Mitek EDEN CT. LEISURE.

ACE SYSTEM 'ONE' COMPUTER

PERCENTAGE SETTINGS

This machine has 8 selectable settings between 72% and 86% in 2% steps. These option switches are located under the plastic cover and can be accessed by removing the re-usable plastic rivets.

SWITCH 1	SWITCH 2	SWITCH 3	%
OFF	OFF	OFF	72
ON	OFF	OFF	74
OFF	ON	OFF	76
ON	ON	OFF	78
OFF	OFF	ON	80
ON	OFF	ON	82
OFF	ON	ON	84
ON	ON	ON	86

These switches are located on switch Block 'A'.

To prevent the unauthorised changing of the machine percentage, a link has been provided which when removed will disable these switches; the machine will however remember the last target percentage set with the link connected.

CHANGING THE TARGET PERCENTAGE

Switch OFF the machine power, link the Orange/Blue and Red/Grey wires of the * terminal block situated at the bottom right hand side of the machine.

Set the switches to the desired position.

Switch ON and wait for the board to reset; the L.E.D. will flash the new target percentage.

Remove the link, switch OFF and ON.

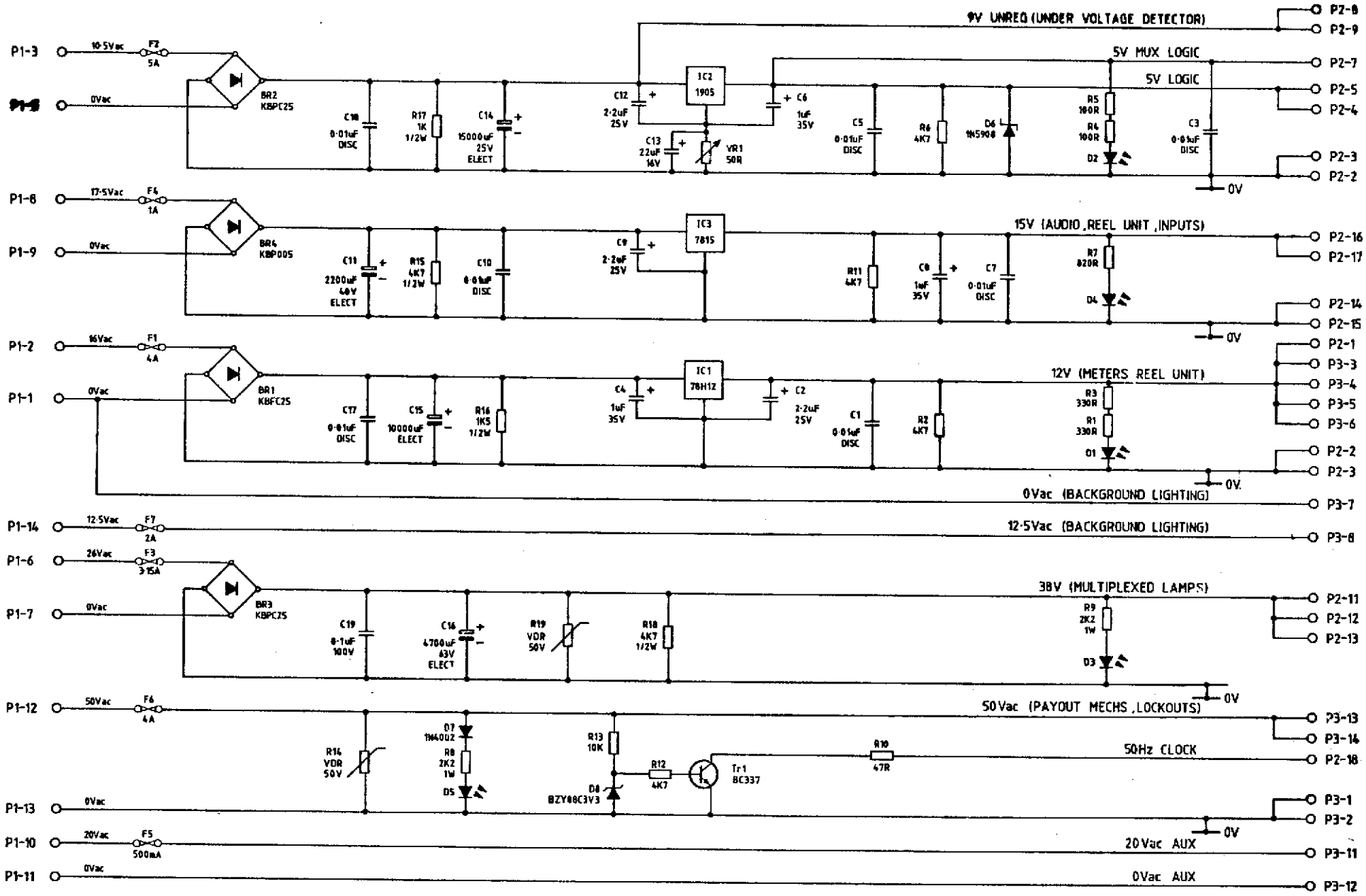
The machine is now ready for play.

CLEARING RAM

If the System One Board is to be placed in a different model, then it is essentia that the board is Ram Cleared. This is achieved as follows:-

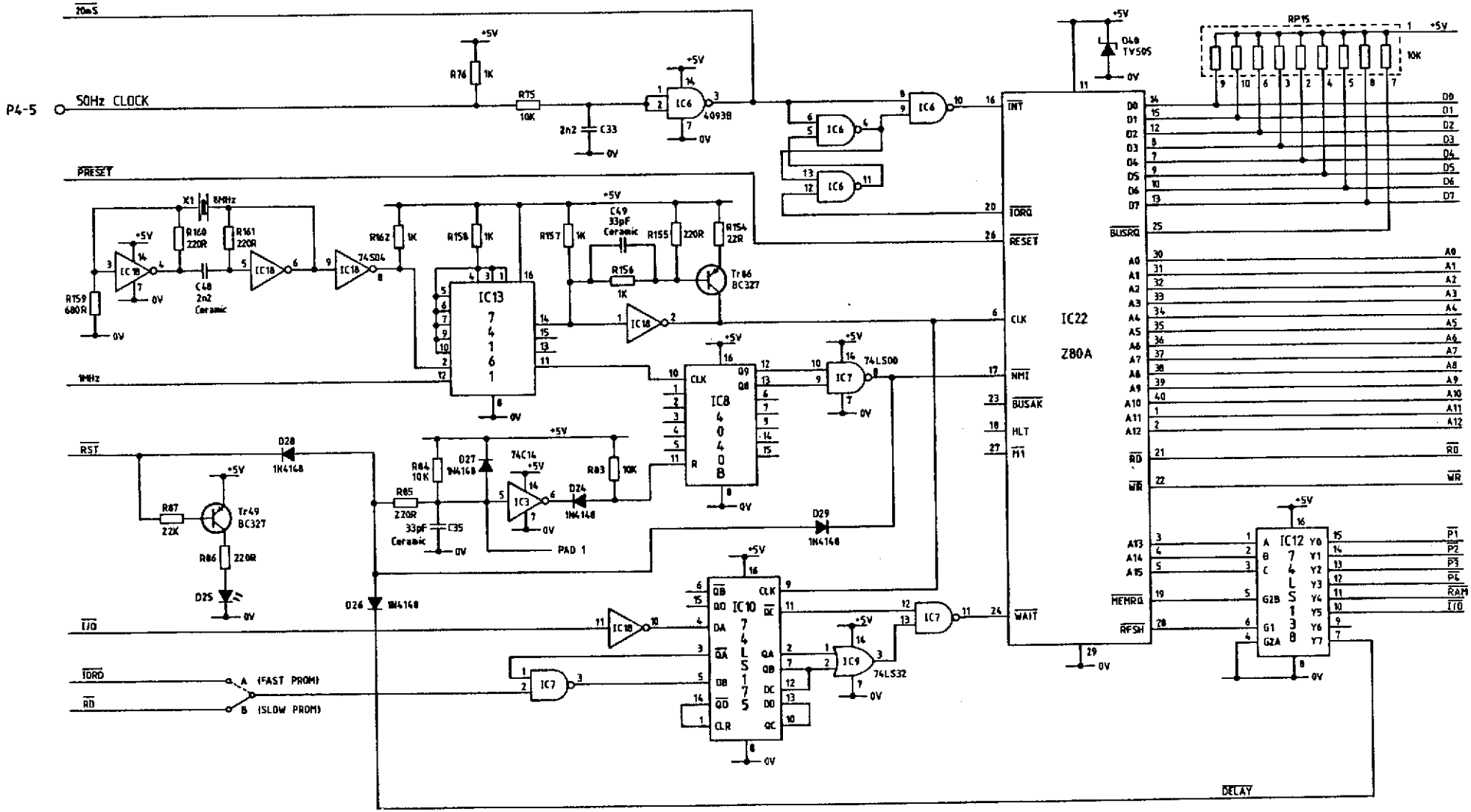
1. Switch Off machine.
2. Remove existing Eproms and insert update (if applicable).
3. Link all three wires of terminal block. *
4. Power up machine for approx. 10 seconds. Check "CLr" displayed on LED's
5. Switch Off machine.
6. Remove links.
7. Power up machine and percentage setting will display on L.E.D.'s.
8. Switching Off and On again will initialize machine which will now be ready for play.

CONTENTS



SYSTEM ONE POWER SUPPLY

AG0189



SYSTEM ONE PROCESSOR

SHEET 1

2

SYSTEM ONE PROCESSOR

Sheet 1

Clock

System One is controlled by a Z80A running at 4MHz. The clock for the processor is derived from an 8MHz crystal and 2 gates of I.C.18. This 8MHz frequency is then divided down by I.C.13 (74161 counter/divider) to provide 4MHz (processor), 1MHz (Sound generator) and 500KHz (Interrupt generator). The 4MHz processor clock is squared up by Tr86 and a gate of I.C.18

Bus Speed

The computer allows both fast access (200n sec) and slow access (450n Sec) E.P.R.O.Ms to be used. The E.P.R.O.M. speed (which determines the operating speed of the system) is selected by the link found adjacent to the crystal at the bottom of the board. The link will normally be tracked into the slow position (B). The actual bus speed is determined by I.C. 10 (74LS175 quad flip flop) which activates the WAIT line input to the Z80A, effectively holding the bus. The wait generator is formed by I.C.18, I.C.10 I.C.9 and I.C.7, this generator also automatically slows the bus when accessing Input/Output devices.

Interrupts

Two Interrupts are present (1) INT which occurs at mains zero cross every 20m Sec and (2) NMI which occurs every 768u Sec. The 20m Sec interrupt uses a 50Hz square wave derived from the power supply to drive a logic latching system using I.C.6 (4093B)

(1) INT When this interrupt is activated by the system, pin 16 of I.C.22 will normally be high, although a very short pulse will be seen going low every 20m Sec. If the interrupt is not enabled by the system (e.g. in Reset) a 50Hz square wave will be seen on pin 16. This interrupt is used to ensure that meters and payout solenoids are turned on or off as the mains voltage crosses zero.

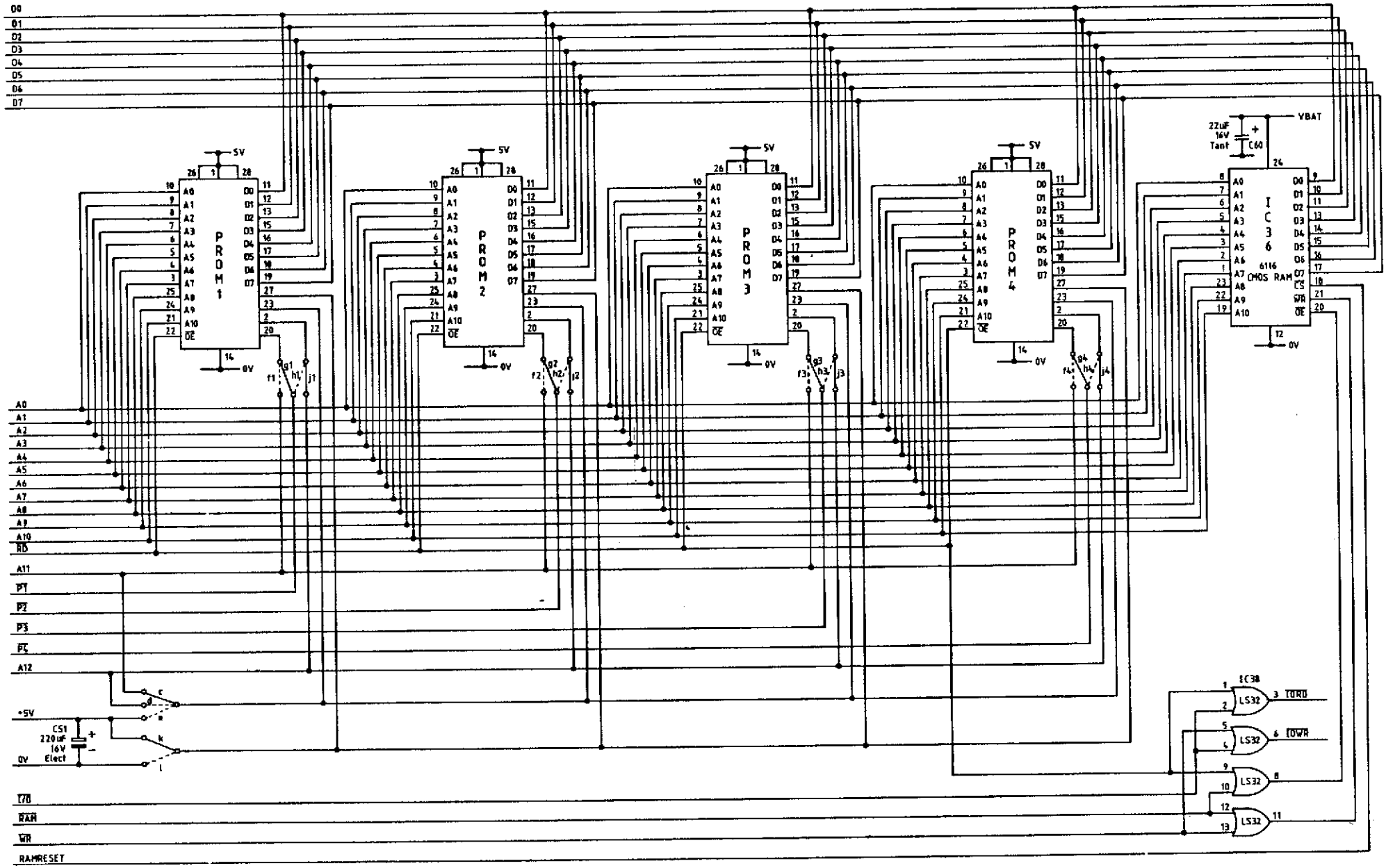
(2) NMI This interrupt is used to control the reel unit and multiplexer. The 500KHz clock is further divided by I.C.8 (4040 counter), the correct count is detected by a NAND gate (I.C.7) which initiates an NMI signal and resets the counter via D29 and the associated circuitry. Under certain circumstances the software of the system will wish to prevent an NMI from occurring; this can be obtained by writing a word to I.C.12 and resetting the count via D26 thus holding off NMI.

Address Bus

The address bus is decoded by I.C.12 (74LS138) in 8K byte blocks which are used to control the program memory - RAM - Input/Output and the NMI hold off.

Reset

The processor is reset by various events taking place (see sheet 7).



SYSTEM ONE PROGRAM MEMORY

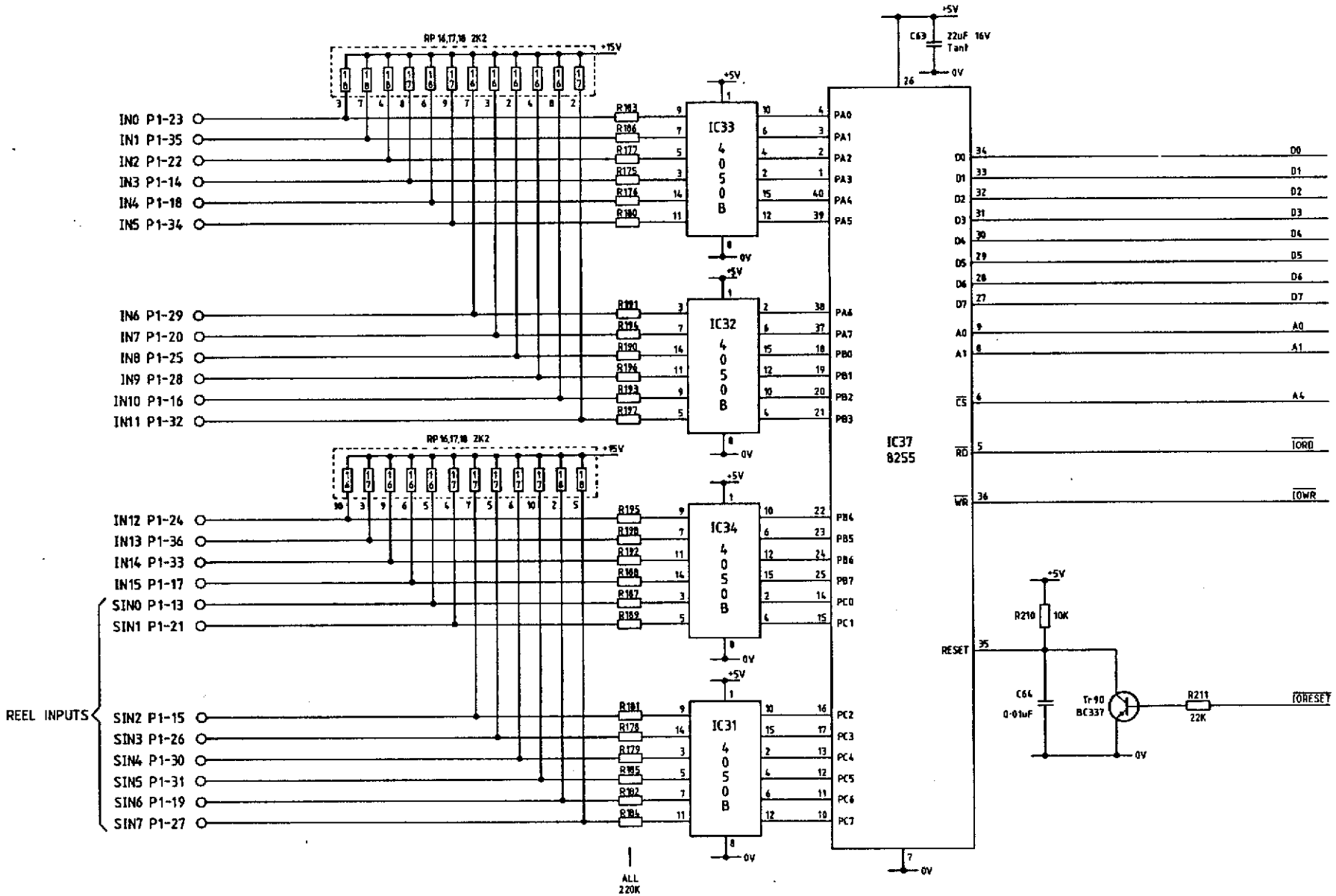
SHEET 2

PROGRAM MEMORY

Sheet 2

System One will support up to 32K bytes of memory in four 2764 E.P.R.O.Ms. Any combination of 2764 and 2732 E.P.R.O.Ms may be used, but care must be taken to insert 2732 types in the lower part of the socket as shown by the illustration on the logic board. A 2K byte battery back-up memory is fitted for software metering and important program data. This memory is deselected (RAM RESET) as soon as the power fails to retain data integrity.

The RAM RESET signal is generated at the same time as the processor reset signal (see sheet 7). The Z80 bus control signals are decoded by I.C.38 (74L532) and are used to control the RAM access and I/O.



SYSTEM ONE INPUTS

SHEET 3

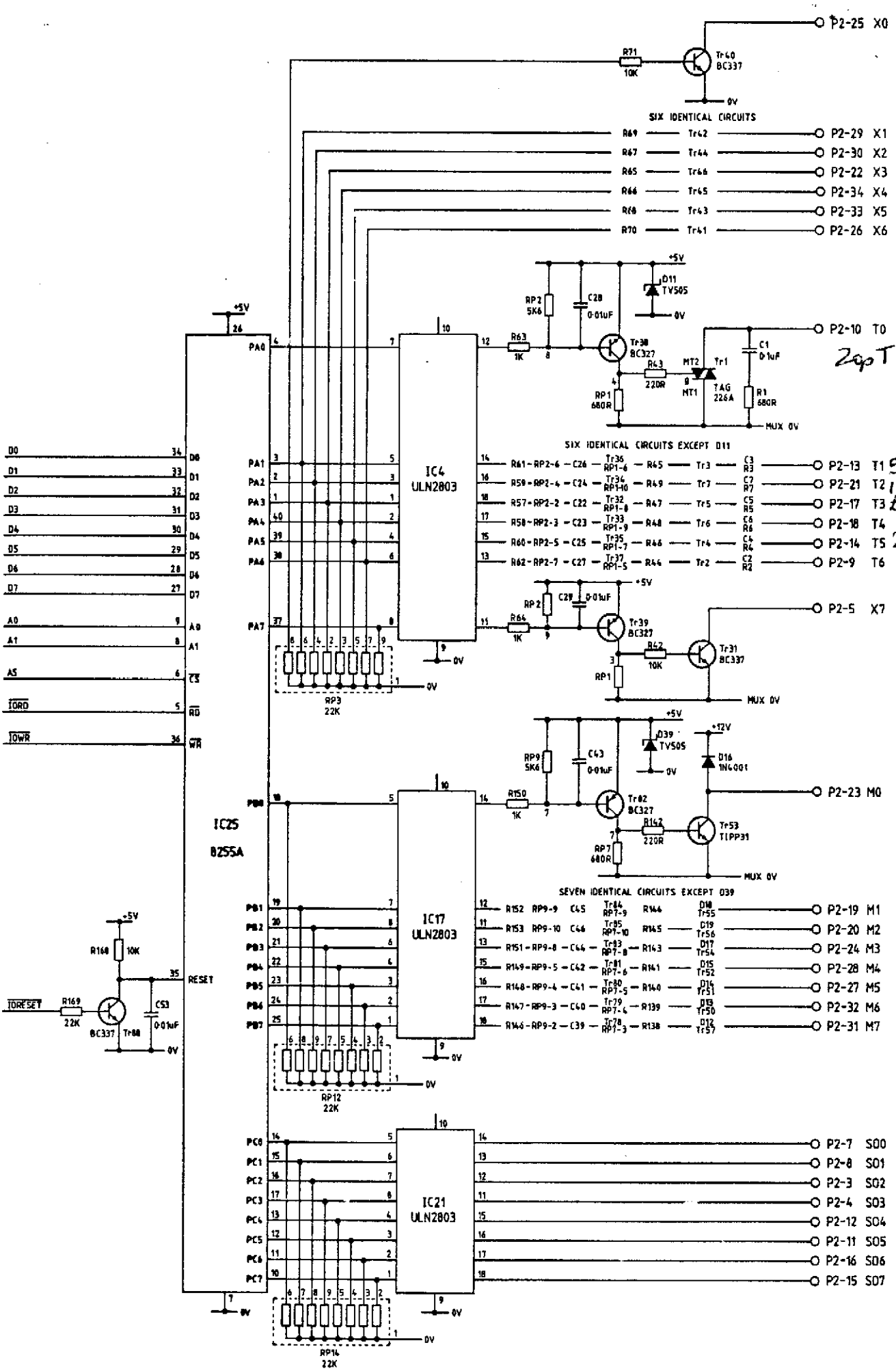
INPUTS

Sheet 3

An 8255A (I.C.3) programmable I/O device is set up to provide 24 input channels. Eight of these inputs are dedicated to the reel unit (SIN0-SIN7), the remaining 16 being used for general switches and coin inputs. Some of these inputs will be used with the switch strobes provided by the multiplexer circuit.

The inputs are pulled up to 15 volt logic level to increase their noise immunity. Each of the inputs are pulled up through a 2K2 resistor and may thus be switched by an open collector darlington transistor. The 15 volt level is converted to the normal 5v logic by I.C.31-34 (4050 level shifter/ buffer). A 220K series resistor protects the level shifter input stages.

The transistor Tr90 and associated components are used to invert the reset signal to compliment the 8255A which is high to reset.



SYSTEM ONE MAIN OUTPUTS

MAIN OUTPUTS

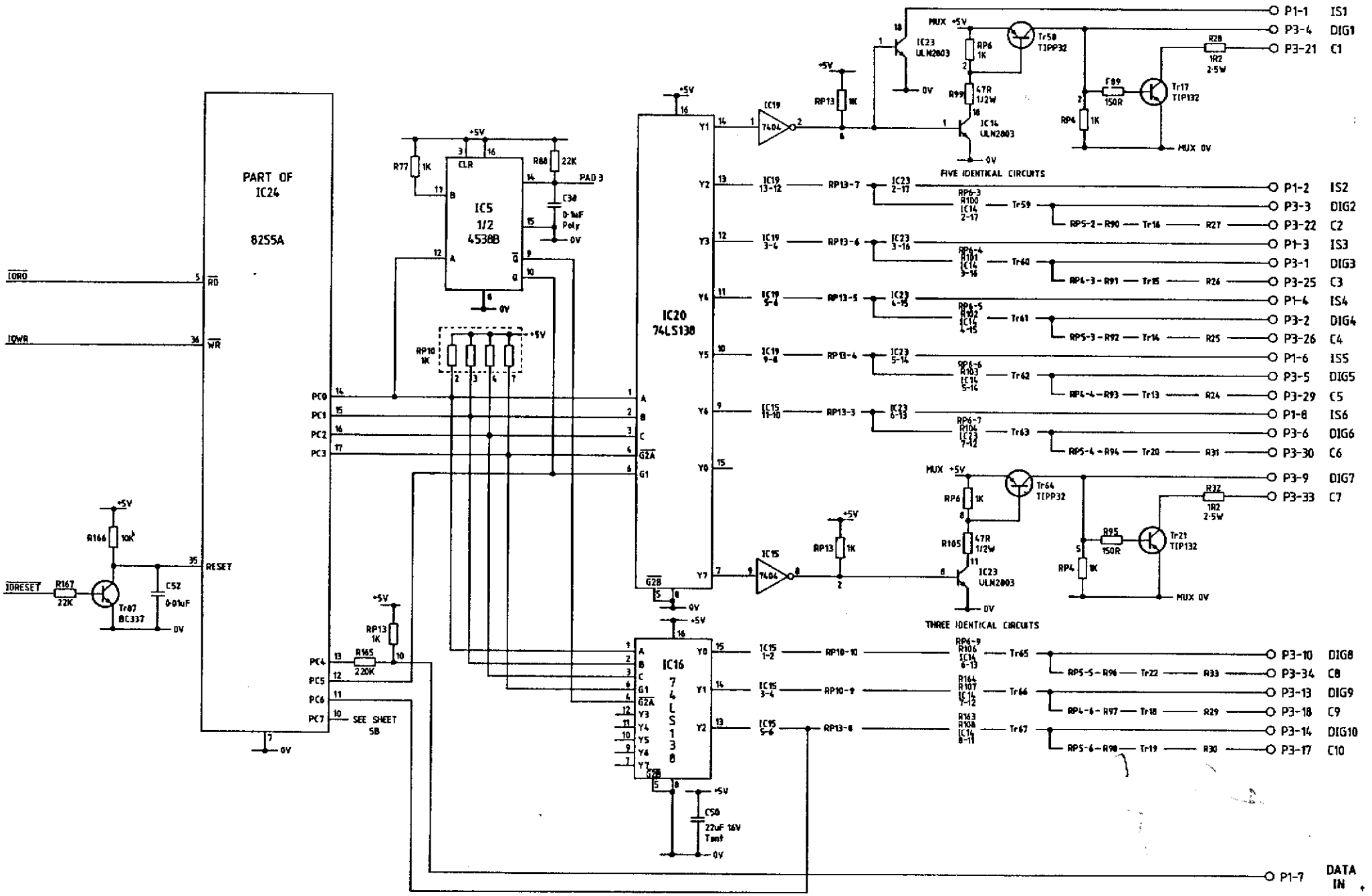
Sheet 4

System One has 24 Outputs for specific control purposes. These are split into 8 stepper motor control drives, 8 meter drives and 8 transistor/ triac drives. The control signal for these outputs are generated from the microprocessor via an 8255A programmable I/O device set up as an output controller.

System One is actually fitted with 7 triacs (TO-T6) which are used for driving 50 volt solenoids such as payout mechanisms or lockouts. These are driven from the 8255A through a ULN2803 darlington driver (I.C.4) and then through a BC327 which drives the gate of the triac. Each of the triac outputs is fitted with a snubber network to minimise noise and transients caused by switching inductive loads. To ensure total flexibility of the system each of the triac ouputs are fed to an open collector transistor Tr40-Tr46. These are effectively in parallel with the triacs and may not be controlled separately; these outputs are termed auxiliaries and are identified as XO-X7; these will be used to control electronic coin mechs etc.

The eight meter outputs are exactly the same in structure to the triac outputs but a transistor replaces the triac output stage. In addition diodes are fitted on board to suppress any back e.m.f.

The stepper motor drives are driven directly from I.C.17(ULN2803) an eight package open collector darlington transistor array.



SYSTEM ONE MULTIPLEXER COLUMN AND L.E.D. DIGIT DRIVE

SHEET 5A

MULTIPLEXER

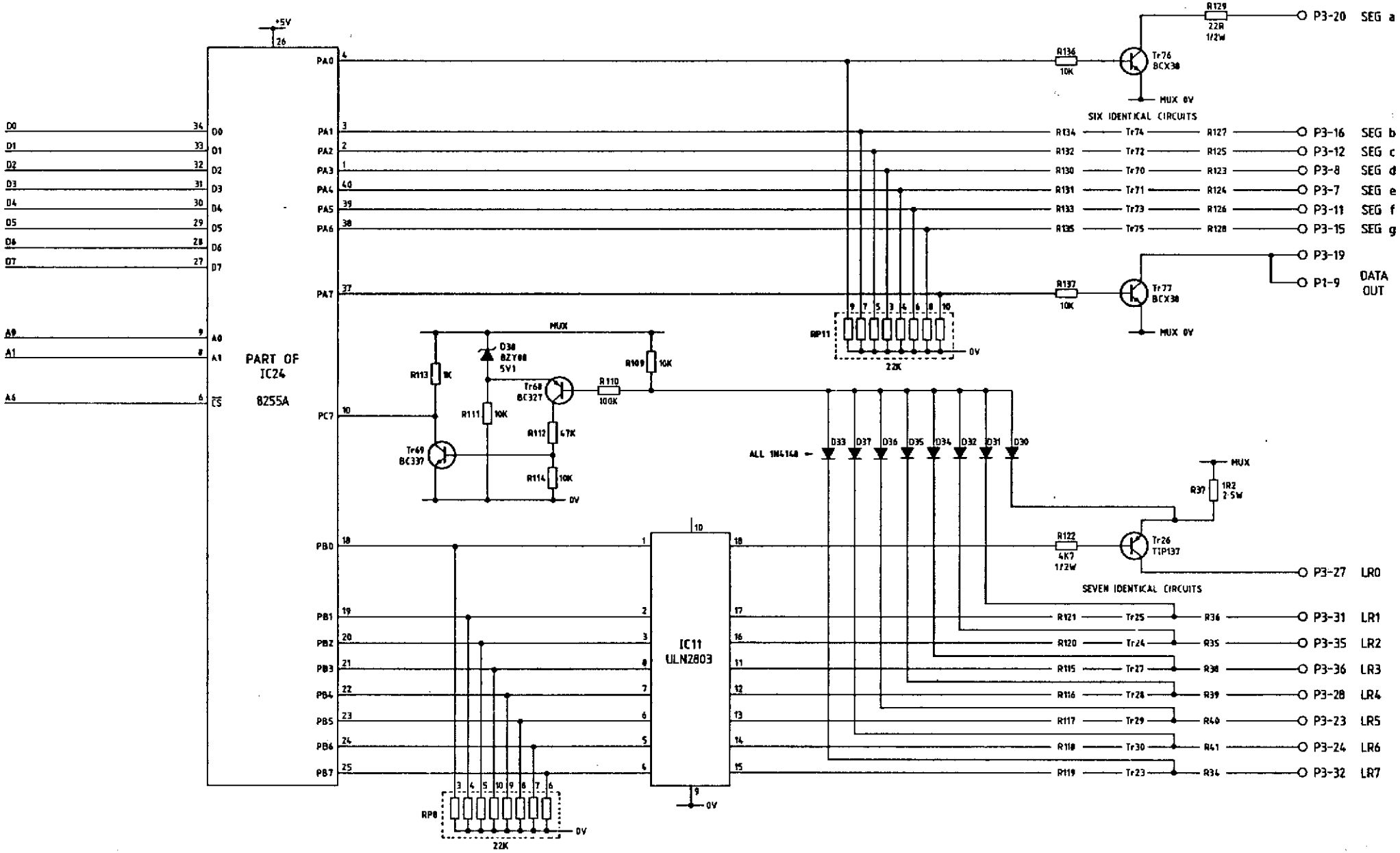
Sheet 5a

WARNING: The multiplexer circuit makes use of high voltages (40V) and care must be taken to avoid damage to this part of the circuit.

The multiplexer system can control up to 80 lamps and 10 seven segment L.E.D. displays. It does this by turning on a single column or display for a short time and then moving onto the next column or display. The system uses 10 columns which are controlled by IC24 (8255A) ports PC0 - PC3. These lines are decoded by IC20 and IC16 (74LS138). The individual drives are inverted by IC19 and IC15 (7404) so that they are active high and directly control the drive circuit.

The first 6 column drives are split into 3 paths. One of the paths is through IC23 (ULN2803) an open collector darlington which is used as an input strobe (IS1 to IS6). The other drive path turns on the L.E.D. digit via a TIPP32 transistor. Some of the display drive current is diverted to feed a power transistor (TIP32) which turns on a column of lamps. The 1R2 resistor limits the current surges to a safe level. The display drives are identified as DIG1 to DIG10 and the column drives by C1 to C10.

Should the processor fail to update this part of the circuit and move on to the next column, IC5 (4538B monostable) detects this failure and turns off the column drives. The monostable will automatically reset as soon as the control is re-established.

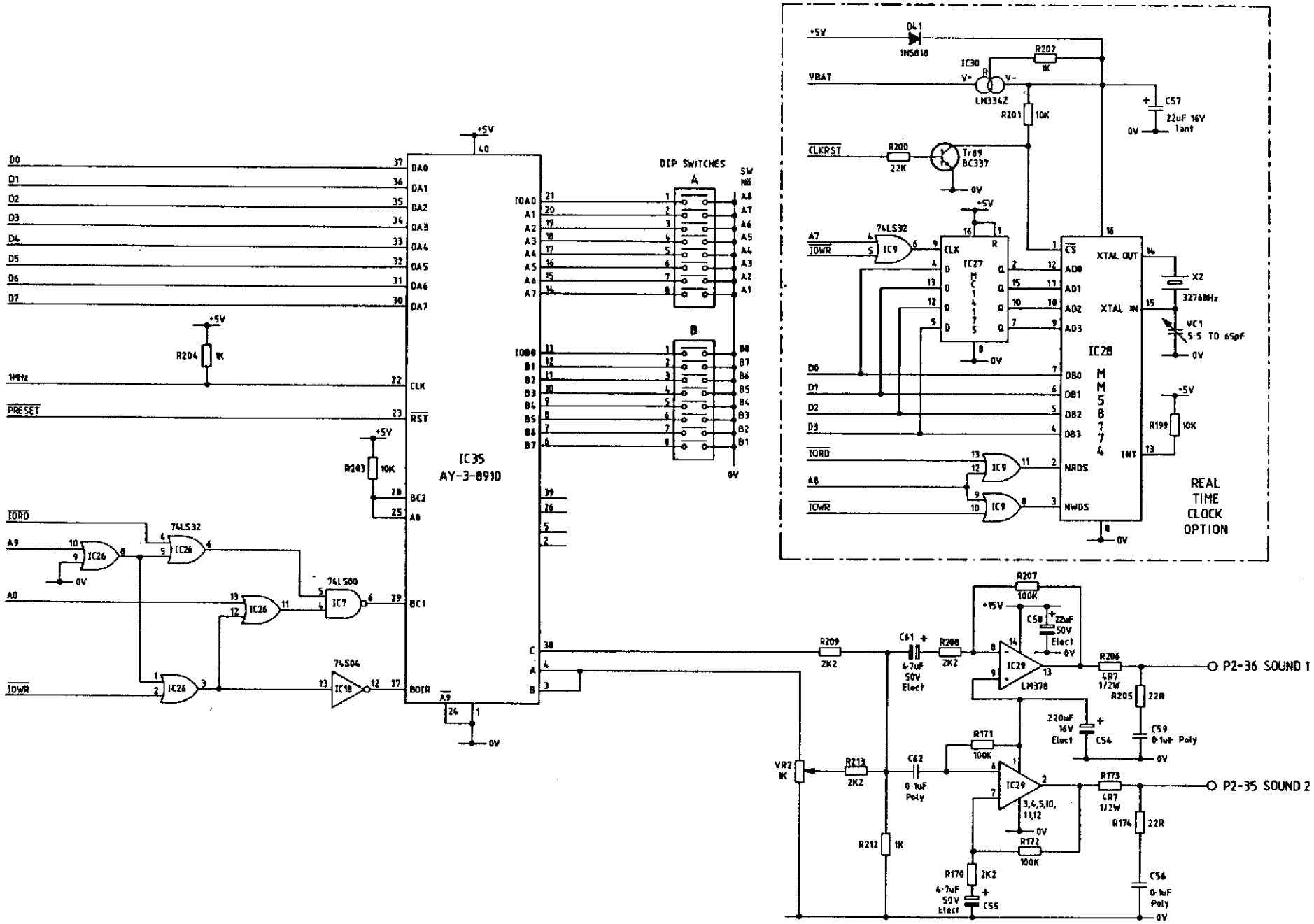


SYSTEM ONE MULTIPLEXER ROW AND L.E.D. SEGMENT DRIVE

SHEET 5B

The individual segments of the L.E.D. are driven directly from the 8255A via BCX38 transistors. The processor arranges for the correct segment information to be present on these outputs as the digit drive is turned on. Port PA7 of the 8255A is used for the transmission of data either by RS232 format or infra-red transmission.

The pattern of lamps to be displayed in each column (LR0-LR7) is determined by the processor which ouputs this information via the 8255A (PB0-PB7). The drive is via I.C.11 (ULN2803) and a TIP137 power transistor. Should the lamp being driven fail so that it presents a short circuit, the voltage developed across the 1R2 resistor (R34-R41) is used to turn Tr68 on and its associated circuitry will pull PC7 low. This condition will be recognised by the software which will turn the drive off to the offending lamp. Once a lamp has been turned off in this way it is necessary to rest the system, usually by switching the mains supply off for a short period.



SYSTEM ONE SOUND AND REAL TIME CLOCK

SHEET 6

SOUND AND REAL TIME CLOCK

Sheet 6

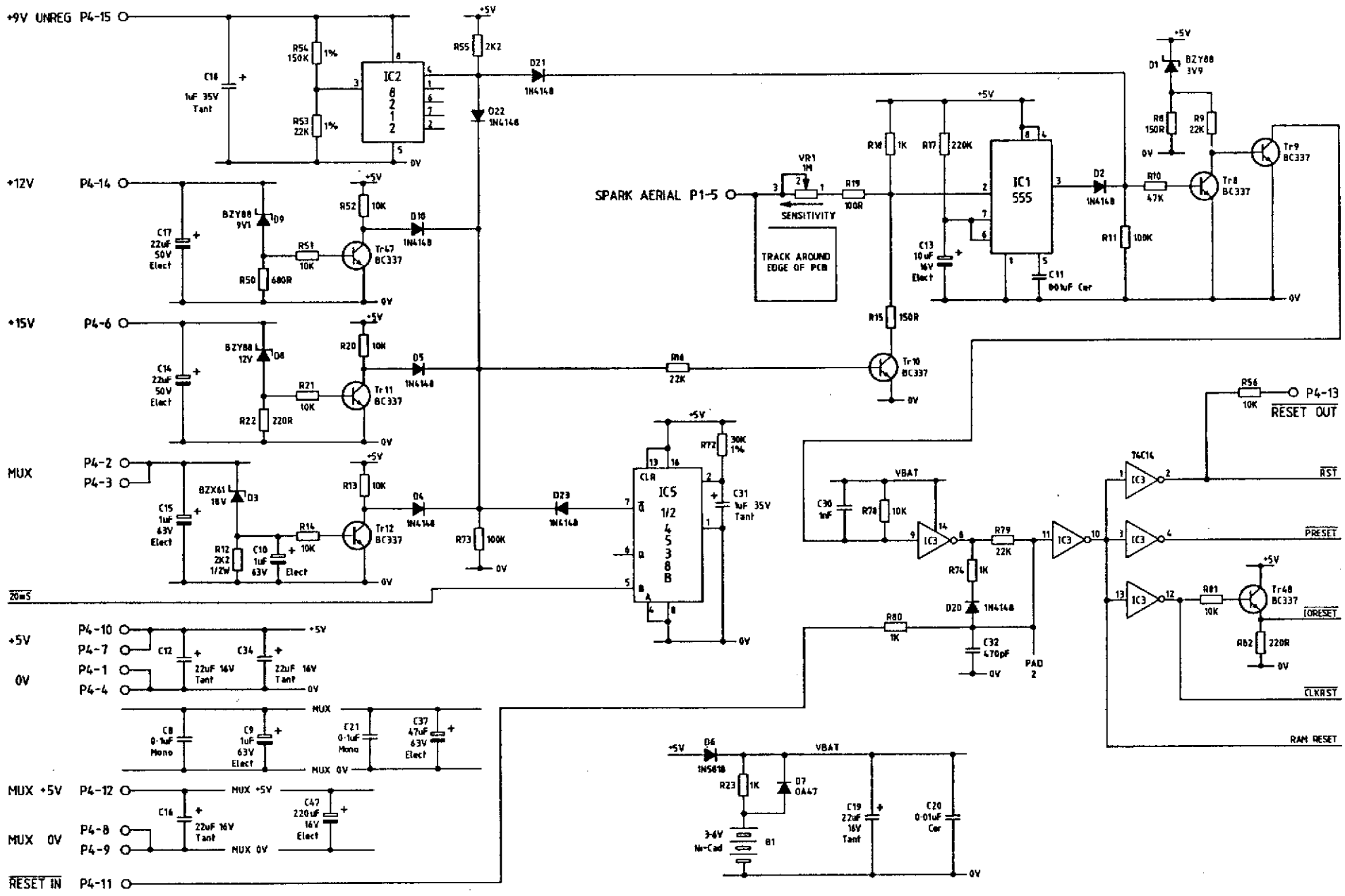
Sound

A single sound generator with I/O capabilities IC35 (AY-3-8910) is used. The logic gates of IC26, IC7, and IC18 are used to adjust the Z80 bus control signals to those used by the sound generator. The sound generator produces three separate outputs, one of these channels (C) is used for machine alarm conditions and is not affected by the volume control. The other two sound channels (A & B) are added together and then connected via a volume control and mixed with channel C. The resulting audio is then amplified by IC29(LM378 bridge amplifier). This is then fed to a 32-35 ohm speaker, a lower speaker impedance must not be used.

Real Time Clock Option

The real time clock is an option and will only be fitted on some boards. The clock is controlled using 4 bits of the processor data bus, the four data lines address the internal registers of the clock via IC27 (MC14175). The clock time keeping is controlled by a 32 KHz crystal with a capacitive trimmer. The trimmer should be adjusted to give exactly 32.768 KHz.

In the event of the machine power being switched off the clock I.C. is fed from the battery via IC30 (LM334Z) which defines the current available to retain time keeping.



SYSTEM ONE RESET AND BATTERY SUPPLY

SHEET 7

RESET

Sheet 7

Each of the supply voltages onto the logic board is monitored and if any one of them fails the system will be held in reset. The 9 volt unregulated supply is taken before the 5 volt logic regulator (see power supply circuit diagram) a falling voltage at this point will indicate imminent failure of the 5 volt logic supplies. The under voltage condition of the 9 volt supply is detected by I.C.2 (8212) and set by R53 and R54. When an under voltage condition occurs, pin 3 of I.C.2 will go high, allowing current to flow through D21 and D22.

The three other voltage detectors use zener diodes to detect the voltage levels. If the voltage being monitored falls the relevent transistor will turn off allowing current to flow in Tr10.

The missing mains eycle detector is built around IC.5 (4538 monostable), it is continuously triggered from the 50Hz (20m Sec) square wave. If this square wave is not present pin 7 of I.C.5 will rise which, again, will cause current to flow into Tr10.

If any sections of the circuit cause current to flow into Tr10, Tr10 will then turn on and trigger a 4 second reset via I.C.1 (555 Timer). This will switch Tr8 on and Tr9 off so that pin 9 of I.C.3 (74C14) is pulled high. This also occurs if the 5 volt supply fails, when D1 will stop conducting and remove the base drive to Tr9. D21 is included to act as a forward loop for extra security.

I.C.3 (74C14) acts as a buffer for the various reset signals and provides some extra timing to ensure a minimum reset time. The supply to this I.C. is fed from the battery supply to ensure that pin 9 is held high when the machine power is turned off.

To ensure the computer is not influenced or corrupted by fluorescent lighting or static voltages, an aerial input is used, normally a single wire is incorporated in the machine loom and connected to this pin. If a spark is present, I.C.1 will detect this and trigger a 4 second reset, the sensitivity of this aerial input can be adjusted by VR1.

Reset Out and Reset In will not normally be used.

PARTS LIST

MACHINE SYSTEM ONE POWER SUPPLY SHEET 1 of 2

PART No	ITEM	DESCRIPTION	QTY
AB0190	10	IC1 12v Regulator 78H12	1
AB0122	7	IC2 5v Regulator LA51905	1
AB0027	3	IC3 15v Regulator 7815	1
AB0158	9	BR1-BR3 Bridge Rectifier	3
AB0010	2	BR4 Bridge Rectifier KBP005	1
AB0007	1	Tr1 Transistor BC337	1
AB0118	6	D1-D5 Red L.E.D.	5
AB0093	5	D6 Suppressor Diode 1N5908	1
AB0199	11	D7 Diode 1N4003	1
AB0055	4	D8 Zener Diode BZY88C3V3	1
AC0003	16	R1, R3 Resistor 330R ¼w	2
AC0032	20	R2, R6, R11, R12 Resistor 4K7 ¼w	4
AC0038	21	R4, R5 Resistor 100R ¼w	2
AC0022	19	R7 Resistor 820R ¼w	1
AC0226	26	R8, R9 Resistor 2K2 1w	2
AC0013	18	R10 Resistor 47R ¼w	1
AC0007	17	R13 Resistor 10K ¼w	1
AB0153	8	R14, R19 50 V d.r.	2
AC0175	23	R15, R18 Resistor 4K7 ½w	2
AC0083	22	R16 Resistor 1K5 ½w	1
AC0224	24	R17 Resistor 1K ½w	1
AD0000	31	C1, C3, C5, C7, C10, C17, C18 Capacitor 0.01uF Ceramic	7
AD0025	32	C2, C9, C12 Capacitor 2.2uF 25v Tant	3
AD0036	33	C4, C6, C8 Capacitor 1uF 35v Tant	3
AD0074	35	C11 Capacitor 2200uF 40v Elect	1
AD0054	34	C13 Capacitor 22uF 16v Tant	1
AD0151	37	C14 Capacitor 15000uF 25v Elect	1
AD0152	38	C15 Capacitor 10000uF 40v Elect	1

PARTS LIST

MACHINE SYSTEM ONE POWER SUPPLY

PART No	ITEM	DESCRIPTION	QTY
AD0169	39	Capacitor 4700uF 63v Elect	1
AG0189	46	Printed Circuit Board	1
AJ0020	51	Heatsink TV40	1
AJ0029	52	Heatsink SK88	2
AJ0025	53	Heatsink (Custom)	1
EC2852		Power Supply Complete	

PARTS LIST

MACHINE SYSTEM ONE SHEET 1

PART No	ITEM	DESCRIPTION	QTY
AA0072	7	IC 1 555 Timer	1
AA0028	2	IC 2 8212 Voltage Detector	1
AA0094	10	IC 3 74C14 Hex Schmitt Trigger	1
AA0229	17	IC 4, 11, 14, 17, 21, 23 ULN 2803	6
AA0291	14	IC 5 CD4538B Dual Monostable	1
AA0046	5	IC 6 CD4093B Schmitt Trigger	1
AA0045	4	IC 7 74L500 Quad NAND	1
AA0230	18	IC 8 CD4040B Counter	1
AA0194	15	IC 9, 26, 38, 74L532 Quad OR	3
AA0137	12	IC 10 74LS175 Hex Flip Flop	1
AA0049	6	IC12, 16, 20, 74L5138 Decoder	3
AA0102	11	IC 13 74161 Counter	1
AA0090	9	IC 15, 19 7404 Hex Inverter	2
AA0080	8	IC 18 74504 Hex Inverter	1
AA0231	19	IC 22 Z80A Processor	1
AA0159	13	IC 24, 25, 37 8255A I/O Device	3
AA0232	20	IC 29 LM378 Audio Amp	1
AA0001	1	IC 31, 32, 33, 34 CD4050B Buffer/Shifter	4
AA0233	21	IC 35 AY-3-8910 Sound Generator	1
AA0196	16	IC 36 6116 LP4 CMOS RAM	1
AB0068	37	Tr1-7 Triac TAG 226A	7
AB0007	31	Tr8-12,31,40-48,68,69,87,88,90 Transistor BC337	19
AB0172	42	Tr 13-22 Transistor TIP 132	10
AB0174	44	Tr 23-30 Transistor TIP 137	8
AB0180	46	Tr 32-39,49,68,78-86 Transistor BC327	19
AB0175	45	Tr 50-57 Transistor TIPP31	8
AB0173	43	Tr 58-67 Transistor TIPP32	10
AB0191	49	Tr 70-77 Transistor BCX38C	8

PARTS LIST

MACHINE SYSTEM ONE SHEET 2

PART No	ITEM	DESCRIPTION	QTY
AB0169	40	D1 Zener Diode BZY88C3V9	1
AB0021	33	D2,4,5,10,20-24,26-37 Diode IN4148	21
AB0182	48	D3 Zener Diode BZX 61C18V	1
AB0049	36	D6 Diode IN5818	1
AB0029	34	D7 Diode OA47	1
AB0181	47	D8 Zener Diode BZY88C12V	1
AB0171	41	D9 Zener Diode BZY88C9V1	1
AB0150	39	D11,D39,D40 Diode TV505	3
AB0199	35	D12-19 Diode 1N4003	8
AB0118	38	D25 Red L.E.D.	1
AB0012	32	D38 Zener Diode BZY88C 5V1	1
AC0037	68	R1-7,R50,R159 Resistor 680R ¼w	9
AC0001	61	R8,R15,R89 -98 Resistor 150R ¼w	12
AC0091	73	R9,R16,R79,R87,R88, R167,R169,R211 Resistor 22K ¼W	8
AC0058	70	R10,R112 Resistor 47K ¼w	2
AC0009	64	R11,R73,R110,R171,R172,R207 Resistor 100K ¼w	6
AC0141	76	R12 Resistor 2K2 ¼w	1
AC0007	63	R13,R14,R20,R21,R42,R51,R52,R56,R65-71,R75,R78,R81,R83	
		R84,R109,R111,R114,R130-137,R166,R168,R203,R210,	
		Resistor 10K ¼w	35
AC0043	69	R17,R165,R175-198 Resistor 220K ¼w	26
AC0002	62	R18,R23,R57-64,R74,R76,R77,R80,R113,R146-153,R156-158	
		R162-164,R204,R212 Resistor 1K ¼w	31
AC0038	95	R19 Resistor 100R ¼w	1
AC0020	67	R22,R43-49,R82,R85,R86,R138-145,R155,R160,R161,	
		Resistor 220R ¼w	22
AC0173	78	R24-41 Resistor 1R2 2.5w	18

PARTS LIST

MACHINE SYSTEM ONE SHEET 3

PART NO	ITEM	DESCRIPTION	QTY
AC0078	72	R53 Resistor 22K 1%	1
AC0190	91	R54 Resistor 150K 1%	1
AC0014	65	R55,R170,R208,R209,R213 Resistor 2K2 ¼w	5
AC0245	94	R72 Resistor 30K 1%	1
AC0174	79	R99-108 Resistor 47R½w	10
AC0175	80	R115-122 Resistor 4K7 ½w	8
AC0146	77	R123-129 Resistor 22R ½w	7
AC0061	71	R154,R174,R205 Resistor 22R ¼w	3
AC0017	66	R173,R206 Resistor 4R7 ½w	2
AC0177	81	RP1,RP7 Resistor Pack 680R 1.25w	2
AC0178	82	RP2, RP9 Resistor Pack 5K6 0.8w	2
AC0179	83	RP3,RP8,RP11,RP12,RP14 Resistor Pack 22K 0.8w	5
AC0180	84	RP4,RP5, Resistor Pack 1K 0.45w	2
AC0234	74	RP6,RP10,RP13 Resistor Pack 1K 0.8w	3
AC0235	75	RP15 Resistor Pack 10K 0.8w	1
AC0191	92	RP16,17,18 Resistor Pack 2K2 1.25w	3
AC0282	93	VR1 50K Horz Preset	1
AC0182	85	VR2 1K Horz Preset	1
AD0076	117	C1-7 Capacitor 0.1uF Metal Film	7
AD0133	112	C8,C21 Capacitor 0.1uF Mono	2
AD0140	114	C9,C10,C15 Capacitor 1uF 63v Elect	3
AD0000	104	C11,C20,C22,C29,C39-C46,C52,C53,C64 Capacitor 0.01uF	
		Ceramic	70
AD0054	105	C12,C16,C19,C34,C50,C60,C63 Capacitor 22uF 16v Tant	7
AD0089	107	C13 Capacitor 10uF 16v Elect	1
AD0174	102	C14,C17,C58, Capacitor 22uF 50v Elect	3
AD0036	103	C18,C31 Capacitor 1uF 35v Tant	2
AD0109	108	C30 Capacitor 1nF	1

PARTS LIST

MACHINE SYSTEM ONE

PART No	ITEM	DESCRIPTION	QTY
AD0157	116	C32 Capacitor 470pF Ceramic	1
AD0110	109	C33,C48 Capacitor 2n2 Ceramic	2
AD0125	110	C35,C49 Capacitor 33pF Ceramic	2
AD0141	115	C36 Capacitor 47uF 63V Elect	1
AD0171	106	C38,C56,C59,C62 Capacitor 0.1uf Polyester	4
AD0136	113	C47,C51,C54 Capacitor 220uF 16v Elect	3
AD0132	111	C55,C61 Capacitor 4.7uF 50v Elect	2
AG0182	121	Printed Circuit Board	1
AK0004	126	Battery 3.6v Nl-Cad	1
AM0055	131	Connector 36 Way (White)	1
AM0098	132	Connector 15 Way (Green)	1
AM0119	133	Connector 36 Way (Yellow)	1
AM0120	134	Connector 36 Way (Blue)	1
AQ0011	141	8 Way D.I.L. Switch	2
AX0013	151	8 MHz Crystal	1
EC2657		Complete Board (Excluding Real Time Clock)	
		REAL TIME CLOCK	
AA0234	1	IC27 MC14175B	1
AA0235	2	IC28 MM58174	1
AA0236	3	IC30 LM334Z	1
AB0007	7	Tr89 Transistor BC337	1
AB0049	6	D41 Diode 1N5818	1
AC0007	12	R199,R201, Resistor 10K ¼w	2
AC0091	13	R200 Resistor 22K ¼w	1
AC0002	11	R202 Resistor 1K ¼w	1
AD0054	16	C57 Capacitor 22uF 16v Tant	1
AD158	17	VC1 Capacitor Trimmer 5.5-65pf	1
AX0014	21	32768 Hz Crystal	1