

Appendix J: Field Service on the INTERVIEW 7000 Series

This appendix is to guide you in proper removal, handling, and installation of logic boards and other components in the INTERVIEW 7000 Series.

- J1 alerts you to the problem of static electricity.
- J2 covers the removal of logic cards.
- J3 discusses the installation of logic cards.
- J4 covers the installation of the optional multiplexer boards.
- J5 discusses the replacement of firmware on the CPM board.
- J6 covers the installation of a hard disk drive in the INTERVIEW 7000, option OPT-951-01-1.
- J7 covers other components requiring attention.

Appendix J1: Eliminating Static Electricity

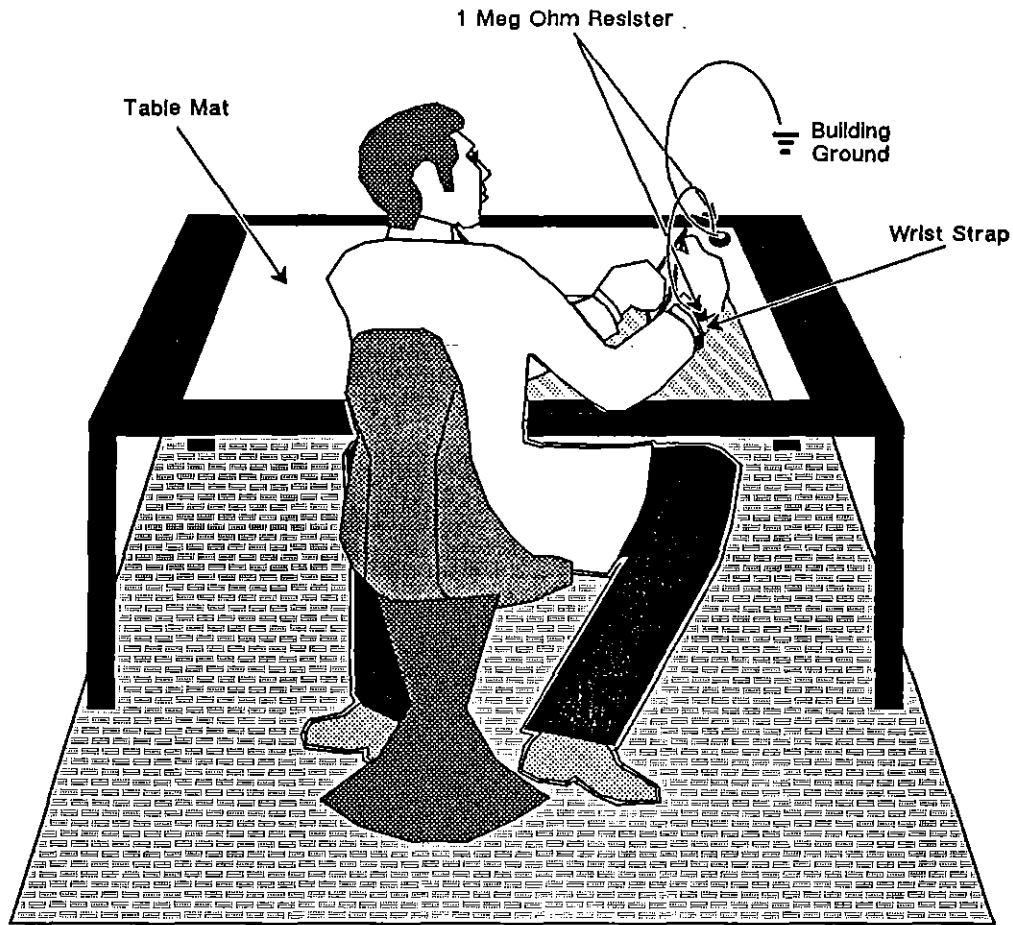


Figure J1-1 Illustration of grounded workstation. Note grounded wrist strap and table mat.

Appendix J1: Eliminating Static Electricity

STATIC ELECTRICITY CAN DAMAGE THE UNIT WHEN THE COVER IS REMOVED. Before you begin to remove the cover, be certain you have taken appropriate anti-static precautions.

J1.1 Take Precautions

As a *minimum* precaution, a grounded wrist strap should be used in conjunction with an anti-static work surface mat. Without these precautions, walking (or just shifting your feet) on a carpet or tile floor, shifting your position in a chair, or simply rolling a chair as little as a foot or two can generate sufficient static electricity to damage circuitry. See Figure J1-1 for an example of a static-free workstation for working with sensitive parts and assemblies.

Place unit on anti-static mat with power OFF. Then put on a grounded wrist strap and proceed.

J1.2 Use of Anti-Static Packing

When returning any boards to the AR Division factory, reuse any bags and anti-static packaging from boards sent by the AR Division previously. Pack the parts tightly to prevent motion which could generate static. If you did not save the packaging, you *must* obtain special anti-static packing before you begin or you will damage the components on the board.

Appendix J2: Removing Logic Boards

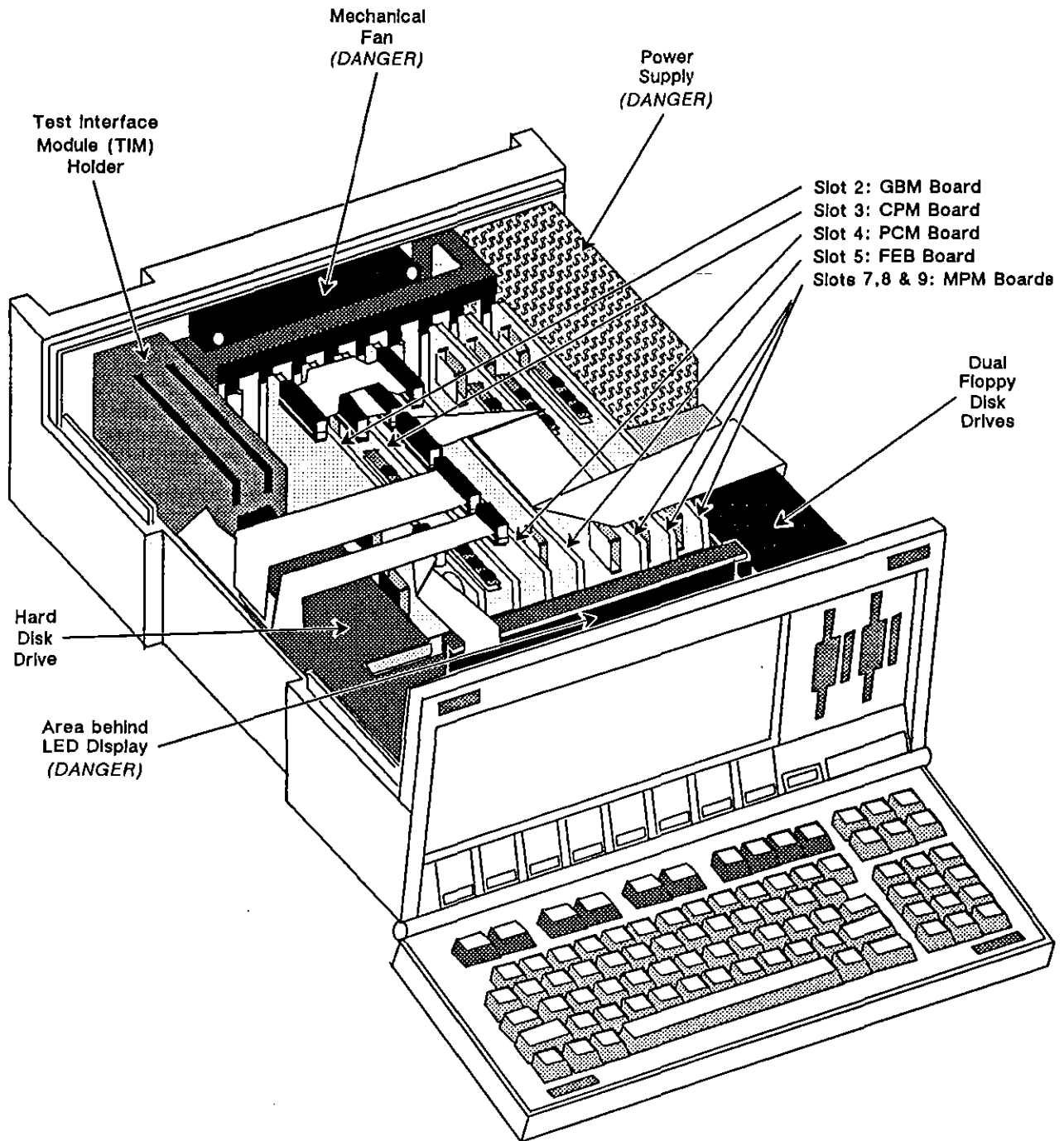


Figure J2-1 Viewing interior components of the INTERVIEW 7000 Series.

Appendix J2: Removing Logic Boards

CAUTION: STATIC ELECTRICITY CAN DAMAGE THE UNIT WHEN THE COVER IS REMOVED. Before you begin this section, you must take the proper anti-static precautions given in Appendix J1.

J2.1 Remove the Cover

To remove the cover of your unit, first unplug all connecting cords on the back of the INTERVIEW. Place the unit on its back and remove the six long screws recessed in the base.

Place the unit in its working position, lying on its base. Open the front panel, sliding the top two blue latches back. At this point the hooks of the latches are exposed out the front of the unit. Press down slightly on the recessed circle of these latches and continue to slide the latches inside the unit until they stop. The indented circle should be almost centered in the sliding area and the hooks of the latches are no longer visible from the front of the unit. *These latches must be properly placed or they will break when you remove the cover.*

Keeping an eye on the position of the latches, grasp the sides of the cover and remove it. The handle on the left side and rubber bumper feet on the right side can help to give you some leverage. You may have to rock the cover slightly back and forth to free it. Replace the handle in its slot on the base.

J2.2 View the Interior Layout

(A) Anticipate Potential Hazards

The inside of your INTERVIEW reveals three potentially hazardous areas. **DO NOT TOUCH THESE AREAS OR INJURY MAY RESULT!** These three danger areas include the mechanical fan at the center back of the unit (physical hazard), the power supply at the back right side of the unit (230V shock hazard), and the area directly behind the LED display (190V shock hazard). See Figure J2-1 for their locations.

Take care as you remove the boards not to make contact with any of these three areas.

(B) View Interior Components of the INTERVIEW 7000 and 7200 TURBO

In addition to these three potentially hazardous components, on the left near the front of your unit is the Winchester hard disk drive. It has two cables running up the side of your hard drive and over it, connecting it to the PCM board. (The standard INTERVIEW 7000 does not have a hard drive, but the bracket to hold it is in position for the option of adding a hard drive.)

Immediately behind the hard disk drive is the TIM (Test Interface Module) holder. The dual floppy disk drives are on the right near the front, with a cable connecting them to the PCM board. In the center of the unit are the nine slots which house your boards.

Reading from left to right, the slots contain the following boards:

- slot 1—empty (unless upgraded with optional multiplexer board)
- slot 2—GBM, Global Bus Module Board
- slot 3—CPM, 68K Processor Board
- slot 4—PCM, 68K Peripheral Board
- slot 5—FEB, Front End Buffer Board
- slot 6—reserved for XDRAM board (OPT-951-23-1)
- slot 7—empty
- slot 8—empty
- slot 9—MPM, 286 Processor Board

There is one cable connecting the LED display to the GBM board. Additionally, there are two jumper cables; one connecting the FEB and GBM boards and a smaller one connecting the CPM and PCM boards.

(C) View Interior Components of the INTERVIEW 7500 and 7700 TURBO

In addition to these three potentially hazardous components, on the left near the front of your unit is the Winchester hard disk drive. It has two cables running up its side and over it, connecting it to the PCM board.

Immediately behind the hard disk drive is the TIM (Test Interface Module) holder. The dual floppy disk drives are on the right near the front, with a cable connecting them to the PCM board. In the center of the unit are the nine slots which house your boards.

Reading from left to right, the slots contain the following boards:

- slot 1—empty (unless upgraded with optional multiplexer board)
- slot 2—GBM, Global Bus Module Board
- slot 3—CPM, 68K Processor Board
- slot 4—PCM, 68K Peripheral Board
- slot 5—FEB, Front End Buffer Board
- slot 6—reserved for XDRAM board (OPT-951-23-1)
- slot 7—MPM, 286 Processor Board
- slot 8—MPM, 286 Processor Board
- slot 9—MPM, 286 Processor Board

There is one cable connecting the LED display to the GBM board. Additionally, there are two jumper cables; one connecting the FEB and GBM boards and a smaller one connecting the CPM and PCM boards.

J2.3 Remove the Boards

As stated previously in Section J1.2, if you have bags and packaging from boards sent by the AR Division previously, reuse those anti-static materials for packing. If you did not save the packaging, you *must* obtain a special anti-static packing before you begin or you will damage the components on the board.

(A) Disconnect the Cables

Make certain the unit is on an anti-static mat and you are wearing your grounded wrist strap.

You may wish to record where each cable was attached for reference when your replacement boards arrive. Refer back to Figure J2-1. Your upgraded replacement boards will be sent as soon as possible.

Notice that several of the connectors are "keyed" for easy, correct alignment. Those that are not "keyed" need to have special care taken to line up the pins with the proper connecting holes when they are reconnected.

Disconnect the cables *carefully*. They may be easily removed with an IC clip holder. Lift the connector straight up, holding onto its edges. **DO NOT PULL ON THE CABLE**; you could break it or damage the connectors. If you do not have an IC clip holder, a blade screwdriver will also work.

CAUTION: If you use a screwdriver, use the top of the black mounting rack (which secures the ends of the boards) as your leverage point. Avoid using the edges of the boards or other components to pry the connector loose.

(B) Remove the Boards

CAUTION: Do not hold any board by its gold edge connector. Hold it by the sides, NEVER touching the components.

It is probably easiest to remove the boards from left to right. To do so, grasp the board by its top corner edges, and *gently* pull it straight up and out. Then, holding the board by its side edges, place it *immediately* into an anti-static bag and close the bag. Repeat the process with each board to be removed.

J2.4 Replace the Cover

If you are not going to replace any boards at this time, continue with this section to replace the cover to protect the remaining components. If you are ready to replace boards, proceed down to Section J2.5, Package the Boards, and then on to Section J3, Installing Logic Boards.

Grasp the cover with the latch area to the front facing you. Make certain the latches are recessed as far as they can go into the cover and their hooks are not beyond the edge of the cover. Slide the cover down. For the INTERVIEW 7200 *TURBO*, 7500, and 7700 *TURBO*—and those INTERVIEW 7000s having the optional hard drive—take care that the two cables to the Winchester hard disk drive (on your left, directly behind the handle) are not being pinched or damaged by the cover. (Some models may contain a small, removable, protective plastic sheet to help shield the cables from the cover.)

Place the unit on its back once again and replace the six screws to hold the cover secure.

J2.5 Package the Boards

In preparation for storage or shipping, package each board removed from the INTERVIEW in its own anti-static bag. If shipping, wrap it further in anti-static packing material and place it securely in a shipping box. You may package several boards in a single box, as long as *each board is wrapped individually in an anti-static bag*. When returning a board, please reference the *return authorization number* from your original packing list. For shipping information, see Appendix E, Communications with the AR Division Factory.

Appendix J3: Installing Logic Boards

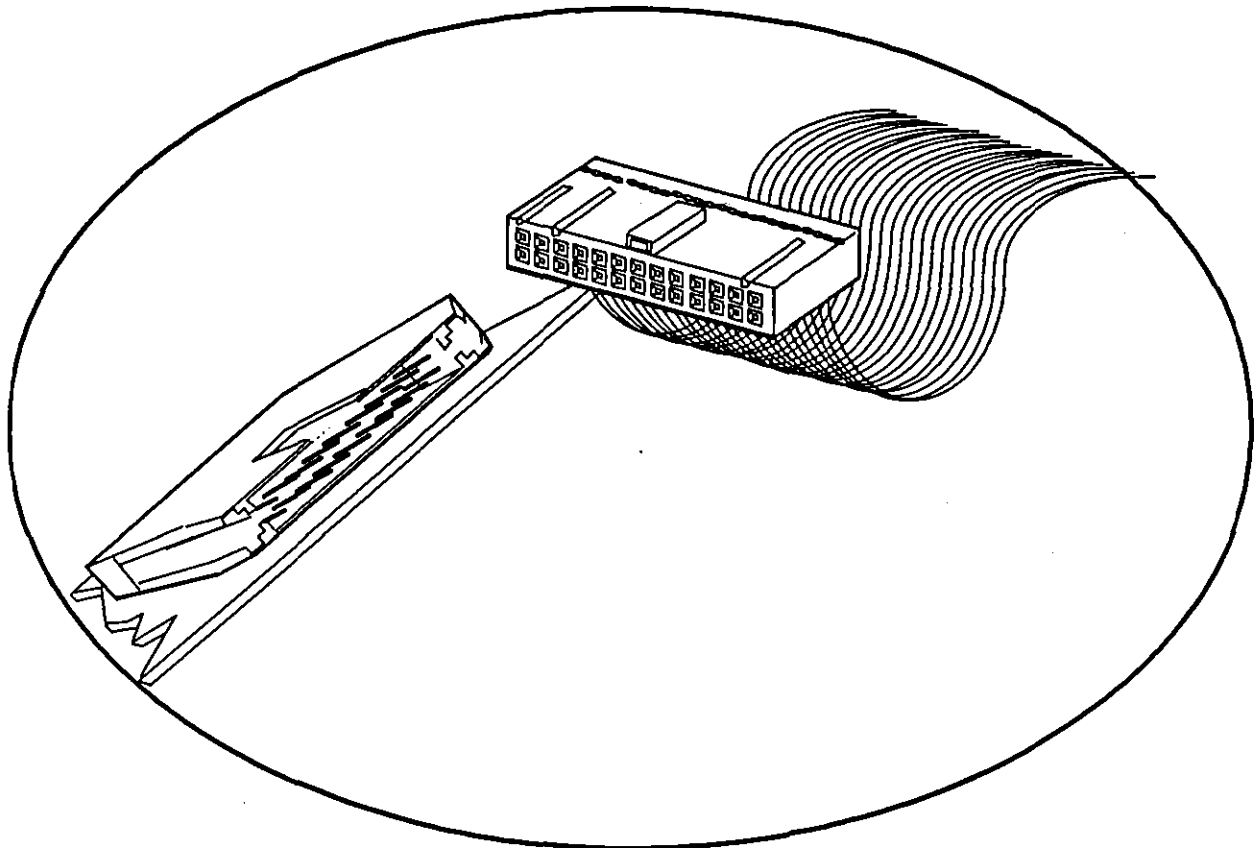


Figure J3-1 Some connectors are "keyed" for correct alignment.

Appendix J3: Installing Logic Boards

Observe the proper handling of the boards: refer to Appendix J1 and J2 for using proper anti-static precautions and removing the boards.

Figure J2-1 gave you visual locations of the components in the INTERVIEW 7000 Series. For a detailed listing of board placement in the slots, see Section J2.2. Each board is labeled in its upper left corner. The motherboard (on the floor of the unit) is labeled with the corresponding name of the board by the slot into which that particular board is set.

J3.1 INTERVIEW 7000 Series Hardware Architecture


In troubleshooting any malfunction, it is important to know which board contains the component that controls the particular function.

The INTERVIEW contains six types of board which are connected to the motherboard and which can be easily removed and replaced. (See Appendix J2 and J4 for board removal information.) These boards are:

- MUX Multiplexer Board (if upgraded with option)
- GBM Global Bus Module
- CPM Control Processor Module
- PCM Peripheral Control Module
- FEB Front-End Buffer
- MPM Main Processor Module

A seventh type of board is installed in the Test Interface Module.

Figure J3-2 is a block diagram showing the components on all of these boards. The figure also shows how the components are interconnected in the unit. Following the figure is a descriptive listing of the components.

NOTE: The symbol  in the diagram represents a bi-directional buffer.

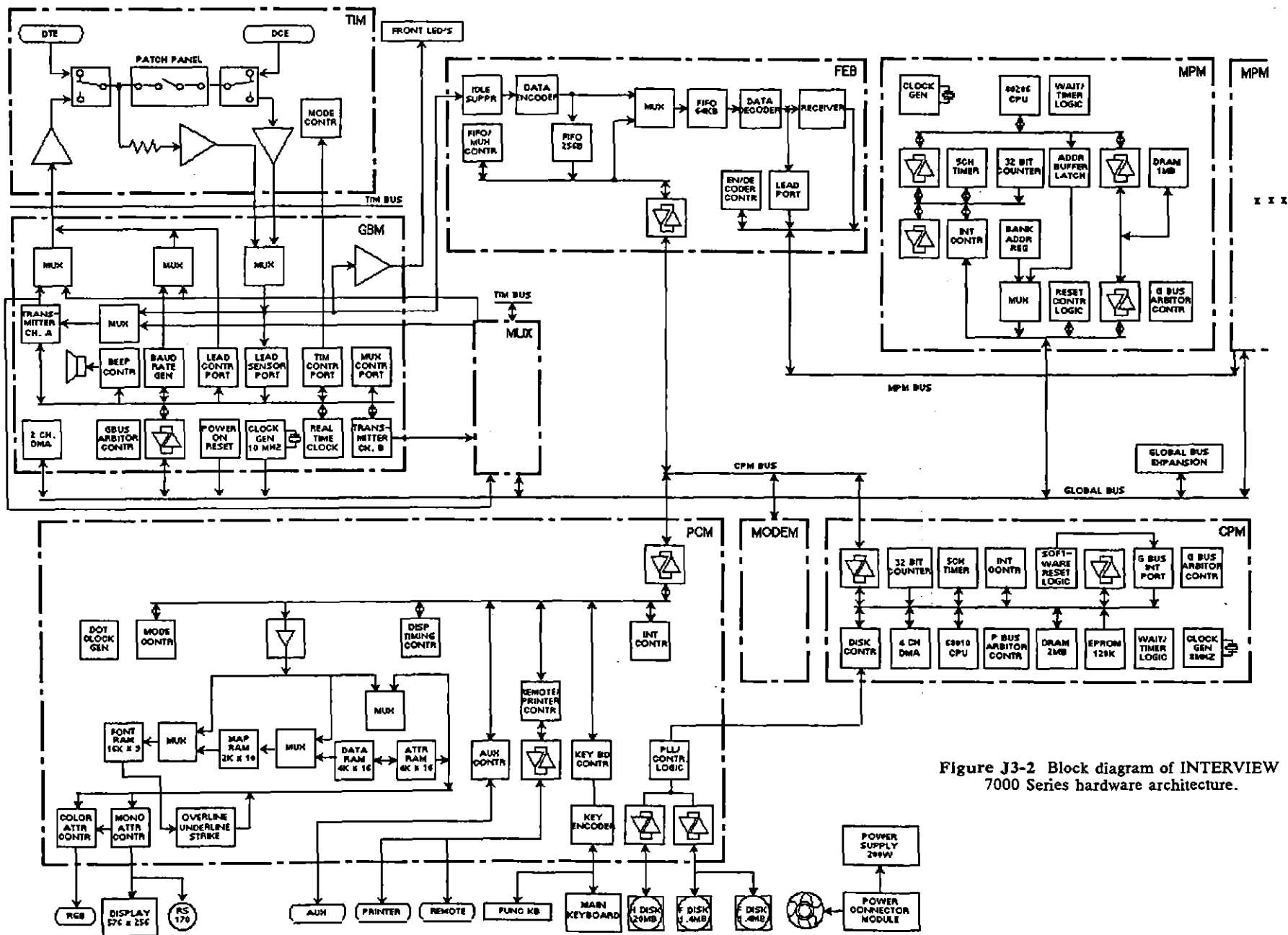


Figure J3-2 Block diagram of INTERVIEW 7000 Series hardware architecture.

(A) MUX (Multiplexer Board)

This board provides whatever additional processing is needed for special data formats such as T1, G.703, ISDN, etc.

The mux board clocks-in data from transmitter channel A on the GBM. Once at the mux board, the data is processed as required and then sent back to the GBM to be transmitted over the line.

(B) GBM (Global Bus Module)

1. *Mux.* The muxes multiplex various signals to be transmitted, received, or monitored depending upon which mode of operation is being used.
2. *Transmitter channel A.* The transmitter generates the data stream to be sent out when the INTERVIEW is in emulate DTE mode. The data can either be sent out directly to the TIM or sent to the mux board for further processing.
3. *Beep control.* The beep control does just that—it controls the beep. There are two types of beeps defined by their length—one second and one-half second. Only the half-second beep is currently in use.
4. *Baud rate generator.* The baud rate generator generates the clock for the transmit data when in emulate DTE mode.
5. *Gbus arbitor control.* This arbitrates requests by the GBM to obtain the global bus. When the bus is idle and the GBM has top priority over all other requests, this logic will enable the GBM to access the global bus.
6. *Power on reset.* This circuitry generates the proper timing for reset signals for the INTERVIEW unit from a power-up situation.
7. *10 MHz clock generator.* This generates the global bus clock.
8. *Lead control port.* The INTERVIEW writes to this port in order to send out the proper control signals for the data interface. These control signals are dependent upon the emulate mode for which the unit is configured.
9. *Lead sensor port.* The INTERVIEW reads the lead sensor port in order to monitor incoming control signals from the data interface.
10. *TIM control port.* The INTERVIEW writes to this port in order to setup the TIM to the desired mode of operation.
11. *Real time clock.* This circuitry keeps track of current time and date. This information can be displayed on the screen for the user and can also be used to timestamp the incoming data.
12. *Transmitter channel B.* This is a second transmit channel used to send data out into the data stream through the mux board.

13. *Mux control port.* The INTERVIEW software writes to this port to set up the muxes for the proper data flow through the GBM, depending upon the mode of operation.
14. *2 channel DMA.* In order for the INTERVIEW to transmit data in emulate mode, the DMA controller requests a byte of data from memory on an MPM. When this byte is obtained, the DMA controller then sends it out through one of the transmitter channels.

(C) CPM (Control Processor Module)

The CPM board controls most of the operations of the INTERVIEW unit.

1. *Disk control circuitry.* The disk controller is the 9580B. In record mode, the disk controller sends a block of data through the PCM to one of the disk drives. When in playback, the disk controller reads one of the drives through the PCM so that the CPM can send recorded receive data to the FEB. The 9580 controls up to three disk drives—one Winchester hard drive and two floppy drives.
2. *8 MHz clock generator.* This circuitry generates the clock that is used by the 68010 CPU and the peripherals on the CPM.
3. *Global bus interrupt port.* This port can be written to by any board that has access to the global bus. There are four global interrupts that can be set, each of which will cause an interrupt of the 68010 processor. Thus, any board that is connected to the global bus has the ability to interrupt the 68010.
4. *Global bus arbitor.* This circuitry queues requests by the CPM for access to the global bus and waits until priority is obtained before enabling the CPM onto the global bus. Control bits are set to determine the mode of operation of the arbitor. One mode causes the CPM to always release the bus after an access. Another mode causes the CPM to hold onto the global bus until it is requested by another board.
5. *4 channel DMA.* The CPM currently uses only two of the available four DMA channels. Channel zero is used for recording data and channel one is used for playback of data. When recording data, the FEB interrupts the CPM to signify that a byte of receive data is available. The DMA then reads the byte from the FEB into memory on the CPM. When enough bytes have been accumulated to form a block, the disk controller will send the block to the specified disk drive. When in playback mode, the DMA sends out bytes of receive data to the FEB. This is data that has been moved into CPM memory by the disk controller. In addition, the DMA circuitry allows for any memory-to-memory transfers necessary between the CPM and other boards.
6. *Software reset logic.* The CPM board contains logic which enables the 68010 to generate a software reset to the rest of the unit. The reset signal is

generated by executing a RESET instruction in the 68010. This will cause the software reset to be generated without disturbing any of the registers within the 68010.

7. *Interrupt controllers.* The three interrupt controllers monitor interrupts from the disk controller, time-out logic, and global bus. These interrupt controllers generate the appropriate vectors for the CPU's interrupt vector table.
8. *Channel timer.* This function is carried out by the 9513A, a chip used to generate output signals that are used as CPU interrupts. The time intervals for these interrupts are user-programmable.
9. *32 bit counter.* This circuitry counts a 1 MHz clock. The CPU can latch this value at any time and then read the lower 16 bits of the count, as well as the upper 16 bits if they are needed. The 32 (or less) -bit count is used by the software to determine specific time intervals necessary for execution of certain routines.
10. *EPROM.* The EPROM contains the power-up software and initialization routines. When the power is turned on, the 68010 processor begins execution by fetching from the EPROM.
11. *Wait/timer logic.* This logic generates an error interrupt to the CPU if an instruction causes the board to hang up. If the processor does not receive an acknowledgment within approximately .33 milliseconds after it has begun a cycle, an interrupt will be generated.
12. *P bus arbitor.* The P bus (CPM bus on block diagram) connects the CPM directly to the PCM and the FEB. Thus, the CPM can directly read and write to ports on any of these boards without accessing the global bus. The arbitor is simply a pair of pals which decode the address from the CPU. If the address is one of the ports on the PCM or FEB, and an acknowledgment has been received from the appropriate board, the data buffers are enabled.
13. *DRAM.* The DRAM is 2 Mbyte of memory space (4 Mbytes in *TURBO* units) that contains the operating software for the INTERVIEW unit. At power up, this software is loaded into the DRAM from either the hard or floppy disks. In addition, any programs that are compiled for run mode are stored in the DRAM.
14. *68010 processor.* This processor is the brain of the INTERVIEW unit. It controls virtually every operation of the box. The 68010 processor operates using the software stored in the DRAM on the CPM.

(D) PCM (Peripheral Control Module)

The PCM board provides the interface to all the major peripherals in the INTERVIEW unit, as well as external peripherals attached to the unit.

1. *Dotclock generator.* The dotclock is generated by buffering a 23.9114 MHz oscillator and then dividing it by two. This gives a dotclock frequency of 11.9557 MHz.
2. *Aux controller.* The aux control function is performed by the 8536 chip on the PCM. (This chip is also known as a CIO.) This part enables the unit to read or write to other nodes through a DB-25 connector located on the back of the unit. The 8536 has two 8-bit ports, and each line may be configured as an input or an output. When configured as an input, the 8536 can be programmed to look for a specific condition on one bit or search for an entire word, and then generate an interrupt.
3. *Remote/printer controller.* The control functions for the remote port and the printer port are performed by the 8530A chip on the PCM. (This chip is also known as the SIO.) The SIO provides a serial interface between the INTERVIEW unit and other nodes. It receives serial data from external sources, strips off any flags or block-check characters, and causes an interrupt when it has an 8-bit word of data to be read out of it. On the transmit side, the SIO takes a word of data from the processor on the CPM, adds the necessary flags and block-check characters, and sends out the data over the serial interface.

The SIO has two available ports on the PCM—one is used for the printer interface and the other is used for the remote interface. For the printer interface, the SIO acts as a DCE. It accepts TD as an input and generates RD as an output. It also generates the appropriate RS-232 handshake control signals. For the remote interface, the SIO acts as a DTE, sending out TD data to the remote port and receiving RD data from the remote port. The remote port is used to control the INTERVIEW unit from a remote terminal instead of from the keyboard.

4. *Display timing controller.* The display timing control functions are performed by the Signetics 2674 chip. During initialization, the CPM programs this chip with information about the display device, including the size of each character in dots, the number of characters per line, the number of lines per screen, and the size of the horizontal and vertical blanking intervals and sync pulses. Also programmed into the chip is the initial location and block size of the character data block in RAM. When the 2674 runs, it automatically generates the proper timing of character data, blanking intervals, and sync pulses. In addition, it also generates control signals which allow for overline, underline, and strikethrough.
5. *Attribute RAM and mux.* The attribute RAM takes a 12 bit address and generates 16 bits of output which define all attributes of a particular

character. The 12 bit address can come from two possible sources. When the display is scanning, data is being read from the attribute RAM and the address comes from a buffer attached to the output of the display controller. When writing to the display, data is being written into the attribute RAM and the address comes from a latch which stores the desired write location as output from the processor on the CPM. Attributes of a character include underline, overline, strikethrough, reverse image, blinking, blanking, low intensity (monochrome only), background color, foreground color, and data type (hex or ASCII).

6. *Data RAM.* The data RAM takes the same 12 bit address as the attribute RAM and generates 12 bits of output which provide character mapping information. The address is multiplexed from either the display controller (read) or the address latch (write) as described for the attribute RAM. One bit of each output word is dedicated as a flag to designate that a particular character may not be displayed in hex format. (These are usually flags, block-check, or control characters.) Three bits of the output represent 8 possible character formats (i.e. ASCII, EBCDIC, hex, etc.) The other eight bits represent 256 possible characters within each character format.
7. *Mapping RAM and mux.* The mapping RAM takes a 10 bit address and generates 10 bits of output which provide the location of a specific character dot pattern in the font RAM. The 10 bit address is multiplexed from two sources. When the display is scanning (read), the address comes from the output of the data RAM. When writing mapping information to the mapping RAM, the address comes from a latch which stores the desired write address from the processor on the CPM. The address input defines a specific character and a specific data format. The mapping RAM takes this information and generates an output which points to the location in font RAM where the actual dot pattern is stored.
8. *Font RAM and mux.* The font RAM takes a 14 bit address and generates 9 bits of actual display dot information. The 14 bit address is multiplexed from two sources. When the display is scanning (read), the lower 4 address bits come from a latch connected to the display controller chip and the upper 10 bits come from the mapping RAM. When writing font information to the font RAM, the address comes from a latch which stores the desired write address from the processor on the CPM. Each character on the screen is 9 dots wide by 12 dots high. The lower 4 address bits decode the specific row within the character and the upper 10 bits decode to a possible 1024 actual character dot patterns. The output is a 9-bit word which gives the actual on-off pattern of dots in a particular row of a given character.
9. *Overline, strikethrough and latch.* This circuitry actually generates the strikethrough and overline attributes by overriding dot information from the font RAM in specific rows of a character. Finally, the resulting dot data is

latched and processed by the video attribute controllers. (Underline is done internally by the attribute controller.)

10. *Monochrome attributes controller.* This function is performed by a 2675 that has been programmed to operate in monochrome mode. The 2675 creates a character clock from the dot clock, such that one character clock is generated for every nine dot clocks. (Each character is nine dots wide.) For each character to be output to the video monitor, the 2675 takes the nine bits of processed dot data, along with control signals for blanking, blinking, underlining, cursor position, and reverse imaging, and creates the serial stream of dot data called monochrome video. This data stream is then sent on through a buffer to the plasma display or through driving transistors to the RS-170 port that can be connected to a CRT.
11. *Color attributes controller.* This function is performed by a 2675 that has been programmed to operate in color mode. For each character to be output to a color monitor, the 2675 takes the nine bits of processed dot data—along with control signals for blanking, blinking, underlining, cursor position, foreground color, and background color—and creates four serial streams of data which will generate the color video. The four different data streams represent red, blue, green, and luminescence. This data passes through a buffer before being sent out to the color monitor through a port in the rear of the unit.
12. *Keyboard controller.* The keyboard controller is an 8051 microcontroller programmed to function like an INTEL 8278. (The 8278 is a keyboard controller that was used until it was obsoleted by the manufacturer.) The controller continually writes out a sequence of addresses that are decoded to represent rows and columns of the main keyboard and function keyboard. The scanning process continues until the controller finds a key depress or key release condition. The controller then interrupts the 68010 processor on the CPM which reads the key value out of the controller.
13. *Key encoder.* The key encoder is simply a combination of buffers and decoders which take the scan address from the keyboard controller and convert it into row and column select signals that go directly to the main keyboard and function keyboard. Each scan address decodes to a unique row and column combination on one of the keyboards.
14. *Interrupt control.* The interrupt control logic combines interrupts from several sources into one interrupt signal that is sent to the CPM board. The CPM then reads a 3-bit code generated by the interrupt logic to determine the source of the interrupt on the PCM. Interrupts from the PCM are caused by key press, key release, break detect on receive data, or interrupts from the 8536 chip (aux controller).
15. *Phase locked loop/disk control logic.* The disk control logic simply takes the disk control signals from the CPM and sends them out to the selected drive,

either floppy or hard. It also buffers control signals from the disk drives and sends them back to the disk controller on the CPM. The 9582 data disk separator recovers clock from a stream of data coming from a disk drive and sends it back to the CPM. The 9582 separator has a built-in phase-locked loop that is used for this clock recovery.

16. *Mode control.* This is simply a latch that is loaded from the CPM. The various bits of this latch control certain aspects of the display. By programming certain bits of this latch, one can force the display to hex format, control the cursor, choose half or full duplex, or program the display controller for operation from a 50 Hz power supply.

(E) FEB (Front-End Buffer)

The Front End Buffer provides the necessary pre-processing for data in the receive path. There are three paths that the data may take through the FEB. In run mode, raw data passes through the FEB to the receiver and gets read by an MPM. The data can also be stored in encoded form on one of the disk drives by the disk controller on the CPM. In playback mode, data does not come from an external device, but from a selected disk drive. In this mode, data from the disk controller is multiplexed into the receive path.

1. *Idle suppress.* When selected, this circuitry removes the idle characters from the receive data stream.
2. *Data encoder.* This circuitry takes the receive data and encodes it in a format that enables easy storage. The encoded format includes data and control lead information along with time ticks.
3. *1024B fifo (small).* The small fifo ("first in, first out") stores the encoded data until it can be read by the DMA controller on the CPM board. This path is used when the INTERVIEW is in record mode.
4. *Fifo/mux control.* The CPM writes to this port to set the appropriate control bits for the fifos and to configure the mux for the proper mode of operation.
5. *Mux.* The mux multiplexes between real-time data and playback data in the receive path.
6. *64K fifo (big).* The big fifo acts as a "rubber band" between the FEB and the MPM—it "stretches or shrinks" with the amount of data received and sends it out at the proper rate. The FEB puts data into the fifo as it receives it and waits for the receiver on the FEB to request a byte.
7. *Data decoder.* The data decoder puts the data back into raw form as it appeared before entering the data encoder. The raw data is then passed on to the receiver to be sent out to the MPM. Control lead information is also output from the decoder and sent to the lead port.

8. *Lead port.* The MPM reads this port on the GBM to obtain information on the status of the control leads.
9. *Encoder/decoder control.* The MPM writes to this port on the GBM to set the control bits for the data encoder and data decoder on the board.
10. *Receiver.* When a byte of data has been processed through the decoder, it passes on to the receiver circuitry. The MPM continuously polls the receiver to check for the presence of a byte of data, and if there is data present, the MPM reads it from the receiver into its memory.

(F) MPM (Main Processor Module)

The MPM does all the higher level processing of the receive data. This board also generates the transmit data to be sent out when in emulate mode. If the XDRAM board is present, see Table J3-1 for proper switch settings for switch S1 on the MPM's for specific allocations of memory space.

1. *Clock generator.* This circuitry generates the clock that runs the 80286 CPU and peripherals on this board.
2. *Global bus arbitor control.* This circuitry queues requests for the global bus. It then grants access to the global bus when the global bus is idle and this board has the highest priority of all requesting boards. This function is performed by the bus arbitor chip.
3. *Bank address register.* The CPU writes to this register to set the upper address bits for the 80286 when it is operating in real mode. In real mode, the CPU does not drive address bits 19 through 23, so these bits must be set in this register if the CPU is running in real mode.
4. *Address buffer latch.* This circuitry simply latches the address bits from the processor in order to guarantee that the address is stable throughout the entire CPU cycle.
5. *Mux.* This multiplexer simply chooses whether to take the upper address bits directly from the processor, or from the bank address register described above. The register is used when the CPU is in real mode, because the CPU will only drive these bits in protected mode.
6. *80286 CPU.* This processor controls the operation of the MPM. The processor operates on software located in the DRAM on the MPM. This software is compiled by the CPM and loaded into the MPM. The software will tell the MPM how to process the data, and what trigger conditions to look for in the data stream. The CPM continually polls the MPM to see if data is available to be sent to any of the user interfaces: printer, plasma display, and remote port.
7. *DRAM.* The DRAM on each MPM is dedicated to storage of receive data. In addition, the DRAM contains the operating software for the MPM. This

memory is dual-ported; this means that the DRAM can be accessed by either the local MPM bus from the 80286 processor or by the global bus. Operation of the DRAM and arbitration of requests from the two ports is controlled by the DRAM controller chip. This chip also generates refreshes for the DRAM at the proper intervals.

8. *Wait/timer logic.* This circuitry generates the proper amount of wait states for some local cycles. It also monitors the operation of the MPM to check for a condition where the CPU gets hung up. The timer logic will generate a non-maskable interrupt to the 80286 processor if a cycle begins and no acknowledge is received within approximately 7 milliseconds.
9. *Reset control logic.* The MPM can be reset in several ways. A global software reset will cause the MPM to go into a reset state. The CPM may also cause a reset on the MPM by writing to a specific global port. Once the MPM has been reset, it will remain in the reset state until the reset is released by the CPM writing to another dedicated global port. Thus, when the unit is first powered up, the CPM can execute its initialization routines, and load the MPM software into the MPM DRAM while the MPM is still in the reset state.
10. *32 bit counter.* The 32 bit counter is made up of four 74LS590's in series which count a 1 MHz clock. These counters are used to determine elapsed time between certain events in the data stream. The count is latched by writing to a dedicated local port. The count is read 16 bits at a time, by reading one of two local ports. The count may be cleared to zero by writing to another dedicated local port.
11. *5 channel timer.* The 5 channel timer is the 9513A, a chip that uses six clock sources as inputs. The user programs the chip to count one of the clock sources and generate an output when the terminal count is reached. The output can be a high or low pulse, or simply a toggle of the output line. Each condition may be executed once or repeatedly. There are five separate outputs, one for each channel. Each channel is independent and may be programmed differently. The 9513A is used on the MPM to generate "timeout" interrupts at specific intervals as required by the user program.
12. *Interrupt control.* The interrupt control circuitry on the MPM consists of three 8259A chips cascaded to allow for a maximum of 22 interrupts to the 80286 processor. Five interrupts come from the 9513A timer logic. Ten interrupts come directly from the global bus. These global interrupts are initiated by peripherals on the global bus. Four other interrupts are software driven interrupts that are caused by another processor writing to dedicated memory-mapped I/O ports on the MPM. Two interrupts come from the FEB, but only one is used.

(G) TIM (Test Interface Module)

The test interface module (TIM) is the interface between the external data path and the INTERVIEW unit. Data enters the unit at the place marked DTE and exits the unit at the place marked DCE.

1. *Mode control.* The mode control circuitry determines the operating mode of the unit. There are three operating modes: monitor, emulate DTE, and emulate DCE. When in monitor mode, the mode control circuitry configures the relays on the TIM so that data may pass through from the DTE to the DCE while being monitored by the INTERVIEW unit. When in emulate DTE mode, the mode control circuitry configures the relays so that the connection to the DTE is broken and data generated by the INTERVIEW unit is transmitted out to the DCE. When in emulate DCE mode, the mode control circuitry configures the relays so that data generated by the DTE is received by the INTERVIEW unit and the connection to the DCE is broken. In addition, when in either emulate mode, the mode control circuitry sets the relays to enable the INTERVIEW to send or receive the appropriate control signals depending on the emulate mode selected.
2. *Patch panel.* The patch panel is simply a row of switches and headers which enable the user to selectively connect and break individual signals on the back of the test interface module.

J3.2 Install a Board

Remove the new board from its static-proof bag. Remember to handle the board by its edges, not touching its components or the gold edge-connector. Grasping the board by the two top corners, slide it *gently* into the correct slot, seating it properly in the connector.

Check the settings for switch S1 on each MPM board to make certain that they are correct. Check that the proper MPM board will be in its correct slot. For the INTERVIEW 7500 and 7700 *TURBO* they should read as shown in Table J3-1.

For the INTERVIEW 7000 and 7200 *TURBO*, place your MPM board in slot 9, with the settings the same as those referenced for that board in Table J3-1 also.

Table J3-1
S1-Switch Settings for MPM Boards
In the INTERVIEW 7000 Series

MPM	Slot 7			Slot 8			Slot 9		
	1	2	3	1	2	3	1	2	3
<u>Units with 3 MPMs:</u>									
Normal†	ON	OFF	ON	OFF	ON	ON	ON	ON	ON
High-Speed††	OFF	OFF	ON	ON	OFF	ON	ON	ON	ON
<u>Units with 1 MPM:</u>									
Normal†							ON	ON	ON
High-Speed††							ON	ON	ON

† These are the normal MPM switch settings. Changing these settings will affect object program compatibility with other units.

†† These MPM switch settings maximize the size of high-speed record RAM when the file *sysixdram_rord* resides on the boot-up disk during power-up.

J3.3 Reconnect the Cables

Reconnect the cables in the reverse order that you removed them. Remember, the smallest jumper cable connects the CPM and PCM boards and the larger jumper cable connects the FEB and GBM boards. Of the other cables, one connects the LED display to the GBM board and another connects the dual floppy disk drives to the PCM board. Additionally, there are two cables connecting the Winchester hard drive to the PCM board in the INTERVIEW 7200 *TURBO*, 7500, and 7700 *TURBO* (and those INTERVIEW 7000s containing the optional hard drive).

Recall that several of the connectors are "keyed" for easy, correct alignment. Those that are not "keyed" need to have special care taken to line up the pins with the proper connecting holes. See Figure J3-1.

J3.4 Test the Unit

Before you completely secure the cover, it is suggested that you test your unit to make certain that it functions after this board exchange. First, replace the cover.

Grasp the cover with the latch area to the front facing you. Make certain the latches are recessed as far as they can go into the cover and their hooks are not beyond the edge of the cover. Slide the cover down. For the INTERVIEW 7200 *TURBO*,

7500, and 7700 *TURBO*—and those INTERVIEW 7000s with the optional hard drive—take care that the two cables to the Winchester hard disk drive (on your left, directly behind the handle) are not being pinched or damaged by the cover. (Some models may contain a small, removable, protective plastic sheet to help shield the cables from the cover.)

Now you can safely test the unit. For this test you must power the unit. Reconnect your power cable, turn on the unit, and check for the system self-tests.

The words "System RAM test now accessing all RAM :CPMOMIM2" appear on your screen, indicating that the first self test for the system is being performed. Following this first test are the tests for the rest of the system. The INTERVIEW prompts the user as each test is passed: RAM, timer, DMA, all MPMs, and 32-bit timer.

The statement "The unit has passed ALL system tests" should appear after these tests. The screen repaints as illustrated in Figure J3-3 for the INTERVIEW 7500 and Figure J3-4 for the INTERVIEW 7000.

If the self test produces an error, try reinstalling the new boards. Go to the beginning of this section and carefully follow the same precautions and instructions given. Replace the cover and power up the unit again so it can perform the self test once more. If the self test still gives errors, call Customer Service.

If the start-up screen is blank or the front-panel LEDs are not red or green (except for the REMOTE and FREEZE LEDs), the connectors may not be attached properly. Try reconnecting them again.

```
      ** INTERVIEW 7500 **  
DISKS: FLOPPY 1 FLOPPY 2 HARD DISK(20M)  
PROCESSORS: 4  
SELF TEST ERRORS: NONE  
  
Press:  
[PROGRAM] to enter the menu page  
[RUN]     to run the default program  
  
Software Version: 8.00  
Firmware  Version: 5.00  
  
OPTIONS:  
  
TIM: RS-232/V.24  
  
Copyright (c) 1987, 1990  
Telenex Corporation
```

Figure J3-3 INTERVIEW 7500 screen after self test.

```
      ** INTERVIEW 7000 **  
DISKS: FLOPPY 1 FLOPPY 2  
PROCESSORS: 2  
SELF TEST ERRORS: NONE  
  
Please insert system disk and press any key.
```

Figure J3-4 INTERVIEW 7000 screen after self test.

J3.5 Secure the Cover

Place the unit on its back once again and replace the six screws to hold the cover secure.

Appendix J4: Installing Multiplexer Board

CAUTION: STATIC ELECTRICITY CAN DAMAGE THE UNIT WHEN THE COVER IS REMOVED. Before you begin this section, you must take the proper anti-static precautions given in Appendix J1.

Observe the proper handling of the boards: refer to Sections J1 and J2 on proper anti-static precautions.

J4.1 Prepare the Slot or Remove Board

(A) Locate the Slot

Read Appendix J2 for instructions on removing the cover and for information on the interior layout of the INTERVIEW 7000 Series. Then refer to Figure J4-1. The optional multiplexer (mux) board will be installed in the first slot, which is likely to be empty.

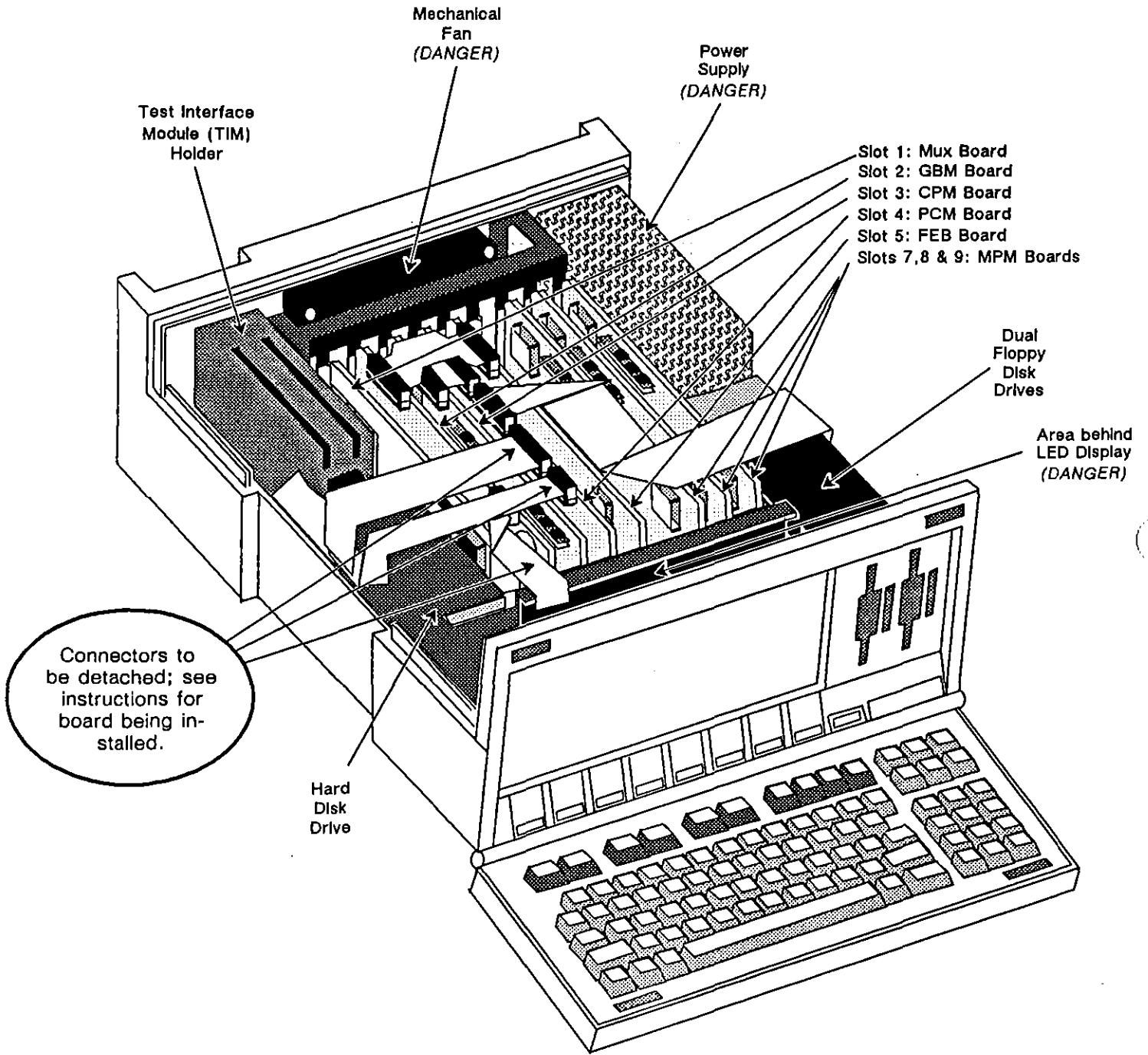


Figure J4-1 Three cable connections are detached to install the mux board in slot 1.

(B) Detach Surrounding Cables

Make certain the unit is on an anti-static mat and you are wearing a grounded wrist strap.

Disconnect the cable connections *carefully*. They may be easily removed with an IC clip holder. Lift the connector straight up, holding onto its edges. **DO NOT PULL ON THE CABLE**; you could break it or damage the connectors. If you do not have an IC clip holder, a blade screwdriver will also work.

CAUTION: If you use a screwdriver, use the top of the black mounting rack (which secures the ends of the boards) as your leverage point. Avoid using the edges of the boards or other components to pry the connectors loose.

Refer to Figure J4-1 to locate the three cable connectors to be detached—two from cables extending from the hard disk drive and one from a cable attached to the back of the LED display. The two from the hard disk drive are attached to the PCM board in slot 4. The other cable is attached to the GBM board in slot 2. Remove these three connectors and fold the cables back out of the way.

(C) Remove Old Board (if Present)

CAUTION: Do not hold any board by its gold edge connector. Hold it by the sides, NEVER touching the components.

Refer to Figure J4-1. If you are replacing the mux board, locate it in slot 1. Remove the board by grasping the top corner edges. *Gently* pull it straight up and out, and holding the board by its side edges, place it on the anti-static mat.

If requested to do so, package and return the old mux board to the AR Division. Instructions for proper packing and shipping may be found in Appendix Section J2.5.

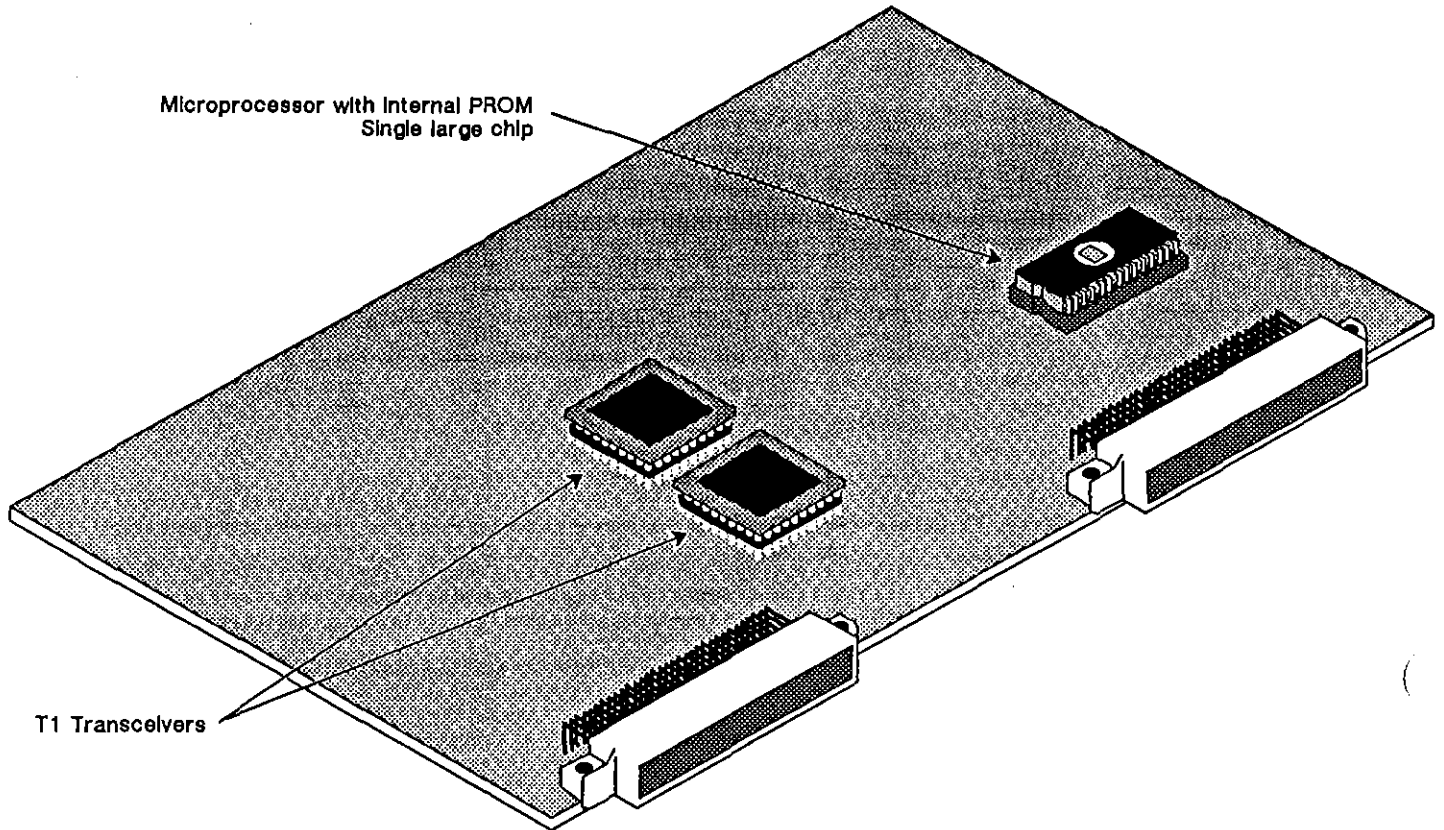


Figure J4-2 All PROMs are factory installed on the T1 mux board, represented above by the most prominent components.

J4.2 Replace the Board

(A) Install the Board in the Appropriate Slot

Install the mux board (T1 mux board represented in Figure J4-2) in slot 1, in the same manner in which you removed it. Take care to hold it only by the edges. *Gently* slide it into its connector.

(B) Reconnect the Cables

The cables should be reconnected in the reverse order in which you disconnected them.

First, replace the jumper cable running from the back of the LED display to the GBM board (in slot 2). Then reconnect the two cables from the hard disk drive to the PCM board (in slot 4).

J4.3 Test the Unit

Before replacing the cover, review your work to be certain you have followed all the instructions correctly. Follow procedures in Section J3.4 to replace the cover (as a safety measure before you test the unit) as well as to test the new firmware in a power-up before you secure the cover.

The mux board option should be listed on the power-up screen in the **OPTIONS:** field. If there are any errors listed on the **SELF TEST ERRORS:** line, repeat the procedures from the beginning of this section and try reseating the mux board. Replace the cover and power up the unit again so it can perform the self test once more. If self test errors persist, contact Customer Service.

J4.4 Secure the Cover

When the **SELF TEST ERRORS:** line shows **NONE**, place the unit on its back and replace the six screws to hold the cover secure.

Appendix J5: Replacing Firmware on the CPM Board

CAUTION: STATIC ELECTRICITY CAN DAMAGE THE UNIT WHEN THE COVER IS REMOVED. Before you begin this section, you must take the proper anti-static precautions given in Appendix J1.

From time to time there may be a PROM change to upgrade the boards in the INTERVIEW. Correct procedures for changing a PROM are documented in this section.

J5.1 Avoid Inherent Difficulties

When removing or installing PROMs, take care to avoid generating static electricity, bending or breaking pins, and making improper connections.

(A) Static Electricity

Preventing static electricity is essential and is covered in Appendix J1. Taking the proper precautions given in that section will protect the sensitive components.

(B) Bent or Broken Pins

Individual pins on any connector or PROM can easily bend or break. Attaching or detaching components as vertically as possible and aligning them properly will help prevent damage to the pins.

(C) Improper Connections

Improper connections can cause system self-test errors as well as damage to the components. You can avoid improper connections with proper alignment of the pins. Be certain each individual pin is secure in its corresponding socket.

Always align the PROM with its notched end above the notched end of the socket. See Figure J5-2.

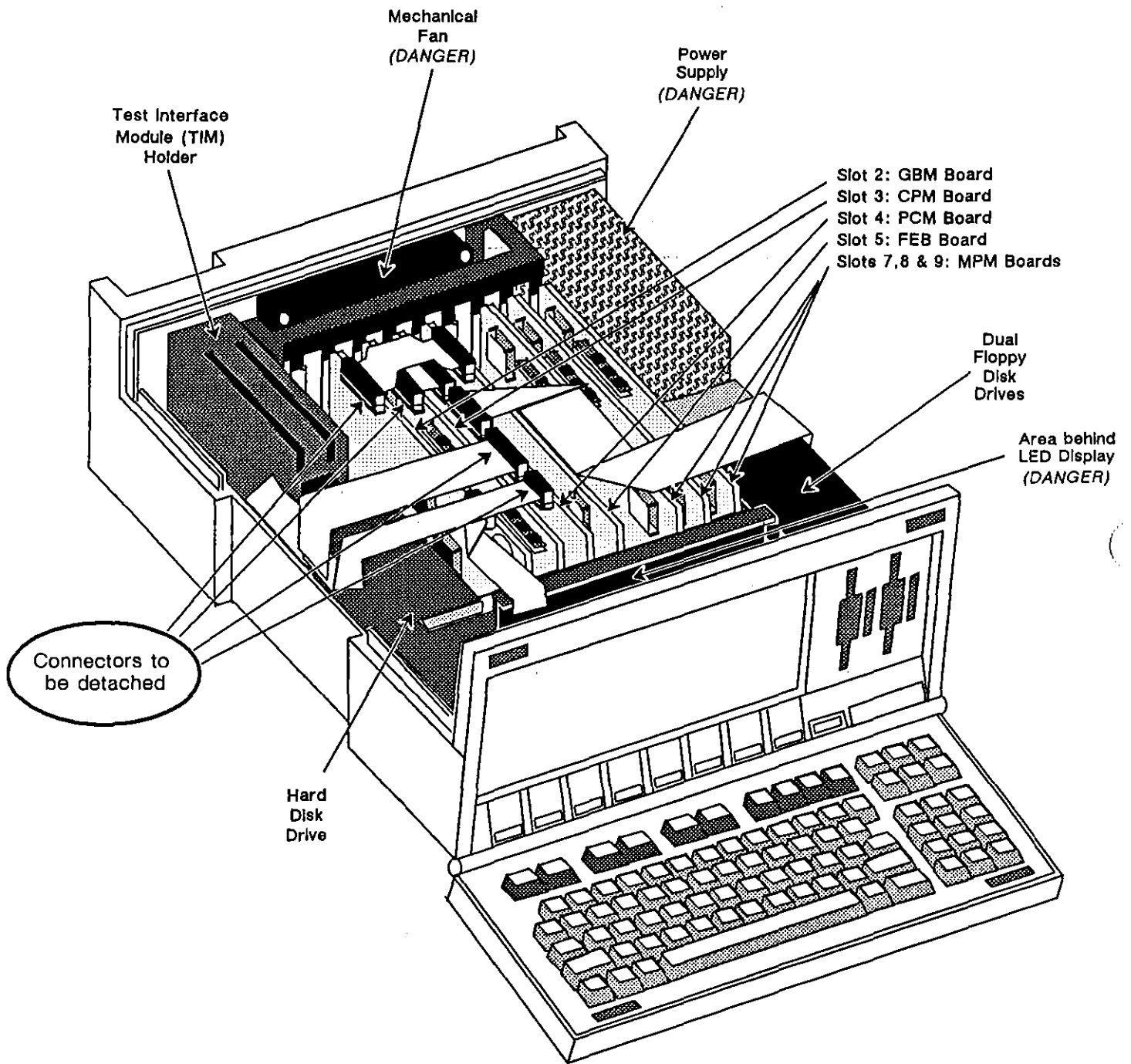


Figure J5-1 Four cable connections are detached to remove the CPM board from slot 3.

J5.2 Remove the CPM Board

(A) Locate the Board

Read Appendix J2 for instructions on removing the cover and for information on the interior layout of the INTERVIEW. Refer to Figure J5-1. The CPM board is in the third slot from the left.

(B) Detach Surrounding Cables

Make certain the unit is on an anti-static mat and you are wearing a grounded wrist strap.

To remove the CPM board, first remove the cables surrounding it and attached to it. Disconnect the cable connections *carefully*. They may be easily removed with an IC clip holder. Lift the connector straight up, holding onto its edges. **DO NOT PULL ON THE CABLE**; you could break it or damage the connectors. If you do not have an IC clip holder, a blade screwdriver will also work.

CAUTION: If you use a screwdriver, use the top of the black mounting rack (which secures the ends of the boards) as your leverage point. Avoid using the edges of the boards or other components to pry the connectors loose.

Refer to Figure J5-1 to locate the four connectors to be detached—two from cables extending from the hard disk drive and one each from two small jumper cables. The two from the hard disk drive are attached to the PCM board in slot 4. One jumper cable is attached to the GBM board in slot 2 and the other is attached to the CPM board in slot 3. Remove these four connectors and fold the cables back out of the way.

(C) Remove the Board

CAUTION: Do not hold any board by its gold edge connector. Hold it by the sides, NEVER touching the components.

Referring to Figure J5-1, locate the CPM board in slot 3 and remove it by grasping the top corner edges. *Gently* pull it straight up and out, and holding the board by its side edges, place it on the anti-static mat.

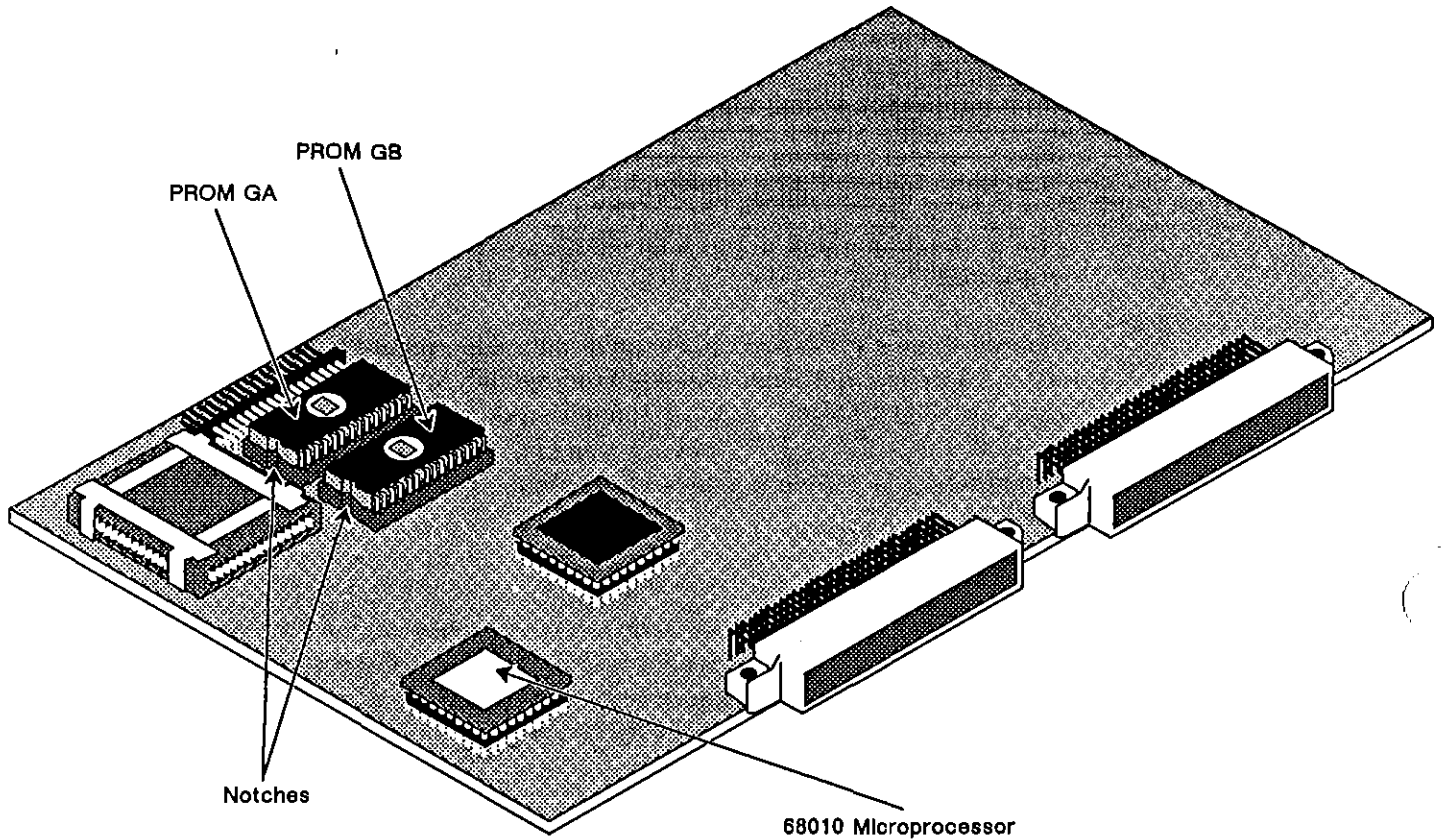


Figure J5-2 PROM GA and PROM GB are located on the upper left side of the CPM board.

J5.3 Exchange the PROMs on the CPM Board

(A) Locate the PROMs

The PROMs to be changed are located in the upper left-hand corner of the CPM board, one above the other. Refer to Figure J5-2. In the INTERVIEW 7000 and 7200 *TURBO*, they are identified as *951GA-101X* and *951GB-102X*; in the INTERVIEW 7500 and 7700 *TURBO*, they are identified as *951GA-111X* and *951GB-112X*. (The *X* refers to the present release level and this last letter will change for each new PROM.) Note that the PROM with GA in its identification number is always in the upper socket and the PROM with GB in its number is always in the lower one.

(B) Remove the PROMs

The PROMs may be removed with an IC clip holder, grasping the ends of the PROM and lifting it as straight up as possible. If an IC clip is unavailable, a blade screwdriver may be used. *Do not use any component on the board to pry up the PROM with the screwdriver.* Place the screwdriver under the smaller edge of the PROM and *gently* maneuver the blade in a rocking, semi-circular motion to loosen the PROM pins as evenly as possible.

Place the old PROM in the packing material in which the replacement PROM was sent for its return to the AR Division. (See Appendix F, Packing and Shipping Instructions.)

(C) Install the New PROMs

To install each replacement PROM, refer to Figure J5-2. After examining the PROMs to make sure the two rows of PROM pins are parallel, notice that one end of each PROM has a notch in it. Each notch has a corresponding one in that PROM's socket on the board. Align the notches as well as the pins and their corresponding holes. Again, the PROM with GA in its identification number goes into the upper socket and the PROM with GB in its number goes into the lower one.

J5.4 Replace the Board

(A) Install the Board in the Appropriate Slot

Replace the board in slot 3 in the same manner in which you removed it. Take care to hold it only by the edges. *Gently* slide it into its connector.

(B) Reconnect the Cables

The cables should be reconnected in the reverse order in which you disconnected them. First, replace the smallest jumper cable from the PCM board to the CPM board. Next, replace the larger jumper cable from the FEB board to the GBM board (in slot 2). Finally, reconnect the two cables from the hard disk drive to the PCM board (in slot 4).

J5.5 Test the Unit

Before replacing the cover, review your work to be certain you have followed all the instructions correctly. Follow procedures in Section J3.4 to replace the cover (as a safety measure before you test the unit) as well as to test the new firmware in a power-up before you secure the cover.

If the SELF TEST ERRORS: line shows anything other than NONE and you are installing the CPM board, try reinstalling the PROMs. Go to the beginning of this section (Appendix J5) and carefully follow the same precautions and instructions given. Replace the cover and power up the unit again so it can perform the self test once more. If the self test still gives errors, call Customer Service.

J5.6 Secure the Cover

When the SELF TEST ERRORS: line shows NONE, place the unit on its back and replace the six screws to hold the cover secure.

Appendix J6: Installing the Hard Disk Drive (OPT-951-01-1)

CAUTION: STATIC ELECTRICITY CAN DAMAGE THE UNIT WHEN THE COVER IS REMOVED. Before you begin this section, you must take the proper anti-static precautions given in Appendix J1.

Refer to Appendix Section J2.1 for cover removal information and to Appendix Section J2.2 for a description of the interior layout.

NOTE: Your unit may not have the cables across the top of the hard drive bracket—they will be installed later. It also does not have MPM boards in slots 7 and 8.

OPT-951-01-1, Winchester 20-Megabyte hard disk drive, is for INTERVIEW 7000 units. Installation consists of four steps: removing the empty hard disk bracket, securing the hard drive in the bracket, replacing the bracket and hard drive in the unit, and connecting cables to the hard drive.

CAUTION: To avoid injury, be sure to review the interior layout of the INTERVIEW for hazardous areas. See Figure J6-1.

ALSO: TURN THE UNIT OFF AND DISCONNECT POWER BEFORE YOU BEGIN THE INSTALLATION PROCEDURE.

J6.1 Remove the Hard Disk Drive and/or Bracket

Locate the hard disk drive bracket at the front of the left side of the unit, as shown in Figure J6-1.

There is an unattached power cable with a four pin female connector behind this bracket. This cable will give power to the hard drive once it is installed. For now, move it towards the back and outside of your unit, clear of the bracket.

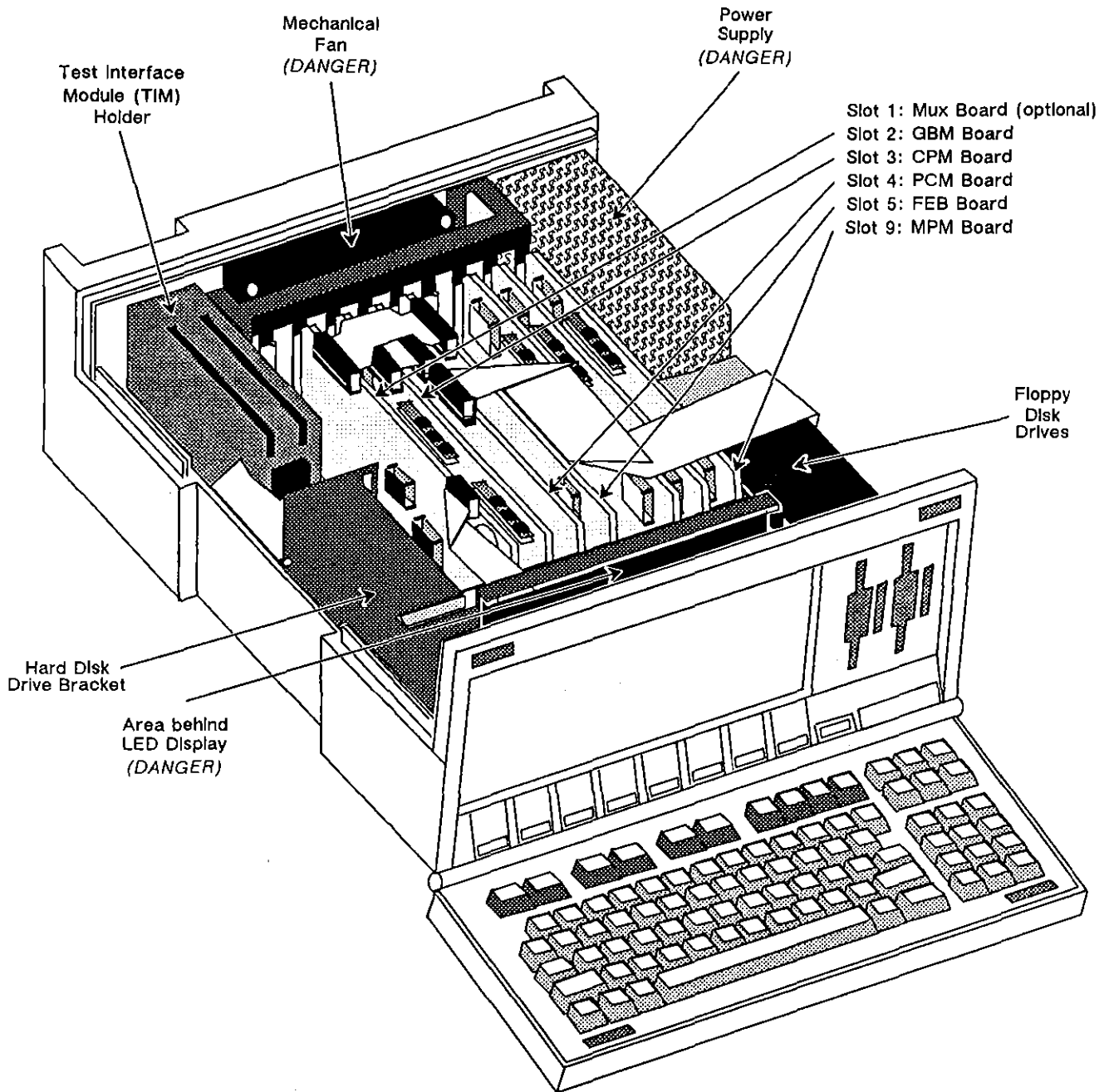


Figure J6-1 Viewing interior components of the INTERVIEW 7000.

There are five screws holding the bracket in the unit—two small Phillips screws toward the front outside of the bracket and three standard-head captive screws holding the bracket to the bottom of the unit, as shown in Figure J6-2. Remove the two small screws and loosen the three captive screws on the base of the bracket—one is in the front and the other two are in the back. Then lift the bracket (with or without a hard disk drive in it) straight up and out of the unit.

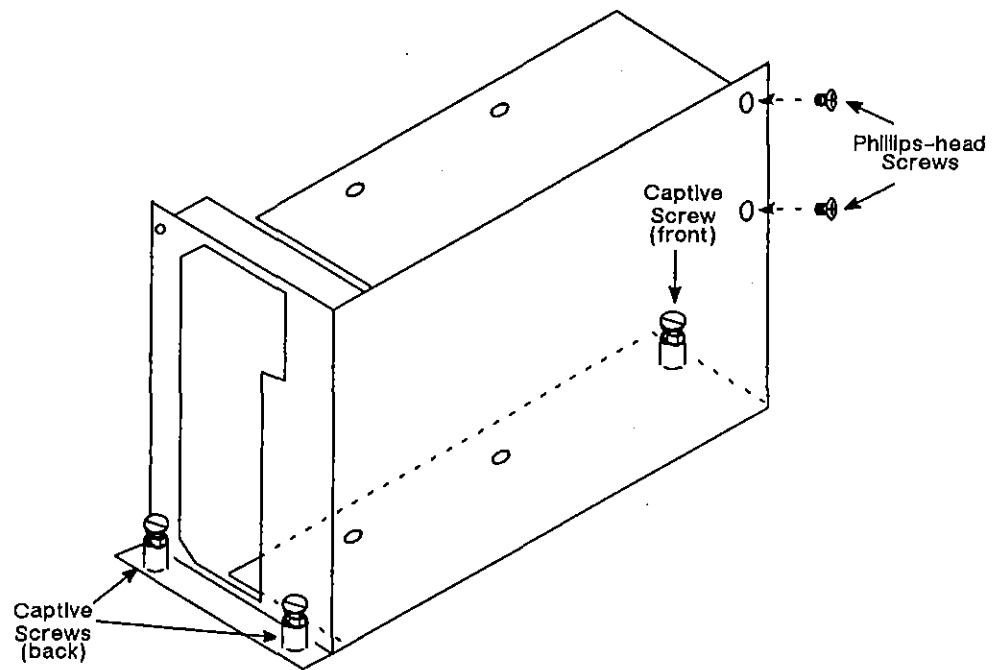


Figure J6-2 Hard disk drive bracket. Note placement of screws.

J6.2 Secure the Hard Disk Drive in the Bracket

Remove the 20-Mbyte hard disk drive from its packing material. Notice one side of the drive has exposed components. This side will remain exposed when you place it in the bracket. Slide the drive into the bracket with the component side of the drive facing out on the open side of the bracket, as shown in Figure J6-3.

Use the four Phillips-head screws included in your installation kit to mount your hard drive into the bracket. Insert and secure two of these into the top of the bracket and the other two into the bottom of the bracket.

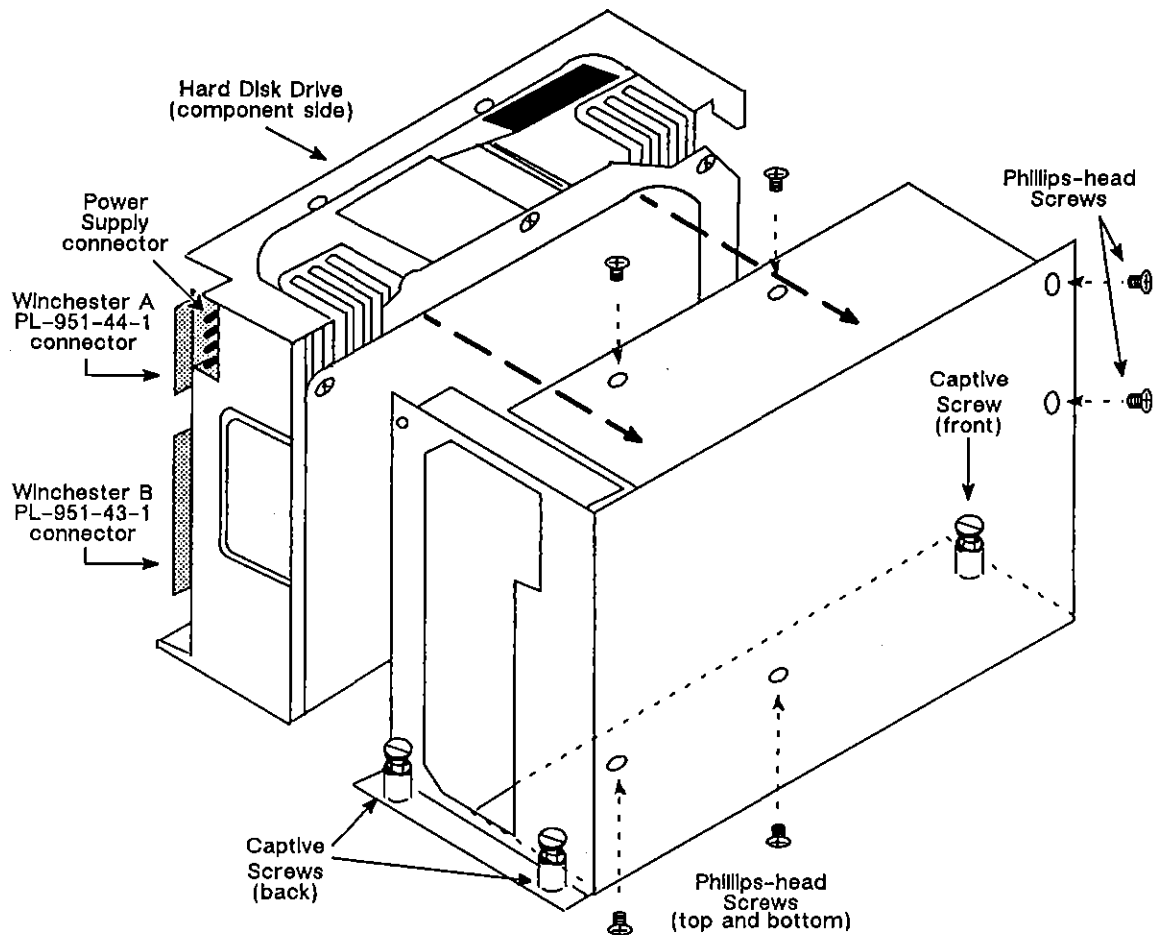


Figure J6-3 Slide the 20-Mbyte hard disk drive into the bracket with the component side exposed and secure the drive in the bracket with the four Phillips-head screws.

J6.3 Replace the Bracket with the Hard Drive into the Unit

Place the hard drive and its bracket in the INTERVIEW 7000 by sliding it down vertically in the same position that the empty bracket had occupied. The exposed (component) side of the bracket and hard drive should face into the unit. Secure the same five screws you released in removing the bracket: three captive screws to the base of the unit and two Phillips screws on the outside of the bracket.

J6.4 Connect the Cables

There are three cables to be connected: the power cable already in your unit and the two cables provided in the installation kit. See Figure J6-3 for the locations of the male connectors on the back of the hard drive.

Locate the power cable (with the four pin female connector) behind the hard drive. With the white wire on top and the red wire toward the bottom, plug the connector into the back at the top of the hard drive.

The two cables provided in the installation kit will connect the hard drive with the PCM board in slot 4, as shown in Figure J6-1. First, note the cables are folded for a proper fit. Examine the connections on the cables. In each case the end near the fold is a female slot connector (which connects to the back of the hard drive) and the other end is a female pin connector (which connects to the PCM board).

Attach the smaller of the two cables, labeled "WINCHESTER A, PL-951-44-1," to the smaller male slot connector on the top of the back of the hard drive. Connect the other end of this cable to the smaller male pin connector on the top of the PCM board, taking care to align the pins in their proper holes. In the same manner, attach the other cable, labeled "WINCHESTER B, PL-951-43-1," to the larger male slot connector on the lower back of the hard drive. Connect the other end of this cable to the larger male pin connector on the top of the PCM board.

Your installation of OPT-951-01-1 is complete. It is recommended that you test your unit after installing your hard disk before you begin operations again.

J6.5 Test the Unit

To test your unit, replace, but do not yet secure, the cover. Grasp the cover with the latch area to the front, facing you. Make certain that the latches are recessed as far as they can go into the cover and that their hooks are not beyond the edge of the cover. Slide the cover down. Take care that the two cables to the hard disk drive are not being pinched or damaged by the cover. (Some models may contain a small, removable, protective plastic sheet to help shield the cables from the cover.)

Now you can safely test the unit. For this test you must power the unit. Reconnect your power cable, turn on the unit, and check for the system self-tests.

The words "System RAM test now accessing all RAM :CPMOMOMIM2" appear on your screen, indicating that the first self test for the system is being performed. Following this first test are the tests for the rest of the system. The INTERVIEW prompts the user as each test is passed: RAM, timer, DMA, all MPMs, and 32-bit timer.

The statement "The unit has PASSED all system tests" should appear after these tests. The screen repaints as illustrated in Figure J6-4.

In the INTERVIEW 7000, the entry in the PROCESSORS: field displays 2.

The SELF TEST ERRORS: line should show NONE and the OPTIONS: line should display 01-1.

If the self test produces an error, try reinstalling the hard drive. Go to the beginning of this section and carefully follow the same precautions and instructions given. Replace the cover and power up the unit again so it can perform the self test once more. If the self test still gives errors, call Customer Service.

If the start-up screen is blank or the front-panel LEDs are not red or green (except for the REMOTE and FREEZE LEDs), the connectors may not be attached properly. Try reconnecting them again.

```
          ** INTERVIEW 7000 **  
  
DISKS: FLOPPY 1 FLOPPY 2 HARD DISK(20M)  
PROCESSORS: 2  
SELF TEST ERRORS: NONE  
  
Press:  
[PROGRAM] to enter the menu page  
[RUN]     to run the default program  
  
Software Version: 8.00  
Firmware Version: 5.00  
  
OPTIONS: 01-1  
  
TIM: RS-232/V.24  
  
Copyright (c) 1987, 1990  
Telenex Corporation
```

Figure J6-4 INTERVIEW 7000 (with OPT-951-01-1) screen after self test.

J6.6 Secure the Cover

Place the unit on its back once again and replace the six screws to hold the cover secure.

Appendix J7: Servicing Other Components

Other components of the INTERVIEW 7000 Series may require changing or modifying. Those changes and modifications will be documented in this section.

J7.1 Changing the Dual Floppy Disk Drive Bracket

If either ejection button of your floppy disk drives tends to stick when you operate the drive, you can eliminate the problem by changing the bracket for the dual floppy disk drives. While this is a simple operation, there are certain steps you must follow to insure proper installation.

First you must prepare the drives for the exchange. Then, you will disconnect the power source from the drives and lift out the present bracket holding the drives. Next you will remove the cables, exchange brackets, and replace the cables. Finally, you will replace the disk drives into the unit and reconnect the power source cables.

(A) Prepare the Drives

To prepare the dual floppy disk drives for removal, remove any disks they contain. This secures the eject button inside the drive so it won't dislodge upon removal of the unit. Locate the cable which attaches the dual floppy disk drives to the PCM board. Detach the connector from the board.

(B) Disconnect the Power Source from the Drives

Locate the small round cables which connect each drive to the power supply. They are found at the lower back of the floppy disk drives. Disconnect them from the drives.

(C) Lift out the Present Bracket

To prepare the present bracket for removal, locate the four captive screws which secure the bracket to the chassis. Using a common blade screwdriver, loosen these four screws from their bosses. These screws will not come out; loosen them sufficiently to release the bracket from the chassis.

Grasp the sides of the bracket and slide it towards the back of the chassis, freeing the eject buttons and the drives from the front panel slots. Then lift the drive assembly up and out of the unit.

(D) Remove the Cables

The dual floppy disk drives have a common cable which you previously detached from the PCM board. Remove the cable from the back of the disk drives, taking care not to damage the cable. Lift the connectors straight off the connecting pins. For reference, this cable is labeled "PL-951-42-1-A."

(E) Exchange the Brackets

In this next step, mark the disk drives so that you are certain to keep them in the same positions in the new bracket as they presently sit in the old bracket.

Using a common blade screwdriver, unscrew the four small screws on the top of the bracket and the four small screws on the bottom of the bracket. Place both brackets upright next to each other. Slide out one disk drive and place it the same position in the new bracket. Similarly, place the second disk drive in the new bracket.

At this point, you will replace the four top screws, turning them just enough to catch the drive in the bracket. One or two turns will suffice on each screw. Turn the assembly over and attach the four bottom screws in the same manner.

Place the assembly upright once again, aligning it with the eject buttons to your right. The drives should still be moveable in the bracket. Grasp the drive closest to you and move it as far to the left and away from you as it will go. Tighten the top two mounting screws for that drive. Follow the same procedure for the drive farthest from you.

Turn the assembly over, keeping the eject buttons on your right. Grasp the drive closest to you and pull it towards you. Tighten the bottom two mounting screws for this drive. Follow the same procedure for the drive farthest from you.

(F) Replace the Cables

Attach the cable to the back of the disk drives. Notice that these cables are "keyed." (Use Figure J3-1 as a reference.) With the eject buttons facing you, wrap the cable around the drive so the cable fold is on the right side of the drive.

(G) Replace the Dual Floppy Disk Drives into the Unit

Check the four bosses which hold the captive screws securing the bracket. If the threaded insert is not flush with or lower than the top of the boss, push it down inside the boss with the tip of a hot soldering iron.

Making sure the power cables you first disconnected are pushed out of the way, place the floppy drive assembly into the unit. Slide it forward, positioning the eject buttons and drive openings into the front panel slots. Tighten down the four captive screws and test the mechanical operation of each disk drive by inserting a floppy disk and then ejecting it.

(H) Reconnect the Power Source Cables

Locate the connecting pins for the power supply cables on the bottom of the rear of each floppy disk drive. Attach these cables to their connectors.

J7.2 Secure the Cover

Grasp the cover with the latch area to the front facing you. Make certain the latches are recessed as far as they can go into the cover and their hooks are not beyond the edge of the cover. Slide the cover down. For the INTERVIEW 7200 *TURBO*, 7500, and 7700 *TURBO*—and those INTERVIEW 7000s with the optional hard drive—take care that the two cables to the Winchester hard disk drive (on your left, directly behind the handle) are not being pinched or damaged by the cover. (Some models may contain a small, removable, protective plastic sheet to help shield the cables from the cover.)

Place the unit on its back once again and replace the six screws to hold the cover secure.

J7.3 Return Parts to AR Division Factory

Any parts which need to be returned to the AR Division should be properly packaged. Contact Customer Service for a RETURN AUTHORIZATION (RA) number.

Customers outside the Washington D.C. 1-800-368-3261
Greater Metropolitan Area

Local customers 644-9190

The RA number should be posted on the outside of the package of all equipment returned for repair. The RA number, as well as a description of the problem, should be cited in all documentation, written correspondence, or telephone conversations concerning the specific repair.

International customers should address the shipment to

Telenex Corporation, AR Division
ATTN RA *number*
c/o Emery Customs Brokers
101A Executive Drive
Sterling, Virginia 22170
U.S.A.

NOTE: For customs purposes, international customers *MUST* identify the country of origin for returned equipment on the *pro forma* invoice. When returning an individual part, use the country of origin listed on the part.

Domestic customers should address the shipment to

Customer Service
Telenex Corporation
AR Division ATTN RA *number*
7401 Boston Boulevard
Springfield, Virginia 22153
U.S.A.

Consult Appendix E for additional information on returning parts to the AR Division Factory.

Appendix K: C Language Summary

[The following material is adapted from the appendixes of the Proposed C Standard (ANSI document X3J11/86-098) with certain additions to describe the INTERVIEW implementation of C. The appendixes are not a part of the American National Standard. Information presented is collected from the Standard but is not necessarily complete.]

[For more information on C language and syntax, consult Section C of the Proposed Standard.]

K.1 LANGUAGE SYNTAX

[Editorial comments which appear in this section but are not part of the proposed standard are enclosed in non-italicized square brackets.]

In the syntax notation used in this section, syntactic categories (non-terminals) are indicated by *italic* type, and literal words and characters (terminals) by **bold** type. [These items have no sub-categories.] A colon following a non-terminal introduces its definition. Alternative definitions are listed on separate lines, except when prefaced by the words "one of." An optional symbol is indicated by the subscript *opt* [here, represented as *{opt}*], so that

{ *expression* *{opt}* }

indicates an optional expression enclosed in braces.

K.1.1 Lexical Grammar

K.1.1.1 Tokens

A token is a minimal lexical element of the language. [Categories of tokens are given below. Each of these categories is further described in a separate sub-section.]

token:

keyword
identifier
constant
string-literal

operator
punctuator

K.1.1.2 Keywords

[These words (entirely in lower-case) are reserved due to their special meanings.]

keyword: one of

auto	double	int	struct
break	else	long	switch
case	enum	register	typedef
char	extern	return	union
const	float *	short	unsigned
continue	for	signed	void
default	goto	sizeof	volatile
do	if	static	while

[* The reserved word **float** is not used in the INTERVIEW implementation of C.]

[The following two words are reserved in the INTERVIEW implementation.]

task **waitfor**

K.1.1.3 Identifiers

An identifier is a sequence of nondigit characters (including the underscore and upper-case letters) and digits. An identifier may not consist of the same sequence of characters as a keyword. [An identifier should also be distinct from user functions or library functions.]

[Essentially, identifiers refer to variables, functions, labels, and various user-defined objects.]

identifier:

nondigit
identifier nondigit
identifier digit

nondigit: one of

_ a b c d e f g h i j k l m
n o p q r s t u v w x y z
A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z

digit: one of

0 1 2 3 4 5 6 7 8 9

K.1.1.4 Constants

[Constants may be any of the basic allowable data types. Floating point constants are not supported.]

constant:

integer-constant
enumeration-constant
character-constant

fractional-constant:

digit-sequence [opt] . digit-sequence
digit-sequence .

exponent-part:

e sign [opt] digit-sequence
E sign [opt] digit-sequence

sign: one of

+ -

digit-sequence:

digit
digit-sequence digit

integer-constant:

decimal-constant integer-suffix [opt]
octal-constant integer-suffix [opt]
hexadecimal-constant integer-suffix [opt]

decimal-constant:

nonzero-digit
decimal-constant digit

octal-constant:

0
octal-constant octal-digit

hexadecimal-constant:

0x hexadecimal-digit
0X hexadecimal-digit
hexadecimal-constant hexadecimal-digit

nonzero-digit: one of

1 2 3 4 5 6 7 8 9

octal-digit: one of

0 1 2 3 4 5 6 7

hexadecimal-digit: one of

0 1 2 3 4 5 6 7 8 9
a b c d e f
A B C D E F

integer-suffix:

unsigned-suffix long-suffix [opt]
long-suffix unsigned-suffix [opt]

unsigned-suffix: one of

u U

long-suffix: one of

l L

enumeration-constant:

identifier

character-constant:

'*c-char-sequence*'

c-char-sequence:

c-char
c-char-sequence c-char

c-char:

any character in the source character set except
the single-quote ' , backslash \ , or new-line character
escape-sequence

escape-sequence: one of

\' \" \? \\
\o \oo \ooo
xh \xhh \xhhh
\a \b \f \n \r \t \v

K.1.1.5 String literals

A string literal is a sequence of zero or more characters enclosed in double quotes, as in "xyz".

A double quote within a string literal is represented by the escape sequence \".

string-literal:

"*s-char-sequence [opt]*"

s-char-sequence:

s-char
s-char-sequence s-char

s-char:

any character in the source character set except
the double-quote ", backslash \, or new-line character
escape-sequence

K.1.1.6 Operators

An operator specifies an operation to be performed that yields a value.

[An operator is a symbol that tells the compiler to perform specific mathematical or logical manipulations.]

operator: one of

```
[ ] ( ) . ->
++ -- & * + - - ! sizeof
/ % << >> < > <= >= == != ^ | && ||
? :
= *= /= %= += -= <<= >>= &= ^= |=
, # ##
```

K.1.1.7 Punctuators

A punctuator is a symbol that has independent syntactic and semantic significance but does not specify an operation...that yields a value.

Depending on context, the same symbol may also represent an operator or part of an operator.

punctuator: one of

```
[ ] ( ) { } * , : = ; ... #
```

K.1.2 Phrase structure grammar

K.1.2.1 Expressions

An expression is a sequence of operators and operands [variables and constants] that specifies how to compute a value or (in the case of a void expression) how to generate side effects.

primary-expression:

```
identifier
constant
string-literal
( expression )
```

postfix-expression:

```
primary-expression
postfix-expression [ expression ]
postfix-expression (argument-expression-list [opt])
```

postfix-expression . *identifier* .
postfix-expression -> *identifier*
postfix-expression ++
postfix-expression --

argument-expression-list:

assignment-expression
argument-expression-list , *assignment-expression*

unary-expression:

postfix-expression
++ *unary-expression*
-- *unary-expression*
unary-operator *cast-expression*
sizeof *unary-expression*
sizeof (*type-name*)

unary-operator: one of

& * + - ~ !

cast-expression:

unary-expression
(*type-name*) *cast-expression*

multiplicative-expression:

cast-expression
multiplicative-expression * *cast-expression*
multiplicative-expression / *cast-expression*
multiplicative-expression % *cast-expression*

additive-expression:

multiplicative-expression
additive-expression + *multiplicative-expression*
additive-expression - *multiplicative-expression*

shift-expression:

additive-expression
shift-expression << *additive-expression*
shift-expression >> *additive-expression*

relational-expression:

shift-expression
relational-expression < *shift-expression*
relational-expression > *shift-expression*
relational-expression <= *shift-expression*
relational-expression >= *shift-expression*

equality-expression:

relational-expression
equality-expression == *relational-expression*
equality-expression != *relational-expression*

AND-expression:

equality-expression
AND-expression & *equality-expression*

exclusive-OR-expression:

AND-expression
exclusive-OR-expression ^ *AND-expression*

inclusive-OR-expression:

exclusive-OR-expression
inclusive-OR-expression | *exclusive-OR-expression*

logical-AND-expression:

inclusive-OR-expression
logical-AND-expression && *inclusive-OR-expression*

logical-OR-expression:

logical-AND-expression
logical-OR-expression || *logical-AND-expression*

conditional expression:

logical-OR-expression
logical-OR-expression ? *expression* : *conditional-expression*

assignment-expression:

conditional-expression
unary-expression *assignment-operator* *assignment-expression*

assignment-operator: one of

= *= /= %= += -= <<= >>= &= ^= |=

expression:

assignment-expression
expression , *assignment-expression*

constant-expression:

conditional-expression

K.1.2.2 Declarations

A declaration specifies the interpretation and attributes of a set of identifiers. A declaration that also causes storage to be reserved for an object or function named by an identifier is a definition.

declaration:

declaration-specifiers init-declarator-list [opt];

declaration-specifiers:

storage-class-specifier declaration-specifiers [opt]

type-specifier declaration-specifiers [opt]

init-declarator-list:

init-declarator

init-declarator-list , init-declarator

init-declarator:

declarator

declarator = initializer

storage-class-specifier:

typedef

extern

static

auto

register

type-specifier:

char

short

int

long

signed

[float not supported]

unsigned

double

const

volatile

void

struct-or-union-specifier

enum-specifier

typedef-name

task-specifier

[The last *type-specifier* in the list above, *task-specifier*, is specific to the INTERVIEW implementation and is not standard C.]

struct-or-union-specifier:
 struct-or-union identifier [opt] { struct-declaration-list }
 struct-or-union identifier

struct-or-union:
 struct
 union

struct-declaration-list:
 struct-declaration
 struct-declaration-list struct-declaration

struct-declaration:
 type-specifier-list struct-declarator-list ;

struct-declarator-list:
 struct-declarator
 struct-declarator-list , struct-declarator

struct-declarator:
 declarator
 declarator [opt] : constant-expression

enum-specifier:
 enum identifier [opt] { enumerator-list }
 enum identifier

enumerator-list:
 enumerator
 enumerator-list , enumerator

enumerator:
 enumeration-constant
 enumeration-constant = constant-expression

declarator:
 pointer [opt] declarator2

declarator2:
 identifier
 (declarator)
 declarator2 [constant-expression [opt]]
 declarator2 (parameter-type-list)
 declarator2 (identifier-list [opt])

pointer:
 * *type-specifier-list [opt]*
 * *type-specifier-list [opt] pointer*

type-specifier-list:

type-specifier
type-specifier-list type-specifier

parameter-type-list:

parameter-list
parameter-list , ...

parameter-list:

parameter-declaration
parameter-list , parameter-declaration

parameter-declaration:

declaration-specifiers declarator
type-name

identifier-list:

identifier
identifier-list , identifier

type-name:

type-specifier-list abstract-declarator [opt]

abstract-declarator:

pointer
pointer [opt] abstract-declarator2

abstract-declarator2:

(abstract-declarator)
abstract-declarator2 [opt] [constant-expression [opt]]
abstract-declarator2 [opt] (parameter-type-list [opt])

typedef-name:

identifier

initializer:

assignment-expression
{ initializer-list }
{ initializer-list , }

initializer-list:

initializer
initializer-list , initializer

task-specifier:

task-identifier { task-body }
task { task-body }
task-identifier

task-body:

external-definition
 layer-declaration
 task-body external-definition
 task-body layer-declaration

layer-declaration:

#pragma layer integer-constant

K.1.2.3 Statements

A statement specifies an action to be performed.

statement:

labeled-statement
compound-statement
expression-statement
selection-statement
iteration-statement
jump-statement
waitfor-statement

[The last *statement* in the list above, *waitfor-statement*, is specific to the INTERVIEW implementation and is not standard C.]

labeled-statement:

identifier : *statement*
 case *constant-expression* : *statement*
 default : *statement*

compound-statement:

{ *declaration-list* [*opt*] *statement-list* [*opt*] }

declaration-list:

declaration
declaration-list declaration

statement-list:

statement
statement-list statement

expression-statement:

expression [*opt*] ;

selection-statement:

if (*expression*) *statement*
 if (*expression*) *statement* else *statement*
 switch (*expression*) *statement*

iteration-statement:

```
while ( expression ) statement
do statement while ( expression ) ;
for ( expression [opt] ; expression [opt] ; expression [opt])
statement
```

jump-statement:

```
goto identifier ;
continue ;
break ;
return expression [opt] ;
```

waitfor-statement:

```
waitfor { }
waitfor { waitfor_list }
```

waitfor-list:

```
expression : statement
waitfor_list expression : statement
```

K.1.2.4 External definitions

file:

```
external-definition
file external-definition
```

external-definition:

```
function-definition
declaration
```

function-definition:

```
declaration-specifiers [opt] declarator function-body
```

function-body:

```
declaration-list [opt] compound-statement
```

K.1.3 Preprocessing directives

[These are instructions to the compiler included in source code.]

The implementation can include sections of program text, conditionally include other source files, and replace macro's.

preprocessing-file:

```
group
preprocessing-file group
```

group:

```
group-part
group group-part
```


group-part:

tokens [opt] new-line
if-section
control-line

tokens:

token
tokens token

if-section:

if-group elif-groups [opt] else-group [opt] endif-line

if-group:

if constant-expression new-line group [opt]
ifdef identifier new-line group [opt]
ifndef identifier new-line group [opt]

elif-groups:

elif-group
elif-groups elif-group

elif-group:

elif constant-expression new-line group [opt]

else-group:

else new-line group [opt]

endif-line:

endif new-line

control-line:

include <x-char-sequence> new-line
include "x-char-sequence" new-line
define identifier tokens [opt] new-line
define identifier (paren identifier-list [opt]) tokens [opt]
new-line
undef identifier new-line
line digit-sequence string-literal [opt] new-line
pragma x-char-sequence new-line
new-line

x-char-sequence:

x-char
x-char-sequence x-char

x-char:

any character in the source character set except the
 new-line character

lparen:

the left-parenthesis character without preceding white space

new-line:

the new-line character

K.1.3.1 AR pragmas

#pragma hook *hook_type hook_text*

hook_type: decimal-constant.

hook_text: string-constant

#pragma layer *integer-constant*

#pragma nowarn

#pragma object *object_file_name*

object_file_name: string constant

#pragma tracebuf *trace_buffer_declaration_list [opt]*

trace_buffer_declaration_list:

trace_buffer_declaration

trace_buffer_declaration_list trace_buffer_declaration

trace_buffer_declaration:

decimal-constant decimal-constant

** decimal-constant*

#pragma il_buffers *decimal-constant*

#pragma il_buffer_size *decimal-constant*