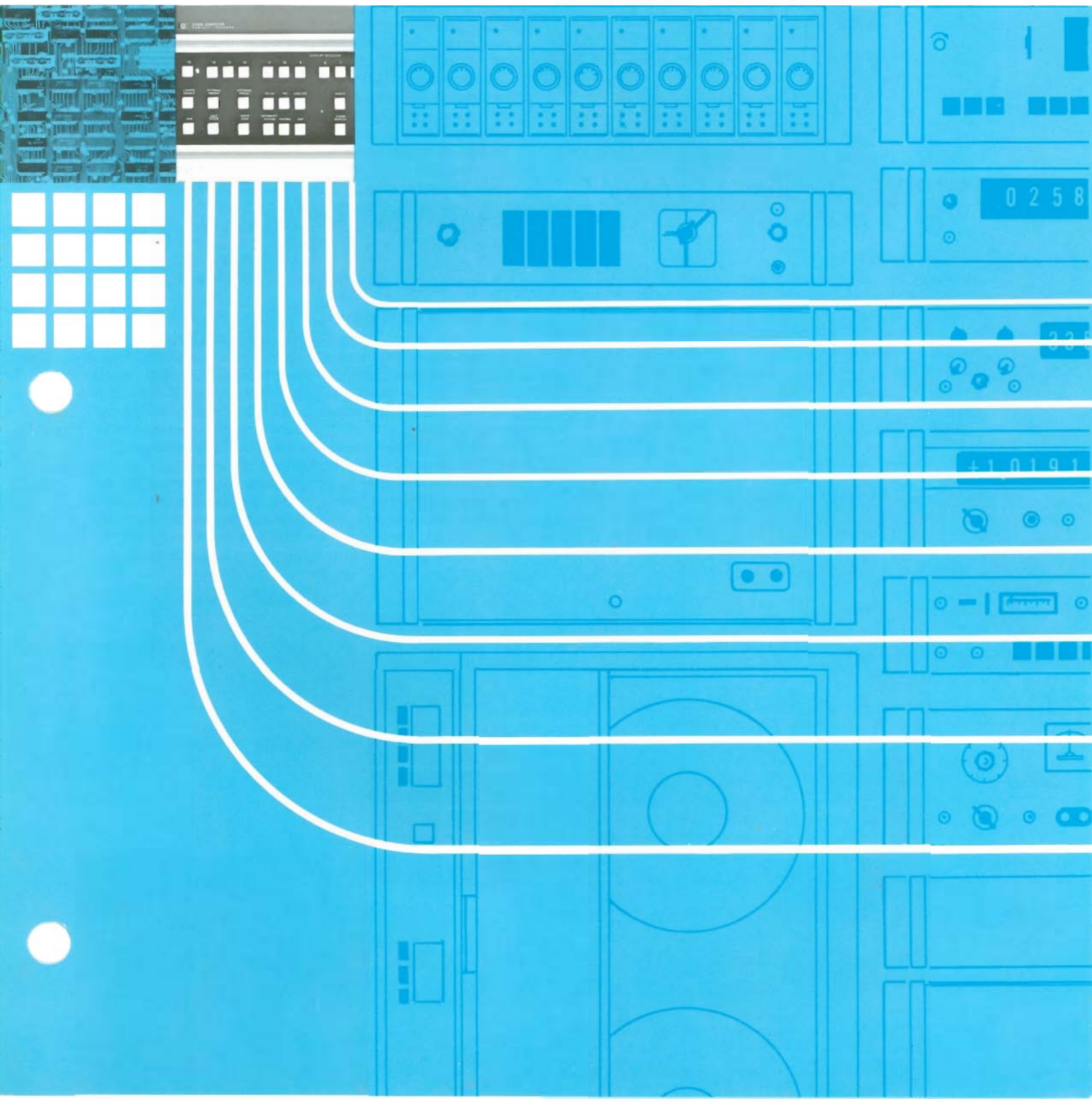




HEWLETT  PAGKARD

Universal Interface

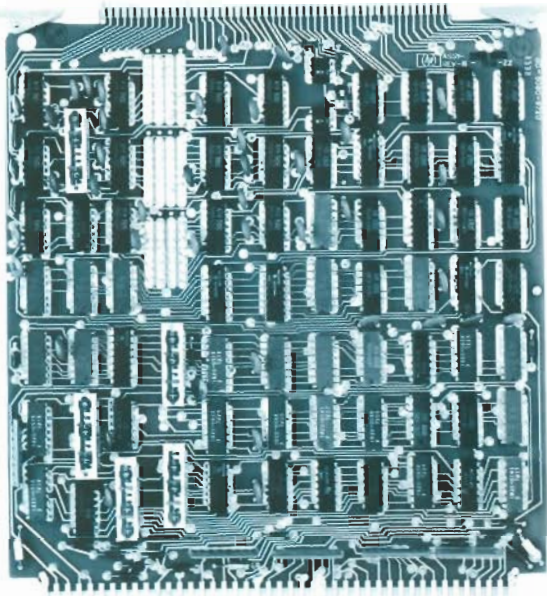
Interface Kit 12930A/-001/-002



HP Computer Museum
www.hpmuseum.net

For research and education purposes only.

Features



Versatile Operation

The **dual channel** Universal Interface Card was especially designed to interface HP 2100 Series Computers with a wide variety of external input/output devices. The card's versatility is achieved by employing a set of **programmable switches** which may be positioned to accommodate most external device interface requirements. The card's unique **dual channel** design provides for the rapid transfer of large data blocks (up to **one million** 16-bit words per second) over relatively long distances (up to **500 feet**) as well as the exchange of control and status information. The Universal Interface Card offers a choice of **differential** or TTL logic (ground true/positive true). Operationally it provides for successive **cycle stealing** under DMA control, separately addressable and independently programmed data and control/status channels, and a power status monitor. These features offer a wide latitude in configuring your computer system to save time and money.

Off-The-Shelf Interface

HP has made the Universal Interface Card as a single plug-in unit to meet most of your diversified interface needs at differential or TTL logic levels and data rates. You can put your computer to work immediately while realizing considerable savings in engineering time and money otherwise required to design and build your own interface.

Easy To Program

Performing input, output and combined input/output operations with the Universal Interface Card is simple using HP Assembly language. Inherent features such as data storage and interrupt logic reduce your programming time to a minimum.

Simple Installation

Supplied complete; plug the Universal Interface Card into a computer I/O slot and connect a cable. Hardware and instructions are provided to assist you in making an interconnecting cable to your device. No expensive and time consuming installation or computer down time required.

Adding A Universal Interface Card To Your Hewlett-Packard Computer

Adding the Universal Interface Card to your Hewlett-Packard Computer is quick, simple and inexpensive. The card enables you to interface HP computers with most digital input/output devices which employ differential or TTL logic levels. And although the card was designed as a general purpose interface, it has many features required to interface standard peripheral devices. Included are 16-bit input and output storage registers, dual channel interrupt logic, and a set of programmable switches to meet exacting interface requirements.

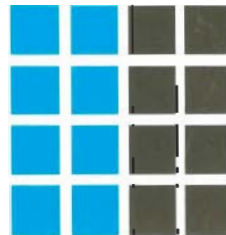
The Universal Interface Card may be programmed for input operations, output operations, or combined input/output operations using the **Data Channel mode** (lower select code), the **Control/Status mode** (higher select code) or the **Dual Channel mode**. When the **Dual Channel mode** is programmed, an **HP Priority Jumper Card** is used to maintain interrupt continuity. These diverse modes of operation allow the transfer of data while simultaneously exchanging control and status information.

Logic compatibility and extended distance transmission are ensured by specifying your interface requirements. You may choose between three interface cards: **Differential Driver** (standard), **Ground True TTL (Option 001)**, or **Positive True TTL (Option 002)**. And regardless of the complexity of your input/output device, you have the proven professional expertise of your Hewlett-Packard representative to assist you in defining your interface requirements.

Functional Description

As shown in the logic diagram, the Universal Interface Card provides one or two interface channels. The higher priority (lower select code) **Data Channel** transfers 16-bit data words between the computer and the input/output device. The lower priority (higher select code) **Control/Status Channel** transfers up to 6 bits of command and status information. The **Data Channel** includes data transfer control circuits and two storage registers. The **storage registers** allow the interface card to accept and send data when convenient for the respective input/output devices. The **Control/Status Channel** includes a control register and a command register. The control register stores up to 6 bits of control information. Input/output status information is strobed directly between the computer and the external device without intermediate storage so that device/computer status is continuously available.

Each interface channel has a set of independent programmable switches which allow you to meet diversified interface requirements. A third set of general-purpose switches is provided so that you may configure the card for a wide variety of applications.



Data Channel Operations

The Flag Buffer FF is set to indicate that the input/output device requires servicing. The Flag Buffer FF may be set by any of the following switch-selectable alternatives: the leading or trailing edge of the device flag, or a Set Flag (STF) command from the computer. The Control FF is set to enable data transfers or to enable interrupt requests to the computer. Both the Control FF and Command FF are set by a Set Control (STC) instruction addressed to the data channel. The Control FF is cleared by a Clear Control (CLC) instruction. The Command FF may be cleared by any of the following switch-selectable alternatives: a Clear Control (CLC) instruction, the leading or trailing edge of the device flag, or the T2 timing pulse from the computer. Data is output to the external device by an OTA/B instruction addressed to the data channel. Once loaded into the output register, the data is presented continuously to the external device. Data is input to the interface by any of three switch-selectable alternatives: the leading edge of the device flag, the trailing edge of the device flag, or the T2 pulse from the computer. Data is strobed to the computer by a LIA/B instruction addressed to the data channel.

Control/Status Channel Operations

The Flag Buffer FF is set to indicate that the input/output device requires servicing, has completed an operation or is ready to receive a command. The Flag Buffer FF may be set by any of the following switch-selectable alternatives: a Set Flag (STF) command from the computer, the leading edge of the device flag, or the trailing edge of the device flag. Both the Control FF and Command FF are set by a Set Control (STC) instruction from the computer. The Control FF is cleared by a Clear Control (CLC) instruction from the computer. The Command FF may be cleared by any of the following switch-selectable alternatives: a Clear Control (CLC) instruction, the leading or trailing edge of the device flag, or the T2 timing pulse from the computer. The Power Status Detector monitors the power-on status of both the external device and the computer. The resulting power fault signal is loaded into the status word as bit 7, and is also used to generate an interrupt request. The power status feature is enabled/disabled with a programmable switch.

Direct Memory Access (DMA) Operations

When coupled through the DMA section of an HP 2100 Series Computer, the Universal Interface Card can accommodate transfer rates up to one million 16-bit words per second. Successive DMA cycle steals are achieved by taking the service request signal from the Flag Buffer FF which allows the input/output device enough time to request the next successive DMA cycle. The Flag Buffer FF may be set asynchronously since the service request will be synchronized on the DMA card. Adding word buffer registers in the external device will allow data transfer to be sustained at the highest synchronous rate.

Table 1. Data Channel (Lower Select Code) Programmable Switch Functions

SWITCH	POS.	FUNCTION
Device Flag	1	Set Flag Buffer FF on positive-going edge of Lower Device Flag.
	2	Set Flag Buffer FF on negative-going edge of Lower Device Flag.
Input Data Register	5	Ungated strobe of input data register at trailing edge of T2 pulse from computer.
	6	Simultaneous strobe of input data register and setting of Flag Buffer FF.
Device Command Instruction	7	Device Command FF does not clear on CLC instruction from computer.
	8	Device Command FF cleared by CLC instruction.
	9	Device Command FF cleared by T2 pulse.
Device Command Flag	9	Device Command FF cleared on negative-going edge of Lower Device Flag.
	0	Device Command FF cleared on positive-going edge of Lower Device Flag.
Device Command Signal	1	Device Command FF signal delayed until T5.
	2	Device Command FF signal issued coincidental with setting of Device Command FF.

Table 2. Control/Status Channel (Higher Select Code) Programmable Switch Functions

SWITCH	POS.	FUNCTION
Channel Enable/Disable	1	Low priority interface channel enabled.
	2	Low priority interface channel inhibited.
Device Flag	9	Set Flag Buffer FF on positive-going edge of Higher Device Flag.
	0	Set Flag Buffer FF on negative-going edge of Higher Device Flag.
Device Command Flag	4	Device Command FF cleared on negative-going edge of Higher Device Flag.
	5	Device Command FF cleared on positive-going edge of Higher Device Flag.
	6	Device Command FF cleared by T2 pulse from computer.
Device Command Signal	4	Device Command FF signal issued coincidental with setting of Device Command FF.
	5	Device Command FF signal delayed until T5.
Device Command Instruction	1	Device Command FF does not clear on CLC instruction from computer.
	2	Device Command FF clears on CLC instruction.

Table 3. General Purpose Programmable Switch Functions

SWITCH	POS.	FUNCTION
Bit 0	1	Lower Device Flag used for input (status) register bit 0.
	2	Input-output device bit 0 used for input (status) register bit 0.
Bit 10	8	Data channel Control FF to control command word bit 10 (CW 10).
	9	Command channel Control FF to control command word bit 10 (CW 10).
	0	Control register bit 10 to control command word bit 10 (CW 10).
Device Command	5	Higher Device Command FF connected to Higher Device Command output. (single channel only.)
	6	Control register bit 10 connected to Higher Device Command output.
Device Flag	9	Higher Device Flag + PON + Lower Device Flag = Lower Device Flag composite.
	0	Higher Device Flag output + Lower Device Flag = Lower Device Flag composite; Lower Device Flag = Lower Device Flag composite.
Power Status	6	Power-on-normal (PON) circuit enabled.
	7	Power-on-normal (PON) circuit disabled.



UNIVERSAL INTERFACE LOGIC

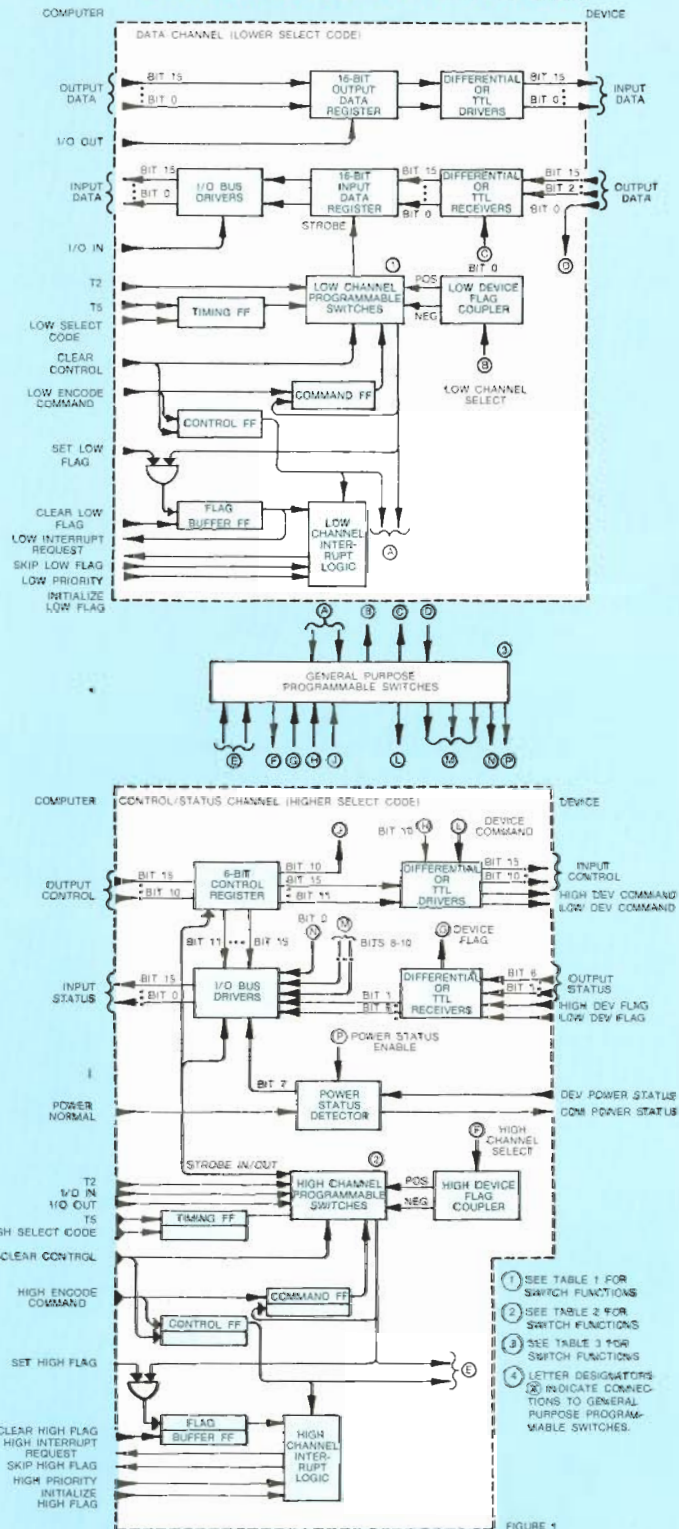


FIGURE 1

Programming

The following sequences illustrate the ease of programming the Universal Interface Card using Assembly language. The Interface Card is assigned select code UNV where UNV may be the lower select code (Data Channel) or higher select code (Control/Status Channel).

Input

Command the external device to acquire and transfer 16 bits (Data Channel) or 6 bits (Control Channel) of information to the computer. The results are left in the A-Register.

MAIN PROGRAM

Label	Operation	Operand
-------	-----------	---------

.		
.		
JSB	INPUT	Jump to input subroutine.
STA	CODE	Store A-register contents in memory location CODE.
.		
.		

SUBROUTINE

INPUT	NOP	Entry point.
STC	UNV, C	Encode external device to perform its function.
SFS	UNV	Is external device busy?
JMP	*- 1	Yes, jump back to SFS instruction.
LIA	MIC	No, transfer input data to A-register.
JMP	INPUT, I	Jump to main program.

Output

Output 16 bits (Data Channel) or 6 bits (Control Status Channel) from the A-Register to the external device.

MAIN PROGRAM

Label	Operation	Operand
-------	-----------	---------

.		
.		
LDA	N	Load A-register with contents of memory location N.
JSB	OUTPT	Jump to output subroutine.
.		
.		

SUBROUTINE

OUTPT	NOP	Entry point.
SFS	UNV	Is external device busy?
JMP	*- 1	Yes, jump back to SFS instruction.
OTA	UNV	No, transfer output data to interface card.
STC	UNV, C	Encode external device to accept the data.
JMP	OUTPT, I	Jump to main program.

Combined Input/Output

Output 16 bits (Data Channel) or 6 bits (Control/Status Channel), command the external device to take action, and then read in the device data. Command data is retained in the A-Register; input data is read into the B-Register.

MAIN PROGRAM

Label	Operation	Operand
-------	-----------	---------

.		
.		
LDA	N	Load A-register with contents of memory location N.
JSB	IOSB	Jump to input/output subroutine.
STB	CODE	Store B-register contents in memory location CODE.
.		
.		

SUBROUTINE

IOSB	NOP	Entry point.
OTA	UNV	Transfer data to interface card.
STC	UNV, C	Encode external device to accept or act on the data.
SFS	UNV	Is external device busy?
JMP	*- 1	Yes, jump back to SFS instruction.
LIB	MIC	No, transfer input data to B-register.
JMP	IOSB, I	Jump to main program.

Specifications

CHARACTERISTIC		SPECIFICATION
OUTPUT LEVELS (Differential or TTL)	'1' LEVEL	+2.4 V, 0.8 ma (source)
	'0' LEVEL	+0.4 V, 32 ma (sink)
DIFFERENTIAL INPUT LEVELS	'1' LEVEL	$V_{Diff} \geq +1 V$, 2.5 K input impedance
	'0' LEVEL	$V_{Diff} \leq -1 V$, 2.5 K input impedance
TTL INPUT LEVELS	'1' LEVEL	+2.4 to +5.0 Vdc, 330 Ω to +5 Vdc
	'0' LEVEL	0 to +0.5 Vdc, 15 ma

Interface Requirements*

Interface Kit	Power Requirements	
12930A	-2V	+4.5V
12930A-001	0.1A	1.8A
12930A-002	0.1A	2.2A

*An auxiliary HP Power Supply Extender may be necessary for installations using several I/O devices with high current requirements. Consult your nearest HP Field Sales Office.

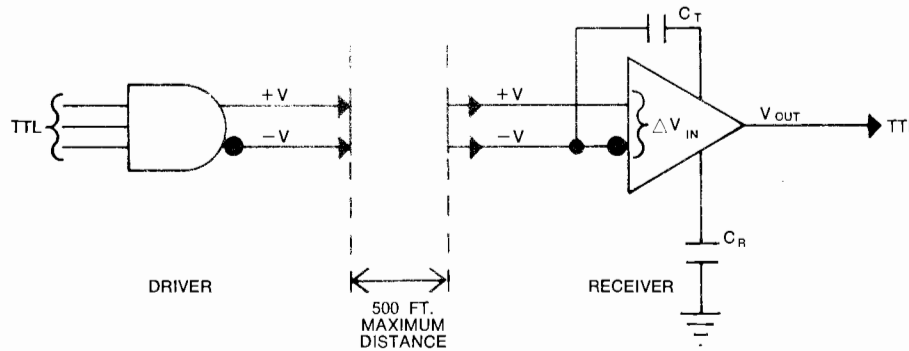
Card Dimensions

Width: 7- $\frac{3}{4}$ inches (196,8 mm)
Height: 8- $\frac{1}{16}$ inches (220,7 mm)

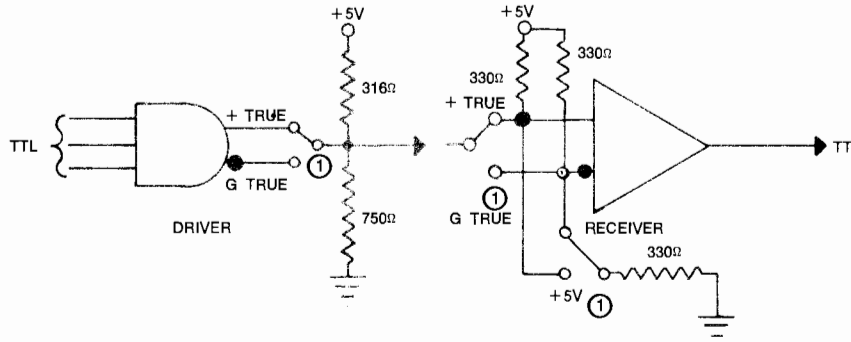
Weight

Net Weight: 18 oz. (511,2 gm)
Shipping Weight: 2 lb. (908 gm)

Differential Logic



TTL Logic



① Connection hard-wired for Positive True or Ground True logic

Equipment Supplied

HP 12930A Interface Kit:

- Standard Dual Channel Universal Interface Card (Part No. 12930-60001) with differential logic.
- Connector Kit (Part No. 12930-60007)
- Test Connector (Part No. 12930-60006)
- Priority Jumper Card (Part No. 2116-6110)
- Diagnostic Software

HP 12930A-001 Interface Kit:

- Optional Dual Channel Universal Interface Card (Part No. 12930-60004) with ground true TTL logic.
- Connector Kit (Part No. 12930-60007)
- Test Connector (Part No. 12930-60008)
- Priority Jumper Card (Part No. 2116-6110)
- Diagnostic Software

HP 12930-002 Interface Kit:

- Optional Dual Channel Universal Interface Card (Part No. 12930-60005) with positive true TTL logic.
- Connector Kit (Part No. 12930-60007)
- Test Connector (Part No. 12930-60009)
- Priority Jumper Card (Part No. 2116-6110)
- Diagnostic Software

