MAINTENANCE MANUAL

EDACS® VERTICAL TURBO CARD
ROA 117 2239

TABLE OF CONTENTS

ERICSSON

FIGURES AND TABLES

SPECIFICATIONS*

ITEM	SPECIFICATION
CURRENT DRAIN	80 to 120 mA
POWER REQUIREMENTS	+5 Vdc ±5%, 120 mA (maximum). +12 Vdc ±5%, 5 mA (maximum). -12 Vdc ±5%, 5 mA (maximum).
MEMORY:	
Volatile	64K bytes
Non-Volatile	128K bytes in the DS-2250 microprocessors (battery powered)
Inter-processor	8K bytes Dual Port
CONNECTIONS	96 pin DIN connector (P1) mating to VME backplane interface.
RS-232 Serial Ports	Two (2), six pin modular RJ-12 connectors (J2 and J3)
I/O Lines:	
Inputs	Two (2) Schmitt trigger lines with 100K ohm pull up to Vcc.
Outputs	Two (2) transistor buffered, open-collector lines with 100k ohm pull up to Vcc. All four (4) I/O lines diode clamped to within +0.5 Vdc above Vcc and -0.5 Vdc below ground.
OSCILLATOR FREQUENCY	11.0592 MHz
INDICATORS (Operating Status)	One red LED per DS-2250 microprocessor
DIMENSIONS	100 mm (high) x 220 mm)long)

* These specifications are intended for use during servicing. Refer to appropriate Specification Sheet for the complete specification.

INTRODUCTION

The Vertical Turbo Card (ROA 117 2239) provides additional processing power and memory for the Ericsson Control Point Trunking Card (ROA 117 2240/3).

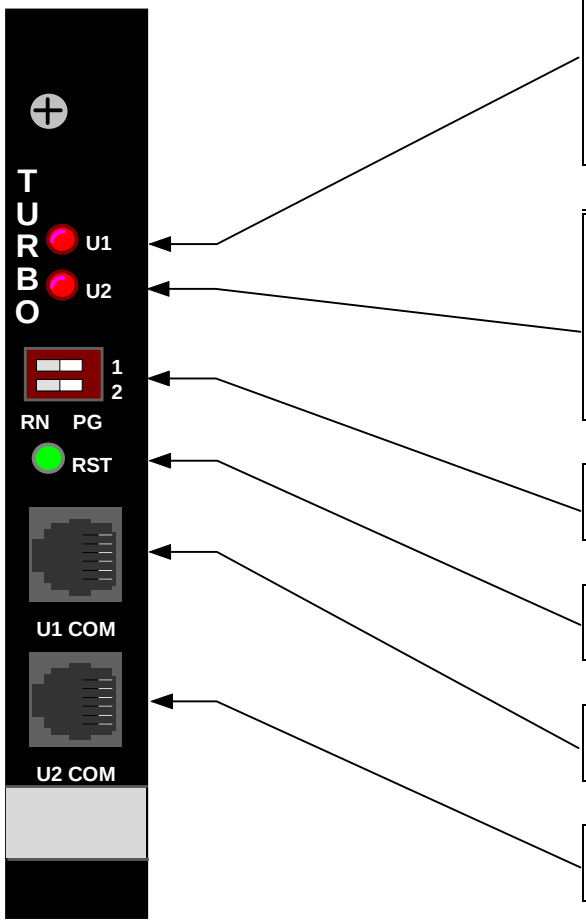
The Turbo Card is manufactured using surface mount components. The card plugs into a Trunking Shelf along with the Control Point Trunking Card and the Simulcast Interface Card. Electrical connections are made by plugging the Turbo Card into the proper card slot which connects P1 into the shelf's backplane.

FRONT PANEL CONTROLS AND INDICATORS

The Vertical Turbo Card's front panel is shown in Figure 1 and described in the accompanying text.

NOTE

The numbers shown in parentheses refer to the circuit diagram's reference designator.



U1 (D1)	✹ **ON** indicates the U1 Processor is in the run mode. ❍ **OFF** indicates a problem exists, the Turbo is in the programming mode, or no program is loaded.
U2 (D2)	✹ **ON** indicates the U2 Processor is in the run mode. ❍ **OFF** indicates a problem exists, the Turbo is in the programming mode, or no program is loaded.
RN/PG (S2)	Selects the Run or Program mode for input to the associated microprocessor.
RST (S1)	Resets both microprocessors and associated circuitry.
U1 COM (J2)	RS-232 serial port used to load software into microprocessor U1.
U2 COM (J3)	RS-232 serial port used to load software into microprocessor U2.

Figure 1 - Vertical Turbo Card Front Panel

Table 1 - Connector Chart

Connector	Description
P1	Turbo Card's interface to the Trunking Card's address/data bus & power and U1, U2 input/output.
J2 (U1 COM)	RS-232 serial interface to U1
J3 (U2 COM)	RS-232 serial interface to U2

CIRCUIT ANALYSIS

The Turbo Card consists of two independent microprocessor sections (See Figure 2). The heart of each section is a DS-2250 microprocessor, U1 or U2. In addition to its internal memory, each microprocessor has a 32K byte external RAM, U12 or U13. Each section also contains a 4K byte Dual Port RAM (DPRAM), U3 or U4, which provides the interface to the Trunking Card. A single oscillator, consisting of U14 and B1, provides the clock for both processors. Each processor uses one half of U8 to interface between its TTL I/O and its RS-232 serial port. When one of the processors triggers U9, it turns on either LED D1 or D2. A single input bit and a single output bit is available on each processor for I/O. The module has a single RESET button which resets both processors. LOAD/RUN circuits on each processor set the operating mode. Port 1 and INT 0 of both processors are tied together to provide a high speed parallel communication link between the two processors.

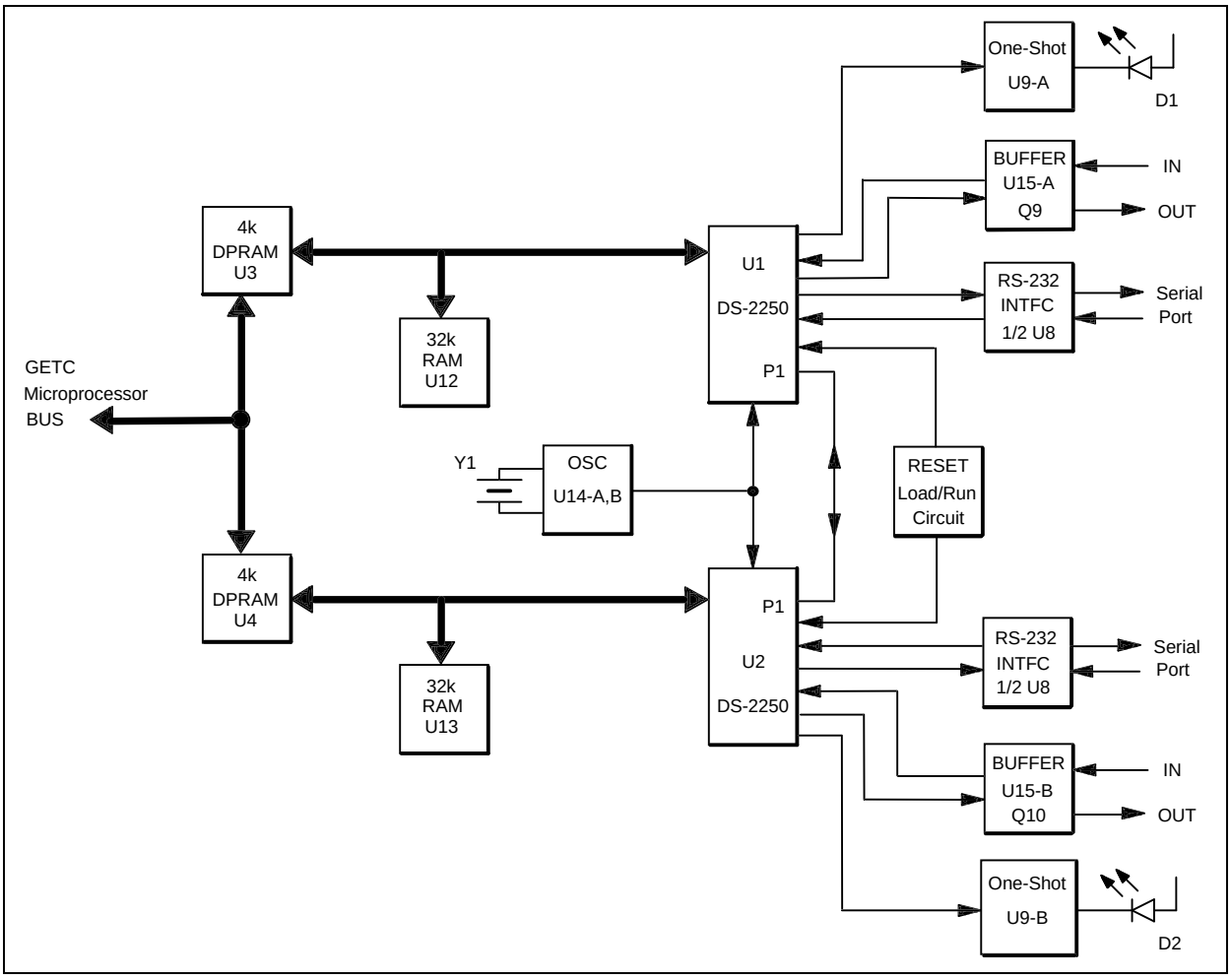


Figure 2 - Turbo Card Block Diagram

MICROPROCESSORS U1 and U2

Microprocessors U1 and U2 are Dallas Semiconductor DS-2250 single-in-line package (SIP) modules. The DS-2250 is a special proprietary derivative of the Intel 8031 microprocessor containing the basic 8031 structure, a bootstrap loader, terminal interface, and internal control of 64K bytes of battery backed-up RAM. The RAM can be partitioned into two separate code and data areas, The code area can be write protected after it is initially loaded. An internal bit, ECE2, under program control alters the memory map allowing access to all available memory (see Figure 3).

DUAL PORT RAM

Dual-port RAM (DPRAM) chips U3 and U4 interface with the Trunking Card's 8032 microprocessor (U1). One DPRAM port is connected to the Trunking Card and the other port is connected to either U1 or U2. To the Trunking Card, U3 and U4 appear as a single 8k byte memory block between addresses 0 and 1FFFH. To the Turbo Card microprocessor U1, U3 appears as a 4k byte RAM addressed from 0 to 0FFFH and likewise, U2 sees U4 as a 4k byte RAM addressed from 0 to 0FFFH. Thus, each microprocessor shares 4K bytes of memory with the Trunking Card processor. This permits the efficient exchange of data between the Trunking Card and the Turbo Card. Integrated circuits U11-D and U10-D drive the output enable (read) input (RAM CS) from the Trunking Card, while U10-A, B, and C along with U11-A and B drive DPRAM chip enables orignating from the Trunking Card write command (WRBAR).

RAM U12 AND U13

As shown in Figure 3, when ECE2 is 0, each processor accesses a 32K RAM at addresses 8000H to FFFFH. These RAM's are on the Turbo Card, not in the DS-2250, thus they are not powered by the DS-2250 battery. This volatile memory space is used as a temporary scratch pad by the processors. U10-E and U10-F drive the RAM CE (chip enable), pins of U12 and U13 respectively, from bit 15 of the address bus. A low enables the RAM.

OSCILLATOR CIRCUIT

U14 is an unbuffered CMOS inverter (74HCU04). In this application, U14-A functions as a linear gain stage with crystal B1 in its feedback path, forming an oscillator at 11.0592 MHz. U14-B buffers the clock and drives both processors' clock input pins.

RESET CIRCUIT

Switch S1 resets the Turbo Card and the Trunking Card's S4 resets the Trunking Card. The software will usually start properly with only an S4 Trunking Card reset; however, both boards may be reset

Depressing the Turbo Card's S1 grounds R21, R22, and the positive side of C21. This turns on PNP transistors Q4 and Q7 pulling the RESET input of each processor high. In this logic state, the microprocessors are reset and not operating. When S1 is released, the voltage on C21's positive terminal and the bases of Q4 and Q7 slowly rises as C21 charges through R8, R15, R21, and R22. Eventually, this voltage rises high enough to turn Q4 and Q7 off allowing the processor RESET inputs to fall low. RESET is kept low at this point by R7 and R14. R8 and R15 hold Q4 and Q7 in the off condition.

LOAD/RUN CIRCUIT

During normal operation (RUN mode), the processors' RESET inputs are held low and the PSEN output controls external memory. Each DS-2250 is put into the LOAD mode by holding its RESET pin high and pulling its PSEN

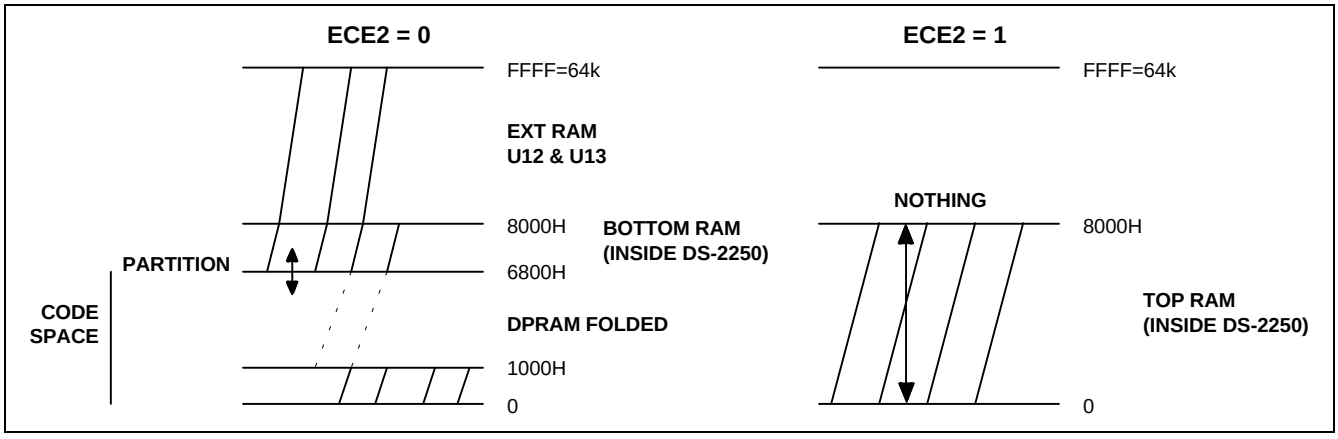


Figure 3 - Memory Map For Each DS-2250

pin low.

Switch S2 selects RUN/LOAD mode for processor U1. Moving S2 down shorts pins 2 and 3, placing U1 in the LOAD mode. This applies Vcc (5V) to R10 and R12. Vcc on R10 turns on Q8 which turns on Q7 through R9 pulling U1's RESET high. Vcc on R12 turns on Q6 which holds PSEN low. When S2 is up (shorting pins 1 and 2) the processor is in the RUN mode. Vcc is not applied to R10 and R12. Q8 is held off by R11 and Q7 is held off by R8 so RESET is pulled low by R7. Q6 is held off by R13 so PSEN is not held low and may become an output of U1.

Switch S3 selects RUN/LOAD mode for processor U2. Moving S3 down shorts pins 2 and 3, placing U2 in the LOAD mode. This applies Vcc (5V) to R17 and R19. Vcc on R17 turns on Q5 which turns on Q4 through R16 pulling U2's RESET high. Vcc on R19 turns on Q3 which holds PSEN low. When S3 is up (shorting pins 1 and 2) the processor is in the RUN mode. Vcc is not applied to R17 and R19. Q5 is held off by R18 and Q4 is held off by R15 so RESET is pulled low by R4. Q3 is held off by R20 so PSEN is not held low and may become an output of U2.

RS-232 INTERFACE

The RS-232 interfaces are used to program the DS-2250 modules and to interface to other serial devices in future applications (refer to the Programming Instructions). An Intel hex format file from a PC can be loaded into memory via the serial ports. This manual and the Software Release Notes (SRN) provide complete instructions for loading software in the field.

U8 is a dual TTL-to-RS-232 duplex serial interface. Capacitors C1, C2, C3, and C4 are used by U8 to convert 5V signals to RS-232 levels. Section 1 converts U1's serial port to RS-232 and section 2 converts U2's serial port to RS-232. The serial output for U1 is at J2-2 and the input is at J2-1. The serial output for U2 is at J3-2 and the input is at J3-1.

I/O BITS

One output bit from U1 is available. It is buffered by Q9 and drives out on P1-B21. Weak pull-up R30 holds P1-B21 high when Q9 is turned off by U1. One input bit to U1 is available. It is buffered from P1-B20 by U15-A and protected from static and overdrive by D3 and R27. Weak pull-up R35 holds the input high when not in use.

One output bit from U2 is available. It is buffered by Q10 and drives out on P1-B23. Weak pull-up R32 holds J P1-B23 high when Q10 is turned off by U2. One input bit to U2 is available. It is buffered from P1-B22 by U15-B and protected from static and overdrive by D4 and R31. Weak pull-up R36 holds the input high when not in use.

LED INDICATORS

LED D1 is controlled by processor U1. The processor must apply pulses to retriggerable one-shot (monostable multivibrator) U9 pin 4 about every half second or faster to keep the LED on. This provides a visual indication that the microprocessor is running. The pulse on U9-4 retriggers the output on U9-6 keeping Q1 on and LED D1 on. If the pulses don't appear before the one-shot times out, U9-6 will fall low turning Q1 and D1 off. R1 and C17 determine the drop-out time.

LED D2 is controlled by processor U2. The processor must apply pulses to retriggerable one-shot (monostable multivibrator) U9 pin 12 about every half second or faster to keep the LED on. This provides a visual indication that the microprocessor is running. The pulse on U9-12 retriggers the output on U9-10 keeping Q2 on and LED D2 on. If the pulses don't appear before the one-shot times out, U9-10 will fall low turning Q2 and D2 off. R4 and C18 determine the drop-out time.

HARDWARE INSTALLATION

Installation or removal of the Turbo Card involves sliding the assembly into or out of the VME Shelf. This may be accomplished with power applied without damaging the assembly.

When installing the Turbo Card, ensure the card is installed in the designated slot. Refer to the specific application drawings.

SOFTWARE INSTALLATION

The following procedures provide instructions for programming the Turbo Card using software provided with the software media kit, an IBM compatible personal computer (PC), and programming cable 19B804346P111.

NOTE

The software contained in the media kit is subject to change resulting from improvements or enhancements. When upgrading the software, refer to the procedures contained in the accompanying software release notes (SRN).

TURBO CARD SOFTWARE INSTALLATION

This procedure provides instructions for downloading the Turbo software to an IBM PC or compatible personal computer.

The Turbo software is distributed in the Turbo Media Kit diskette as multiple files. These files must be loaded into the PC such that they are co-located with the Trunking Card PC Programmer. Once loaded the new software becomes available for selection.

Equipment Required

- IBM PC/XT/AT or compatible with at least 640K memory, monitor and keyboard running MS-DOS version 3.3 or higher.
- Two Disk Drives, a single 3-1/2 inch HD floppy and fixed (hard) drive.
- Serial Port configured as either COM1 or COM2.
- Parallel port for connection to a printer (optional, but recommended).
- CPTC Software Media Kit AE/LZY 213 767/2.
- Programming Cable, 19B804346P111 (DB-9 to RJ-12).
- TQ-3357 V4.03 (or later) PC Programmer

Procedure

1. Run the Trunking Card PC Programmer (TQ-3357).
2. Load the Turbo Distribution diskette in the disk drive.
3. From the Current Personalities Screen, access the LOAD utility by selecting the **F8 Utils**, **F8 Files** and then the **F1 Load**. The “New File Loader” dialog box will appear.
4. Enter the path to the Turbo Distribution diskette files.

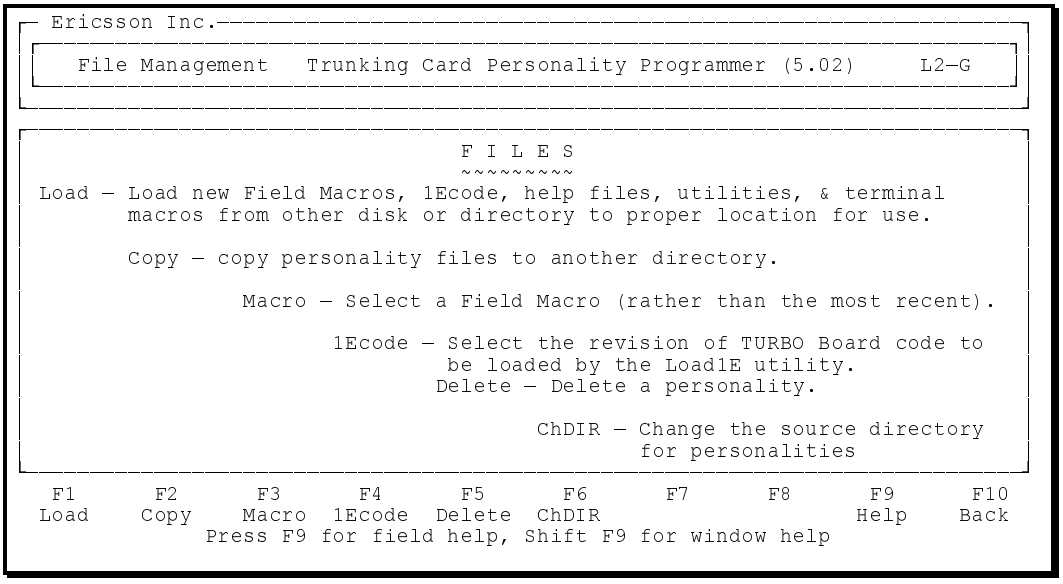


Figure 4 - Trunking Card PC Programmer Load File Menu

5. The programmer will load all files , including the Field Macros into the PC Programmer's working directories.

6. It is now possible to program the Turbo Card.

Programming The Turbo Card

This procedure downloads the Turbo software to the microprocessors U1 and U2 on the Turbo board.

NOTE

Re-programming the Turbo Card will not alter previously stored Personality Data. When Personality Data is present, "**load1e.exe**" clears and performs CRC functions over the code portion of memory only. The "**load1e.exe**" also stores CRC data in the DS-2250's memory for future data corruption checks.

1. Refer to TQ-3357 Chapter 4 - *Upgrading Firmware with the Load1E Utility* for complete instructions on downloading the Turbo software .

2. Connect the Programming Cable, 19B804346P111, from the PC's serial port connector to the Turbo card input port connector **U1 COM** (see Figure 5).

NOTE

References in the Trunking Card PC Programmer to J103 and J104 refer to connectors **U1 COM** (J2) and **U2 COM** (J3), respectively.

3. With power ON, move the Turbo Card **RN/PG** switches to the **PG** position (toward the right). This places the processors U1 and U2 into the programming mode. If either switch is already in the **PG** position, move the switch to the **RN** position and then back to the **PG** position.

NOTE

References in the Trunking Card PC Programmer to switches S2 and S3 correspond to DIP Switch S2 sections 1 and 2, respectively. When directed to move the switches to the "front" or programming mode, move the switch to **PG**. When directed to move the switches to the "rear" or run mode, move the switches to **RN**.

4. The Turbo Card LEDs **U1** (D1) and **U2** (D2) should turn OFF indicating that the Turbo Card is in the programming mode.

5. Execute the "**load1e.exe**" program on the PC and follow the on screen instructions.

6. The "**load1e.exe**" program loads the file "**1etop.hex**"

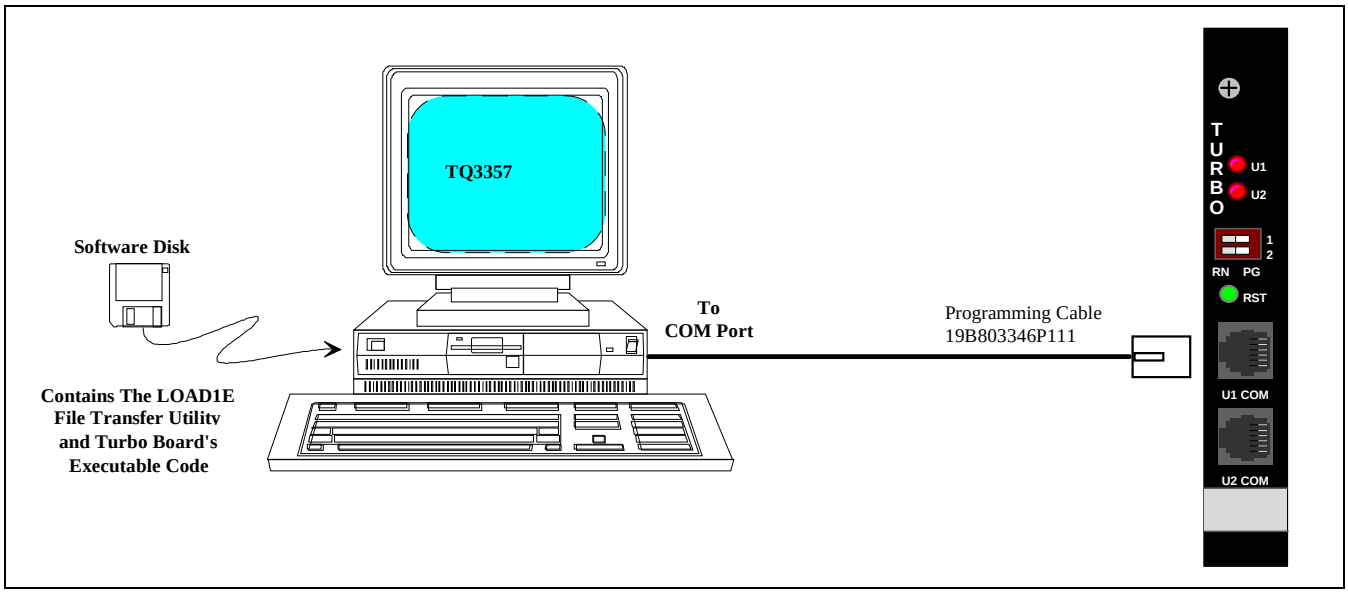


Figure 5 - Turbo Card Programming

into the Turbo Card's upper half of memory for use by the processor U1.

7. Monitor the PC's on screen instructions and prompts.

8. When directed, move the programming cable from the **U1 COM** connector to **U2 COM**.

9. After the cable is moved to U2 COM, the PC will indicate it is loading the "**1ebot.hex**" file into the Turbo Card's lower half of memory for use by the processor U2.

10. Disconnect the programming cable upon successful completion of the programming procedure and return the Turbo Card to the Normal operating mode.

Returning To Normal Operating Mode

Upon successful completion of the programming, the PC displays a "**FINISHED - SWITCH S2 AND S3 TO THE REAR**" message.

1. Move the Turbo Card **RN/PG** switches to the **RN** position (toward the left). This places the processors U1 and U2 into the run mode.

2. Press S1 to reset the Turbo Card.

3. The Turbo Card LEDs, **U1** (D1) and **U2** (D2), will light indicating the code is executing.

4. This completes the Turbo Card programming. If any problems were encountered or if any error messages were received, refer to the Error section below or Trouble Shooting section of this manual.

ERRORS

The transfer process uses the file 1ECRC.HEX for error checking and verification. Any error during this procedure generally indicates a defective communication link between the PC and Turbo Card. If errors occur, check connectors and cables. Cycle the **RN/PG** switch from the **PG** to **RN** and back to **PG**. Repeat the programming sequence.

Errors usually generate one or more of the following:

- Error 1 Did not receive sign-on banner from DS-2250.
- Error 2 Did not receive CR-LF from DS-2250.
- Error 3 Did not receive prompt from DS-2250.
- Error 4 Did not receive CRC value from DS-2250.
- Error 5 Did not receive serial number from DS-2250.

"**Cannot open COM Port**" - The PC's COM Port is non-existent or in use by other software or hardware. A PC re-configuration is required.

"**Cannot open 'filename'** " - Be sure file exists in the appropriate directory.

"**Bad CRC**" - A CRC error means that after loading, memory contents are incorrect or the wrong "**1ecrc.Hex**" file was used. If the "**1ecrc.Hex**" file is the same shipped with the software, a Turbo Card hardware problem is indicated.

"**Wrong serial number-check cables**" - If cabling is correct, DS-2250 microprocessors may have been swapped. The four byte serial number is printed to the screen to help in restoring DS-2250's to their proper locations. The serial numbers will be the same, except for least significant bit, for both DS-2250's The least significant bit must be logic 1 for the top DS-2250 (U1) and logic 0 for the bottom DS-2250 (U2).

"**Illegal serial number**" - Serial number is either invalid, was never programmed, or has been erased.

Serial Numbering

An error will occur when U1 and U2 are swapped. Each processor has a unique serial number with U1 having an odd serial number and U2 having a serial number one digit less than U1's serial number. The PC's on screen information displays the processors' serial numbers for verification. The most significant digits of U1 and U2's serial numbers must match.

Do not swap U1 and U2 DS2250 microprocessors or take one DS-2250 from one Turbo Card and put it in another Turbo Card. However, it is permissible to swap DS-2250's as pairs if the U1 and U2 positions are maintained.

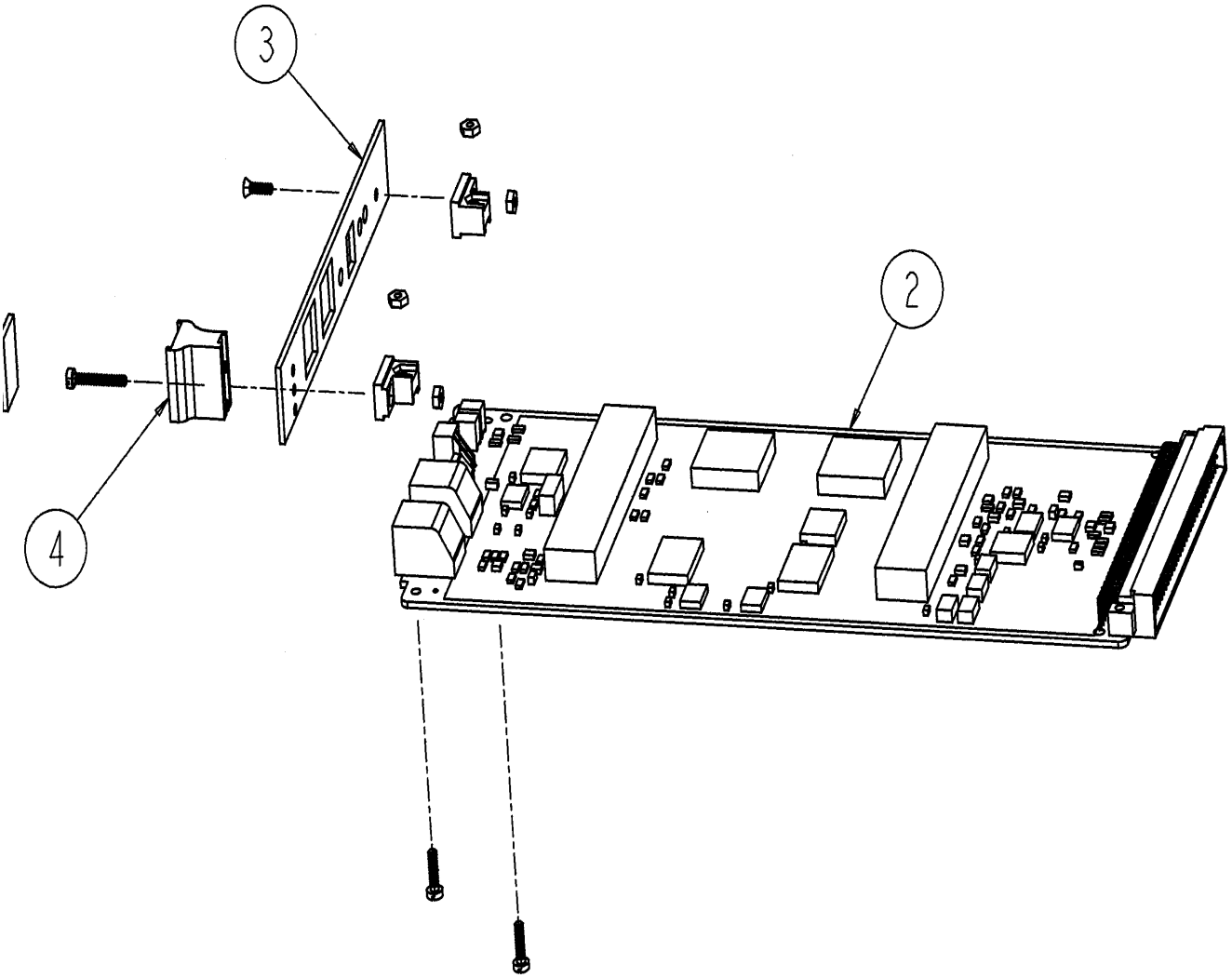
TROUBLESHOOTING

If a problem is traced to the Turbo Card, perform the following checks and inspections:

- If an error message is received while loading the Turbo Card software, review Programming Instructions - Errors section for possible corrective action.
- Visually check for damaged parts, unsoldered pins or parts, broken cable or pins (P1), or unseated DS-2250 modules.
- Look for trash in the SIP sockets. A magnifying glass or low power microscope is helpful.
- Verify the RN/PG switch is in the RN position in the RUN condition.
- Check +5, +12 and -12 volt lines.
- With a high speed, high impedance scope, check for oscillations at U14-4. A somewhat flattened sine wave of about 4V amplitude at 11.0592 MHz should be seen.

If the problem persists, substitute the Turbo Card with a known good Turbo Card. Ensure the substitute card has the correct software loaded.

If the DS-2250 modules are suspect, substitute the modules with modules from a known good board. Be sure to put U1 from the good Turbo Card into XU1 of the suspect Turbo Card and likewise for U2. Remember to swap DS-2250's as pairs and reprogram the Turbo card if necessary.



VERTICAL TURBO CARD
ROA 117 2239
(1/1078 ROA 117 2239, Sh. 1, Rev. A)

VERTICAL TURBO CARD
131 32-ROA 117 2239
Revision: D

Symbol	PART NUMBER	DESCRIPTION
		---------- CRYSTAL ----------
B1	RTM 501 658/01	11.0592 MHz
		---------- CAPACITOR ----------
C1	RJE 584 3168/47	Tantalum Chip: 47 µF 16V Case D
C10	RJC 464 3045/1	10nF 0805 50V ±10%
C11	RJC 464 3045/1	10nF 0805 50V ±10%
C12	RJC 464 3045/1	10nF 0805 50V ±10%
C13	RJC 464 3045/1	10nF 0805 50V ±10%
C14	RJC 464 3045/1	10nF 0805 50V ±10%
C15	RJC 464 3045/1	10nF 0805 50V ±10%
C16	RJC 464 3045/1	10nF 0805 50V ±10%
C17	RJE 584 3107/22	Tantalum Chip: 2.2 µF 10V Case A
C18	RJE 584 3107/22	Tantalum Chip: 2.2 µF 10V Case A
C19	RJC 463 4042/27	27pF 0805 50V ±5%
C2	RJE 584 3168/47	Tantalum Chip: 47 µF 16V Case D
C20	RJC 463 4042/27	27pF 0805 50V ±5%
C21	RJE 584 3207/1	Tantalum Chip: 1 µF 20 v case a
C22	RJC 464 3045/1	10nF 0805 50V ±10%
C23	RJC 464 3045/1	10nF 0805 50V ±10%
C24	RJC 464 3045/1	10nF 0805 50V ±10%
C25	RJC 464 3045/1	10nF 0805 50V ±10%
C26	RJC 464 3045/1	10nF 0805 50V ±10%
C3	RJE 584 3168/47	Tantalum Chip: 47 µF 16V Case D
C5	RJE 584 3168/47	Tantalum Chip: 47 µF 16V Case D
C6	RJC 464 3045/1	10nF 0805 50V ±10%
C7	RJC 464 3045/1	10nF 0805 50V ±10%
C8	RJC 464 3045/1	10nF 0805 50V ±10%
C9	RJC 464 3045/1	10nF 0805 50V ±10%
		---------- DIODES ----------
D1	RKZ 433 637/1	LED: 90 degree. Red
D2	RKZ 433 637/1	LED: 90 degree. Red
D3	RKZ 123 03/1	Dual switching, in series
D4	RKZ 123 03/1	Dual switching, in series
		---------- FUSES ----------
F1	REZ 701 16/2	Thermistor Circuit Protector: 0.5A 60V PTC.
F2	REZ 701 28/1	Thermistor Circuit Protector: 0.5A 15V PTC.
F3	REZ 701 28/1	Thermistor Circuit Protector: 0.5A 15V PTC.
		---------- JACKS ----------
J2	RNV 403 19/06	Fork Contact Unit: MMP-JACK VINKLAT 6/6
J3	RNV 403 19/06	Fork Contact Unit: MMP-JACK VINKLAT 6/6
		---------- CONNECTORS ----------
P1	RPV 403209/102	96 pole, 4 ground pins.
		---------- TRANSISTORS ----------
Q1 thru Q3	RYN 121 675/1	Silicon : NPN, Low profile; sim to MMBT3904.
Q4	RYN 120 619/1	Silicon : PNP, Low profile; sim to MMBT3906.
Q5 and Q6	RYN 121 675/1	Silicon : NPN, Low profile; sim to MMBT3904.
Q7	RYN 120 619/1	Silicon : PNP, Low profile; sim to MMBT3906.
Q8 thru Q10	RYN 121 675/1	Silicon : NPN, Low profile; sim to MMBT3904.
		---------- RESISTORS ----------
R1	REP 625 425/47	Chip 47K Ohm 5% 1/8w
R2	REP 625 425/1	Chip 10K Ohm 5% 1/8w
R3	REP 625 424/1	Chip 1K Ohm 5% 1/8w
R4	REP 625 425/47	Chip 47K Ohm 5% 1/8w
R5	REP 625 425/1	Chip 10K ohm 5% 1/8w
R6	REP 625 424/1	Chip 1K Ohm 5% 1/8w
R7	REP 625 424/1	Chip 1K Ohm 5% 1/8w
R8	REP 625 425/1	Chip 10K ohm 5% 1/8w
R9	REP 625 425/1	Chip 10K ohm 5% 1/8w
R10	REP 625 425/1	Chip 10K Ohm 5% 1/8w
R11	REP 625 425/1	Chip 10K Ohm 5% 1/8w
R12	REP 625 425/1	Chip 10K Ohm 5% 1/8w
R13	REP 625 425/1	Chip 10K Ohm 5% 1/8w
R14	REP 625 424/1	Chip 1K Ohm 5% 1/8w
R15	REP 625 425/1	Chip 10K Ohm 5% 1/8w
R16	REP 625 425/1	Chip 10K Ohm 5% 1/8w
R17	REP 625 425/1	Chip 10K Ohm 5% 1/8w
R18	REP 625 425/1	Chip 10K Ohm 5% 1/8w
R19	REP 625 425/1	Chip 10K Ohm 5% 1/8w
R20	REP 625 425/1	Chip 10K Ohm 5% 1/8w
R21	REP 625 425/1	Chip 10K Ohm 5% 1/8w
R22	REP 625 425/1	Chip 10K Ohm 5% 1/8w
R23	REP 625 427/1	Chip 1 Meg Ohm 5% 1/8w
R24	REP 625 424/1	Chip 1K Ohm 5% 1/8w
R25	REP 625 426/1	Chip 100K Ohm 5% 1/8w
R26	REP 625 426/1	Chip 100K Ohm 5% 1/8w
R27	REP 625 423/1	Chip 100 Ohm 5% 1/8w
R28	REP 625 425/1	Chip 10K Ohm 5% 1/8w
R29	REP 625 425/1	Chip 10K Ohm 5% 1/8w
R30	REP 625 426/1	Chip 100K Ohm 5% 1/8w
R31	REP 625 423/1	Chip 100 Ohm 5% 1/8w
R32	REP 625 426/1	Chip 100K Ohm 5% 1/8w
R33	REP 625 425/1	Chip 10K Ohm 5% 1/8w
R34	REP 625 425/1	Chip 10K Ohm 5% 1/8w
R35	REP 625 426/1	Chip 100K Ohm 5% 1/8w

R36	REP 625 426/1	Chip 100K Ohm 15% 1/8w
R39	REP 625 424/47	Chip 4.7K Ohm 5% 1/8w
R40	REP 625 424/47	Chip 4.7K Ohm 5% 1/8w
		---------- SWITCHES ----------
S1	RMD 955 006/01	1 pole PCB.
S2	RMF 356 006/02	2 position right angle DIP
		---------- TEST POINTS ----------
Tp1	RPV 403 813/01	Connector, test.
		---------- INTEGRATED CIRCUITS ----------
U1	RYT 919 6004/1	Microprocessor SIP Module; sim to Dallas DS2250.
U2	RYT 919 6004/1	Microprocessor SIP Module; sim to Dallas DS2250.
U3	RYT 119 6100/1	CMOS Dual Port RAM, 32k (4k x 8 bit); sim to IDT7134SA70J.
U4	RYT 119 6100/1	CMOS Dual Port RAM, 32k (4k x 8 bit); sim to IDT7134SA70J.
U5	RYT 306 6011/C	Octal 3-State Noninverting Transparent Latch; sim to 74HC573.
U6	RYT 306 6011/C	Octal 3-State Noninverting Transparent Latch; sim to 74HC573.
U8	RYT 109 6073/1	EIA232-D and CCITT V.28 Driver/Receiver; sim to MC145406.
U9	RYT 306 2024/C	Digital: CMOS 2 x Momostable Multivibrator; sim to 74HC4538.
U10	RYT 306 2020/C	Digital: CMOS 6 x Inverter, Schmitt Trigger; sim to 74HC14.
U11	RYT 318 0000/C	Digital: 4x2 NAND Gate; sim to 74AC00.
U12	RYT 119 6005/4C	Digital: 32k x 8k Static RAM, sim to ECI55257AFL.
U13	RYT 119 6005/4C	Digital: 32k x 8k Static RAM, sim to ECI55257AFL.
U14	RYT 306 6045/C	Digital: 6 x Inverter; sim to 74HCU04.
U15	RYT 306 2020/C	Digital: CMOS 6 x Inverter, Schmitt Trigger; sim to 74HC14.
		---------- SOCKETS ----------
XU1	RNK 860 17/040	Sim-holder, 40 pole Angled.
XU2	RNK 860 17/040	Sim-holder, 40 pole Angled.
		---------- MISCELLANEOUS ----------
2	TVK 117 2216 R1	Multi-layer print board.
3	SXA 120 4174/11	VME front panel.
4	NTM 201 1079	Hardware kit.

PRODUCTION CHANGES

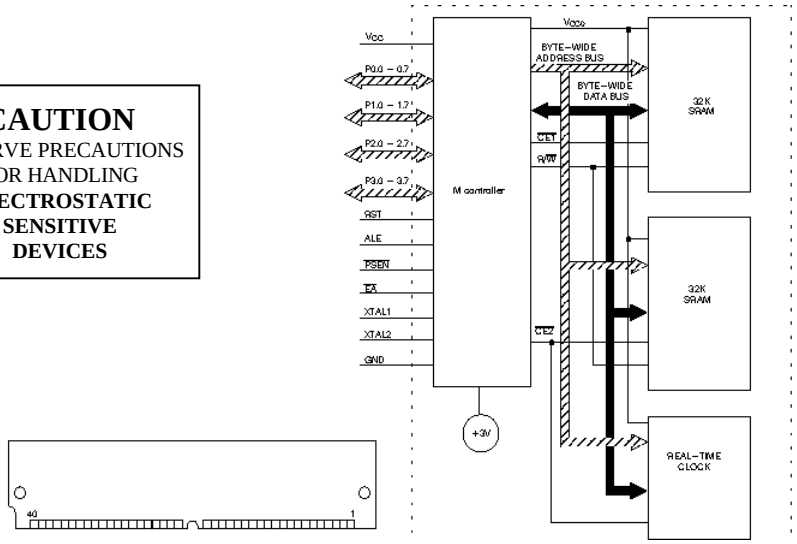
Changes in the equipment to improve performance or simplify circuits are identified by a "Revision Letter," which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the parts list for the descriptions of the parts affected by these revisions.

R1A **ROA 117 2239** - Initial production using 131-32 ROA 117 2239 Rev. C Parts List.

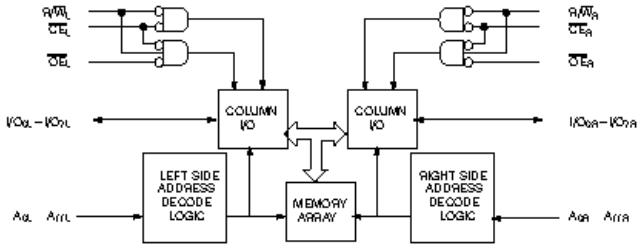
R1B **ROA 117 2239** - Changed part number for J2 and J3 from RNV 256 103 to RNV 403 19/06.

U1, U2 - MICROCONTROLLER
RYT 919 6004/1 (DS2250)

CAUTION
OBSERVE PRECAUTIONS
FOR HANDLING
ELECTROSTATIC
SENSITIVE
DEVICES

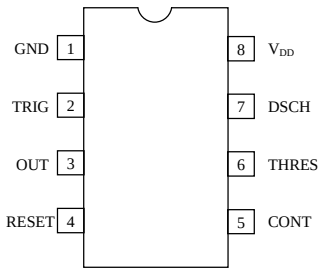


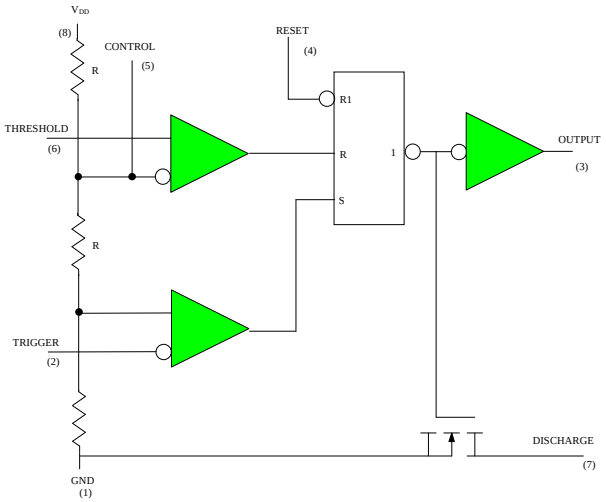
U3, U4 - DUAL PORT RAM
RYT 119 6100/1 (IDT7134SA70J)



CAUTION
OBSERVE PRECAUTIONS
FOR HANDLING
ELECTROSTATIC
SENSITIVE
DEVICES

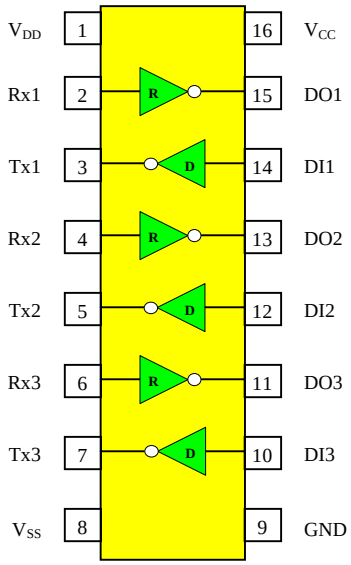
U5, U6 - 8X1 D LATCH
RYT 306 6011/C (74HC573)



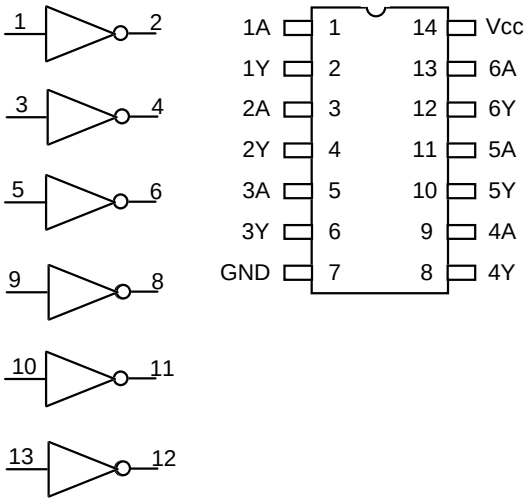


U8 - MONOLITHIC TIMER RYT 109 6073/1 (MC 145406)

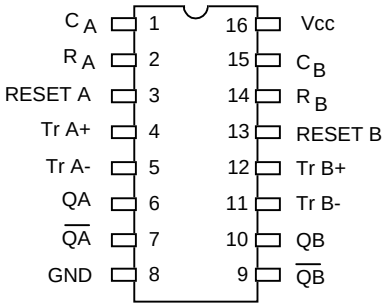
D = Driver
R = Receiver
DI = Data In
DO = Data Out



U10, U15- 6 X INVERTER, SCHMITT TRIGGER RYT 306 2020/C (74HC14)



U9 - 2 X CMOS MONOSTABLE MULTI-VIBRATOR RYT 306 2024/C (74HC438)



FUNCTION TABLE

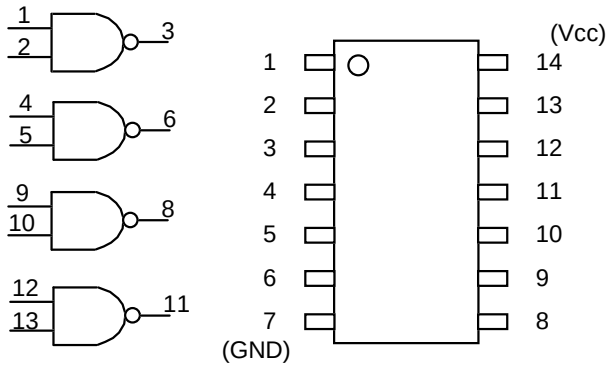
INPUTS			OUTPUTS	
Reset	+Triggr	- Trigg	Q	$\overline{Q}$
L	X	X	L	H
X	H	X	L	H
X	X	L	L	H
H	L	↓	⊓	⊓
H	↑	H	⊓	⊓

X = H or L

↑ = from L to H

↓ = from H to L

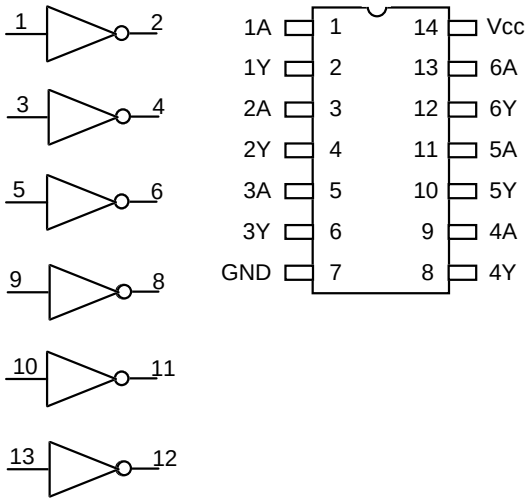
U11 - 4X2 NAND GATE
RYT 318 0000/C (74AC00)



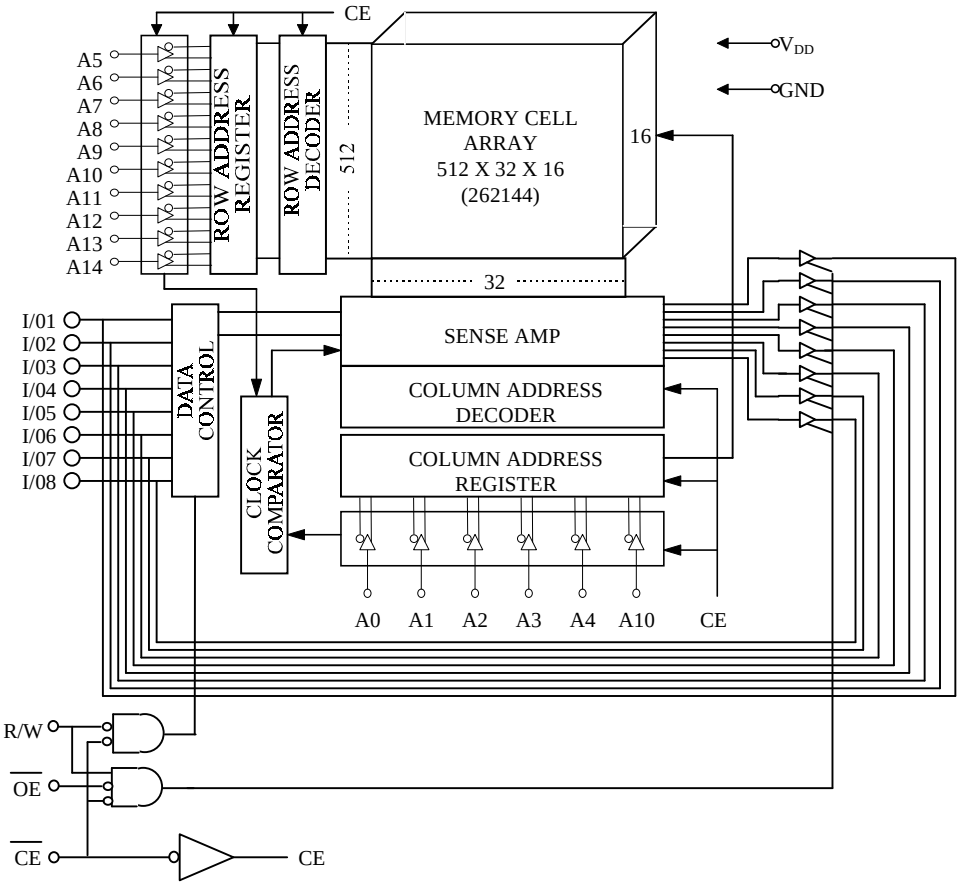
TRUTH TABLE

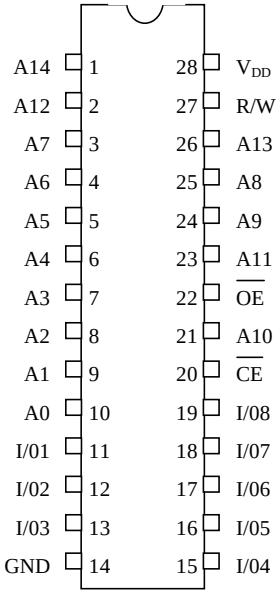
INPUTS		OUTPUTS
A1 (A2,A3,A4)	B1 (B2,B3,B4)	O1 (O2,O3,O4)
L	L	H
L	H	H
H	L	H
H	H	L

U14- 6 X INVERTER, SCHMITT TRIGGER
RYT 306 6045/C (74HCU04)

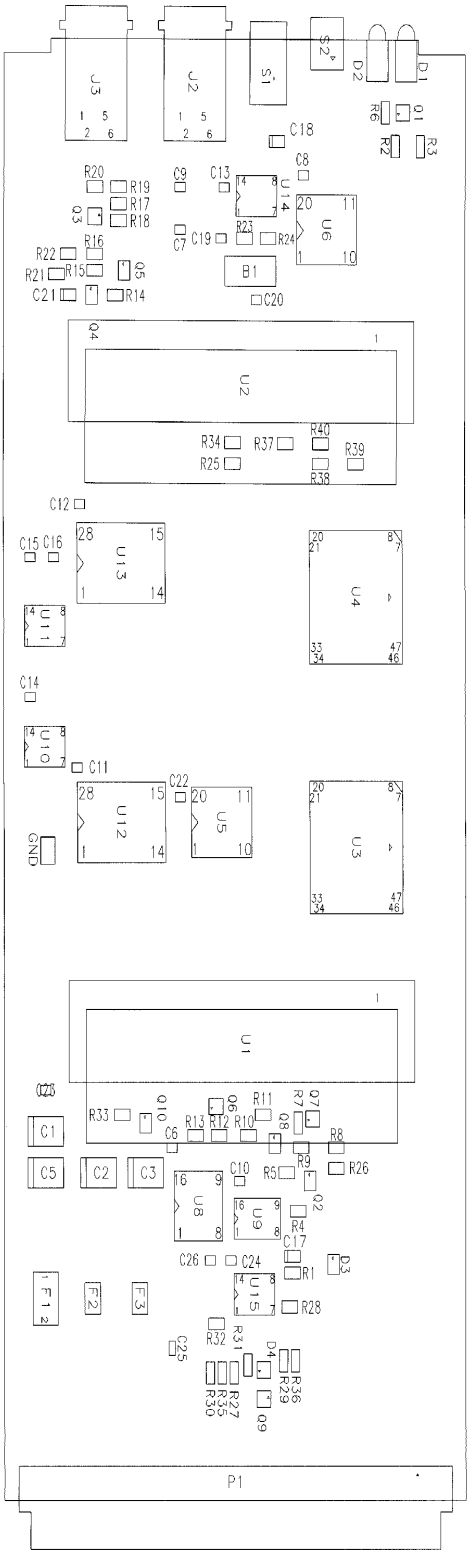


U12, U13 - 32K X 8 STATIC RAM
RYT 119 6005/4C (EC155257AFL)





PIN NAMES	FUNCTION
A0 thru A14	Address Inputs
R/W	Read/Write Control Input
OE	Output Enable
CE	Chip Enable
I/01 thru I/08	Data Input/Output
V_{DD}	Power (+5V)
GND	Ground



VERTICAL TURBO CARD
ROA 117 2239
(1078-ROA 117 2239, Sh. 1, Rev. A)

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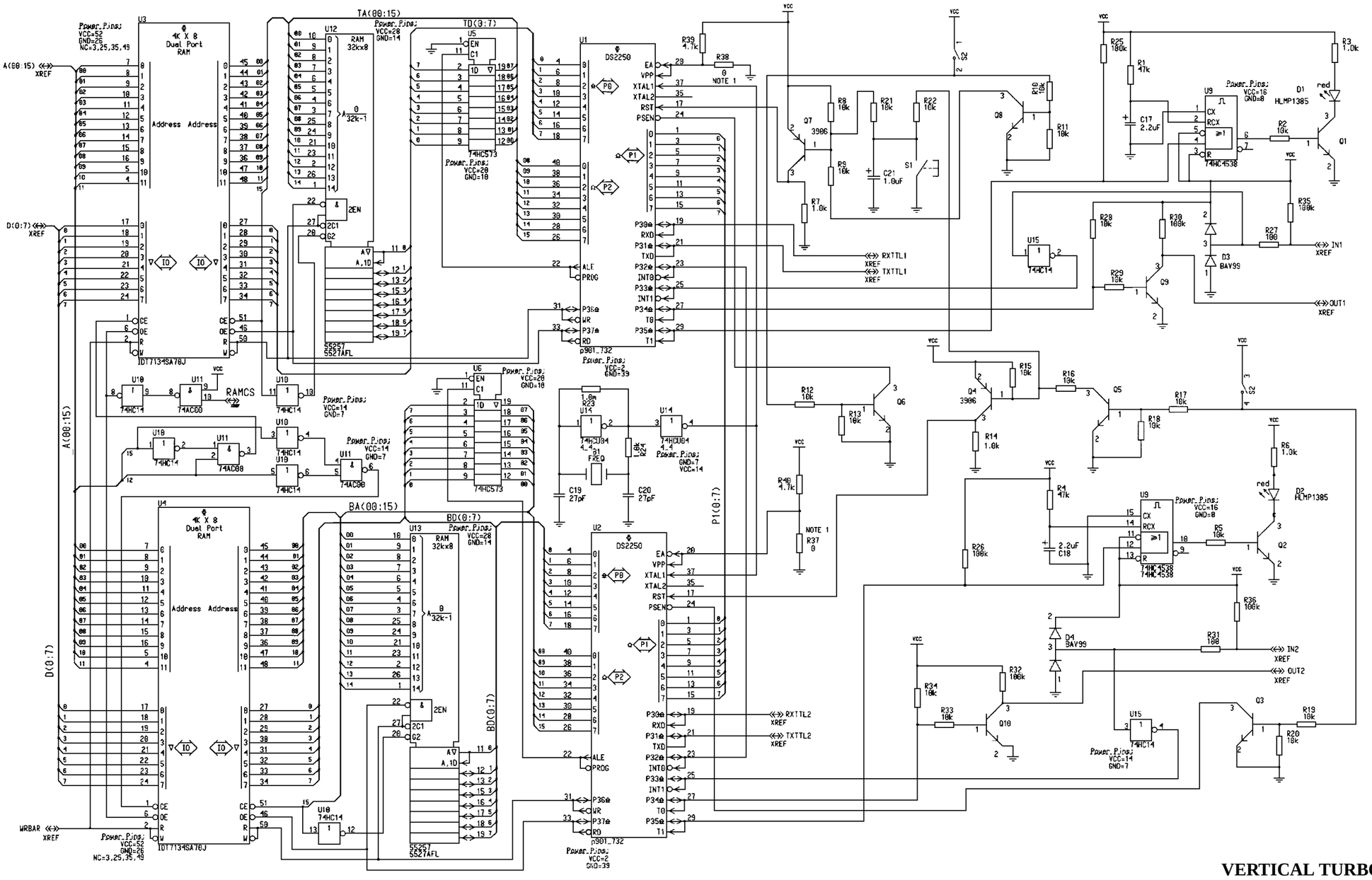
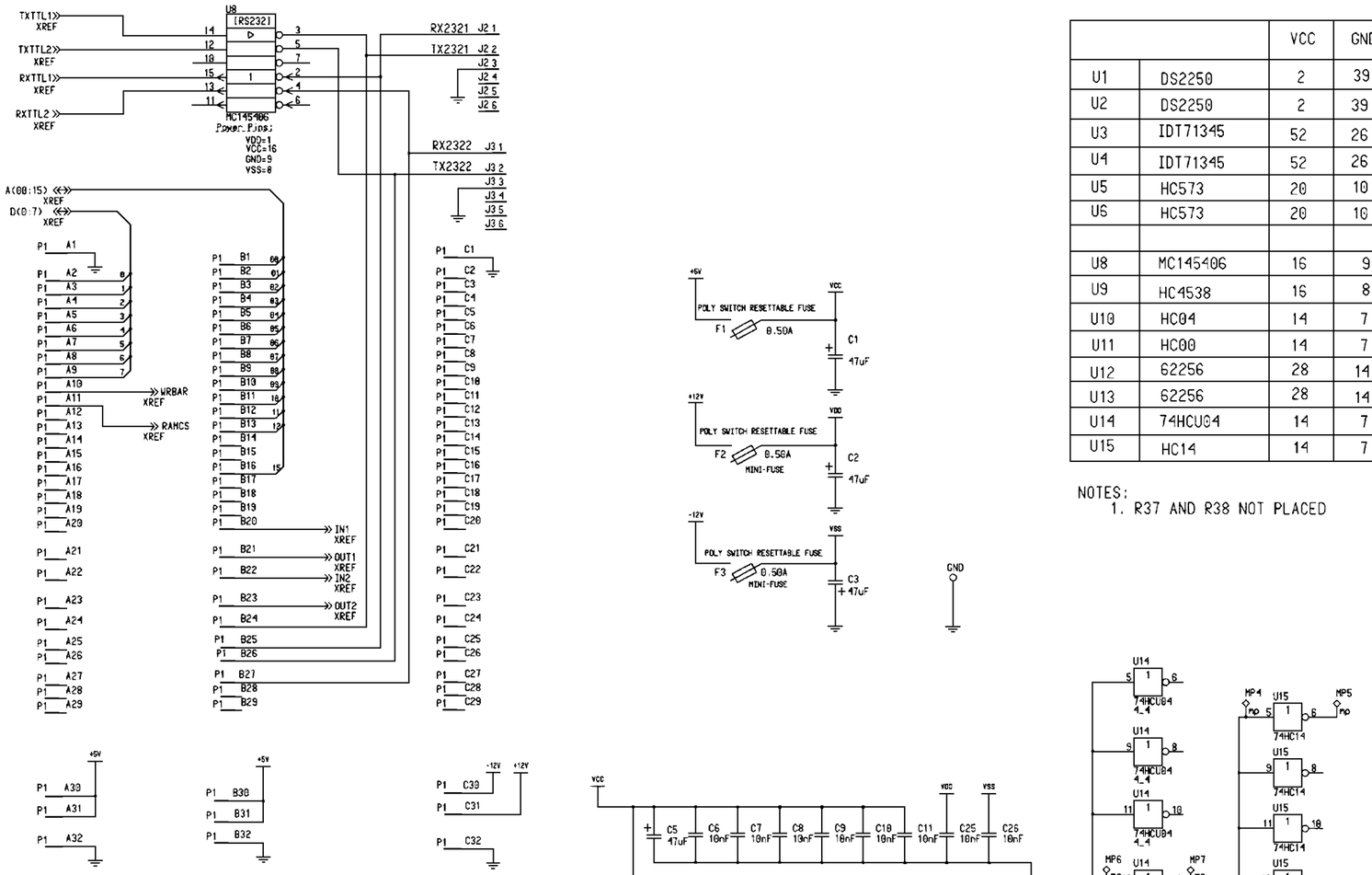


VERTICAL TURBO CARD
ROA 117 2239

(1911-ROA 117 2239, Sh. 1, Rev. A)



		VCC	GND	TYPE
U1	DS2250	2	39	SIMM 40
U2	DS2250	2	39	SIMM 40
U3	IDT71345	52	26	PLCC52
U4	IDT71345	52	26	PLCC52
U5	HC573	20	10	SO20W
U6	HC573	20	10	SO20W
U8	MC145406	16	9	SO16W
U9	HC4538	16	8	SO16W
U10	HC04	14	7	SO14
U11	HC00	14	7	SO14
U12	62256	28	14	SO28
U13	62256	28	14	SO28
U14	74HCU04	14	7	SO14
U15	HC14	14	7	SO14

NOTES:
1. R37 AND R38 NOT PLACED

VERTICAL TURBO CARD
ROA 117 2239
(1911-ROA 117 2239, Sh. 2, Rev. A)

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