Service
Guide

Putting solutions
where the problems are.

Attaché™
Portable Computer by Otrona

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ATTACHE

Portable Computer

Service Guide

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Introduction

This service guide is intended for use by Attache owners and by service personnel in the Otrona dealer network. Complete instructions for servicing Attache are included here.

For qualified dealer service personnel:

This guide can be used to run diagnostics, assemble and disassemble the unit, swap modules, and troubleshoot each component through the entire system until the problem is resolved.

For the Attache user:

This guide can be used to run diagnostics and perform preliminary troubleshooting procedures. We say "preliminary" troubleshooting procedures because problem analysis may require swapping modules from a different unit to isolate the problem, and most users will typically not have ready access to spare modules for testing purposes.

When using the service maps, do not attempt to perform steps that are shaded on the maps. These steps are for qualified dealer service personnel only.

If you are in doubt or have any questions about servicing the unit, contact your dealer FIRST.

Using This Guide

This service guide is divided into four major sections:

1. Service Overview — A component-level introduction to the Attache modules, general maintenance and cleaning procedures, and environmental considerations for effective operation of the machine are found in Section 1. Read this introduction before you attempt to service the unit.

2. Diagnostic Test Programs — Each of the test programs that are used for Attache performance verification are found in Section 2. Use this section to run diagnostic tests.

3. Module Removal and Installation — Procedures for removing and installing each Attache module are found in Section 3. Use this section to swap modules.

4. Troubleshooting and Service Maps — Problem analysis maps are provided in Section 4 to help step you through the problem determination process. Use this section to isolate and correct problems.
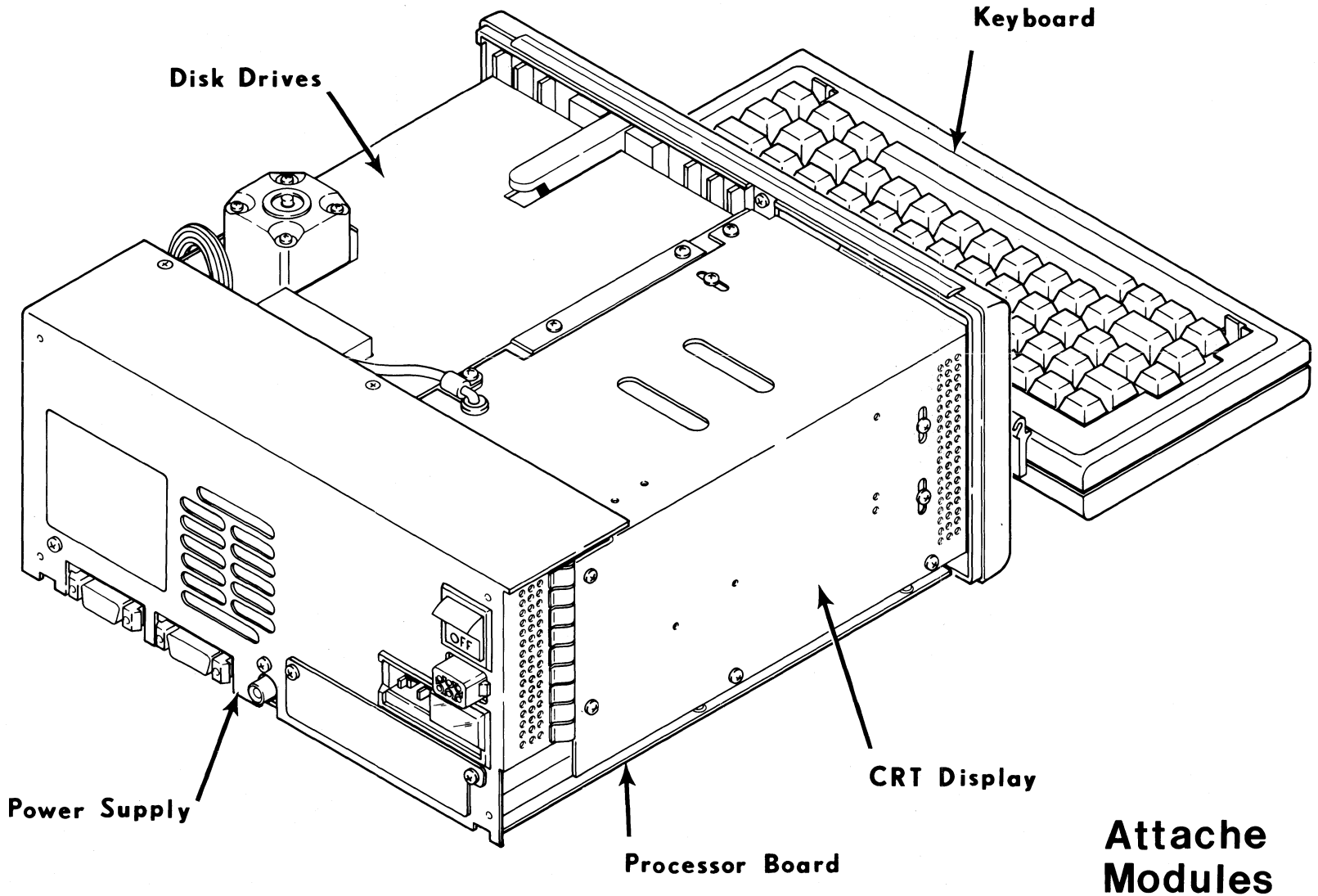
Disk Drives

Keyboard

Power Supply

CRT Display

Processor Board

Attache Modules

Attache is designed for durability and reliable performance. It is also designed for easy service if a problem occurs.

Attache hardware consists of five components housed in a high impact metal cabinet. These components or modules include the processor board, display screen, disk drives, keyboard, and power supply.

Attache's diagnostic programs are contained in ROM. Tests can be performed even if one or both disk drives are not functioning.

These diagnostic programs help you determine which module is not functioning properly. After identifying the faulty module, you simply remove that module and install a replacement part.

General Maintenance Procedures

Clean the unit with a mild non-abrasive household cleansing product. Be gentle—do not scrub. Do not spray the cleansing agent into the drive area or keyboard.

Use a cotton swab to clean around the drives and keyboard. Do not attempt to clean inside of the drive mechanism.

Use a commercial solvent-type disk head cleaning kit to clean the drive heads. These kits contain a special cleaning diskette and are available from your dealer.

Do not attempt to manually clean the drive heads.

Environmental Considerations

Even the best computer designs can malfunction if environmental specifications are exceeded. Improper power cords, fuses, and voltage selection can cause the machine to malfunction.

Use only those voltage selections, fuse sizes, and power cords that are recommended in the Attache Operator's Guide.

Temperature extremes can also cause problems. Diskettes, for example, will only function properly in the temperature range 50 to 125 degrees F and 10 to 51 degrees C.

If diskettes are exposed to temperatures outside of these ranges for extended periods, let them acclimate at room temperature for a short time prior to using them.

While Attache is not as temperature sensitive as the diskettes, the unit may not boot following exposure to extreme temperatures. If this occurs, let the unit acclimate at room temperature for a short time prior to booting the system.

Diagnostic Programs   Section 2

All diagnostic programs for troubleshooting and perfor-
mance verification are contained in the Attache Resident
Monitor, which is built into ROM.

Commands for running diagnostic programs are as
follows:

G —Display Pattern Test   R —Main Memory Test

H —Display RAM Test   S —Select Output Port

I —Input Test   T —Clock Test

J —Jump   U —United Tests

K —Keyboard Test   V —Read Disk Sector*

L —Loop Tests   W —Write Disk Sector*

M —Memory Map Test   X —I/O Transmit Test

O —Output Test   Y —I/O Receive Test

P —Format Test*   Z —Disk Drive Test*

Q —CMOS Memory Test

* This test requires a diskette. Note that disk tests are
  only as reliable as the media being used. Be sure
  that the diskette being used in the test is function-
  ing properly.

  WARNING: P, W, and Z tests alter diskette con-
  tents. Do not use diskettes containing valuable data
  or programs when running these tests.

** The Q test will set default Set-up Mode parameters
  on some processor board versions. After the diag-
  nostics have run to completion, you may have to
  reset the clock and activate the Set-up Mode to
  reset these parameters. Refer to the Q Test in this
  section for additional information.

Running the Diagnostic Programs

1. Power up the unit.

2. Insert diskettes in both drives. Use only blank diskettes or diskettes that do not contain important information that you wish to keep. The P, W, Z, and 1Z tests will destroy the contents of the diskettes.

3. Open the Drive A door so that the system will not boot the diskette.

4. Press the **RESET** key at the same time as the **SHIFT** key on the right side of the keyboard.

5. The system will attempt to boot the diskette, sense that the drive door is open, and revert to terminal mode (No System on Disk — Now in Terminal Mode is displayed).

6. Close the Drive A door so that the drive tests will execute properly.

7. Press **CTRL** and **LINE FEED** simultaneously. @ on the screen indicates that monitor mode is active.

8. With monitor mode activated, type the letter for the individual test that you wish to run, or type U and press **RETURN** to run the United Tests.

   The United Tests automatically execute the diagnostics that test the unit's main functions. These tests are as follows: H (Display RAM), Q (CMOS RAM), T (clock), M (memory map), R (main RAM), Z (drive A), and 1Z (drive B). These tests run in approximately 20 minutes.

9. Refer to the individual tests in this section of the service guide for run times and errors that may be reported.

   Note that the Q test will set default Set-up Mode parameters on some processor board versions. After the diagnostics have run to completion, you may have to reset the clock and activate the Set-up Mode to reset these parameters. Refer to the Q Test in this section for additional information.

Individual Tests

Any two or more diagnostic tests can be run sequentially as United tests by specifying the tests when the U Test is activated. You may also run the tests in a continuous loop by activating the L Test as the first letter in the command. Refer to the L Test and U Test discussions in this section of the Service Guide.

G — Display Pattern Test

Format: G (no parameters)

Function: Tests the display by filling the screen with the character "+" in each position except the cursor position (lower right corner).

Run Time: Less than 3 seconds.

Exit: Press any key.

Reports: None.

Failures: Suspect (1) loose cables, (2) CRT display module, (3) processor board module.

H — Display RAM Test

Format: H (no parameters)

Function: Tests all data bits in all locations of the alphanumeric, graphic, and attribute display memories.

Run Time: Less than 3 seconds.

Exit: Automatic at end of test.

Reports: Errors are reported in the format "llccddff", where:

    'll = the line containing the error

    cc = the character position of the error

    dd = the bit position(s) in error (in binary ones)

    ff = the frame in which the error is found.

    Frame 00-80 = graphics RAM
               CO = alphanumeric RAM
               EO = attribute RAM

Note: The frame code corresponds directly to the display memory IC's on the processor board as follows:

00-U704	40-U706	80-U708	EO-U432
20-U705	60-U707	CO-U433	

Failures: Suspect (1) loose cables, (2) processor board module.

I — Input Test

Format: ppI

Function: Reads one byte of data from the port specified in "pp". This test can be used in conjunction with the ouput command to read status or data from a port.

Run Time: Less than 3 seconds.

Exit: Automatic after byte is read.

Reports: One byte of data is displayed.

Failures: Suspect (1) operator error, (2) loose cables, (3) processor board module.

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J — Jump

Format: addrJ

Function: Jumps to the specified address and begins program execution. Control returns to Monitor Mode if a RETURN is encountered and the stack has not been altered and the EPROM is still enabled.

If no address is specified and a system diskette is inserted in drive A, a system boot occurs. Otherwise the system enters Terminal Mode.

Run Time: Less than 3 seconds.

Exit: None.

Reports: None.

Failures: Suspect (1) operator error, (2) loose cables, (3) processor board module.

K — Keyboard Test

Format: K (no parameters)

Function: Displays each key that is pressed, followed by its hexadecimal value. Note that both upper and lower case codes may be returned.

Run Time Less than 3 seconds.

Exit: Type the character ˆ to exit.

Reports: None.

Failures: Suspect (1) loose cables, (2) keyboard module, (3) processor board module.

L — Loop Tests

Format: L (test)

Function: Runs the test entered after "L" continuously.

Run Time: Runs the test continuously until you exit.

Exit: Press any key.

Reports: The test being "looped" reports as normal.

Failures: Refer to the failed test.

M — Memory Map Test

Format: Maps the memory in the reverse of standard order, with the numbers 7-1 written in the first location of virtual blocks 1-7 respectively.

Memory is then remapped to the standard configuration and the numbers are read back. Read-back values should then be 1-7 for the corresponding blocks.

Run Time: Less than 3 seconds.

Exit: Automatic at end of test.

Reports: Any virtual block that returns an erroneous number is reported in the format vn, where "v" is the virtual block number and "n" is the number returned.

Failures: Suspect (1) loose cables, (2) processor board module, (3) power supply module.

O — Output Test

Format: ppddO ("O" not "0")

Function: Outputs one data byte to a port, where "pp" is the port and "dd" is the data to send. Can be used in conjunction with the input command to send data to a port and then read status or data from the port.

For example: F2440 sends ASCII character "D" to the printer port.

Run Time: Less than 3 seconds.

Exit: Automatic after byte is sent.

Reports: None.

Failures: Suspect (1) operator error, (2) loose cables, (3) processor board module.

P — Format Diskette Test

Format: P(n) where "n" is the drive number (P = A, 1P = B).

Warning: This test will alter diskette contents. Do not use diskettes containing valuable data or programs when running this test.

Function: Formats the diskette in the specified drive.

Run Time: Less than 35 seconds.

Exit: Immediately by pressing any key, or automatically when formatting is complete.

Reports: None.

Note: The format produced is not the same optimized format that FORMAT.COM produces with CP/M. Use this routine for test purposes only.

Failures: Suspect (1) write-protect tab, (2) bad diskette, (3) dirty drive heads, (4) disk drive module, (5) processor board module, (6) power supply module.

Q — CMOS RAM Test

Format: Q (no parameters)

Function: Tests all CMOS RAM locations with a test of each data bit.

Run Time: Less than 3 seconds.

Exit: Automatic at end of test.

Reports: Any bad location is reported in the format "aadd", where "aa" is the address (0-3F) and "dd" is the failed bits (0-F).

Note: This test may reset CMOS RAM to its default values, depending upon the EPROM version of the system. If the Terminal Mode header is "Otrona Attache," the Set-up Mode parameters will reset to their default settings. If the header is "Otrona Attache x" (where "x" is any letter), the parameters will remain at their current settings.

Failures: Suspect (1) loose cables, (2) clock batteries, (3) processor board module, (4) power supply module.

R — Main RAM Test

Format: nR, where "n" is the RAM row number (0-3).

Function: Main RAM consists of four rows (0-3) of 16K RAM chips. R Test maps the block under to virtual memory area 8000-BFFF hex and checks all locations with every data bit.

Run Time: Less than 3 minutes.

Exit: Automatic at end of test.

Reports: The first nine errors found are reported as aaaa-dd, where "aaaa" is the relative address of the bad location (from the beginning of the row) and "dd" indicates the data bits in error.

Failures: Suspect (1) loose cable connections, (2) processor board module, (3) power supply module.

S — Select Output Ports

Format: bbpcS

```
      | |  |  |
      | |  |  |_____ Communications Port
      | |  |_____ Printer Port
      | |_____ Comm Port Baud Rate
      |_____ Printer Port Baud Rate
```
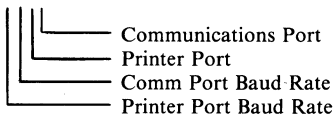
0 = deselect   1 = select

Baud Rate Table:
0 =	not changed	5 =	1200 Baud
1 =	110 Baud	6 =	2400 Baud
2 =	150 Baud	7 =	4800 Baud
3 =	300 Baud	8 =	9600 Baud
4 =	600 Baud	9 =	19200 Baud

Function: Selects the printer and communications ports to print test commands and results. Selections made here will also apply to input and output via the X and Y (transmit and receive) commands.

If terminal mode is then entered from monitor mode, the selections will remain in force.

If neither port is selected, default is to the communications port. If both ports are selected, input is accepted from either and output is sent to both.

Run Time: Less than 3 seconds.

Exit: Automatic after setting ports.

Reports: None.

Failures: Suspect (1) operator error, (2) loose cables, (3) processor board module.

T — Real-Time Clock Test

Format: T (no parameters)

Function: Tests the real-time clock for basic function without disturbing the current clock setting.

Run Time: Less than 3 seconds.

Exit: Automatic at end of test.

Reports: A question mark is displayed if the clock fails.

Failures: Suspect (1) clock not set, (2) clock batteries, (3) processor board module, (4) power supply module.

U — United Tests

Format: U (test [s]) **RETURN**

Function: Runs specified tests in sequence.

For example, UHQT runs the Display RAM, CMOS RAM, and Real-Time Clock Tests in sequence.

If no test is specified, H, Q, M, T, R, 1R, 2R, 3R, Z, and 1Z are run sequentially.

Note that the U command may be preceded by the L command to cause a continuous loop of tests (LU. . .).

Run Time: Refer to individual tests.

Exit: Automatic at end of tests, or immediately by pressing any key.

Reports: Each test reports as normal.

Failures: Refer to failed test.

V — Read a Sector from a Disk

Format: cchsV

```
sector number

surface

0 = drive 0, head 0
1 = drive 1, head 0
4 = drive 0, head 1
5 = drive 1, head 1

cylinder number
   (0-27 hex )
```
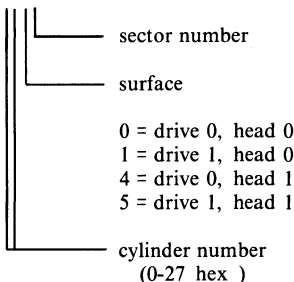
Function: Reads the specified disk sector into the memory space FE00-FFFF hex (512 bytes).

Run Time: Less than 5 seconds.

Exit: Automatic at end of transfer.

Note: Use this test with CP/M formatted diskettes only.

Reports: Data is still sent to memory when an error occurs, but the data is sent incorrectly. Any error detected in the transfer is reported as "cchs-ssee", where:

cchs = the sector selection as input
  ss = controller status register ST0 (see table)
  ee = controller status register ST1 (see table)

ssee is interpreted as (X = Don't Care)

0000 = error in data transfer from controller to RAM.

2X0X = Error caused by: drive select jumper missing, door not closed / head not loaded, no disk in logged drive, or disk not spinning properly.

4X01 = Missing address mark.

4X04 = Missing sector ID.

4X20 = CRC error in data or ID field.

4800 = Drive not ready.

Any other code indicates an error caused by the floppy controller.

Failures: Suspect (1) operator error, (2) bad diskettes, (3) dirty disk drive heads, (4) loose cables, (5) disk drive module (6) processor board module, (7) power supply module.

W — Write a Sector to a Disk

Format: cchs W

       └────── sector number

      └────── surface

          0 = drive 0, head 0
          1 = drive 1, head 0
          4 = drive 0, head 1
          5 = drive 1, head 1

      └────── cylinder number
          (0-27 hex)

Warning: This test will alter diskette contents. Do not use diskettes containing valuable data or programs when running this test.

Function: Writes to the specified disk sector from the memory space FE00-FFFF hex (512 bytes).

Run Time: Less than 5 seconds.

Exit: Automatic at end of transfer.

Reports: Any error detected in the transfer is reported as "cchs-ssee", where:

      cchs = the sector selection as input
        ss = controller status register ST0 (see table)
        ee = controller status register ST1 (see table)

      ssee is interpreted as (X = Don't Care)

      0000 = error in data transfer from controller to RAM.

      2X0X = error caused by: drive select jumper missing, door not closed / head not loaded, no disk in logged drive, or disk not spinning properly.

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4X01 = Missing address mark.

4X04 = Missing sector ID.
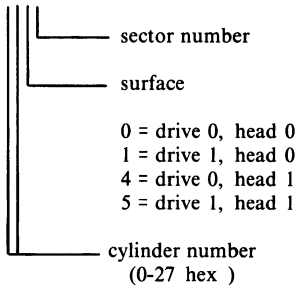
4X20 = CRC error in data or ID field.

4800 = Drive not ready.

Any other code indicates an error caused by the floppy controller.

Failures: Suspect (1) write-protect tab, (2) operator error, (3) bad diskettes, (4) dirty disk drive heads, (5) disk drive module, (6) processor board module, (7) power supply module.

X — I/O Port Transmit

Format: nnnnmmmmx, where "nnnn" is the hexadecimal number of bytes to transmit and "mmmm" is the starting memory address from which to transmit.

Function: Transmits data through the port(s) selected by the S command to another system in Y (receive) test mode.

Data format is as follows:

```
CR
nn
nn
.
.
nn
CR
```

Where "nn' is two characters per data byte, sent in pseudo-hex (0,1,2,3,4,5,6,7,8,9,:,;, <,>,?), with the most significant digit sent first.

Run Time: Depends upon amount of data to transfer.

Exit: Automatic at end of data transfer.

Reports: None.

Failures: Suspect (1) operator error, (2) loose cables, (3) processor board module, (4) power supply module.

Y — I/O Port Receive

Format: nnnY, where "nnnn" is the starting address for the data to load.

Function: Receives data through the port(s) selected by the S command from another system in X (transmit) test mode.

Run Time: Depends on amount of data to transfer.

Exit: Automatic at end of data transfer.

Reports: None.

Failures: Suspect (1) operator error, (2) loose cables, (3) processor board module, (4) power supply module.

Note: A subroutine which may be used to emulate the Attache Y Test on other systems is as follows:

```
           CR   =      0DH
CD 07C3 CY:   CALL   CI ;WAIT FOR CR
FE0D          CPI    CR
20F9          JRNZ   CY
CD 07C3 L1:   CALL   CI ;TAKE DATA
FE0D          CPI    CR
CA 0610       RZ
E60F          ANI    OFH ;ELSE STORE
07            RLC
07            RLC
07            RLC
07            RLC
57            MOV    D,A
CD 07C3       CALL   CI
E60F          ANI    OFH
B2            ORA    D
77            MOV    M,A
23            INX    H
18E7          JMPR   L1

        CI:   User Port Input Routine
```

Z — Automatic Disk Test

Format: nZ, where "n" is the drive number (Z = A, 1Z = B).

Warning: This test will alter diskette contents. Do not use diskettes containing valuable data or programs when running this test.

Note: Both Z and 1Z tests require a diskette inserted in Drive A. 1Z also requires a diskette in Drive B.

Function: Tests the diskette in the specified drive. The entire contents of the diskette are erased on both sides during this test. Errors are reported if defective media are used. The test sequence is as follows:

1. The diskette is formatted with E5.

2. A "worst-case" test pattern is written in sector 1 of each track on side 0.

3. The test pattern is read back from sector 1 of each track of side 0.

4. Steps 2 and 3 are repeated for each sector on the side.

5. Steps 2 through 4 are repeated for side 1.

Run Time: Less than 6 minutes.

Exit: Automatic at end of test.

Note: Disk tests are only as reliable as the media being used. Be sure that the diskette being used in the test is functioning properly.

A dirty head surface will cause errors during Z Test. If the test fails, use a commercial solvent type head cleaning solution to clean the heads. With the cleaning diskette in Drive A, run Z Test again. With the cleaning diskette in Drive B, run 1Z Test. The test will stop in less than 40 seconds. Then run Z Test again, using a normal system diskette.

Reports: Errors are reported in the following format:

cchs-ssee
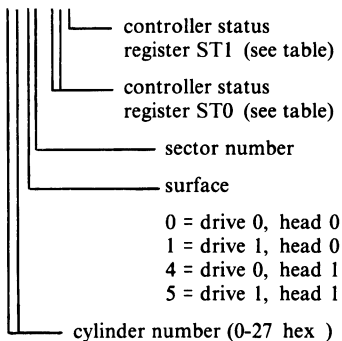
```
| | | | | |
| | | | | └──── controller status
| | | | |        register ST1  (see table)
| | | | └────── controller status
| | | |          register ST0  (see table)
| | | └──────── sector number
| | └────────── surface
| |                0 = drive 0, head 0
| |                1 = drive 1, head 0
| |                4 = drive 0, head 1
| |                5 = drive 1, head 1
| └──────────── cylinder number (0-27 hex )
```

cchs = the sector selection as input
  ss = controller status register ST0 (see table)
  ee = controller status register ST1 (see table)

ssee is interpreted as (X = Don't Care)

0000 = error in data transfer from controller to RAM.

2X0X = error caused by: drive select jumper missing, door not closed / head not loaded, no disk in logged drive (no disk in drive A while running 1Z), or disk not spinning properly.

4X01 = Missing address mark.

4X04 = Missing sector ID.

4X20 = CRC error in data or ID field.

4800 = Drive not ready.

Any other code indicates an error caused by the floppy controller.

Failures: Suspect (1) write-protect tab, (2) operator error, (3) bad diskettes, (4) dirty disk drive heads, (5) disk drive module, (6) processor board module, (7) power supply module.

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NEC 765 Status Register Identification Table

Status Register 0

NO.	NAME	SYMBOL	DESCRIPTION
D7	Interrupt Code	IC	D7 = 0 and D6 = 0 Normal termination of command (NT). Command was completed and properly executed.
D6			D7 = 0 and D6 = 1 Abnormal termination of of command (AT). Execution of command was started, but was not successfully completed.
			D7 = 1 and D6 = 0 Invalid command issue (IC). Command which was issued was never started.
			D7 = 1 and D6 = 1 Abnormal termination because during command execution the ready signal from FDD changed state.
D5	Seek End	SE	When the FDC completes the SEEK command, the flag is set to 1 (high).
D4	Equipment Check	EC	If a fault signal is received from the FDD, or if the Track 0 signal fails to occur after 77 step pulses (Recalibrate Command), then this flag is set.

NO.	NAME	SYMBOL	DESCRIPTION
D3	Not Ready	NR	When the FDD is in the not ready state and a read or write command is issued, this flag is set.
D2	Head Address	HD	This flag is used to indicate the state of the head at Interrupt.
D1	Unit Select 1	US 1	This flag indicates a Drive Unit number at Interrupt.
D0	Unit Select 0	US 0	This flag indicates a Drive Unit number at Interrupt.

Status Register 1

NO.	NAME	SYMBOL	DESCRIPTION
D7	End of Cylinder	EN	This flag is set when the FDC tries to access a sector beyond the final sector of a cylinder.
D6			Not used. This bit is always 0 (low).
D5	Data Error	DE	This flag is set when the FDC detects a CRC error in either the ID field or the data field.
D4	Over Run	OR	This flag is set if the FDC is not serviced within a certain interval by the main systems during data transfers.

NO.	NAME	SYMBOL	DESCRIPTION
D3			Not used. This bit is always 0 (low).
D2	No Data	ND	This flag is set if the FDC cannot find the sector specified in the IDR Register during execution of READ DATA, WRITE DELETED DATA or SCAN commands.

During execution of READ ID, this flag is set if the FDC cannot read the ID field without an error.

During execution of the READ A CYLINDER command, this flag is set if the starting sector cannot be found. |
| D1 | Not Ready | NW | This flag is set if the FDC detects a write protect signal from the FDD during execution of WRITE DATA, WRITE DELETED DATA, or FORMAT A CYLINDER commands. |
| D0 | Missing Address Mark | MA | This flag is set if the FDC cannot detect the ID Address Mark after encountering the index hole twice.

If the FDC cannot detect the Data Address Mark or Deleted Data Address Mark, this flag is set. |

The following pages describe the correct procedures for removing and installing each of the Attache component modules. A Phillips screwdriver is the only tool required for removal and installation of these modules.

WARNING — HIGH VOLTAGE

HIGH VOLTAGE IS PRESENT WHENEVER AT-TACHE IS POWERED ON. ALWAYS UNPLUG THE UNIT PRIOR TO REMOVING THE CABINET.

Cabinet Removal

1. Separate the keyboard cable from the main unit and place Attache face down on a soft surface to avoid scratching the cabinet.

2. Loosen and remove the four #6-32 x .500 Phillips screws (A) from the back of the unit.

3. Remove the rear computer feet (B).

4. Gently slide the cabinet (C) up from the main unit until it is clear of the computer. Be careful when sliding the cabinet as it may bind when clearing the processor board. Do not force. Some wiggling may be necessary.

WARNING — HIGH VOLTAGE

HIGH VOLTAGE IS PRESENT WHENEVER AT-TACHE IS POWERED ON. ALWAYS UNPLUG THE UNIT PRIOR TO REMOVING THE CABINET.

Attache Cabinet Assembly Parts List

Qty	Description	Otrona Part Number
1	Cabinet	68-051201
2	Computer Feet	53-051219
4	#6-32 x .500 Phillips Screws	29-000616

Cabinet Installation

1. With Attache face down, gently slide the cabinet (C) over the unit. Be careful when sliding the cabinet as it may bind on the processor board or it may disconnect the CRT or disk drive power cables. Do not force. Some wiggling may be necessary.

2. Before installing the feet, plug the unit in and power up to insure that the power cables are connected. Check the cable position by viewing through the holes on the right rear side of the cabinet. Listen for disk drive operation and check that the CRT display is functioning.

3. Align the rear computer feet (B) and insert the four #6-32 x .500 Phillips screws (A) through the feet. Tighten the screws.

4. Attach the keyboard and keyboard cable to the unit.

Processor Board Module Removal

Note: If the unit contains the optional multifunction board, remove that board prior to removing the processor board module.

1. Remove the cabinet from the unit.

2. Loosen 10 of the 12 #4-40 x .500 Phillips screws (A) from the bottom of the processor board (B). Do not remove the two screws (C) that connect the expansion connector to the processor board (see illustration).

3. Disconnect the flat-ribbon disk drive cable (D) by pressing the eject tabs on either side of the connector.

4. Disconnect the 11-pin power supply cable (E).

5. Remove all screws (A) and split-lock washers (F) that were loosened above.

6. Lift out the processor board.

Jumper Locations for Processor Board

Standard jumpers locations for RS-232 are illustrated on the next page. Jumper locations are shaded on the diagram.

NOTE: J303, J305 1-3 and 4-6 may not appear on some processor board versions. Consult the Attache Technical Manual.
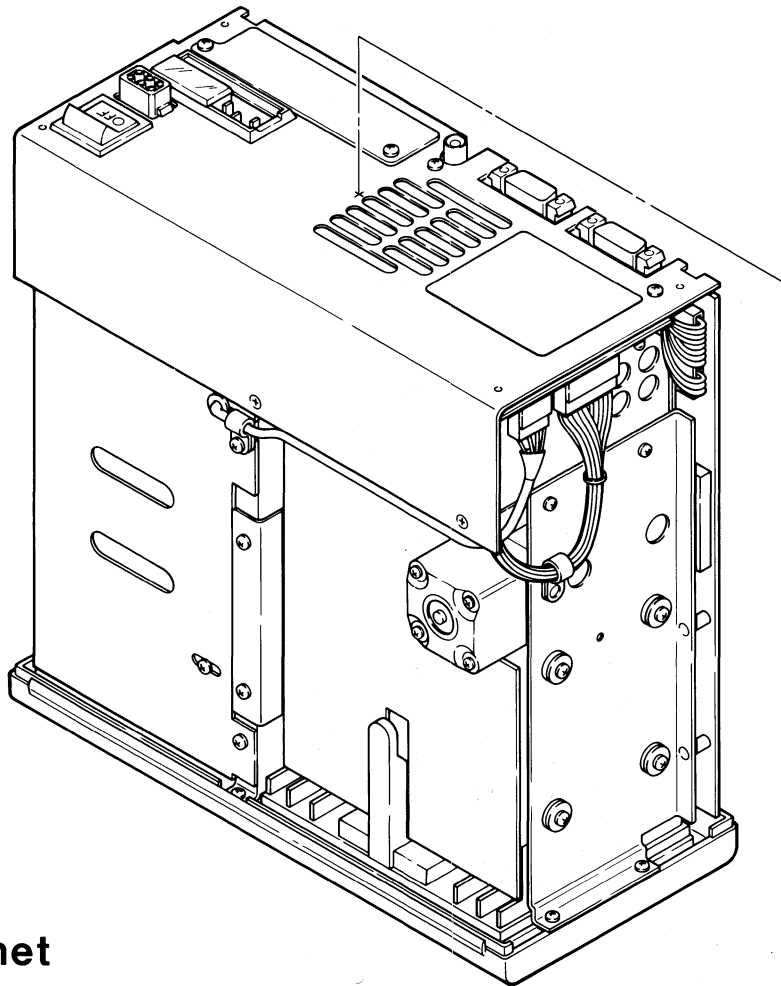
Cabinet
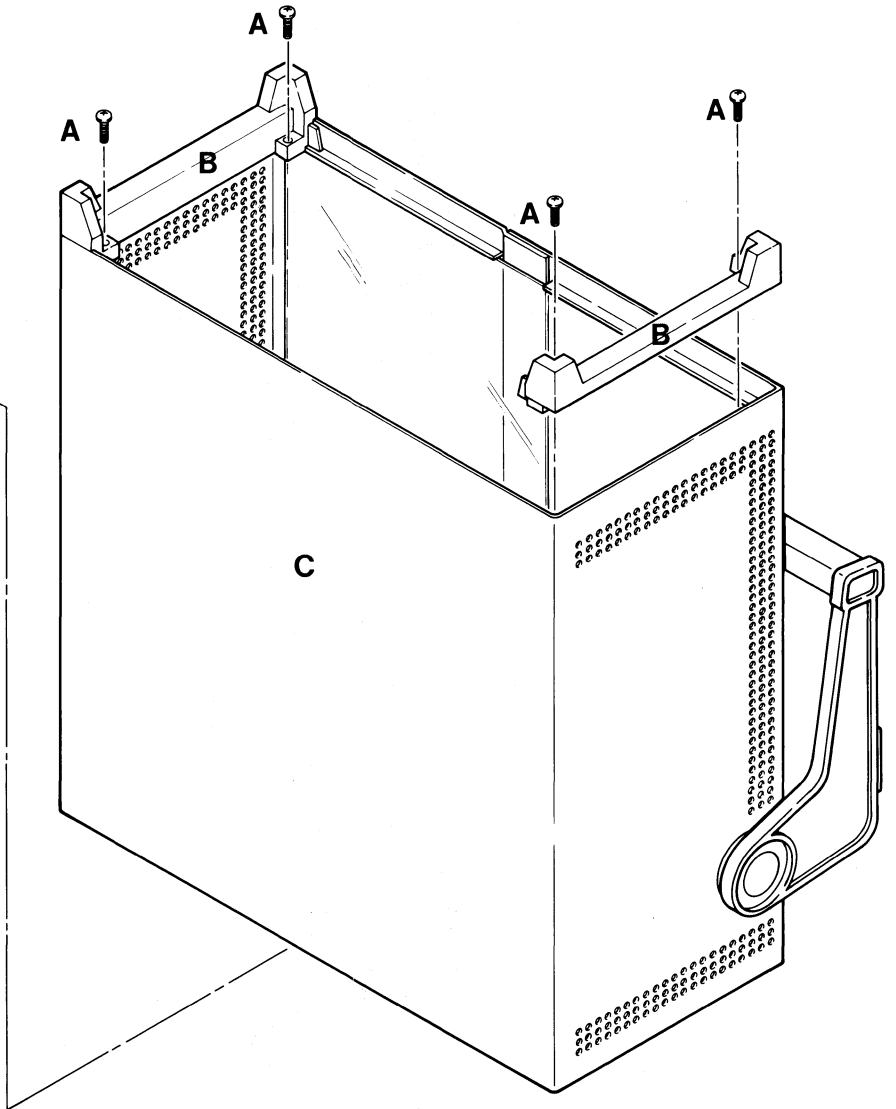
WARNING — HIGH VOLTAGE

HIGH VOLTAGE IS PRESENT WHENEVER AT-TACHE IS POWERED ON. ALWAYS UNPLUG THE UNIT PRIOR TO REMOVING THE PROCESSOR BOARD MODULE.

Processor Board Module Assembly Parts List

Qty	Description	Otrona Part Number
1	Processor Board	65-051205
1	11-Pin CPU Power Supply Cable	64-051202
10	#4-40 x .500 Phillips Screws	29-000416
10	#4 Split-lock Washers	29-110004

Processor Board Installation

1. With the unit upside down on a soft surface, place the processor board (B) onto the unit with the screw holes lined up.

2. Connect the 11-pin power supply cable (E) and check for correct installation.

3. Connect the disk drive flat-ribbon cable (D).

4. Insert all 10 #4-40 x .500 Phillips screws (A) and split-lock washers (F) and tighten.
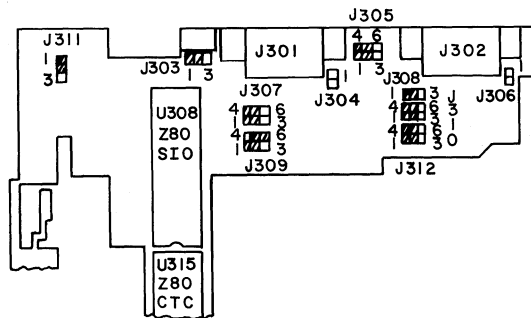
5. Reinstall the cabinet.

Power Supply Module Removal

Note: If the unit contains the optional multifunction board, remove that board prior to removing the power supply module.

1. Remove the cabinet from the unit.

2. Disconnect the 8-pin disk drive cable (A) from the power supply module (B).

3. Disconnect the 5-pin CRT cable (C) from the power supply module.

4. Disconnect the 12-pin CPU power cable (indicated by arrow) from the processor board.

5. Remove the two #6-32 x .250 flathead Phillips screws (D) from the top of the power supply module.

6. Remove the four #6-32 x .250 Phillips screws (E) and #6 split-lock washers (F) from the rear of the power supply module. The option board cover (G) will release with removal of two of these screws.

7. Remove the two #4-40 x .250 Phillips screws (H) and #4 star washers (I) from the left side of the power supply module. The power supply module will then come free.

WARNING — HIGH VOLTAGE

HIGH VOLTAGE IS PRESENT WHENEVER AT-TACHE IS POWERED ON. ALWAYS UNPLUG THE UNIT PRIOR TO REMOVING THE POWER SUPPLY MODULE.

DO NOT REMOVE
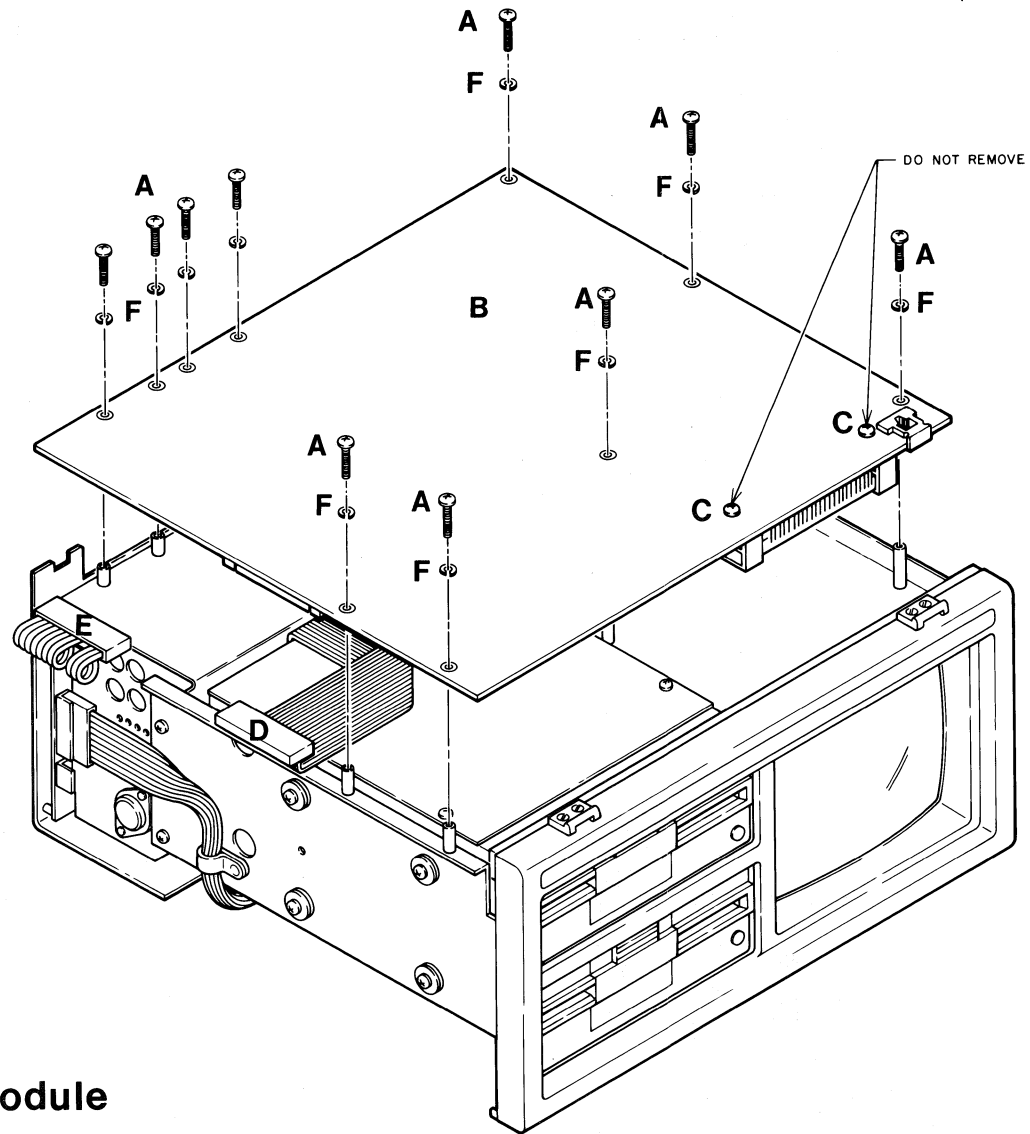
Processor Board Module

Power Supply Module Assembly Parts List

Qty	Description	Otrona Part Number
1	Power Supply Module	67-051201
2	#6-32 x .250 Flathead Phillips Screws	29-040608
4	#6-32 x .250 Phillips Screws	29-000608
2	#4-40 x .250 Phillips Screws	29-040408
4	#6 Split-lock Washers	29-110006
2	#4 Star Washers	29-114004
1	Option Board Cover	42-051210

Power Supply Module Installation

1. Insert the power supply module (B) in the back of the main unit.

2. Connect the 8-pin disk drive cable (A) to the power supply module.

3. Connect the 5-pin CRT cable (C) to the power supply module.

4. Connect the 12-pin CPU power cable (indicated by arrow) to the processor board.

5. Insert the two #6-32 x .250 flathead Phillips screws (D) into the top of the power supply module and tighten.

6. Insert two of the four #6-32 x .250 Phillips screws (E) and #6 split-lock washers (F) through the option board cover (G) and into the rear of the power supply module and tighten.

7. Insert the other two #6-32 x .250 Phillips screws (E) and #6 split-lock washers (F) into the rear of the power supply module and tighten.

8. Insert the two #4-40 x .250 Phillips screws (H) and #4 star washers (I) through the chassis and into the side of the power supply module and tighten.

9. Reinstall the cabinet.

Display Module (CRT) Removal

1. Remove the cabinet from the unit.

2. Remove the two #6-32 x .250 Phillips screws (A) with #6 star washers (B) from the mounting holes positioned on the lower left edge of the display module frame (C).

3. Remove the two #4-40 x .250 Phillips screws (D) with #4 star washers (E) from the mounting holes on the left rear edge of the display module frame.

4. Remove the # 6-32 x .250 Phillips screw (F) with #6 star washer (G) from the mounting hole located at the right forward edge of the display module frame.

5. Disconnect the power cable (H) from the 5-pin contact (I) at the left rear side of the unit. BE SURE THE UNIT IS UNPLUGGED.

6. Remove the #6-32 x .500 Phillips screw (J) with the #6 star washer (K) and #6 flat-washer (L) from the wire retaining clamp (M) and mounting hole.

7. Carefully angle the display module away from the system's face plate. Remove the display module from the chassis.

WARNING — HIGH VOLTAGE

HIGH VOLTAGE IS PRESENT WHENEVER ATTACHE IS POWERED ON. ALWAYS UNPLUG THE UNIT PRIOR TO REMOVING THE CRT DISPLAY MODULE.

Power Supply Module
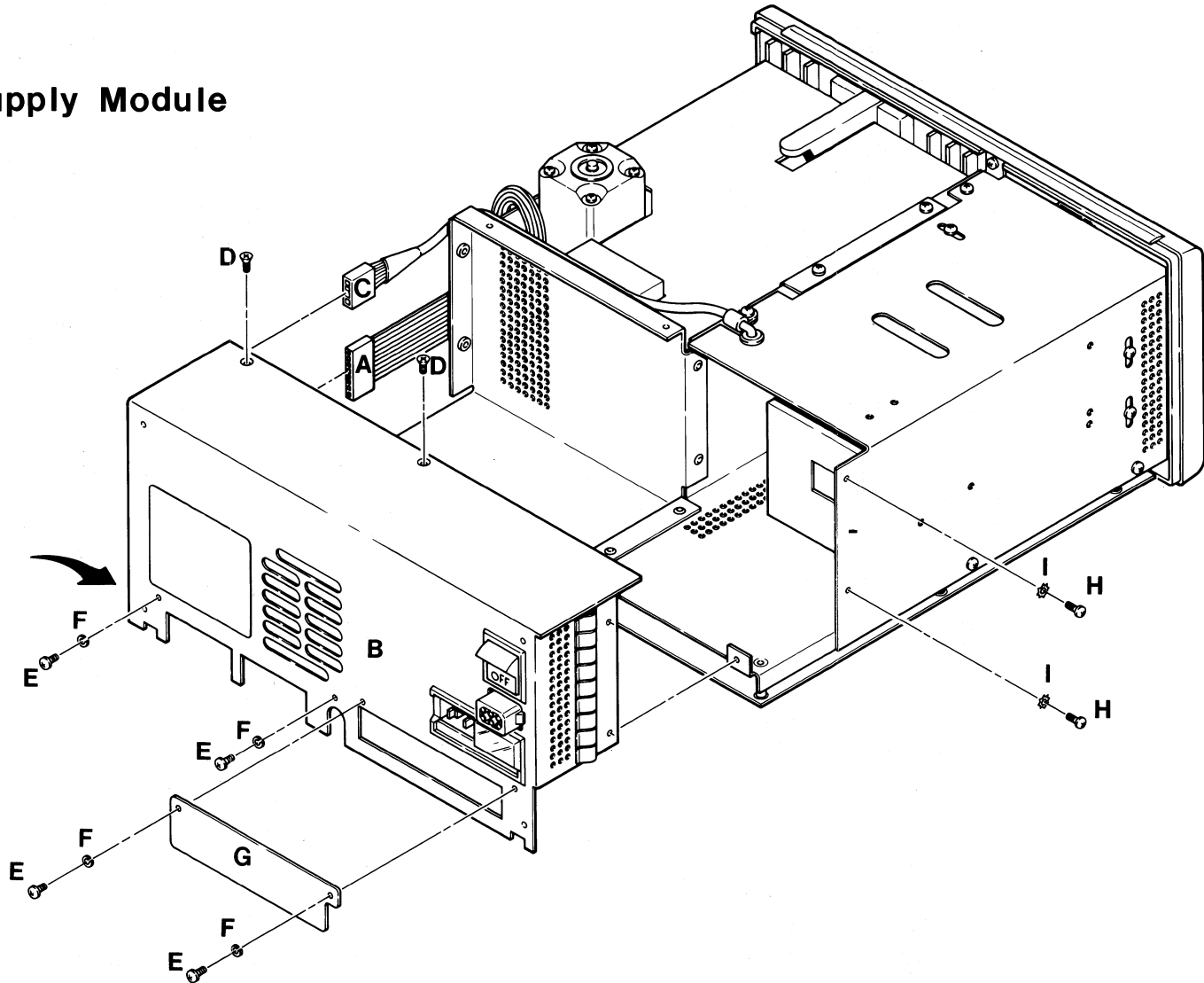
Display Module (CRT) Assembly Parts List

Qty	Description	Otrona Part Number
1	CRT Module	67-051206
1	CRT Power Cable	64-051208
3	#6-32 x .250 Phillips Screws	29-000608
2	#4-40 x .250 Phillips Screws	29-000408
1	#6-32 x .500 Phillips Screw	29-000616
4	#6 Star Washers	29-114006
2	#4 Star Washers	29-114004
1	#6 Flat Washer	29-111206

Display Module (CRT) Installation

1. With the power cable (H) facing up and to the rear of the main unit, guide the display module (C) into the chassis, making certain the power cable is positioned correctly and not pinched between the chassis and display module frame.

2. Insert the two #6-32 x .250 Phillips screws (A) with #6 star washers (B) into the mounting holes positioned on the lower left edge of the display module frame and tighten.

3. Insert the two #4-40 x .250 Phillips screws (D) with #4 star washers (E) into the mounting holes on the left rear edge of the display module frame and tighten.

4. Insert the #6-32 x . 250 Phillips screw (F) with #6 star washer (G) into the mounting hole located at the right forward edge of the display module frame and tighten.

5. Connect the power cable (H) to the 5-position contact (I) at the left rear side of the unit. BE SURE THE UNIT IS UNPLUGGED.

6. Gently push excess slack in the power cable into the display module (C) and position the wire retaining clamp (M) over the mounting hole adjacent to the point where the power cable enters the display module.

7. Insert the #6-32 x .500 Phillips screw (J) with the #6 star washer (K) and #6 flat-washer (L) through the wire retaining clamp and into the mounting hole and tighten.

8. Reinstall the cabinet.

Keyboard Module Removal

1. Disconnect the keyboard connector cable (A) from the keyboard module and release the keyboard module from the unit.

2. With the keyboard placed on a soft surface to avoid scratching, gently loosen the six #4-40 x .500 Phillips screws (B) on the bottom side of the keyboard module.

3. As the screws are removed, the upper (C) and lower (D) keyboard housing pieces will separate from the keyboard P.C. board (E).

4. Remove the upper keyboard housing piece and then remove the keyboard P.C. board.

WARNING — HIGH VOLTAGE

HIGH VOLTAGE IS PRESENT WHENEVER AT-TACHE IS POWERED ON. ALWAYS DISCONNECT THE KEYBOARD CABLE PRIOR TO REMOVING THE KEYBOARD HOUSING.
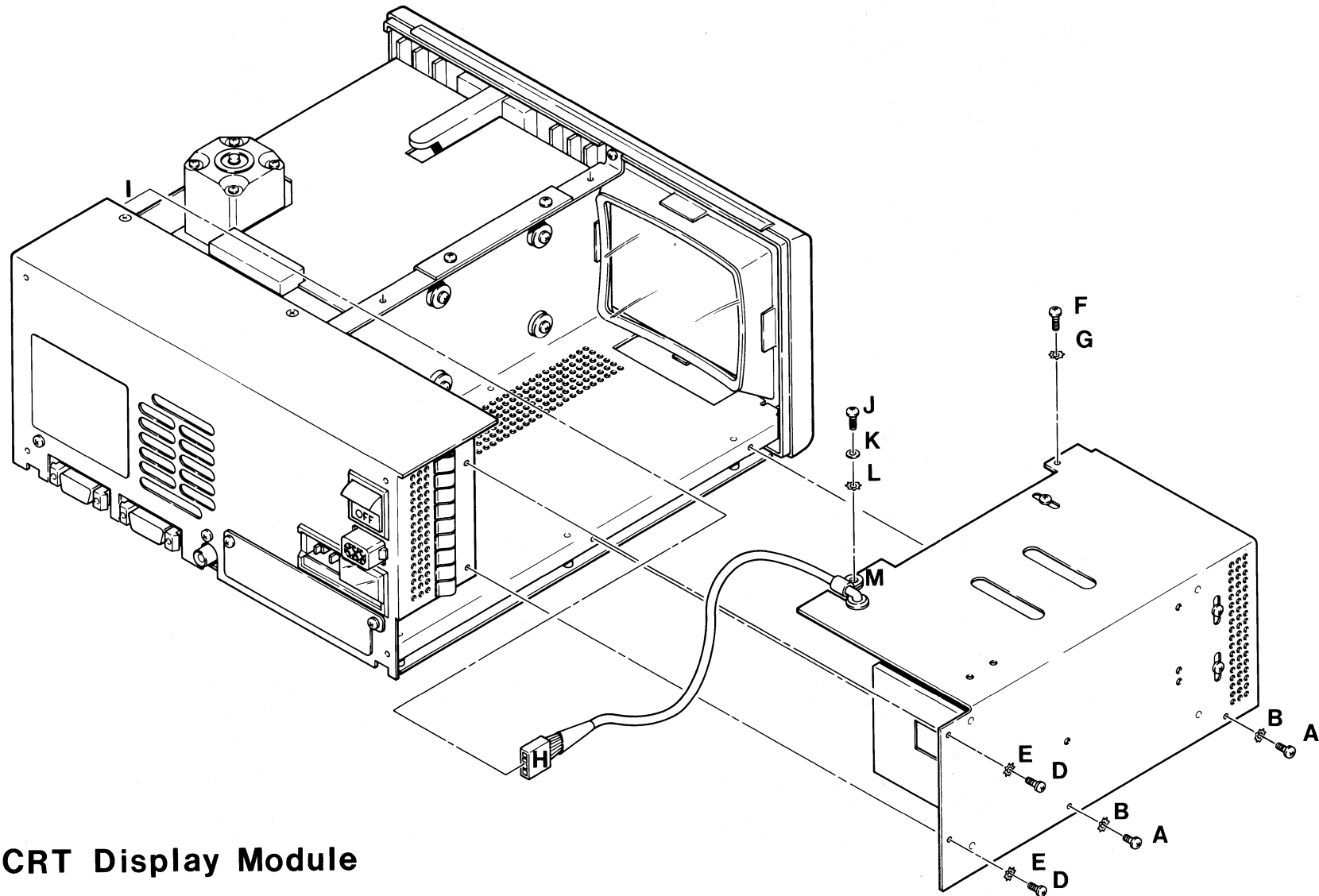
CRT Display Module

Keyboard Module Assembly Parts List

Qty	Description	Otrona Part Number
1	Keyboard PCB Assembly	65-051203
1	Keyboard Bottom	53-051208
1	Keyboard Top	53-051211
1	Coiled Keyboard Cord	23-900003
6	#4-40 x .500 Phillips Screws	29-000416
2	Keyboard Hinge	53-051209
2	Keyboard Latch	53-051210
2	#4-40 x .250 Phillips Screws	29-00408
2	#4-40 x .250 Phillips Flathead Screws	29-000412

Keyboard Module Installation

1. Place the keyboard P.C. board (E) with the keys facing up on the lower keyboard housing piece (D) with the screw holes lined up for both pieces.

2. Place the upper keyboard housing piece (C) on the keyboard P.C. Board with the screw holes lined up.

3. Turn the assembled keyboard module over and insert the six #4-40 x .500 Phillips screws (B).

4. Tighten each screw, maintaining the same relative pressure for each screw until all screws are tight. Then tighten or loosen screws as required to level the keyboard P.C. board.

5. Connect the keyboard connector cable and attach the assembled keyboard module to the main unit.

Disk Drive Module Removal

1. Remove the cabinet from the unit.

2. Disconnect the 8-pin disk drive cable (A) from the power supply (B).

3. Loosen and remove the two #4-40 x .500 Phillips screws (C) and split-lock washers (D) from the bottom of the right floppy bracket (E).

4. Remove the two #6-32 x .250 Phillips screws (F) and star washers (G) from the top of the frame.

5. Remove the two #6-32 x. 250 Phillips screws (H) and star washers (I) from the right floppy bracket (near the power supply).

6. Remove the two #4-40 x .250 Phillips screws (J) and star washers (K) that connect the floppy bracket to the front bezel (L).

7. Disconnect the flat-ribbon disk drive cable (M) from the processor board (N) by pressing the eject tabs on either side of the connector.

8. Slide the disk drive module (O) out the right side of the unit.

WARNING — HIGH VOLTAGE

HIGH VOLTAGE IS PRESENT WHENEVER AT-TACHE IS POWERED ON. ALWAYS UNPLUG THE UNIT PRIOR TO REMOVING THE DISK DRIVE MODULE.

Keyboard
Module
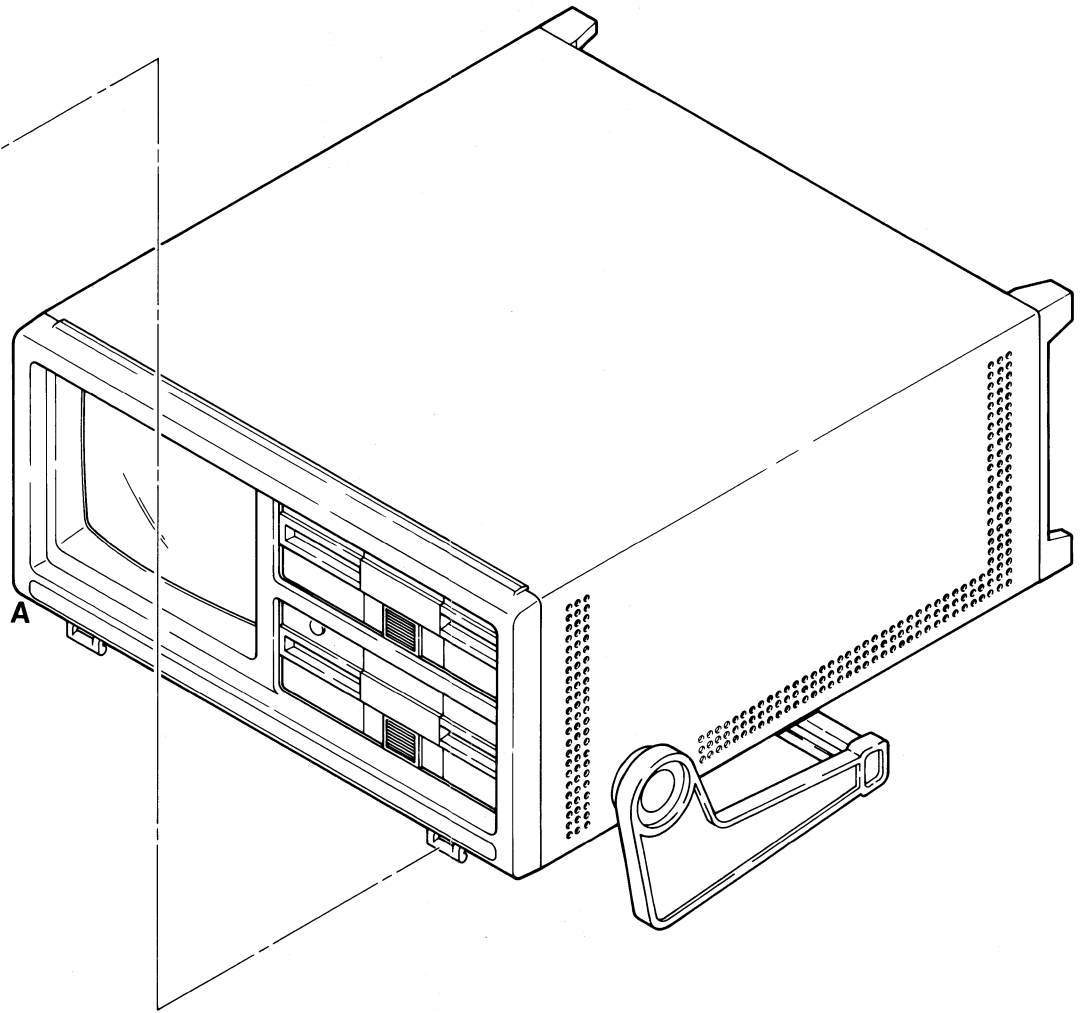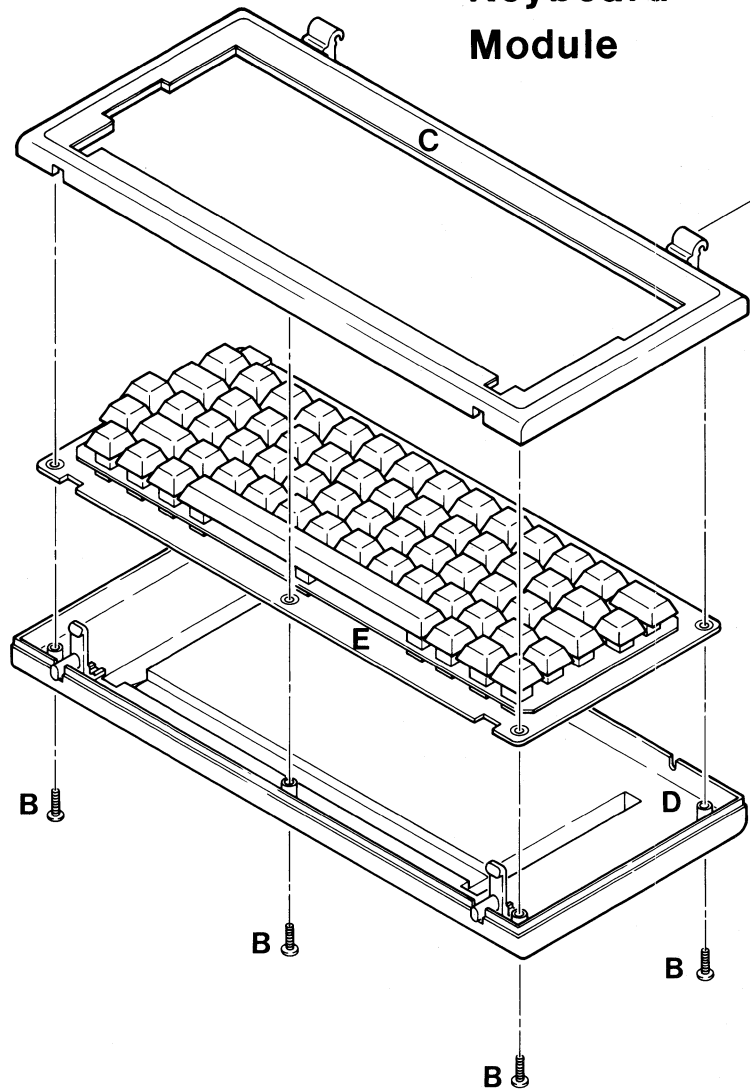
Disk Drive Module Assembly Parts List

Qty	Description	Otrona Part Number
1	Disk Drive Module (TEAC)	67-051207
	(Remex)	67-051203
	(Single TEAC Drive)	66-051206
1	8-Pin Disk Drive Cable (TEAC)	64-051216
1	8-Pin Disk Drive Cable (Remex)	64-051207
1	Flat-Ribbon Disk Drive Cable (Remex)	23-020034
1	Flat-Ribbon Disk Drive Cable (TEAC)	23-020035
2	#4-40 x .500 Phillips Screws	29-000416
4	#6-32 x . 250 Phillips Screws	29-040608
2	#4-40 x .250 Phillips Screws	29-040408
4	#6 Split-lock Washers	29-110006
4	#4 Star Washers	29-114004

Disk Drive Module Installation

1. Slide the disk drive module (O) in the right side of the unit.

2. Connect the 8-pin disk drive cable (A) to the power supply (B).

3. Connect the flat-ribbon disk drive cable (L) to the processor board (M).

4. Insert the two #4-40 x .250 Phillips screws (J) and star washers (K) through the right floppy bracket (E) and tighten into the front bezel (L).

5. Insert the two #6-32 x .250 Phillips screws (F) and star washers (G) in the top of the frame and tighten.

6. Insert the two #6-32 x .250 Phillips screws (H) and star washers (I) in the rear of the right floppy bracket (near the power supply). Push down on the top of the power supply and tighten the screws.

7. Insert the two #4-40 x .500 Phillips screws (C) and split-lock washers (D) into the bottom of the right floppy bracket. Push in on the bottom of the right floppy bracket and then tighten the screws.

8. Reinstall the cabinet.

Removal of a Single TEAC Disk Drive

Note: This procedure applies to TEAC drives only. The two REMEX drives are a single unit and may not be swapped individually.

1. Remove the cabinet from the unit.

2. Remove the disk drive module.

3. Disconnect the 8-pin disk drive cable (A) from the drive module.

4. Disconnect the flat-ribbon disk drive cable (B) from the drive module.

5. Remove the two upper or lower (depending on which drive you want to remove) #6-32 x .500 flat-head Phillips screws (C) from the mounting bracket (D) on either side of the drive module. This will release the spacers and washers as well.

6. Remove the drive from the mounting bracket.

WARNING — HIGH VOLTAGE

HIGH VOLTAGE IS PRESENT WHENEVER AT-TACHE IS POWERED ON. ALWAYS UNPLUG THE UNIT PRIOR TO REMOVING THE DISK DRIVE FROM THE DISK DRIVE MODULE.
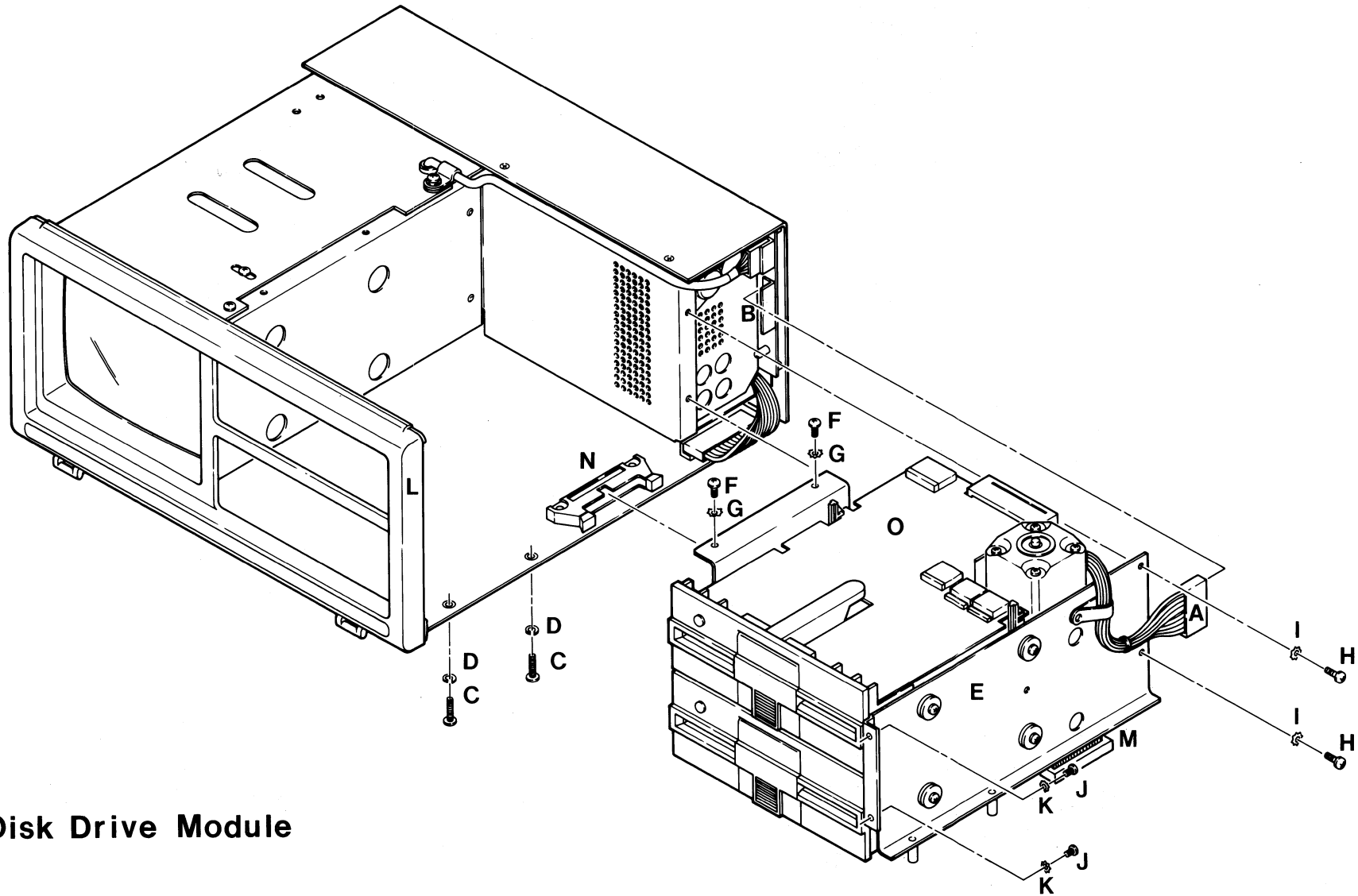
Disk Drive Module

TEAC Drive Module Assembly Parts List

Qty	Description	Otrona Part Number
1	8-Pin Disk Drive Cable	23-020035
1	Flat Ribbon Disk Drive Cable	64-051216
4	#6-32 x .500 Flathead Phillips Screws	29-045506
8	#6 Star Washers	29-114004
1	Right Floppy Bracket	42-051232
1	Drive Bottom Shield	42-051234
1	Left Floppy Shock Mount	64-051213
4	Shock Mounts	53-051201
4	#4 Flat Washer .500 OD	29-111004
4	#4 x .250 Clear Spacer	29-210008
2	2-pin .1" Center Jump Plug	10-029903

## Installation of a Single TEAC Disk Drive

NOTE: This procedure applies to TEAC drives only. The two REMEX drives are a single unit and may not be swapped individually.

1. Configure the jumpers and removable chip as follows for each drive:

   Drive A: Jumper position DS0.
   Remove the jumper from position DS1.
   Install chip R204 (R-Pack Terminator).

   Drive B: Jumper position DS1.
   Remove the jumper from position DS0.
   Remove chip R204 (R-Pack Terminator).

   Note: For single drive units, TEAC drives are shipped configured as A drives.

2. Insert the drive into the drive mounting bracket (D) and fasten with four #6-32 x .500 flathead Phillips screws (C) on each side of the module (two screws on each side for each drive). Be sure to reinstall the washers and spacers for these screws as illustrated on the diagram.

3. Connect the 8-pin disk drive cable (A) and the flat-ribbon disk drive cable (B).

4. Reinstall the disk drive module.

5. Test the drive using the Z test for drive A or 1Z test for drive B.

6. Reinstall the cabinet.

Clock Battery Removal and Installation

The real-time clock uses two 1.5 volt silver oxide batteries (Duracell MS76 or equivalent), which are located on the right rear side of the processor board module.
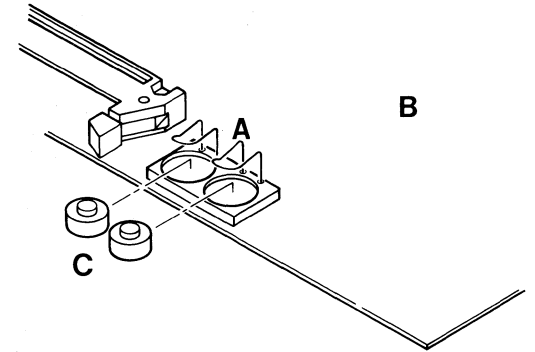
Clock Batteries

1. Remove the cabinet from the unit.

2. Lift the retaining clips (A) on the right side of the processor board (B) and remove the batteries (C).

3. Install new batteries by lifting the retaining clips and inserting the new batteries.

4. Reinstall the cabinet.

Note: If the clock batteries require frequent replacement, you may need to replace the clock chip on the processor board. Consult the Attache Technical Manual.
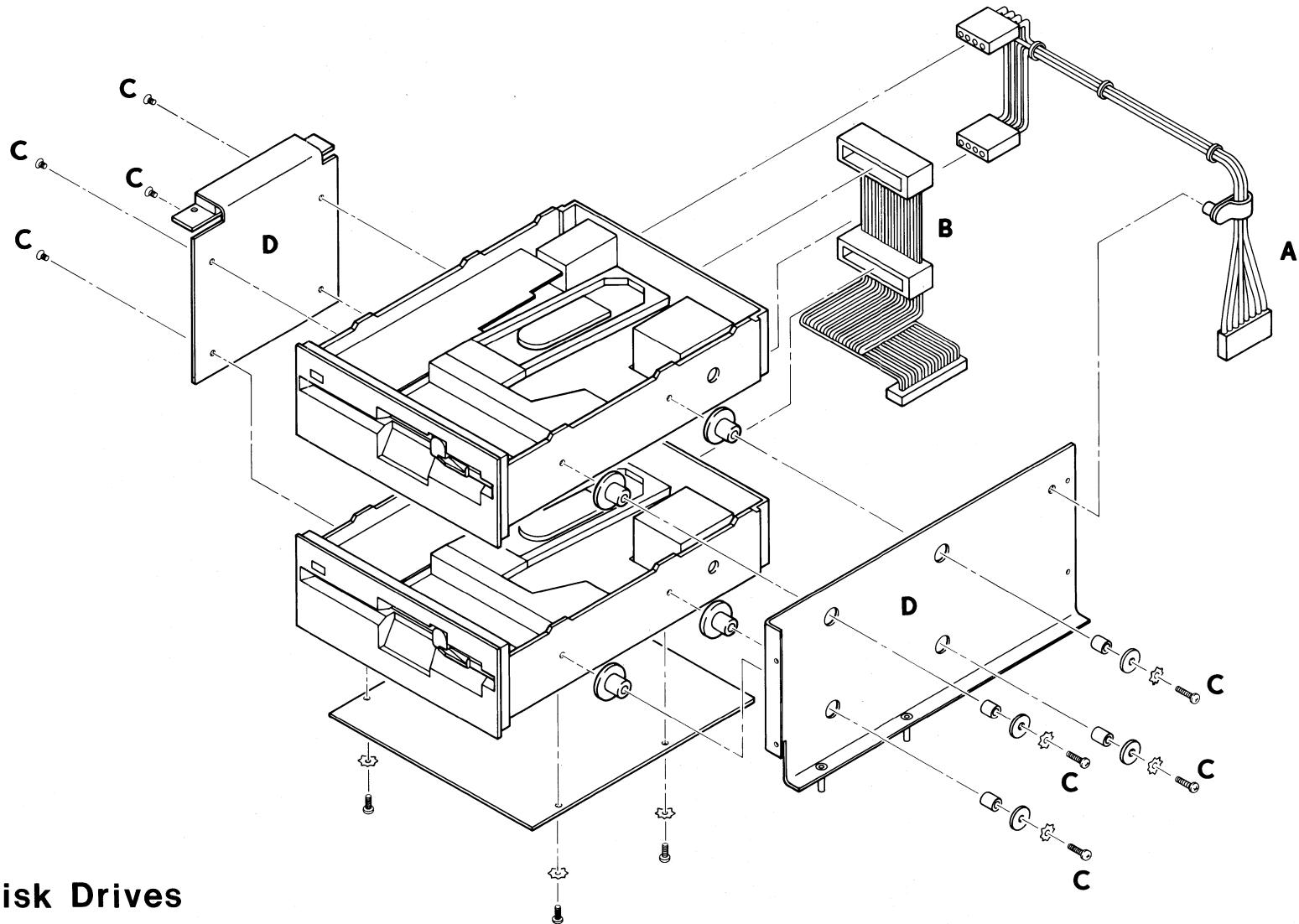
Teac Disk Drives

The service maps on the following pages are designed to help you isolate problems at the module level. These maps follow the troubleshooting process from preliminary problem identification through diagnostic analysis and the actual assembly and disassembly that is required for swapping the faulty module.

These maps are intended primarily for use by qualified dealer service personnel. Attache users will be able to follow the maps to the solution for most problems.

However, problems that are more complicated or involve more advanced troubleshooting techniques should be handled by qualified dealer service personnel. Areas that are shaded in the service maps indicate steps that should NOT be taken by the user.

Procedures that require swapping modules will, of course, depend on the availability of replacement modules. If you do not have access to another unit to use for swapping modules while testing a problem, return the unit to your dealer for service.

If you are in doubt or have any questions concerning these procedures, contact your dealer FIRST.

How to Use the Service Maps

The service maps consist of a series of numbered steps. The reference number (shown at the left of each step) identifies the step and is used to direct you through the maps.

For example, step 0010 asks you a question. If your answer is YES, you move to step 0020, which will ask you another question.

If your answer to step 0010 is NO, you move next to step 0100. This process of questions and answers continues until you have arrived at the solution to the problem.

Sample Service Map

REF#	DESCRIPTION	ACTION REQUIRED	
0010	Is power up normal?	Yes	No
		GOTO 0020	GOTO 0100

To use the maps, begin at step 0010 and proceed as directed until you have completed step 0900 or 0910.

Note: areas that are shaded in the service maps indicate steps that should be taken by qualified service personnel only. Return the unit to your dealer for service rather than proceed into a shaded area.

After you have solved the problem, use the maps to work backward and reinstall any good modules that were replaced during the troubleshooting process.

If possible, test the modules that were replaced one at a time in a different unit. Then run all diagnostics again and test the unit in operation to insure that it is functioning properly.

Troubleshooting Service Maps

Preliminary Problem Analysis			
REF#	DESCRIPTION	ACTION REQUIRED	
0010	Is power up normal? Does the screen display "OTRONA ATTACHE" when the power is turned on?	Yes GOTO 0020	No GOTO 0100
0020	Does the Diagnostic "U" test run without reporting errors?	Yes GOTO 0030	No GOTO 0200
0030	Does the unit boot?	Yes GOTO 0040	No GOTO 0300
0040	Does the screen display characters properly?	Yes GOTO 0050	No GOTO 0400

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

0050	Does the keyboard function properly?	Yes GOTO 0060	No GOTO 0500
0060	Does the sound generator function properly?	Yes GOTO 0070	No GOTO 0600
0070	Does the real-time clock function properly?	Yes GOTO 0080	No GOTO 0700
0080	Do the disk drives function properly?	Yes GOTO 0900	No GOTO 0800

Shaded areas indicate steps for qualified dealer service personnel only.

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Troubleshooting Service Maps

		Power Up Not Normal	
REF#	DESCRIPTION	ACTION REQUIRED	
0100	Check the main power fuse. Is the fuse good? Is it securely seated in the fuse box?	Yes GOTO 0105	No Replace the fuse if it is blown and seat it securely in the fuse box. GOTO 0105
0105	Check the voltage selector. Is the voltage card set to the proper selection?	Yes GOTO 0110	No Set the voltage selector. GOTO 0110

Shaded areas indicate steps for qualified dealer service personnel only

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Troubleshooting Service Maps

0110	Check the power cord. Is it functioning properly?	Yes GOTO 0115	No Replace the power cord. GOTO 0115
0115	Plug in the unit and power on. Look through the holes on the lower right rear side of the cabinet. Is the green LED on?	Yes GOTO 0120	No GOTO 0125
0120	Is the fan functioning properly?	Yes GOTO 0155	No GOTO 0125
0125	Unplug the unit and remove the cabinet. Are the CRT and disk drive power cables seated properly in the pin connectors on the power supply? Is the CPU power cable seated properly in the pin connector on the processor board?	Yes GOTO 0130	No Seat the CRT, CPU, and disk drive power cables properly in the pin connectors. GOTO 0130

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

0130	Disconnect the disk drive, CRT, and CPU power cables. Plug in the unit and power on. Is the green LED on?	Yes GOTO 0135	No Replace the power supply module. GOTO 0150
0135	Power down and unplug the unit. Connect the CPU power cable. Plug in the unit and power on. Is the green LED on?	Yes GOTO 0140	No Replace the processor board module. GOTO 0150
0140	Power down and unplug the unit. Connect the disk drive power cables. Plug in the unit and power on. Is the green LED on?	Yes GOTO 0145	No Replace the disk drive module. GOTO 0150

Shaded areas indicate steps for qualified dealer service personnel only.

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Troubleshooting Service Maps

0145	Power down and unplug the unit. Connect the CRT power cable. Plug in the unit and power on. Is the green LED on?	Yes GOTO 0150	No Replace the display module. GOTO 0150
0150	Power down and unplug the unit. Connect all power cables. Plug in the unit and power on. Is the green LED on?	Yes GOTO 0155	No GOTO 0125
0155	Does the screen display "OTRONA ATTACHE" when you power up?	Yes GOTO 0160	No GOTO 0910
0160	Will the unit boot?	Yes GOTO 0900	No GOTO 0300

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

		Diagnostic Test Failure and Probable Cause	
REF#	DESCRIPTION	ACTION REQUIRED
0200	If G Test fails:	Suspect: (1) loose cable connections, (2) CRT display, (3) processor board GOTO 0030
0205	If H Test fails:	Suspect: (1) loose cable connections, (2) processor board GOTO 0030
0210	If I Test fails:	Suspect: (1) operator error, (2) loose cable connections, (3) processor board GOTO 0030
0215	If J Test fails:	Suspect: (1) operator error, (2) loose cable connections, (3) processor board GOTO 0030

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

0220	If K Test fails:	Suspect: (1) loose cable connections, (2) keyboard, (3) processor board GOTO 0030
0225	If L Test fails:	Suspect: (1) operator error, (2) refer to failed test GOTO 0030
0230	If M Test fails:	Suspect: (1) loose cable connections, (2) processor board (3) power supply GOTO 0030
0235	If O Test fails:	Suspect: (1) operator error, (2) loose cable connections, (3) processor board GOTO 0030
0240	If P Test fails:	Suspect: (1) write-protect tab, (2) bad media, (3) dirty heads, (4) disk drives, (5) processor board, (6) power supply GOTO 0030

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

0245	If Q Test fails:	Suspect: (1) loose cable connections, (2) clock batteries, (3) processor board, (4) power supply. GOTO 0030
0250	If R Test fails:	Suspect: (1) loose cable connections, (2) processor board, (3) power supply GOTO 0030
0255	If S Test fails:	Suspect: (1) operator error, (2) loose cable connections, (3) processor board GOTO 0030
0260	If T Test fails:	Suspect: (1) clock not set (2) clock batteries, (3) processor board, (4) power supply GOTO 0030

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

0265	If U Test fails:	Suspect: (1) operator error, (2) refer to failed test GOTO 0030
0270	If V Test fails:	Suspect: (1) operator error, (2) bad media or dirty heads, (3) loose cable connections, (4) disk drives, (5) processor board, (6) power supply GOTO 0030
0275	If W Test fails:	Suspect: (1) write-protect tab, (2) bad media, (3) dirty heads, (4) disk drives (5) processor board (6) power supply GOTO 0030
0280	If X Test fails:	Suspect: (1)operator error (2) loose cable connections, (3) processor board, (4) power supply GOTO 0030

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

0285	If Y Test fails:	Suspect: (1) operator error, (2) loose cable connections (3) processor board, (4) power supply GOTO 0030
0290	If Z Test fails:	Suspect: (1) write-protect tab, (2) bad media (3) dirty heads, (4) disk drives, (5) processor board, (6) power supply GOTO 0030

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

	Unit Does Not Boot		
REF#	DESCRIPTION	ACTION REQUIRED	
0300	Check the diskette in Drive A. Does the disk have a known good system on it?	Yes GOTO 0310	No Replace the diskette with a good disk and retry the bootstrap operation.
0310	Run Diagnostic "U." Do all diagnostics run without reporting errors?	Yes GOTO 0320	No Determine which diagnostic failed. Rerun that test and document any errors that are reported. Refer to individual diagnostic tests in this manual to determine the problem.

Shaded areas indicate steps for qualified dealer service personnel only.

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Troubleshooting Service Maps

0320	Will the unit boot after all diagnostics have run without reporting errors?	Yes GOTO 0900	No Run Diagnostic "V" on Track 0 Sector 1 ("LU1V"). GOTO 0330
0330	Can Diagnostic "V" read the track (FE03/) with no errors reported? Does Byte 3 = "A7"?	Yes GOTO 0340	No Bad program on disk. The diskette in Drive A does not contain a readable boot program. Replace the diskette and retry the bootstrap operation.
0340	Does the unit boot after the Diagnostic "V" has run with no errors reported?	Yes GOTO 0900	No GOTO 0800

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

		CRT Display Not Functioning Properly	
REF#	DESCRIPTION	ACTION REQUIRED	
0400	Will the unit boot?	Yes GOTO 0410	No GOTO 0300
0410	Activate Set-up Mode and adjust display brightness. Is the display now correct?	Yes GOTO 0900	No GOTO 0420
0420	Attach an external monitor to the RCA jack on the back of the unit. Does the display appear correct on the external monitor?	Yes GOTO 0430	No Replace the processor board module. GOTO 0450

Shaded areas indicate steps for qualified dealer service personnel only

Troubleshooting Service Maps

0430	Unplug the unit and remove the cabinet. Is the CRT power cable properly seated in the pin connector near the power supply? Do all other cables appear to be properly seated?	Yes Replace the display module. GOTO 0440	No Seat the cables properly in the pin connectors. If the display screen does not display correctly after seating the cables, replace the display module. GOTO 0440
0440	Is the display now correct after the display module has been replaced?	Yes GOTO 0900	No Replace the processor board module. GOTO 0450

Shaded areas indicate steps for qualified dealer service personnel only

Troubleshooting Service Maps

0450	Is the display now correct after the processor board module has been replaced?	Yes GOTO 0900	No Replace the power supply module. GOTO 0460
0460	Is the display now correct after the power supply module has been replaced?	Yes GOTO 0900	No GOTO 0910

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

		Keyboard Not Functioning Properly	
REF#	DESCRIPTION	ACTION REQUIRED	
0500	Replace the keyboard cable. Does the keyboard function properly now?	Yes GOTO 0900	No GOTO 0510
0510	Run Diagnostic "K". Do all keys function properly during this test?	Yes GOTO 0520	No Replace the keyboard module and run Diagnostic "K" again. GOTO 0530
0520	Does the keyboard function properly after running the diagnostic test "K"?	Yes GOTO 0900	No Replace the keyboard module. GOTO 0530

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

0530	Does the keyboard function properly after the keyboard module has been replaced?	Yes GOTO 0900	No Replace the processor board module. GOTO 0540
0540	Does the keyboard function properly after the processor board module has been replaced?	Yes GOTO 0900	No GOTO 0910

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Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

| **Sound Generator Not Functioning Properly** |

REF#	DESCRIPTION	ACTION REQUIRED	
0600	Activate Set-up Mode. Set the volume to "16" and the key sound to "CLICK." Does the sound generator function properly now?	Yes GOTO 0900	No GOTO 0610
0610	Remove the cabinet and then remove the processor board. Remove Jumper J501 and then scope pin 5. Is the result positive voltage?	Yes Replace the power supply module. GOTO 0620	No Replace the processor board module. GOTO 0630

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

0620	Does the sound generator function properly after the power supply module has been replaced?	Yes GOTO 0900	No Replace the processor board module. GOTO 0640
0630	Does the sound generator function properly after the processor board module has been replaced?	Yes GOTO 0900	No Replace the power supply module. GOTO 0640
0640	Does the sound generator function properly after both the power supply module and processor board module have been replaced?	Yes GOTO 0900	No GOTO 0910

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

Real-Time Clock Not Functioning Properly			
REF#	DESCRIPTION	ACTION REQUIRED	
0700	Run the utility program "TIME" and set the clock. Activate Set-up Mode. Is the clock functioning properly now?	Yes GOTO 0710	No Remove the cabinet and replace the clock batteries GOTO 0720
0710	Power the unit down for several minutes and then power it up again. Is the clock still functioning properly?	Yes GOTO 0900	No Remove the cabinet and replace the clock batteries. GOTO 0720
0720	Use the TIME utility to reset the clock after replacing the batteries. Is the clock functioning properly now?	Yes GOTO 0730	No GOTO 0740

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

0730	Power the unit down for several minutes and then power it up again. Is the clock still functioning properly?	Yes GOTO 0900	No GOTO 0740
0740	Run Diagnostic "T". Does the test return a question mark?	Yes Replace the processor board module. GOTO 0750	No Check that the batteries are seated properly and retry the TIME utility procedure.
0750	Use the TIME Utility to reset the clock. Is the clock functioning properly now?	Yes GOTO 0900	No GOTO 0910

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

REF#	DESCRIPTION	ACTION REQUIRED	
	Disk Drives Not Functioning Properly		
0800	With diskettes inserted in both drives, run Diagnostic "Z" for Drive A and "1Z" for Drive B. Do the tests run without reporting any errors?	Yes GOTO 0810	No Clean the heads and replace the diskettes. Then retry Diagnostic "Z" and "1Z". GOTO 0805
0805	Do the tests run without reporting any errors after the diskettes have been replaced and the heads have been cleaned?	Yes GOTO 0810	No Document all errors. GOTO 0810
0810	Will the unit boot?	Yes GOTO 0815	No GOTO 0830

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

0815	Log Drive B and run DIR. Does the program execute properly?	Yes GOTO 0820	No GOTO 0830
0820	Check the CRT display module. Does the CRT's P.C. Board have a cylinder-like shield around the flyback transformer?	Yes GOTO 0830	No Replace the display module. GOTO 0825
0825	Does the unit function properly after you have replaced the display module?	Yes GOTO 0900	No GOTO 0830
0830	Are the disk drive power cable and disk drive CPU cable properly seated in the pin connectors? Are jumpers attached properly on the drive's P.C. Board?	Yes GOTO 0840	No Seat the cables and jumpers properly. GOTO 0835

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

0835	Does the unit function properly after cables and jumpers have been seated?	Yes GOTO 0900	No GOTO 0840
0840	Does the unit contain TEAC drives?	Yes GOTO 0850	No Replace the Remex disk drive module. GOTO 0845
0845	Does the unit function properly after the Remex disk drive module has been replaced?	Yes GOTO 0900	No Replace the processor board module. GOTO 0860

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

0850	Is only one TEAC Drive failing?	Yes Replace the failing TEAC drive. GOTO 0855	No Replace both TEAC drives. GOTO 0855
0855	Does the unit function properly after the TEAC drive or drives have been replaced?	Yes GOTO 0900	No Replace the processor board module. GOTO 0860
0860	Does the unit function properly after the processor board module has been replaced?	Yes GOTO 0900	No GOTO 0910

Shaded areas indicate steps for qualified dealer service personnel only.

Troubleshooting Service Maps

		Problem Resolution	
REF#	DESCRIPTION	ACTION REQUIRED	
0900	Problem resolved.	Retrace your steps through the service maps. Where more than one module was replaced, determine which module was actually at fault.	
		Reinstall any module that did not actually require replacement. If possible, test the old modules one at a time in a different unit.	
		Run all diagnostic tests again and test the unit in operation to insure that it is now functioning properly.	
		Return all faulty modules to your dealer.	
		If you are a dealer, contact your customer service representative at Otrona for instructions on returning faulty modules to the factory.	
0910	Problem not solved.	Begin the troubleshooting process again, using different replacement modules if possible. Document your work in detail as you go.	
		If the problem is still not corrected, reinstall the old modules and return the unit to your dealer for service.	
		If you are a dealer and cannot resolve the problem after completing step 0910, contact your customer service representative at Otrona.	

Shaded areas indicate steps for qualified dealer service personnel only.

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