



**PLEASE CHECK FOR CHANGE INFORMATION
AT THE REAR OF THIS MANUAL.**

**50M30
PROGRAMMABLE
DIGITAL
INPUT/OUTPUT
CARD**

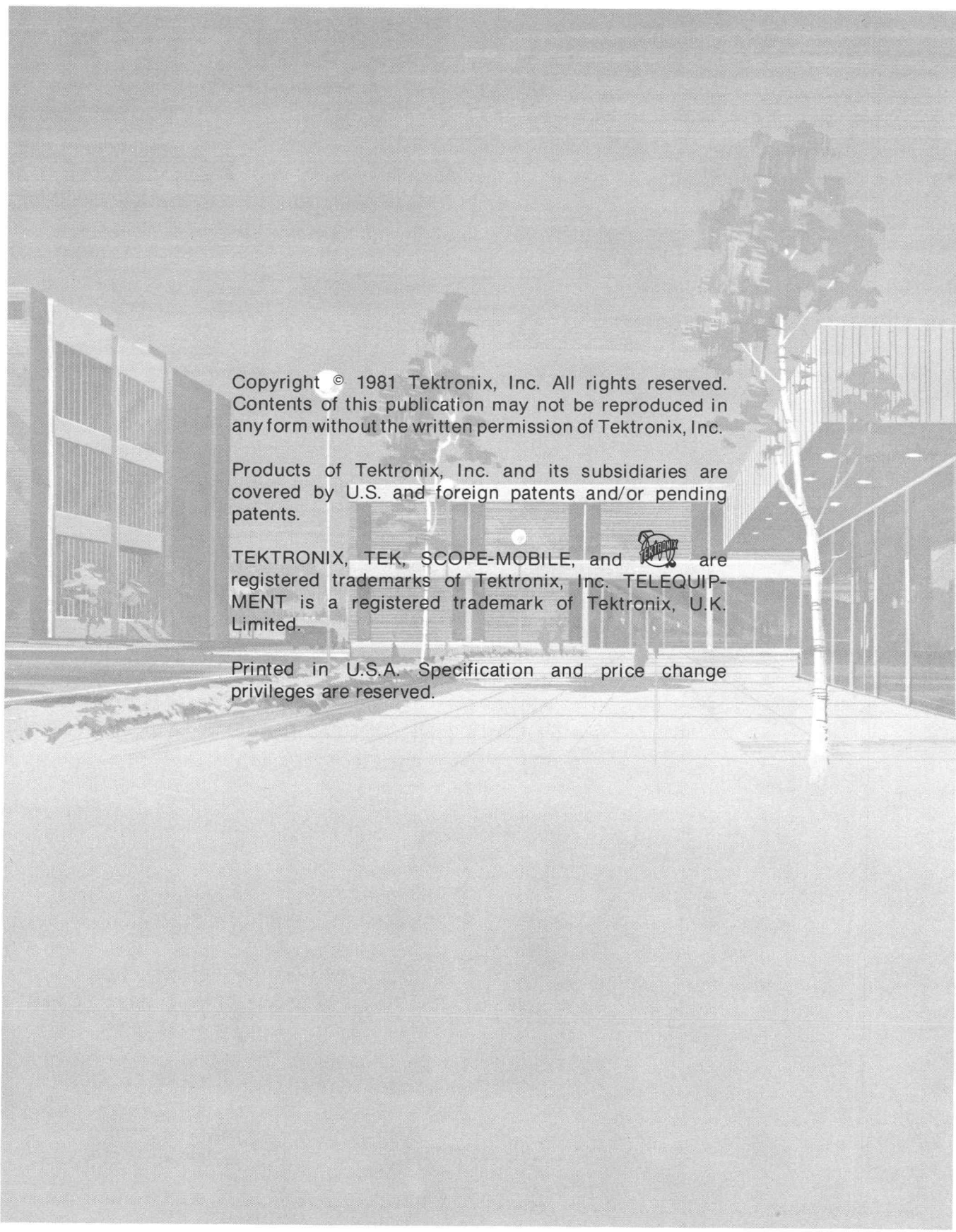
INSTRUCTION MANUAL

**Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97077**

070-3722-00
Product Group 75


Serial Number _____

First Printing OCT 1981
Revised JAN 1982



Copyright © 1981 Tektronix, Inc. All rights reserved.
Contents of this publication may not be reproduced in
any form without the written permission of Tektronix, Inc.

Products of Tektronix, Inc. and its subsidiaries are
covered by U.S. and foreign patents and/or pending
patents.

TEKTRONIX, TEK, SCOPE-MOBILE, and  are
registered trademarks of Tektronix, Inc. TELEQUIP-
MENT is a registered trademark of Tektronix, U.K.
Limited.



Printed in U.S.A. Specification and price change
privileges are reserved.

TABLE OF CONTENTS

	Page
LIST OF ILLUSTRATIONS	ii
LIST OF TABLES	ii
OPERATORS SAFETY SUMMARY	iii
SERVICE SAFETY SUMMARY.....	v

WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

	Page
Section 1 SPECIFICATION	
Instrument Description	1-1
Standard Accessories	1-1
Related Documents	1-1
Performance Conditions	1-1
Electrical Characteristics	1-2
Environmental Characteristics	1-3
Mechanical Characteristics	1-3
Section 2 PREPARATION FOR USE	
External Power Considerations	2-1
Front Panel Interface Cabling	2-1
Input/Output Data Synchronization ...	2-1
Buffered Trigger, Return Trigger, and Error Signals	2-2
Front Panel Indicator Lights	2-2
Function Card Installation	2-2
Repackaging for Shipment	2-5
Section 3 PROGRAMMING INFORMATION	
Introduction	3-1
General Information	3-1
Power-up Default and INIT	
Command Settings	3-1
Command Summary	3-2
Detailed Command List	3-3
Status Bytes and Error Codes	3-7
Section 4 PERFORMANCE CHECK PROCEDURE	
Introduction	4-1
Front Panel Connections	4-1
Performance Check Interval	4-1
Services Available	4-1
Test Equipment Required	4-1
Preliminary Procedure	4-3
Section 5 THEORY OF OPERATION	
Circuit Description	5-1
Memory and Decoders 	5-1
Front Panel Interface 	5-2
Section 6 MAINTENANCE	
Static-Sensitive Components	6-1
General Maintenance	6-1
Troubleshooting	6-1
Section 7 REPLACEABLE ELECTRICAL PARTS	
Section 8 DIAGRAMS AND ILLUSTRATIONS	
Block Diagram	
Schematics	
Parts Location and Component Reference Charts	
Section 9 REPLACEABLE MECHANICAL PARTS	
EXPLODED VIEW	
ACCESSORIES	
CHANGE INFORMATION	

LIST OF ILLUSTRATIONS

Fig. No.		Page
2-1	External (user) power connections	2-1
2-2	Front panel (user) interface cable assembly	2-2
2-3	50M30 front panel interface connector. IDV (20A) and ODR (23A) are level sensitive, not edge sensitive	2-3
2-4	Timing diagrams for 50M30 data input/output synchronization	2-4
4-1	50M30 performance check test circuit	4-2

LIST OF TABLES

Table No.		Page
1-1	Electrical Characteristics	1-2
1-2	Environmental Characteristics	1-3
1-3	Mechanical Characteristics	1-3
4-1	List of Test Equipment Requirements	4-1
6-1	Relative Susceptibility to Static Discharge Damage	6-1

OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary 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 could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could 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.

Power Source

This product is intended to operate from a power module connected to 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 module power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective ground connection by way of the grounding conductor in the power module 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 Fuse

To avoid fire hazard, use only the fuse of correct type, voltage rating and current rating as specified in the parts list for your product.

Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

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

Do Not Operate Without Covers

To avoid personal injury, do not operate this product without covers or panels installed. Do not apply power to the plug-in via a plug-in extender.



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.

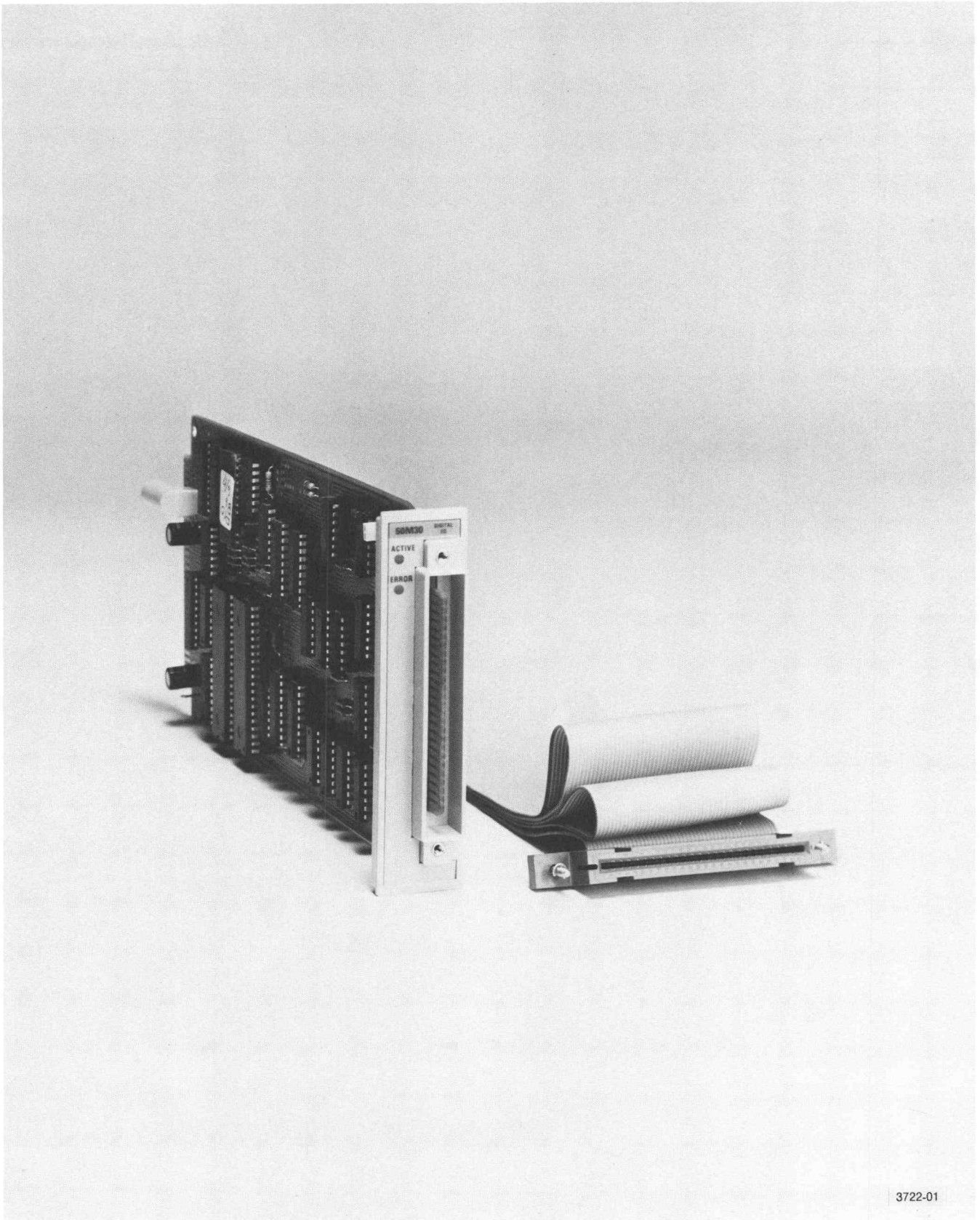
Use Care When Servicing With Power On

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 protective panels, soldering, or replacing components.

Power Source

This product is intended to operate in a power module connected to 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.



50M30 Programmable Digital Input/Output Card

SPECIFICATION

Instrument Description

The TEKTRONIX 50M30 Programmable Digital Input/Output Card is a function card used in the MI 5010/MX 5010 Multifunction Interface system.

The 50M30 provides 16 digital input and 16 digital output lines. The digital inputs accept data from pushbuttons, switches, contact closures, and most digital devices capable of supplying TTL input/output levels. The digital outputs provide TTL levels to control various types of test and measurement instruments, relays, indicators, etc. The digital outputs can be configured for open-collector outputs by positioning an internal jumper and using power supplied by the user.

Programming of the 50M30 is via the IEEE 488 (GPIB) bus specified and described in IEEE 488 Standard 488-1978. System commands sent to the MI 5010 microprocessor, along with specialized programming commands unique to the 50M30, control the selection of the data input/output channels and the arming/triggering functions of the card.

Four lines at the front panel connector operate as input/output pairs to handshake data with the user's external system. One handshake pair allows the user's data source to be synchronized with the 50M30 data input register and the other handshake pair allows the user's data storage device to be synchronized with the 50M30 data output register.

Standard Accessories

- 1 Instruction Manual
- 1 Reference Guide
- 1 User Cable Assembly

NOTE

Refer to the tabbed Accessories page in the rear of this manual for more information.

Related Documents

Instruction Manual, MI 5010/MX 5010 Programmable Multifunction Interface w/Interface Extender.

Performance Conditions

The limits stated in the Performance Requirements column of Table 1-1 are valid only if the 50M30 is operating in an ambient temperature between 0°C and +50°C, unless otherwise noted.

Information given in the Supplemental Information column of the following tables is provided for user information only, and should not be interpreted as Performance Requirements.

The 50M30 must be in an environment whose limits are described under Environmental Characteristics (Table 1-2).

Allow at least 5 minutes warmup time for operation to specified accuracy, 60 minutes after storage in high humidity environment.

Table 1-1
ELECTRICAL CHARACTERISTICS

Characteristics	Performance Requirements	Supplemental Information
INPUT/OUTPUT DATA LINES		
Data Outputs Using Internal Supply		16 open-collector TTL with 2 k Ω pull-up resistors.
Logical "1"		+5 V \pm 2% (open circuit). Source current = 2.5 mA +2%, -7% maximum.
Logical "0"		\leq 0.7 V Sink current = 40 mA maximum.
Data Outputs Using External (User) Supply		
Maximum Voltage		+15 V to J1210-10A.
Pull-up Resistors		2 k Ω .
Logical "1"		Equal to external supply voltage (open circuit). Source current = 7.5 mA \pm 5% plus external supply tolerance.
Logical "0"		\leq 0.7 V. Sink current = 40 mA maximum.
Data Inputs		
Input Buffers		16 Schmitt triggers.
Logical "1" (+V _{threshold})		+1.7 V typical. +1.5 min, +2 V max. Source current = -0.14 mA nominal, -0.16 mA maximum.
Logical "0" (-V _{threshold})		0.9 V typical. +0.6 V min, 1.1 V max. Source current = -0.18 mA nominal, -0.21 mA maximum.

Table 1-2
ENVIRONMENTAL CHARACTERISTICS^a

Characteristics	Description
Temperature	Meets MIL-T-28800B, class 5.
Operating	0°C to +50°C
Non-operating	–55°C to +75°C
Humidity	Meets MIL-T-28800B, class 5.
	95% RH, 0°C to 30°C
	75% RH, to 40°C
	45% RH, to 50°C
Altitude	Meets MIL-T-28800B, class 5.
Operating	4.6 km (15,000 ft)
Non-operating	15 km (50,000 ft)
Vibration	0.38 mm (0.015 in.) peak to peak, 5 Hz to 55 Hz, 75 minutes. Meets MIL-T-28800B, class 5, when installed in qualified power modules. ^b
Shock	30 g's (1/2 sine) 11 ms duration, 3 shocks in each direction along 3 major axes, 18 total shocks. Meets MIL-T-28800B, class 5, when installed in qualified power modules. ^b
Bench Handling ^c	12 drops from 45°, 4 in. or equilibrium, whichever occurs first. Meets MIL-T-28800B, class 5.
Transportation ^c	Qualified under National Safe Transit Association Preshipment Test Procedures 1A-B-1 and 1A-B-2.
EMC (without user cable)	Within limits of MIL-461A, and F.C.C. Regulations, Part 15, Subpart J, Class A.
Electrical Discharge	20 kV maximum charge applied to instrument case. Excluding front panel connector J1210.

^aWith power module.^bRefer to TM 5000 power module specifications.^cWithout power module.

Table 1-3
MECHANICAL CHARACTERISTICS

Characteristics	Description
Nominal Overall Dimensions	
Height	4.457 inches (113.2 mm).
Width	1.068 inches (27.13 mm).
Length	10.147 inches (257.7 mm).
Net Weight	.450 lbs (.205 kg).
Finish (Front Panel)	Plastic/aluminum laminate.



PREPARATION FOR USE

External Power Considerations

Before installation, the user may select the desired voltage source for the pull-up resistors associated with the CHA 1 data output drivers. Voltage source selection is accomplished by placing jumper plug P1204 on J1204 in the desired position. See Fig. 2-1.

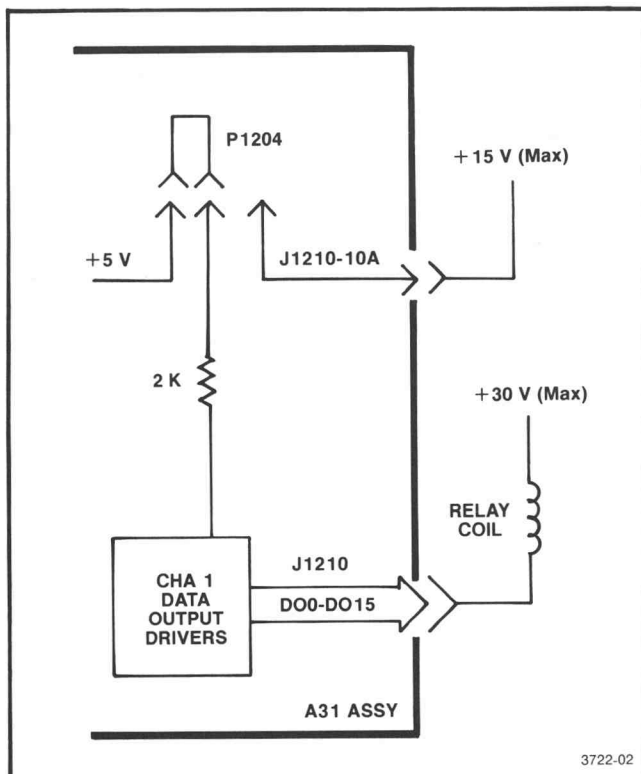


Fig. 2-1. External (user) power connections.

For +5 V internal source, P1204, located in the upper right corner on the component side of the circuit board, must be set to connect the two upper pins on J1204. For +15 V (maximum) external power source, set P1204 to connect the two lower pins. The external voltage source is then connected to pin 10A on the front panel connector, J1210.

The maximum safe external voltage that can be used to power devices connected to any of the data output lines, DO0-DO15, is +30 V.

CAUTION

To prevent damage to the 50M30 refer all internal jumper settings, front panel interface wiring, and external voltage source selection to qualified technical personnel.

Front Panel Interface Cabling

Figure 2-2 shows a schematic drawing of the 50-wire, flat-ribbon cable assembly provided with the 50M30. This cable assembly is used for connecting external data or sensor points to the front panel connector, J1210. The front panel connector, with signal line nomenclature, is shown in Fig. 2-3.

For convenience, a front panel input/output reference log is provided at the back of this section of the manual. Enter the card slot number and pertinent data associated with your external system requirements. Reproduce the completed reference log, if desired, but retain the original in the manual for future reference.

When connecting the unterminated ends of the wires in the flat-ribbon cable, the red-striped wire indicates pin 1A on J1210, the next wire indicates pin 1B. The A and B paired-wire pattern is then followed on down to the last pair of wires 25A (49) and 25B (50).

Input/Output Data Synchronization

If desired, four pins on the front panel interface connector can be used to synchronize ("handshake") the data input or data output with devices in the user's external system.

Data Input Mode:

- Input Data Valid (IDV-pin 20A).
- Input Data Received (IDR-pin 21A).

Data Output Mode:

- Output Data Valid (ODV-pin 22A).
- Output Data Received (ODR-pin 23A).

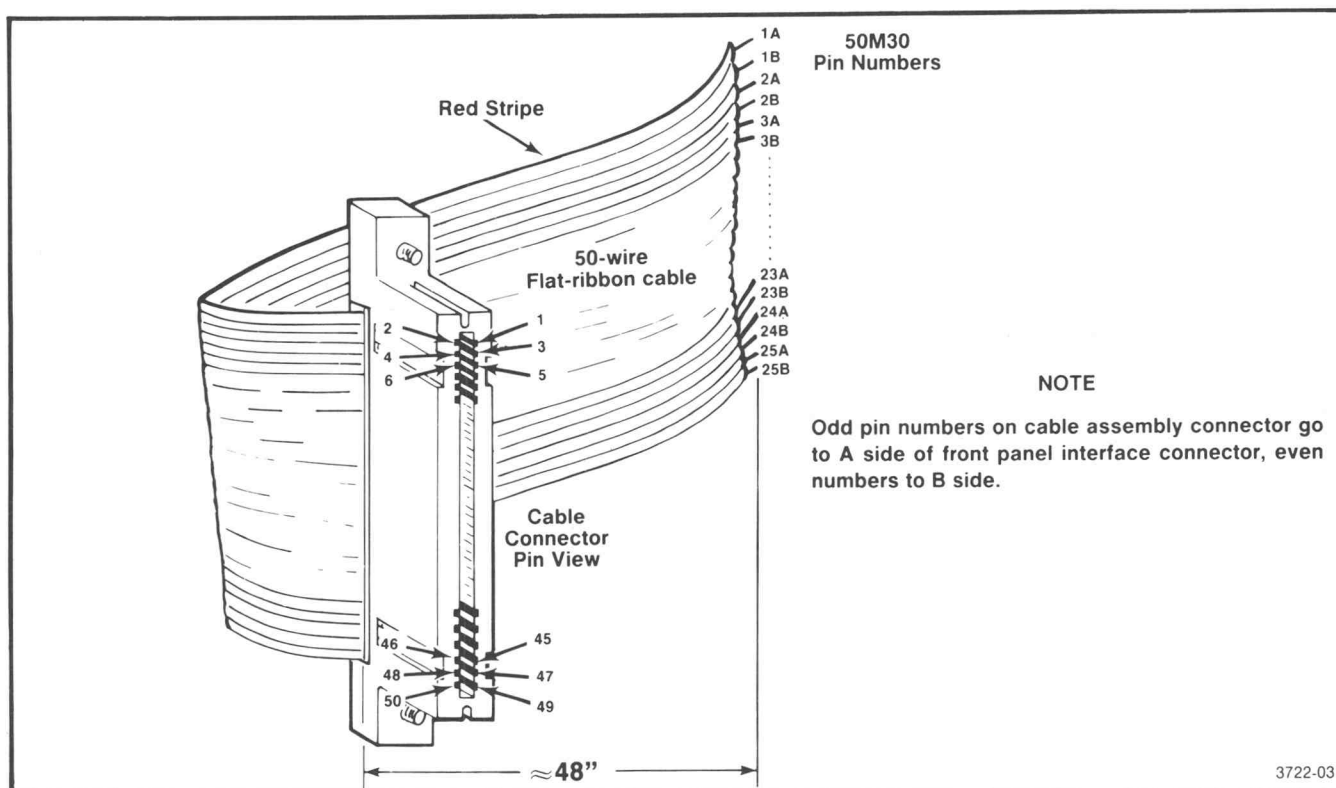


Fig. 2-2. Front panel interface cable assembly.

Handshake timing diagrams for the data input and data output modes are illustrated and described in Fig. 2-4.

Function Card Installation

CAUTION

To prevent damage to the 50M30, turn off the power module before installing or removing the function card from the MI 5010/MX 5010 units. Do not use excessive force when installing or removing any unit from the MI 5010/MX 5010 system.

Buffered Trigger, Return Trigger, and Error Signals

If the 50M30 is programmed for the DT TRIG status, the low-level BFR TRIG output signal, pin 24A on the front panel connector, occurs when the program software sends the TRIGGER (TRIG) command to the 50M30.

The ERROR signal output, pin 25B, performs the same function as the ERROR indicator light on the front panel.

Front Panel Indicator Lights

If the ERROR indicator light remains illuminated after the power-up self-test routine has been completed, it indicates a hardware error has occurred on the 50M30.

The ACTIVE indicator light is pulsed on for a minimum of 20 ms each time the program software or the MI 5010 microprocessor selects the 50M30.

The 50M30 may be installed in any vacant slot in either the MI 5010 (slots 1, 2, or 3) or the MX 5010 (slots 4, 5, or 6).

Place the function card in the upper and lower guide rails associated with the chosen slot and push firmly straight in until the rear edge card connector mates with its connector on the Main Interconnect board at the rear of the MI 5010 or MX 5010.

Be certain that the function card is aligned with the associated thumb screw on the rear panel, then use the thumb screw to lock the function card in its designated slot.

50M30
FRONT PANEL
INTERFACE CONNECTOR

J1210

FRONT VIEW (TOP)

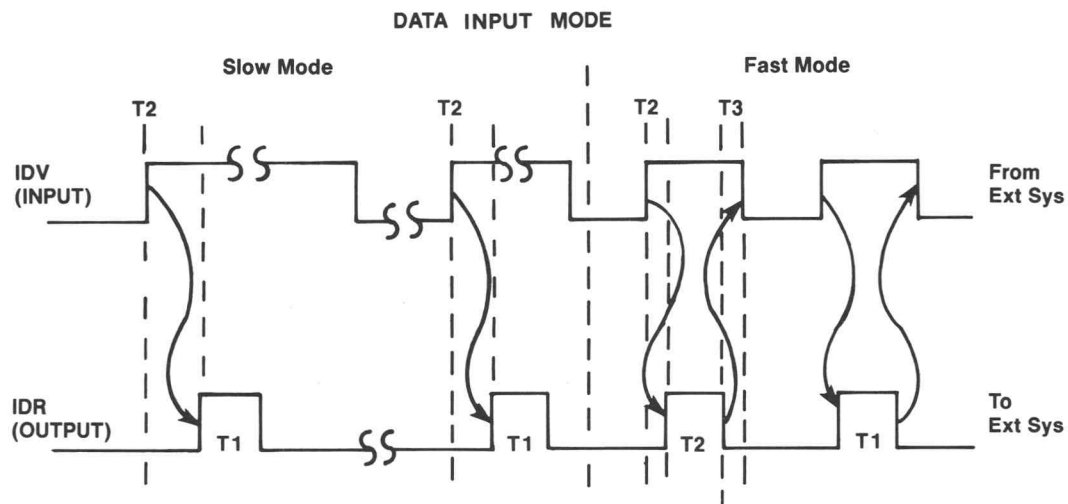
	OUTPUT OR INPUT	PIN A		PIN B	OUTPUT OR INPUT
	DIG GND	1		1	DIG GND
	D00	2		2	D01
	D02	3		3	D03
	D04	4		4	D05
	D06	5		5	D07
	D08	6		6	D09
	D010	7		7	D011
	D012	8		8	D013
	D014	9		9	D015
	USER SUPPLY VOLTAGE (+15V MAX)	10		10	NC
	DIG GND	11		11	DIG GND
	D10	12		12	D11
	D12	13		13	D13
	D14	14		14	D15
	D16	15		15	D17
	D18	16		16	D19
	D110	17		17	D111
	D112	18		18	D113
	D114	19		19	D115
	IDV (INPUT DATA VALID)	20		20	DIG GND
	IDR (INPUT DATA RECEIVED)	21		21	DIG GND
	ODV (OUTPUT DATA VALID)	22		22	DIG GND
	ODR (OUTPUT DATA RECEIVED)	23		23	DIG GND
	BFR TRIG	24		24	DIG GND
	RET TRIG (NOT USED)	25		25	ERROR

NOTE

IDV (INPUT DATA VALID) AND
ODR (OUTPUT DATA RECEIVED)
ARE LEVEL SENSITIVE, NOT
EDGE SENSITIVE.

3722-04

Fig. 2-3. 50M30 front panel interface connector. IDV (20A) and ODR (23A) are level sensitive, not edge sensitive.

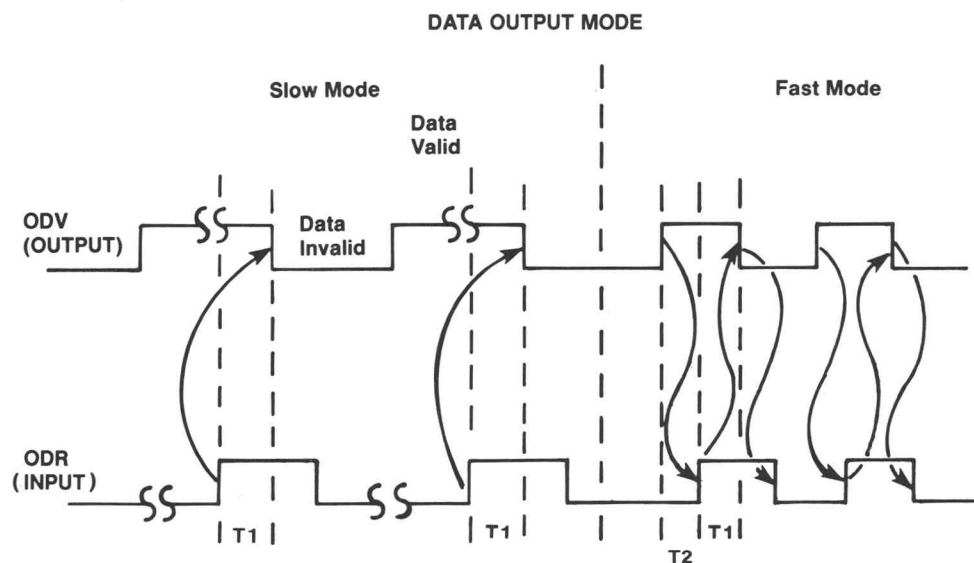


Slow Mode — T_2 is a function of the user's software. Ext Sys holds IDV high (or low) for an indefinite period.

Fast Mode — T_2 is a function of the user's software. T_3 is external system dependent.

NOTE

$$3 \mu s \leq T_1 \leq 6 \mu s$$



Slow Mode — 50M30 resets ODV 1 to 2 μs after rising edge of ODR (T_1). ODR must go low in response to ODV going low within 2 μs .

Fast Mode — Ext Sys sets ODR on rising edge of ODV (T_2). 50M30 resets ODV 1 to 2 μs after rising edge of ODR. Ext Sys must reset ODR within 2 μs after ODV goes low. T_2 is external system dependent.

3722-05

Fig. 2-4. Timing diagrams for 50M30 data input/output synchronization.

Repackaging for Shipment

If the instrument is to be shipped to a Tektronix Service Center for service or repair, attach a tag showing: owner (with address) and the name of the individual at your firm that can be contacted. Include complete instrument description, serial number, and a description of the service required.

If the original package is not fit to use or not available, repackage the instrument as follows:

Surround the instrument with polyethylene sheeting, or other suitable material, to protect the exterior finish. Obtain a carton of corrugated cardboard of adequate strength that has inside dimensions no less than six inches more than the instrument dimensions. Cushion the instrument by tightly packing dunnage or urethane foam between the carton and the instrument, on all sides. Seal the carton with shipping tape or an industrial stapler.

The carton test strength for your instrument is 200 pounds.

50M30
FRONT PANEL INPUT/OUTPUT REFERENCE LOG

SLOT NUMBER _____ :

“A” Side Pin No./Name	Sensor Point/Comments	“B” Side Pin No./Name	Sensor Point/Comments
1A/DIG GND		1B/DIG GND	
2A/DO0		2B/DO1	
3A/DO2		3B/DO3	
4A/DO4		4B/DO5	
5A/DO6		5B/DO7	
6A/DO8		6B/DO9	
7A/DO10		7B/DO11	
8A/DO12		8B/DO13	
9A/DO14		9B/DO15	
10A/UVS (+ 15 V max)		10B/NC	No connection
11A/DIG GND		11B/DIG GND	
12A/DI0		12B/DI1	
13A/DI2		13B/DI3	
14A/DI4		14B/DI5	
15A/DI6		15B/DI7	
16A/DI8		16B/DI9	
17A/DI10		17B/DI11	
18A/DI12		18B/DI13	
19A/DI14		19B/DI15	
20A/IDV		20B/DIG GND	
21A/IDR		21B/DIG GND	
22A/ODV		22B/DIG GND	
23A/ODR		23B/DIG GND	
24A/BFR TRIG		24B/DIG GND	
25A/RET TRIG (Not implemented)		25B/ERROR	

PROGRAMMING INFORMATION

INTRODUCTION

General Information

Programming and remote control of the 50M30 Programmable Digital Input/Output Card is via the microprocessor in the MI 5010 Programmable Multifunction Interface unit. In turn, the MI 5010 is programmed and controlled via the digital interface specified and described in IEEE Standard 488-1978.

Programming the 50M30 for digital input/output operations requires a thorough understanding of the operation and commands listed in the MI 5010/MX 5010 Instruction manual. The Programming Information section of the MI 5010/MX 5010 Programmable Multifunction Interface w/Interface Extender Instruction manual contains information related to function card commands, system operating modes, message formats, message processing, IEEE 488 interface messages, basic programming examples, status bytes, error codes, and other useful information related to programming the complete Multifunction Interface system.

This section of the 50M30 Instruction manual contains only those commands resident in the 50M30 firmware and other information related to digital input/output operations.

The 50M30 cannot be operated under local control nor does it have a front panel control to return it to a "local" mode.

The ACTIVE indicator light is illuminated every time the microprocessor selects the 50M30.

The ERROR indicator light will remain illuminated if the microprocessor detects a hardware error on the 50M30 during the power-up self-test routine. The error is reported to the controller in response to the error query (ERR?).

Power-up Default and INIT Command Settings

After the power-up self-test routine has been successfully completed, the 50M30 goes to the following default settings:

CHA 1;DAT 0;DT OFF;ARM OFF;CHA 2;ARM OFF;

When the INIT command is sent the 50M30 returns to its power-up default settings, but does not cause SRQ to be asserted.

NOTE

Refer to the MI 5010/MX 5010 Instruction manual for information related to obtaining system settings by the use of the SET?, SELECT, and FSET? commands.

The TEST command resets the 50M30 handshake lines, but does not affect the settings.

COMMAND SUMMARY**NOTE**

The following commands may be sent to the 50M30 in either the immediate or buffered mode. These commands will not affect the 50M30 unless it has first been selected by the proper SELECT command argument.

Header	Argument(s)	Description
ARM	ON	Handshake lines generate both a logical condition and SRQ when an ODR or IDV signal occurs.
	COND	Handshake lines generate only a logical condition when an ODR or IDV signal occurs.
	SRQ	Handshake lines generate only an SRQ when an ODR or IDV signal occurs.
	OFF	No action is generated by handshake lines.
ARM?		Armed status query.
CHA	<num>	Accesses channel defined by argument.
CHA?		Channel query.
DAT	<num>	Puts binary equivalent defined by argument in channel 1 output register. <num> can be decimal, binary, or hexadecimal.
	B<num>	
	H<num>	
DAT?		Decimal data format query.
BDAT?		Binary data format query.
HDAT?		Hexadecimal data format query.
DT	SET	Alter settings after receipt of <GET> message or TRIG command.
	TRIG	Change input/output data after receipt of <GET> message or TRIG command.
	OFF	<GET> message or TRIG command has no effect.
DT?		Device trigger status query.
FLAG?		Flag query for ODR or IDV interrupts.
FSET?		50M30 current settings query.
NAM?		Card name query.

PROGRAMMING NOTES

DETAILED COMMAND LIST

ARM

Type:

Setting and Query

Mode:

Immediate or buffered.

Setting Syntax (one of the following):

ARM ON
ARM SRQ
ARM COND
ARM OFF

Query Syntax:

ARM?

Query Response (one of the following):

ARM ON;
ARM SRQ;
ARM COND;
ARM OFF;

Discussion:

The ARM command defines the action taken by the 50M30 upon receipt of an Output Data Received (ODR) or an Input Data Valid (IDV) signal from an external system:

- ARM SRQ —causes the SRQ line on the IEEE 488 digital interface to be asserted.
- ARM COND —causes a logical condition that satisfies the WAIT COND command.
- ARM ON —causes both of the above actions to occur.
- ARM OFF —causes no action to be taken.

CHANNEL (CHA)

Type:

Operational and Query

Mode:

Immediate or buffered

Setting Syntax:

CHANNEL <num>

Example:

CHA 1
or
CHA 2

Query Syntax:

CHA?

Query Response (one of the following):

CHA 1;
CHA 2;

Discussion:

The CHANNEL command accesses the desired input/output data channel. The argument value for <num> is:

- 1 (for data output channel).
- 2 (for data input channel).

DATA (DAT)

Type:

Setting and Query

Mode:

Immediate or buffered

Setting Syntax (one of the following):

(CHA 1 Only)

DATA<num>

DATA B<num>

DATA H<num>

Examples:

DAT 4369

DAT B00010001000100010001

DAT H1111

Query Syntax (one of the following):

(CHA 1 or CHA 2)

DAT?

BDAT?

H DAT?

Query Response (one of the following):

DAT <decimal number>;

DAT B<binary number>;

DAT H<hexadecimal number>;

Discussion:

The DATA commands load the output register of the data output channel with the binary equivalent of the argument value. The decimal range for <num> is from 0 to 65535; hexadecimal range from 0000 to FFFF. Preceding <num> with the letter B causes the number to be recognized as a binary number; preceding <num> with the letter H causes it to be recognized as a hexadecimal number. Channel 1 must have been previously selected.

DT

Type:

Operational and Query

Mode:

Immediate or buffered

Setting Syntax (one of the following):

DT SET

DT TRIG

DT OFF

Query Syntax:

DT?

Query Response (one of the following):

DT SET;

DT TRIG;

DT OFF;

Discussion:

The DT (Device Trigger) command directs the use of the <GET> interface message or the TRIG command:

DT SET —causes the 50M30 to wait until receipt of the <GET> message or the TRIG command before altering its settings.

DT TRIG —causes the 50M30 to wait until receipt of the <GET> message or the TRIG command before changing the input or output data.

DT OFF —<GET> or TRIG command has no effect on operation of the 50M30.

FLAG?

Type:

Query

Mode:

Immediate or buffered

Query Syntax:

FLAG?

Query Response (one of the following):

FLAG 0;

FLAG 1;

Discussion:

The FLAG? query asks status information about the Output Data Received (ODR) signal or the Input Data Valid (IDV) signal.

Response is:

FLAG 1; - if ODR or IDV occurred.

FLAG 0; - if ODR or IDV did not occur.

Execution of the FLAG? query causes the response to be FLAG 0 until an ODR or IDV signal occurs.

FSETTINGS? (FSET?)

Type:

Query

Mode:

Immediate or buffered

Query Syntax:

FSETTINGS?

Example:

FSET?

Query Response:

<current settings>;

Example:

DT OFF;CHA 1;DAT 0;ARM OFF;CHA 2;ARM OFF;

Discussion:

The FSET? query asks for the current settings of the 50M30. The 50M30 must have been previously selected by the proper SELECT command argument in order to obtain the current settings.

NOTE

The response to this command may be stored and used at a later time to reset the 50M30 to those settings noted in the response.

NAME? (NAM?)

Type:

Query

Mode:

Immediate or buffered

Query Syntax:

NAME? or NAM?

Query Response:

NAME DIOM30,V79.1,Fxx;

Discussion:

The NAME? query asks for the name of the 50M30 function card. In the response DIO is the three letter code for the 50M30, V79.1 is the Tektronix Codes and Formats version number, and Fxx is the firmware version number.

PROGRAMMING NOTES

STATUS BYTES AND ERROR CODES

NOTE

Refer to the MI 5010/MX 5010 Instruction manual for status byte (STB) and error code definitions.

Serial Poll Response (STB)	Error Query Response	Description
99	36x	50M30 ROM error.
225	74x	Cannot clear 50M30 PIA Data Direction Registers.
225	75x	Cannot operate 50M30 PIA Control Registers.
192+x	79x	ODR or IDV signal occurred with ARM SRQ or ARM ON status set.

NOTE

The value of "x" in the status byte and error code responses depends on which slot contains the 50M30. The range of "x" is 1 through 6.

If the MI 5010 is busy when serial polled, the status byte code will be 16 higher than that listed.



WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

PERFORMANCE CHECK PROCEDURE

Introduction

This Performance Check procedure consists of three software routines that perform the following checks for the 50M30 Digital Input/Output Card:

1. Verifies that the handshake logic is correctly initialized by the INITIALIZE (INIT) command.
2. Checks ability to transfer data from data output channel (CHA 1) to data input channel (CHA 2).
3. Checks DT TRIG operation with the TRIGGER (TRIG) command.

Front Panel Connections

Before any of the three software routines are performed the front panel connector (J1210) must be externally wired according to the schematic drawing shown in Fig. 4-1.

Performance Check Interval

Other than a first time performance check, it is not necessary to check the performance of the 50M30 at regular

intervals. The performance check should be performed under the following conditions:

- Incoming inspection
- If used infrequently
- After repair
- Operating conditions indicate degradation of performance

The 50M30 has no internal adjustments for calibration purposes. If the instrument fails this performance check procedure, circuit troubleshooting is then indicated.

Services Available

Tektronix, Inc. provides complete instrument repair facilities at local field service centers and at the factory service center. Contact your local Tektronix field office or representative for more information.

Test Equipment Required

The test equipment (or equivalent) listed in Table 4-1 is suggested to perform this Performance Check procedure.

Table 4-1
LIST OF TEST EQUIPMENT REQUIREMENTS

Description	Performance Requirements	Example
Controller	GPIO compatibility	TEKTRONIX 4051, or TEKTRONIX 4052
GPIO Cable	Standard GPIO interconnect, length 2 meters.	Tektronix Part No. 012-0630-01
Power Module	GPIO compatibility	TEKTRONIX TM 5003 or TEKTRONIX TM 5006
Programmable Multifunction Interface		TEKTRONIX MI 5010/MX 5010
Oscilloscope with 10X Probe		Any of the following Tektronix: 400-Series 300-Series 200-Series T900-Series 5000-Series 7000-Series

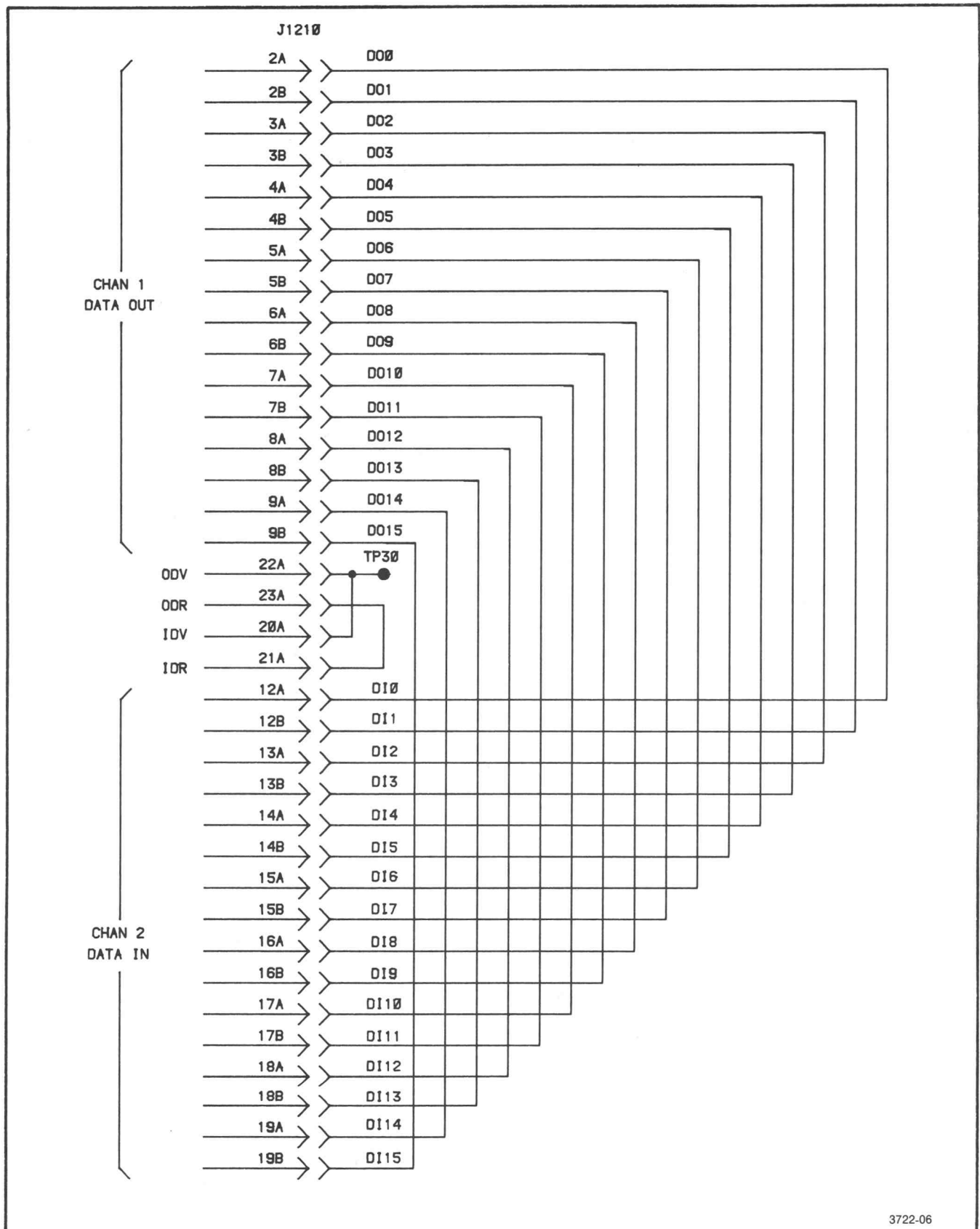


Fig. 4-1. 50M30 performance check test circuit.

1. Preliminary Procedure

a. Be certain that the front panel connector is wired according to the schematic drawing shown in Fig. 4-1.

b. Set up IEEE 488 (GPIB) controller, GPIB cable, TM 5000-Series power module, and the MI 5010/MX 5010 system for programming operations over the IEEE 488 digital interface. Verify that MI 5010 bus address is set to decimal 23, and message terminator to EOI ONLY.

c. Insert the 50M30 in any vacant slot in the MI 5010 (1, 2, or 3) or MX 5010 (4, 5, or 6).

d. Turn on the power and allow 5 minutes for warm-up time.

e. During warm-up time, create three files and load the three software routines into the controller's memory. The routines are found in steps 2, 3, and 4.

NOTE

If a controller other than that listed in Table 4-1 is being used, all three software routines must be modified to be applicable to your controller.

2. Check Handshake Logic With INIT Command (File 1)

a. Operate the controller to <RUN> the following program:

```
100 REM *** 50M30 TEST 1
110 PRINT "ENTER SLOT # OF CARD UNDER TEST : ";
120 INPUT S
130 PRINT @23:"INIT;SEL ";S
140 PRINT @23:"CHA 1;DATA 21845;"
150 GO TO 130
```

b. Program explanation—a data transfer is started and then suspended in line 150, leaving pin 22A on front panel connector (J1210) at a high level. On receipt of the INIT command in line 130, pin 22A is cleared to a low level.

c. With the program running, use an oscilloscope with 10X probe to view the signal at TP30 (see Fig. 4-1).

d. CHECK—that the signal on TP30 is alternating between TTL high and low levels. If so, the INIT command is correctly initializing the handshake logic.

e. Remove the oscilloscope probe and stop <BREAK> the program.

3. Check Data Transfer Without TRIGGER (TRIG) Command (File 2)

a. Operate the controller to <RUN> the following program:

```
100 REM *** 50M30 TEST 2 ***
110 PRINT "ENTER SLOT # OF CARD UNDER TEST : ";
120 INPUT S
130 PRINT @23:"INIT;SEL ";S
140 C=1
150 A=43690
160 PRINT @23:"CHA 1;DATA ";A;"CHA 2;DATA?;"
170 INPUT @23:B
180 IF A=B THEN 200
190 PRINT "ERROR - SENT DATA ";A;" , RECIEVED DATA ";B
200 C=C+1
210 IF C>2 THEN 140
220 A=21845
230 GO TO 160
```

b. Program explanation—a 16-bit word consisting of alternate 1's and 0's is sent, followed by its complement. After each transfer, the data received is compared with the data sent. If the data is the same, the program continues to run with no errors reported or printed. If the data is not the same, an error message is printed.

c. CHECK—that no error messages are reported for at least 1 minute.

d. Stop <BREAK> the program.

4. Check Data Transfer With TRIGGER (TRIG) Command (File 3)

a. Operate the controller to <RUN> the following program:

```
100 REM *** 50M30 TEST 3
110 PRINT "ENTER SLOT # OF CARD UNDER TEST : ";
120 INPUT S
130 PRINT @23:"INIT;SEL ";S
140 PRINT @23:"DT TRIG;"
150 A=21845
160 PRINT @23:"CHA 1;DATA ";A
170 PRINT @23:"TRIG;CHA 2;DATA?;"
180 INPUT @23:B
190 IF A=B THEN 170
200 PRINT "ERROR - SENT DATA ";A;" , RECIEVED DATA ";B
210 GO TO 170
```

b. Program explanation—sets DT TRIG status in line 140 and responds to TRIG command in line 170. The program runs continuously with no errors printed if 50M30 is operating properly.

c. CHECK—that no error code messages are printed for at least 1 minute.

d. Stop <BREAK> the program.

THEORY OF OPERATION

CIRCUIT DESCRIPTION

Memory and Decoders

The 50M30 Digital Input/Output function card connects to the MI 5010 or MX 5010 Main Interconnect assembly via P1010. The microprocessor in the MI 5010 selects this card for data transfers (EBD0-EBD7) by setting pins 4 and 5 of U1022B high. The low level on pin 6 of U1022B enables the address decoder (U1011) on pin 5, and enables the bidirectional data buffer (U1021) on pin 19. Pins 4 and 5 of U1011 must be low and pin 6 must be high to enable the address decoder when a valid memory address (EBVMA) for the 50M30 is placed on the external address bus (EBA0-EBA15). The five control lines to the 50M30 are buffered by non-inverting buffers U1009B, C, D, G, and H. The CARD SELECT line is set high each time the microprocessor addresses the 50M30. The read/write control signal on pin 5 of U1009D is inverted by U1220D causing pin 14 of U1220D to be low during a read operation.

The memory devices for the 50M30 consists of a 2K x 8 bit ROM (U1001), the output peripheral interface adapter (PIA-X, U1100), and the input peripheral interface adapter (PIA-Y, U1120).

The 16 address bits (EBA0-EBA15) are buffered by unidirectional, non-inverting buffers U1000 and U1010; buffered address bits BA11 and BA12 are not used. The hexadecimal addresses for the 50M30 operating system are in the hexadecimal 4000-DFFF range.

Integrated circuit U1011 decodes buffered address bits BA13, BA14, and BA15 to select the ROM or both PIAs for addressing. The ROM (U1001) is selected when hexadecimal address 4000 sets pin 18 low. An instruction word is placed on the BD0-BD7 data bus when the read/write and clock signals on pins 1 and 2 of U1022A both go high.

Both peripheral interface adapters, U1100 and U1120, are selected for addressing when hexadecimal address 8000 sets pin 23 on each device to a low state. Buffered address bit BA3 is inverted by U1104E. The inversion of BA3 allows the microprocessor to select either U1100 or U1120 for data transfer. Communication with the internal registers of U1100 or U1120 is via address bits BA0 and BA1. For either PIA, pin 23 must be low and pin 24 must be

high to select the proper channel. Buffered data is clocked into (a write operation) or out of (a read operation) an internal register on the rising edge of the clock signal on pin 25 of either PIA.

NOTE

For more detailed information related to internal register addressing for U1100 or U1120, refer to the manufacturer's data sheet.

At power-up, the RESET control line (U1009B, pin 3) goes low. This resets all internal registers of the PIAs to zero. The microprocessor then configures all of the CA1, CA2, CB1, CB2 ports of the PIAs as inputs. The CA2-X line (U1100, pin 39) is held high by R1212 at power up. This causes the ERROR light, DS1202 (schematic 2) to be illuminated with a low level on pin 1 of U1212A until the completion of the self-test routine. Upon successful completion of the self-test routine, the CA2-X line is programmed to a low level, which turns off the ERROR light. If a 50M30 related error occurs, the CA2-X line is programmed high, keeping DS1202 illuminated. The ERROR signal (a high level) is also routed to the front panel connector, J1210, via U1211F.

Interrupt signals to the microprocessor in the MI 5010 are via the IRQ-X and IRQ-Y lines (pins 12 and 13 of U1022D, respectively). An interrupt from either PIA causes pin 24B of P1010 to go low and remain low until the microprocessor clears the interrupt condition.

Address decoder U1011 is also used to enable two logic gates (U1223C and U1223B) for the output trigger, and one logic gate (U1223A) for the input trigger. Hexadecimal address 6000 enables U1223C and U1223B with a high on pins 10 and 5 respectively. Hexadecimal address A000 enables U1223A with a high on pin 13. The output pin of these gates (8, 6, or 12) is set high whenever all three inputs to any particular gate are all high at the same time. Note that U1223B or U1223A are triggered for a write operation (pin 4 or pin 1 is high), while U1223C is triggered for a read operation (pin 9 is high). The microprocessor strobes hexadecimal address 6000 whenever it needs to output data from the 50M30 front panel connector and strobes hexadecimal address A000 whenever it needs to input data from the front panel connector.

Theory of Operation—50M30

The high level BFR TRIG signal on pin 9 of U1103C is generated via the GPIB Control chip in the MI 5010. This signal is generated in response to the Group Execute Trigger <GET> a message from the IEEE 488 digital interface, or from a "forced GET" instruction from the microprocessor. The BFR TRIG signal can be enabled or inhibited by programming the CB2-X line (U1103, pin 10) high or low. If enabled (high), the CA1-X input to U1100 (pin 40), is used as a feedback path to set an interrupt flag bit in an internal register. This action notifies the microprocessor that the 50M30 has received the BFR TRIG signal.

Front Panel Interface

The power-on routine in the 50M30 firmware configures the peripheral registers of U1100 (PA-X and PB-X ports) as outputs. Data that is to be transferred to the second rank storage latches, U1102 and U1101, is then written into these peripheral registers. The data may then be transferred to the front panel connector, J1210, via the hex inverter buffer/drivers U1201, U1212, and U1200. These integrated circuits are open-collector devices capable of high voltage outputs. The user can increase the output voltage above the normal TTL levels by relocating P1204 on J1204 and applying an external voltage source to pin 10A of J1210. Maximum safe external voltage on pin 10A is +15 V.

The data is transferred to the output when the DATA OUTPUT TRIG signal on pin 11 of U1102 and U1101 goes high. This signal goes high when either the BFR TRIG signal is generated or a software trigger is generated by a dummy write operation to hexadecimal address 6000 (see Memory and Decoder description).

In addition to data output transfer, the DATA OUTPUT TRIG signal clocks U1125B, a D-type flip-flop, on pin 11. Pin 12 of U1125B was at a low state during the power-up self-test routine and then changed to the high state if no 50M30 related errors had occurred. When the data is transferred, the high state on pin 9 of U1125B is clocked through to pin 3 of U1209A. Flip-flops U1209A, B, and C are clocked by the B02 (1 MHz) signal on pin 9. The 1 MHz clock causes the high level on pin 3 to advance to pin 2(4), then to pin 5(6), and then to pin 7 at 1 μ s intervals. Pin 5 of U1209B drives the OUTPUT DATA VALID (ODV) line to the front panel connector. This sequence of events ensures that the output data is valid for at least 2 μ s before ODV (J1210-22A) goes high.

When the user's external device sets pin 22B of J1210 high to indicate OUTPUT DATA RECEIVED (ODR), pins 5 and 4 of U1103B are both high. The output of U1103B then goes low to reset U1125B at pin 13. The resetting of U1125B causes pin 18 of U1100, CB1-X to make a transition from a low state to a high state. This low to high transition (an interrupt) tells the microprocessor that the user's external device has received the output data.

The peripheral registers of U1120 (PA-Y and PB-Y ports) are configured as inputs by the power-on routine. When the user's external device sets the INPUT DATA VALID (IDV) line on pin 20A of J1210 high, the data from the user's external device is transferred via the hex-Schmitt-trigger inverters U1222, U1213, and U1123 to the input storage latches U1122 and U1121 and the peripheral registers of U1120.

The low IDV signal on pin 2 of U1222 is inverted by U1220A to clock U1125A to a high state on pin 5 and to enable, via U1110C and U1110A, the input storage latches (U1122 and U1121) on pin 11. The low to high transition on pin 5 of U1125A causes an interrupt to the microprocessor via the CA1-Y line (pin 40 of U1120). An interrupt service routine in firmware reads the peripheral registers of U1120 and transfers the input data to an assigned block in the MI 5010 memory (RAM).

The high level on pin 14 of U1209F is also clocked through U1209F, E, and D at 1 μ s intervals, setting pin 10 of U1103D to a high state. After the input data has been stored in memory, the microprocessor programs the CB2-Y line of U1103D (pin 13) to go high for at least one instruction cycle and then low again. This produces a positive-going pulse on the INPUT DATA RECEIVED (IDR) line, J1210-21A, and resets pin 5 of U1125A to a low state. The low state propagates down to pin 10 of U1209D at 1 μ s intervals, disabling U1103D. This action terminates the IDR signal within 2 or 3 μ s even if the CB2-Y line remains high for longer than one instruction cycle.

Input data can also be loaded into the input storage latches (U1122 and U1121), and the peripheral registers of U1120 by the BFR TRIG signal propagating through to pin 10 of U1110C, or by a dummy write operation to hexadecimal address A000 (via U1223A, schematic 1) to pin 2 of U1110A.

At power-on the firmware initialization routine sets the second rank output storage latches, U1102 and U1101, to all zeros and then clears U1125B and U1125A via U1103A, U1211E, and U1223C (schematic 1) by performing a dummy read operation to hexadecimal address 6000.

The low level CARD SELECT input to the base of Q1100 may be of very short duration. The pulse stretching circuit consisting of U1104F (schematic 1), Q1100, Q1101, and associated components ensures that the ACTIVE indicator light (DS1201) will remain on long enough to be seen (20 ms minimum), even though the 50M30 is selected for only one instruction cycle.

MAINTENANCE

Static-Sensitive Components

CAUTION

Static discharge can damage any semiconductor component in this instrument.

This instrument contains electrical components that are susceptible to damage from static discharge. See Table 6-1 for relative susceptibility of various classes of semiconductors. Static voltages of 1 kV to 30 kV are common in unprotected environment.

Observe the following precautions to avoid damage:

1. Minimize handling of static-sensitive components.
2. Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive assembly or components.
3. Discharge the static voltage from your body by wearing a wrist strap while handling these components. Servicing static-sensitive assemblies or components should be performed only at a static-free work station by qualified service personnel.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Keep the component leads shorted together whenever possible.
6. Pick up components by the body, never by the leads.
7. Do not slide the components over any surface.
8. Avoid handling components in areas that have a floor or work surface covering capable of generating a static charge.

9. Use a soldering iron that is connected to earth ground.

10. Use only special antistatic suction type or wick type desoldering tools.

Table 6-1
RELATIVE SUSCEPTIBILITY
TO STATIC DISCHARGE DAMAGE

Semiconductor Classes	Relative Susceptibility Levels ^a
MOS or CMOS microcircuits or discretes, or linear microcircuits with MOS inputs. (Most Sensitive)	1
ECL	2
Schottky signal diodes	3
Schottky TTL	4
High-frequency bipolar transistors	5
JFETs	6
Linear microcircuits	7
Low-power Schottky TTL	8
TTL (Least Sensitive)	9

^aVoltage equivalent for levels:

1 = 100 to 500 V 4 = 500 V 7 = 400 to 1000 V(est.)
 2 = 200 to 500 V 5 = 400 to 600 V 8 = 900 V
 3 = 250 V 6 = 600 to 800 V 9 = 1200 V

(Voltage discharged from a 100 pF capacitor through a resistance of 100 Ω .)

General Maintenance

Except for the Service Display LED in the MI 5010, general maintenance procedures for the 50M30 are similar to the general maintenance procedures for the MI 5010. Refer to the MI 5010/MX 5010 Instruction manual.

Troubleshooting

Refer to the Theory of Operation section of this manual and the schematic diagrams to gain an understanding of circuit operation.

Maintenance—50M30

To help determine the cause of the difficulty, run the test programs given in the Performance Check section of this manual.

Most problems can be solved using conventional digital troubleshooting techniques. To eliminate external circuits as possible sources of trouble, disconnect the front panel circuits and, if necessary, set J1204/P1204 jumper plug combination to use the internal +5 V power supply. See Preparation for Use section of this manual.

REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

LIST OF ASSEMBLIES

A list of assemblies can be found at the beginning of the Electrical Parts List. The assemblies are listed in numerical order. When the complete component number of a part is known, this list will identify the assembly in which the part is located.

CROSS INDEX-MFR. CODE NUMBER TO MANUFACTURER

The Mfr. Code Number to Manufacturer index for the Electrical Parts List is located immediately after this page. The Cross Index provides codes, names and addresses of manufacturers of components listed in the Electrical Parts List.

ABBREVIATIONS

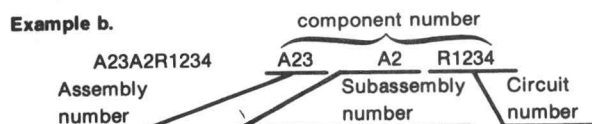
Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER (column one of the Electrical Parts List)

A numbering method has been used to identify assemblies, subassemblies and parts. Examples of this numbering method and typical expansions are illustrated by the following:



Read: Resistor 1234 of Assembly 23



Read: Resistor 1234 of Subassembly 2 of Assembly 23

Only the circuit number will appear on the diagrams and circuit board illustrations. Each diagram and circuit board illustration is clearly marked with the assembly number. Assembly numbers are also marked on the mechanical exploded views located in the Mechanical Parts List. The component number is obtained by adding the assembly number prefix to the circuit number.

The Electrical Parts List is divided and arranged by assemblies in numerical sequence (e.g., assembly A1 with its subassemblies and parts, precedes assembly A2 with its subassemblies and parts).

Chassis-mounted parts have no assembly number prefix and are located at the end of the Electrical Parts List.

TEKTRONIX PART NO. (column two of the Electrical Parts List)

Indicates part number to be used when ordering replacement part from Tektronix.

SERIAL/MODEL NO. (columns three and four of the Electrical Parts List)

Column three (3) indicates the serial number at which the part was first used. Column four (4) indicates the serial number at which the part was removed. No serial number entered indicates part is good for all serial numbers.

NAME & DESCRIPTION (column five of the Electrical Parts List)

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

MFR. CODE (column six of the Electrical Parts List)

Indicates the code number of the actual manufacturer of the part. (Code to name and address cross reference can be found immediately after this page.)

MFR. PART NUMBER (column seven of the Electrical Parts List)

Indicates actual manufacturers part number.

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
000JJ	INDUSTRIAL DEVICES	700 HUDSON AVE	EDGEWATER, NJ 07020
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
03508	GENERAL ELECTRIC COMPANY, SEMI-CONDUCTOR PRODUCTS DEPARTMENT	ELECTRONICS PARK	SYRACUSE, NY 13201
04222	AVX CERAMICS, DIVISION OF AVX CORP.	P O BOX 867, 19TH AVE. SOUTH	MYRTLE BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD, PO BOX 20923	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SEMICONDUCTOR DR.	SANTA CLARA, CA 95051
34335	ADVANCED MICRO DEVICES	901 THOMPSON PL.	SUNNYVALE, CA 94086
56289	SPRAGUE ELECTRIC CO.	87 MARSHALL ST.	NORTH ADAMS, MA 01247
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NE 68601

Component No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
A31	670-7202-00		CKT BOARD ASSY: DIGITAL I/O	80009	670-7202-00
A31C1000	290-0755-00		CAP., FXD, ELCTLT: 100UF, +50-10%, 10V	56289	502D223
A31C1001	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A31C1010	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A31C1011	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A31C1020	290-0755-00		CAP., FXD, ELCTLT: 100UF, +50-10%, 10V	56289	502D223
A31C1021	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A31C1100	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A31C1101	281-0813-00		CAP., FXD, CER DI: 0.047UF, 20%, 50V	04222	GC705-E-473M
A31C1110	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A31C1111	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A31C1112	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A31C1120	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A31C1121	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A31C1124	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A31C1200	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A31C1201	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A31C1209	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A31C1210	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A31C1220	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A31DS1201	150-1107-00		LT EMITTING DIO: RED, 650NM, 20MA	000JJ	5321A11
A31DS1202	150-1107-00		LT EMITTING DIO: RED, 650NM, 20MA	000JJ	5321A11
A31Q1100	151-0188-00		TRANSISTOR: SILICON, PNP	04713	SPS6868K
A31Q1101	151-0281-00		TRANSISTOR: SILICON, NPN	03508	X16P4039
A31R1000	315-0622-00		RES., FXD, CMPSN: 6.2K OHM, 5%, 0.25W	01121	CB6225
A31R1012	315-0202-00		RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
A31R1013	315-0202-00		RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
A31R1014	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
A31R1015	315-0202-00		RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
A31R1016	315-0202-00		RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
A31R1021	315-0202-00		RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
A31R1100	315-0332-00		RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
A31R1101	315-0270-00		RES., FXD, CMPSN: 27 OHM, 5%, 0.25W	01121	CB2705
A31R1102	315-0274-00		RES., FXD, CMPSN: 270K OHM, 5%, 0.25W	01121	CB2745
A31R1103	315-0824-00		RES., FXD, CMPSN: 820K OHM, 5%, 0.25W	01121	CB8245
A31R1104	315-0221-00		RES., FXD, CMPSN: 220 OHM, 5%, 0.25W	01121	CB2215
A31R1106	307-1096-00		RES NTWK, FXD, FI: 7, 2 OHM, 2%, 1W	91637	MSP08A01202G
A31R1107	315-0202-00		RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
A31R1108	315-0205-00		RES., FXD, CMPSN: 2M OHM, 5%, 0.25W	01121	CB2055
A31R1109	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
A31R1115	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
A31R1200	307-1096-00		RES NTWK, FXD, FI: 7, 2 OHM, 2%, 1W	91637	MSP08A01202G
A31R1202	315-0331-00		RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
A31R1210	307-1096-00		RES NTWK, FXD, FI: 7, 2 OHM, 2%, 1W	91637	MSP08A01202G
A31R1211	315-0202-00		RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
A31R1212	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
A31R1214	315-0202-00		RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
A31R1215	315-0202-00		RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
A31R1216	315-0513-00		RES., FXD, CMPSN: 51K OHM, 5%, 0.25W	01121	CB5135
A31R1217	315-0513-00		RES., FXD, CMPSN: 51K OHM, 5%, 0.25W	01121	CB5135
A31TP1020	214-0579-00		TERM, TEST POINT: BRS CD PL	80009	214-0579-00
A31U1000	156-0956-02		MICROCIRCUIT, DI: OCTAL BFR W/3STATE OUT	01295	SN74LS244NP3
A31U1001	160-1480-00		MICROCIRCUIT, DI: 2048 X 8, EPROM, PRGM	80009	160-1480-00
A31U1009	156-0956-02		MICROCIRCUIT, DI: OCTAL BFR W/3STATE OUT	01295	SN74LS244NP3
A31U1010	156-0956-02		MICROCIRCUIT, DI: OCTAL BFR W/3STATE OUT	01295	SN74LS244NP3
A31U1011	156-0469-02		MICROCIRCUIT, DI: 3/8 LINE DCDR	01295	SN74LS138NP3

Replaceable Electrical Parts—50M30

Component No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
A31U1021	156-1111-02		MICROCIRCUIT,DI:OCTAL BUS XCVR W/3 STATE	80009	156-1111-02
A31U1022	156-0384-02		MICROCIRCUIT,DI:QUAD 2-INP NAND GATE	01295	SN74LS03
A31U1100	156-1205-00		MICROCIRCUIT,DI:PERIPHERAL INTFC ADAPTER	80009	156-1205-00
A31U1101	156-1065-01		MICROCIRCUIT,DI:OCTAL D TYPE TRANS LATCHES	34335	AM74LS373
A31U1102	156-1065-01		MICROCIRCUIT,DI:OCTAL D TYPE TRANS LATCHES	34335	AM74LS373
A31U1103	156-0384-02		MICROCIRCUIT,DI:QUAD 2-INP NAND GATE	01295	SN74LS03
A31U1104	156-0058-02		MICROCIRCUIT,DI:HEX INVRTR,SCREENED	01295	SN7404
A31U1110	156-0479-02		MICROCIRCUIT,DI:QUAD 2-INP ORGATE	01295	SN74LS32NP3
A31U1120	156-1205-00		MICROCIRCUIT,DI:PERIPHERAL INTFC ADAPTER	80009	156-1205-00
A31U1121	156-1065-01		MICROCIRCUIT,DI:OCTAL D TYPE TRANS LATCHES	34335	AM74LS373
A31U1122	156-1065-01		MICROCIRCUIT,DI:OCTAL D TYPE TRANS LATCHES	34335	AM74LS373
A31U1123	156-0645-01		MICROCIRCUIT,DI:SCHMITT-TRIG,POS-NAND GATE	80009	156-0645-01
A31U1125	156-0388-03		MICROCIRCUIT,DI:DUAL D FLIP-FLOP	07263	74LS74A
A31U1200	156-0153-02		MICROCIRCUIT,DI:HEX INVERTER BUFFER	27014	DM8006
A31U1201	156-0153-02		MICROCIRCUIT,DI:HEX INVERTER BUFFER	27014	DM8006
A31U1209	156-0391-02		MICROCIRCUIT,DI:HEX LATCH W/CLEAR	01295	SN74LS174
A31U1211	156-0153-02		MICROCIRCUIT,DI:HEX INVERTER BUFFER	27014	DM8006
A31U1212	156-0153-02		MICROCIRCUIT,DI:HEX INVERTER BUFFER	27014	DM8006
A31U1213	156-0645-01		MICROCIRCUIT,DI:SCHMITT-TRIG,POS-NAND GATE	80009	156-0645-01
A31U1220	156-0645-01		MICROCIRCUIT,DI:SCHMITT-TRIG,POS-NAND GATE	80009	156-0645-01
A31U1222	156-0645-01		MICROCIRCUIT,DI:SCHMITT-TRIG,POS-NAND GATE	80009	156-0645-01
A31U1223	156-0481-02		MICROCIRCUIT,DI:TRIPLE 3 INP & GATE	27014	DM74LS11NA+

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols

Graphic symbols and class designation letters are based on ANSI Standard Y32.2-1975.

Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The overline on a signal name indicates that the signal performs its intended function when it is in the low state.

Abbreviations are based on ANSI Y1.1-1972.

Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

Y14.15, 1966 Drafting Practices.
Y14.2, 1973 Line Conventions and Lettering.
Y10.5, 1968 Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

American National Standard Institute
1430 Broadway
New York, New York 10018

Component Values

Electrical components shown on the diagrams are in the following units unless noted otherwise:

Capacitors = Values one or greater are in picofarads (pF).
Values less than one are in microfarads (μ F).

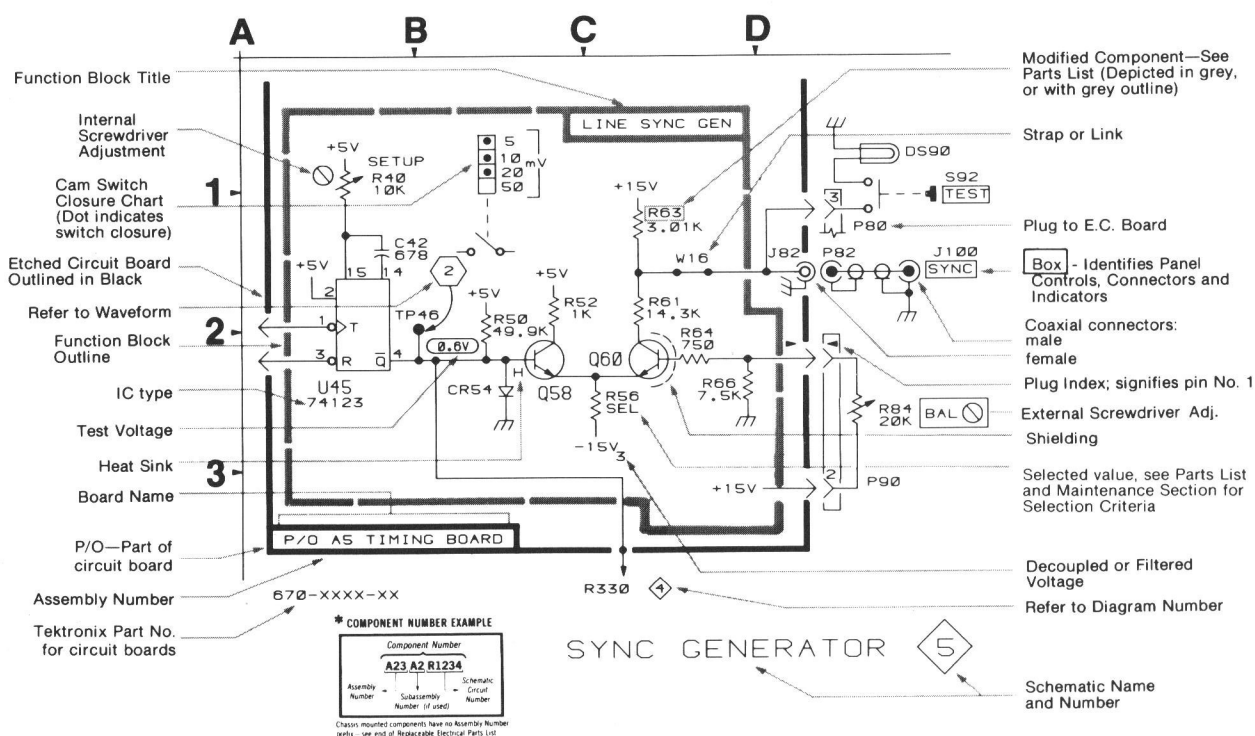
Resistors = Ohms (Ω).

The information and special symbols below may appear in this manual.

Assembly Numbers and Grid Coordinates

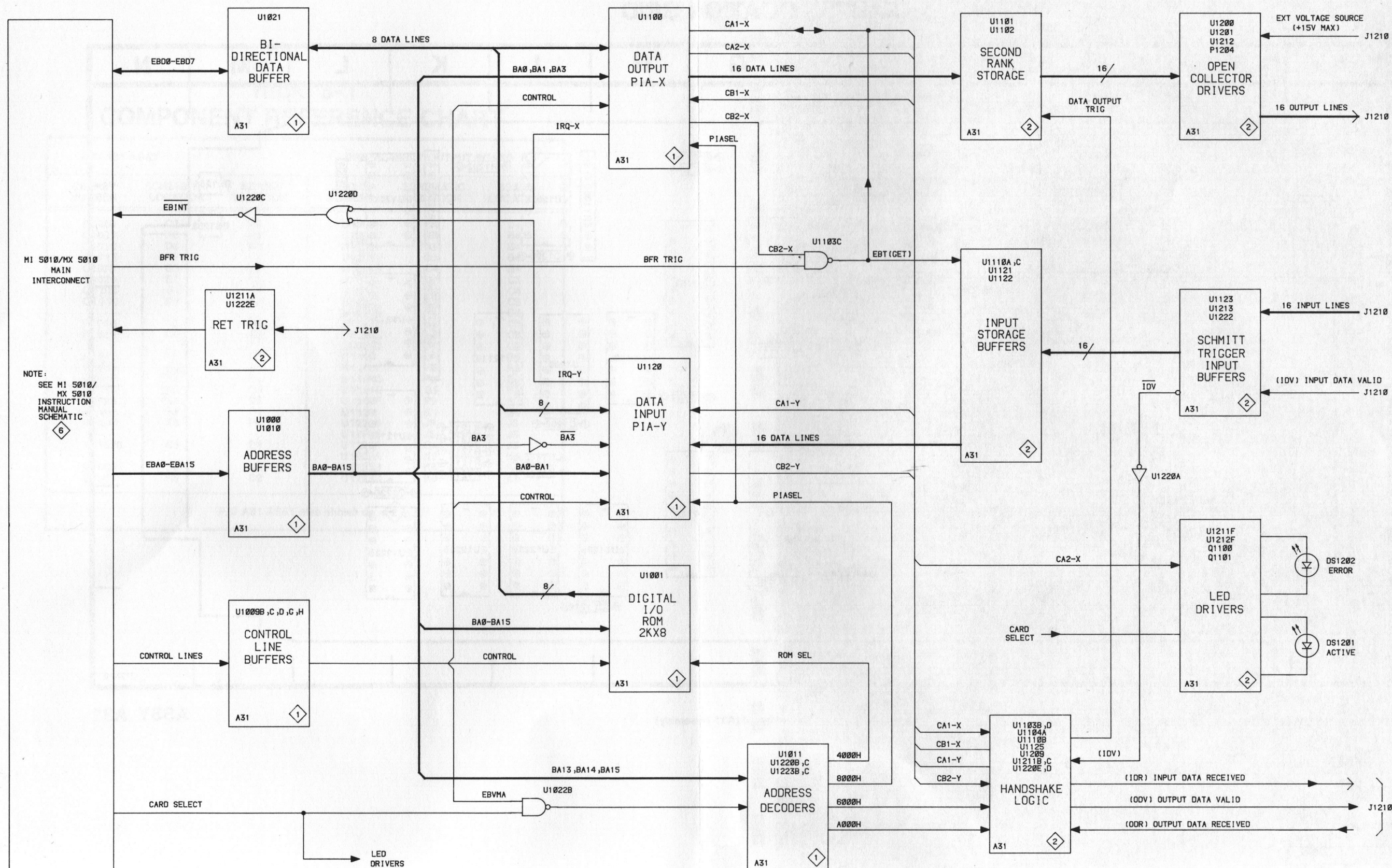
Each assembly in the instrument is assigned an assembly number (e.g., A20). The assembly number appears on the circuit board outline on the diagram, in the title for the circuit board component location illustration, and in the lookup table for the schematic diagram and corresponding component locator illustration. The Replaceable Electrical Parts list is arranged by assemblies in numerical sequence; the components are listed by component number *(see following illustration for constructing a component number).

The schematic diagram and circuit board component location illustration have grids. A lookup table with the grid coordinates is provided for ease of locating the component. Only the components illustrated on the facing diagram are listed in the lookup table. When more than one schematic diagram is used to illustrate the circuitry on a circuit board, the circuit board illustration may only appear opposite the first diagram on which it was illustrated; the lookup table will list the diagram number of other diagrams that the circuitry of the circuit board appears on.





50M30 BLOCK DIAGRAM



PARTS LOCATION GRID

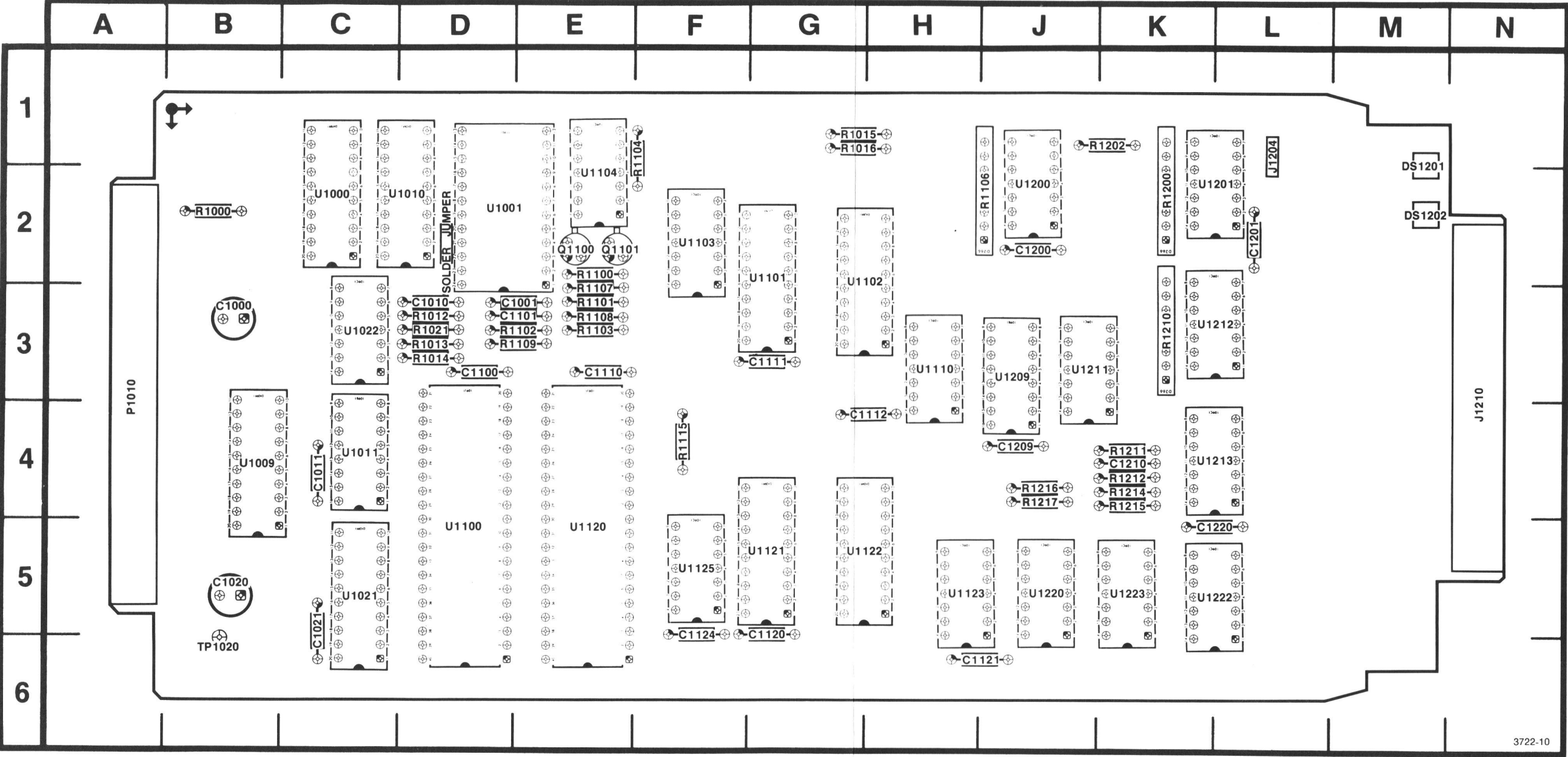
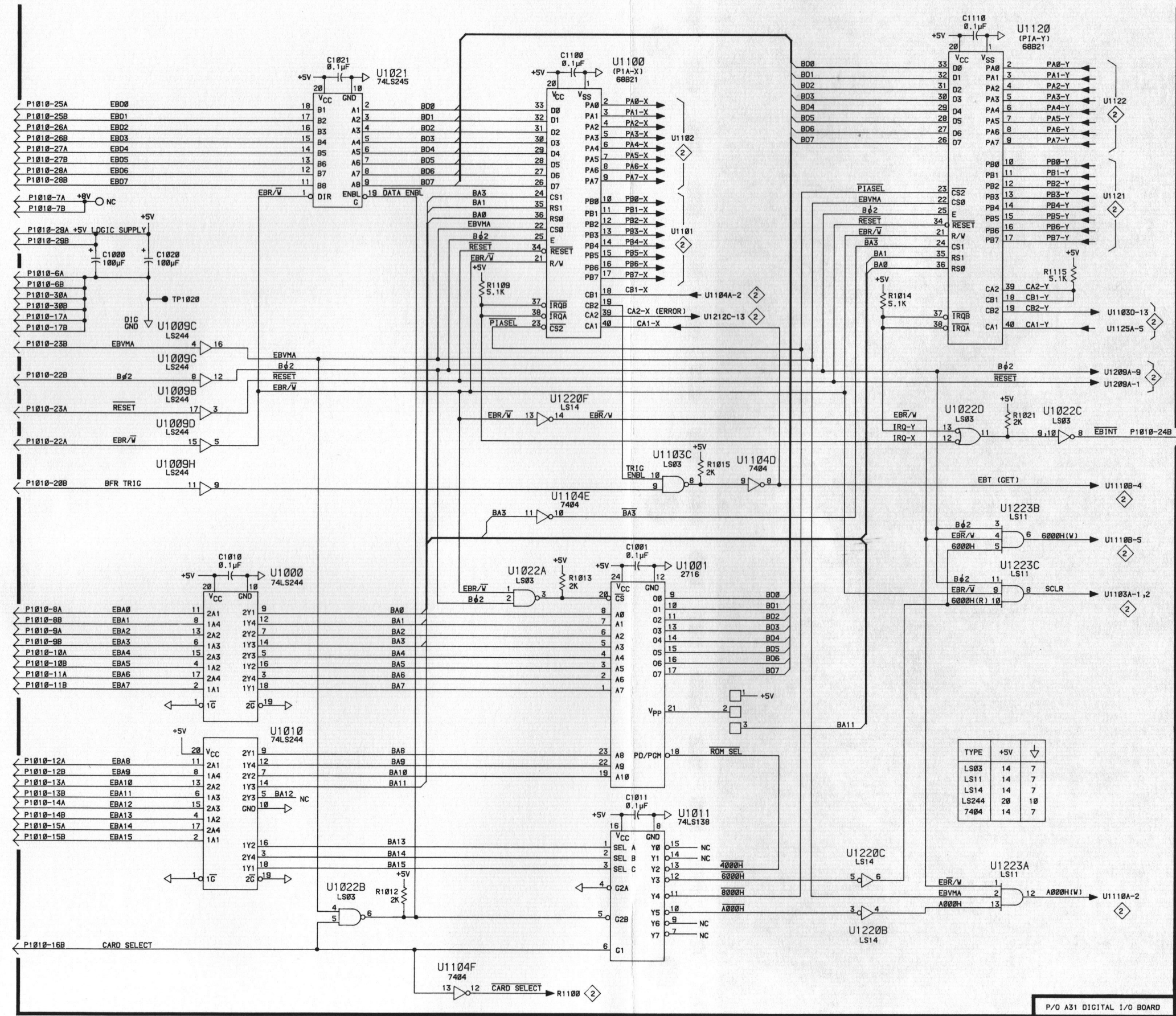


Table 8-1
COMPONENT REFERENCE CHART

P/O A31 ASSY			DIGITAL INPUT/OUTPUT BOARD ①		
CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1000	C3	B3	U1009B	C4	B4
C1001	H6	D3	U1009C	C4	B4
C1010	D6	D3	U1009D	C4	B4
C1011	H8	C4	U1009G	C4	B4
C1020	C3	B5	U1009H	C5	B4
C1021	E1	C5	U1010	D7	C2
C1100	G1	D3	U1011	H8	C4
C1110	K1	E3	U1021	E1	C5
P1010	B2	A3	U1022A	F6	C3
P1010	L5	A3	U1022B	E9	C3
			U1022C	K4	C3
			U1022D	J4	C3
R1012	E9	D3	U1100	G1	D5
R1013	G6	D3	U1103C	H5	F2
R1014	J3	D4	U1104D	H5	E2
R1015	H5	G1	U1104E	G5	E2
R1021	K4	D3	U1104F	F9	E2
R1109	F3	D3	U1120	K1	E4
R1115	K3	F4	U1220B	J9	J5
TP1020	C3	B6	U1220C	J8	J5
			U1220F	G4	J5
U1000	D6	C2	U1223A	K9	K5
U1001	H6	D2	U1223B	K5	K5
			U1223C	K6	K5
P/O A31 ASSY also shown on ②					

A B C D E F G H I J K L

1
2
3
4
5
6
7
8
9



Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

Component Number		
A23	A2	R1234
Assembly Number	Subassembly Number (if used)	Schematic Circuit Number

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

MEMORY/DECODER 1

Table 8-2
COMPONENT REFERENCE CHART
 (see Fig. 8-1)

P/O A31 ASSY			DIGITAL INPUT/OUTPUT BOARD 2		
CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1101	B9	D3	R1212	C7	K4
C1111	E3	G3	R1214	K6	K4
C1112	E1	G4	R1215	E7	K4
C1120	H10	G6	R1216	B6	J4
C1121	K9	H6	R1217	B6	J4
C1124	M9	F6			
C1200	H3	J2	U1101	F3	G3
C1201	H1	L2	U1102	F1	G2
C1209	L9	J4	U1103A	D6	F2
C1210	L10	K4	U1103B	F6	F2
C1220	D9	K4	U1103D	F6	F2
DS1201	C9	M1	U1104A	G5	E2
DS1202	D7	M2	U1110A	G8	H3
			U1110B	D5	H3
J1204	L1	L1	U1110C	F8	H3
J1210	M1	N3	U1121	I10	G5
J1210	A6	N3	U1122	H8	G5
P1010	A6	A3	U1123	E11	H5
P1010	M12	A3	U1125A	G7	F5
P1204	L1	L1	U1125B	G5	F5
Q1100	B9	E2	U1200	I3	J2
Q1101	C9	E2	U1201	I1	K2
R1000	B6	B2	U1209A	I5	J3
R1016	E6	G1	U1209B	J5	J3
R1100	B9	E2	U1209C	J5	J3
R1101	B8	E3	U1209D	J7	J3
R1102	B9	D3	U1209E	J7	J3
R1103	B9	E3	U1209F	I7	J3
R1104	C8	E1	U1211A	K12	J3
R1106	K1	H2	U1211B	L6	J3
R1107	B8	E3	U1211C	K6	J3
R1108	C9	E3	U1211D	K6	J3
R1200	J1	K2	U1211E	E7	J3
R1202	D7	J1	U1211F	K7	J3
R1210A	L6	K3	U1212A	K5	K3
R1210B	K7	K3	U1212B	I2	K3
R1210C	K5	K3	U1212C	C7	K3
R1210D	L1	K3	U1213	E9	K4
R1210F	K6	K3	U1220A	E8	J5
R1211	K12	K4	U1220D	E6	J5
			U1220E	D6	J5
			U1222A	E8	K5
			U1222E	J12	K5
P/O A31 ASSY also shown on 1					

REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number
00X Part removed after this serial number

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

1 2 3 4 5 Name & Description

Assembly and/or Component

Attaching parts for Assembly and/or Component

Detail Part of Assembly and/or Component

Attaching parts for Detail Part

Parts of Detail Part

Attaching parts for Parts of Detail Part

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol ---*--- indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

"	INCH	ELCTRN	ELECTRON	IN	INCH	SE	SINGLE END
#	NUMBER SIZE	ELEC	ELECTRICAL	INCAND	INCANDESCENT	SECT	SECTION
ACTR	ACTUATOR	ELCTLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICON	SEMICONDUCTOR
ADPTR	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
ALIGN	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED
AL	ALUMINUM	EQPT	EQUIPMENT	MACH	MACHINE	SKT	SOCKET
ASSEM	ASSEMBLED	EXT	EXTERNAL	MECH	MECHANICAL	SL	SLIDE
ASSY	ASSEMBLY	FIL	FILLISTER HEAD	MTG	MOUNTING	SLFLKG	SELF-LOCKING
ATTEN	ATTENUATOR	FLEX	FLEXIBLE	NIP	NIPPLE	SLVG	SLEEVEING
AWG	AMERICAN WIRE GAGE	FLH	FLAT HEAD	NON WIRE	NOT WIRE WOUND	SPR	SPRING
BD	BOARD	FLTR	FILTER	OBD	ORDER BY DESCRIPTION	SQ	SQUARE
BRKT	BRACKET	FR	FRAME or FRONT	OD	OUTSIDE DIAMETER	SST	STAINLESS STEEL
BRS	BRASS	FSTNR	FASTENER	OVH	OVAL HEAD	STL	STEEL
BRZ	BRONZE	FT	FOOT	PH BRZ	PHOSPHOR BRONZE	SW	SWITCH
BSHG	BUSHING	FXD	FIXED	PL	PLAIN or PLATE	T	TUBE
CAB	CABINET	GSKT	GASKET	PLSTC	PLASTIC	TERM	TERMINAL
CAP	CAPACITOR	HDL	HANDLE	PN	PART NUMBER	THD	THREAD
CER	CERAMIC	HEX	HEXAGON	PNH	PAN HEAD	THK	THICK
CHAS	CHASSIS	HEX HD	HEXAGONAL HEAD	PWR	POWER	TNSN	TENSION
CKT	CIRCUIT	HEX SOC	HEXAGONAL SOCKET	RCPT	RECEPTACLE	TPG	TAPPING
COMP	COMPOSITION	HLCPS	HELICAL COMPRESSION	RES	RESISTOR	TRH	TRUSS HEAD
CONN	CONNECTOR	HLEXT	HELICAL EXTENSION	RGD	RIGID	V	VOLTAGE
COV	COVER	HV	HIGH VOLTAGE	RLF	RELIEF	VAR	VARIABLE
CPLG	COUPLING	IC	INTEGRATED CIRCUIT	RTNR	RETAINER	W/	WITH
CRT	CATHODE RAY TUBE	ID	INSIDE DIAMETER	SCH	SOCKET HEAD	WSHR	WASHER
DEG	DEGREE	IDNT	IDENTIFICATION	SCOPE	OSCILLOSCOPE	XFMR	TRANSFORMER
DWR	DRAWER	IMPLR	IMPELLER	SCR	SCREW	XSTR	TRANSISTOR

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

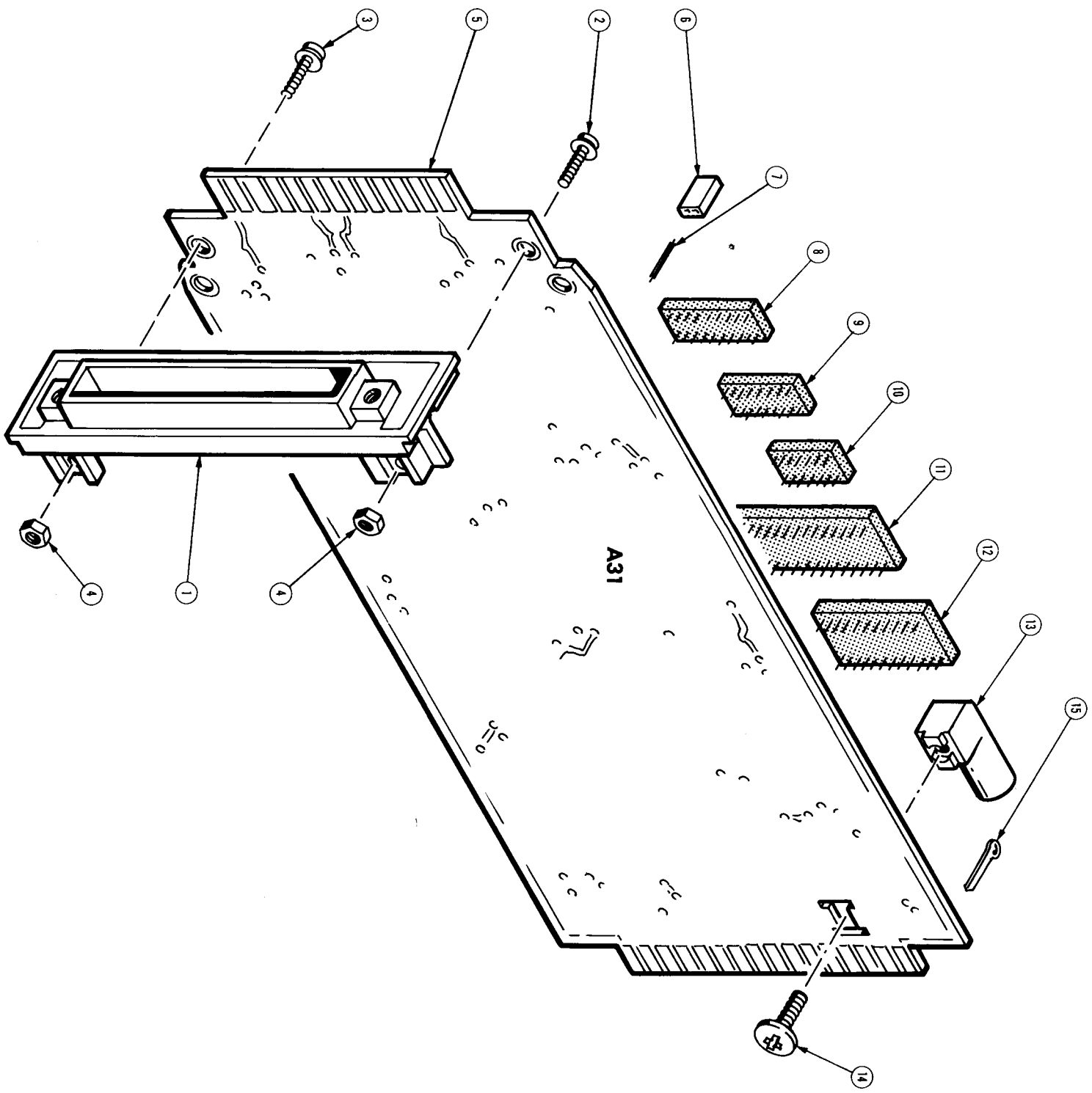
Mfr. Code	Manufacturer	Address	City, State, Zip
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
71785	TRW, CINCH CONNECTORS	1501 MORSE AVENUE	ELK GROVE VILLAGE, IL 60007
73803	TEXAS INSTRUMENTS, INC., METALLURGICAL MATERIALS DIV.	34 FOREST STREET	ATTLEBORO, MA 02703
79136	WALDES, KOHINOOR, INC.	47-16 AUSTEL PLACE	LONG ISLAND CITY, NY 11101
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153

Replaceable Mechanical Parts—50M30

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-1	333-2857-00		1						PANEL,FRONT:W/SUBPANEL (ATTACHING PARTS)	80009	333-2857-00
-2	211-0121-00		1						SCR,ASSEM WSHR:4-40 X 0.438 INCH,PNH BRS	83385	OBD
-3	211-0116-00		1						SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
-4	210-0551-00		2						NUT,PLAIN,HEX.:4-40 X 0.25 INCH,STL - - - * - - -	000BK	OBD
-5	-----		1						CKT BOARD ASSY:DIGITAL I/O(SEE A31 REPL)		
-6	131-0993-00		1						. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
-7	131-0608-00		3						. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-8	136-0634-00	B010100 B010164X	8						. SOCKET,PLUG-IN:20 LEAD DIP,CKT BD MTG	73803	CS9002-20
-9	136-0260-02	B010100 B010164X	2						. SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP,LOW CLE	71785	133-51-92-008
-10	136-0269-02	B010100 B010164	14						. SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
	136-0751-00	B010165	1						. SKT,PL-IN ELEK:MICROCKT,24 PIN	09922	DILB24P108
-11	136-0623-00	B010100 B010164	2						. SOCKET,PLUG-IN:40 DIP,LOW PROFILE	73803	CS9002-40
	136-0728-00	B010165	8						. SKT,PL-IN ELEK:MICROCKT,14 CONTACT	09922	DILB14P-108
-12	136-0578-00	B010100 B010164	1						. SKT,PL-IN ELEK:MICROCKT,24 PIN,LOW PROFILE	73803	C S9002-24
	136-0757-00	B010165	2						. MICROCIRCUIT,40 DIP	09922	DILB40P-108
-13	214-3230-00		1						. FASTENER,MDL:POLYCARBONATE (ATTACHING PARTS)	80009	214-3230-00
-14	213-0041-00		1						. SCR,TPG,THD CTG:6-32 X 0.375 INCH,TRH STL - - - * - - -	83385	OBD
-15	214-0579-00		1						. TERM,TEST POINT:BRS CD PL	80009	214-0579-00



FIG. 1 EXPLODED



@

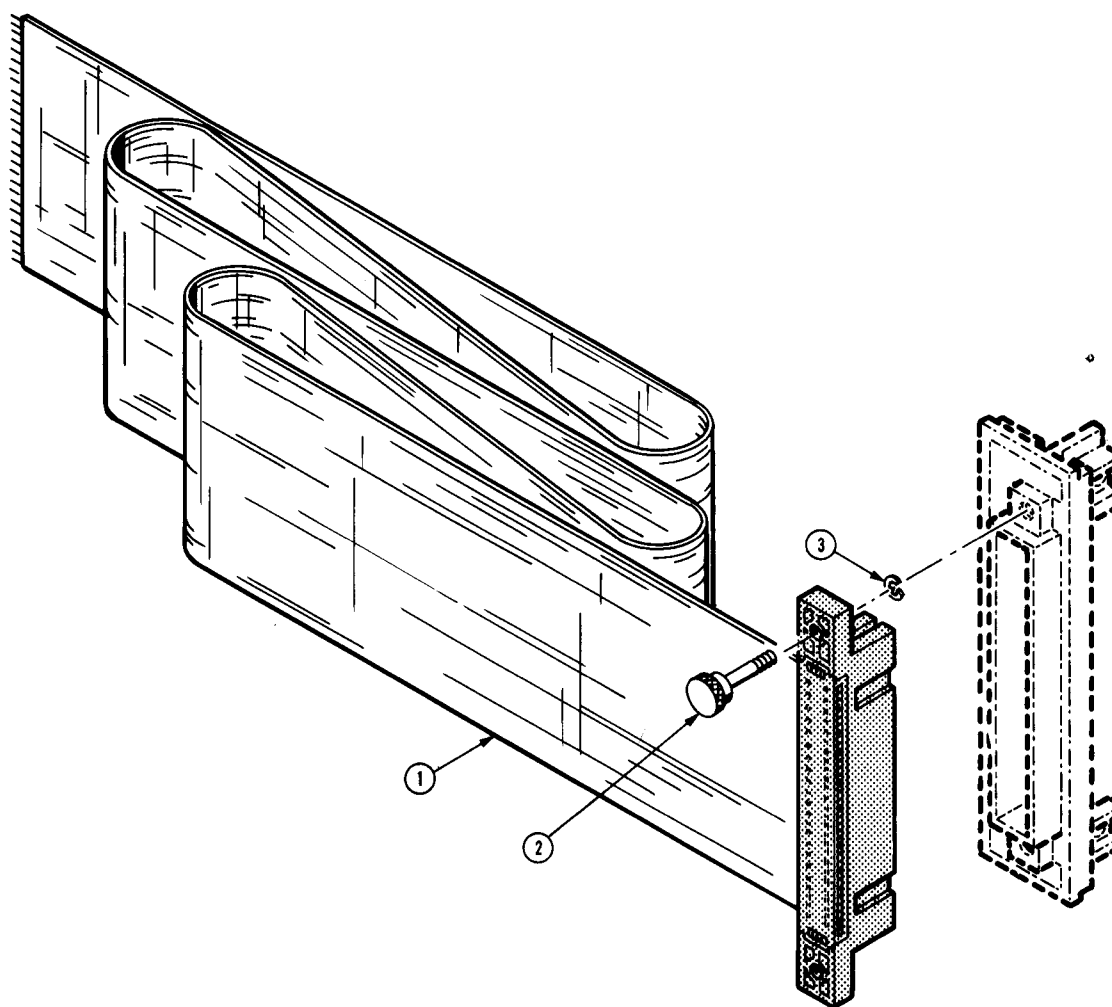


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
STANDARD ACCESSORIES											
-1	015-0430-00		1						CABLE ASSY:EXTENDER	80009	015-0430-00
-2	213-0889-00		2						. THUMBSCREW:4-40 X 0.45 L,0.25 OD,SST	80009	213-0889-00
-3	354-0350-00		2						. RING,RETAINING:0.073"FREE ID X 0.015",STL	79136	5133-9MD
	070-3722-00		1						MANUAL,TECH:INSTRUCTION	80009	070-3722-00
	070-3884-00		1						MANUAL,TECH:REFERENCE	80009	070-3884-00

DESCRIPTION**Section 3 PROGRAMMING****PROGRAMMING EXAMPLE****NOTE**

The following example was developed using a Tektronix 4050-series controller. If another controller is used, the programming example must be modified for that particular controller.

Digital-to-Analog Converter Testing

The routine in Example 1 was developed using the TEKTRONIX 50M30 and TEKTRONIX DM 5010 to test a digital-to-analog converter. The DM 5010 address was decimal 16 (line 120) and the 50M30 was selected in slot 1 (lines 150 and 180). Line 200 outputs the data to the DAC under test. Line 220 triggers the DM 5010 to read the voltage from the DAC under test. Lines 1000-1010 look for an SRQ from the MI 5010 or DM 5010.

Example 1:

```
100 REM      EXAMPLE #1
110 REM DAC TEST WITH DM5010
120 D=16
130 M=23
140 ON SRQ THEN 1000
150 C=1
160 DIM R(256)
170 PRINT @D:"INIT;DCV 20;MODE TRIG;DIGIT 3.5"
180 PRINT @M:"INIT;SEL ";C;"CHA 1"
190 FOR K=0 TO 255
200 PRINT @M:"DATA ";K;"DATA?"
210 INPUT @M:K$
220 INPUT @D:R(K+1)
230 NEXT K
240 REM DATA IN ARRAY R IS READY FOR PROCESSING
250 END
1000 POLL X,Y;D;M
1010 PRINT "STATUS BYTE IS ";Y
1020 RETURN
```

Date: 10-6-81

Change Reference: C2/1081

Product: 50M30

Manual Part No.: 070-3722-00

DESCRIPTION

TEXT CHANGES

Page 1-3, Table 1-2, Environmental Characteristics

Change under Characteristics and Description:


EMC Within limits of MIL-461A, and FCC Regulations,
Part 15, Subpart J, Class A.

To read:

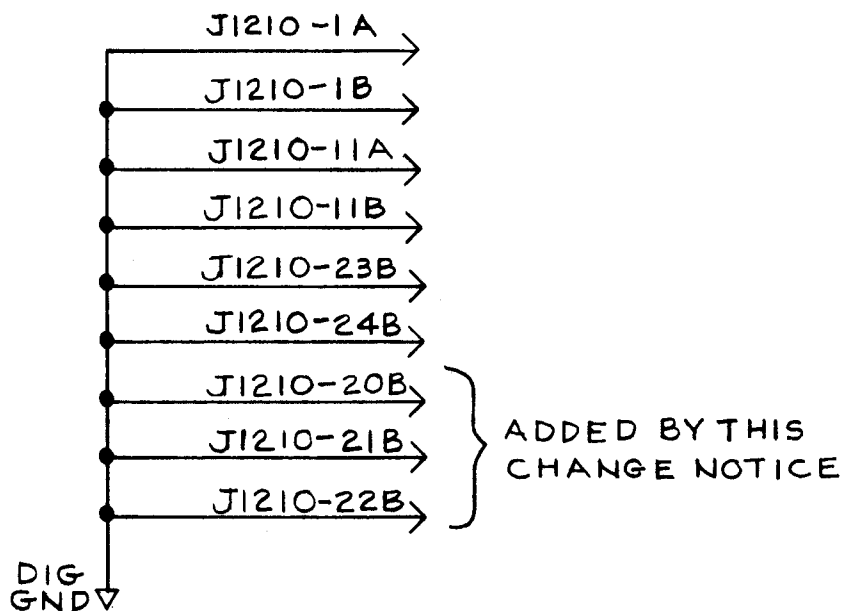
EMC^d Within limits of VDE Ø871 and MIL-461A tests REØ1,
REØ2, CEØ1, CEØ3, RSØ1, RSØ3, CSØ1, and CSØ2.

Add to bottom of Table 1-2:

^d System performance subject to exceptions of power module and other
individual plug-ins.

DESCRIPTION**SCHEMATIC CHANGES**DIAGRAM  INPUT/OUTPUT CHANNELS (FRONT PANEL INTERFACE)Changes to diagram 

1. Left center part of diagram - change J1210-22B to read: J1210-23A.
2. Lower right part of diagram - change ground connections to read as shown in the following drawing:



Date: 12-21-81Change Reference: C4/1281Product: 50M30 Programmable Digital Input/OutputManual Part No.: 070-3722-00**DESCRIPTION****TEXT CORRECTIONS**

Page 2-1, second column, under Input/Output Synchronization

Add the following sentence to the first paragraph:

Refer to the ARM command in the Detailed Command List (Programming Information section) for more information.

Page 3-3, first column, under the ARM command

Add the following NOTE at the bottom of the first column.

NOTE

The two-wire handshake convention must be followed when synchronizing data transfers. If the IDV (or ODR) line is toggled without regard to IDR (or ODV) the 50M30 will not respond properly to the ARM ON, ARM SRQ, or ARM COND commands. The IDV or ODR lines should not be used as single line interrupt inputs. If used as single line interrupts, the data query command (DAT?) can be used to clear the handshake lines.