MAINTENANCE MANUAL
TURBO BOARD 19D903536P1
For TRUNKING CARD (GETC 1e)

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SPECIFICATIONS

Current Drain	80 to 120 mA
Supply Voltage (Vcc)	4.75 Vdc to 5.25 Vdc
Memory:	
Volatile	64k bytes
Non-Volatile	128k bytes in the DS-2250 microprocessors (battery powered)
Inter-processor	8k bytes Dual Port
RS-232 Serial Ports	Two (2)
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.
Surge Protection	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	3.00 inches x 7.75 inches (board)

NOTE

These specifications are intended for use during service. Refer to the approriate Specification Sheet for the complete Specification.

INTRODUCTION

The Turbo Board (19D903536P1) provides additional processing power and memory for the Ericsson GE Trunking Card (GETC). The combination of the Turbo Board installed in the GETC results in a configuration known as the GETC 1e as shown in Figure 1. The GETC logic board may be either a *Classic* GETC (19D902104) or a Lightning GETC (19D904266). The *Lightning* GETC provides protection against voltage surges and lightning; thus, the name *Lightning* GETC.

The GETC 1e provides the capability for additional software and expanded features of the Enhanced Digital Access Communication System (EDACS™). Beginning in January 1993, the GETC 1e is a standard configuration in an EDACS's Downlink, CNI, SCAT, Simulcast Control Point, Station, and Satellite Receiver.

Currently, the Turbo Board is required when using the GETC with Link software 344A4895G1 (or later) in the Downlink configuration. GETC applications using the 349A9607G1 EPROM (U2 on the GETC Logic Board) require the Turbo Board configuration.

The Turbo Board is manufactured using surface mounted components and socketed SIP microprocessor packages. The board mounts on spacers above the GETC Logic Board. Electrical connection is made by removing U3 from the GETC Logic Board and plugging the Turbo Board's 28-pin ribbon cable and connector P1 into the GETC's socket XU3. A small shield above the Turbo Board protects it from damage when sliding the GETC drawer in and out. A complete GETC 1e is shown in the Installation Instructions Diagram in this manual.

Table 1 - Connector Chart

Connector	Description
P1	Turbo Board's interface to the GETC's address/data bus & power.
J1/P2	Configure jumper to allow serial interface to U2 at TTL levels.
J2	RS-232 serial interface to U1
J3	RS-232 serial interface to U2
J4	U1 I/O
J5	U2 I/O

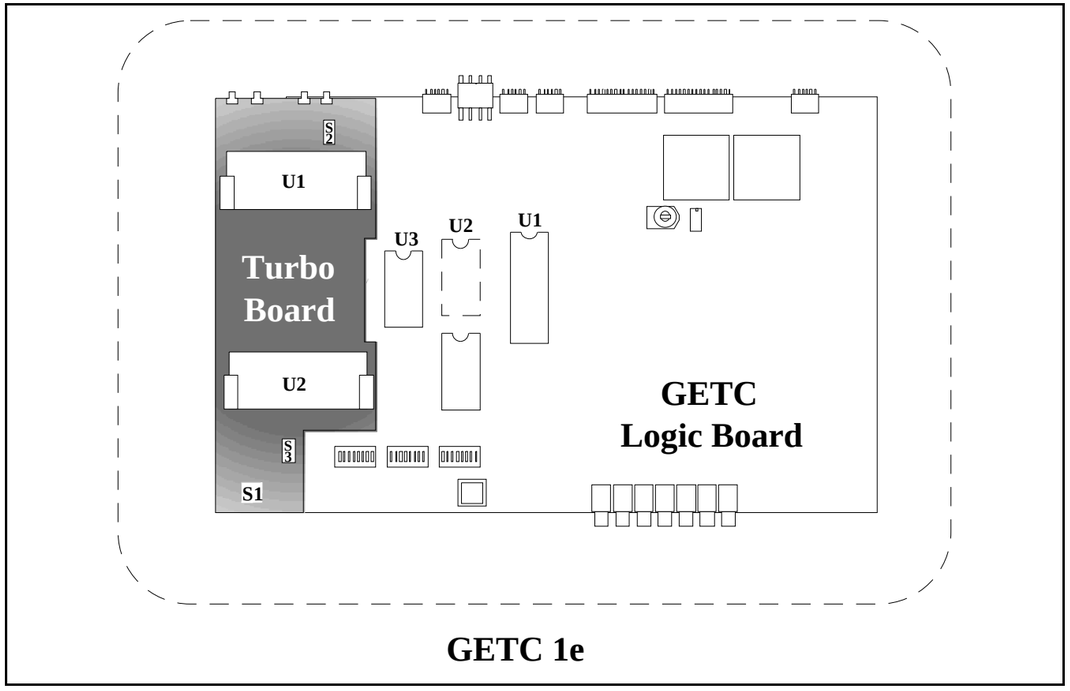


Figure 1 - GETC 1e Components

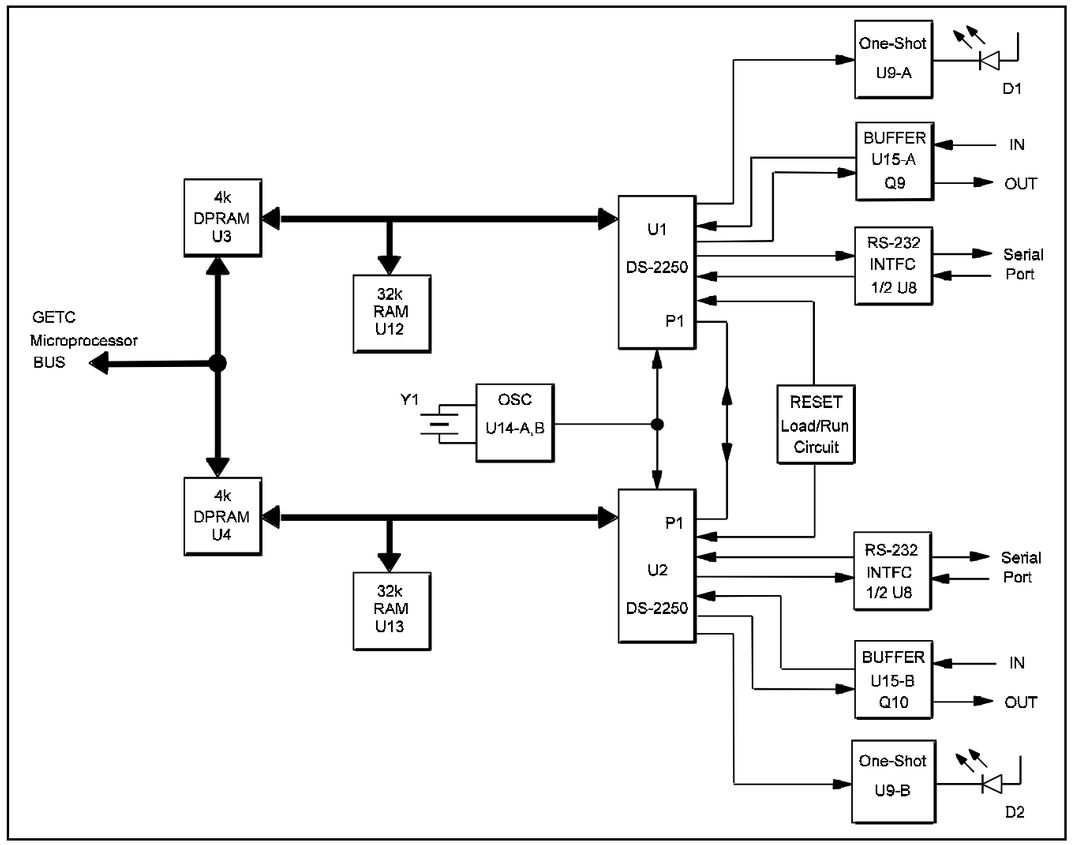


Figure 2 - Turbo Board Block Diagram

CIRCUIT ANALYSIS

The Turbo Board 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 GETC. A single oscillator, consisting of U14 and Y1, provides the clock for both processors. Each processor has a serial port which is converted to RS-232 by U8. Indicator LED's D1 and D2 are activated by one-shots in U9 as long as they are triggered by the associated processor. A single input bit and a single output bit are 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.

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).

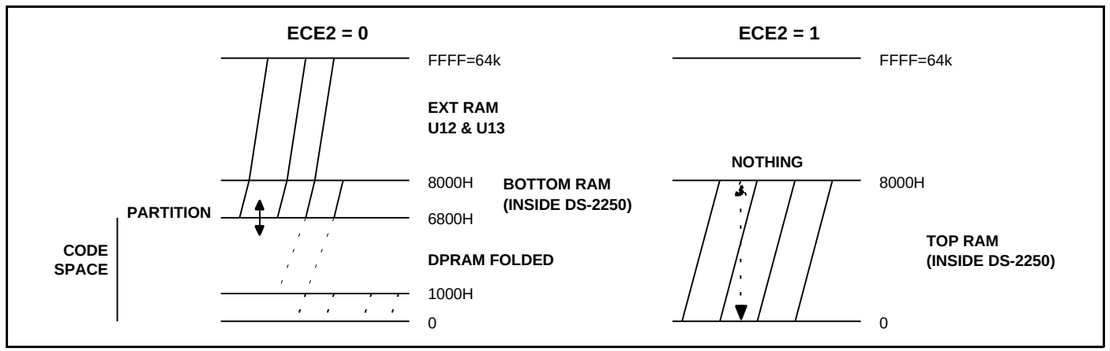


Figure 3 - Memory Map For Each DS-2250

DUAL PORT RAM

Dual-port RAM (DPRAM) chips U3 and U4 interface with the GETC's 8032 microprocessor (U1). One DPRAM port is connected to the GETC and the other port is connected to either U1 or U2. To the GETC, U3 and U4 appear as a single 8k byte memory block between addresses 0 and 1FFFH. To the Turbo Board 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 GETC processor. This permits the efficient exchange of data between the GETC and the Turbo Board. Integrated circuits U11-D and U10-D drive the output enable (read) input from the GETC, while U10-A, B, and C along with U11-A and B drive DPRAM chip enables from the GETC.

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 Board, 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 Y1 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 Board and the GETC's S4 resets the GETC. The software will usually start properly with only an S4 GETC reset; however, both boards may be reset

Depressing the Turbo Board'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 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 J2-1 and the input is at J2-2. The serial output for U2 is at J3-1 and the input is at J3-2. J1/P2 is inserted in the RXD line of U2 to allow interfacing to U2's serial port at TTL levels.

I/O BITS

One output bit from U1 is available. It is buffered by Q9 and drives out on J4-2. Weak pull-up R30 holds J4-2 high when Q9 is turned off by U1. One input bit to U1 is available. It is buffered 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 J5-2. Weak pull-up R32 holds J5-2 high when Q10 is turned off by U2. One input bit to U2 is available. It is buffered 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) U9A-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) U9B-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.

INSTALLATION

This procedure details the steps for installing the Turbo Board into the GETC shelf. If the Turbo Board was previously installed, proceed to Programming Instructions. The following materials are provided for installing the Turbo Board:

- Turbo Board 19D903536P1
- Harness 19C337712G1
- Hardware Kit 344A4019G1

GETC PREPARATION

Prepare the GETC for the Turbo Board installation by performing the following:

1. Remove U3 (19A705558P1) from the XU3 socket on the GETC board. Observe precautions for handling electrostatic sensitive devices. Return the memory IC to stock for use in other applications. Later in this procedure, the Turbo Board's P1 ribbon cable will mate with the GETC's now empty XU3 socket.

2. Solder an orange wire jumper 19A115663P4 (part of Hardware Kit 344A4019G1, item #10) from J107 to J7-7. Route the wire as shown in the Installation Diagram. This allows access to the test point covered by the Turbo Board installation.

3. Bend over or slightly move any components whose height will interfere with the Turbo Board installation.

TURBO BOARD INSTALLATION

Use the following procedures to install the Turbo Board. Refer to the Installation Diagram (19D438125). Mounting hardware for the Turbo Board is contained in Hardware Kit 344A4019G1 (see Parts List).

1. Remove the three (3) screws located on the J3 end of the GETC Board.

2. Install three (3) threaded spacers (item #3) in place of the screws removed in step 1.

3. Insert the Rockwell Modem into J3 on the GETC Board and align the mounting holes over the GETC shelf standoffs. If the GETC is not equipped with a modem, skip to step 6.

4. Insulate the modem by installing the eight (8) fiber washers (item #8). Insert four washers between the board and the mounting standoffs and place four washers on top of the modem board over the mounting holes.

NOTE

Ensure the modem is insulated from its mounting standoffs using eight A4035306P25 washers (item #8). Four washers mount on top of the modem's printed circuit board and four washers mount on the bottom of the modem's printed circuit board.

5. Secure the modem by installing two screws (removed in step 1) through the washers and modem board into the standoffs located on the end opposite J3.

6. Install two (2) nylon washers (item #5) (omit if a modem is installed) and two (2) threaded inserts (item #3) into the shelf standoffs located to the left of J3.

NOTE

When installing a Rockwell Modem, discard the two 19A701365 nylon washers (item #5). When the modem is not installed, these two washers provide insulation between the GETC Shelf and the Turbo Board's mounting standoffs.

7. Align the Turbo Board holes over the threaded spacers installed in steps 1 and 2 (orient the Turbo Board so connectors J2 and J3 are toward the rear of the GETC Shelf).

8. Secure the Turbo Board by installing two (2) pan head screws (item #6) and two (2) lock washers (item #7) through the board and into the threaded inserts located near the front of the GETC Shelf (near S1 and Y1).

9. Install three threaded inserts (item #3) through the board into the remaining spacers. These will be used to mount the guard.

10. Install the guard (item #1) using three (3) flat head screws (item #4). The guard protects the Turbo Board from inadvertent damage when sliding the GETC Shelf in and out of the service position.

11. Plug the ribbon cable from J1 on the Turbo Board into the XU3 socket on the GETC Board.

12. Install the harness assembly, 19C337712G1, by sliding the P2/P3 end of the harness through the hole provided into the back of the GETC shelf.

13. Connect the 19C337712G1 Harness P2 and P3 to the J2 and J3 Turbo Board connectors, respectively.

14. Secure the harness to the GETC shelf using retaining strap (item #9) as shown in the Installation Diagram.

15. Mount the other end of the harness on the rear of the GETC Shelf. Secure the J103/J104 support bracket to the shelf using the two (2) nut clips (Item #9) and self tapping screws (item #10).

When the installation is complete, examine the GETC Shelf for any loose hardware and follow the programming instructions in the next section.

PROGRAMMING INSTRUCTIONS

The following procedures provide instructions for programming the Turbo Board using software diskette 344A4414, an IBM compatible personal computer (PC), and interconnecting cable TQ-3360. The PC reads data from files on the 344A4414 diskette and uses the PC's COM port to serially transfer the data to the Turbo Board through J103 and J104 at the rear of the GETC Shelf.

NOTE

The software, 344A4414, 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).

1ETOOL FEATURES

The "**1etool.exe**" is a utility program shipped with Turbo software beginning with Group 2 (V2.00). Its first application is to read software version number from a Turbo Board. Other utilities may be added later.

To read a Turbo Board's software version number, connect a PC programming cable TQ3360 from either COM port on your PC to either J103 or J104 on the rear of the GETC. Execute the "**1etool.exe**" program and follow the on screen instructions to select a COM port. The program reads the Turbo Board code and displays a string of information. The string includes the software version number and media kit number.

LOAD1E FEATURES

The PC uses "**Load1e.exe**" as a file transfer utility to serially move data from the "**1etop.hex**" and "**1ebot.hex**" files on the 344A4414 diskette to the code segment of the Turbo Board's memory. The "**1ecrc.hex**" file provides Cyclical Redundancy Check (CRC) information for use in error checking during the file transfer or "programming" process.

Group 2 Enhancements

The 344A4414G2 and later versions of "**Load1e.exe**" provide enhanced COM Port support. "**Load1e.exe**" allows you to specify the PC's COM Port (COM1 or COM2) for use during Turbo Programming. This allows you to configure the PC for using "Load1e.exe" and other serial devices such as a mouse or modem.

The "**Load1e.exe**" program also provides texual error message outputs (numbered errors in previous versions). The error messages will allow you to quickly diagnose problems and take corrective action.

Another enhancement to the "**Load1e.exe**" program is its ability to leave the GETC's current Personality Programming intact. When Personality Data is present, "**Load1e.exe**" program clears and performs CRC functions over the code portion of memory only. The "**Load1e.exe**" program also stores CRC data in the DS-2250's memory for future data corruption checks.

LOADING SOFTWARE INTO THE TURBO BOARD

This procedure provides instructions for programming the Turbo Board installed in the GETC. The installation process uses the software diskette 344A4414, an IBM compatible personal computer (PC), and an interconnecting cable (TQ-3360).

The PC reads data from the files on the 344A4414 diskette transfers the data to the Turbo Board microprocessors through connectors J103 and J104 at the rear of the GETC Shelf.

Required Items

- IBM compatible PC with at least 640K memory, monitor and keyboard.
- Hard disk is recommended; but, not required.
- Serial Port configured as either COM1 or COM2.
- TQ-3360 programming cable.
- Male DB-25 to female DB-9 adapter or cable if the PC's serial port connector is a male DB-9 connector instead of a male DB-25 connector.
- Software distribution diskette 344A4414GX.

NOTE

If an error occurs, check connectors and cables. Cycle S2 and S3 from the front position, to the rear position, and again to the front position. Refer to the Error or Troubleshooting sections of this manual if the error persists.

Preparation

Prepare the PC for programming the GETC Turbo Board by performing the following steps:

1. Connect the TQ-3360 programming cable from the PC's serial port connector to the GETC Shelf connector J104 (see Figure 4). (A DB-25 to DB-9 adapter may be needed.)

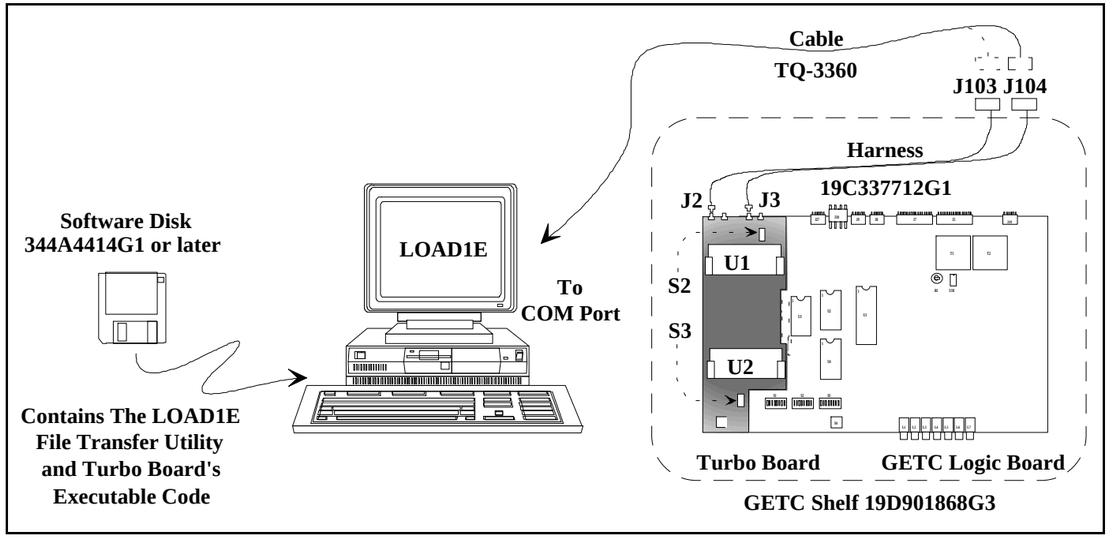


Figure 4 - Turbo Board Programming

2. Using standard DOS commands or a software file manager, create a directory named "**LOAD1E**" on the PC's hard drive.

3. Make "**LOAD1E**" the current default directory and copy the following files from the software diskette into the "**LOAD1E**" directory:
   - load1e.exe
   - 1etop.hex
   - 1ecrc.hex
   - 1ebot.hex

4. Move the Turbo Board **run/load** switches S2 and S3 to the load position (toward the front of the GETC shelf). The front position of S2 and S3 places the processors U1 and U2 into the programming mode. If either switch is already toward the front, move the switch to the rear and then back to the front position.

5. The Turbo Board LEDs D1 and D2 should turn OFF indicating that the Turbo Board is in the programming mode.

Programming Mode

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

NOTE

When using Group 2 software, re-programming the GETC Turbo Board 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. Execute the "**load1e.exe**" program on the PC and follow the on screen instructions.

   The "**load1e.exe**" program loads the file "**1etop.hex**" into the Turbo Board's upper half of memory for use by the top processor U1.

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

3. When directed, move the TQ-3360 programming cable from the GETC Shelf J104 to J103.

4. The PC will indicate it is loading the "**1ebot.hex**" file into the Turbo Board's lower half of memory for use by the bottom processor U2.

Normal Mode

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

1. Move switches S2 and S3 to the "run" position (toward the back of the GETC shelf).
2. Press S4 to reset the GETC.
3. The Turbo Board LEDs, D1 and D2, will light indicating the station code is executing.
4. Disconnect the TQ-3360 programming cable upon successful completion of the programming procedure.

This completes the Turbo Board 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 Board. When errors occur, check connectors and cables. Cycle S2 and S3 from the front position, to the rear position, and again to the front position for the file transfer mode.

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 Board 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 byte, for both DS-2250's The east significant byte must be an odd number for the top DS-2250 (U1) and exactly one less 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.

The "**Load1e.exe**" file transfer utility uses the DS-2250 serial numbers to check the cable configuration during programming. Upon completion of Turbo Board programming, the Turbo Board's executable code checks the DS-2250 serial numbers and will not operate if the serial numbers are in the wrong location or if the two serial numbers do not compare correctly.

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

TROUBLESHOOTING

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

- If an error message is received while loading the Turbo Board 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 S2 and S3 are positioned toward the rear of the Turbo Board in the RUN condition.
- Verify the jumper P2 is installed on pins J1-1 and J1-2.
- Check for 5 Vdc ± 0.25 Vdc at C5+.
- 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 Board with a known good Turbo Board. Ensure the substitute board 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 Board into XU1 of the suspect Turbo Board and likewise for U2. Remember to swap DS-2250's as pairs and reprogram the Turbo board if necessary.

GETC 1e MODULE
19D903536P1
(Ref: 344A3912, Rev. 0)
Issue 1

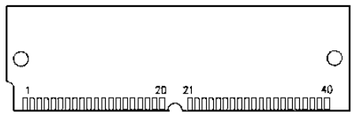
SYMBOL	PART NUMBER	DESCRIPTION
		— — — CAPACITORS — — —
C1 thru C5	19A705205P21	Tantalum: 22 µf ±20%, 20 VDCW.
C6 thru C16	19A702052P14	Ceramic: .01 µf ±10%, 50 VDCW.
C17 and C18	19A705205P19	Tantalum: 2.2 µf ±20%, 10 VDCW.
C19 and C20	19A702061P35	Ceramic: 30 pf ±5%, 50VDCW.
C21	19A705205P2	Tantalum: 1 µf ±20%, 16 VDCW.
C22 thru C24	19A702052P14	Ceramic: .01 µf ±10%, 50 VDCW.
		— — — — DIODES — — — —
D1 and D2	HSMS-T400	LED; Hewlett Packard.
D3 and D4	19A700053P2	Silicon: 2Diode, Fast Recovery, 250 mA, 70 PIV.
		— — — — JACKS — — — —
J1 thru J5	22-12-2034	3Pin; Molex
J8 and J9	22-10-2091	9Pin; Molex
		— — — — PLUGS — — — —
P1	19B802001P1	Header, 14X2; Samtec Special SEP-50546-1.7/01
		— — — TRANSISTORS — — —
Q1 thru Q3	19A700076P2	Transistor; NPN, 3904
Q4	19A700059P2	Transistor; PNP, 3906
Q5 and Q6	19A700076P2	Transistor; NPN, 3904
Q7	19A700059P2	Transistor; PNP, 3906
Q8 thru Q10	19A700076P2	Transistor; NPN, 3904

COMPONENTS, ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	PART NUMBER	DESCRIPTION
		— — — — RESISTORS — — — —
R1	19B800607P473	Metal Film: 47k ohms ±5%, 1/8 w.
R2	19B800607P103	Metal Film: 10k ohms ±5, 1/8 w.
R3	19B800607P271	Metal Film: 270 ohms ±5%, 1/8 w.
R4	19B800607P473	Metal Film: 47k ohms ±5%, 1/8 w.
R5	19B800607P103	Metal Film: 10k ohms ±5%, 1/8 w.
R6	19B800607P271	Metal Film: 270 ohms ±5%, 1/8 w.
R7	19B800607P102	Metal Film: 1k ohms ±5%, 1/8 w.
R8 thru R13	19B800607P103	Metal Film: 10k ohms ±5%, 1/8 w.
R14	19B800607P102	Metal Film: 1k ohms ±5%, 1/8 w.
R15 thru R22	19B800607P103	Metal Film: 10k ohms ±5%, 1/8 w.
R23	19B800607P105	Metal Film: 1M ohm ±5%, 1/8 w.
R24	19B800607P102	Metal Film: 1k ohms ±5%, 1/8 w.
R25 and R26	19B800607P104	Metal Film: 100k ohms ±5%, 1/8 w.
R27	19B800607P101	Metal Film: 100 ohms ±5%, 1/8 w.
R28 and R29	19B800607P103	Metal Film: 10k ohms ±5%, 1/8 w.
R30	19B800607P104	Metal Film: 100k ohms ±5%, 1/8 w.
R31	19B800607P101	Metal Film: 100 ohms ±5%, 1/8 w.
R32	19B800607P104	Metal Film: 100k ohms ±5%, 1/8 w.
R33 and R34	19B800607P103	Metal Film: 10k ohms ±5%, 1/8 w.
R35 and R36	19B800607P104	Metal Film: 100k ohms 5%, 1/8 w.
		— — — — SWITCHES — — — —
S1	19A701324P1	SW, PUSHBUTTON.
S2 and S3	SE1DGPC	SW, 2 Position Slide; ALCO.
		— — INTEGRATED CIRCUITS — —
U1 and U2	DS2250-64-12	Microprocessor, SIP module; Dallas.
U3 and U4	IDT 7134S70J	CMOS Dual-Port RAM, 32k (4kX8-Bit); IDT 7134SPLCC.
U5 and U6	19A703471P318	Octal 3-State Noninverting Transparent Latch, 74HC573.
U8	19A149446P2	RS-232 Drivers/Receivers, MAX232A.
U9	MC514538BDW	Multivibrator (Retriggerable, Resettable).
U10	19A703483P304	Hex Inverter, 74HC04A
U11	19A703483P302	Quad 2-Input NAND Gate, 74HC00.
U12 and U13	19A705981P101	Static RAM (SRAM), HM62256A.
U14	19A703995P2	Hex Unbuffered Inverter, 74HCU04.
U15	19A703483P321	Hex Schmitt-Trigger Inverter, 74HC14.
		— — — — CRYSTALS — — — —
Y1	19A702511G26	11.059 MHz.
		— — — — SOCKETS — — — —
XU1 and XU2	4-382486-0	SIMM Socket; AMP.
		— — — — JUMPERS — — — —
P2	19A702104P1	Jumper.
	CI-192-028	Insulator (Under Y1); BIVAR.
		— — — MISCELLANEOUS— — —
		HARDWARE KIT 344A4019G1 (1e Installation)
1	19B802166P1	Guard
3	19B201955P9	Spacer, Thread (Qty. 8).
4	N84P13004B6	Screw, Machine; Flat head steel (Qty. 3).
5	19A701365P8	Washer, Flat nylon (Qty. 2).
6	N80P13004B6	Screw, machine: Pan head; No. 6-32 x 1/4" (Qty. 2).
7	N404P13B6	Lockwasher, internal tooth: No. 6 (Qty. 2).
8	4035306P25	Washer, Fiber (Qty. 8).
9	19J706152P5	Strap, Retaining.
10	19A115663P4	Hook-up wire, orange.
		HARNESS INSTALLATION HARDWARE KIT 19C337712G1
	7160861P33	Clip.
	19A134011P1	Screw (wire tie).

MICROCONTROLLER U1/U2
DS2250

PACKAGE OUTLINE

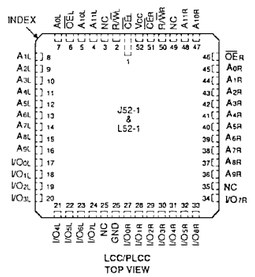


PIN ASSIGNMENTS

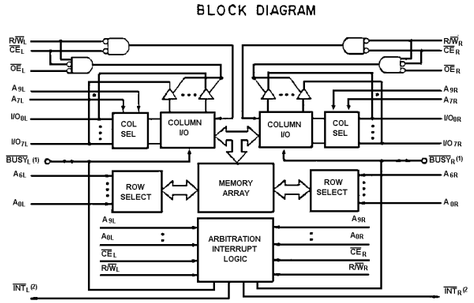
The following table summarizes the pin assignments for the DS2250:

1	P1.0	2	V_{cc}
3	P1.1	4	P0.0 (AD0)
5	P1.2	6	P0.1 (AD1)
7	P1.3	8	P0.2 (AD2)
9	P1.4	10	P0.3 (AD3)
11	P1.5	12	P0.4 (AD4)
13	P1.6	14	P0.5 (AD5)
15	P1.7	16	P0.6 (AD6)
17	RST	18	P0.7 (AD7)
19	P3.0 (RXD)	20	EA* (V_{pp})
21	P3.1 (TXD)	22	ALE (PROG*)
23	P3.2 (INT0*)	24	PSEN*
25	P3.3 (INT1*)	26	P2.7 (A15)
27	P3.4 (T0)	28	P2.6 (A14)
29	P3.5 (T1)	30	P2.5 (A13)
31	P3.6 (WR*)	32	P2.4 (A12)
33	P3.7 (RD*)	34	P2.3 (A11)
35	XTAL2	36	P2.2 (A10)
37	XTAL1	38	P2.1 (A9)
39	GND	40	P2.0 (A8)

DUAL PORT SRAM U3/U4
IDT7134S70J (344A3040P201)



BLOCK DIAGRAM

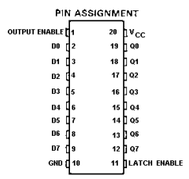


NOTES:

1. IDT7130 (MASTER): $\overline{BUSY}$ is open drain output and requires pullup resistor.
   IDT7140 (SLAVE): $\overline{BUSY}$ is input.
2. Open drain output requires pullup resistor.

OCTAL 3-STATE NONINVERTING TRANSPARENT LATCH U5, U6
19A703471P318 (74HC573)

PIN ASSIGNMENT

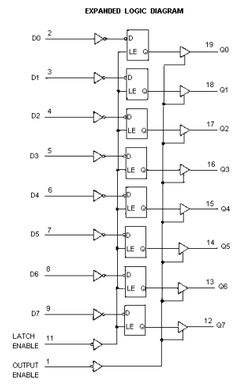


FUNCTION TABLE

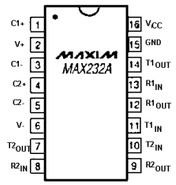
INPUTS			OUTPUT
OUTPUT ENABLE	LATCH ENABLE	D	Q
L	H	H	H
L	H	L	L
L	L	X	no change
H	X	X	Z

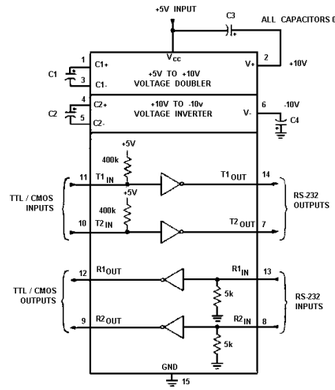
X = don't care
Z = high impedance

EXPANDED LOGIC DIAGRAM



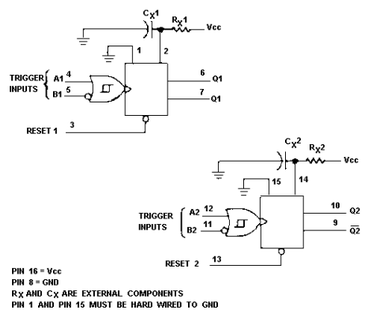
RS-232 DRIVERS/RECEIVERS U8
19A149446P2 (MAX232A)



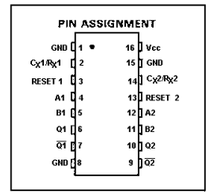


MULTIVIBRATOR (Retriggerable, Resettable) U9
MC14538BDW

BLOCK DIAGRAM



PIN ASSIGNMENT

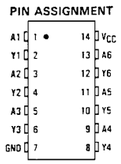


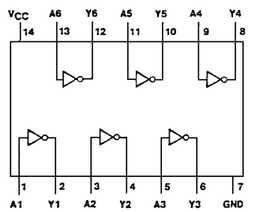
FUNCTION TABLE

Inputs			Outputs	
Reset	A	B	Q	$\overline{Q}$
H	↑	H	⊓	⊔
H	L	↓	⊓	⊔
H	X	L	Not Triggered	
H	H	X	Not Triggered	
H	L,H,↓	H	Not Triggered	
H	L	L,H,↑	Not Triggered	
L	X	X	L	H
↓	X	X	Not Triggered	

HEX INVERTER U10
19A703483P304

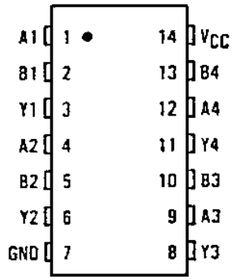
PIN ASSIGNMENT

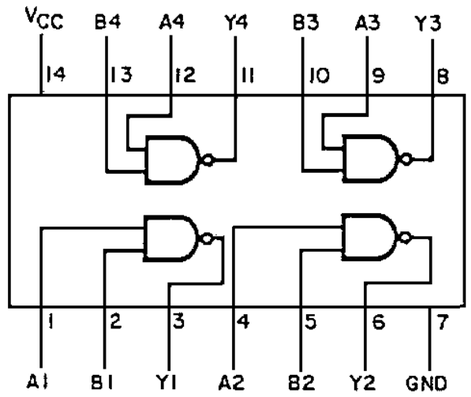




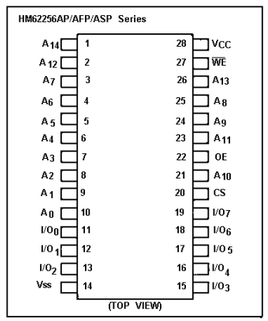
QUAD 2-INPUT NAND GATE U11
19A703483P302 (74HC00)

PIN ASSIGNMENT



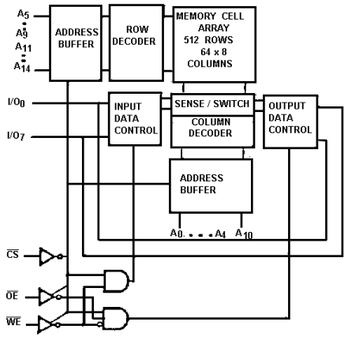


STATIC RAM U12, U13
19A705981P101 (62256)



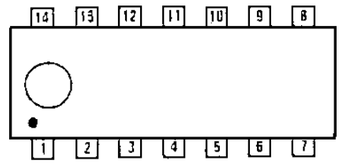
■ PIN DESCRIPTION

Symbol	Function
A_0 - A_{14}	Address
I/O_0 - I/O_7	Input / Output
$\overline{CS}$	Chip Select
$\overline{WE}$	Write Enable
$\overline{OE}$	Output Enable
NC	No Connection
Vcc	Power Supply
Vss	Ground

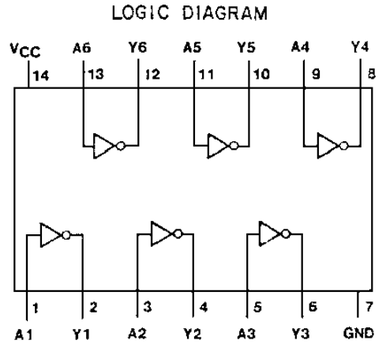


HEX UNBUFFERED INVERTER U14
19A703995P2 (74HCU04)

PIN CONFIGURATION

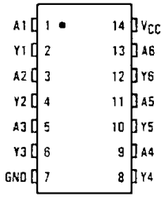


LOGIC DIAGRAM



HEX SCHMITT-TRIGGER INVERTER U15
19A703483P321 H(74HC14)

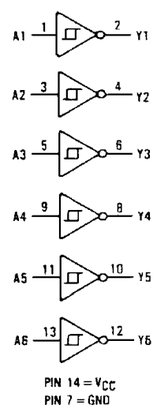
PIN ASSIGNMENT



FUNCTION TABLE

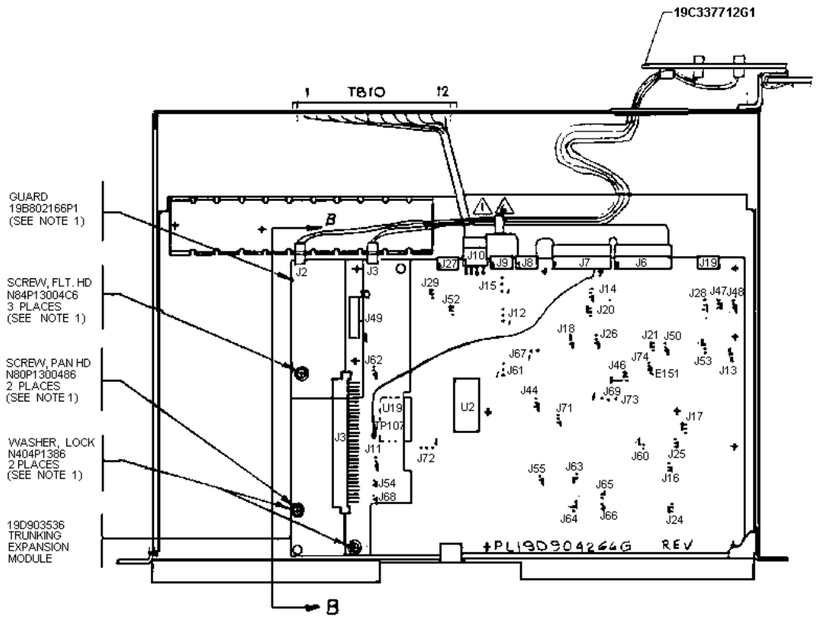
Input	Output
A	Y
L	H
H	L

LOGIC DIAGRAM



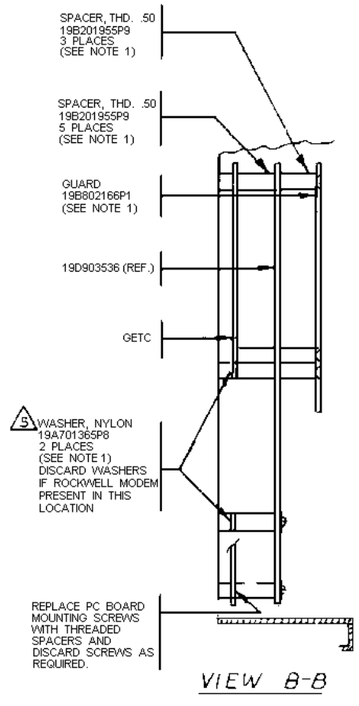
$Y = \overline{A}$

PIN 14 = V_{CC}
PIN 7 = GND



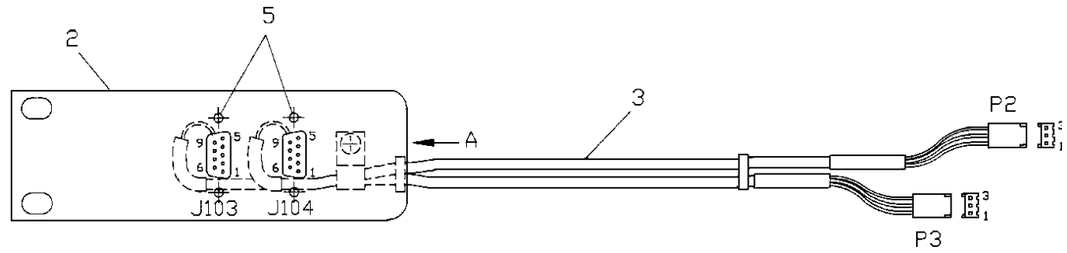
GETC 1E

1. PART OF HARDWARE KIT 344A4019G1
2. REMOVE U3 FROM GETC BOARD AND PLUG 19D903536 BOARD INTO XU3. U3 TO BE HANDLED AS STATIC SENSITIVE DEVICE AND RETURNED TO STOCK IN STATIC-FREE TUBE.
3. SOLDER ST26-0 WIRE FROM TP107 TO J7-7. ROUTE APPROXIMATELY AS SHOWN.
4. BEND OVER ELECROLYTIC CAPACITORS ON GETC BOARD TO AVOID INTERFERENCE WITH 1e MODULE.
5. IF MODULE IS LOCATED IN THIS LOCATION, REMOVE LOCKWASHERS AND SCREWS FROM THIS END OF MODULE AND INSTALL THREADED INSERTS. LEAVE LOCKWASHERS ON FAR END OF MODULE.
6. TIE CABLE TO EXISTING HARNESS WITH 19J706152P5.
7. IN SIMULCAST SYSTEM, MOUNT 19C337712G1, 1 RU BELOW GETC AFTER MOVING ANTENNA MOUNT DOWN 1 RU. USE 7160861P33 SPRING NUTS AND 19A134011P1 SCREWS PROVIDED.



GETC 1e
19D901868G3

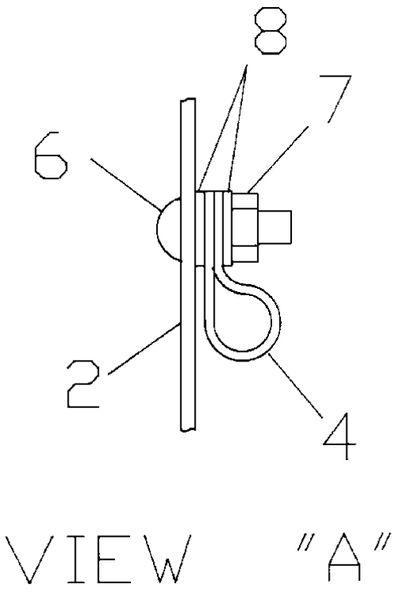
(19D438125, Sh. 3, Rev. 7)



HARNESS ASSEMBLY
19C337712G1
Issue 1

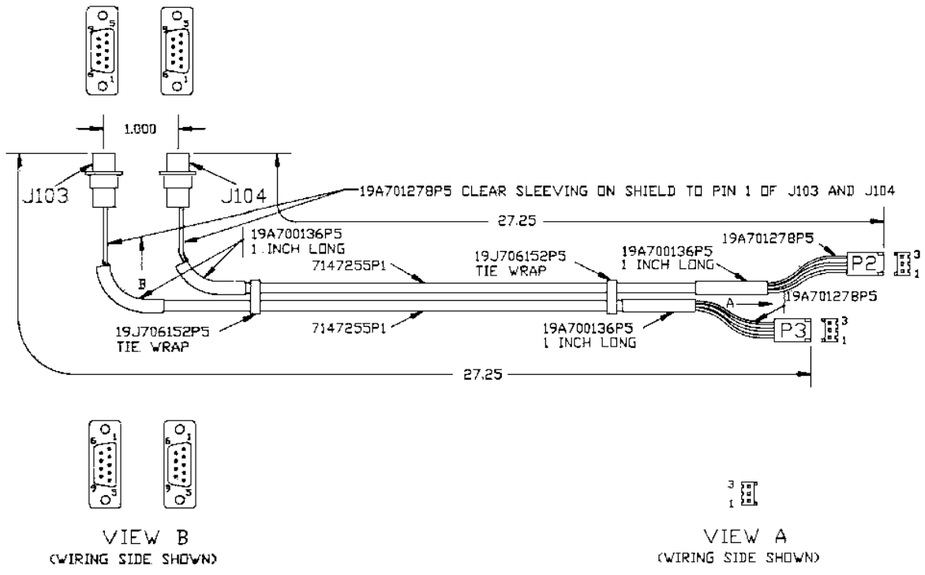
SYMBOL	PART NUMBER	DESCRIPTION
2	19C337711P1	support.
3	19D904442P1	CA.
4	19A701863P14	Strain Relief
5	19B209717P10	Screwlock: No. 4-40; sim to AMP 205817-1.
6	N80P13005B6	Machine Screw, panhead, No. 6-32 x 5/16.
7	7141225P3	Hex Nut: No. 6-32.
8	N404P13B6	Lockwasher, internal tooth: No. 6.

★ COMPONENTS, ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



TURBO BOARD HARNESS
19C337712G1

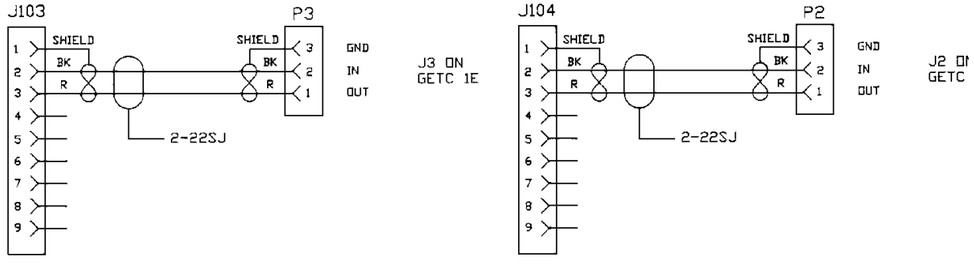
(19C337712, Sh 1, Rev. 0)



VIEW B
(WIRING SIDE SHOWN)

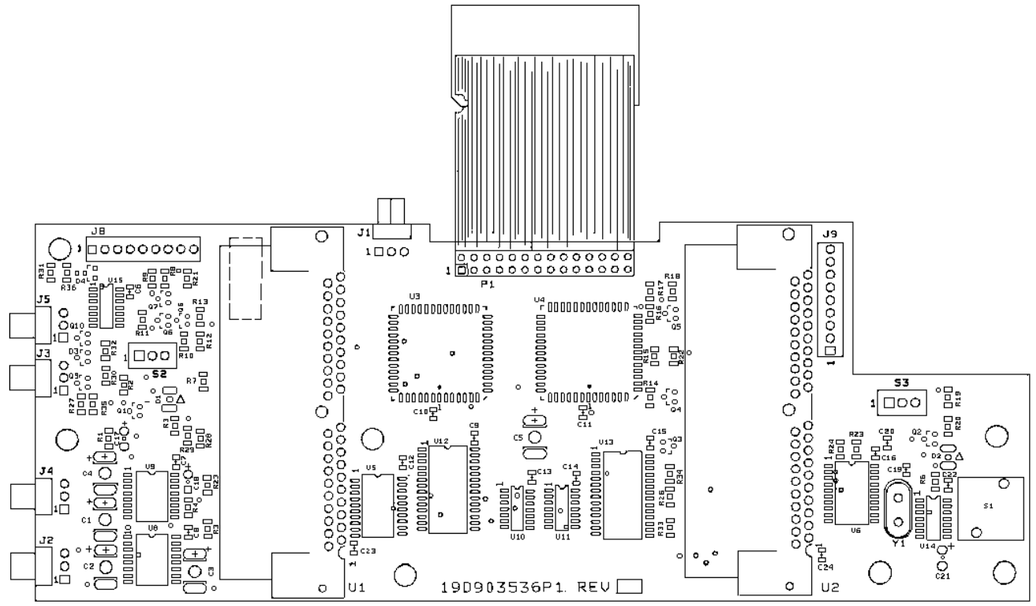
VIEW A
(WIRING SIDE SHOWN)

MATERIAL LIST				
ITEM	EGE PART NUMBER	VENDOR PART NUMBER (OR EQUIVALENT)	DESCRIPTION	QTY
J103	19B209727P18	AMP 205203-1	DB9 FEMALE CONNECTOR HOUSING	1
	19B209727P11	AMP 5-66504-9	FEMALE CONTACT (24-20 AWG)	3
J104	19B209727P18	AMP 205203-1	DB9 FEMALE CONNECTOR HOUSING	1
	19B209727P11	AMP 5-66504-9	FEMALE CONTACT (24-20 AWG)	3
P2	19A700041P29 19A704779P26	MOLEX #22-01-2035 MOLEX #08-55-0101	3 CIRCUIT FEMALE HOUSING FEMALE CONTACT (22-30 AWG)	1 3
P3	19A700041P29 19A704779P26	MOLEX #22-01-2035 MOLEX #08-55-0101	3 CIRCUIT FEMALE HOUSING FEMALE CONTACT (22-30 AWG)	1 3



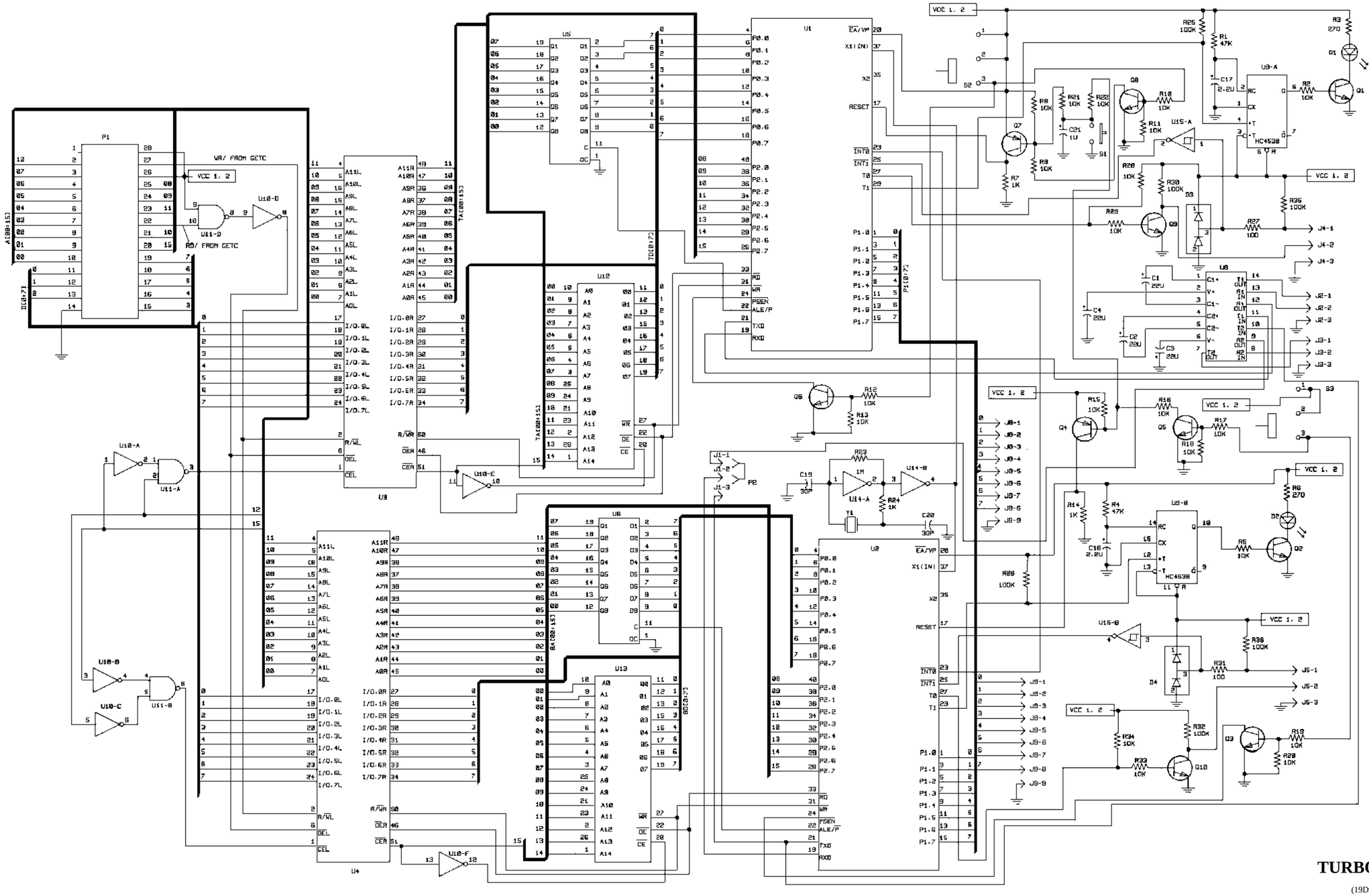
TURBO BOARD HARNESS
19C337712G1

(19D904442, Sh 1, Rev. 0)



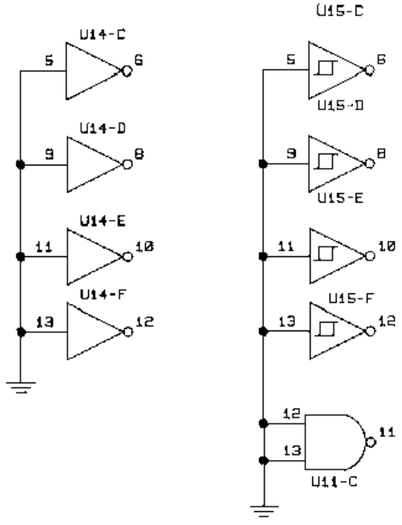
COMPONENT LAYOUT

(19D903536, Sh. 1, Rev. 1)



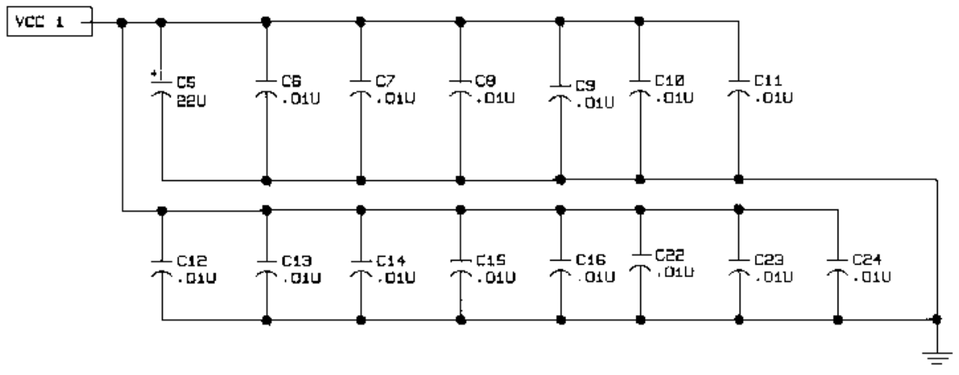
TURBO BOARD

(19D903613, Sh. 1, Rev 0)



UNUSED GATES

		VCC	GND	TYPE
U1	DS2250	2	33	SIMM 40
U2	DS2250	2	33	SIMM 40
U3	IDT7134S	52	26	PLCC52
U4	IDT7134S	52	26	PLCC52
U5	HC573	20	10	SO20W
U6	HC573	20	10	SO20W
U8	MAX232	16	15	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



BYPASS CAPACITORS

NOTES:

1. CHANGES TO THIS DIAGRAM WILL AFFECT DRAWING REVISIONS LISTED ON 344A3813.

ALL RESISTORS ARE 0.1 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY MULTIPLIER K OR M.
CAPACITOR VALUES IN F UNLESS FOLLOWED BY MULTIPLIER U, N OR P
INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER M OR U

THIS SCHEMATIC DIAG APPLIES TO	
MODEL NO.	REV LETTER
19D903536P1	

TURBO BOARD

(19D903613, Sh. 2, Rev. 0)

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