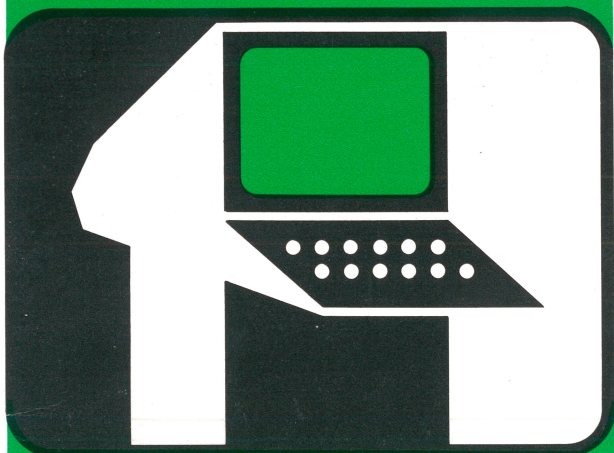# Tektronix®

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PLOT 10

TERMINAL CONTROL SYSTEM

USER'S REFERENCE GUIDE

- 4010A01 PLOT 10 Terminal Control System (TCS)
- 4010A10 PLOT 10 TCS for IBM 360 with TSO
- 4010A11 PLOT 10 TCS for CDC SCOPE/ INTERCOM, with Opt. 20 I/F
- 4010A12 PLOT 10 TCS for DEC PDP-11 with DOS
- 4662A01 PLOT 10 Utility Routines
- 4663A01 PLOT 10 Utility Routines
- 4010A05 PLOT 10 Character Generation System

4010A01 PLOT 10 TERMINAL CONTROL SYSTEM (TCS)

The TEKTRONIX Plot 10 Terminal Control System is a software interface giving easy access to the graphic capabilities of Tektronix 4010 Series of terminals. TCS may be enhanced with 4662A01/4663A01 Plot 10 Utility Routines by routing output of TCS to the 4662/4663 Interactive Digital Plotters. A * indicates a function instead of a routine.

ROUTINE DESCRIPTIONS

A1IN (NCHAR, IARRAY)

Accepts NCHAR characters from the terminal and stores them in IARRAY using A1 FORTRAN format.

A1OUT (NCHAR, IARRAY)

Outputs first NCHAR characters from IARRAY. Puts terminal in alphanumeric mode and updates graphic beam position.

AINST (NCHAR, IARRAY)

Accepts NCHAR characters from the terminal and stores them in IARRAY using Am format.

ANCHO (ICHAR)

Outputs a single non-control ADE character, ICHAR. Puts terminal in alphanumeric mode and updates graphic beam position.

ANMODE

Puts terminal in alphanumeric mode, so alphanumeric data can be output.

ANSTR (NCHAR, IARRAY)

Outputs first NCHAR non-control ADE characters from IARRAY. Puts terminal in alphanumeric mode and updates graphic beam position.

AOUTST (NCHAR, IARRAY)

Outputs first NCHAR characters from IARRAY, where the characters are stored in Am format. Puts terminal in alphanumeric mode and updates graphic beam position.

BAKSP

Moves alpha cursor left one space.

BELL

Rings the terminal's bell. No effect on terminal status.

CARTN

Generates a carriage return without a linefeed.

CHRSIZ (ICHAR)

Sets character size to ICHAR value of 1, 2, 3, or 4 (1, the largest 4014/15 Terminal character size, to 4, the smallest).

CSIZE (IHORZ, IVERT)

Returns IHORZ (horizontal), IVERT (vertical) current character size in screen units.

CZAXIS (ICODE)

Specifies 4014/15 Terminal beam brightness by ICODE (0= normal, 1= defocused, or 2= write through).

DASHA (X, Y, L)

Draws dashed line to virtual coordinates X, Y. L is dash style, represented by concatenated digits, (e.g., 23= 5 units invisible, 10 units visible).

SOFTWARE DASH LENGTH IN SCREEN UNITS

	5	10	25	50	
Visible	1	3	5	7	
Invisible	2	4	6	8	L

Single digits are also used to specify "L":

-1—move

0—draw

1—short dash

2—dash-dot

3—medium dash

4—long dash

9—alternates visible and invisible segments between data points

DASHR (X, Y, L)

Draws dashed line to a point with a displacement of X, Y in virtual space. L is the dashed line type. See table in DASHA.

DASHSA (X, Y, L)

Draws segmented line (curved for polar transformation) to virtual coordinates X, Y. L is the dashed line type. See table in DASHA.

DASHSR (X, Y, L)

Draws segmented line (curved for polar transformation) to a point with a displacement of X, Y. L is the dashed line type. See table in DASHA.

DCURSR (ICHAR, IX, IY)

Activates graphic cursor, so the cursor can be positioned. Returns ICHAR, ADE of the keyboard character pressed; also returns screen coordinates IX, IY.

DRAWA (X, Y)

Draws line to virtual coordinates X, Y.

DRAWR (X, Y)

Draws line to a point with a displacement of X, Y in virtual space.

DRAWSA (X, Y)

Draws segmented line (curved for polar transformation) to virtual coordinates X, Y.

DRAWSR (X, Y)

Draws segmented line (curved for polar transformation) to a point with a displacement of X, Y in virtual space.

DRWABS (IX, IY)

Draws line to screen coordinates IX, IY.

DRWREL (IX, IY)

Draws line to a point with a displacement of IX, IY in screen units.

DSHABS (IX, IY, L)

Draws dashed line to screen coordinates IX, IY. L is dashed line type. See table in DASHA.

DSHREL (IX, IY, L)

Draws dashed line to a point with a displacement of IX, IY in screen units. L is dashed line type. See table in DASHA.

DWINDO (XMIN, XMAX, YMIN, YMAX)

Defines portion of virtual space in which vectors will be drawn.

XMIN, YMIN—minimum virtual coordinates of respective axis

XMAX, YMAX—maximum virtual coordinates of respective axis

ERASE

Erases screen without changing mode or beam position.

FINITT (IX, IY)

Moves cursor to screen coordinates IX, IY and puts terminal in Alpha mode. Program is then terminated by executing a FORTRAN STOP statement.

HDCOPY

Generates hard copy of screen contents.

HOME

Moves alpha cursor to home position without erasing screen.

INCPLT (IONOFF, IDIR, NO)

Performs incremental plotting in screen units.

IONOFF—beam status

$0 =$ off

$1 =$ on

IDIR—direction code (0-7)

NO—number of repetitions

INITT (IBAUD)

Initializes Terminal and Terminal Status Area by:

(a) erasing screen and moving cursor to HOME position

(b) setting terminal to alphanumeric mode

(c) setting margin values to left, right extremes

(d) defining window so that virtual space portion displayed is equivalent in coordinates with the screen

Must be first call to TCS.

IBAUD—transmission rate in characters per second

4

*KCM (RC)

Converts RC centimeters to length in screen units.

*KIN (RI)

Converts RI inches to length in screen units.

*LEFTIO (IBUFF)

Returns number of characters remaining in input buffer or the amount of space (in characters) remaining in output buffer.

IBUFF—buffer to be examined.

1 = input buffer

0 = output buffer

LINEF

Moves alpha cursor down one line.

*LINHGT (NUMLIN)

Returns height in screen units of NUMLIN lines of text, based on current character size.

LINTRN

Selects transformation type linear. Default transformation type.

*LINWDT (NUMCHR)

Returns width in screen units of NUMCHR characters, based on current character size.

LOGTRN (KEY)

Selects transformation type logarithmic. Extent of log definition determined by KEY:

KEY—extent of log definition

1 = X axis log

Y axis linear

2 = X axis linear

Y axis log

3 = X, Y axes both log

MOVABS (IX, IY)

Moves the beam to screen coordinates IX, IY.

MOVEA (X, Y)

Moves the beam to virtual coordinates X, Y.

MOVER (X, Y)

Moves the beam to a point with a displacement of X, Y in virtual space.

MOVREL (IX, IY)

Moves the beam to a point with a displacement of IX, IY in screen units.

NEWLIN

Generates a carriage return and line feed.

NEWPAG

Erases screen and positions alpha cursor at the home position.

PNTABS (IX, IY)

Plots a point at screen coordinates IX, IY.

PNTREL (IX, IY)

Plots a point displaced by IX, IY in screen units.

POINTA (X, Y)

Plots a point in virtual space at coordinates X, Y.

POINTR (X, Y)

Plots a point in virtual space displaced by X, Y.

POLTRN (ANGMIN, ANGMAX, RSUPRS)

Selects transformation type polar.
ANGMIN—mimimum angle
ANGMAX—maximum angle
RSUPRS—radius suppression factor

RECOVR

Updates terminal hardware to match terminal status area variables.

RESET

Accomplishes INITT without NEWPAG.

RESTAT (RARRAY)

Restores status of terminal from 60-word real array, RARRAY.

RROTAT (DEG)

Sets rotation angle for relative virtual vectors.
DEG—angle of rotation, in degrees, relative to the original display position

RSCALE (FACTOR)
Sets scale factor for relative virtual vectors.
FACTOR—rescaling factor relative to the original
display size

RSTTAB (ITAB, ITBTBL)
Selectively removes a tab setting.
ITAB—screen coordinate to be removed from
ITBTBL (0 removes all tabs)
ITBTBL—array name of tab table

SCURSR (ICHAR, IX, IY)
Activates graphic cursor, so the cursor can be
positioned at any point. Returns ICHAR, ADE of
the keyboard character pressed; also returns
IX, IY screen coordinates.

SEEBUF (KFORM)
Returns KFORM, format of current output buffer,
after the following terminal code:
1—4010 and 4012 Terminals
2—4014 Terminals
3—all Terminals where interline characters may
be suppressed
4—like 3, except output is unbuffered (see TCS
User Manual for complete description of
output)

SEEDW (XMIN, XMAX, YMIN, YMAX)
Returns current values of virtual window limits.
XMIN,YMIN—minimum user coordinates
XMAX,YMAX—maximum user coordinates

SEELOC (IX, IY)
Returns beam location in screen coordinates
IX, IY.

SEEMOD (LINE, IZAXIS, MODE)
Returns values of modes.
LINE—hardware line type in effect
IZAXIS—hardware Z-axis mode
MODE—software mode:
0= alphanumeric
1= vector
2= point plot
3= incremental plot
4= dash

SEEMRG (ML, MR)
Returns left, ML, and right, MR, margins in screen
coordinates.

SEEREL, (RCOS, RSIN, SCALE)

Returns values used in computing rotation and scaling for relative virtual graphics.

RCOS—cosine of rotation angle

RSIN—sine of rotation angle

SCALE—multiplier used for scaling

SEETRM (ISPEED, ITERM, ISIZE, MAXSR)

Returns terminal status information.

ISPEED—baud rate in characters per second set in INITT

ITERM—terminal type set in TERM

ICSIZE—character size set in CHRSIZ

MAXSR—maximum screen address set in TERM

SEETRN (XFAC, YFAC, KEY)

Returns window and transformation factors.

XFAC—X scale factor

YFAC—Y scale factor

KEY—transformation key

1= line

2= log

3= polar

SEETW (MINX, MAXX, MINY, MAXY)

Returns screen window information.

MINX, MINY—minimum screen coordinates

MAXX, MAXY—maximum screen coordinates

SETBUF (KFORM)

Sets KFORM, the output buffer type, according to format returned by 1, 2, 3, or 4 (see SEEBUF). System dependent.

SETMRG (MLEFT, MRIGHT)

Sets left, MLEFT, and right, MRIGHT, margins to be used by CARTN, HOME, and NEWPAG.

SETTAB (ITAB, ITBTBL)

Inserts screen coordinate ITAB in array ITBTBL.

SVSTAT (RARRAY)

Saves current state of the terminal by placing it in 60-word array, RARRAY.

SWINDO (MINX, LENX, MINY, LENY)

Defines portion of the terminal screen upon which virtual window vectors will be drawn.

MINX, MINY—minimum screen coordinates of respective axis

LENX, LENY—extents of window in screen units along respective axis

TABHOR (ITBTBL)

Moves alpha cursor horizontally to next larger coordinate in table ITBTBL.

TABVER (ITBTBL)

Moves alpha cursor down to the next smaller coordinate in table ITBTBL.

TCSLEV (LEVEL)

Returns the last date of modification and the level number for TCS.

LEVEL—a three element integer array where:

Level (1)= year of modification

Level (2)= julian day (present calendar)

Level (3)= level number

TERM (ITERM, ISCAL)

Identifies terminal type and number of addressable points.

ITERM—terminal type

0= 4006-1

1= 4010, 4012, 4013

2= 4014, 4015

3= 4014 or 4015 with EGM

ISCAL—number of addressable points (1024 or 4096)

TINPUT (ICHAR)

Accepts ICHAR, a single ADE character, from terminal.

TINSTR (LEN, IARRAY)

Accepts LEN characters from terminal and stores them in IARRAY, the ADE array.

TOUTPT (ICHAR)

Outputs ICHAR, a single ADE character.

TOUTST (NCHAR, IARRAY)
> Outputs NCHAR characters from IARRAY, the ADE array.

TSEND
> Dumps output buffer.

TTBLSZ (ITBLSZ)
> Sets the size of the tab table arrays, ITBLSZ.

TWINDO (MINX, MAXX, MINY, MAXY)
> Defines portion of the terminal screen in which vectors will be drawn.
> MINX, MINY—minimum screen coordinates of respective axis
> MAXX, MAXY—maximum screen coordinates of respective axis

VCURSR (ICHAR, X, Y)
> Activates graphic cursor, so the cursor can be positioned at any point. Returns ICHAR, ADE of the keyboard character pressed; also returns IX, IY virtual coordinates.

VWINDO (XMIN, XRANGE, YMIN, YRANGE)
> Defines portion of virtual space upon which vectors will be drawn.
> XMIN, YMIN—minimum virtual coordinates of respective axis
> XRANGE, YRANGE—extents of window in virtual units along respective axis

4662A01/4663A01
PLOT 10 UTILITY ROUTINES

The TEKTRONIX 4662A01/4663A01 PLOT 10 Utility Routines add software support for the TEKTRONIX 4662/4663 Interactive Digital Plotters. All routines are useable on both plotters and terminals, except where the * indicates routines which require a 4663 with the appropriate option.

ROUTINE DESCRIPTIONS

*ADOWN (IFONT, ICHAR)
Begins alpha downloadable process to define a single character. (Option 32)
IFONT—font number (0-15)
ICHAR—ADE value of character being defined (32 to 127)

*AEND
Ends alpha down load process. (Option 32)

ANCEN (ICHAR)
Outputs ICHAR, a centered single ADE character.

ANMOV (HORZ, VERT)
Causes graphic move relative to current position. Units are multiples of the current character size.
HORZ—real number of character widths to be moved
VERT — real number of character heights to be moved

*AOVER
Specifies that the normal after-print move is to take place from the original start point of the current character. Allows over-printing of characters. (Option 32)

ARC (IRADS, START, STOP)
Draws arc in screen space centered at current pen position with a radius of IRADS (+ IRADS is counter-clockwise, − IRADS is clockwise) from START to STOP degrees. (Option 31)

ARC3PT (INX, INY, NDX, NDY)

Draws arc in screen space from current pen position through the point INX, INY to the point NDX, NDY. (Option 31)

*ASIZE (IFONT, MINX, MAXX, MINY, MAXY)

Sets the character size for the downloadable characters in the specified font. Values specified correspond to the minimum and maximum X and Y values for a nominal upper case letter (i.e., A). (Option 32)

IFONT—font number (0-15)

MINX, MINY—minimum X, Y values

MAXX, MAXY—maximum X, Y values

CIRCLE (IRADS)

Draws circle in screen space centered at current position with radius IRADS. (Option 31)

*DCHAR (IFONT, ICHAR)

Deletes the specified character definition in the specified font. (Option 32)

IFONT—font number (0-15)

ICHAR—ADE of character to be deleted (32-127)

*DFONT (IFONT)

Deletes all down loaded character definitions in the font specified. (Option 32)

IFONT—font number (0-15; <0 deletes all fonts)

*DMACRO (NUM)

Clears the specified programmable macro from 4663 plotter memory. (Option 31)

NUM—numeric label associated with this macro (0-255; <0 deletes all macros)

DMGIN (NUM, NREC, IPEN, KXRAY, KYRAY)

Allows input of up to NUM points from the Plotter, selected with the Graphic Input button or crosshair. Returns actual number of points received, NREC; integer arrays IPEN, pen up (0) or down (1); and KXRAY, KYRAY screen coordinates.

*DSHTYP (ITYPE)

Sets the dash type to be used with TCS dash commands.

ITYPE—dash-line type

0 = fixed

1 = variable

FONT (IFONT)

Selects character font.

IFONT—font number (0-6 for 4662; 0-15 for 4663)

*FORMLN (FINCH)

Sets form length in inches, FINCH, for media advance. (Option 36)

GRAIN (PGRAIN)

Sets arc smoothness granularity, PGRAIN (0.0 to 1.0).

LINROT (DEGREE)

Sets DEGREE (+ DEGREE is counter-clockwise, —DEGREE is clockwise), which is the angle of rotation for text by degrees.

*PEN (INUM)

Selects pen to be used with graphic commands.

INUM—pen desired

0 = activate crosshair

1 = pen 1

2 = pen 2

PENLOC (IPEN, IX, IY)

Returns the current pen location and pen status from an immediate GIN operation on the Plotter.

IPEN—pen status

0 = up

1 = down

IX, IY—X, Y screen coordinates of present pen location

PLCHAR (IHORSZ, IVERSZ)

Sets the character size in Plotter addressing units (0 to 4095).

IHORSZ—width

IVERSZ—height

PLCOPY (KCOPY)

Defines the position of the 4662 plotting area selection switch.
KCOPY—standard(0) or copy(1)

PLINIT (KDEVIC)

Initializes software for Plotter with address KDEVIC. (<0 is preview mode; 1-4 correspond to A-D on the 4662; and 11-18 correspond to A-H on the 4663).

PLOFF

Turns the Plotter logically off; directs output to the terminal.

PLON

Turns the Plotter logically on.

PSPEED (KCPS)

Sets block mode (KCPS= 0) or continuous mode (KCPS$>$ 0) input/output. (KCPS$>$ 0 is the speed of transmission in characters per second.) Continuous mode supported in 4662 mode only.

SETSIG (KSIG)

Defines a signature character to precede transmissions from the Plotter.
KSIG—ADE character (1-126, excluding 22).

SLCHAR (DEGREE)

Sets DEGREE (+ DEGREE is clockwise, —DEGREE is counter-clockwise), the angle of slant for characters by degrees.

*SMACRO (NUM)

Initiates a programmable macro definition. (Option 31)
NUM—numeric label associated with this macro (0-255).

SWCHAR (INABLE)

Enables/disables software characters.
INABLE—disable (0) or enable (1)

*TMACRO

Terminates the programmable macro currently being defined. (Option 31)

VARC (RADS, START, STOP)

Draws arc in virtual space centered at current pen position with a radius of RADS (+ RADS is counter-clockwise, —RADS is clockwise) from START to STOP degrees. (Option 31)

VARC3P (XINT, YINT, XEND, YEND)

Draws arc in virtual space from current pen position through the point XINT, YINT to the point XEND, YEND. (Option 31)

VCIRCL (RADS)

Draws circle in virtual space centered at current position with radius RADS. (Option 31)

VMGIN (NUM, NREC, IPEN, XRAY, YRAY)

Inputs NUM points from the Plotter, entered with the Graphic Input button. Returns actual number of points received, NREC; integer arrays IPEN for pen up (0) or pen down (1); and KXRAY, KYRAY virtual coordinates.

*XMACRO (NUM)

Expands the specified programmable macro. (Option 31)
NUM—numeric label associated with this macro (0-255)

*XTENT (LEFT, IRIGHT)

Specifies the control values for constant end-to-start spacing. The left (LEFT) and right (IRIGHT) values define a constant character width to be used as the spacing character. (Option 32)

4010A05 PLOT 10 CHARACTER GENERATION SYSTEM

The 4010A05 PLOT 10 Character Generation System provides special character generation through TCS relative graphics.

CHARACTER CONSTRUCTOR MAINLINE

New characters are interactively defined and associated with three-digit integer character codes. A subroutine is created with a (user specified) five-character name, and argument IC for the character codes. It is written to a file. Interactive control commands are:

A—redefine start point
E—normal end
F—abnormal end
X—cancel and restart

Cursor commands are:

D—exact visible
I—integral invisible
M—exact invisible
V—integral visible

Answers to questions are: YES—NO; or integers (preceding zeroes are necessary).

LCHAR (IC)

Draws a well-formed "long" character associated with ADE code, IC.

SCHAR (IC)

Draws an efficient "short" character associated with ADE code, IC.

SLETS (LENGTH, IARRAY, CHARS, XSIZE, YSIZE, ISLANT)

ADE character array, IARRAY, having LENGTH characters is output with other than default scaling and slant. XSIZE and YSIZE are multiplicative scale factors. ISLANT is slant from 1 (45°) to 22 (about vertical); positive is to the right. CHARS is the name of the subroutine (SCHARS or LCHARS) to be used to draw the characters.

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ASCII CODE CHART

B7 B6 B5 →	Ø Ø Ø	Ø Ø 1	Ø 1 Ø	Ø 1 1	1 Ø Ø	1 Ø 1	1 1 Ø	1 1 1
BITS — B4 B3 B2 B1	CONTROL		HIGH X & Y GRAPHIC INPUT		LOW X		LOW Y	
Ø Ø Ø Ø	NUL 0	DLE 16	SP 32	0 48	@ 64	P 80	\ 96	p 112
Ø Ø Ø 1	SOH 1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113
Ø Ø 1 Ø	STX 2	DC2 18	" 34	2 50	B 66	R 82	b 98	r 114
Ø Ø 1 1	ETX 3	DC3 19	# 35	3 51	C 67	S 83	c 99	s 115
Ø 1 Ø Ø	EOT 4	DC4 20	$ 36	4 52	D 68	T 84	d 100	t 116
Ø 1 Ø 1	ENQ 5	NAK 21	% 37	5 53	E 69	U 85	e 101	u 117
Ø 1 1 Ø	ACK 6	SYN 22	& 38	6 54	F 70	V 86	f 102	v 118
Ø 1 1 1	BEL 7	ETB 23	' 39	7 55	G 71	W 87	g 103	w 119
1 Ø Ø Ø	BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120
1 Ø Ø 1	HT 9	EM 25	) 41	9 57	I 73	Y 89	i 105	y 121
1 Ø 1 Ø	LF 10	SUB 26	* 42	: 58	J 74	Z 90	j 106	z 122
1 Ø 1 1	VT 11	ESC 27	+ 43	; 59	K 75	[91	k 107	{ 123
1 1 Ø Ø	FF 12	FS 28	, 44	< 60	L 76	\ 92	l 108	| 124
1 1 Ø 1	CR 13	GS 29	– 45	= 61	M 77	] 93	m 109	} 125
1 1 1 Ø	SO 14	RS 30	. 46	> 62	N 78	∧ 94	n 110	~ 126
1 1 1 1	SI 15	US 31	/ 47	? 63	O 79	_ 95	o 111	RUBOUT (DEL) 127

Copies of this card can be obtained from your
TEKTRONIX Application Engineer.