4120 SERIES
OPTION MD
(020-1492-00)

Please Check for
CHANGE INFORMATION
at the Rear of This Manual

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MANUAL REVISION STATUS

PRODUCT: 4120 Series Option MD

This manual supports the following versions of this product: Serial Numbers B010100 and up.

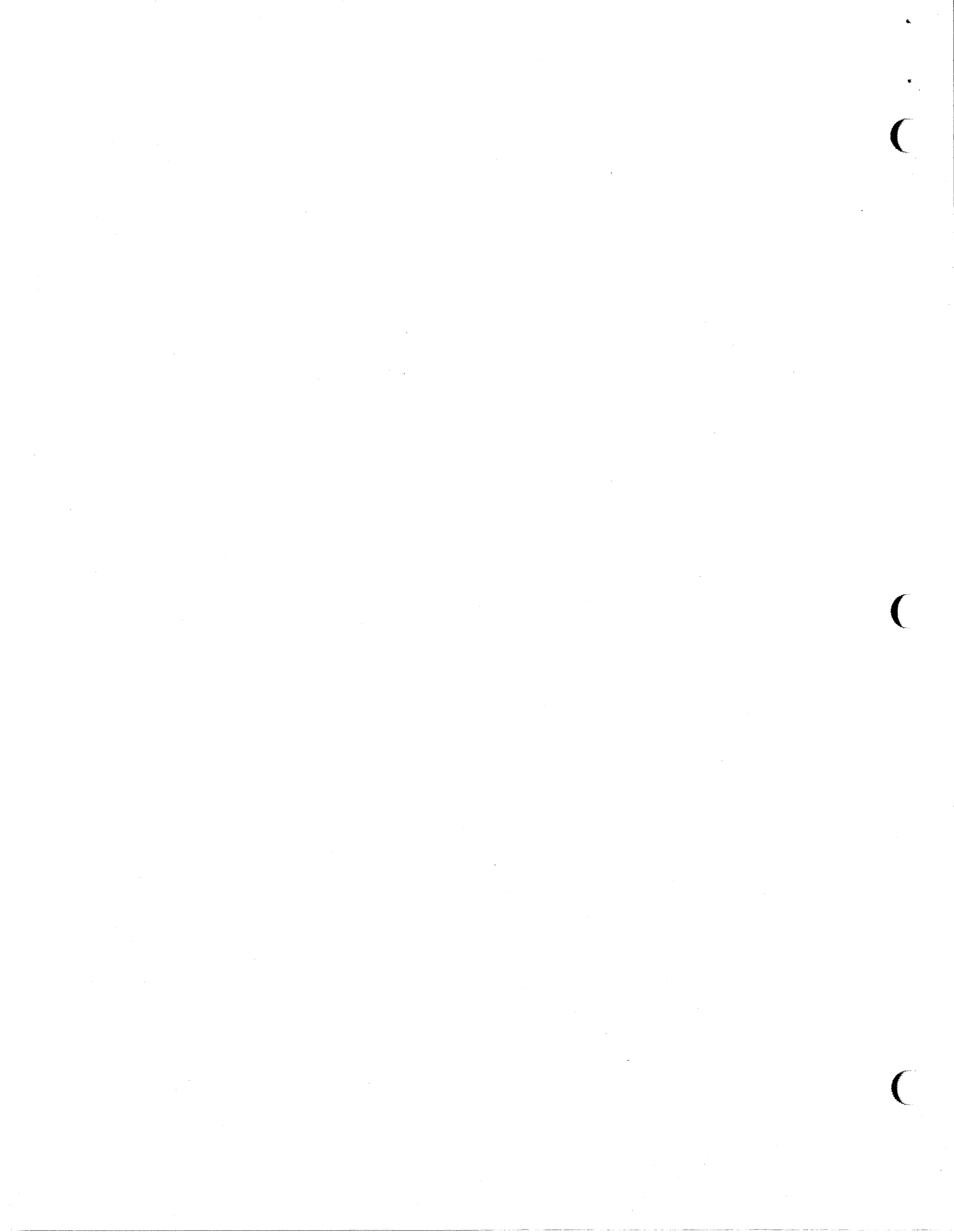| REV DATE	DESCRIPTION
JUL 1986	Original Issue.

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TABLES

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PARTS LIST

OPERATORS SAFETY SUMMARY

This general safety information is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

TERMS

IN THIS MANUAL

CAUTION statements identify conditions or practices that can result in damage to the equipment or other property.

WARNING statements identify conditions or practices that can result in personal injury or loss of life.

AS MARKED ON EQUIPMENT

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

SYMBOLS

IN THIS MANUAL

⚠ This symbol indicates where applicable cautionary or other information is to be found.

AS MARKED ON EQUIPMENT

⚡ DANGER high voltage.

⏚ Protective ground (earth) terminal.

⚠ ATTENTION — refer to manual.

! Refer to manual.

POWER SOURCE

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

GROUNDING THE PRODUCT

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the power input or output terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

DANGER ARISING FROM LOSS OF GROUND

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating) can render an electric shock.

USE THE PROPER POWER CORD

Use only the power cord and connector specified for your product.

Use only a power cord that is in good condition.

Refer cord and connector changes to qualified service personnel.

USE THE PROPER FUSE

To avoid fire hazard, use only the fuse specified in the parts list for your product, and which is identical in type, voltage rating, and current rating.

Refer fuse replacement to qualified service personnel.

DO NOT OPERATE IN EXPLOSIVE ATMOSPHERES

To avoid explosion, do not operate this product in an atmosphere of explosive gases unless it has been specifically certified for such operation.

DO NOT REMOVE COVERS OR PANELS

To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

SERVICE SAFETY SUMMARY

FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the preceding Operators Safety Summary.

DO NOT SERVICE ALONE

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

USE CARE WHEN SERVICING WITH POWER ON

Dangerous voltages may exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.

Disconnect power before removing the power supply shield, soldering, or replacing components.

DO NOT WEAR JEWELRY

Remove jewelry prior to servicing. Rings, necklaces, and other metallic objects could come into contact with dangerous voltages and currents.

X-RADIATION

X-ray emission generated within this instrument has been sufficiently shielded. Do not modify or otherwise alter the high voltage circuitry or the CRT enclosure.

POWER SOURCE

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

HANDLING

Due to the weight of the Monitor, and its component subassemblies, at least two persons are required to perform installation or service to prevent injury to personnel or damage to the Monitor.

IMPLOSION PROTECTION

Whenever the implosion shield is removed from the CRT, protection against implosion hazard is reduced. Service personnel should wear full face masks and protective clothing at any time the CRT is removed from the CRT module or the implosion shield is not in place.

4120 SERIES

OPTION MD

INTRODUCTION

This manual is a supplement to the 4115/4120 Series Service Manuals, 4110/4120 Series Command Reference Manual, and the 4110/4120 Series Command Reference Manual.

Option MD is special firmware required to support a McDonnell Douglas Programmable Function Keyboard (PFK). The PFK is used for selecting functions in a host program and is a separate keyboard connecting a RS-232 line through a peripheral port on a 4120 Series terminal. The Option MD consists of 12 EPROMs that are direct mechanical replacements for 12 selected EPROMs in the 4120 Series terminal.

The terminal supports the PFK as a GIN (graphics input) device. The GIN system is modified to support the PFK, to support a new report format, and to control lights on the PFK.

4120 SERIES OPTION MD INSTALLATION

Installing Option MD consists of replacing four EPROMs on the 80286/7 Processor board and eight EPROMs on the Peripheral Port board.

WARNING

The following removal/replacement procedures may expose you to hazardous voltages. Removing or installing boards without first turning off ac power may result in damage to the equipment. Disconnect power to the terminal before proceeding.

The installation instructions consist of four parts:

- o Gaining access to the Card cage
- o Replacing selected 80286/7 Processor board EPROMs
- o Replacing selected Peripheral Port board EPROMs
- o Completing and verifying the installation

GAINING ACCESS

Refer to the 4115/4120 Series Field Procedures (070-5270-00) manual for detailed cabinet removal/replacement procedures. Those procedures are summarized here.

Remove two screws from back top cover. Slide the cover back from the instrument about 2 inches. Now, grasp the exposed bottom edge of the cover, spread the sides, and lift the cover up and away from the instrument. (The cover slides off when tilted to about a 45 degree angle.)

REPLACING 80286/7 PROCESSOR BOARD EPROMS

⌇ *CAUTION* ⌇

Handle all EPROMs and circuit boards with
established precautions as they are subject
to damage from static discharge.

1. Locate the processor board. The 80286/7 Processor board is
   located in slot "2", the second board from the left, as
   indicated by the ECB location label below the Card cage.

2. Disconnect the cables connected to the Processor
   board. Note their locations for reinstallation.

NOTE

You may have to disconnect other cables to
remove the processor board.

It is not necessary to observe the polarity
on the RAM bus cable.

3. Pull out on the upper and lower arms of the 80286/7
   Processor board ejectors. This unlocks the circuit board
   from the Card cage.

4. Remove the 80286/7 Processor board board by pulling it out
   of the Card cage.

5. Remove the EPROMs (U329, U335, U529, and U535) from the
   80286/7 Processor board with an IC puller, or an insulated
   blade screwdriver, prying alternately (carefully) on one
   side, then the other, until the EPROM can be lifted out.

6. Install the four replacement EPROMs (also marked with the
   same circuit numbers marked on the original EPROMs), while
   ensuring that all pins are positioned properly, orienting
   the substitute EPROMs with the index mark pointing to the
   board stiffener. Lock each EPROM in place by pushing it
   firmly into the socket.

INSTALLATION

7. Place the adhesive-backed label (marked 672-1260-00) on
   the 80286/7 Processor board, directly over the original
   number.

8. Place the 80286/7 Processor board back in slot 2. Gently
   push the board into the Card cage, being careful that it
   does not pull wires or cables that might get looped around
   components.

<div align="center">

~~~~~~~~~~~
{ *CAUTION* }
~~~~~~~~~~~

</div>

   The circuit board locking levers must remain
   extended until the circuit board is inserted
   all the way into the Motherboard connector.
   The circuit board is locked into position by
   closing the levers. Attempting to force the
   circuit board into place by closing the
   levers may result in breaking the levers or
   the Motherboard connectors.

9. Put the cables back on the 80286/7 Processor board and the
   ECC RAM circuit board(s), seating the connectors firmly.

REPLACING THE PERIPHERAL PORT INTERFACE BOARD EPROMS

Remove the PERIPHERAL PORT INTERFACE (PPI) board (typically in
slot 5), handling the board and the EPROMs with care.

1. Remove the EPROMs (U150, U160, U170, U180, U250, U260, U270,
   and U280) with an IC puller, or an insulated blade
   screwdriver, prying alternately (carefully) on one side,
   then the other, until the EPROM is removed.

2. Install the eight replacement EPROMs (also marked with the
   same circuit numbers marked on the original EPROMs) being
   careful to orient the substitute EPROMs in the proper manner
   (with pins all in place). Lock each EPROM in place by
   pushing it firmly into the socket.

3. Place the adhesive-backed label (marked 672-1261-00) on the
   Peripheral Port board, directly over the original number.

4. Reinstall the Peripheral Port board.

5. Replace any cables or wires that you may have disconnected.

COMPLETING AND VERIFYING THE INSTALLATION

Replace the cabinet cover by reversing the "gaining access" procedure. Replace the power cord.

Turn on power and wait for the power-up self test to be completed. If the self test fails, go through the instructions again, making sure the EPROMs are in the right sockets and the boards are securely mounted, with no interference from the installed board nor any adjoining boards.

Satisfactory completion of the Power-Up self test indicates that the installation is complete. Further verification of operation requires the connection of a PFK and running a sample program.

OPERATING INSTRUCTIONS

The remainder of this document describes the specific commands and firmware changes that are unique for Option MD. Since this document only describes changes, you may want to read the following information in conjunction with the standard description of the appropriate command in the 4110/4120 Series Command Reference Manual. In that 4110/4120 Manual, the standard descriptions apply except as noted on the following pages.

SUMMARY OF CHANGES

The REPORT-TERMINAL-SETTINGS command is expanded to allow an additional Special Inquiry code of "~" (ADE 126) and "M" (ADE 77).

  o   If Option MD is not installed, the report is <SP><SP>

  o   If Option MD is installed without PFK support, the report is ~M<SP><SP>0

  o   If Option MD is installed with PFK support, the report is ~M<SP><SP>1

The SET-GIN-RATES command is expanded to control lights in the PFK.

The DISABLE-GIN command turns off ENABLE-GIN command codes for the PFK Choice functions. The ENABLE-GIN command has a list of the codes.

The ENABLE-GIN command is changed so that a zero count specifies that GIN remains enabled until disabled by the user or system. Zero count can be specified for all current GIN devices and functions (not just PFK).

The PORT-ASSIGN command has a PFK protocol.

The following firmware commands are modified to support the PFK,
including Table 1.

Table 1

DESCRIPTION OF COMMANDS CHANGED WITH MD OPTION

Command	Description of Change
DISABLE-GIN	Accepts Choice-function device function codes
ENABLE-GIN	Choice function added, 0 event-count action changed *
PORT-ASSIGN	PFK/M option added *
SET-GIN-RATES	Light on/off setting *
REPORT-GIN-POINT	Error IP11 level 2 issued for Choice function
SET-GIN-CURSOR	Error IC11 level 2 issued for Choice function
SET-GIN-DISPLAY-START-POINT	Error IX11 level 2 issued for Choice function
SET-GIN-GRIDDING	Error IQ10 level 2 issued for Choice function
SET-GIN-LOGICAL-FUNCTION	Error IO11 level 2 issued for Choice function
SET-GIN-INKING	Error II11 level 2 issued for Choice function
SET-GIN-RUBBERBANDING	Error IR10 level 2 issued for Choice function
SET-GIN-STROKE-FILTERING	Error IF10 level 2 issued for Choice function

* Detailed descriptions follow.

ENABLE-GIN COMMAND

Since there are extensive changes in the ENABLE-GIN command (with Option MD), the following is a full, detailed description of the ENABLE-GIN command function.

Host Syntax

<EC>IE   int:GIN-code   int:GIN-count

Setup Syntax

GINENABLE <SP>   GIN-code   GIN-count

Parameters

GIN-code
   An integer of the form $2048M + 8D + F$, where M is a mode code, D is an 8-bit device code, and F is a 3-bit function code.

Functions for values other than those listed are not present.

   Valid values for M are:
      0   GIN events on key press
      1   GIN events on key press and also on key release

   Valid values for D are:
      1   Tablet (absolute mode)
      3   Peripheral Port 0 (P0:)
      4   Peripheral Port 1 (P1:)
      5   Peripheral Port 2 (P2:)
      6   Tablet (relative mode)
      8   Mouse
      9   Joystick

   Valid values for F are:
      0   Locate
      1   Pick
      2   Stroke
      4   Choice

GIN-count (0 to 65535)
    Specifies the number of GIN events possible before the
    device-function combination is automatically disabled. A
    value of 0 specifies that GIN is not to be automatically
    disabled and that an infinite number of GIN events can be sent.

Description

This command enables GIN (graphic input) for the device,
function, and mode specified in the GIN-code parameter.

GIN-code. The GIN-code parameter combines a mode code (M)
with the device-function code used by other GIN commands.

                              NOTE

            This is the only GIN command that uses a
            GIN-code containing mode information as well
            as device and function code information.
            Other GIN commands use the device-function
            code that consists of the least-significant
            11 bits of the GIN-code. Device-function
            codes take the form 8D + F, whereas GIN-codes
            take the form 2048M + 8D + F.

The mode code (M) specifies when GIN events occur for the locator
and pick functions for mouse and tablet devices. When M is 0,
GIN events occur only on key press. When M is 1, GIN events
occur both on key press and also on key release. Key-release GIN
events cannot occur in conjunction with inking or rubberbanding.
The terminal detects an error if you attempt to enable GIN with M
= 1 in the GIN code for a device-function combination for which
rubberbanding or inking has already been enabled.

                              NOTE

            GIN events are caused by changes in the
            status of the GIN device keys; they do not
            depend on the state of the GIN device keys
            before GIN is enabled. The first GIN event
            after ENABLE-GIN is the first valid tran-
            sition (down, if M is 0; up or down, if M is
            1) detected after GIN is enabled.

OPERATING INSTRUCTIONS

Table 2 summarizes the supported GIN devices and the features
that trigger GIN events.

Table 2

GIN DEVICE CODES (D)

Device Code	Motion Devices	Event Devices
0	Thumbwheels	Keyboard keys
1, 6	Stylus or puck	Stylus or puck button
3	Peripheral Port 0 o 4662 Joystick o 4663 Joystick o 4957 Stylus o 4958 Stylus o 4957 Puck o 4958 Puck o None for PFK	4662 CALL key 4663 POINT key 4957 stylus button 4958 stylus button 4957 puck buttons 4958 puck buttons PFK keys
4	Peripheral Port 1	Same as Device Code 3
5	Peripheral Port 2	Same as Device Code 3
8	Mouse	Mouse buttons
9	Joystick	Joystick trigger and position switches (if macros are defined for them)

Table 3 lists the valid <u>device-function</u> codes for supported devices and is needed for general reference in other GIN commands.

Table 3

DEVICE-FUNCTION CODES

(8D + F)

Device Code (D)	Function Code (F)			
	0 (Locate)	1 (Pick)	2 (Stroke)	4 (Choice)
0 -- Thumbwheels	0	1		
1 -- Tablet (absolute)	8	9	10	
3 -- Peripheral Port 0	24	25		28
4 -- Peripheral Port 1	32	33		36
5 -- Peripheral Port 2	40	41		44
6 -- Tablet (relative)	48	49		
8 -- Mouse	64	65	66	
9 -- Joystick	72	73		

Table 4 lists the valid <u>GIN-codes</u> that include those shown in
Table 3 when M (in Table 4) is 0. <u>Codes greater than 2048 are
used only with the ENABLE-GIN command.</u>

Table 4

GIN-CODES

(2048M + 8D + F)

Device Code	Mode code (M)= 0 Function Code				Mode code (M)= 1 Function Code			
	0	1	2	4	0	1	2	4
0	0	1						
1	8	9	10		2056	2057		
3	24	25		28	2072	2073		
4	32	33		36	2080	2081		
5	40	41		44	2088	2089		
6	48	49			2096	2097		
8	64	65	66		2112	2113		
9	72	73						

GIN-count. GIN-count specifies how many events of the
function are to occur before the function is automatically
disabled. A function can be enabled for an unlimited number of
events by specifying a count of zero.

When GIN is enabled, some of the dynamic attributes of the cursor
segment are saved and set. See the discussion of the SET-
GIN-CURSOR command for details about what happens to the
cursor segment when GIN is enabled. For each device-function
combination, the terminal remembers a separate GIN space
location. When the device and function is enabled, this
GIN-space location changes as the device is manipulated. The
GIN-space location is transformed into terminal space coordinates
through a GIN-area to GIN-window transform to update the GIN
cursor position and for the GIN reports. (See the SET-GIN-AREA
and SET-GIN-WINDOW commands in the 4110/4120 Series Command
Reference with 3D Manual for details.)

When a 3D segment is used as a GIN cursor, these GIN window space
coordinates are used to update the 3D position of the cursor
according to the current GIN logical function for the device and
function. (See the SET-GIN-LOGICAL-FUNCTION command in the
4110/4120 Series Command Reference with 3D manual.)
The GIN cursor segment "blinks" once for each GIN event.

> **CAUTION**
>
> If you want to simultaneously enable more
> than one device, use the ENABLE-GIN command.
> Undesired results may occur if the terminal
> is simultaneously enabled for graphic input
> with two different style enabling commands;
> specifically, ENABLE-GIN, ENABLE-4010-GIN, or
> ENABLE-4953-TABLET-GIN.

GIN Devices

There are five GIN device types: thumbwheels, tablet, peripheral
ports, mouse, and joystick. A tablet can be used in two modes,
absolute and relative.

Thumbwheels. The operator positions the GIN cursor by moving the
thumbwheels and signals a GIN event by pressing a key on the
keyboard. Every character that is sent to the host as a result
of pressing the key causes a GIN event. This includes the
contents of key-macros. Each of these characters is sent as the
key char report of a GIN-report. If pressing a key does
not cause characters to be sent to the host, it does not cause a
GIN event.

Pressing a keyboard key does not signal a GIN event if the terminal is in local mode, even though GIN may be enabled with the thumbwheels as the GIN device. In local mode, characters typed on the keyboard are treated as if they came from the host rather than the keyboard.

Only "locator" and "pick" functions are valid functions for the thumbwheels.

Tablet. The operator positions the GIN cursor segment by moving the stylus or puck on the graphic tablet. The operator also signals a locator, pick, or first-stroke-point GIN event by pressing the stylus against the tablet, or by pressing a button on the puck. Subsequent-stroke-point GIN events are signaled automatically as the stylus/puck is moved across the tablet surface. A last-stroke-point GIN event is signaled when the stylus or puck button is released or when the puck is lifted off the tablet. Due to the magnetic fields involved in digitizing points on a tablet, if the last-point is signalled by lifting the puck or stylus off the tablet surface, the xy<+->report may not be accurate.

When a tablet device is enabled for any GIN function, one (and only one) of the following ports is accessed under the described conditions:

o Port P0: if a tablet protocol is assigned to P0: before P1: or P2:

o Port P1: if a tablet protocol is assigned to P1: before P0: or P2:

o Port P2: if a tablet protocol is assigned to P2: before P0: or P1:.

For more information on assigning protocols to peripheral ports, see the PORT-ASSIGN command later in this document.

The key code returned for tablet locator/pick functions is given in Table 5. The same table applies for a mouse when the mouse buttons are not defined. Note that the code for a button release is the code for the button press plus 32 (shifted two places to the right in an ASCII code chart).

Table 5

TABLET/MOUSE KEY REPORTS

Switch Pressed or Released	Key Code If Pressed	Key Code If Released
None (Response to REPORT-GIN-POINT command)	<SP> (ADE 32)	<SP> (ADE 32)
Stylus/Mouse	O (ADE 48)	P (ADE 80)
Tablet button	Z (ADE 90)	z (ADE 122)
Tablet/mouse	1 (ADE 49)	Q (ADE 81)
Tablet/mouse	2 (ADE 50)	R (ADE 82)
Tablet button	.	.
.	.	.
.	.	.
.	9 (ADE 57)	Y (ADE 89)
.	A (ADE 65)	a (ADE 97)
.	.	.
.	.	.
.	.	.
.	F (ADE 70)	f (ADE 102)

The table covers the button press and release reports for Option 13/14 tablets, 4957/4958 tablets, and the mouse. The mouse can be defined as the stylus (Z), four-button puck (Z, 1, 2, 3), and 16 button puck (Z, 1 -- 9, A -- F).

The GIN-key-report for subsequent points of a stroke is J or <SB> (ADE 74 or 26, respectively), except that it is O or <US> (ADE 79 or 31) for the last point of the stroke. The SET-TABLET-HEADER-CHARACTERS command controls whether these characters are the letters or the control characters.

Relative Mode Tablet Device. The tablet that is assigned to
Device Code 1 also may be used as a "relative mode" device
referred to by Device Code 6.

Most GIN device-parameters -- signature character, cursor,
inking, rubberbanding, gin display start point, and gin gridding
-- are shared by devices 1 and 6. Thus, for example, setting
gridding for Device-Function 9 also sets gridding for Device-
Function 49. However, GIN-Area specifications are stored
separately for devices 1 and 6. Devices 1 and 6 cannot be
enabled simultaneously. An attempt to do so generates an error.

When enabled by device-function codes 48 or 49, the GIN cursor
position is not mapped directly from the position of the tablet
puck (stylus), but is moved in the same direction as the puck
(stylus) is moved.

This mode of operation is very similar to that of thumbwheel or
mouse GIN. Large motions of the cursor can be accomplished with
repeated small movements of the puck. The 4957 or 4958's
proximity zone is approximately 1.5 inches (4 cm), so to keep the
cursor from moving whenever the puck is moved, the puck must be
moved out of proximity.

When GIN is first enabled, the GIN cursor is positioned at the
last cursor position or at the position specified by the SET-GIN-
START-POINT command.

Peripheral ports. If a Tektronix 4662/4663 plotter is attached
to the PPI, the operator positions the plotter pen by moving the
joystick and signals a GIN event by pressing the CALL button on a
4662 or a POINT button on a 4663. If a 4957/4958 Graphics Tablet
is connected, it operates as described above under Tablet.

NOTE

> The position on the screen of the graphic
> cursor is not updated when GIN is done from a
> plotter, until the operator signals a GIN
> event by pressing a button on the plotter.

The key char-report included in GIN-reports for the plotter is 0, 1, or 2: on a 4662 Plotter, 0 if the stylus is up, 1 if the stylus is down, and 2 if the CALL button is held down until the bell rings once; on a 4663 Plotter, 0 if the MOVE button is pressed, 1 if the DRAW button is pressed, and 2 if the LAST POINT button is pressed. The key char-report for tablet GIN-reports is as shown for the tablet device.

The stroke function is not allowed on peripheral ports, even with tablet protocol assigned. To access stroking on a 4957 or 4958 tablet, use the tablet device.

NOTE

When GIN device 1 corresponds to a peripheral interface port tablet, the port belonging to this tablet must not be enabled for GIN as device-code 3, 4, or 5 when device 1 is enabled, and vice-versa.

A Choice function can be enabled when the following two conditions are met:

1. When a PFK is attached to a PPI

2. When the PPI has been assigned to PFK/M

When the operator presses a button on the PFK, a GIN event is signaled and a GIN-Choice-report is sent. The integer in the report is the number of the key that was pressed, as shown in Table 6.

Table 6

PFK KEY NUMBERS

Actual Representation					
	0	1	2	3	
4	5	6	7	8	9
10	11	12	13	14	15
16	17	18	19	20	21
22	23	24	25	26	27
	30	32	33	34	

OPERATING INSTRUCTIONS

Mouse. (Requires Option 4M). The operator positions the GIN
cursor segment by moving the mouse across any flat surface and
signals a GIN event by pressing one of the mouse buttons. The
mouse buttons do not auto-repeat.

Every character sent to the host as the result of pressing a
mouse button causes a locator, pick, or first-stroke-point GIN
event. This includes the contents of key-macros.

Every character sent to the host as the result of releasing a
mouse button causes a locator or pick event. Subsequent
stroke-point GIN events are signaled automatically while the
mouse button is held down.

If a release-mouse-button macro is not defined (or if one is
defined with one or more characters that are sent to the host
computer), releasing the mouse button causes a last-stroke-point
GIN event.

The characters in the release-mouse-button macro are not sent to
the host for the stroke function (they are ignored).

                            NOTE

          The mouse movement may be ignored if the
          mouse and thumbwheels are moved
          simultaneously.

The default character assigned the mouse is 1 for the left
button, 2 for the center button, and 3 for the right button.

Table 5, earlier in this document, shows the key code returned
for mouse locator/pick functions when the mouse buttons have not
been defined.

The key char-report included in locator, pick and first-
stroke point GIN-reports for the mouse are 1, 2, 3, or a host
bound character in a press-mouse-button macro.

For subsequent stroke points, the key char-report is:

J

For last stroke point, the key char-report is:

O

When mouse keys have been defined with the DEFINE-MACRO command,
the character codes reported in GIN-key-reports are those in the
macro definition (except, of course, characters inside Key-
Execute-Character brackets; see the SET-KEY-EXECUTE-CHARACTER
command in the 4110/4120 Series Command Reference Manual for
details). If a mouse key press is defined but the corres-
ponding key release is not, then the character codes sent
whenever a key release causes a GIN event are those defined for
the key press plus 32 modulo 128. For example, if a mouse
key press is defined to be "M" (ADE 77) and if the key release is
not defined, then the key release code is "m" (ADE 109). Like-
wise, if a mouse key press is defined to be "m" (ADE 109) and if
the key release is not defined, then the key release code is <CR>
(ADE 13) because MOD 128 (109 + 32) is 13.

Joystick. The operator moves the joystick to position the GIN
cursor segment and presses the joystick trigger to signal a GIN
event. The joystick trigger auto-repeats if it is held down for
more than half a second. (When GIN is not enabled for the
joystick, the joystick trigger behaves as a regular keyboard
key.) Each character that is sent to the host computer causes a
GIN event, including characters in macros defined for the trigger
and position switches. If a macro is defined for a position
switch, the switch does not move the GIN cursor segment.

The default key character of the joystick trigger is O. The
position switches have no default characters.

Only locator and pick functions are valid for the joystick.

                          NOTE

        The internal GIN table for the joystick
        overlaps the table for Peripheral Port 2.
        This overlap means that the joystick and
        Peripheral Port 2 share all GIN parameters
        such as cursor segment and signature
        characters. Trying to enable one while
        the other is enabled causes an error to be
        detected.

GIN Functions

Locator Function. The GIN locator function returns a single
report for each GIN event. The report contains a <u>key char-
report</u>, an <u>xy<+->report</u>, and may or may not contain a
<u>view-number</u>. See GIN-report message type in the
<u>4110/4120 Series Command Reference Manual</u>. All five GIN
devices can be used for the locator function.

Pick Function. The GIN pick function returns one or more reports
for each operator action. Each report contains a <u>key
char-report</u>, an <u>xy<+->report</u>, may or may not contain a
<u>view-number</u>, and reports which segment was picked. See
<u>GIN-report</u> message type in the <u>4110/4120 Series Command
Reference Manual</u>.

The terminal compares all detectable segments visible in the
current view when a pick GIN event occurs. The pick GIN event
occurs in display priority order, to an area the size of the pick
aperture centered on the current GIN location.

If more than one segment is within the pick aperture, the 2D
segment with the highest display priority is picked; if no 2D
segment is within the pick aperture, the 3D segment with the
highest display priority is picked.

For segments that have the same display priority, the order of
picking is not defined. When a primitive whose pick-ID is not 0
appears in the pick aperture area, the segment number and pick-ID
of the primitive are reported in a <u>GIN-report</u>. Either only
one <u>GIN-report</u> is sent for the first picked segment, or one
<u>GIN-report</u> is sent for each picked segment depending on
GIN-report-format, as set by SET-GIN-REPORT-FORMAT.

If, during a pick operation, the pick aperature covers primitives
in a segment with different pick-ID numbers, the terminal returns
the pick-ID that was last defined. If no visible detectable
segment falls within the pick aperture, the terminal sends a
GIN-pick-report in which the pick-ID number is zero.

If the image of more than one 3D segment falls within the pick
aperture, the following segment is picked:

o   If the view's object-surface-display attribute is
    wireframe, the segment picked is the one with the
    highest display priority.

o   If the view's object-surface-display attribute is
    shaded-surface or hidden-line, the segment picked is
    the one "closest" to the front plane in the W-axis
    direction.

    o   If there is more than one segment with the same minimum
        W-coordinate in the pick aperature, the segment picked is
        the one with the highest display priority.

    o   If the segments have the same display priority, the order
        of picking is undefined.

Stroke Function.   The GIN stroke function returns two or more
GIN-reports for each stroke action:

    o One or more first-point
    o Zero or more subsequent points
    o One last-point

When the operator presses the tablet's stylus, puck button, or
mouse button, one (or more) first-point is sent to the host
computer.   As the stylus, puck, or mouse is moved across the
surface, subsequent points are sent at a rate determined by SET-
GIN-STROKE-FILTERING.   When the stylus, puck, or mouse button is
released, a last-point is sent to the host computer.   Each point
sent is considered to be one GIN event.   If the GIN count expires
in the middle of a stroke, the remaining points of the stroke are
not digitized or sent.

It is possible to digitize points faster than the terminal can
send the corresponding GIN-reports to the host computer.   When
this happens, the terminal uses blocks of main memory to store
the digitized points.   If no more main memory is available, the
terminal rings the bell and stops digitizing.   When more memory
becomes available, you can resume digitizing points.   To avoid
this condition, set stroke filtering to slow digitizing or be
sure there is sufficient main memory available.

Choice Function. The GIN Choice function returns a single report for each GIN event. The report indicates which choice the operator selected from the available selections. The report is a GIN-Choice- report. See GIN-report message type later in this manual for more information. The Choice function can only be used with a PFK attached to a peripheral port; the ENABLE-GIN command reports an error if the Choice function is used with other devices.

The cursor is invisible when the GIN choice-function is enabled, as the function returns the operator's choice, not the location of a cursor on the screen.

For the same reason, the commands for setting GIN parameters do not accept the choice function.

Disabling GIN

The device and function combination is disabled when any of the following occurs:

o   The count specified in the ENABLE-GIN command expires

o   The terminal receives a DISABLE-GIN command for that device and function

o   The terminal receives a CANCEL command

o   The operator presses the CANCEL key

Defaults

GIN-code
    as shipped -- none
    on power-up -- none
    if omitted -- O

GIN-count
    as shipped -- none
    on power-up -- none
    if omitted -- O (unlimited number)

Errors

IO11   (Level 2)   Invalid GIN-code.

IE00   (Level 2)   The cursor segment for the specified device and function has been deleted because of the SET-GIN-CURSOR command that assigned it to that device and function.

IE03   (Level 2)   Command is invalid at this time. The segment being used as the cursor for the specified device and function is a segment that is currently being defined; or, in the 4128 and 4129, a 3D cursor is specified for a pick or stroke function.

IE10   (Level 2)   The specified GIN device is not installed in the terminal.

IE13   (Level 2)   One of the following:

    o The specified device is already enabled

    o The protocol assigned to the peripheral port does not support GIN

    o The specified GIN device-function mode is invalid because inking or rubberbanding is set for that device-function and the mode is set for key-releases

    o 4128 and 4129: The locator function is enabled for GIN with a 3D cursor and either inking or rubberbanding is specified

IE21   (Level 2)   Invalid GIN-count.

References

PORT-ASSIGN command
SET-GIN-AREA command
SET-GIN-CURSOR command
SET-GIN-LOGICAL-FUNCTION command
SET-GIN-STROKE-FILTERING command
GIN-REPORT message type

PORT-ASSIGN COMMAND

Parameters

protocol-identifier
   A string specifying the protocol being assigned to the
   peripheral port. Value added with Option MD is **PFK/M**.

Description

Port Identifier
   The port must be assigned the PPORT protocol identifier if a
   peripheral port is to be the source in a COPY, LOAD, or SPOOL
   command, or if it is to be either the source or the destination
   in a PORT-COPY command. A context error results If the
   protocol identifier is **PFK/M** (as well as others).

The following are set when a terminal port with Option MD is
assigned to PFK/M:
   o Port baud rate   9600
   o Port bits   1 8
   o Port parity   NONE
   o Port flagging   NONE

Since the other peripheral port communication settings are not
used with this protocol, they are not set. Table 7 (an extension
of the 4110/4120 Command Reference Manual Peripheral Port
Protocol Identifier Table) lists the valid protocol identifier
added with the Option MD.

Table 7

PERIPHERAL PORT PROTOCOL IDENTIFIER

Protocol Identifier	Description
PFK/M	McDonnell Douglas' PFK. Assigns a communications protocol that assumes that the device at this port is a PFK.

Errors
   PA21   (Level 2):   Invalid protocol-identifier (Must be PFK/M
                       or as listed in 4110/4120 Series Command
                       Reference Manual)

Inquiry Command.

   REPORT-PORT-STATUS command

SET-GIN-RATES COMMAND

Since there are extensive changes in the SET-GIN-RATES area (with MD), the following is a full, detailed, description of the SET-GIN-RATES command.

Host Syntax

        `<EC>IU  int-array:  settings table`

Setup Syntax

        `<EC>IU<SP>  settings table`

Parameters

Settings table. The settings table is an integer array with 0 to 32768 elements. Elements 1 and 2 are device-code and sub-device-code, respectively. Device-code specifies the GIN device (0 for thumbwheels, 3, 4, and 5 for the peripheral ports, 8 for mouse, and 9 for joystick). Sub-device-code specifies which hardware function is set by the command. The following functions are available:

        0 Set rate table
        1 Set light state

For sub-device-code 0, elements 3 through 14 are GIN-space units in the range of 0 to 4095. There may be 0 to 12 table entries for the thumbwheels, 0 to 8 table entries for the mouse, and 0 to 2 table entries for the joystick.

For sub-device-code 1, the elements 3 and up specify which PFK lights are turned on or off. These elements are interpreted as pairs. The first element of the pair is a light number, the second is an action code. A light number of -1 specifies all of the lights. The action code specifies whether the light is to be turned on (1) or off (0).

OPERATING INSTRUCTIONS

Description

This command modifies some GIN device characteristics.

With sub-device-code 0, the command alters or initializes rate
tables. A rate table determines how far the GIN-position is
moved in GIN-space units (see SET-GIN-AREA Command in the
4110/4120 Series Command Reference Manual) for a given
movement of the GIN device. The three keyboard GIN devices have
rate tables.

With sub-device-code 1, the command selectively turns lights on
or off on the PFK keys.

Changing Rate Tables. There are two special cases for elements 3
through 14 of the settings table:

o   If no values are entered, the rate table is set to the
     default values.

o   If some values are not entered, the rate table is completed
     with the last specified entry. For example, the setup
     command:

     <EC>IU 0 0 25 50 100 200 sets the thumbwheel rate table
     to 25 50 100 200 200 200 200 200 200 200 200 200.

Use with the Thumbwheels. As you turn the thumbwheels, counts
are accumulated by the terminal. The number of counts accumulated
depends on how far the thumbwheels are turned between sampling by
the terminal. A complete revolution of a thumbwheel causes 44
counts to be generated. The terminal samples the thumbwheel
counts 22 times a second.

The GIN position is moved a distance determined by the number of
counts accumulated and the entries in the rate table. If the
count is one, the first value in the rate table is used. If the
count is four, the fourth entry in the rate table is used, and so
on.

Up and right thumbwheel movements cause positive count changes.
Down and left cause negative changes. If the count is a negative,
the negative of the respective rate-table entry is used. If more
than 12 counts are accumulated, the 12th entry is used. Note
that entries above 12 are not necessary as it is impossible to
turn the thumbwheels that fast.

Pressing the SHIFT key while moving the thumbwheels causes
rate table values to be ignored. The distance to move is equal
to the number of counts accumulated.

4014 Terminal "Feel". An approximate feel of a 4014 terminal can be accomplished by entering these values for a rate table: 0 0 80 160 240 320 400 480 560 640 720 800 880 and 960.

Use with the Mouse. As with the thumbwheels, the terminal samples the mouse 22 times a second to determine the number of accumulated counts. Up and right are positive counts. Count values range from -128 to +127. These count values correspond to absolute velocities from 0 to <+->15.5 inches/second. Mouse rate table entries determine the distance in GIN-space coordinates that the mouse GIN-position is moved each sample.

The eight mouse rate table entries correspond to sample counts of 16, 32, 48, 64, 80, 96, 112, and 128. For example, if 48 counts accumulate in the sampling time, the third entry in the rate table is used. Count values other than 16, 32, 48, 64, 80, 96, 112, and 128 are linearly interpolated between the table entries.

Use with the Joystick. Joystick switch closures are translated into joystick GIN movement based on the joystick rate- table entries. There are two joystick rate table entries, each in GIN-space coordinates per second.

The first entry sets the unshifted joystick GIN speed; the second sets the shifted joystick GIN speed. The default rate table entry for unshifted joystick speed (2048) moves the cursor across the screen in two seconds (with the default GIN area and GIN window).

Setting the Lights. To turn the lights on or off in the PFK keys, the port to which the PFK is attached must be assigned to PFK/M. The settings table numbers are the same as the keys on the PFK (see Table 6).

An example, using Port 0, is the following settings table array arranged in pairs:

       3 1 -1 0 1 1 5 1

Pairs, in order of appearance:

3 = Port 0 (4 = Port 1, 5 = Port 2)
1 = Set light state

-1 = All lights
0 = Lights off

                                                 (Continued)

OPERATING INSTRUCTIONS

(Continued)
1   = Light 1
1   = Light on

5   = Light 5
1   = Light on

The above settings table command turns all the lights off, then
turns lights 1 and 5 on for the PFK attached to PPI 0.

If there is an error in the settings table (other than having
an odd number of elements in the array), the pairs of light
numbers and action codes before the error affects the lights;
the codes past the error in the command array do not change the
lights.

Defaults

       If omitted -- set thumbwheels

Settings table (for PFK)

       as shipped -- 3 1 -1 0
       on power-up -- 3 1 -1 0
       if omitted -- set thumbwheels

Errors

IU10 (Level 2)   Device code or sub-device code not present.
Valid device code and sub-device code pairs are
o   0,0 for thumbwheels
o   8,0 for mouse
o   9,0 for joystick
o   3,1, 4,1, and 5,1 for PFK

IU11 (Level 2)   Invalid settings table entries. Array lengths are
o   0 to 14 for thumbwheels
o   1 to 10 for mouse
o   1 to 4 forjoystick
o   Any number of even elements

Array elements 1 and 2 are -32768 to 32767
Array elements for Rate tables 3 and after are
0 to 4095
Light numbers for light setting commands are -1
to 31
Light numbers for action code are 0 or 1.

IU13 (Level 2)   Port in use or not assigned to PFK/M for
function 1.

References

ENABLE-GIN command
PORT-ASSIGN command

Inquiry Command

None

MESSAGE TYPE

GIN-REPORT

Syntax

Added to the 4110/4120 Command Reference Manual GIN-report
Message-Type is:

> [EOM-indicator]<note 1>
> GIN-Choice-report
> [EOM-indicator]<note 3>

> GIN-Choice-report   =   [char-report:sig]<note 2>
>   int-report:Choice

<note 1>This EOM-indicator is sent only if (1) at least one
character has been sent since the last EOM-indicator (2)
this GIN-report causes the maximum report line length to be
exceeded.

<note 2>A sig-char or term-sig-char is not sent if it is
<NL>.

<note 3>An EOM-indicator occurs at the end of each GIN-
locator/pick/stroke-report only if the most recent SET-REPORT
-EOM-FREQUENCY command specifies EOM-frequency to be "more
frequently."

DESCRIPTION

Choice. The Choice integer-report indicates the operator's
choice. For the PFK, the number given is the number of the key
that was pressed. (See Table 6, the ENABLE-GIN command for PFK
numbering, earlier in this manual.)

References

DISABLE-GIN command
ENABLE-GIN command
CANCEL key

REPLACEABLE PARTS LIST

TEK PN	Qty	NAME and Description
334-6785-00	2	MARKER, IDENT:MKD MCDONNELL DOUGLAS D-4125
334-6786-00	2	MARKER, IDENT:MKD MCDONNELL DOUGLAS D-4128
334-6787-00	2	MARKER, IDENT:MKD MCDONNELL DOUGLAS D-4129

Processor board.

Mechanical parts list

TEK PN	NAME and Description
334-4565-00	LABEL: Sticky-back ID number, blank. Please type "672-1260-00" on the label.

Electrical parts list

Refer to the 4110/4120 Service Manual, TEK PN 070-5521-00, 80286/7 Processor board, for the component locations of circuit numbers listed below:

CKT NO	TEK PN	NAME and Description
U329	160-4132-01	MICROCIRCUIT, DIGITAL: EPROM, 32K X 8, prgm
U335	160-4220-00	MICROCIRCUIT, DIGITAL: EPROM, 32K X 8, prgm
U529	160-4133-01	MICROCIRCUIT, DIGITAL: EPROM, 32K X 8, prgm
U535	160-4221-00	MICROCIRCUIT, DIGITAL: EPROM, 32K X 8, prgm

PARTS LIST

Peripheral Port Interface board.

Mechanical parts list

TEK PN	NAME and Description
334-4565·00	LABEL: Sticky-back ID number, blank. Please type "672-1261-00" on the label.

Refer to the 4110/4120 Service Manual, TEK PN 070-3815-00, Option 10 Peripheral Port Interface board, for the component locations of circuit numbers listed below:

CKT NO	TEK PN	NAME and Description
A1U150	160-4212-00	MICROCIRCUIT, DIGITAL: EPROM, 4K X 8, prgm
A1U160	160-4214-00	MICROCIRCUIT, DIGITAL: EPROM, 4K X 8, prgm
A1U170	160-4216-00	MICROCIRCUIT, DIGITAL: EPROM, 4K X 8, prgm
A1U180	160-4218-00	MICROCIRCUIT, DIGITAL: EPROM, 4K X 8, prgm
A1U250	160-4213-00	MICROCIRCUIT, DIGITAL: EPROM, 4K X 8, prgm
A1U260	160-4215-00	MICROCIRCUIT, DIGITAL: EPROM, 4K X 8, prgm
A1U270	160-4217-00	MICROCIRCUIT, DIGITAL: EPROM, 4K X 8, prgm
A1U280	160-4219-00	MICROCIRCUIT, DIGITAL: EPROM, 4K X 8, prgm