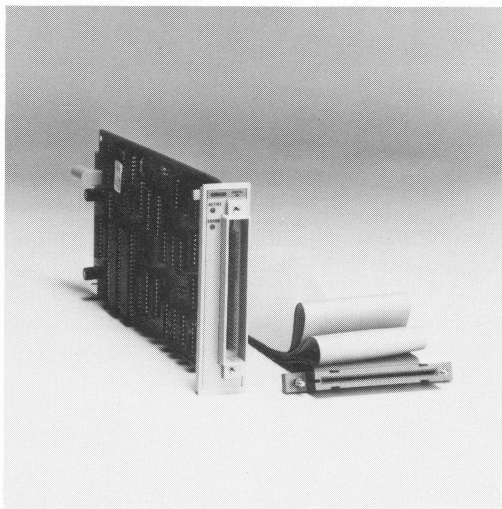# Tektronix
COMMITTED TO EXCELLENCE

50M30 PROGRAMMABLE DIGITAL INPUT/OUTPUT CARD

REFERENCE GUIDE

GENERAL INFORMATION

Instrument Description

The 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 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 internal jumpers and using power supplied by the user.

Programming of the 50M30 is via the IEEE 488 (GPIB) bus specified and described in the 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/trigger 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.

NOTE

Refer to the 50M30 Instruction manual for details related to external power sources, front panel interface cabling, and input/output data synchronization.

PROGRAMMING INFORMATION

General Information

Programming the 50M30 Programmable Digital Input/Output Card for digital data transfers requires a thorough understanding of the operation and commands listed in the MI 5010/MX 5010 Instruction manual and Reference Guide. The MI 5010/MX 5010 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, and error codes.

NOTE

This reference guide contains only those commands resident in the 50M30 firmware and other information related only to digital input/output operations.

Command Format

Each command consists of a header, usually followed by an alpha or numeric argument. Query commands do not have arguments, the header contains the question mark character (?) to identify it as a query command.

Examples:

    ARM SRQ;
    CHA 2;
    DAT?;

Send commands with a space between the header and argument. Additional formatting characters <CR>, <LF>, and <SP> may be added between the space and argument.

Argument Formats

Alpha arguments must be sent as listed in the command lists.

The 50M30 responds to the following numeric arguments <numbers>.

- Signed or unsigned integers, including zero. Unsigned integers are interpreted to be positive. Examples: $+1$, 2, 3, -1, -10.

- Signed or unsigned decimal numbers. Unsigned decimals are interpreted to be positive. Leading zeros may be deleted. Examples: -3.2, $+5.0$, 1.2, .8, 28.7.

- Numbers expressed in scientific notation. Examples: $+1.0E-2$, $-1.E+1$, $0.E+0$.

The 50M30 sends a decimal equivalent number for query argument responses. (Error messages are integers.)

Message Delimiters

The following message delimiters are used to punctuate commands:

Delimiter	Placement
<space>	After header
<semicolon>	After message unit (query or last command argument)

Examples:

ARM SRQ;
FSET?;
DAT HFFFF;

COMMANDS BY FUNCTION

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 with the proper SELECT command.

Arming Status	Channel Select
ARM ON	CHA <num>
ARM COND	CHA?
ARM SRQ	
ARM OFF	
ARM?	

Device Trigger Status	Input/Output Data Loading
DT SET	DAT<num>
DT TRIG	DAT B<num>
DT OFF	DAT H<num>
DT?	DAT?
	BDAT?
General Status	HDAT?
FSET?	FLAG?
NAM?	

PROGRAMMING NOTES

ASCII & IEEE 488 (GPIB) CODE CHART

col 0 (octal 0–)	col 20	col 40	col 60	col 100	col 120	col 140	col 160
NUL — 0 / 0 / (0)	DLE — 20 / 10 / (16)	SP — 40 / 20 / (32)	0 — 60 / 30 / (48)	@ — 100 / 40 / (64)	P — 120 / 50 / (80)	` — 140 / 60 / (96)	p — 160 / 70 / (112)
SOH (GTL) — 1 / 1 / (1)	DC1 (LLO) — 21 / 11 / (17)	! — 41 / 21 / (33)	1 — 61 / 31 / (49)	A — 101 / 41 / (65)	Q — 121 / 51 / (81)	a — 141 / 61 / (97)	q — 161 / 71 / (113)
STX — 2 / 2 / (2)	DC2 — 22 / 12 / (18)	" — 42 / 22 / (34)	2 — 62 / 32 / (50)	B — 102 / 42 / (66)	R — 122 / 52 / (82)	b — 142 / 62 / (98)	r — 162 / 72 / (114)
ETX — 3 / 3 / (3)	DC3 — 23 / 13 / (19)	# — 43 / 23 / (35)	3 — 63 / 33 / (51)	C — 103 / 43 / (67)	S — 123 / 53 / (83)	c — 143 / 63 / (99)	s — 163 / 73 / (115)
EOT (SDC) — 4 / 4 / (4)	DC4 (DCL) — 24 / 14 / (20)	$ — 44 / 24 / (36)	4 — 64 / 34 / (52)	D — 104 / 44 / (68)	T — 124 / 54 / (84)	d — 144 / 64 / (100)	t — 164 / 74 / (116)
ENQ (PPC) — 5 / 5 / (5)	NAK (PPU) — 25 / 15 / (21)	% — 45 / 25 / (37)	5 — 65 / 35 / (53)	E — 105 / 45 / (69)	U — 125 / 55 / (85)	e — 145 / 65 / (101)	u — 165 / 75 / (117)
ACK — 6 / 6 / (6)	SYN — 26 / 16 / (22)	& — 46 / 26 / (38)	6 — 66 / 36 / (54)	F — 106 / 46 / (70)	V — 126 / 56 / (86)	f — 146 / 66 / (102)	v — 166 / 76 / (118)
BEL — 7 / 7 / (7)	ETB — 27 / 17 / (23)	' — 47 / 27 / (39)	7 — 67 / 37 / (55)	G — 107 / 47 / (71)	W — 127 / 57 / (87)	g — 147 / 67 / (103)	w — 167 / 77 / (119)
BS (GET) — 10 / 8 / (8)	CAN (SPE) — 30 / 18 / (24)	(— 50 / 28 / (40)	8 — 70 / 38 / (56)	H — 110 / 48 / (72)	X — 130 / 58 / (88)	h — 150 / 68 / (104)	x — 170 / 78 / (120)
HT (TCT) — 11 / 9 / (9)	EM (SPD) — 31 / 19 / (25)	) — 51 / 29 / (41)	9 — 71 / 39 / (57)	I — 111 / 49 / (73)	Y — 131 / 59 / (89)	i — 151 / 69 / (105)	y — 171 / 79 / (121)
LF — 12 / 1A / (10)	SUB — 32 / 1A / (26)	* — 52 / 2A / (42)	: — 72 / 3A / (58)	J — 112 / 4A / (74)	Z — 132 / 5A / (90)	j — 152 / 6A / (106)	z — 172 / 7A / (122)
VT — 13 / 1B / (11)	ESC — 33 / 1B / (27)	+ — 53 / 2B / (43)	; — 73 / 3B / (59)	K — 113 / 4B / (75)	[— 133 / 5B / (91)	k — 153 / 6B / (107)	{ — 173 / 7B / (123)
FF — 14 / 1C / (12)	FS — 34 / 1C / (28)	, — 54 / 2C / (44)	< — 74 / 3C / (60)	L — 114 / 4C / (76)	\ — 134 / 5C / (92)	l — 154 / 6C / (108)	| — 174 / 7C / (124)
CR — 15 / 1D / (13)	GS — 35 / 1D / (29)	- — 55 / 2D / (45)	= — 75 / 3D / (61)	M — 115 / 4D / (77)	] — 135 / 5D / (93)	m — 155 / 6D / (109)	} — 175 / 7D / (125)
SO — 16 / 1E / (14)	RS — 36 / 1E / (30)	. — 56 / 2E / (46)	> — 76 / 3E / (62)	N — 116 / 4E / (78)	^ — 136 / 5E / (94)	n — 156 / 6E / (110)	~ — 176 / 7E / (126)
SI — 17 / 1F / (15)	US — 37 / 1F / (31)	/ — 57 / 2F / (47)	? (UNL) — 77 / 3F / (63)	O — 117 / 4F / (79)	_ (UNT) — 137 / 5F / (95)	o — 157 / 6F / (111)	RUBOUT (DEL) — 177 / 7F / (127)

ADDRESSED COMMANDS

UNIVERSAL COMMANDS

LISTEN ADDRESSES

TALK ADDRESSES

SECONDARY ADDRESSES OR COMMANDS

KEY TO CHART

octal — 25 / PPU → GPIB code
NAK → ASCII character
hex — 15 / (21) → decimal

3402-4

COMMAND DESCRIPTIONS

Header	Argument(s)	Description
ARM	**ON**	Handshake lines generate both a logical condition and SRQ when 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 the handshake lines.
ARM?		Armed status query.
CHA	<**num**>	Accesses channel defined by argument. <num> = 1 for data output channel. = 2 for data input channel.
CHA?		Accessed channel query.
DAT	<**num**> **B**<**num**> **H**<**num**>	Puts binary equivalent of <num> into Channel 1 data output register. <num> can be decimal <num>, binary B<num>, or hexadecimal H<num>.

Header	Argument(s)	Description
DAT?		Decimal data format query (Channel 1 or 2).
BDAT?		Binary data format query (Channel 1 or 2).
HDAT?		Hexadecimal data format query (Channel 1 or 2).
DT	SET	Alter settings after receipt of <GET> interface message or TRIG command.
	TRIG	Change input/output data after receipt of <GET> or TRIG command.
	OFF	<GET> or TRIG command has no effect.
DT?		Device trigger status query.
FLAG?		Flag query for ODV or IDV interrupts.
FSET?		50M30 current settings query.
NAM?		Function card name query.

POWER-UP DEFAULTS

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;

NOTE

When the INIT command is sent the 50M30 returns to its power-up default settings.

STATUS BYTES AND
ERROR CODES

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 the 50M30 is located. 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.