

DDX - 48

48 CHANNEL DIGITAL DEMULTIPLEXER

FOR DIGITAL/ANALOGUE LIGHTING CONTROL APPLICATIONS

Designed in Australia for International Conditions by:

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FEATURES

- * Control of up to 512 dimmers over a single shielded pair control cable.
- * Accepts DMX-512 protocol.
This is the digital multiplex system specified by the USITT. Using this protocol allows the DDX-48 to be used with a variety of existing and future equipment without the need for costly interfaces and converters.
- * Allows existing analogue systems to be upgraded to digital control simply and effectively without having to invest in a complete digital system.
- * Output hold facility.
In the event of the digital data cable being severed or the controlling console simply stops transmitting, the DDX-48 retains the output levels present immediately prior to disconnection.
- * Control Line Output Drive.
To optimise the data transmission each DDX-48 operates as a repeater for the DMX-512 control line, retransmitting the data instead of simply receiving only. In the event of a power failure, the control line is automatically switched through maintaining signal to other receiving units.
- * Full speed 250 k baud data transmission rate.
- * Full 8 bit conversion giving smooth unstepped response.
- * 48 output channels for direct connection to analogue dimmer control inputs.
- * All analogue outputs are short circuit and diode protected.
- * Outputs on 15 pin 'D' connectors suitable for temporary permanent installations.
- * Industry standard input/link connector (5 pin AXR).
- x Reduced cable costs, size and weight.
- * 240 Volt operation.
Requires no special or external power supplies.
- * Two year warranty (Australia only).
- * Steel 19" single rack-unit chassis.

1.0 INTRODUCTION

The JANDS DDX-48 is a professional digital receiver/line-driver designed for use in digital multiplex control systems. The DDX-48 bridges the gap between existing technology wire-per-channel analogue receivers and the more recently introduced digital control desks. The use of digital multiplexing allows up to 512 control channels to be transmitted through a shielded-pair, saving on both cost and weight over a standard analogue system.

1.1 Description

Each DDX-48 decodes signals which conform to DMX-512 specification, and converts them to their analogue equivalent. This specification allows for up to 512 control channels to be sent via a balanced digital line. Each DDX-48 decodes a bank of 48 channels as selected by a "BANK SELECT" switch on the front panel. Where more than one DDX-48 is used in a system, the digital line is 'daisy chained' using the "OUT" connector on the front panel. Each DDX-48 on this line will terminate the line and re-transmit the control information automatically, resulting in optimum signal transmission in bad conditions.

The 48 analogue outputs are directly compatible with most existing wire-per-channel receivers, such as dimmers and colour strollers, being 0 to +10 VDC. The outputs are terminated on four 15 pin 'D' connectors on the front panel, suiting temporary and permanent applications.

Each unit comes ready to mount in a standard 19" rack and occupies one rack space (1 3/4, inches).

2.0 INSTALLATION

Before leaving the factory each and every JANDS product is carefully tested and inspected for physical imperfections. As soon as your unit shipment is received, please check for any damage incurred during transit. If any damage has occurred, immediately notify the transport company and your dealer so that a claim to cover damages may be initiated. Be sure to retain the shipping carton and all packaging material for the transporters inspection. Even if no damage has occurred, it is an advantage to retain the packaging materials should you have occasion to ship the unit.

2.1 Mains Supply Changes

The power- to supply a DDX-48 may be either 240 or 120 VAC. Both types are manufactured, the rating being marked on the back panel near the power socket. To change the voltage, disconnect power, remove the lid (6 screws), and wire the terminal strip as shown in Figure 1. When finished, check for errors and replace the lid.

VIEW FROM ABOVE OF TERMINAL STRIP
WHEN LOOKING FROM FRONT OF UNIT

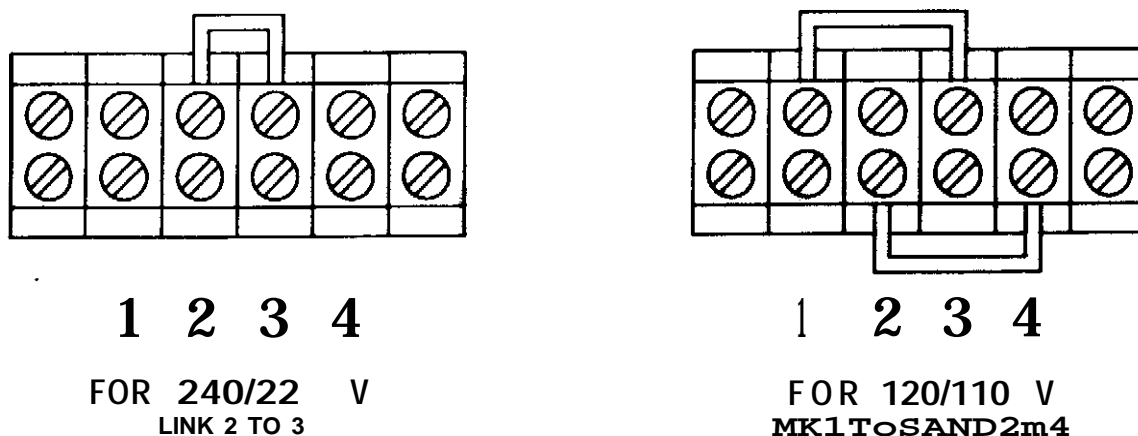


Figure 1. Mains Wiring Configurations

2.2 Output Voltage Adjustment

As supplied, a DDX-48 will output +10 VDC at full. This may be adjusted over the range +6 to +12 V if required to interface to non-standard equipment. If so, remove the lid (6 screws) and plug a digital control line into the "IN" socket on the front panel, wired as in Appendix D. APPLY power. set the control console to output channel #1 at full. Referring to Figure 2, adjust the output level trim to give the required output voltage on pin 1 of the first 'D' connector. All channels will now output to this standard.

HEWFRWAEOVEWWJNaRCUITBOARD
WIEN LOCKING FRGU FWNT GF UNIT

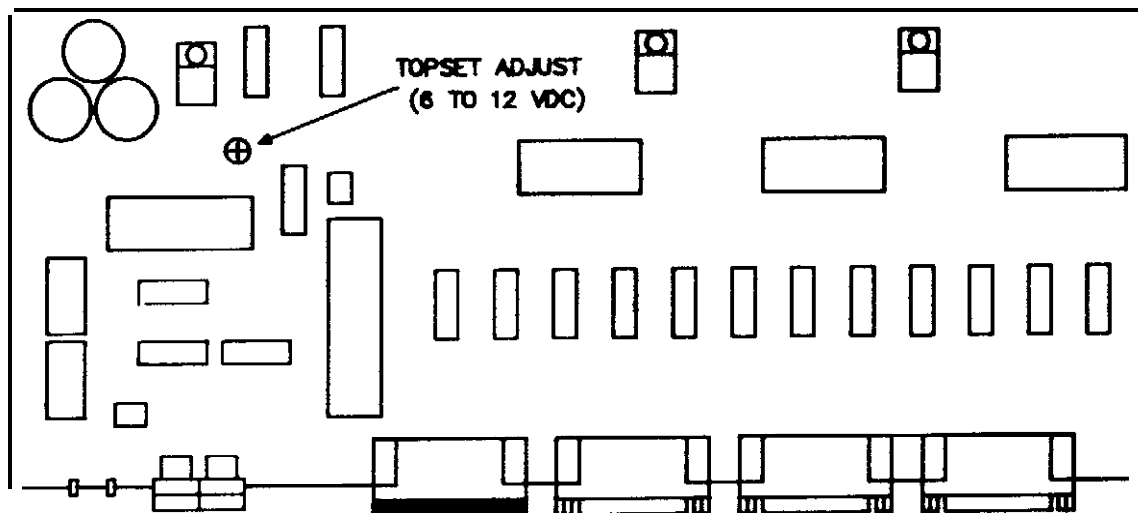


Figure 2. Output Level Trim Location.

2.3 Rack Mounting

The DDX-48 has been designed to be installed in a standard 19" rack, and occupies one rack space. When mounted with dimmers, it should be placed beneath the dimmers to minimize heat build-up.

Slide the unit into its position in the rack, and secure using the four rack screws supplied.

2.4 Wiring

If more than one DDX-48 is to be used from the one control desk, plug a daisy-chain lead from the first DDX-48 "OUT" socket to the next "IN" socket.

The analogue outputs are arranged in four groups of twelve channels, to simplify the interface between the DDX-48 and 12 channel dimmers. Plug in the appropriate leads, and screw the retaining screws home. Again the leads should be wired as in Appendix D.

3.0 POWERING UP

Switch the front panel "POWER" switch on. The red "POWER" LED will light if the internal power supplies are operating. Turn off, connect a digital control source, and turn on again. The green "SIGNAL" LED will light, if the digital control data is of the correct protocol and data rate.

3.1 To Select a Bank

The DDX-48 selects a bank of 48 channels from the possible 512 available on the DMX-512 line. The 48 channels are sequential and the starting channel must be as of racks of 12. The "BANK SELECT" switches on the front panel are used to select which 48 channels will be output. Refer to Table 1 to obtain the required "BANK SELECT" setting eg.

```
if BANK SELECT=02
```

```
then DDX-48 CHANNEL #1=DESK CHANNEL #13
```

Hence the first 12 desk channels would be ignored by this DDX-48 and the 48 output channels would be the four racks 2,3,4, and 5. The remaining desk channels would also be ignored by this DDX-48.

Note: If desired, more than one DDX-48 can be set to the same or overlapping banks, resulting in parallel outputs.

The highest valid "BANK SELECT" setting is "40": "BANK SELECT" setting "00" turns all analogue outputs off. Control line information still passes to the "OUT" connector in this state.

TABLE L : ~~~Valid Bank Select Settings and. ~the Channels Output

"BANK SELECT"	Channels Decoded	"BANK SELECT"	Channels Decoded
00	OUTPUTS OFF	21	241 - 288
01	1 - 48	22	253 - 300
02	13 - 60	23	265 - 312
03	25 - 72	24	277 - 324
04	37 - 84	25	289 - 336
05	49 - 96	26	301 - 348
06	61 - 108	27	313 - 360
07	73 - 120	28	325 - 372
08	85 - 132	29	337 - 384
09	97 - 144	30	349 - 396
10	109 - 156	31	361 - 408
11	121 - 168	32	373 - 420
12	133 - 180	33	385 - 432
13	145 - 192	34	397 - 444
14	157 - 204	35	409 - 456
15	169 - 216	36	421 - 468
16	181 - 228	37	433 - 480
17	193 - 240	38	445 - 492
18	205 - 252	39	457 - 504
19	217 - 264	40	469 - 512
20	229 - 276		

3.2 Final Test

The DDX-48 is now ready for use.
Connect and turn on the dimmers.
Control lighting channel numbers as defined in Section 3.2.

When POWERING UP any system, the sequence followed should be:

First DESK,
then DDX-48/s AND ANY OTHER DEMULTIPLEXERS,
then DIMMERS AND ALL OTHER RECEIVERS.

This minimiaes the chances of producing the lighting-equivalent of an audio 'thump' and prevents damage to sensitive devices such as colour strollers. This also extends lamp and dimmer life.

Use the REVERSE procedure when POWERING DOWN.

3.3 Normal Operation

The green "SIGNAL" LED flashes when the data is undated and so the flash rate and intensity are dependent on the controlling console. Some consoles will cause this LED to visibly but regularly flash. If the LED does not light, or flashes irregularly, refer to the TROUBLE-SHOOTING section.

If the control console stops transmitting or the control line is severed, the DDX-48 holds the levels present immediately prior to the data loss. The hold period is determined internally at around 15 minutes. After this time the outputs slowly fade to off. Rate of fade is not necessarily the same for each channel.

4.0 MAINTENANCE

With care, the DDX-48 will require little or no maintenance. If a fault develops refer the Fault Diagnosis Table in Appendix B (page 7). If the unit will still not perform as described, the DDX-48 should be taken to an authorised JANDS distributor for professional service. For Dealer listing, refer to Appendix C (page 8).

4.1 Cleaning

Use a mild detergent and water with a soft cloth or paper towel to clean external surfaces, taking care to prevent water entering the chassis.

4.2 Guarantee

Each and every JANDS product is guaranteed against defects in material and workmanship for a period of two years in Australia. Contact your distributor for overseas guarantee details. In Australia, JANDS will replace defective parts and make necessary repairs under this warranty if our examination reveals evidence of faulty workmanship or material. The warranty does not cover damage caused by misuse, accident or neglect, or if the serial number has been defaced or removed. The warranty card is included with each unit which sets out the conditions of the warranty. There is no need to return this card. Your bill of sale is sufficient to establish warranty. Should there be a need to ship the unit to JANDS factory for repair, the unit must be shipped in its original package (or a replacement which is available at a small cost) and all freight charges must be pre-paid. If a warranty claim is established the unit will be repaired and returned freight collect.

Appendix A DDX-48 SPECIFICATIONS

Digital Line Input/Output connector	S Pin AXR Pin 1 - Shield Pin 2 - Cold Pin 3 - Hot Pin 4 - Spare Cold Pin 5 - Spare Hot
Input Signal	Electrically must conform to RS485A specification.
Data Protocol	Must conform to full speed USITT DMX-512 specification (250 k baud).
Maximum Digital Control Line Length	Undefined due to variation in cable parameters. With high quality cable, over 500 metres can be obtained.
Suitable Cable Types	Belden 9841 or equivalent (1 pair, no spares) Belden 9842 or equivalent (2 pairs, spares provided)
Channel Selection	Channels are grouped in banks of 48 selected via front panel "Bank Select" switch in accordance with Table 1.
Channel Output	0 (off) to +10 vdc (full) on front panel 'D' type connectors, diode and short circuit protected.
Output Error	10% for 1k Load <1% for >10k Load (typical)
Update Rate	Dependent upon controller.
Front Panel LED Indicators	POWER (red) and SIGNAL (green).
Power	220-260 VAC 50Hz. 20W maximum. 105-135 VAC 60Hz. 20W maximum. Supply voltage internally set.
Mains Fuse	250 mA 3AG.
Size (mm)	19" wide x 1 3/4" high (1 Rack Unit) (480 wide x 45 high x 200 deep)
Weight	3 kilograms

Appendix B FAULT DIAGNOSIS TABLE

SYMPTOM	FAULT	SOLUTION
No Power LED (red).	- 240V supply disrupted. - Front panel switch not on. - Fuse blown.	- Connect SuPPLY. - Turn on. - Replace fuse with 250mA 3AG fuse.
Power LED (red) on but no signal LED (green).	- Digital Line "Ot connected. - Cable failure. - Controlling console not transmitting.	- Plug in. - Repair cable - Fault not in DDX-48.
Signal LED (green) active, but erratic or no output.	- Cable failure. - Dank Select switch setting not valid. - Line switch on back panel incorrectly set. - Transmission speed incorrect.	- Repair cable. - Carefully reset Rank Select switch as per Table 1. - Select appropriate setting as outlined in Section 3.2. - Adjust ContrOller data speed (250 k baud). Fault not in DDX-48.

Note: The green "SIGNAL" LED flashes each time the data is updated. With some consoles this will cause the LED to visibly flash, during normal operation. A random or slow flashing "SIGNAL" LED can indicate incorrect digital data baud rate or protocol. Check controller specification.

Appendix C Spare Parts AND Accessories

SPARE PARTS	QTY per DDX-48	PART NUMBER
Bank Select Switch	2	
Power Switch	1	EC262
Lid screws '/- x a/E. Black	11	ss004
Male 15 Pin 'D' type connector PCB	4	
Fuse - 240 VAC 2S0m 3AG	1	EF125
Male 5 Pin AXR chassis Mt Black	1	MO5328
Female 5 Pin AXR chassis Ht Black	1	MO5318
ACCESSORIES		
Male 5 Pin AXR in line	1	AXR512 (CANNON)
Female 5 Pin AXR in line	1	AXRS11 (CANNON)
Female 15 Pin 'D' type connector	LINE 4	
Rack Mount Kit Cage Nuts (50)	4	1557
Rack Mount Ls/Is x '/- screws (50)	4	1559
Digital Control Cable - 30m		
- 50m		
- 75e		
- loon		

Appendix D ~ CONNECTOR PIN TERMINATIONS

ANALOGUE OUTPUTS

'D' CONNECTOR PIN	CHANNEL OUTPUTS			
	CON #1	CON #2	CON #3	CON #4
1	1	13	25	37
2	2	14	26	38
3	3	15	27	39
4	4	16	28	40
5	5	17	29	41
6	6	18	30	42
7	7	19	31	43
8	8	20	32	44
9	9	21	33	45
10	10	22	34	46
11	11	23	35	47
12	12	24	36	48
13	GND	GND	GND	GND
14	NC	NC	NC	NC
15				

Note that these output channels are for the "BANK SELECT" setting "01" only and change in increments of 12 channels each time the select switch settings are increased by one. It is recommended that all unused DB15 pins (14 and 15) be connected to ground.

DIGITAL CONTROL LINE INPUT

AXR CONNECTOR PIN (MALE 1)	SIGNAL
1	SHIELD
2	RECEIVE -VE
3	RECEIVE +VE
4	SPARE
5	SPARE

DIGITAL CONTROL LINE OUTPUT

AXR CONNECTOR PIN (FEMALE)	SIGNAL
1	SHIELD
2	TRANSMIT -VE
3	TRANSMIT +VE
4	SPARE
5	SPARE

It is recommended that the specified cable type be used in all conditions. However, for short runs other cable types will operate successfully. Experimentation is the best method for determining the suitability of a cable. Note that the cable must have two cores within the shield.

Note also that digital control cables should NEVER be 'Y' split to obtain two outputs. If more than one output is required, an active splitter-box should be used.



The DDX-48 Demultiplexer Unit

Introduction

The DDX-48 was designed to fill a need between DMX-512 producing control consoles and analogue input dimmers. This allows operators to use the latest console without having to invest in new dimmers.

The unit receives DMX-512 signal, and decodes a bank of 48 channels from information in that signal. The outputs appear on four 25 pin 'D' connectors on the front panel. The 48 channels received can be selected by the 'Bank Select' switch, also on the front panel.

A DMX-512 output is provided for linking to other DMX-512 receivers that may be on the control line. Line termination is unnecessary with the DDX-48 because of its 'Active Output' circuitry. This circuit automatically terminates the incoming control line, and re-transmits the information to the 'DMX-512 Output' connector. This maintains signal level in even the most harsh conditions.

The Circuit

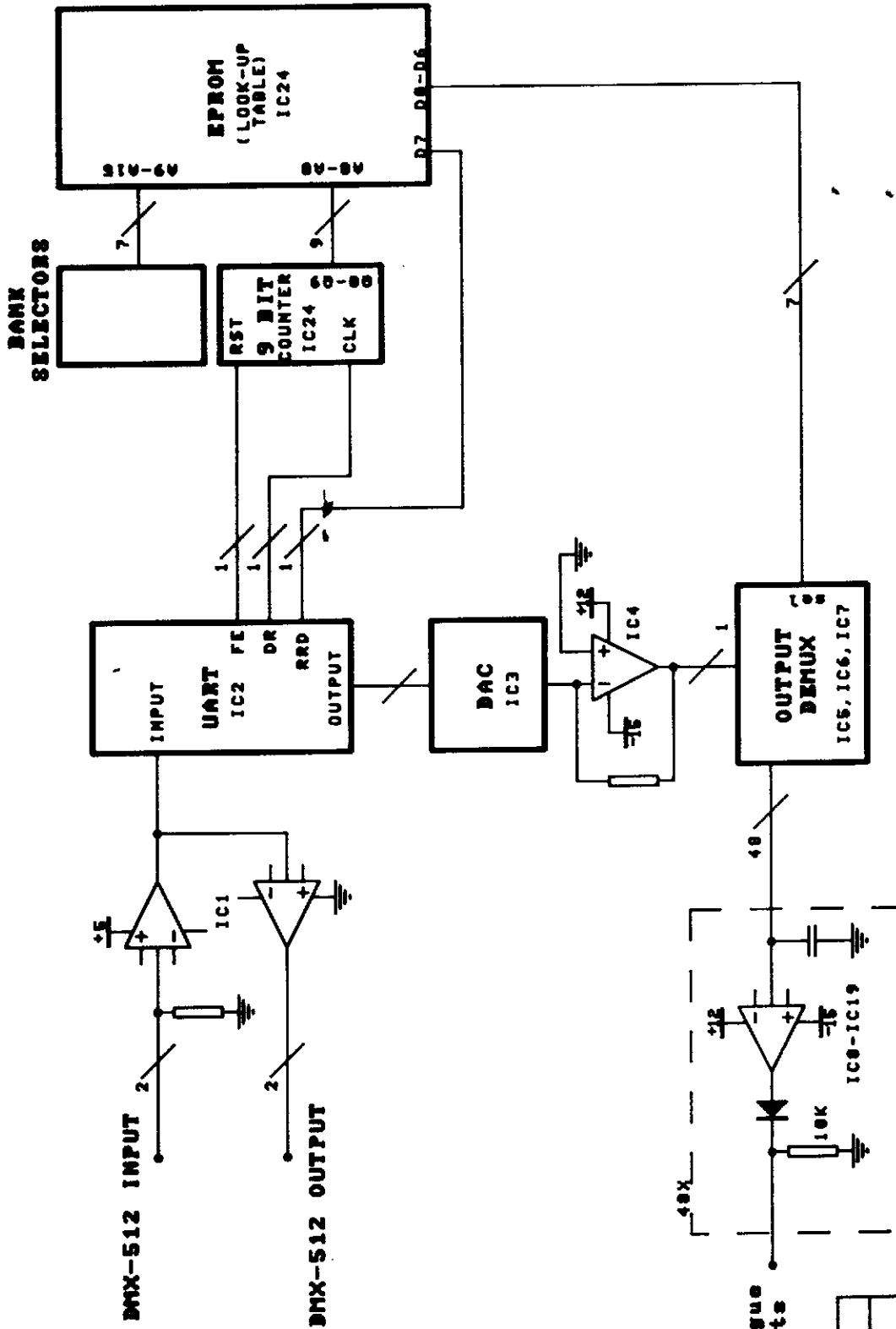
The circuit is based around the UART (IC2). This is an asynchronous receiving device for use specifically in this sort of application. It receives serial input from the control console via the line receiver (IC1), and decodes it into parallel data for the DAC (IC3). The analogue equivalent appears at the output of the DAC buffer (IC4). Clock is provided by an inverter type crystal oscillator (IC21 and XI), at 16 X the data rate.

When the UART receives the Break part of the signal, it sees this as a badly framed word and asserts FE (framing error) pin 14. This is used to reset and synchronise the counters.

As the UART receives the 'data packet identifier' and subsequent data words, it asserts DR (data received). This is used to clock the counter and point to the next word. An EPROM is used as a look up table to convert the counter output and 'bank select' information into demultiplexer addresses (IC5-7) via level translators (IC25). Sample and hold buffers (IC8-19) are used to hold the channel information.

An intermediate flip-flop (IC22) is used to ensure the circuit does not decode the 'data packet identifier' as channel information.

A simple linear power supply provides power for the circuit. A pair of relays disconnect the unit from the data line when power is removed.



5 PIN AXB	
PIN	CONNECT
1	GND
2	510
3	510

15 PIN 'D'	
PIN	CONNECT
1-12	CHANNEL OUTPUT 1-12
13	GND
14, 15	N/C

DBX-48 BLOCK DIAGRAM

Y1116

NUMBER OF SIGNALS _____

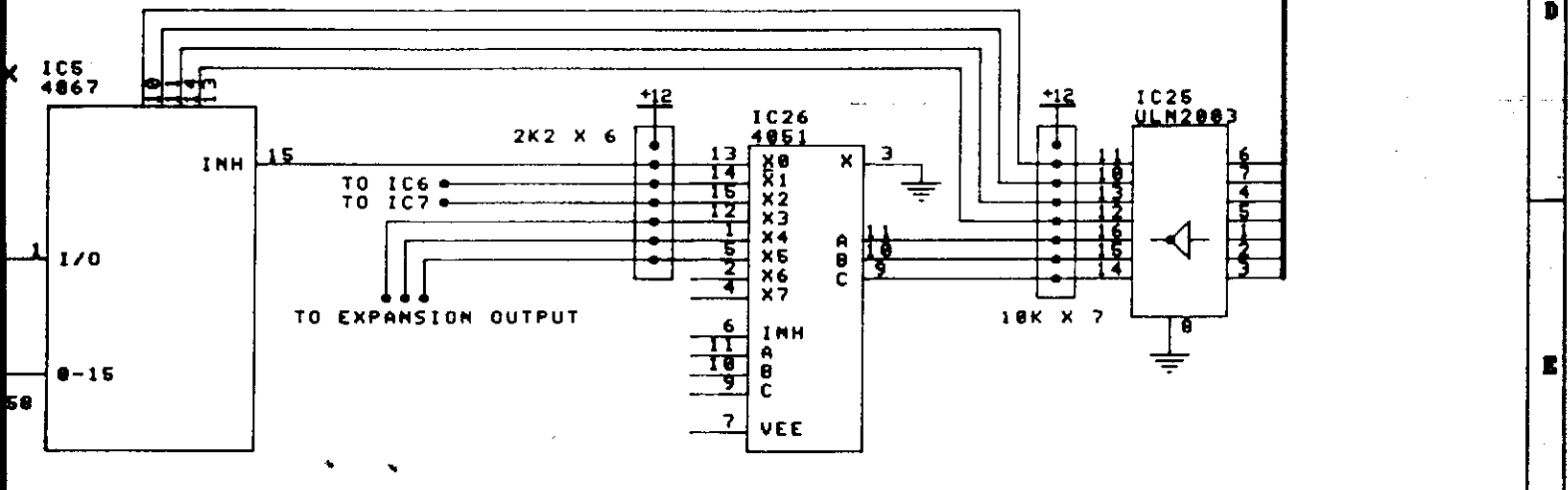
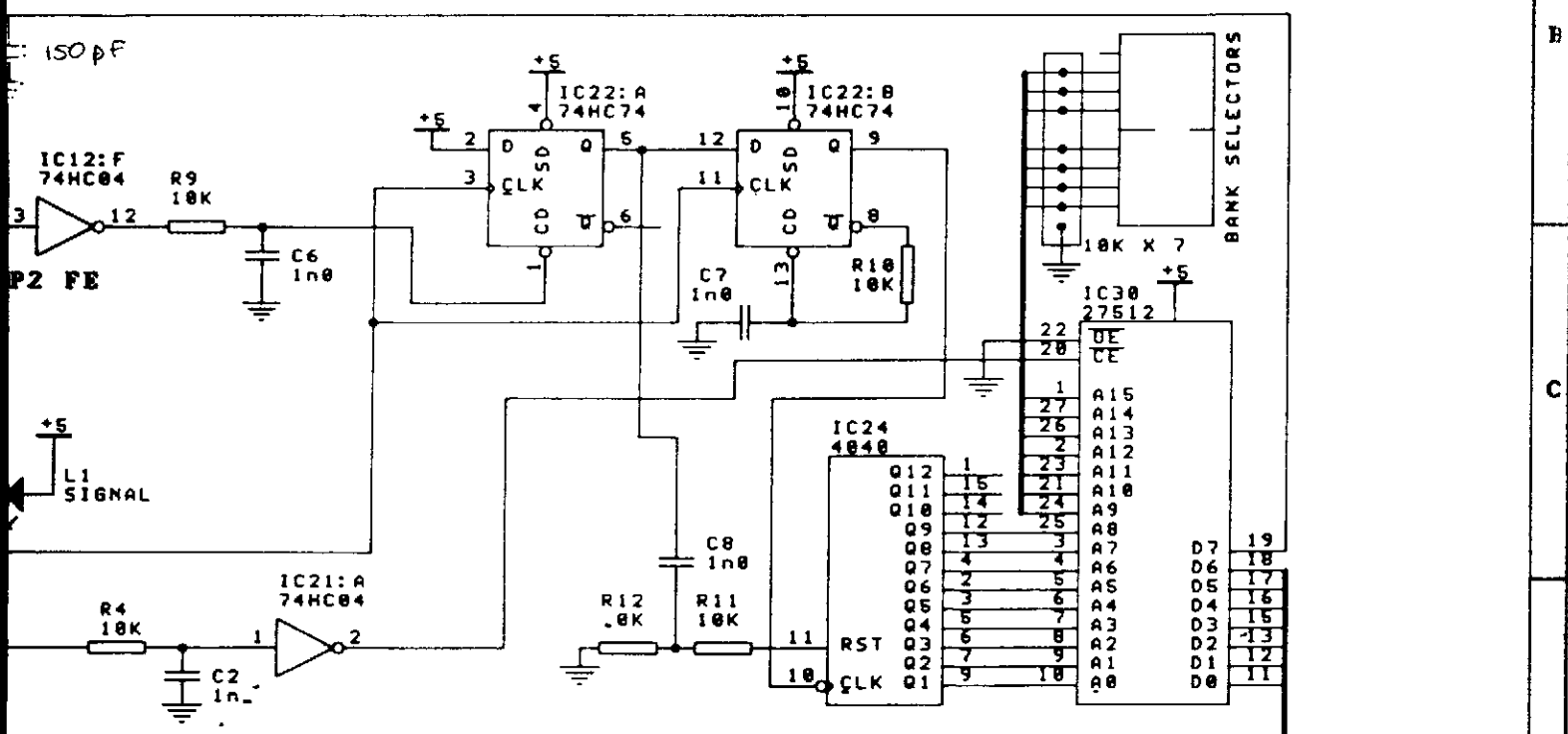
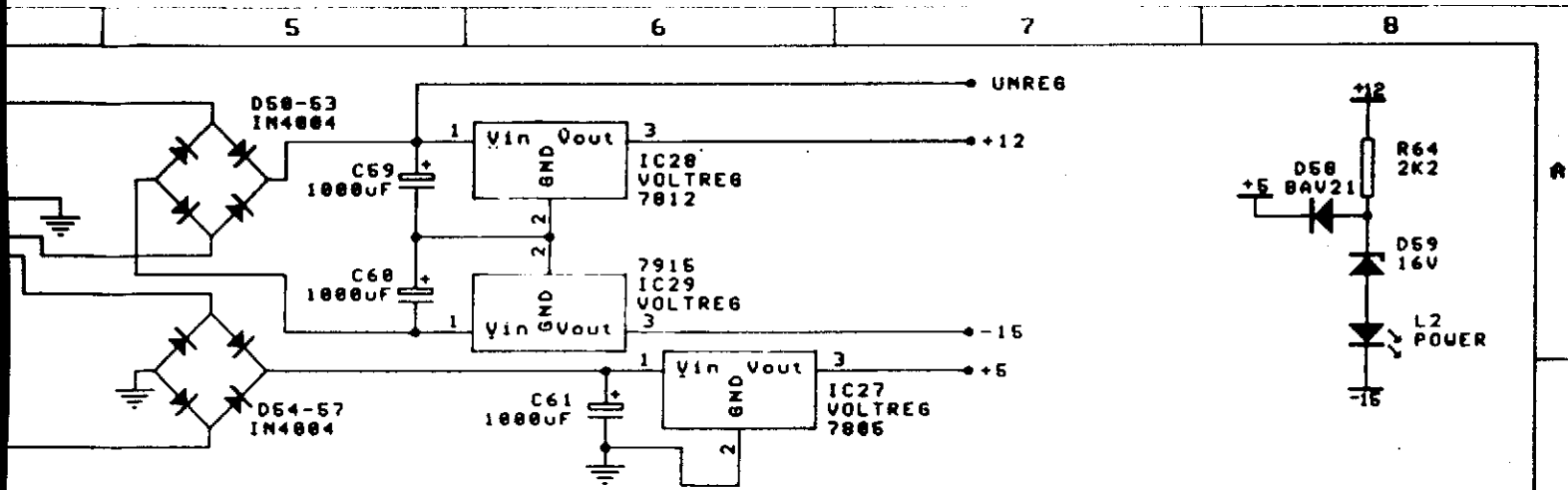
Size M4

Revision _____

DATE: 15 JUN 1978

BY: [Signature]

APP: [Signature]



Title		
DDX-48 DEMULTIPLEXER CARD		
Size	Number	Revision
A3	1265.43/B1	1
Date: 1-DEC 1988		Sheet 1 of 1
File: ddx48/1		Drawn By: D. TIMMINS





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JANDS SERVICE BULLETIN 6/5/1991

DDX48 MODIFICATIONS

FOR CIRCUIT CARD NUMBERS BEFORE 1265.43/B3.4

TOP OF CIRCUIT BOARD.

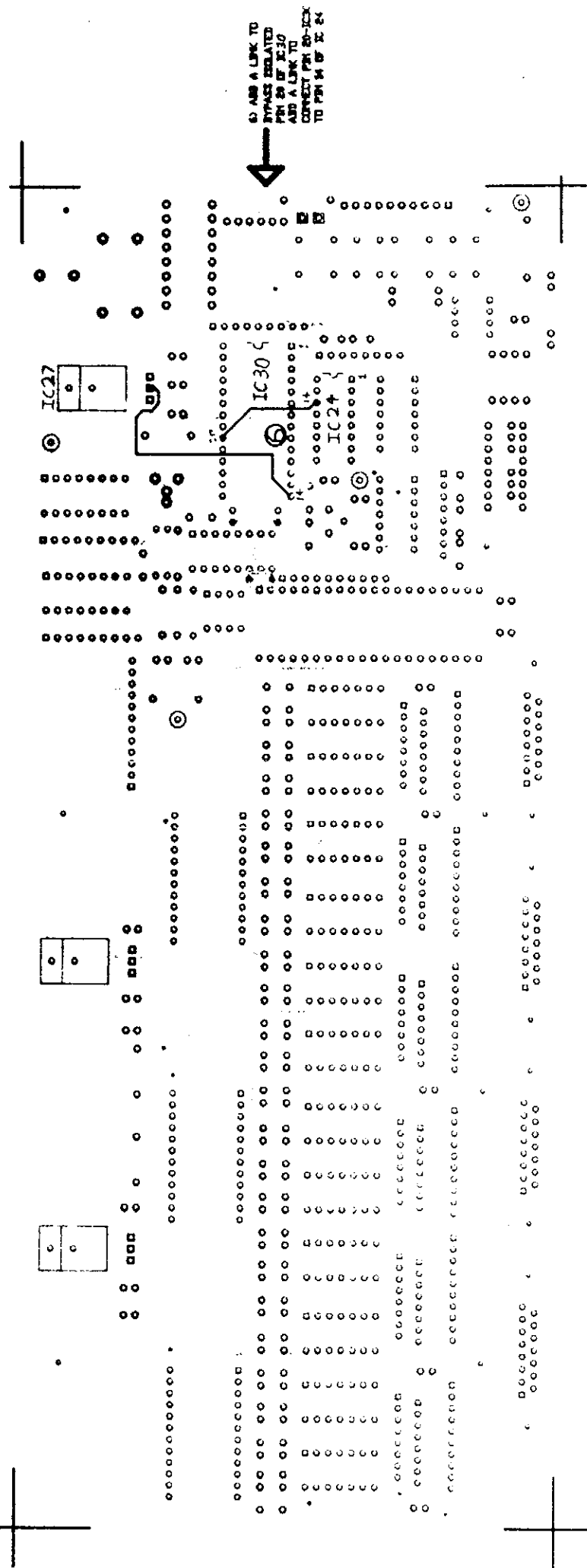
- 1) ENSURE THAT THE POSITIVE VOLTAGE REGULATOR IC28 IS 7812 NOT 7815 AS PREVIOUSLY FITTED.
- 2) REMOVE R2 10k AND SOLDER ONE SIDE OF A 3k9 REPLACEMENT TO THE LEFT HOLE OF THE REMOVED RESISTOR (CONNECTED TO IC3 DAC0801 PIN 14) & THE OTHER SIDE OF THE 3k9 REPLACEMENT TO IC2 6402 PIN 1. TOPSET OF THE ANALOGUE OUTPUT MUST BE RETRIMMED WITH R14.
- 3) REMOVE RI3 3k9 AND D1 BAV200 & PLACE 3k9 IN THE BLANK HOLE DIRECTLY BELOW ITS OLD POSITION (ABOVE IC3 DAC0801).
- 4) REMOVE IC30 27512 & CUT TRACKS ON TOP OF THE CIRCUIT CARD SO AS TO ISOLATE PIN 20 (RECONNECTION OF PIN 20 IS COMPLETED IN STEP 6). REINSERT IC30 27512.
- 5) ENSURE THE CAPACITORS C6=2n2, C2=1n5, C1=3n3 ALL ARE LOCATED TOGETHER BELOW IC21 74HC04

BOTTOM OF CIRCUIT CARD.

- 6) ADD LINK FROM IC30 27512 PIN 20 TO IC24 4040 PIN 14.
ADD LINK TO RECONNECT TRACK PATH CUT WHEN ISOLATING PIN 20 OF IC30 (27512) BETWEEN PIN14 OF IC30 27512 AND IC27 7805 PIN 2 (CENTRE PIN).

Peter G. Henskens.
SERVICE MANAGER.

DDX48 MODIFICATIONS
 BOTTOM OVERLAY
 FOR P.C.B. BEFORE 1265.43/B3.4



5) ADD A LINK TO STRAPS RELATED PINS OF IC30
 ADD A LINK TO CORRECT PINS 20-22CX TO PINS 14 OF IC 24

IC27

IC30

IC24

5