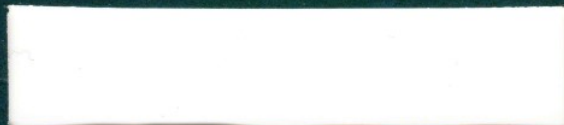
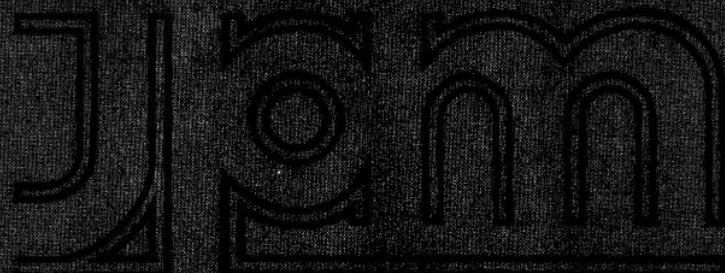




**JPM Micro-Processor
Service Manual**





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HIGH VOLTAGE WARNING

High voltage is used on certain machines.
Personnel other than qualified service engineers
must ensure that the machine is disconnected from
the mains electrical supply before carrying out any
service or cleaning operations on the internal
workings of the equipment.

Three Reel - Sp game - AWP

Nudge Nudge Up

Part No. 10000

② Introduction

Nudge Double Up Deluxe

The purpose of this Service Manual is to enable the Service Engineer to ensure that the equipment is installed and working properly initially, and also to help him locate and in many cases correct, any fault that occurs. The text and accompanying photographs and drawings are intended to be easily understood and as straightforward as possible without involving the Engineer in detailed explanations of the various sophisticated electronic circuitry that is contained in the machine. This basic approach in no way reflects on the ability of the Service Engineer but ensures that the repair, when necessary, can be carried out in the shortest possible time so that the machine may be back in service quickly. Where component failure is diagnosed or indeed, merely suspected, an exchange board may be obtained from the Factory if indeed it is not carried as an operating spare.

A great deal has been written about the potential benefits of Solid State machines and indeed the reliability of the individual components is beyond doubt, however, a machine that is improperly installed and serviced will inevitably break down and, by doing so, destroy any credibility it once had. The Service Engineer can have a considerable effect on the success of microprocessors in Fruit Machines and there are those who, being used to relays and switches, may be sceptical about such machines. This Manual will be of as much help to those Engineers as it will to Engineers with a greater depth of electronic experience.

THE CONCEPT OF THE J.P.M. SYSTEM

The concept of the J.P.M. Stepper Reel Unit systems differs from the conventional system in that the game is played within the computer and the reel unit displays the results of this game. The programme is continually altering the values of three counters. These values are used when the start button is pressed to determine how many symbols each non-held reel will advance. This the final position of any reel is not known until the start button is pressed because the advance value is not decided until that time.

NOTE

The information contained in this Manual, which remains the property of J.P.M. (Automatic Machines) Limited, is loaned solely for the purpose of operating, maintaining and repairing J.P.M. equipment and may not be used by, or loaned to, any person for any other reason. Neither may it, or any part thereof, be copied or reproduced by any means or for any purpose, other than with the express permission of J.P.M. (Automatic Machines) Limited. J.P.M. (Automatic Machines) Limited reserve the right to make any alterations to components and/or component values where necessary to conform to their policy of continuous product improvement and to keep pace the technological advancement.

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4 3 Reel AWP Machine Nudge Double Up Deluxe

Nudge Double Up DE LUXE is J.P.Ms new 3 reel AWP machine in new style cabinet.

The machine has normal 2 of a kind left-to-right and 3 of a kind wins with one 2 way criss-cross and one 3 way criss-cross.

Nudge Feature

This is an each way nudge facility which permits the player to select either Up or Down Nudge. The reel Band apertures are enlarged to allow the player to view six symbols on each reel before deciding which way to nudge. Random-Hold is

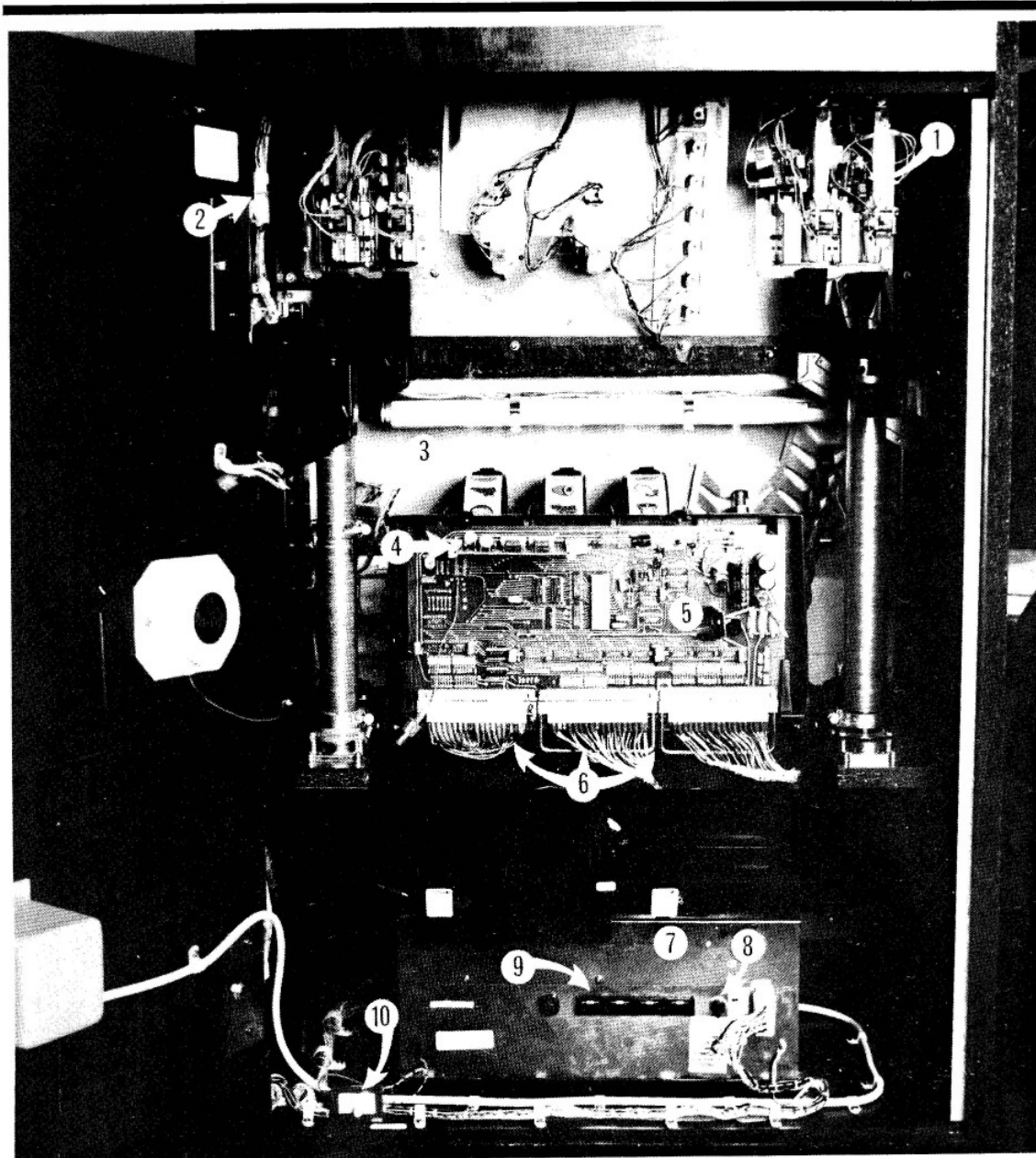
available and electronic Sound effects accompany all playing modes. A random number of Nudges available up to a maximum of 10 is displayed on the plaque; associated with this is a Double Up Feature giving the player the opportunity to Double Up the Nudges available up to the maximum of 10 using the Double or Nothing Nudge Gamble Button. 10p, 20p and 40p wins may be collected or gambled up to a maximum of 80p. The machine accepts 5p, 10p, 10p tokens and 50p for 5 x 10p change.

More than one coin may be accepted prior to playing and the accumulated credit is displayed digitally through the award glass.




Installation Procedure ⑤

Nudge Double Up Deluxe



Before switching on machine:

1. Check that mains socket and plug top are earthed.
2. Check that the Main Board is secure.
3. Check that Main Board, Plugs and Sockets are married together.
4. Check that the Program Board is in position.
5. Check that Triac Packs are connected.
6. Switch on Machine, wait for reels to initialise them proceed with test routine.

- 
1. Lockout Triac Pack.
 2. Self Test Switch.
 3. Credit Display
 4. Memory Board.
 5. Main PCB.
 6. PCB Plugs 1, 2, 3
 7. Power Unit
 8. Main Switch.
 9. Mains Fuse.
 10. Isolation Switch.

6 Basic Description of System

Nudge Double Up Deluxe

The J.P.M. processor controlled reel unit is a new concept in gaming machine design. This new concept is achieved by utilising a D.C. stepping motor to drive each reel. This motor is driven by the S.R.U. controller whose C.P.U. is the Texas Instruments TMS 9980 microprocessor.

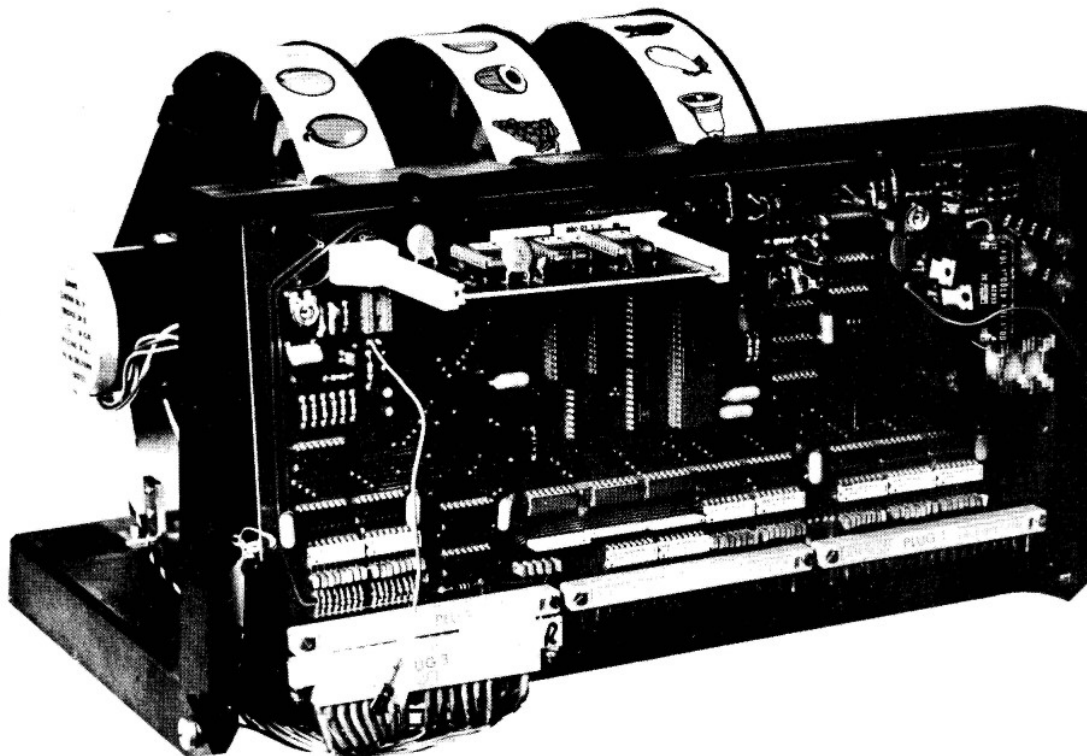
It does not take an electronics expert to realise that a system that positions a reel accurately, having information on its position derived within the C.P.U., has a tremendous advantage over traditional systems. The most significant advantage is that no data is taken from the reel itself thus doing away with the need for contacts and wipers.

Stepping Motor - Basic Description

The Stepping Motor is controlled by a DC (24V) power supply and the drive logic within the controller. Unlike

a conventional motor which has a free running shaft the stepper shaft rotation is in fixed repeatable known increments (1.8° or (200 steps per revolution)). These steps are achieved for each incoming pulse from the drive circuitry; thus a train of 200 pulses will result in shaft rotation of exactly 360° or 1 revolution. The step angle error is less than 5% of 1 step and is not cumulative no matter how many steps are taken. An on reel unit positional correction for the C.P.U. is given by a sensor unit and information is taken from the reel during the first spin on switch-on.

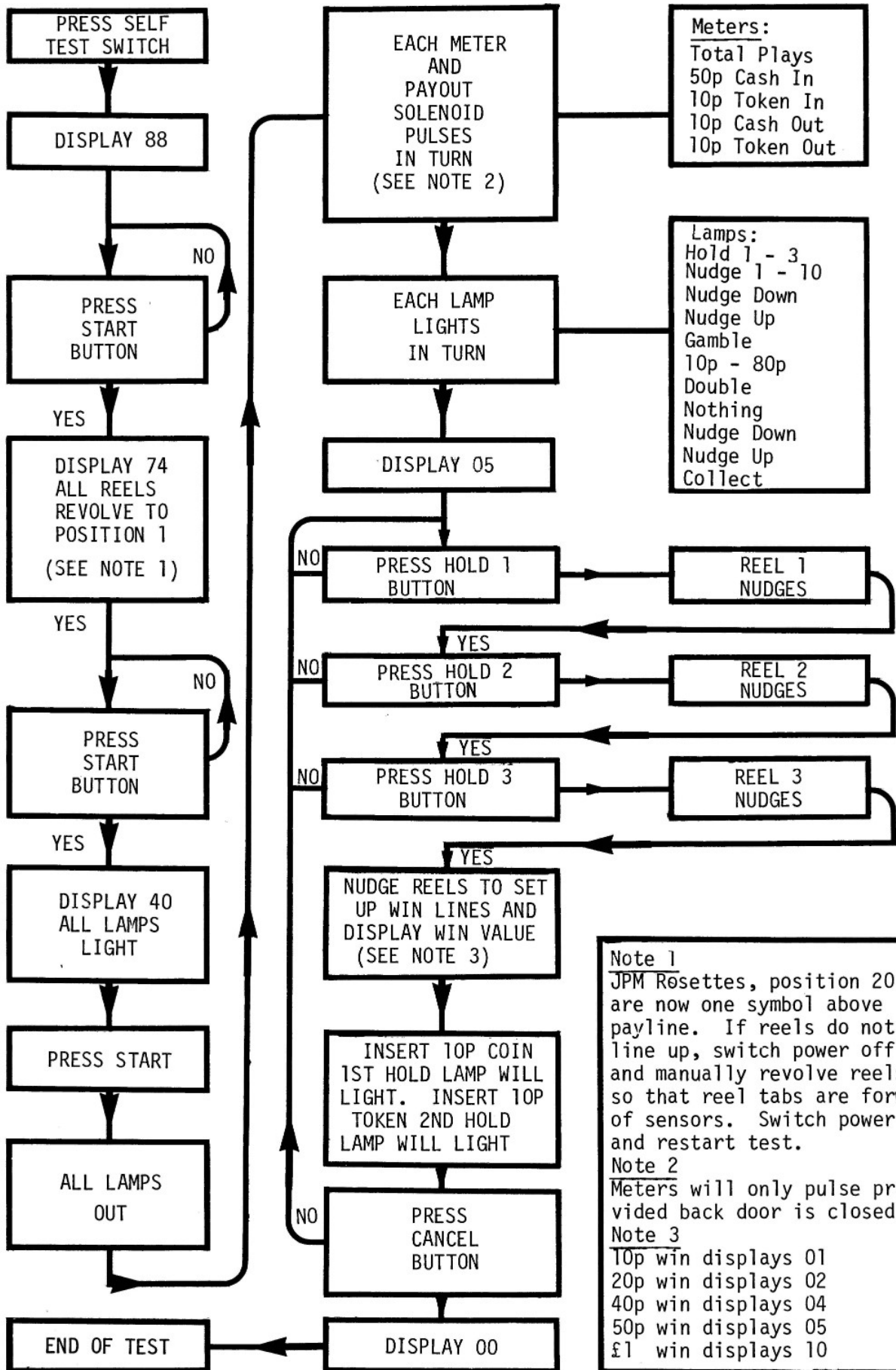
This first spin is an initialisation spin of 200 steps (360°), from then on all movements are controlled by the processor and it knows its exact position at all times.



The Stepper Reel Unit & Main Board Assembly

Self Test Routine 7

Nudge Double Up Deluxe



Meters:
 Total Plays
 50p Cash In
 10p Token In
 10p Cash Out
 10p Token Out

Lamps:
 Hold 1 - 3
 Nudge 1 - 10
 Nudge Down
 Nudge Up
 Gamble
 10p - 80p
 Double
 Nothing
 Nudge Down
 Nudge Up
 Collect

Note 1
 JPM Resets, position 20, are now one symbol above payline. If reels do not line up, switch power off and manually revolve reels so that reel tabs are forward of sensors. Switch power on and restart test.

Note 2
 Meters will only pulse provided back door is closed

Note 3
 10p win displays 01
 20p win displays 02
 40p win displays 04
 50p win displays 05
 £1 win displays 10

8 Reel Band Positioning Nudge Double Up Deluxe

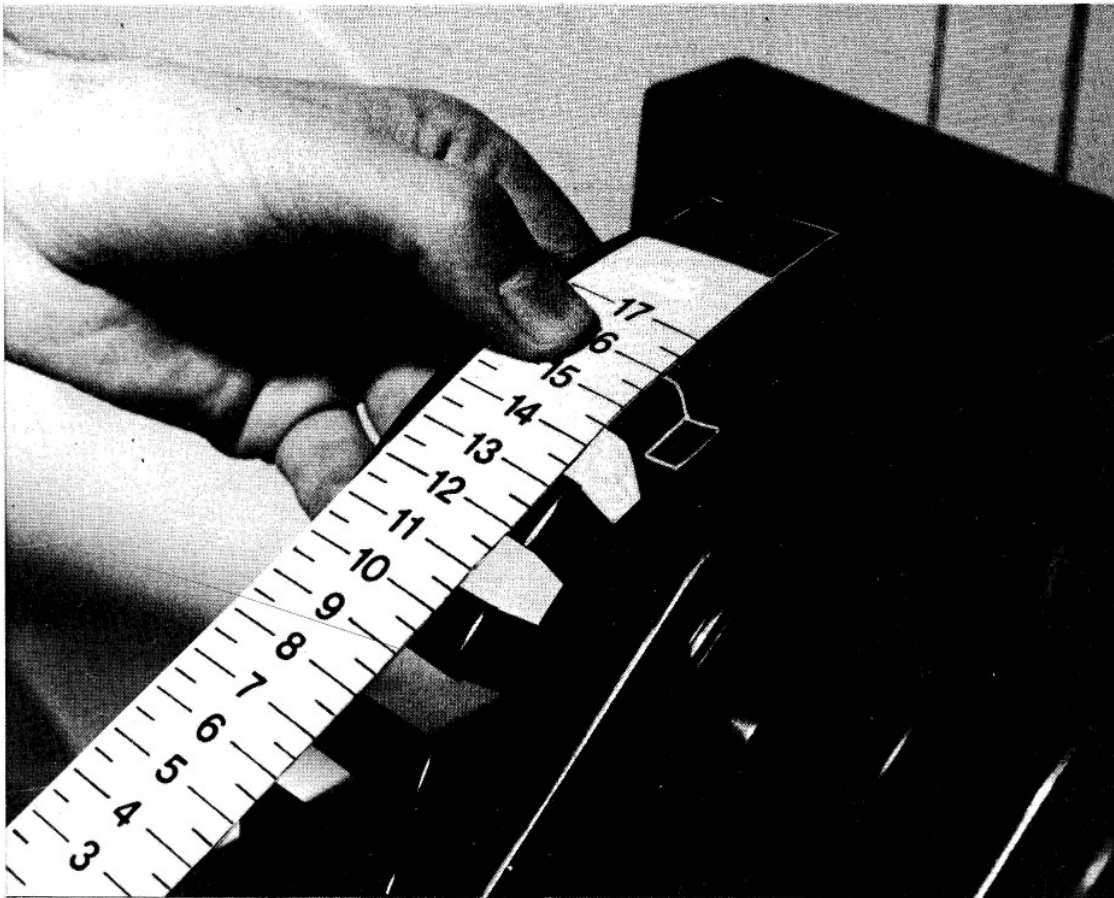
To check or re-align the Reel Band Positions, proceed as follows:

1. Set each reel tab to a position forward of Sensor, (as illustrated).
2. Switch ON machine.
3. Press Self-Test Button (Display 88).
4. Press Start Button.
5. Reels will spin and position themselves with tabs just before sensors. In this position J.P.M. rosettes on the Reel Bands should line up one step above pay-line. Adjust Reel Bands if necessary using fruit symbols on the pay-line as a guide to alignment. Temporarily secure bands to reels with tape.
6. Switch machine OFF and ON, reels will initialise. Check if alignment is still correct, if so, secure Reel Bands to reels with Double sided tape.

Later type reel bands will be seen to have a series of steps numbered at the beginning of the band. These steps are to ensure accurate positioning of the band.

Place reel band on reel with step marker $14\frac{1}{2}$ exactly to the bottom of the reel spoke which incorporates the sensor tab (as illustrated). Secure with double sided tape. The band is now secured accurately.

N.B. - STEP $14\frac{1}{2}$ APPLIES TO NUDGE DOUBLE UP DELUXE AND EACH WAY NUGDER ONLY!



Position of Reel Tab and Sensor

System Capability 9

Nudge Double Up Deluxe

1. Outputs

The system has 56 transistors outputs each one capable of sinking up to 800 MA of DC current.

As an S.R.U. controller 16 of these outputs are dedicated to driving the stepper motors on the reels. The balance of 40 outputs are available to drive.

- a) Lamps.
- b) Meters.
- c) Triac for heavy AC loads such as payouts or lamp banks.
- d) Display units.
- e) External output expansion systems.

2. Inputs

The system has 24 inputs available to input data to the system.

As an S.R.U. controller 5 of the inputs are allocated for reel index data input to the system. Three of the remaining inputs are available as TTL level inputs. The remaining 16 inputs are configured for current drive (20 MA) for data input from switches (buttons, coins etc.) This form of drive minimises interference from noise.

3. Timing

A second interrupt is obtained from the CPU crystal oscillator to provide a drive signal for the stepper motors to ensure an accurate 60 r.p.m. of rotation.

4. Tones

The basic tone generation system is a voltage controlled oscillator driven by a 6 bit D/A converter.

5. Memory

The system is fitted with 256 bytes of RAM for working storage and up to 3K bytes of PROM for program and data storage.

6. Operation

At power on, the supply failure and power on detection circuit forces the CPU into RESET which forces the processor to start execution of the application (game) program from its start point.

The CPU then performs a series of sequential operations as defined by the program stored in the PROM. This sequence of operations will contain input operations where the CPU reads the state of selected inputs to determine if a switch is open or closed. It will also contain output operations which will cause the reels to rotate and lamps to light as determined by the game sequence and switch inputs.

During the normal execution of the program 2 levels of interrupt occur where the CPU suspends the operation of the normal program and branches to carry out a separate concurrent program for a few milliseconds. It is these interrupt programs that drive the reels and flash lamps and refresh the credit displays automatically without direct intervention of the main game program. Spark detection circuitry is incorporated to force the CPU to RESET should someone try to interfere with the system with a spark generator.

Two extension PCB's can be provided to expand the system.

a) Bus Extension

This provides non-volatile data storage for powerdown situations, and 24 DIL switch inputs to enable the system to be parameterised.

b) Logic Extension

The PCB provides a further 16 outputs each capable of sinking 800 MA.

To interface this PCB to the system, we tap off the address lines in the test box socket with a ribbon cable connector.

10 The S.R.U Controller

The controller is connected to the reel unit assembly via three 35 way Varelco connectors. No.1 connector contains the reel drive circuitry. No. 2 connector contains 16 inputs and motors supply. No. 3 connector contains outputs and power supply inputs for the main board.

The right hand section of the control boards has the power supply section. Next to the power supply are circuits providing various safety functions, i.e. spark and missing pulse detection, the 6MH XTAL controlled clock. Zero crossing detector which also gives a 10m sec. reference for the processor. On the centre section of the board is the C.P.U. (TMS 9980) and its associated buffers and two 256 x 4 bit rams and a SN 74138 decoder (3 to 8 lines). Top left of the controller is a 35 way edge connector to accommodate the memory card, below this is a 14 way dil socket which is a test or input extension. The extreme upper left is the tone generation circuit.

The lower section of the board from right to left are five output ports each of 8 bits (74LS259N) with the resistors packs and ZTX450 transistors for the 40 outputs. To the left of the output section are three 8 bit input ports (74LS251N). The two LS138's are 3 lines binary to 8 separate output decoder chips used to select the input and output ports which themselves have integral 3 to 8 decoders. Thus with six lines any individual input or output line

may be selected and then enabled by a seventh line.

The extreme lower left section contains the output ports (259's) for the reel drive circuits, resistor packs and BCX 38A transistors.

Memory Board

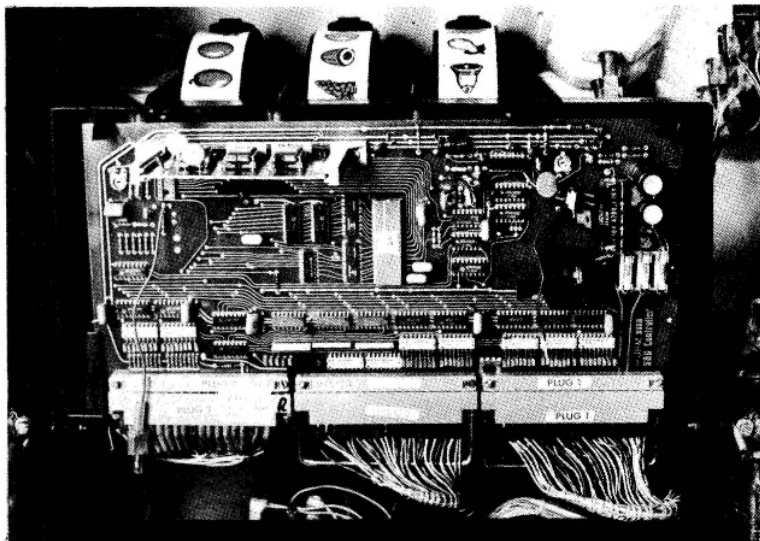
This board contains up to three TMS 2708 eproms each containing 1,000 words of program. This board gives the control unit its identity and the eproms contain the program for the individual game.

To cater for the needs of more complex games such as on export models, two further boards may be used as an extension to the system. These boards are:

1. A bus extension which is an input extension and also provides non-volatile (switch off) memory and means of adjusting various factors of the games.
2. A logic extension to provide extra outputs such as lamp/solenoid drives over the above the 40 provided on the main board.

Display

Credit display is achieved by use of 2 or 4 digit 7 segment led unit.



1. Tone Generator Circuit.
2. Tone potentiometer
3. 14 Way Dil Test Socket.
4. Memory Board.
5. Crystal.
6. Aerial potentiometer
7. Power Supply L.E.D. Indicators.
8. TMS 9980.
9. Reel Drive Circuit.
10. Varelco Plugs.
11. 2Amp Supply Fuses.

Triac Packs 11

Nudge Double Up Deluxe

Because the Triac (DC controlled AC switch) is a more susceptible component to break down in the control circuit, this component and its associated resistor has been incorporated in an external Triac Pack and is situated on or near the device that has to be switched, i.e. at payout solenoids lock-out solenoids and lamps where applicable (e.g. continental machines).

These are three connectors on the Pack.

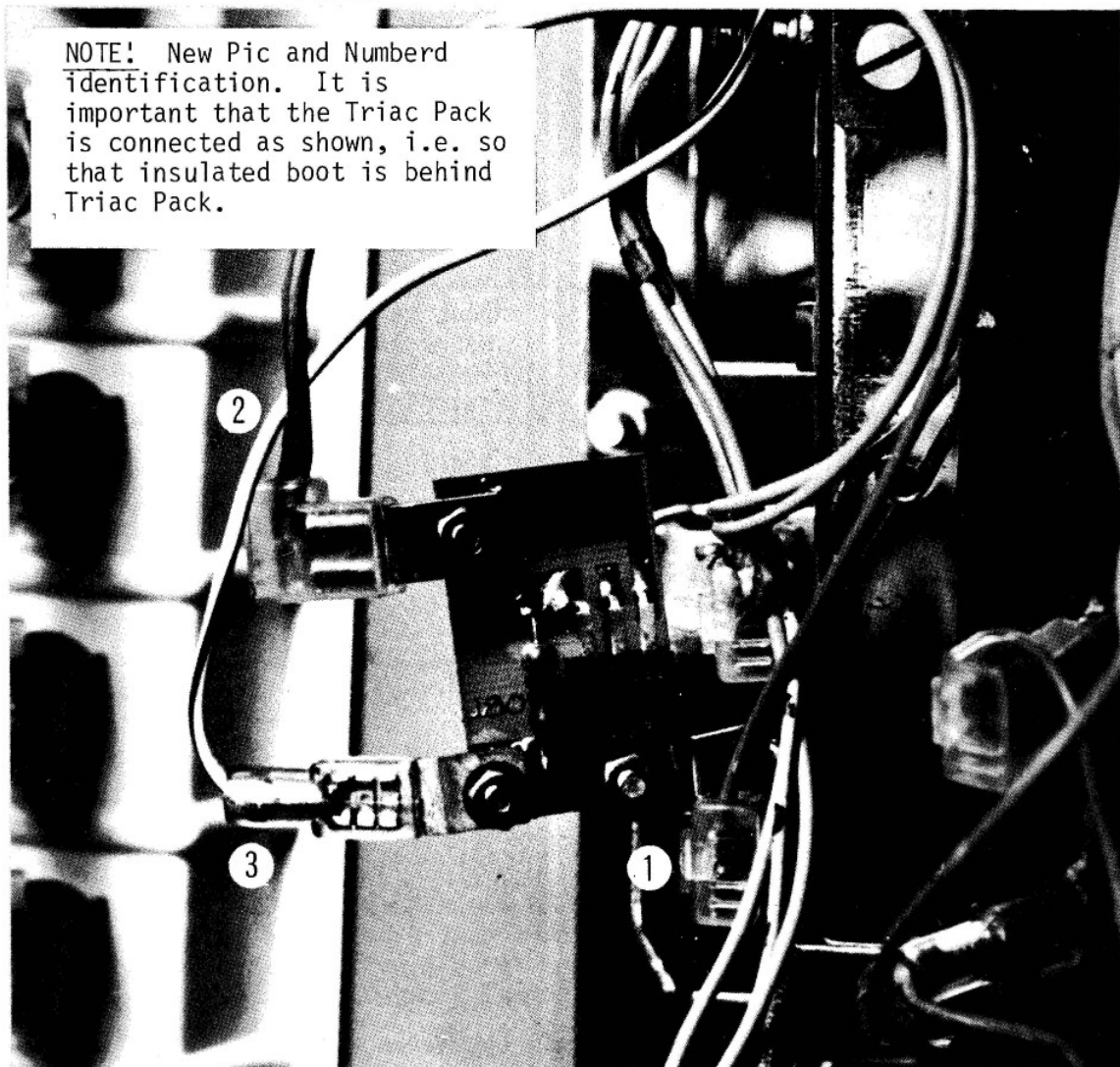
- 1 Female $\frac{1}{4}$ " AMP tag which is connected to the solenoids or lamps where applicable.

- 2 Male $\frac{1}{4}$ " AMP tag which is the 12 V Raw DC line (Purple)

- 3 Male $\frac{3}{16}$ " AMP tag which is the signal (switch line) from the controller.

Note: Should more than one device be switched from one signal line, the extra solenoids are linked to the female $\frac{1}{4}$ " AMP tag (1 above).

The 50 volt line (Yellow) is connected directly to the Solenoid(s).



Triac Pack. Coin Lockout location

12 Servicing Hints

Nudge Double Up Deluxe

Removal of Main Board for S.R.U. Chassis

1. Disconnect wire to speaker
2. Remove Plugs 2 and 3 (plugs should be pulled vertically downwards to prevent damage to pins).
3. Grip both sides of Main Board with fingers and release spring catches by using thumb pressure against top of SRU Chassis.
4. Hinge top of board slightly towards you to clear SRU Chassis.
5. Place thumbs under base of memory card guides and fingers on top of SUR Chassis. Exert pressure with thumbs to remove board from Plug Socket 1.

Replacement of Main Board in S.R.U. Chassis.

1. Offer board into board guides and ensure locating pins in plug and socket 1 are aligned.
2. Press board firmly into position and locate board retaining clips.
3. Fit plug sockets 2 and 3 to board taking care to ensure correct alignment.
4. Re-connect speaker wires.

Tone Adjustment

To reduce tone pitch, adjust potentiometer in an anti-clockwise direction. To raise pitch, adjust in a clockwise direction.

Type of Interference	Mains-Borne	Electrostatic	Electromagnetic
Typical Environmental Associations	Motors Fluorescent lights. Arcade surroundings	Nylon carpets sparks from electrical devices	Radar installations Radio-Taxis
Aerial	No	Yes	Yes
Capacitor Back of Board	Yes	No	No
Sensitivity Potentiometer	Yes	Yes	Yes

Under no Circumstances Should:

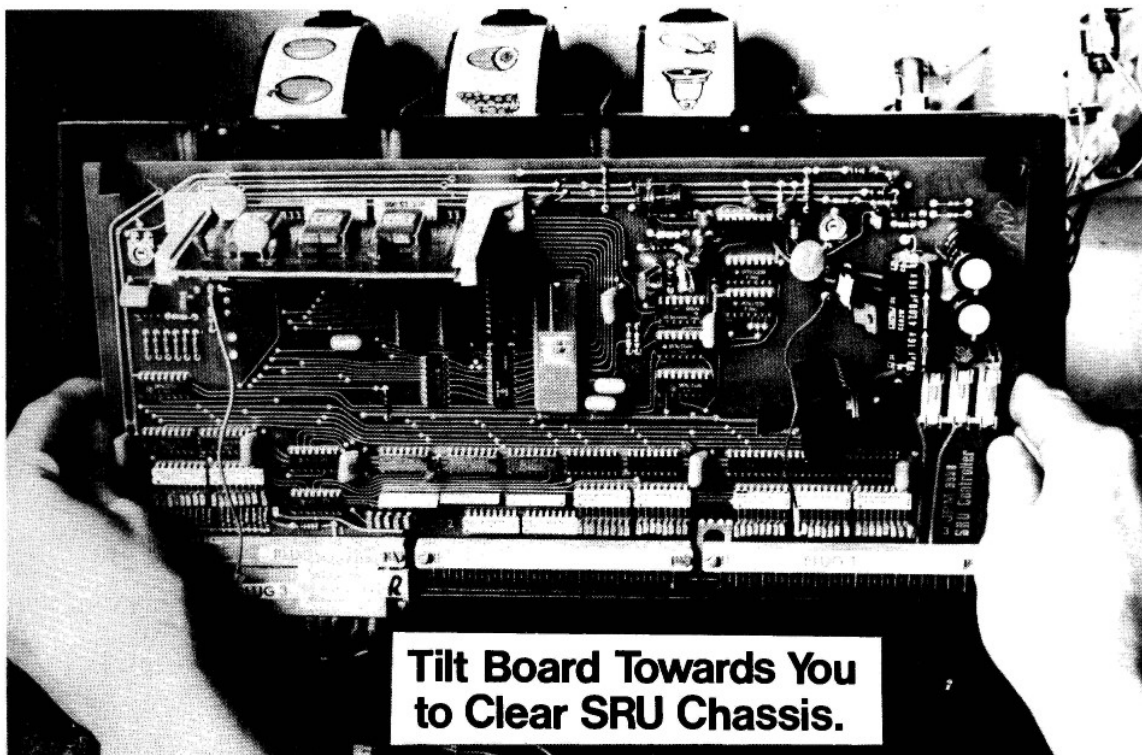
- a) The capacitor be removed
- b) the aerial shortened
- c) the pot. be turned fully anticlockwise since this disables the reset circuit.

Potentiometer Setting

The pot. should be turned clockwise to the highest level consistent with normal operation with few, if any, unwarranted resets occurring over an extended period. At this setting the circuit will be sensitive to surges in interference over and above the normal background level.

With the pot. correctly set for normal operation as above it will be quite common for more than one reset to occur on start-up due to repeated striking of the internal fluorescent lamps.

Note: If the reset circuit is incorrectly tuned the machine may lock up sounding the tone which normally accompanies reset but without reset actually taking place.



Some Do's & Don'ts

Do's:

1. Always use a low wattage precision soldering iron when working on the Logic Board. Excessive heat and large soldering bits can damage Printed Circuit.
2. Always ensure that earth connections are re-connected if removed to replace parts or units.
3. It is recommended that faulty or flashing fluorescent tubes be replaced to prevent interference.
4. Always check earth connections are made in power points.
5. Always make sure that Plugs and Sockets make good connections as these can cause intermittent faults.
6. Always use a de-soldering tool to clear printed circuit track when replacing components.
7. Do ring out After Sales Department if you have a problem.

Don'ts:

1. Never remove the label from an Eprom as this could destroy the programme.
2. Never remove a component or plug before ensuring that the power is switched off.
3. Never exert excessive pressure on the Varelco Plugs and Sockets as this may cause the pins to open resulting in poor contact.
4. Never use excessive heat on Varelco Pin when removing wires as this can displace the Pin.
5. Never attempt to set up a winning combination by turning the reels. (N.B. This can be achieved by using the test procedure).
6. Do not fit any fuse other than an anti-surge fur on the main board.
7. Do not replace a coin meter before checking whether an internal or external diode is required.
8. Do not attempt to dismantle a stepper motor.

14 Fault Finding

Nudge Double Up Deluxe

CAUTION

Sub standard or non-approved electronic components must not be used as replacements. This could lead to subsequent breakdowns and will invalidate warranty.

The following table of faults and possible causes is intended only as a guide to the Engineer and should not be regarded as the sole cause of a particular fault.

<u>Fault</u>	<u>Possible Cause</u>
Lamp continuously lit	Suspect relevant transistor short circuit.
Coil continuously energised	Check Triac Pack. Suspect relevant transistor short circuit.
Lamp not lighting	Check lamp, check wiring on plug and socket, or transistor failure O/C.
Coils not energising	Check coil, check Triac Pack, check plug and socket connections, check transistor failure O/C.
1, 2 or 3 reel not revolving	Check plug and socket connection, check for broken wire in plug socket 1. Check transistors and diodes.
Intermittent payout and coin lockout chattering.	Bad connections under insulated cover on 3/16" tag to relevant triac pack.
Main board fuse repeatedly blowing through no obvious reason.	Wrong fuse fitted. Fit anti-surge fuse.
Machince will not start with credit displayed.	Check coin acceptor microswitches.
No Initialisation On Switch On. Continuous Tone.	Check that power supply LED are on. Check board fuses. Check plugs and sockets on 1 2 and 3. Check aerial adjustments. Check 1022/4528 clobber chip. Check O/C capacitor C11. Check programme board dirty contact on edge connector. Check connections transformer terminal strip.
Extended inialisation Tone.	1C22 MC 14538 faulty. Check internal lighting system by removing light fuse. Check for external static.
Continual Tone.	Coin switch jammed (later models). Bad connection on memory board. Faulty 1C22 (MC 14538)

Nudge Double Up Deluxe

NOTE!

Full details and specifications of components may be obtained from the After Sales Department

Spares can be obtained from our spares sales department.

FAULT	POSSIBLE CAUSE
Double Nudging of Symbols.	Tight spot on motor. Loose reel. Reel out of SYNC through physical obstruction. Obsolete programme. Bad connection on vareclo plug 1.
Reels Strobing.	Incorrect value of resistor on reel unit. Recommended value should be 10 OHM 50W rating (see TSB 6).
Reel Oscillating.	Tight spot on motor.
Reel Revolving in Opposite Direction to Other Reels.	Plug 1 bad pin connection. Faulty transistor.
Reels Out of Alignment.	Short circuit light source.
Incorrect Payouts.	Short circuit light source (Reels out of alignment). Open circuit light source (Paying out on criss cross position with incorrect symbol). Processor thinks tag is in the sensor.
No Payout (Cash)	Check if M/C will payout on 50p change if so check sensors.
No Payout	Payout commences then solenoid remains energised until M/C is switched off. Check for short on triac. Check for leaky transistor. Check for incorrect solenoid drive. Transistor fitted should be ZTX450.
Machine Initialises During Payout.	Check Traic. Check payout solenoid for radiation by disconnecting solenoid feed when paying out. Aerial too sensitive.

16 Engineers Test Box Operation of Hexadecimal

Function

To allow a Service Engineer to check the static operation of the S.R.U. Main Board and any sub boards, switches, buttons, lamps, etc. connected to it without removal from the machine.

The main S.R.U. board has 24 input and 56 output drive lines numbered 00 to 23 and 00 to 55 respectively.

Use of Engineers Test Box For Nudge Double Up De Luxe

Switch machine OFF and remove programme card. Insert plug from Engineers Test Box into socket on main board ensuring that RED trace wire is at top left hand corner, i.e. Pin 1. Disconnect speaker.

Set Test Box digital switches to 00.

Switch ON power to machine.

To Test Inputs and Outputs

1. Inputs

Dial up relevant input no. L.E.D. on test box will change state when relevant

input is operated e.g. to test start switch input, (Port 14 or O.E.) set digital switches to O.E., RED L.E.D. is now lit, operate start switch, RED L.E.D. will extinguish. All other inputs may be checked in a similar manner by referring to input-output chart.

2. Outputs

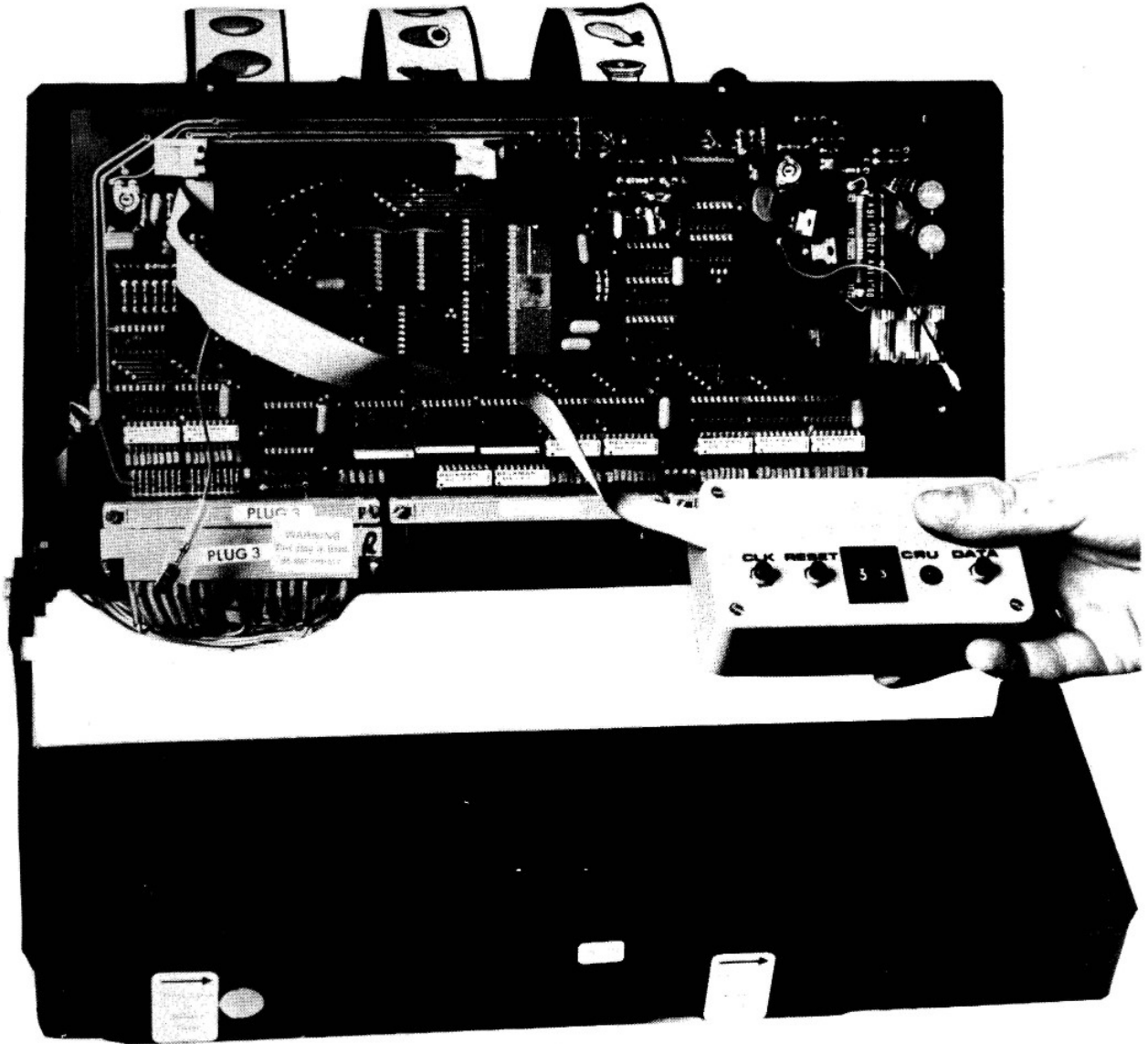
Dial up relevant output port No. using digital switches and Press and hold clock button, press data button to operate output. E.g. to test token payout solenoid, (Port No.54 or 36) set digital switches to 36, press data button to operate token payout solenoid. Other outputs may be tested in a similar manner.

Reminder

Switch Power Off.

1. Remove Test Box Plug.
2. Reconnect speaker.
3. Insert Programme Card.

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18 Out Puts

Nudge Double Up Deluxe

HEX	PORT	PLUG	PIN	TRANSISTOR	COLOUR	FUNCTION
00	0	1	35	Q1	WHT/RED	1ST REEL MOTOR
01	1	1	34	Q2	GRN/	
02	2	1	32	Q4	RED	
03	3	1	30	Q6	WHT/GRN	
04	4	1	28	Q8	WHT/RED	2ND REEL MOTOR
05	5	1	29	Q7	GRN/	
06	6	1	31	Q5	RED	
07	7	1	33	Q3	WHT/GRN	
08	8	1	27	Q9	WHT/RED	3RD REEL MOTOR
09	9	1	26	Q10	GRN	
0A	10	1	24	Q12	RED	
0B	11	1	22	Q14	WHT/GRN	
0C	12	1	20	Q16	NOT USED	
0D	13	1	21	Q15	NOT USED	
0E	14	1	23	Q13	NOT USED	
0F	15	1	25	Q11	NOT USED	
10	16	2	14	Q17	GRN/GREY	1ST HOLD LAMP
11	17	2	13	Q18	YEL/PUR	2ND HOLD LAMP
12	18	2	11	Q20	BRN/YEL	3RD HOLD LAMP
13	19	2	9	Q22	GRN/BRN	1ST NUDGE LAMP
14	20	2	7	Q24	BLUE/GRN	2ND NUDGE LAMP
15	21	2	8	Q23	WHT/ORG	3RD NUDGE LAMP
16	22	2	10	Q21	RED/ORG	4TH NUDGE LAMP
17	23	2	12	Q19	YEL/BLK	5TH NUDGE LAMP
18	24	2	6	Q25	ORG/WHT	6TH NUDGE LAMP
19	25	2	6	Q26	BRN/PUR	7TH NUDGE LAMP
1A	26	2	3	Q28	PINK/BLUE	8TH NUDGE LAMP
1B	27	3	33	Q30	GREY/GRN	9TH NUDGE LAMP
1C	28	3	32	Q32	WHT/PUR	10TH NUDGE LAMP
1D	29	3	34	Q31	BLUE/GREY	TOKEN OUT METER

Out Puts¹⁹

Nudge Double Up Deluxe

HEX	PORT	PLUG	PIN	TRANSISTOR	COLOUR	FUNCTION
1E	30	2	2	Q29	WHT/YEL	REFILL TOKEN METER
1F	31	2	4	Q27	GRY/ORG	TOTAL PLAYS METER
20	32	3	31	Q33	ORG/RED	TOKEN IN METER
21	33	3	30	Q34	YEL/PINK	CREDIT DISPLAY PLUG POS 7 + 2
22	34	3	28	Q36	PUR/WHT	CREDIT DISPLAY PLUG POS 6 + 11
23	35	3	26	Q38	RED/BLK	CREDIT DISPLAY PLUG POS 10 + 5
24	36	3	24	Q40	BLK/WHT	CREDIT DISPLAY PLUG POS 8 + 3
25	37	3	25	Q39	BRN/ORG	CREDIT DISPLAY PLUG POS 9
26	38	3	27	Q37	ORG/GRN	CREDIT DISPLAY PLUG POS 4
27	39	3	29	Q35	RED/YEL	10p OUT METER
28	40	3	23	Q41	BLUE/BLK	50p IN METER
29	41	3	22	Q42	PINK/RED	NUDGE GAMBLE LAMP
2A	42	3	20	Q44	BLK/BLUE	DOUBLE LAMP (GLASS)
2B	43	3	18	Q46	GRN/RED	NOTHING LAMP (GLASS)
2C	44	3	16	Q48	BLUE/WHT	DOWN LAMP (PLAQUE)
2D	45	3	17	Q47	BRN/RED	UP LAMP (PLAQUE)
2E	46	3	19	Q45	BLK/YEL	10p GAMBLE LAMP
2F	47	3	21	Q43	RED/GREY	20p GAMBLE LAMP
30	48	3	15	Q49	PUR/RED	40p GAMBLE LAMP
31	49	3	14	Q50	BLU/ORG	80p GAMBLE LAMP
32	50	3	12	Q52	YEL/WHT	TOTAL CASH IN METER
33	51	3	10	Q54	PUR/PINK	GAMBLE + COLLECT LAMP
34	52	3	8	Q56	BLK/GRN	START LAMP
35	53	3	9	Q55	BRN/BLUE	10p PAYOUT TRIAC
36	54	3	11	Q53	ORG/GRY	10p TOKEN PAYOUT TRIAC
37	55	3	13	Q51	GRN/PINK	10p LEVEL S/W

20 In Puts

Nudge Double Up Deluxe

HEX No.	PORT No.	PLUG No.	PIN No.	IC No.	PIN No.	WIRE COLOUR	FUNCTION
00	0	1	2	8	4	BLU/WHT	(See opto sensor pack 1)
01	1	1	3	8	3	GRY/WHT	(See opto sensor pack 2)
02	2	1	5	8	2	PINK/WHT	(See opto sensor pack 3)
03	3	1	6	8	1		Not Applicable
04	4	1	4	8	15		Not Applicable
05	5	2	34	8	14		Not Applicable
06	6	2	32	8	13		Not Applicable
07	7	2	31	8	12		Not Applicable
08	8	2	24	9	4	ORG/PUR	(1st Hold Micro Switch)
09	9	2	26	9	3	GRN/WHT	(2nd Hold Micro Switch)
0A	10	2	28	9	2	PUR/ORG	(3rd Hold Micro Switch)
0B	11	2	30	9	1		Not Applicable
0C	12	2	29	9	15		Not Applicable
0D	13	2	27	9	14	BLU/YEL	(Cancel Micro Switch)
0E	14	2	25	9	13	YEL/GRY	(Start Micro Switch)
0F	15	2	23	9	12	RED/BLU	(Nudge Down Micro Switch)
10	16	2	20	10	4	PUR/BRN	(Nudge Up Micro Switch)
11	17	2	18	10	3		Not Applicable
12	18	2	20	10	2	PINK/YEL	(Test Micro Switch)
13	19	2	22	10	1	BRN/GRN	(Refill Key Switch)
14	20	2	21	10	15	BLK/GRY	(5p Coin Switch)
15	21	2	19	10	14	WHT/RED	(10p Coin Switch)
16	22	2	17	10	13	GRY/YEL	(10p Token Switch)
17	23	2	15	10	12	BLU/RED	(50p Coin Switch)

Nudge Double Up Deluxe

REEL DRIVE SYSTEM

SOURCE SENSOR PACK - 1ST REEL

	Plug No.	Pin No.	IC	Pin No.	Wire Colour	
Anode	1	8			Blue/Yel) Light Source
Cathode	1	9			Blue/Blk	
Collector	1	16			Blue/Grn) Light Sensor
Emitter	1	2	8	4	Blue/Wht	

SOURCE SENSOR PACK - 2ND REEL

	Plug No.	Pin No.	IC	Pin No.	Wire Colour	
Anode	1	10			Gry/Yel) Light Source
Cathode	1	11			Gry/Blk	
Collector	1	17			Gry/Grn) Light Sensor
Emitter	1	3	8	3	Gry/Wht	

SOURCE SENSOR PACK - 3RD REEL

	Plug No.	Pin No.	IC	Pin No.	Wire Colour	
Anode	1	12			Pnk/Yel) Light Source
Cathode	1	13			Pnk/Blk	
Collector	1	18			Pnk/Grn) Light Sensor
Emitter	1	5	8	2	Pnk/Wht	

22 Main Board Power Supplies

Nudge Double Up Deluxe

Plug No.	Pin No.	Supply Voltage	Colour	Function
3	1	12 volts AC	Gry/Blue)	Main Board Power Supplies
3	2	9 volt AC	Gry/Red)	
3	3	12 volts AC	Wht/Blk)	
3	4	9 volts AC	Wht/Pnk)	
3	5	-17 volts DC*	Pink	Switch Input Supply
3	6	Digital zero volt	Blue	Zero Volt Line
3	7	8 volts DC*	Grn	Feed to Display
3	35	Ground	Grn/Yel	
3				
2	35	34 volts DC	Brn/Blk	Stepper Motor Supply
2	1	Ground	Grn/Yel	

*All DC voltages are nominal.

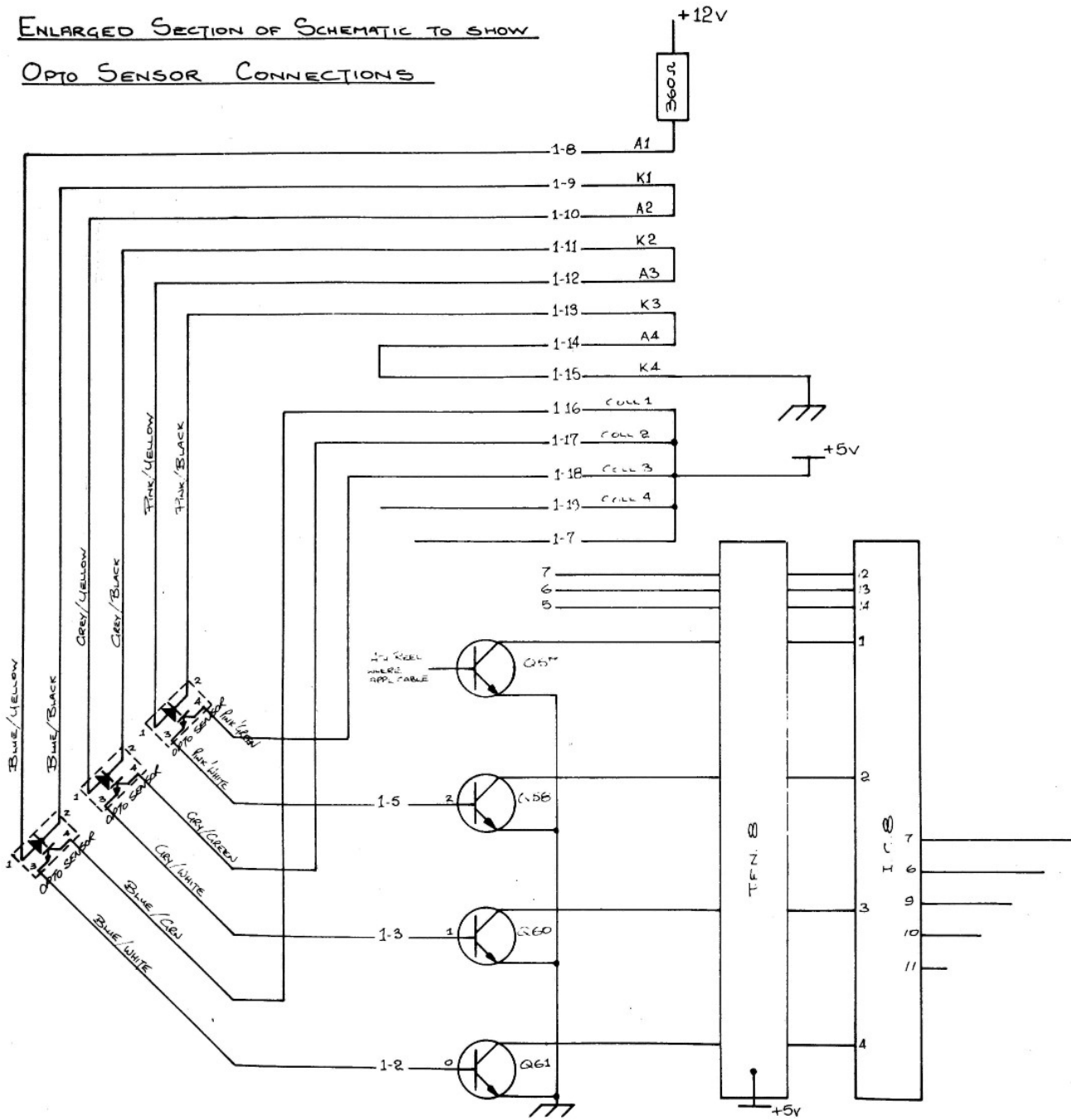
To Test Credit Display using Port No's 33 - 38	Display Shows
Turn on Outputs 33 to 38	00
Turn off Output 33	11
Turn off Output 34	33
Turn on Output 33	22
Turn off Output 35	66
Turn on Output 34	44
Turn on Output 35	00
Turn off Output 36	88
Turn on Output 36	00
Turn off Output 37	00
Turn off Output 36	80
Turn on Output 36	00
Turn on Output 37	00
Turn off Output 38	00
Turn off Output 36	08

Each drive line to the display has now been checked and the ability of the display to latch in data has been verified.

Faults:

If, when there is zero credit on the machine the display shows 11, 22, 44 or 88, then there is a fault associated with output 33, 34, 35 or 36 respectively.

ENLARGED SECTION OF SCHEMATIC TO SHOW
OPTO SENSOR CONNECTIONS



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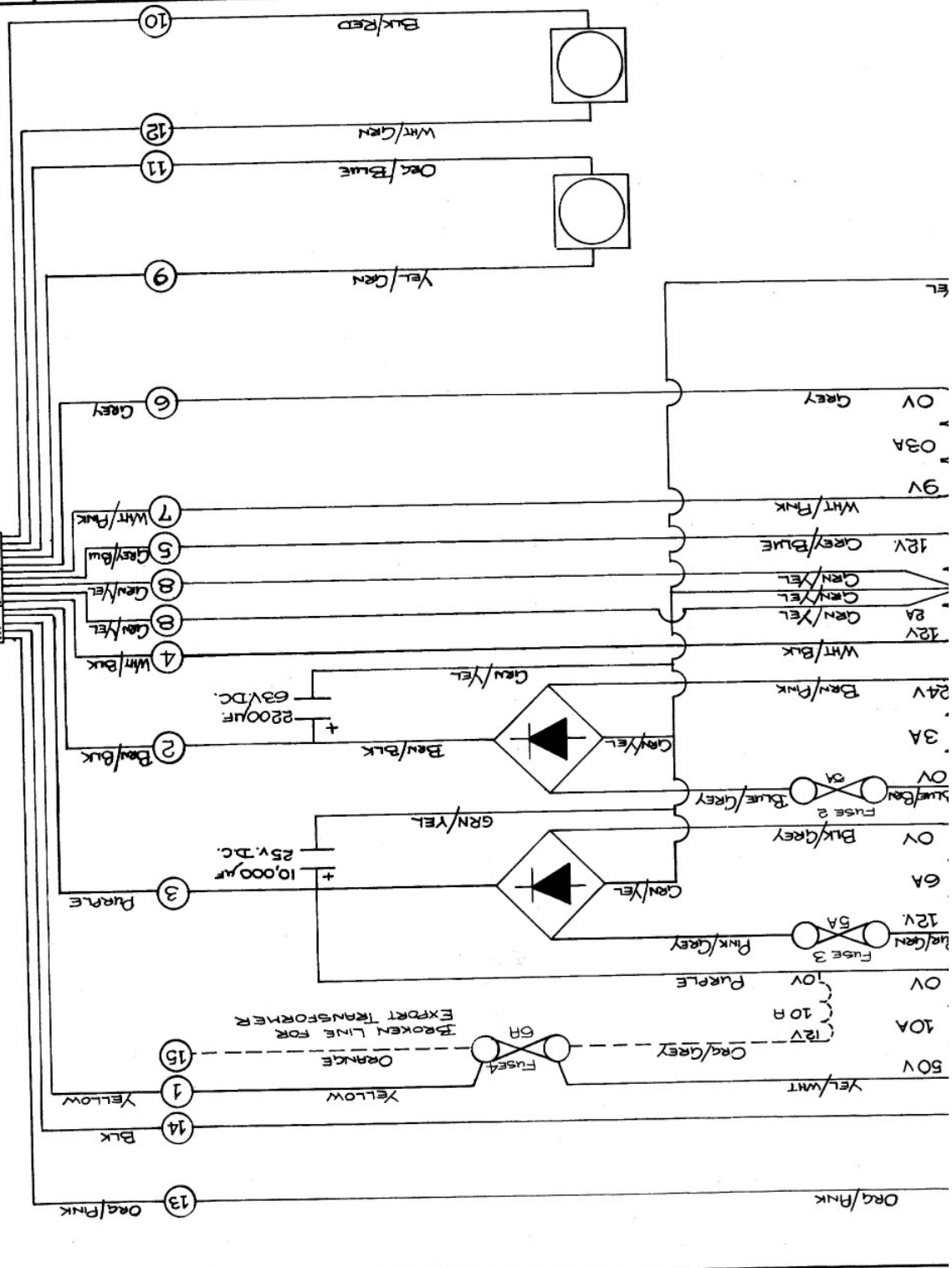


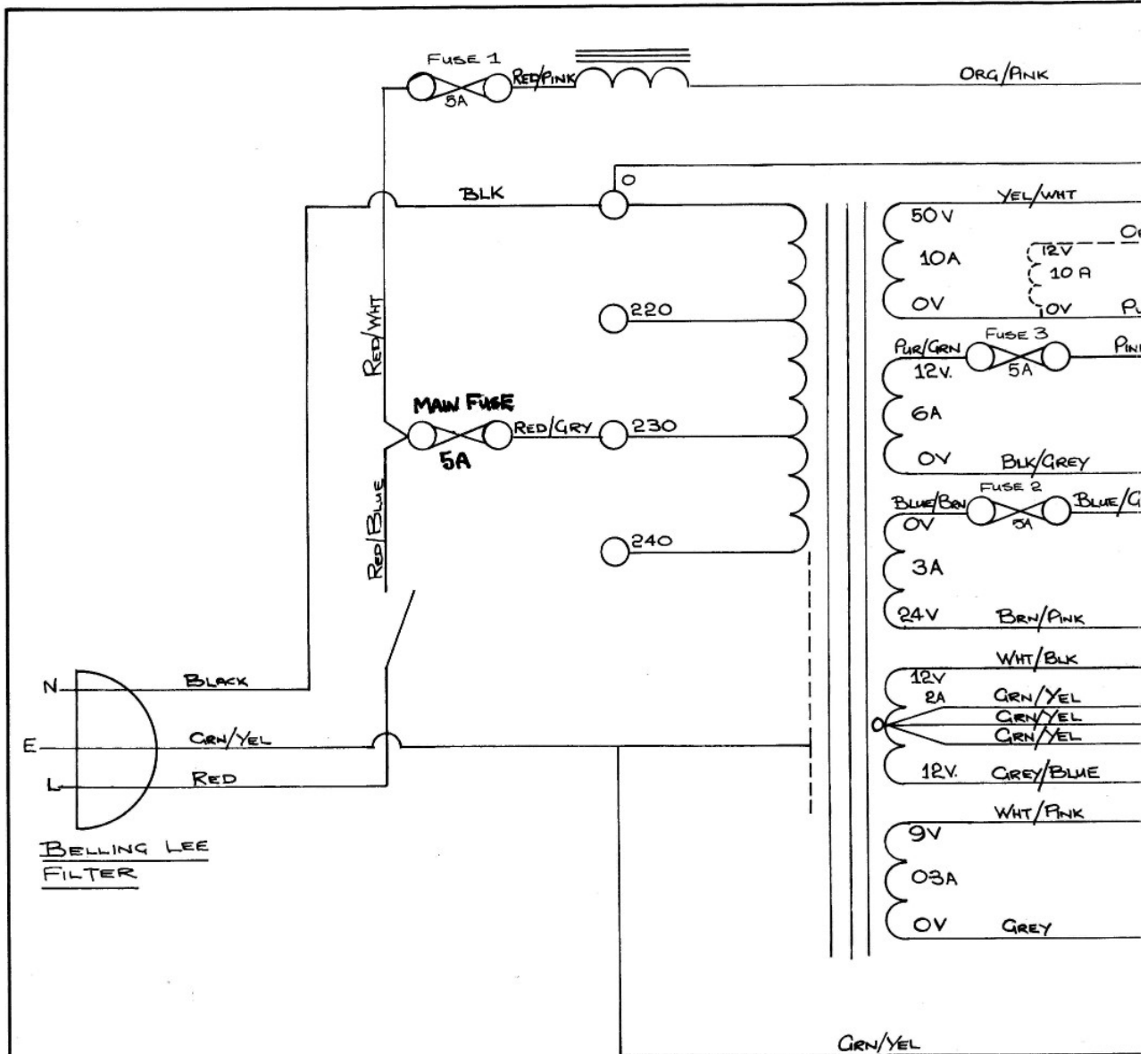
TITLE M.P.U. TRANSFORMER BRACKET
MATERIAL L.O.M.
FINISH

DRAWING No. M0064 (R)

SCALE N.T.S.
DATE 11/12/78
APPROVED
DRAWN T.B.
T.B.

1	Yel	Wht	Pnk	Red	Pnk	Org
2	Blk	Wht	Pnk	Red	Pnk	Org
3	Yel	Wht	Pnk	Red	Pnk	Org
4	Wht	Blk	Org	Blk	Blk	Blk
5	Grn/Yel	Blk	Blk	Blk	Blk	Blk
6	Grn/Yel	Blk	Blk	Blk	Blk	Blk
7	Wht/Pnk	Blk	Blk	Blk	Blk	Blk
8	Grn/Yel	Blk	Blk	Blk	Blk	Blk
9	Yel/Grn	Blk	Blk	Blk	Blk	Blk
10	Blk/Red	Blk	Blk	Blk	Blk	Blk
11	Org/Blue	Blk	Blk	Blk	Blk	Blk
12	Wht/Grn	Blk	Blk	Blk	Blk	Blk
13	Org/Pnk	Blk	Blk	Blk	Blk	Blk
14	Blk	Blk	Blk	Blk	Blk	Blk
15	Yellow	Blk	Blk	Blk	Blk	Blk





POWER UNIT FUSE RATING

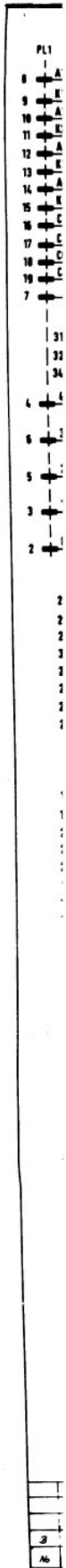
<u>MAIN FUSE</u>	5 AMPS 240 VOLTS
<u>FUSE 1</u>	5 AMPS 240 VOLTS (LIGHTING)
<u>FUSE 2</u>	5 AMPS 37 VOLTS MOTOR FUSE
<u>FUSE 3</u>	5 AMPS 12 VOLTS RAW D.C. (LAMPS)
<u>FUSE 4</u>	5 AMPS 50 VOLTS (SOLENOID & LOCKOUT)

No.	DESCRIPTION	CHK'D	APP'D	DATE
REVISIONS				

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COPYSTAT

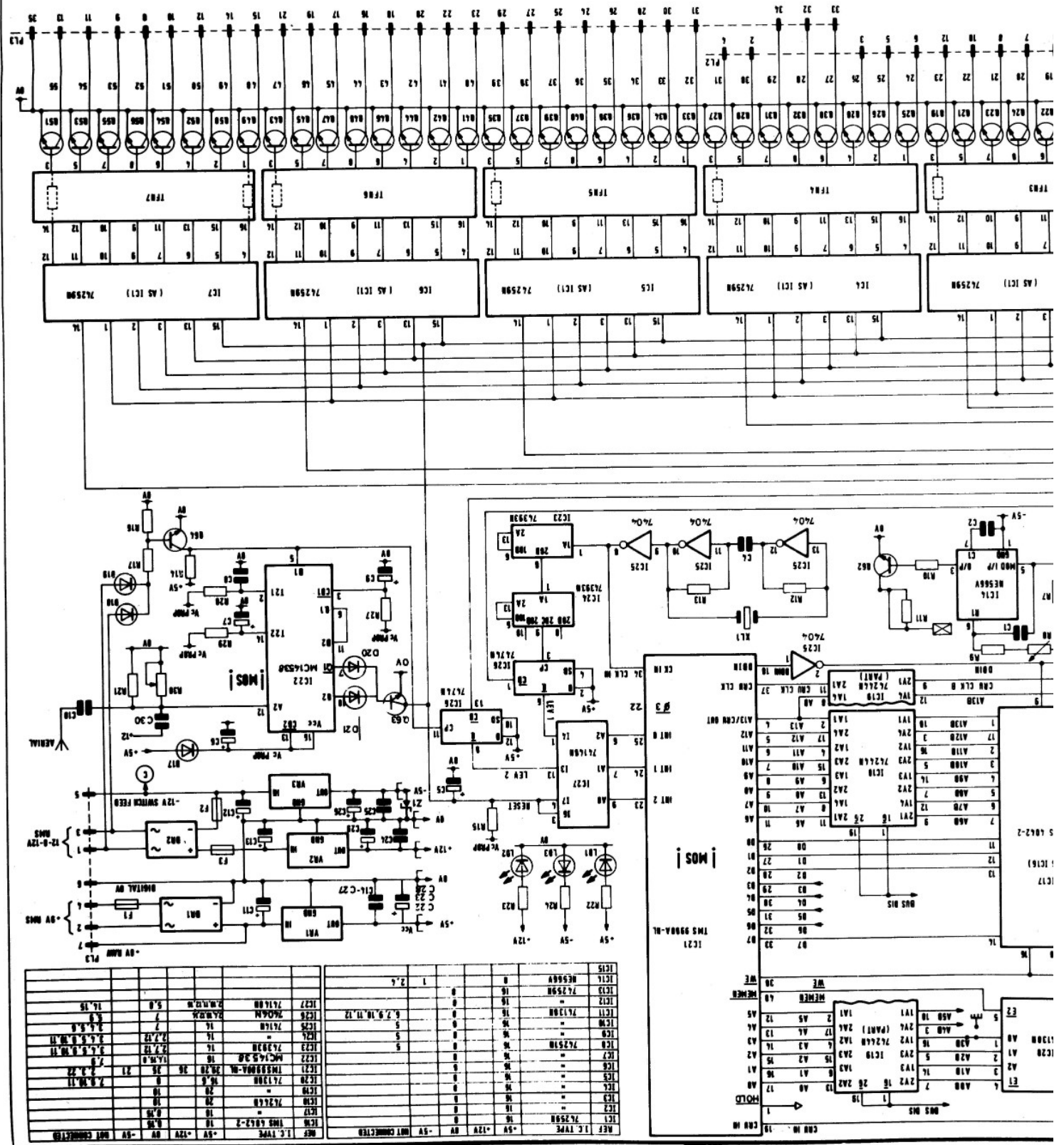
DO NOT SCALE



Item	Sik/Drg.No	Qty	Unit	Description	MANUF		TYPE	Remarks (CCT Ref etc)
					MAT'L	FINISH		
01	I80I85	1	ea	PCB Drilled				Double Sided PTH
02				Side 1 Artwork				
03				Side 2 Artwork				
04				Side 1 Solder Resist				
05				Side 2 Solder Resist				
06	M 0196			Drilling & Mat'l Spec				
07								
08								
09	I80043	8	ea	IC 16 Pin DIL 8 Bit Addressable Latch	TI	SN 74LS 259N		IC's I-7- IC13 Alts I80043A & B
10	I80042	3	ea	IC 16 Pin DIL 8 - 1 Line Encoder	TI	SN 74LS 251N		IC's 8 - IO Alts I80042A & B
11	I80015	3	ea	IC 16-Pin DIL 3 - 8 Line Decoder	TI	SN 74LS 138N		IC's II; 12; 20 Alts I80015A - N
12	I80027	1	ea	IC 8 Pin DIL Tone Generator	Signetics	NE 566		IC I4 Alts I80027A - C
13	I80014	2	ea	IC 18 Pin DIL Static Ram	TI	4042-NL-2		IC's I6; I7 Alts I80014A & B
14	I80163	2	ea	IC 20 Pin DIL Optal Buffer	TI	SN 74LS 244N		IC's I8; I9
15	I80047	1	ea	IC 40 Pin DIL Microprocessor	TI	TMS 9980-AML		IC 2I ALT I80047A
16	I803II	1	ea	IC 16 Pin DIL Dual Monostable Multivibrator	Motorola	MC 14538 B'P		IC 22
17	I80II9	2	ea	IC 14 Pin DIL Dual 4 Bit Binary Counter	TI	SN 74LS 393N		IC's 23, 24 Alts I80II9A-F
18	I80344	1	ea	IC 14 Pin DIL Hex Inverter	TI	SN 7404		IC 25
19	I80I2I	1	ea	IC 14 Pin DIL Dual O Type Bistable	TI	SN 74LS 74 AN		IC 26 Alt I80I2IA
20	I80I22	1	ea	IC 16 Pin DIL 8-3 Line Priority Encoder	TI	SN 74LS 148N		IC 27 Alt I80I22A-H
21								
22	I20032	1	ea	I4 Pin DIL Skt	Aucat	514 ACILD	SKT 2	Alt I20032A
23	I20030	1	ea	I8 Pin DIL Skt	Aucat	518 ACILD	SKT 3	Alt I20030A
24	I20029	1	ea	40 Pin DIL Skt	Aucat	540 ACILD	SKT 4	Alt I20029A
25								
26	I80063	16	ea	Transistor NPN Darlington Switching 80V 300 MA	Ferranti	BCY 38A	QI-16 Inc	performed to to I8-L Pack
27	I80029	48	ea	Transistor NPN Switching 60V 1A	Ferranti	ZTY 450	QI7-64 Inc	performed to to I8-L Pack
28	I80070	21	ea	Diode 100V 150 MA	TI	IN 4148	DI-2I Inc	
29	I80051	1	ea	Voltage Regulator +5V I.5A	TI	UA7805CKC	Mounted On VPI Iter 80	T220 Pack
30	I80052	1	ea	Voltage Regulator +12V I.5A	TI	UA7812CKC	VR2	T220 Pack
31	I80053	1	ea	Voltage Regulator -5V I.5A	TI	UA7905CKC	VR3 T220 Pack	Alt I80053A
32	I80347	1	ea	Bridge Rectifier 6A 50V	Gen Intr	KBPC 6-005	BR1	
33	I80049	1	ea	Bridge Rectifier 50V 1A	Gen Instr	U-005	BR2	
34	I80II8	3	ea	L.E.D. 0.2" Ø Red	TI	TIL 220	LD I,2,3	Alt I80II8A,B,I80III
35								
36	I80272	1	ea	Capacitor Polystyrene Radial 1000 pf 16V				C1
37	I80343	11	ea	Capacitor Metallised Polyester Radial 0.2uf+10% 100V	Flessey	Mini-Box		C2, I4-20,24,25 & 27
38	I80187	1	ea	Capacitor Tantalum Bead I uf +20% 16V				C3
39	I80348	1	ea	Capacitor Metallised Polyester Radial 0.01uf +10% 400V	Procond			C4
40	I80299	1	ea	Capacitor Tantalum Bead 100uf +20% 10V				C5 Alt I80338
41	I80301	1	ea	Capacitor Electrolytic Radial 330uf -10 +50% 6V	Europe Chem-Conn			C6
42	I80074	1	ea	Capacitor Electrolytic Axial 22uf -10 +50% 10V	Europe Chem-Conn			C7 Alt I80341
42	I80076	1	ea	Capacitor Metallised Polyester 0.1uf + 10% 160V Axial	Wima	Tropyfoil M		C8 Alt I800II
44	I80270	1	ea	Capacitor Ceramic Disc 0.1 uf 35V				C10
45	I80269	1	ea	Capacitor Electrolytic Axial 4700uf -10 +50% 16V	Europe Chem-Conn			C11
46	I80190	2	ea	Capacitor Electrolytic Radial 1000uf -10 +50% 25V	Europe Chem-Conn			C12, I3
47	I80092	6	ea	Capacitor Tantalum Bead 10uf +20% 35V				C9, C22,23,26,28 &29 Alt I80229
48	I80099	1	ea	Capacitor Ceramic Disc 0.01uf 35V				C30 Alt I80342

Item	Stk/Drg.No.	Qty	Unit	Description	MANUF		TYPE	Remarks (CCT Ref etc)
					MAT'L	FINISH		
49								
50	I80307	6	ea	Res carbon Film IK5 5% 0.25W	Mullard	CR25	RL-6	Brown, Green, Red, Gold Alt I80307A
51	I80077	5	ea	Res Carbon Film 470R 5% 0.25W	Mullard	CR25	R7,I2,I3,22,24	Yellow, Violet, Brown, Gold Alt I80077A
52	I80040	1	ea	Res Carbon Film 6K8 5% 0.25W	Mullard	CR25	R9	Blue, Violet, Brown, Gold Alt I80040A
53	I80095	1	ea	Res Carbon Film 270P 5% 0.25W	Mullard	CR25	R10	Red, Violet, Brown, Gold Alt I80095A
54	I80176	1	ea	Res Carbon Film 47R 5% 0.25W	Mullard	CR25	R11	Yellow, Violet, Black, Gold Alt I80176A
55	I80300	4	ea	Res Carbon Film IK 5% 0.25W	Mullard	CR25	R14,I5,I7,23	Brown, Black, Red, Gold Alt I80300P
56	I80037	4	ea	Res Carbon Film 10K 5% 0.25W	Mullard	CR25	R16,I9,20,26,	Brown, Black, Orange, Gold Alt I80037A
57	I80274	1	ea	Res Carbon Film 220K 5% 0.25W	Mullard	CR25	P21	Red, Red, Yellow, Gold Alt I80274A
58	I80179	1	ea	Res Carbon Film 360P 5% 0.5W	Mullard	CR37	P25	Orange, Blue, Brown, Gold
59	I80178	2	ea	Res Carbon Film 100K 5% 0.25W	Mullard	CR25	R27	Brown, Black, Yellow, Gold Alt I80178A
60	I80113	1	ea	Res Metal Oxide 160K 2% 0.25W	Electrosil	TR4	P28	Brown, Blue, Yellow, Red Alt I80113A
61								
62	I80175	1	ea	Res Preset Skeletal 4K7 % W				P8 R8
63	I80275	1	ea	Res Preset Skeletal 100K % W				R30
64								
65	I80244	5	ea	Thick Film Network 16 Pin DIL 8 x 330R	AB Micro Electronics	761-3-330P	TFN 3-7	
66	I80181	1	ea	Thick Film Network 9 Pin SIL 8 x 10K to Common	AB Micro Electronics	850-01-1K	TFN 8	
67	I80182	2	ea	Thick Film Network 9 Pin SIL 8 x 1K to Common	AB Micro Electronics	850-91-1K	TFN 9, 10	
68	I80340	4	ea	Thick Film Network 16 Pin DIL 8 x 2K7	AB Micro Electronics	761-3-2K7	TFN 11,12, 1 & 2	
69								
70	I20019	3	ea	Connector PCB Mnto 35W Rt Anode Pins	Varelo	7023-35-000-001	PL I-3	
71	I20020	1	ea	Connector PCB Mnto 35W Edge Contact	Varelo	001-9040-6072-00-001	PL 4	
72	I20026	2	ea	PCB Guide Moulded	Varelo	6072-3218	PL I & 2	
73	I80166	1	ea	Polarising Key	Varelo	6072-3618	Fitted to PL 4 Pos'n I5	
74								
75	I60097	1	ea	Fuseholder 3 section	Bellin's Lee	L2222	PH I	
76	I60050	3	ea	Fuselink Antisurge 5mm Ø x 20mmL 2.5A 250V	Beswick	I23	PL 2 & 3	
77								
78	I80171D	1	ea	Crystal 6 MHz	Interface Quartz Devices	HC 16/U	X I	
79	I80168	1	ea	Heatsink 10.5°C/W	Similar to RS Comps	401-964	HS I	
80								
81								
82	040022	8	ea	Screw CH HD Slotted #3 x 16	M.S.	ZN & PASS		
83	040082	11	ea	Nut Full #3	M.S.	ZN & PASS		
84	040083	11	ea	Washer Int Tooth #3	B.M.S.			
85	040095	3	ea	Bolt Hex HD #6 x 10	M.S.	ZN & PASS		Use with items 20 & 80, 87
86								
87	I00153	2	ea	Retaining Spring				To Drg. H0012
88								
89	200129	2	ea	Flying Lead Assy				Complete to P/L 200129
90	200140	1	ea	Aerial Lead Assy				Complete to P/L 200140
91								
92			A/R	Tape Insulating				Use for insulating tracks under DL I & 2 and under HS
93								
94			A/R	Heatsink Compound				Use between items 29 & 80
95								
96			A/R	Resin Single Part			RTV I	Use between C11, 12 & 13

Main Board Drawing 25



REF	IC TYPE	QTY	VALUE	NOTE
1C1	74259N	5	AS IC1	
1C2	74259N	5	AS IC1	
1C3	74259N	5	AS IC1	
1C4	74259N	5	AS IC1	
1C5	74259N	5	AS IC1	
1C6	7404	10		
1C7	7404	10		
1C8	7404	10		
1C9	7404	10		
1C10	7404	10		
1C11	7404	10		
1C12	7404	10		
1C13	7404	10		
1C14	7404	10		
1C15	7404	10		
1C16	7404	10		
1C17	7404	10		
1C18	7404	10		
1C19	7404	10		
1C20	7404	10		
1C21	7404	10		
1C22	7404	10		
1C23	7404	10		
1C24	7404	10		
1C25	7404	10		
1C26	7404	10		
1C27	7404	10		
1C28	7404	10		
1C29	7404	10		
1C30	7404	10		
1C31	7404	10		
1C32	7404	10		
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1C34	7404	10		
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1C36	7404	10		
1C37	7404	10		
1C38	7404	10		
1C39	7404	10		
1C40	7404	10		
1C41	7404	10		
1C42	7404	10		
1C43	7404	10		
1C44	7404	10		
1C45	7404	10		
1C46	7404	10		
1C47	7404	10		
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1C49	7404	10		
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1C86	7404	10		
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1C89	7404	10		
1C90	7404	10		
1C91	7404	10		
1C92	7404	10		
1C93	7404	10		
1C94	7404	10		
1C95	7404	10		
1C96	7404	10		
1C97	7404	10		
1C98	7404	10		
1C99	7404	10		
1C100	7404	10		

NOTE: REEL 1 MOTOR WIRES HAVE BLUE SLEEVE
 REEL 2 MOTOR WIRES HAVE GREY SLEEVE
 REEL 3 MOTOR WIRES HAVE PINK SLEEVE

REVISIONS	
NO.	DESCRIPTION

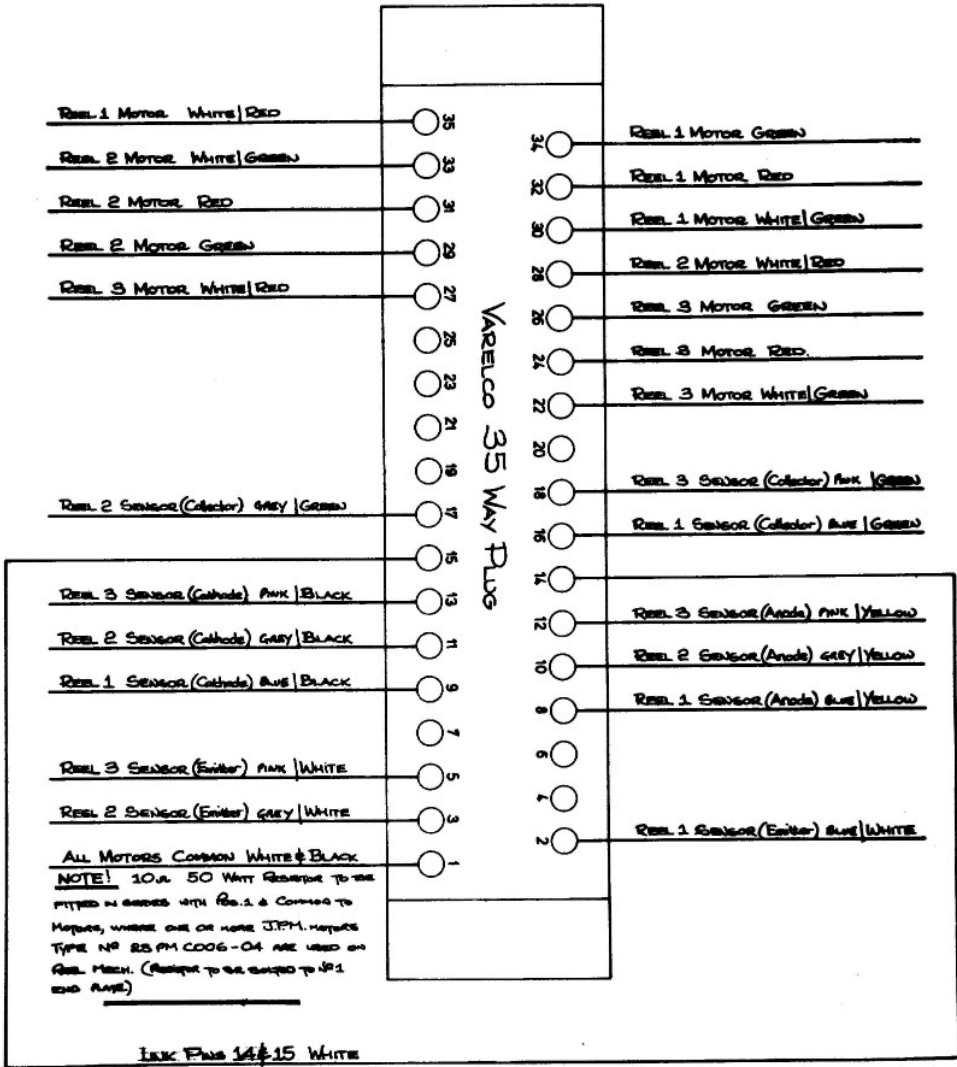
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TITLE: WIRING FOR PLUS 1
 ADV 3 REEL MACHINE
 FINISH

DRAWING No. M0067
 DRAWN: [Signature]
 APPROVED: [Signature]
 DATE: 15.12.76
 SCALE: 1

DO NOT SCALE DRAWING



INTEGRATED CIRCUIT LIST

74393	Dual 4-bit Binary Ripple Counter with individual reset.
TMS 4042-2	256 x 4-bit Static Random Access Memory
14538	CMos Dual Retriggerable Monostable.
TMS 9980	NMos 16-bit Microprocessor with Multiplexed 8-bit Data Buss and 14-bit Address Buss.
NE 566	Voltage Controlled Oscillator.
7414	Hex Inverter with Hysteresis.
7474	Dual positive Edge-Triggered 'D' Type Bistable with Individual Clock, Data, Set and Reset Inputs.
74138	High Speed 1 of 8 Decoder/Demultiplexer.
74148	8 Input Priority Encoder with active 'Low' Inputs.
74244	Octal High Current Non-Inverting Buffer/Driver.
74251	8 Input Digital Multiplexer with True and Complimentary Outputs.
74259	8-bit Addressable Latch with Common Data Input.

Note! Further information may be obtained by reference to the relevant Manufacturers Data Sheets.

Glossary of Terms

Nudge Double Up Deluxe

Address - A number that designates a specific location in a storage or memory device.

buffer - An isolating circuit used to avoid reaction of a driven circuit on its driver circuit.

Bus - One or more conductors used to transmit logic or power.

C.P.U. - Central Processor Unit. The heart of a computer system contains main storage, and arithmetic units and thus controls instruction processing.

Clock - A device that generates periodic signals used for synchronization.

Chip - Often used in reference to an integrated circuit. A piece of silicon or similar material containing an integrated circuit.

Flip-Flop (storage element) - A circuit having two stable states and can change from one state to another by application of a control signal and will remain in that state after removal of signal.

Flow-Chart - A map of a solution to a problem, symbols are used to represent operations, data, flow, etc.

Gate - A device having one output channel and one or more input channels where the output channel state is determined by the input channel states.

Hardware - The electronics and circuitry of any computer system which are "hard" i.e. physical objects.

Interrupt - To stop a process in such a way that it can be resumed.

Interface - A shared boundary, i.e. a hardware component linking two circuits or devices.

Multiplex - Simultaneous transmission of two or more messages on a single channel.

Program - A sequence of instructions that controls a computer or microprocessor routine or behaviour.

Port - An input or output route for transferring data to or from a system.

P.R.O.M. - Programmable read only memory. A ROM into which information can be written by means of special equipment.

R.A.M. - Random Access Memory. A memory device that can be written to and read from under programme control.

R.O.M. - Read Only Memory. A memory device that can read only and contains information that is fixed.

E.P.R.O.M. - Erasable P.R.O.M.

E.A.R.O.M. - Electricity Alterable Read Only Memory.

S.R.U. - Stepper Motor Reel Unit.

T.T.L. - Transistor Transistor coupled logic circuits.

Warranty

Seller warrants that its Stepper Reel Unit system and printed circuit boards and parts thereon are free from defects in material and workmanship under normal use and service for a period of ninety (90) days from date of shipment. None of the Seller's other products or parts thereof are warranted.

If the products described in this manual fail to conform to this warranty, Seller's sole liability shall be, at its option, to repair, replace or credit Buyer's account for such products which are returned to Seller during said warranty period, provided:

- a) Seller is promptly notified in writing upon discovery by Buyer that said products are defective
- b) Such products are returned prepaid to Seller's plant and
- c) Seller's examination of said products discloses to Seller's satisfaction that such alleged defects existed and were not caused by accident, misuse, neglect, alteration, improper repair installation or improper testing.
- d) Only seller's recommended or approved electronic components are used as service replacements.

In no event shall Seller be liable for loss of profits, loss of use, incidental or consequential damages.

Except for any express warranty set forth in a written contract between Seller and Buyer which contract supercedes the terms of this order, this warranty is expressed in lieu of all other warranties expressed or implied including the implied warranties of merchantability and fitness for a particular purpose and of all other obligations or liabilities on the Seller's part and it neither assumes nor authorizes any other person to assume for the Seller any other liabilities in connection with the sale of products under this order.

