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Minipak

MAINTENANCE HANDBOOK. MINIPAK LIGHTING CONTROL.

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MAINTENANCE HANDBOOK

MINIPAK LIGHTING CONTROL

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Included with this handbook

* Fig 1. Output Waveforms and Voltages
  Drg. No.: SA245/01/A1 issue C (circuit diagram of Minipak Dimmer Module)
* Trigger PCB Component Layout and Parts Lists.
* Control Cable connection details

Also available

*Minipak handbook supplement No.1
(for modules manufactured prior to October 1979).
*Control Desk Handbooks.
*Minipak Installation Handbook.

MAINTENANCE HANDBOOK

MINIPAK LIGHTING CONTROL

1. DESCRIPTION

1.1 Minipak is one of the family of Strand Electric dimmers. It is used in conjunction with a remote control desk, and provides 12 separate lighting control circuits, making it ideal for use by schools, non professional theatres, and other small installations.

1.2 The unit consits of three dimmer modules and one control module, all housed in a single sheet steel vented rack. Each dimmer module has four separate lighting control circuits, each with a 10 Amp outlet and fuse.
The control module contains an extra low voltage (-33V DC) power supply with its associated fuse, a 14 way control input socket, and a terminal block for mains connection.

2. ACCESS TO MODULES AND WIRING.

> WARNING:
> ALWAYS DISCONNECT SUPPLY BEFORE ATTEMPTING TO REMOVE OR SERVICE ANY MODULE. DO NOT ATTEMPT TO USE A MINIPAK DIMMER RACK UNLESS ALL MODULES ARE IN PLACE.

2.1 Dimmer Modules

2.1.1 Each dimmer module is secured by four self tapping screws which mate with self-aligning spring steel speed nuts in the rack.
When replacing these, do not over-tighten, as damage to the speed nuts may result.

2.1.2 Wiring to the modules is via a six pin Molex plug and a three way mains terminal block. The control cables in the rack are labelled "group 1", "group2" and "group 3" to correspond with the Dimmer Module in the system.

The mains wiring to each module consists of a green earth wire, a heavy (6sq.mm) blue neutral wire and a 6 sq mm active (phase) wire which may be red, yellow or brown. Connect these to the corresponding terminals on the module.

2.2 Control Module

2.2.1 Access to the control wiring is via the cover plate on the right hand end of the rack, this is secured by four 2 BA mushroom head screws. The module itself is secured by two self tapping screws at the front and one rear screw which is accessible by removing the cover plate on the end of the rack.

2.2.2 Wiring to the control module consists of the three phase,neutral and earth supply which is connected to the mains terminal block and earth stud.

2.2.3 Control wiring is normally via a 14 pin Cannon socket on the front of the control module, however, if required, the control may be "hard wired" to the terminals within the control module.

2.2.4 If the control is to be hard wired, fourteen wires will be required. Connect the twelve channel control wires to the appropriate terminals on the terminal block labelled 1-12. Connect the common (or 0 V) wire to the terminal labelled "C",and the desk D.C. supply wire to the terminal labelled "T" on the three way terminal block which is mounted on the small power supply card. Wiring details of the desk control cables are given in the attached supplement. (no.:2)

3. FUSES

3.1 Dimmer Module Fuses

3.1.1 Each dimmer channel is protected by an individual 10 Amp cartridge fuse (BS 1362). It is essential that these be replaced with the correct type of fuse to ensure protection of the semi-conductor devices.

As the type of lamps used in stage luminaires often fail in a short circuit condition, it is common for the dimmer fuse to blow at the same time. The four dimmer fuses for each module are mounted on the front of the modules. Two types of fuse carrier are in service. Earlier versions used a removable carrier in which the fuse is secured by a single 6 B.A. screw. Always ensure that this screw is tight before replacement. Later versions use a captive fuse carrier in which the fuse clips into a slot in the carrier which is then pushed into position.

3.1.2 Each dimmer module also has a 1 Amp (3 AG) glass fuse fitted in a screw type carrier located on the back of the module. The module must be removed for access to this fuse.

3.2.1 The control module is fitted with a 1 Amp (8 AB) ceramic fuse which is mounted in an identical holder to the dimmer module fuses. This fuse holder is labelled 1 Amp, ensure that the replacement fuse is of the correct type.

3.2.2 An E.L.V. 1.5 Amp (3A.G.) glass cartridge fuse is mounted on clips on the small power supply card in the control module.

4. MODULE DESCRIPTION AND DIS-ASSEMBLY.

4.1 Electrical Description

4.1.1 Identification of Modules:
Two versions of Minipak have been produced. Modules supplied prior to October 1979 are electrically different from later models and are unsuitable for use with output patch panels incorporating a common neutral wiring arrangment. The earlier version is easily identified by the colours of the wiring to the output sockets, the wire to the active terminal of the socket will be brown and the wire to the neutral terminal grey.

Modules produced after October 1979 have a grey wire to the active terminal and a blue wire to the neutral terminal of the output socket.
The ealier versions may be updated if required, by returning them to Rank Electronics. All modules in a system should be updated together.
An electrical description of the modules manufactured prior to October 1979 is available as a separate supplement to this handbook and is available on request from Rank Electronics.

4.1.2 Electrical Description of Modules Manufactured after October 1979:
Refer Drg. No.: SA 245 - 01/A1 Issue C (Fig 1)
These modules employ ' active switching'. The single phase 240 Volt 40 Amp supply is connected to the Active, Neutral and Earth terminals at the rear of the module. The neutral line is supplied directly to the four load output sockets and to the ELV supply transformer within the module.

The active (phase) line is fed to four 10 Amp fuses (one for each channel) and to a 1 Amp fuse for the ELV supply transformer. The fused active supplies are then fed to four individual triacs which are controlled by the gate signals produced by the "Four Way Minipak Trigger Card". The output of each triac is filtered by a substantial inductive filter which reduces the output waveform rise time, and is then fed to the corresponding output socket on the front of the module. The gate signals to the triacs are connected via a nine pin Molex plug and socket and are electrically segregated from the E.L.V. control circuitry by four toroid transformers on the trigger card.

The outputs from the trigger card are deter--mined by D.C. control signals from the control desk. These are supplied via the control module to the six pin Molex plug which connects to the trigger card via a 9 pin "Redline" connector. When replacing the trigger card, be careful to align the unused pin on the "Redline" connector with the slot in the edge of the P.C.B. The control signal will vary between 0 Volt (Zero output) and - 10 V.D.C. (Full Output) depending on the position of the fader lever on the control desk.

4.1.3 Four Way Minipak Trigger Card

4.1.3.1 GENERAL

The Minipak Trigger Card consits of a regulated DC power supply, ripple rejection filter for removal of mains-bourne interference,zero-crossing detector, and four trigger ICS. Each trigger IC is used for single phase control of a triac, providing full-wave AC control of the output waveform.

Low voltage control circuitry is provided utilizing pulse transformer drive to the triacs and a 16V A.C. E.L.V. supply to the trigger card.

4.1.3.2 POWER SUPPLY

Power is supplied to the card from an external 32 V A.C. centre-tap transformer (16V-0-16V) via pins 6,7,9 of the REDLINE connector. This is bridge rectified to provide approx. 20 V of unregulated DC accross C10 and -20V accross C11. IC5 and C12 generate a regulated +15V supply, and R43, R44 and ZD1 provide a -15V rail.

NOTE:

- These voltages are floating with respect to DIMMER COMMON (Mains Earth) and are referenced to PIN 7, REDLINE connector.

4.1.3.3 RIPPLE FILTER

A 50 Hz phase reference signal is input to 3/4 of IC 6, an active filter designed to reject control tones superimposed on the mains supply by some Electrical Authorities.

IC6 is configured as an active Bi-quad Bandpass filter with its centre frequency set to 50Hz. An attenuation of 40dB/decade is obtained for frequencies outside the pass-band. Adjustment of the filter's phase shift is made by selecting R49 and adjustment of RV 2.

NOTE:
RV2 is set and sealed at the factory and need not be reset if changing IC6. However, selection and adjustment of other components in the filter is critical, and these should not be changed without the appropriate factory test jig.

4.1.3.4 ZERO CROSSING DETECTOR.

The filtered waveform is applied to diodes D9, D10 across the input of the discharge comparator (¼ x IC 6).
Each diode is biassed to approx. 15mV by R56, R58 or R57, R59. The diodes do not conduct until the applied reference waveform is greater than 0.5V, so for a period (approx. 0.5ms) corresponding to the zero-crossing of the 50Hz reference, a voltage of approx. 30 mV appears accross the comparator input.

The comparator output drives Q1 into saturation, discharging C15 via R61 - D11, D12 together with the saturation voltage of Q1 determine the voltage to which C15 discharges (approx. 1.5V). At the end of each sync pulse, C15 charges towards +15V via R62. The selected time constant (22ms) is such that the voltage ramp over a 10 ms period is approx. linear. Q2 is used as a voltage follower to buffer the charge/discharge waveform across C15, and provides the reference ramp for the trigger IC'S (IC1, 2, 3, 4).

4.1.3.5 TRIGGER PULSE GENERATION.

IC'S 1, 2, 3, 4 are used for single phase control of the triac for each dimmer channel, and utilize pulse-train triggering. R9, 19, 29, 39 set the current drive to the pulse transformer and hence to the triac gate.

When the ramp voltage input to pin 6 of the trigger IC exceeds the control voltage on pin 5, the voltage on pin 7 increases to approx. 14 V and C4 charges via R4.
Upon reaching a preset (internal to the IC) threshold level, C2 is dicharged via pin 14.
A buffered output at pin 15 is linked by R6 to pin 9 which drives the pulse output stage, producing a trigger pulse at pin 10. This process continues until the ramp at pin 6 is reset at the next zero-crossing of the mains reference voltage.

4.1.3.6 CONTROL VOLTAGE

The output from a standard STRAND control desk (0 to - 10v via diode and 10 K resistance) inputs via R10, 11, 12 to pin 5 of the trigger IC. Since the IC requires a positive control voltage (with respect to pin 16), the trigger card 0V rail is floated with respect to MAINS EARTH (Dimmer Common).
Adjustment of RV 1 allows the trigger card 0V to be set between -2 and -9.5V approx. with respect to Dimmer Common (Mains Earth),and is used to set minimum light output level.

NOTE:

TOPSET, at maximum light output is set by accurate adjustment of the -10V reference in the CONTROL DESK.

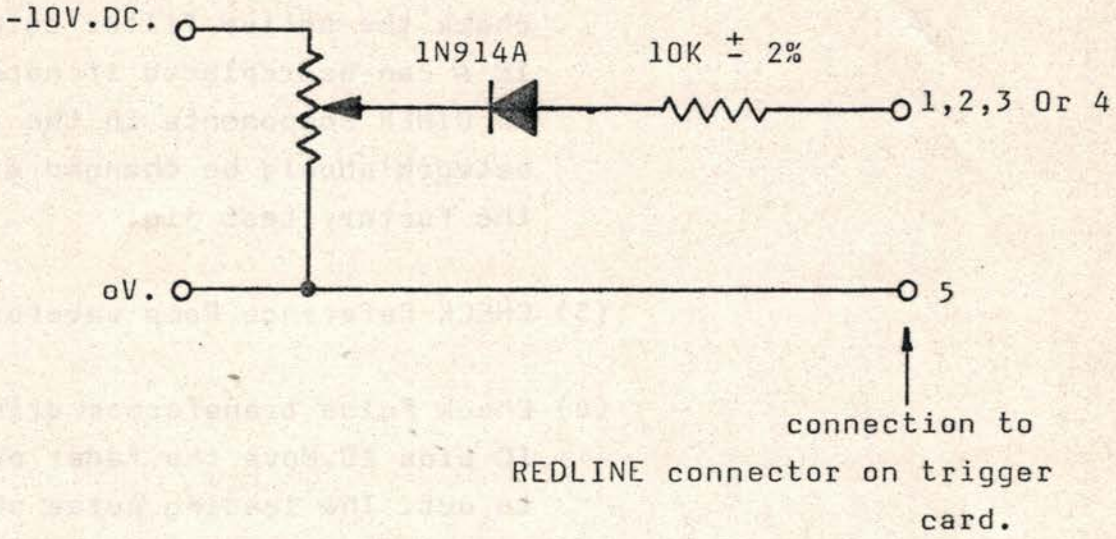
NOMINAL WAVEFORMS and VOLTAGES are shown in FIG.1

4.1.3.7 TEST PROCEDURES:

Prior to servicing the trigger card, check the board for mechanical faults,incorrectly inserted IC's etc.. Faults related to single channels are most probably lack of control voltage, faulty trigger IC or triac.

Faults common to all 4 channels are most likely power supply, zero-crossing detector or reference ramp generator.

The trigger card should be tested in a MINIPAK module or test rig using the same circuit, with the control input fed from the following circuit:



MODULE LOAD : 60 W

EQUIPMENT REQUIRED :

Oscilloscope.

Multimeter (sensitivity greater than 10,000 Ω/V).

All voltages and waveforms are measured with respec to pin 7 unless otherwise stated. Most waveforms can be observed with the oscilloscope displaying a 20 ms time interval across its screen, synchronised to the mains waveform.

(1) CHECK DC SUPPLY RAILS.

a. On + ve end C/2	+15V	±0.6V
b. On - ve end ZD1	-15V	±10 %

(2) CHECK SUPPLY RAIL RIPPLE

a. On + ve end C12 less than 5 mV

b. On - ve end ZD1 less than 100mV

(3) Check that the input voltage at IC1, 2, 3, 4 pin 5 varies as the associated channel lever and master fader, if any, are operated.

(4) CHECK SYNC PULSE OUTPUT
The output of the zero-crossing detector appears at IC 6/pin 12. If this is absent, check the active filter output at IC 6 pin 3. IC 6 can be replaced if necessary - but NO OTHER components in the active filter network should be changed without access to the factory test jig.

(5) CHECK Reference Ramp waveform at Q2 emitter

(6) Check Pulse transformer drive at trigger IC pins 10.Move the fader evenly from full to out. The leading pulse should move smoothly across the screen, the number of pulses decreasing as it does, until all pulses disappear at fader position zero.

(7) If all tests have been affirmative, and the dimmer channel output is still inoperative, replace the triac and recheck all electrical connections between the triac, filter choke and output socket.

(8) Waveforms and circuit detail are included as fig. 1.

4.1.4 Minipak Dimmer Module Dis-assembly

Disconnect power and remove the module from the rack as described in section 2.1.1 The trigger card is now easily accesible. Remove the Redline connector, undo the two plastic PCB clips, lift the trigger card away from the module and remove the molex "gate signal" plug.
The four triacs are mounted on a heatsink on the opposite side of the module. Remove the four self tapping screws securing the mesh cover and lift it away from the module. The heatsink is secured to the back panel of the module

by two 4 BA screws and nuts. All wiring to the triacs is connected by spade lugs. It is suggested that only one triac be removed at a time to avoid mixing the wiring. Each triac is secured by two 4 BA screws and nuts and is insulated from the heatsink by a mica washer. These insulators must be replaced whenever a triac is changed. Smear both the mica washer and triac with a little silicon thermal compound before replacement.

The four filter chokes are secured by pop-rivets which must be drilled out for replacement . The replacement filter choke can be mounted using new pop-rivets or 4 BA screws and nuts.

The fuse carriers and output sockets are secured to the front panel by 4 BA screws. These will all have to be removed for access to their wiring.

4.2 Control Module

4.2.1 Electrical Description

The Minipak control module provides the connecting point for the mains supply and also the ELV signals from the control desk.

The three phase and neutral supply is connected to the mains terminal block as previously described. It is then fed to the three dimmer modules and also to the 1 Amp control fuse on the front of the control module. The fused supply is then fed to the control transformer which supplies 24 Volts AC to the DC power supply card. This is fused, (1.5 Amp), half wave rectified and filtered to provide -33VDC (approx.) to the control desk via the control terminals and Cannon socket.

5. FAULT FINDING

The Minipak system is designed to be serviced on a "modular" basis and where possible it is recommended that faulty modules be replaced and sent to Rank Electronics for repair. The following service notes are provided as a guide to servicing the Minipak system and should be used in conjunction with the previous circuit descriptions and the attached circuit diagrams.

Note 1.
ALL SERVICING TO MINIPAK SYSTEMS SHOULD ONLY BE UNDERTAKEN BY QUALIFIED SERVICE PERSONNEL.

Note 2.
The information given below is mainly confined to trouble shooting on Minipak dimmer racks and should be used in conjunction with the appropriate maintenance handbook for the ELV control desk.

5.1 Total failure of all modules in a rack.
Check that the pilot lights on the control desk are lit. If not, check that power to the racks is available and switched on. Check that control cables are connected and the 1 Amp control fuses in the desk and control module are intact.
With a Model 8 AVO or similar high impedance voltmeter, check for a reading of -33 VDC between the terminals marked "C" & "T" on the ELV supply card in the control module. Place an individual fader lever at full and check for a reading of approx. -8.5 VDC between the appropriate control terminal and "C" on the ELV supply card. If no reading, suspect fault in control desk or control wiring, particularly in the common wiring.

5.2 Total failure of all channels in one module.
Check all fuses on the module. Check the mains supply for one lost phase and check wiring to the module. Check the control wiring to that module and also the transformer fuse at the rear of the module. Check the secondary of the transformer at the Redline connector (16v-0-16v). If all the above prove OK replace or repair the trigger card, and or triacs as required.

Note:
If the module is operated with the mesh heatsink cover removed, exercise caution as the heatsink may be live.

5.3 Failure of an individual channel:
Check the fuse for that channel and replace if necessary.
Put the appropriate fader lever at full and check control volts at the Terminal block in the control module and also at the Redline connector on the trigger card.

If control voltage is present, check the module wiring for that channel and also the filter choke for continuity. If these are O.K. replace the appropriate TCA 280 A integrated circuit on the trigger card. If the channel still does not function, change the TRIAC.

5.4 One Channel will not go out:
Check the control voltage for that channel which should vary between OV and approx. -8.5 VDC as the fader lever is moved. If O.K. replace the triac for that channel. If this does not rectify the fault change or service the trigger card.

5.5 All channels in module will not go out:
Check the set up of RV1 on the trigger card as detailed in section 6.

5.6 Two or more channels fade simultaneously when only one fader is moved.
Check the control wiring for short circuits, especially the CANNON plugs, and the edge connectors in the control desk. Check for a mains voltage reading between the triac heatsink and neutral, as the mica washer insulation may have broken down.

DANGER: IN THIS FAULT CONDITION THE HEATSINK WILL BE LIVE.

6. SET UP PROCEDURE

Before any adjustments are made to modules in a MINIPAK SYSTEM, check that the control desk has been correctly adjusted as detailed in the appropriate CONTROL DESK maintenance handbook.

EQUIPMENT REQUIRED: 60 W LAMP LOAD (Minimum)
TRUE RMS AC VOLTMETER
OR CATHODE RAY OSCILLOSCOPE (CRO)

NOTE:
Measurement of output voltages or wave forms must be done with a minimum load of 60 Watts connected.

(1) With the fader lever for the channel at full, check that the dimmer output is within 10 volts of the mains voltage. This must be done by measuring the mains voltage and the load voltage and NOT by measuring the voltage directly across the dimmer.

(2) Adjust RV1 on the trigger card with the channel fader lever at "1" to give a load voltage of 10 volts RMS.

(3) Repeat (1) and (2) for the other three dimmer channels in each module, and readjust RV1 if necessary to optimise the minimum output on all channels. Check that the output goes to zero when the fader is at zero.

(4) Repeat for all modules in RACK.

NOTE:

If a TRUE RMS AC VOLTMETER is unavailable , output waveforms should be monitored with a CRO.

If no test equipment is available, a rough set can be made by observation of the test load minimum light output.
In such cases, the use of a 1 KW load is recommended.

NOTE:

The potentiometer marked RV 2 on the module trigger cards must not be altered in the field and is sealed with red varnish.
If it does become altered then the trigger card must be returned to Rank Electronics for re-adjustment.

7. GENERAL MAINTENANCE

As Minipak is all solid state, no routine maintenance should be required other than to check terminals etc for tightness and also to remove any dust, etc , which might build up inside the module.
A service contract is available from Rank Electronics which will ensure that this is carried out on a regular basis and also that the control desk is serviced where necessary.
Contact your local Rank Electronics office for details.

ITEM	CCT REF.	DESCRIPTION	RANK PART No./ DWG No.	QTY.	SUPP CODE
1		P.C.B. Artwork	2-879		
2		" Silk Screen	2-880		
3		" Drilling Detail	2-881		
4	R56, 57	Resistor 1M ± 5% ¼ watt carbon film		2	
5	R8,18,28				
	38,	" 330K " " " " "		4	
6	R4,14,24				
	34	" 220K " " " " "		4	
7	R3,13,23,				
	33	" 150K " " " " "		4	
8	R5,15,25	" 100K " " " " "		5	
	35,64				
9	R6,16,26				
	36	" 82K " " " " "		4	
10	R47	" 12K ± 2% ¼ Watt Metal Film		1	
11	R11,21,31				
	41	" 27K " 5% " " "		4	
12	R55,63	" 22K " " " " "		2	
13	R12,22,				
	32,42	" 12K " " " " "		4	
14	R10,20,				
	30,40,48,				
	45,				
	60	" 10K " " " " "		7	
15	R52	" 4K7 " " " " "		1	
16	R43	" 1K2 " " " " "		1	
17	R58,59	" 1K " " " " "		2	
18	R1	" 680R " " " " "		1	
19	R46	" 51K ± 2% Metal Film "		1	
20	R44	" 390R ± 5% Carbon Film "		1	
21	R2	" 330R " " " " "		1	
22	R61	" 150R " " " " "		1	
23	R9,19,29,39	" 33R " " " " "		4	

NOTES:

USED ON 1-683

RELEVANT CCT. DIAG: SA245-01/A1

RELEVANT ASSY DIAG:

MINIPAK 4 WAY MODULE PCB

PPL 1M

ITEM	CCT REF.	DESCRIPTION	RANK PART No./ DWG No.	QTY.	SUPP CODE
24	R7,17,27, 37	Resistor 10R ± 5% ¼ watt carbon film		4	
25	R62	" 220K ± 2% ¼ watt Metal Film		1	
26	R54,50	" 47K " " " " " "		2	
27	R49	" 39K " " " " " "		1	
28	R51,53	" 10K " " " " " "		2	
29	RV1	1K trimpot Spectral 63P or Soanar HTL		1	
30	RV2	10K " " 62-1-1-103		1	
31	C2,4,6,8	Capacitor InF greencap 100v		4	
32	C3,5,7, 9,12	" 1uF 35V tantalum		5	
33	C1	" 10uF, 25v, 25V RB electro		1	
34	C11	" 100uF, 25V RT "		1	
35	C10	" 220uF, 25V RT "		1	
36	C13,14	" 68nF ± 5% 100v Polycarb Type BJ2541		2	
37	C15	" 100nF ± 5% 100v Polycarb Type BJ-2241		1	
38	Q1, Q2	Transistor 2N5088		2	
39	IC1,2,3, 4	Integrated circuit TCA 280A		4	
40	IC5	" " MC78M15 or 7815		1	
41	IC6	" " UA4136 Quad op. Amp.		1	
42	D1,2,3,4, 5,6,7,8 9,10,11,12	Diode IN4148		12	
43	ZD1	Zener Diode BZX79C15		1	

NOTES:	USED ON		
	1-683		
RELEVANT CCT. DIAG: SA-245-01/A1			
RELEVANT ASSY DIAG:		MINIPAK 4 WAY MODULE PCB	

ITEM	CCT REF.	DESCRIPTION	RANK PART No./ DWG No.	QTY.	SUPP CODE
44		Bridge Rectifier Soanar W02		1	
45		Transistor Standoffs		2	
46		Toroid cores H5BT14.5 x20 x 7.5		4	
47		Cable ties		4	
48		IC Socket 16 Pin		4	
49		IC Socket 14 Pin		1	
50		CN Pins		16	
51		Connector Plug. 9 Pin Molex H9306		1	
52		Connector, Redline (9 pin)		1	

NOTES:	USED ON		
RELEVANT CCT. DIAG: SA245-01/A1			
RELEVANT ASSY DIAG:		Minipak 4 Way Module P.C.B.	

PPL 1M

ITEM	CCT REF.	DESCRIPTION	RANK PART No./ DWG No.	QTY.	SUPP CODE
1		PCB Artwork	4-626	1	
		" Silk Screen	4-627	1	
		" Drilling Detail	4-628	1	
2		Diode, Silicon Rectifier C.I.G.A.		1	
3		Capacitor Electrolytic 220uF 63V RT		1	
4		Terminal Block, Klippon MK8/3		3	
5		Fuse Clip, Swann 1397-01-05		2	
6		Fuse, 3AG 1.5A		1	

NOTES:	USED ON		
RELEVANT CCT. DIAG: SA 245-02	1-661		
RELEVANT ASSY DIAG:		MINIPAK CONTROL MODULE PCB	

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STRAND ELECTRIC DIVISION

SUPPLEMENT NO. 2

S.M.C. and D.M.C. CONTROL DESKS

CONTROL CABLE AND PLUG WIRING

Plug - Cannon CA 3106.E20.27PB

Plug Pin No.	Wire Colour	Circuit
A	Black	1
B	Brown	2
C	Red	3
D	Orange	4
E	Yellow	5
F	Green	6
G	Blue	7
H	Violet	8
I	Grey	9
J	White	10
K	Orange/Black and White/Black	Common
L	Pink and Pink/Black	Supply
M	Grey/Black	11
N	Yellow/Black	12

HEAD OFFICE

RANK INDUSTRIES AUSTRALIA PTY. LTD.
STRAND ELECTRIC DIVISION
60 ROSEBANK AVENUE,
CLAYTON SOUTH...3169
TELEPHONE NO.: (03) 5418502
TELEX NO.: STRAN AA31809 CABLES: SPOTLIGHT

SYDNEY OFFICE

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12 BARCOO STREET
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N.S.W.
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TASMANIA

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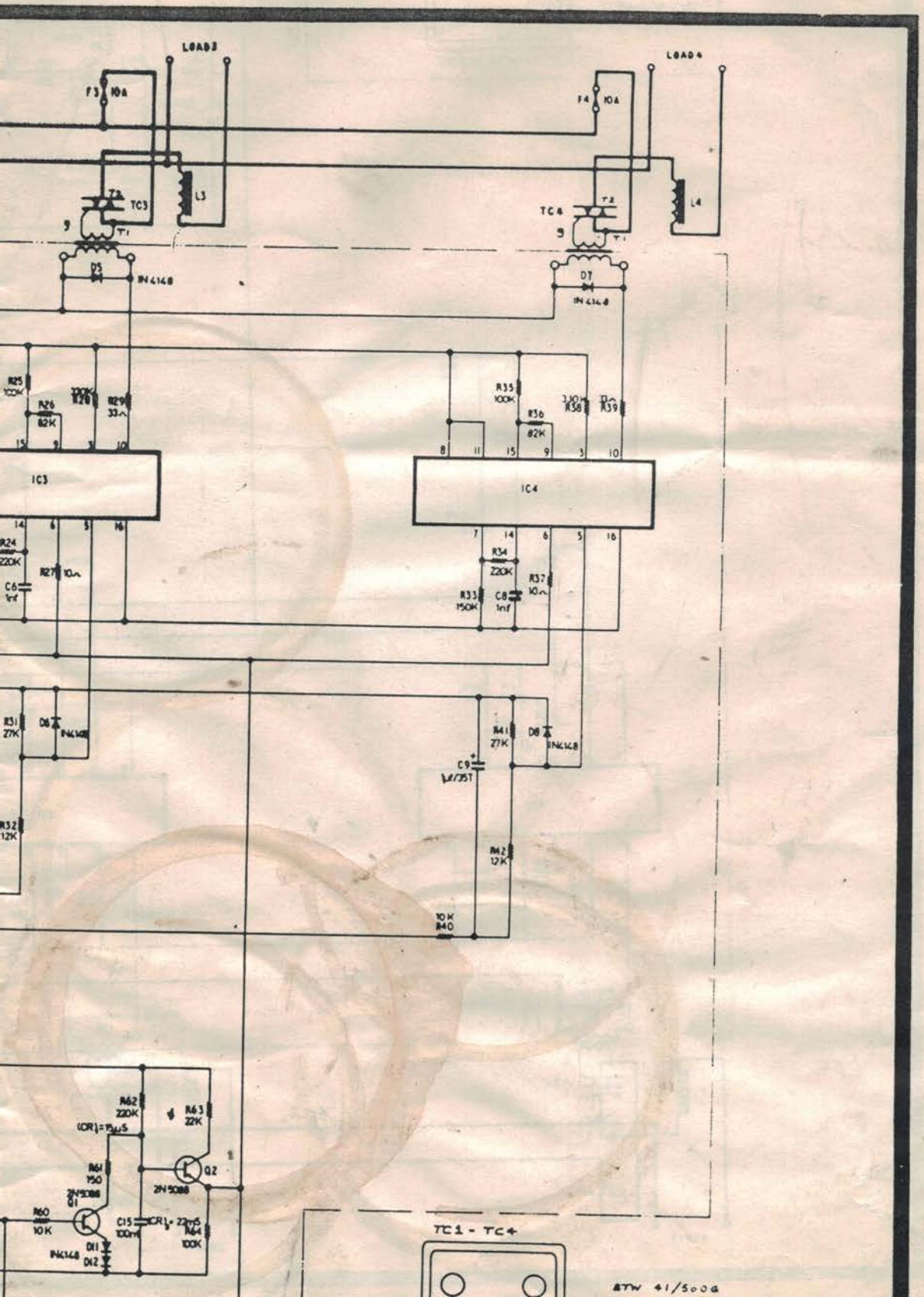
LAUNCESTON...7250
TASMANIA
TELEPHONE: (003) 318935 AND (003) 311606
TELEX: AA58784


LOAD3
LOAD4
F3 10A
F4 10A
TC3
TC4
L3
L4
T1
T2
D5 IN4148
D7 IN4148
R25 220K
R26 82K
R29 33Ω
R35 100K
R36 82K
R38 330Ω
R39
IC3
IC4
R24 220K
R27 10Ω
C6 1nf
R34 220K
R37 10Ω
R33 150K
C8 1nf
R31 27K
D6 IN4148
R41 27K
D8 IN4148
C9 1µ/35T
R32 12K
R42 12K
10K R40
R62 220K
R63 22K
CR1=
R61 150
Q1 2N5088
Q2 2N5088
R60 10K
C15 100nf
CR1= 22nf
R64 100K
D11 IN4148
D12
TC1 - TC4
ATW 41/5008

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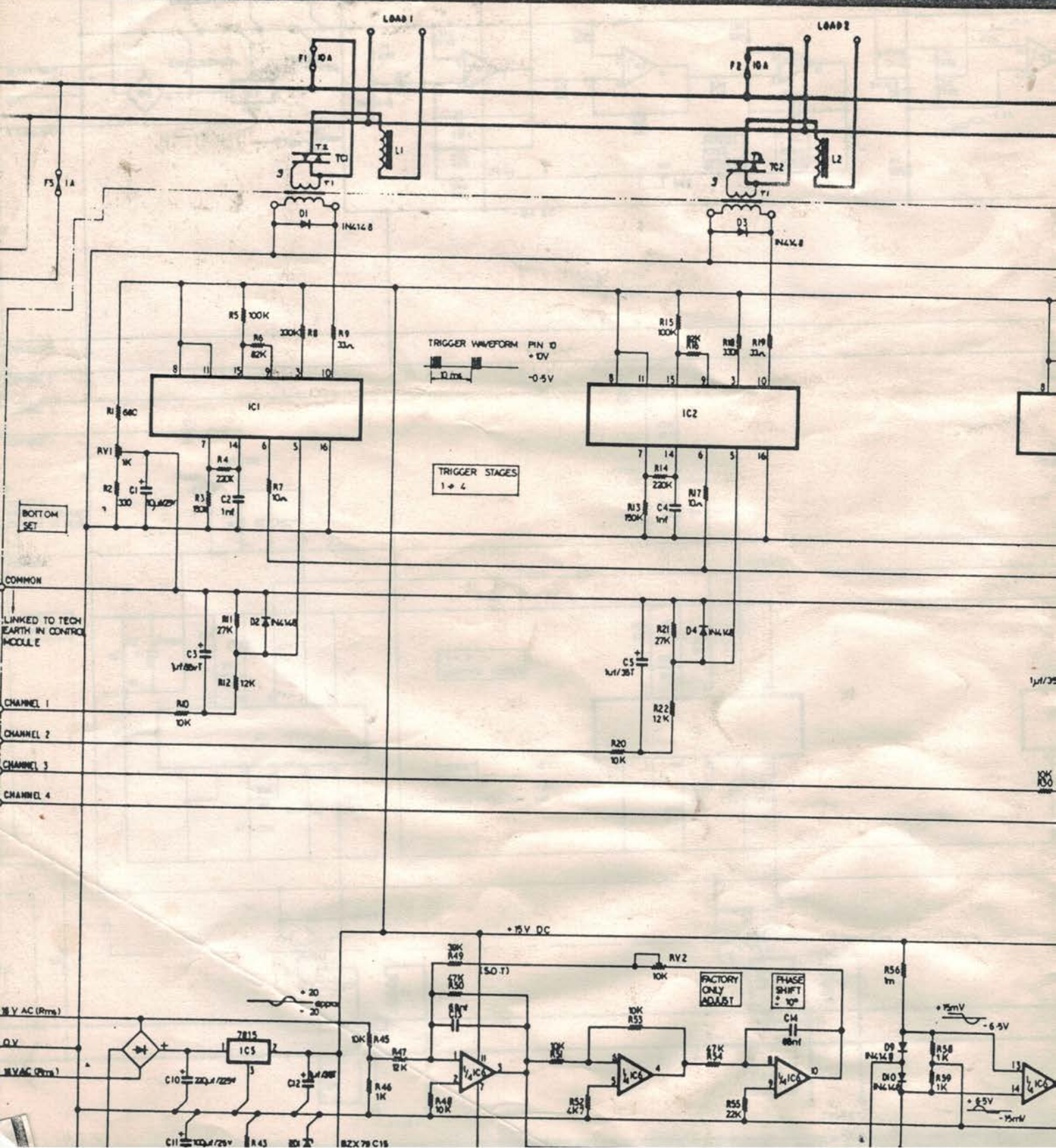
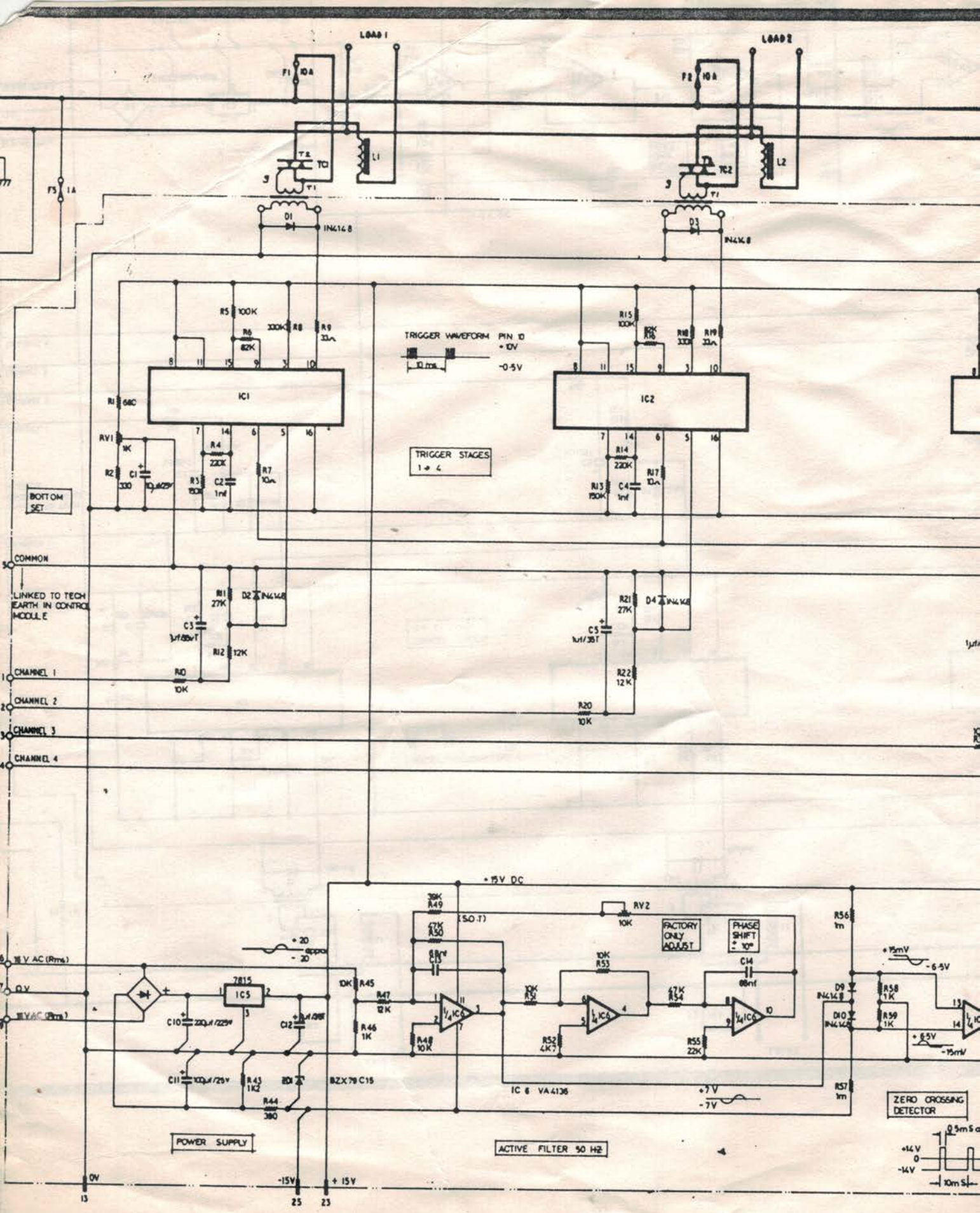
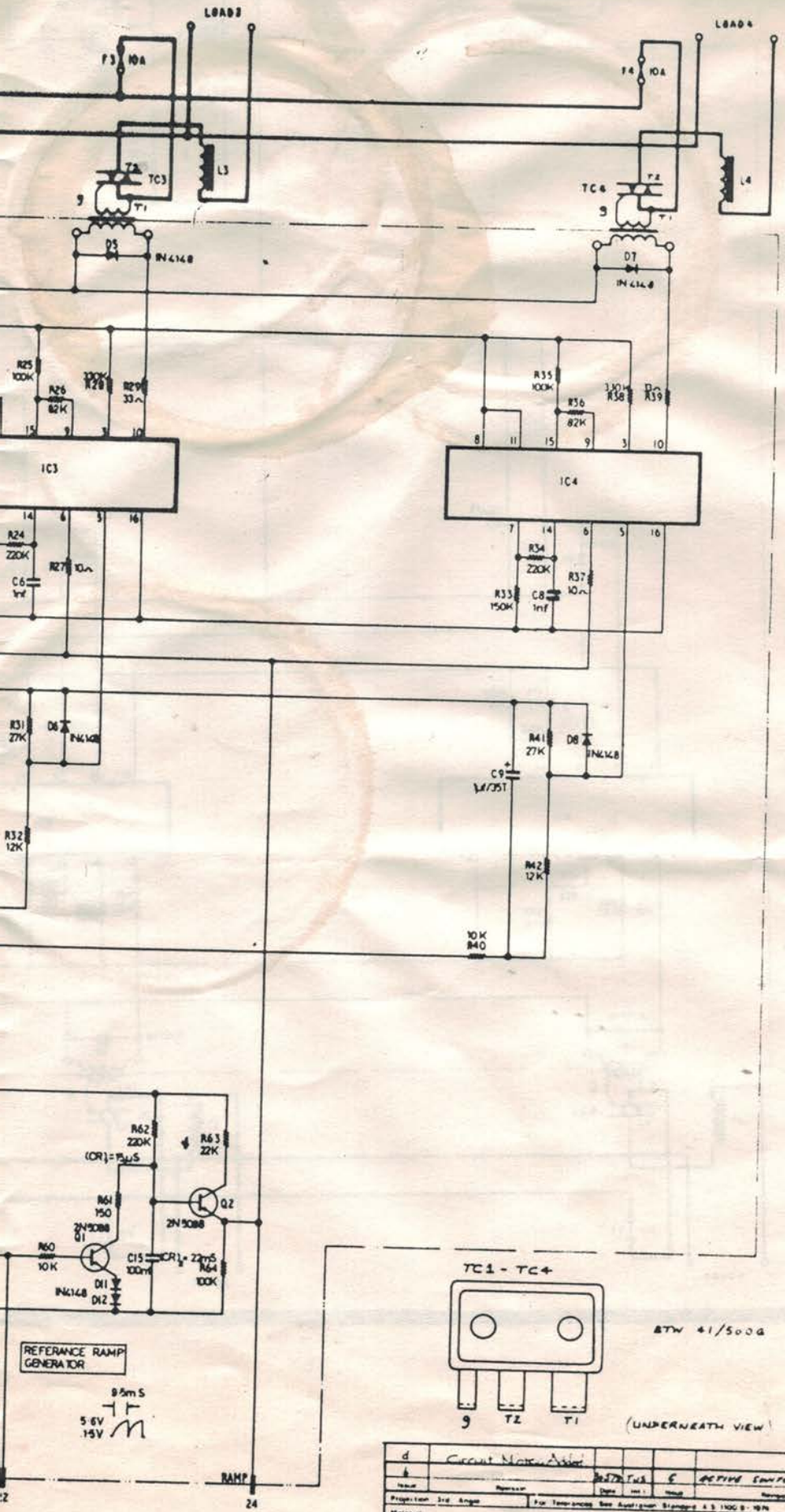
- Dimming & Control
- Curtains & Screens
- Stage Machinery




LOAD 1
LOAD 2
F1 10A
F2 10A
F3 1A
TC1
TC2
L1
L2
D1 IN4148
D3 IN4148
R5 100K
R6 82K
R8 330K
R9 33Ω
R15 100K
R16 82K
R18 330K
R19 33Ω
IC1
IC2
TRIGGER WAVEFORM PIN 10
+10V
-0.5V
10 ms
TRIGGER STAGES 1 → 4
R1 680
RV1 1K
R2 330
C1 10µ/25V
R4 220K
R3 150K
C2 1nf
R7 10Ω
R14 220K
R13 150K
C4 1nf
R17 10Ω
BOTTOM SET
COMMON
LINKED TO TECH EARTH IN CONTROL MODULE
R11 27K
D2 IN4148
C3 1µf/35V
R12 12K
R10 10K
R21 27K
D4 IN4148
C5 1µf/35V
R22 12K
R20 10K
CHANNEL 1
CHANNEL 2
CHANNEL 3
CHANNEL 4
+15V DC
RV2 10K
FACTORY ONLY ADJUST
PHASE SHIFT ± 10°
R49 39K
R50 47K
C6 68nf
(SOT)
R53 10K
R52 4K7
R54 47K
R55 22K
C14 68nf
R56 1m
R57 1m
+15mV
-6.5V
+6.5V
-15mV
D9 IN4148
D10 IN4148
R58 1K
R59 1K
+20
-20
approx
36 V AC (Rms)
0 V
36 V AC (Rms)
7815
IC5
C10 220µf/25V
C12 µf/35V
C11 100µf/25V
R43 1K2
ZD1 BZX79C15
R44 390
R45 10K
R47 12K
R46 1K
R48 10K
IC 6 VA4136
+7V
-7V
ZERO CROSSING DETECTOR
0.5mS approx
+14V
0
-14V
10mS
POWER SUPPLY
ACTIVE FILTER 50 HZ
0V
-15V
+15V
13
25
23



d	Circuit Notes Added					
c				C	ACTIVE SWITCHING INT	
Issue	Remarks	Date	Init.	Issue	Remarks	Date / Init.
Projection 3rd Angle	For Tolerances See Australian Standard A.S. 1100.2 - 1974				Scale	
Material						
Finish						
Drawn G Gerassimou 10-4-78	MINIPAK 4 WAY MODULE CIRCUIT DIAGRAM				Dwg. No. SA245 - 01/A1	
Chkd						
Appd PRW 11-4-78						
RANK INDUSTRIES AUSTRALIA. PTY. LTD. 10 Frank Street Burwood Victoria 3125 Telephone 29-2734 STRAND ELECTRIC AND ENGINEERING DIVISION					Sheet of	Issue C