CONTROL DATA CORPORATION

# CONTROL DATA®
# 6602-A/B/C/D/E
# 6612-B/C/D/E/F/G
# STANDARD OPTION 10342-1
# CONSOLE DISPLAY

## REFERENCE MANUAL

# REVISION RECORD

| REVISION | DESCRIPTION |
|---|---|
| A | Manual released. This manual supersedes the 6602-A/B/C/D/E/6612-B/C/D/E Console Display |
| (11-1-70) | section of the obsolete 6000 Series Peripheral Equipment Reference Manual, Pub. No. 60156100. |
| | The information contained herein is the same as that found in Rev. J of the obsolete manual. |
| B | Manual revised; includes Engineering Change Order 35619, publications change only. Cover, Title |
| (9-5-74) | Page and page 1 are revised. |

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or use Comment Sheet in the back of this manual.

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# 6602—A/B/C/D/E,6612—B/C/D/E/F/G, STANDARD OPTION 10342—1 CONSOLE DISPLAY

The CONTROL DATA® 6602-A/B/C/D/E 6612-B/C/D/E/F/G Console Display permits the visual display of information from the 6000 Series system processors as well as modification of register contents and Central Processor programs. The 6602/6612 Console Display consists of one controller and either one or two consoles (see Figure 1). The 6612-F/G and Standard Option 10342-1 are limited to one console. The controller for Standard Option 10342-1 is in a peripheral cabinet.

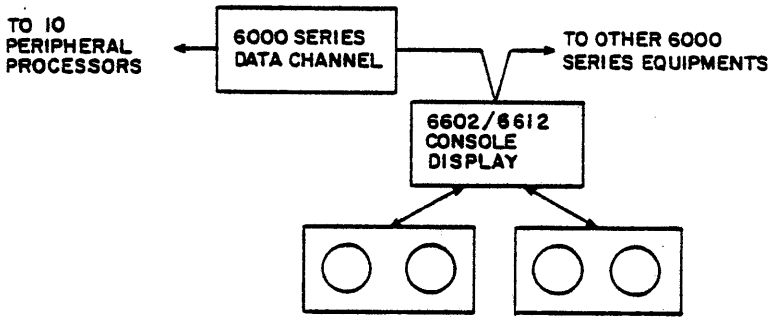


Figure 1. Typical Configuration

## FUNCTIONAL DESCRIPTION

### SYSTEM RELATIONSHIP

The controller is mounted in either the central computer cabinet or in a peripheral controller cabinet. The console (DD60-A/B/C) is a cathode ray tube (CRT) display unit. Each console contains two 12-inch CRT's and a manual keyboard.

The CRT's provide program monitoring during 6000 Series computer operations. Several operations may be displayed at the same time.

Data may be visually displayed within a 10-inch square raster on each CRT. This display can be either alphanumeric (Character mode) or graphic (Dot mode). The 262, 144 dot locations in the display area are arranged in a 512 by 512 array. Each array location is uniquely defined by an X and a Y coordinate. An address of (000, 000) is located in the lower left corner of the display area. (777, 777) is located in the upper right corner.

The controller must be reselected each time an output is intended for a different CRT. Due to the persistence of the CRTs, however, up to four independent displays may be viewed simultaneously. Displays should be regenerated at least 25 times a second to avoid flicker.

There is no status response available from the console, which is always ready to receive data when the power is switched on. The controller accepts data at the maximum rate that it can be painted: 3 usec intervals for coordinate words (Dot mode) and 6 usec intervals for character words (Character mode). (Each character word contains two characters.) If the power to the console is switched off, the controller operates normally. Nothing will be painted and a keyboard input request will return code 00 (no data).

## DISPLAY MODES

### Dot Mode

Dot mode permits tailoring the display to meet the needs of the programmer. A dot is painted in response to each Y coordinate received at the location specified by it and the last X coordinate received.

### Character Mode

Character mode permits painting (display) of controller generated characters in any one of three different sizes: large, medium or small. Sixteen large characters, each painted within a 32 by 32 array, may be displayed on a line. A line may also contain up to 32 medium sized (16 by 16) character locations or 64 small sized (8 by 8) character locations. Once the initial character location has been specified and the Write operation has begun, spacing of successive characters on the line is regulated by the controller. At the end of a line, a new initial character location must be sent to the controller. It is also necessary to specify a new initial location for successive writes on a line unless normal

controller generated spacing is desired. The console interprets a 6--- code as specifying X coordinate --- and a 7--- code as specifying Y coordinate ---, where --- = 000 - 777. These codes may appear at any place in the Write that follows Character mode selection and should be considered in the message length count.

## CRT ALLOCATION

Typical operation of the 6602/6612 Console Display allocates one screen for presentation of operator directives, and another for status information on the current problem or information on other problems being run. Although none of the central computer or PPU registers or memory locations are displayed automatically, a Peripheral Processor control program can extract this information and send it to the console for viewing. In addition, a control program can change the contents of the registers or Central Memory locations and can interrupt, step, or terminate a Central Processor program with manual inputs from the console keyboard.

## CONSOLE KEYBOARD

The console keyboard has 48 alphanumeric and special characters (see Table 1). When the console receives a Keyboard Input Request function code from the PPU it permits the PPU to input a Character code in the lower 6 bits of an input word. A Character code is always available from the keyboard. It will be either 00 (no data) or the code representing the last key pressed by the operator.

TABLE 1. 6602/6612 CONSOLE DISPLAY AND KEYBOARD* CHARACTER CODES

| Character | Code | Character | Code | Character | Code |
|---|---|---|---|---|---|
| (Space) | 00 | P | 20 | 5 | 40 |
| A | 01 | Q | 21 | 6 | 41 |
| B | 02 | R | 22 | 7 | 42 |
| C | 03 | S | 23 | 8 | 43 |
| D | 04 | T | 24 | 9 | 44 |
| E | 05 | U | 25 | + | 45 |
| F | 06 | V | 26 | - | 46 |
| G | 07 | W | 27 | * | 47 |
| H | 10 | X | 30 | / | 50 |
| I | 11 | Y | 31 | ( | 51 |
| J | 12 | Z | 32 | ) | 52 |
| K | 13 | 0 | 33 | Blank | 53 |
| L | 14 | 1 | 34 | = | 54 |
| M | 15 | 2 | 35 | Blank | 55 |
| N | 16 | 3 | 36 | , | 56 |
| O | 17 | 4 | 37 | . | 57 |

*Keyboard codes are identical to character codes with the following additions and one exception (space):

| | | | |
|---|---|---|---|
| No Data | 00 | Backspace | 61 |
| Carriage Return | 60 | Space | 62 |

# PROGRAMMING

## CODES

The 6602/6612 function code addends are listed in Table 2. In the discussion of these codes, bit 0 is the rightmost bit.

A function code is the sum of the Equipment Select addend and one addend from each of the remaining three groups.

EXAMPLE:

| | |
|---|---|
| Equipment select | 7--- |
| Console 1, left screen | -2-- |
| Dot mode | --1- |
| 64 characters/line | ---0 |
| Function code | 7210 |

TABLE 2. FUNCTION CODES

| Equipment Select | 7--- | Select Console Display |
|---|---|---|
| Console/Tube | -0-- | Console 0, Left Screen |
| | -1-- | Console 0, Right Screen |
| | -2-- | Console 1, Left Screen * |
| | -3-- | Console 1, Right Screen * |
| Mode | --0- | Character Mode |
| | --1- | Dot Mode |
| | --2- | Keyboard Input Request |
| Character Size | ---0 | 64 Characters/Line (Small) |
| | ---1 | 32 Characters/Line (Medium) |
| | ---2 | 16 Characters/Line (Large) |
| NOTE<br>For Dot mode and Keyboard Input Request bits 0-2 are ignored and generally are 000. | | |
| * Console 1 selection is not applicable on a 6612-F/G. | | |

DATA TRANSFER

Data Output

There are two basic data word formats, one for each of the two modes of operation in the 6602 Console Display (Figure 2).

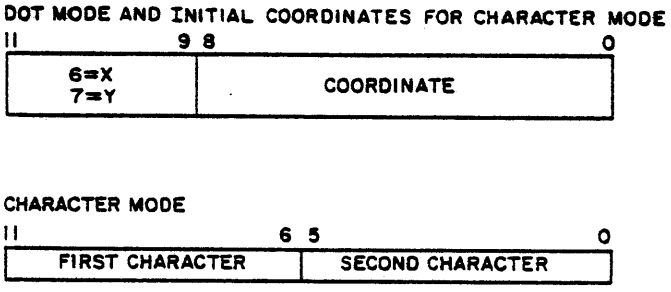


Figure 2. Data Word Formats

Dot Mode: In Dot mode, a 6--- data word represents a 9-bit X coordinate, and 7--- represents a 9-bit Y coordinate. Receipt of an X coordinate word designates the X coordinate only. Receipt of a Y coordinate word, however, both designates the Y coordinate and forces a period (.) into the character translators. This causes a dot to be painted at the intersection of the new Y coordinate and the last X coordinate received.

Character Mode: In Character mode, a 12-bit data word contains two 6-bit character codes. These codes are translated serially in the controller and sent to the character generator where various control signals are formed.

### Data Input

The 6602/1612 Console Display, like any other piece of peripheral equipment, can input data only when requested. After being selected by a keyboard input function (7-20), the controller senses Channel Active condition and inputs a 6-bit Character code to the computer. Only one code is available to the PPU during the time a key is pressed. The 00 (no data) code is available to the PPU at all other times.

## PROGRAMMING CONSIDERATIONS

### Timing

Because of console timing considerations, a 1 usec pause (minimum) must be allowed between disconnecting a channel after an output and the execution of an input function. This time is the same as the execution time for a 00 PSN instruction. Below is a coded example of this use of the Pass instruction.

```
74d     Activate channel d
73d     Output (A) words
75d     Disconnect channel d
00      Pass
77d     Function on channel d
7020    Select Keyboard Input
74d     Activate channel d
70d     Input to A from channel d
75d     Disconnect channel d
```

## Programming Example

The following program requests an input of one line of data from the console and displays this data on the console's left CRT as it is being typed in. Figure 3 is the flow chart for this program.

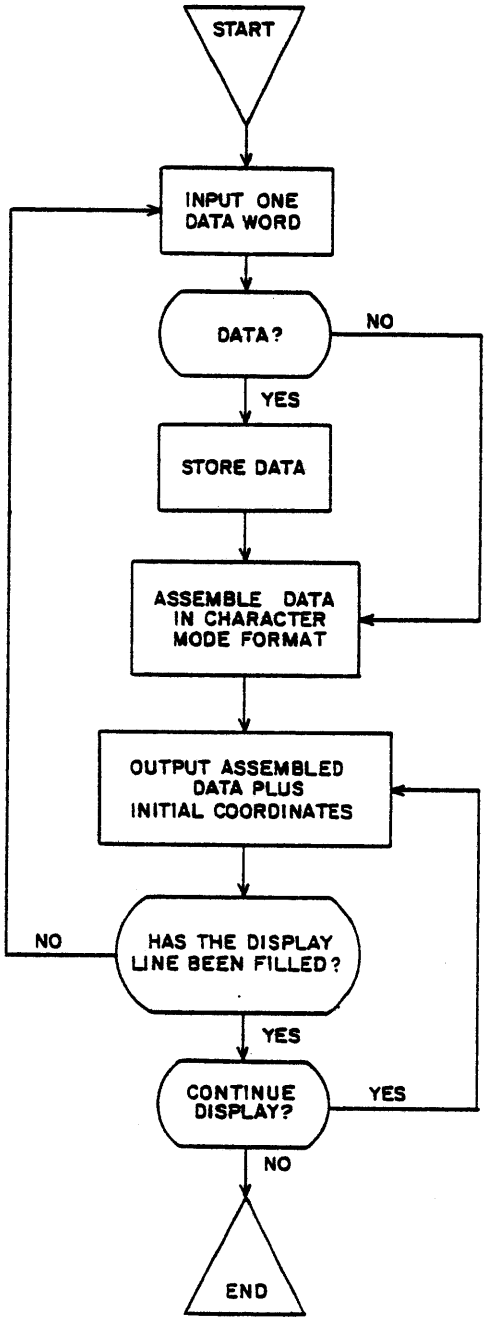


Figure 3. Flow Chart of Program to Input Data From Console and Display on CRT

```
START       LDN     00
            STD     DELTA       Set input address incrementer to zero
LOOP        AJM     LOOP, CHANNEL   Test for channel inactive
            FNC     7020B, CHANNEL  Select console 0, keyboard input
            ACN     CHANNEL     Activate channel
            IAN     CHANNEL     Input one word
            DCN     CHANNEL     Disconnect channel
            ZJN     GENERATE    Exit on No Data
            STM     INPUT, DELTA    Store data word
            LMN     62B         Sense Space
            NJN     ADVANCE     Exit on Space
            STM     INPUT, DELTA    Store character code = 00
ADVANCE     AOD     DELTA       Advance input address incrementer
GENERATE    LDN     00
            STD     ECHO        Set message address incrementer to zero
            STD     FOX         Set output address incrementer to zero
NEXT        LDM     INPUT, ECHO     Load first character
            SHN     6           Left Shift six
            STD     MEMORY      Store temporarily
            AOD     ECHO        Advance message address incrementer
            LDM     INPUT, ECHO     Load second character
            ADD     MEMORY      Assemble output word
            STM     OUTPUT, FOX     Store output word
            LDD     FOX
            SBN     16
            ZJN     DISPLAY     Exit on a full line
            AOD     FOX         Advance output address incrementer
            AOD     ECHO        Advance message address incrementer
            LJM     NEXT        Exit to assemble next output word
DISPLAY     AJM     DISPLAY, CHANNEL    Test for channel inactive
            FNC     7001B, CHANNEL  Select console 0, left CRT, medium character
            LDN     18          Word count plus two
            ACN     CHANNEL     Activate channel
            OAM     MESSAGE, CHANNEL    Output message
            DCN     CHANNEL     Disconnect channel
            LJM     LOOP        Jump to beginning
MESSAGE     CON     6000B, 7757B    Initial coordinates, upper left corner
OUTPUT      BSS     16          Output addresses
INPUT       BSS     32          Input Addresses
            ORG
DELTA                           Input address incrementer
ECHO                            Message address incrementer
```

```
FOX                                    Output address incrementer
MEMORY                                 Temporary storage
CHANNEL     EQU     11                 Define Data Channel
```

# MANUAL OPERATION

## CONSOLE CONTROLS

Operator controls on the Console are located in two areas:

1) The POWER ON/OFF switch is located under the right side of the desk top, and

2) The display adjustments DEAD START switch, and EMERGENCY OFF switch are directly below the two CRT's (Figure 4). Three of these controls, INTENSITY, FOCUS, and ASTIGMATISM are separate for each CRT. The remaining controls affect both CRT's equally.

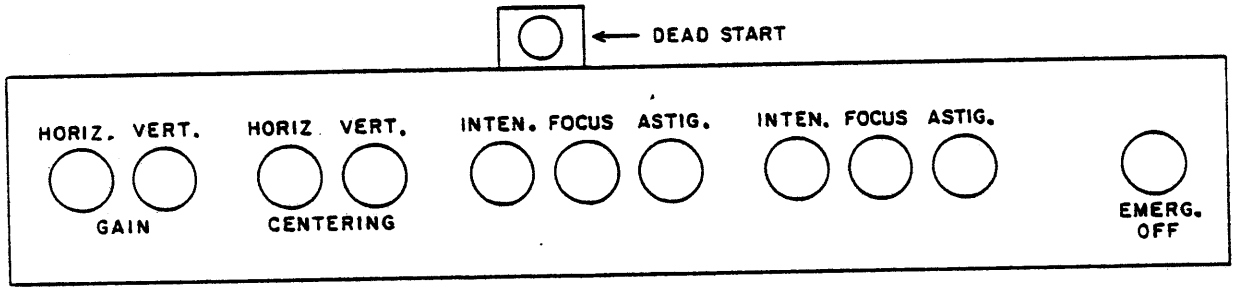


Figure 4. Operator Control Panel

### POWER ON/OFF Switch

This switch applies or disconnects the ac voltages to the DD60A/B/C.

### HORIZONTAL GAIN Control

This control varies the width of the CRT rasters.

### VERTICAL GAIN Control

This control varies the height of the CRT rasters.

HORIZONTAL CENTERING Control

This control varies the horizontal location of the CRT displays.

VERTICAL CENTERING Control

This control varies the vertical location of the CRT displays.

HORIZONTAL CHARACTER SIZE Control (DD60-A only)

This control varies the width of the characters about their centers.

VERTICAL CHARACTER SIZE Control (DD60-A only)

This control varies the height of the characters about their centers.

INTENSITY Controls

These two controls vary the brightness of the CRT displays.

FOCUS Controls

These two controls are used to obtain optimum image clarity in the center areas of the CRT displays.

ASTIGMATISM Controls

These two controls are used to obtain optimum image clarity at the edges of the CRT displays.

DEAD START Switch (DD60-B/C only)

This pushbutton switch dead starts the computer system in a particular operating sequence.

EMERGENCY OFF Switch (DD60-B/C only)

NOTE

Do not press EMERGENCY OFF unless absolutely necessary because it turns off power to the entire computer system.

This pushbutton switch disconnects ac voltages to the display console and the entire computer system after an incorporated delay.

OPERATING PROCEDURES

CAUTION

Failure to rotate INTENSITY controls fully counterclockwise prior to warm-up may result in irreparable damage to the CRT's.

To turn the DD60A/B/C on, rotate both INTENSITY controls fully counterclockwise and press the POWER ON/OFF switch to the ON position.

After the 40- to 80-second incorporated time delay has passed, rotate the INTENSITY controls clockwise to obtain proper intensity of the symbols. Further manipulation of the other controls (GAIN, CENTERING, FOCUS, etc.) may or may not be necessary.

In the event it is necessary to turn the DD60A/B/C off, rotate both INTENSITY controls fully counterclockwise and press the bottom POWER ON/OFF switch.

## COMMENT SHEET

MANUAL TITLE 6602-A/B/C/D/E / 6612-B/C/D/E/F/G STANDARD OPTION 10342-1 CONSOLE DISPLAY Reference Manual

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