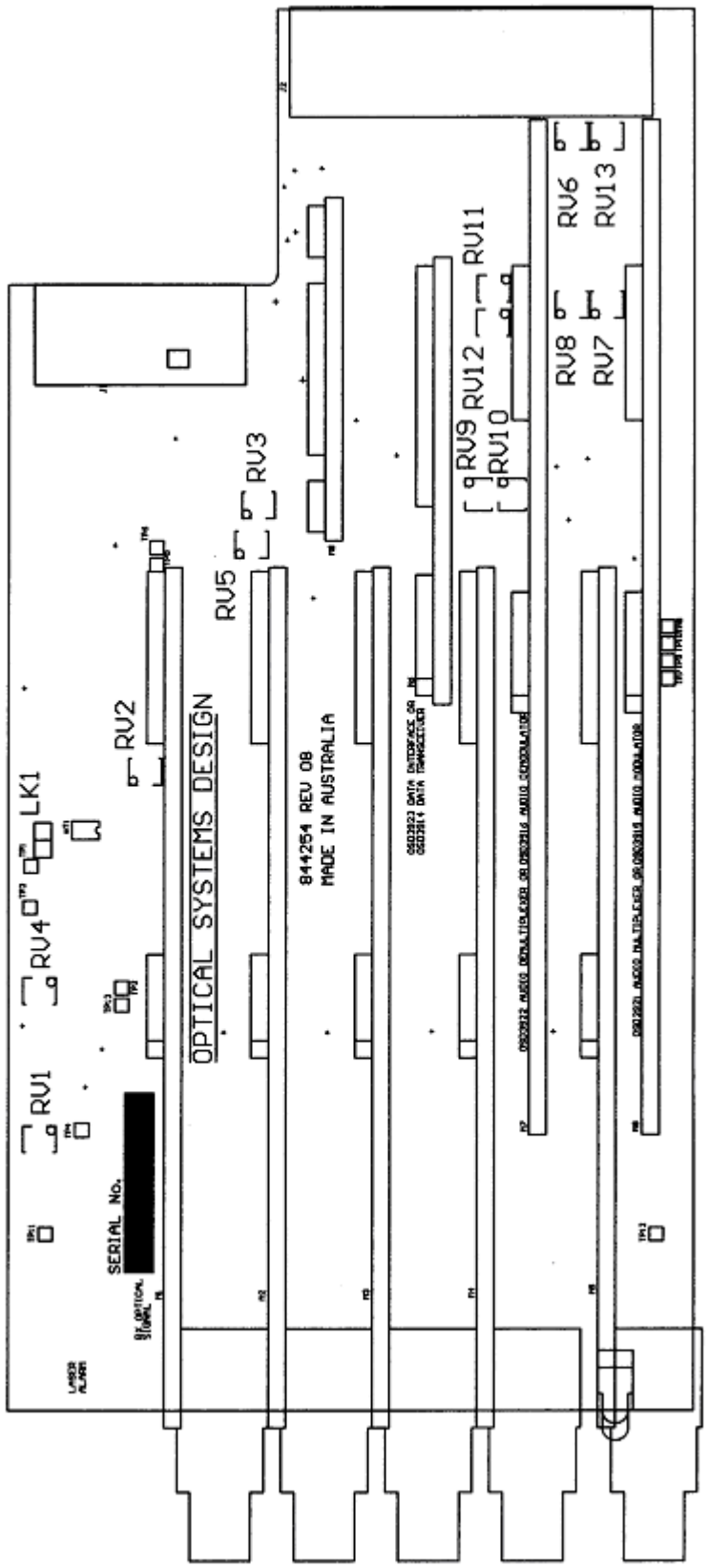

FIGURE 3. OSD390 SYSTEM MOTHERBOARD ADJUSTABLE COMPONENTS