

DS-3000 RO

VISUAL

DISPLAY UNIT

HAL DS-3000 RO VISUAL DISPLAY UNIT

TECHNICAL MANUAL

WARRANTY

The HAL Communications DS-3000 RO Visual Display Unit is fully guaranteed against defects in materials and workmanship for a period of one year. Should repair or replacement parts be required, notify HAL Communications Corp. promptly. The warranty period is measured from the date of the original invoice to the postmark date of your notification letter. Please do not return your unit to the factory for repair or adjustment until you have received a written return authorization.

HAL Communications assumes no responsibility for the repair or replacement of parts for units which have been damaged, abused, improperly installed, or modified and reserves the right to change the design of this visual display system without incurring obligation to incorporate such changes into existing units.

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1. INTRODUCTION AND SPECIFICATIONS

The HAL Communications DS-3000 R0 is a visual display unit designed for use in teleprinter systems. It is capable of decoding, storing, and displaying up to 1440 alphanumeric characters on the screen of a video monitor.¹ When used with a suitable demodulator (terminal unit) such as the HAL ST-5 or ST-6, it provides instantaneous, silent reception of radioteletype signals.

The DS-3000 accepts serially transmitted character codes and generates the video signal required to display those characters on the monitor screen. The incoming characters are stored in a recirculating memory, which is used to refresh the display on every complete scan of the raster.

Display Characteristics

The 1440-character display "page" is divided into 20 horizontal lines of 72 characters each. Characters are produced by a pattern of bright dots on a dark field. The 35 dots in the matrix used to display each character are arranged in five vertical columns of seven dots each, as shown in Figure 1.1. The character height is equal to the space required for seven horizontal scan lines. The width is approximately five sevenths of the height. The actual size of the displayed characters depends, of course, on the size of the monitor screen. Complete display specifications are given in Table 1.1.

The first incoming characters appear on the bottom line of the display. When that line is full, all characters in it shift up one line, leaving the bottom line blank and ready to receive new characters. This line feed process recurs each time the bottom line is filled or when a line feed character is received. When all 20 lines have been used, the next line feed causes the top line to be deleted.

Input Characteristics

The display unit inputs accept serially transmitted, five-level, Baudot-coded characters, the standard for radioteletype and many other types of data transmission. The unit operates at all standard speeds--60, 66, 75, and 100 words per minute.

A current-loop input is provided that is used to connect the system in series with the station loop circuit. Complete input specifications appear in Table 1.2.

¹The video monitor is not supplied with the DS-3000. An optional monitor is available.

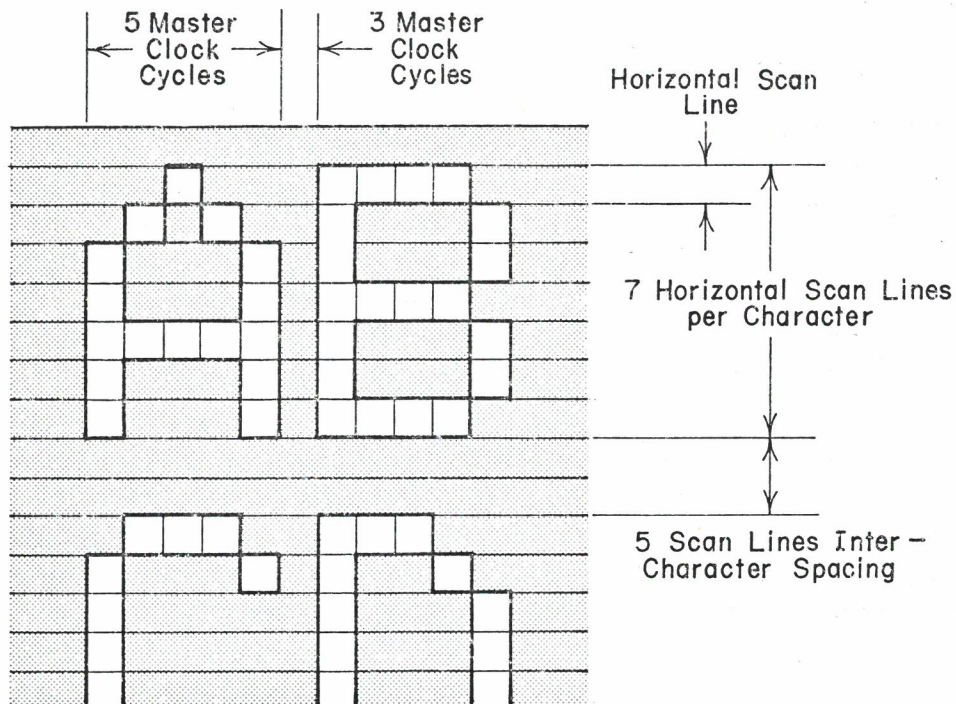


Figure 1.1: Character Display Format

TABLE 1.1
DISPLAY SPECIFICATIONS

Character format	5 x 7 dot matrix
Line format	72 characters/line
Page format	20 lines/page
Character width-to-space ratio	5:3
Character-plus-space time ¹	652 nanoseconds
Line height-to-space ratio	7:5
Horizontal scan lines per character line	7
Horizontal scan lines per intercharacter space	5
Horizontal line display percent ²	74 percent
Vertical field display percent ³	91 percent

¹Defined as the time required during a horizontal scan to display one character plus an intercharacter space.

²Defined as the percentage of the horizontal line used in displaying 72 characters and the spaces between them.

³Defined as the percentage of the vertical field used in displaying 20 character lines and the interline spaces.

Figure 1.2 shows the format of the input code. The code for a particular character consists of a start pulse, five data pulses, and a stop pulse. Each pulse may represent either a "mark" or a "space." Mark pulses are represented by the flow of current. During space pulses, the current is interrupted.

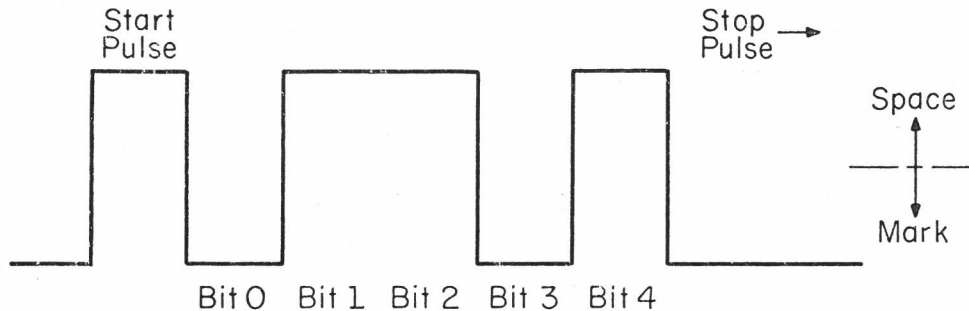


Figure 1.2: Format of Typical Input Character

The start pulse for any character is a space. Data pulses 0 through 4 follow the start pulse and may be either marks or spaces, depending on the character being received. The stop pulse is a mark. All pulses are of equal length except the stop pulse, which may be longer than the others. The pulse length varies with the operating speed, as indicated in Table 1.2.

As Figure 1.3 illustrates, the input mark and space pulses must fall within a certain current range to produce valid copy. The loop current must be in the range from 18 to 120 mA for mark pulses and less than 2 mA for spaces. Pulses which fall in the forbidden current range may cause uncertainty or errors in the display.

Output Characteristics

The output video signal is compatible with EIA RS-170, 525-line-per-frame television systems, standard in the United States. Table 1.3 lists the video output specifications; the waveform is shown in Figure 1.4.

Construction and Physical Specifications

The DS-3000 circuitry is constructed on two printed circuit boards. The logic and signal-processing circuitry occupies the larger of these boards. The power supply components are mounted on the smaller one. They are housed in an attractive two-tone white and blue cabinet. Size, weight, temperature, and input power specifications are given in Table 1.4.

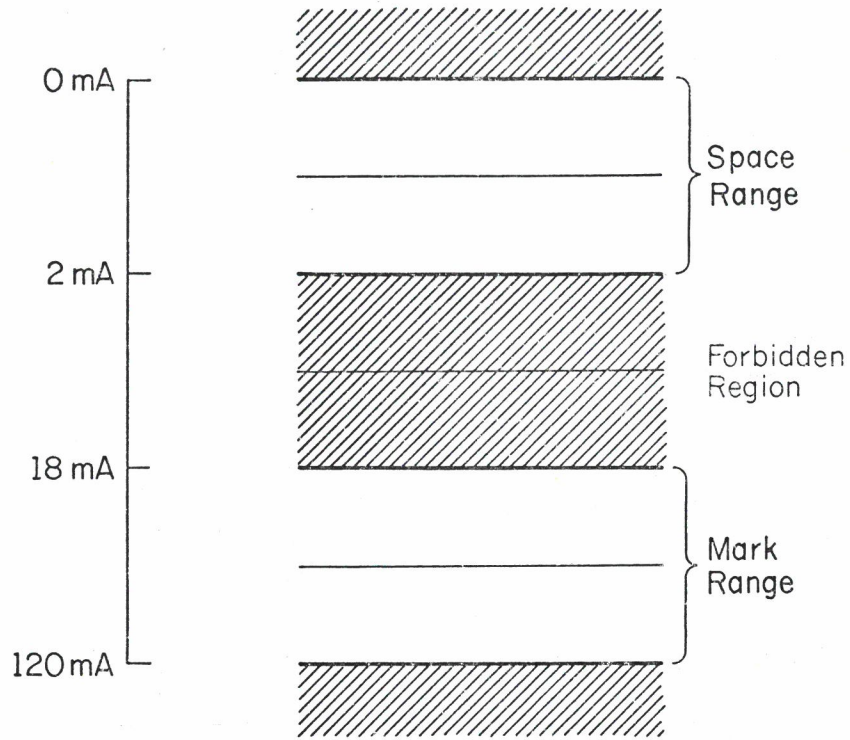


Figure 1.3 Input Limits

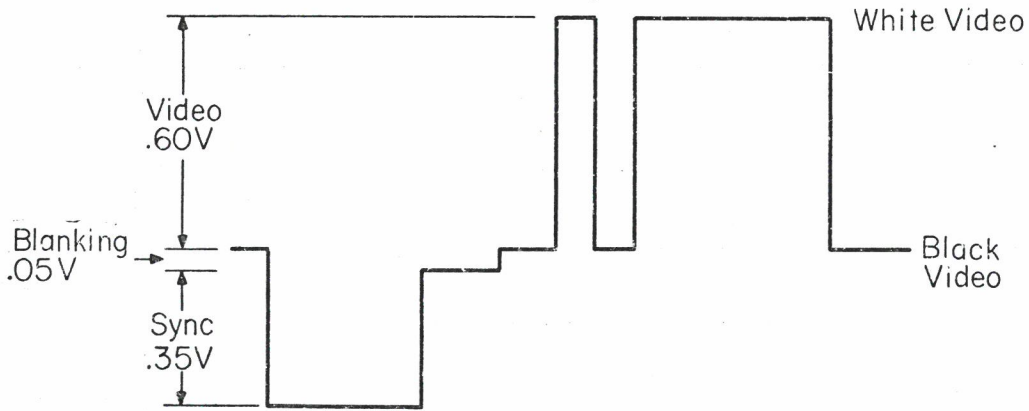


Figure 1.4 Video Output Format

TABLE 1.2
INPUT SPECIFICATIONS

Input data form:	Serial
Word format	
Pulse 1:	Start pulse
Pulse 2:	Data pulse 0
Pulse 3:	Data pulse 1
Pulse 4:	Data pulse 2
Pulse 5:	Data pulse 3
Pulse 6:	Data pulse 4
Pulse 7:	Stop pulse
Select pulse length	
60 WPM:	22 milliseconds
66 WPM:	20 milliseconds
75 WPM:	17.57 milliseconds
100 WPM:	13.47 milliseconds
Start pulse length:	Same as select pulse
Data pulse length:	Same as select pulse
Stop pulse length:	Greater than or equal to select pulse
Loop (current) input	
Mark current:	18 to 120 mA
Space current:	2 mA or less
Input impedance:	20 ohms or less
Isolation, loop to case:	10 megohms or greater

Accessories

The DS-3000 R0 is supplied with the following accessories:

- One two-circuit ("stereo") plug for loop connection to the DS-3000
- One one-circuit ("mono") plug for loop connection to other equipment

TABLE 1.3
VIDEO SPECIFICATIONS

Lines per field:	262.5
Fields per frame:	2
Lines per frame:	525
Line rate:	15.750 KHz
Field rate: ¹	60 Hz
Timing tolerance:	±0.1%
Synchronization voltage:	0.35 volt peak-to-peak
Synchronization polarity:	negative
Video voltage: ²	0.60 volt peak-to-peak
Composite video signal voltage:	1.0 volt peak-to-peak
Voltage tolerance:	±10% with specified load
Peak video bandwidth: ³	6.1 MHz
Load impedance:	75 ohms ±5%

¹Fields are automatically interlaced.

²Figure 1.4 shows the proper video output waveform.

³Defined as the frequency above which all energy could be eliminated with no degradation of picture quality. Readability decreases noticeably when energy below 6.1 MHz is eliminated.

TABLE 1.4
GENERAL SPECIFICATIONS

Size:	3.5" H, 17" W, 9" D (8,9 x 43,2 x 22,9 cm)
Weight:	7.5 pounds (3,4 kilograms)
Shipping weight:	14 pounds (6,4 kilograms)
Operating temperature:	65 to 80 ^o F (18.3 to 26.7 ^o C)
Power requirements:	105 to 125 v AC, 50 to 60 Hz, 25 watts

2. INSTALLATION AND OPERATING INSTRUCTIONS

Installation

The DS-3000 R0 is very simple to install. The first step is to connect the video output to an external video monitor. A type F connector should be used on the DS-3000 end of the video cable. The cable itself should be type RG-59/U or similar medium diameter 75-ohm characteristic impedance coaxial cable. The cable should be less than 50 feet in length and should be terminated at the monitor end in a 75-ohm termination (usually provided in the monitor). NOTE: *Because of the wide video bandwidth generated by the DS-3000 (6.7 MHz), a commercial-quality video monitor should be used. Modification of a standard television set will not produce a satisfactory display.*

The serial Baudot input data is connected to the LOOP connector of the DS-3000. A two-circuit ("stereo") phone plug is furnished for this connection. The input signal must have current and voltage levels compatible with the specifications given in section 1. The two conductor input cable should be connected to the "tip" and "ring" terminals of the plug. The "sleeve" terminal is not used. The input cable need not be shielded if it is less than 25 feet in length.

The DS-3000 R0 power cord should be connected to a standard grounding ac outlet that provides 105 to 125 v AC, 50 to 60 Hz. *The DS-3000 should be connected to a safety ground through either the three conductor AC power plug or by means of a separate wire between the ground terminal of the DS-3000 and a suitable ground or both. Failure to properly ground the cabinet of the DS-3000 may create a shock hazard: All HAL warranties and liabilities are voided if a proper safety ground is not connected to the DS-3000.*

Operation

After all cables have been connected to the DS-3000, turn the DS-3000 and video monitor power on. Select the speed corresponding to the input data rate on the SPEED (WPM) switch on the DS-3000 rear panel. Incoming data should now be displayed on the video monitor. If data is not displayed, turn off the power to *all* components of the system and check the cable connections. CAUTION: *If the input connector is removed from the DS-3000 LOOP connector at a time when the external loop supply is still operational, the full loop voltage will be present between the "tip" and "ring" of the connector. To prevent accidental shocks, turn the external loop supply OFF before removing this connector from the DS-3000.*

Reception of the Baudot code for BELL (FIGS case "S"), is signaled to the video monitor by application of a DC bias on the video output signal of the DS-3000. The video monitor will display a bell symbol and "flash" as the DC bias is applied and removed. The amount of DC bias can be varied over the approximate range of +1 to +12 volts by the VOLUME control on the DS-3000 rear panel. The DC level (or "volume") of the bell signal can be adjusted

by turning the TONE switch ON and adjusting the VOLUME control. The TONE switch is normally left in the OFF position.

Maintenance

A complete set of schematic diagrams is included with this manual. The minimum test equipment required to service the DS-3000 are: a Tektronix 465 (or equivalent) oscilloscope, Simpson 260 VOM, a source of Baudot test data, and a commercial quality video monitor. A thorough understanding of digital circuitry and familiarity with microcomputer hardware and software techniques is also essential. It is highly recommended that, should a malfunction occur, the DS-3000 be returned to the HAL Communications Corp. factory for repair.