

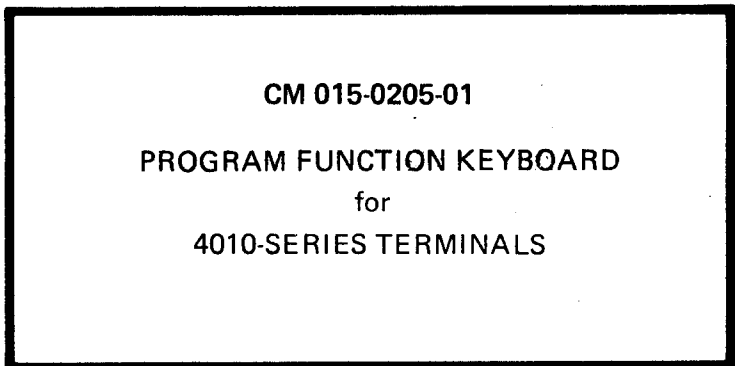
INSTRUCTION MANUAL

Serial Number _____

Copyright © 1976 by Tektronix, Inc., Beaverton, Oregon.
Printed in the United States of America. All rights reserved.
Contents of this publication may not be reproduced in any form without permission of Tektronix, Inc.

U.S.A. and foreign TEKTRONIX products covered by U.S. and foreign patents and/or patents pending.

TEKTRONIX is a registered trademark of Tektronix, Inc.



PROGRAM FUNCTION KEYBOARD FOR 4010 SERIES TERMINALS

PROGRAMMING

The PFK has 32 lighted keys which are numbered from 0 to 31 with 0 in the upper left corner of the keyboard. Pressing a key will generate a character or characters which go to the terminal and through the terminal to the computer interface. The possible characters generated with each keystroke are:

- (1) Unique header character
- (2) Overlay character
- (3) PFK character

The first two characters may be chosen or omitted by strap option in the keyboard while the PFK character is always generated.

The unique header character always comes first, if chosen, and can be strapped to any ASCII character which can be used to identify PFK inputs.

The overlay character delineates which of eight possible overlays are on the front of the PFK. Bit 7 is always a logical one and Bit 6 is a logical zero. This character has the binary number of the overlay in its three least significant bits. It always precedes the PFK character when chosen.

The PFK character uses the five least significant bits to designate the button pushed in binary. Bit 6 is logical one and Bit 7 is logical zero.

Programming the lights is accomplished by sending an ESC 5 sequence to the terminal. All characters received after that will not print on the terminal screen but will either light or extinguish a keyboard key. All characters with Bit 6 = 1 and Bit 7 = 0 will light the keyboard light designated by the binary number in Bits 1 through 5. All other characters except control characters will extinguish the light which is addressed by the least significant bits. While in this mode, the CAN control character will turn

PFK FOR 4010 SERIES TERMINALS

off all the lights. A received CR will exit this mode and return the terminal to normal mode. The ESC 5 sequence also locks both keyboards as described below.

The keyboard interface card also has logic on it and strap options for locking the keyboard of the terminal. When a CR is transmitted to the computer (on line only) on the terminal's bus or if an ESC 5 sequence is received, the keyboard lock circuit will energize and will lock both keyboards if the strap option is chosen. The keyboard can be unlocked by sending the terminal an ESC 6 sequence from the computer (on-line) or the keyboard (off-line). When the terminal is off-line this circuit will not lock the keyboard. Pushing the reset key will unlock the keyboards. The terminal will normally power-up with the keyboards unlocked.

The PFK can be used to enter crosshair cursor coordinates. The PFK cannot be used to enter graphic information from the graphic tablet. PFK entries can be interspersed in a string of points entering the computer only if the operator stops entering points momentarily while he presses the Function Key of interest.

STRAP OPTIONS

Fig. 1 shows strap options on the PFK circuit board. The 4010-4002A patch must be in the 4010 position.

The unique header character may be strapped to any ASCII character.

The position of straps G and F don't matter, but G must have a strap in place. Strap B should be on as shown all the time. Straps A and C must be in the OFF position. The other straps choose the following:

- D - Chooses unique header character
- E - Chooses overlay character

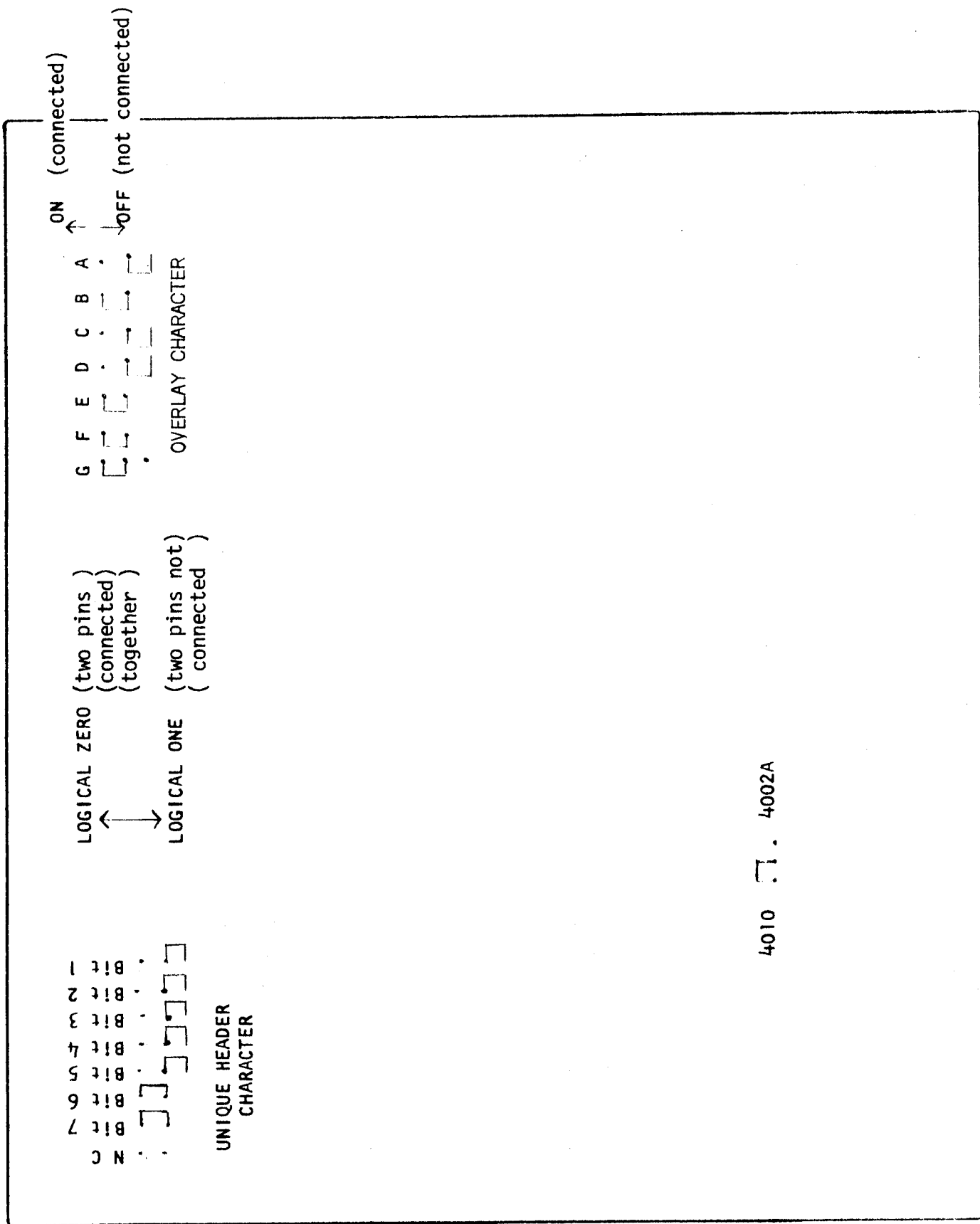


Figure 1. Program Function Keyboard Circuit Board.

PFK FOR 4010 SERIES TERMINALS

NOTE 1 - Terminal modification for use with PFK interface (4010,4012,4013):

TC-2 - Disconnect U23 Pin 2 from VCC.

Connect U23 Pin 2 to card edge Pin Y (Klock).

This modification is already included on TC-2 etched circuit cards with number 670-1729-05 and higher. Some cards with 670-1729-04 have the modification as part of an "anti-burn" modification.

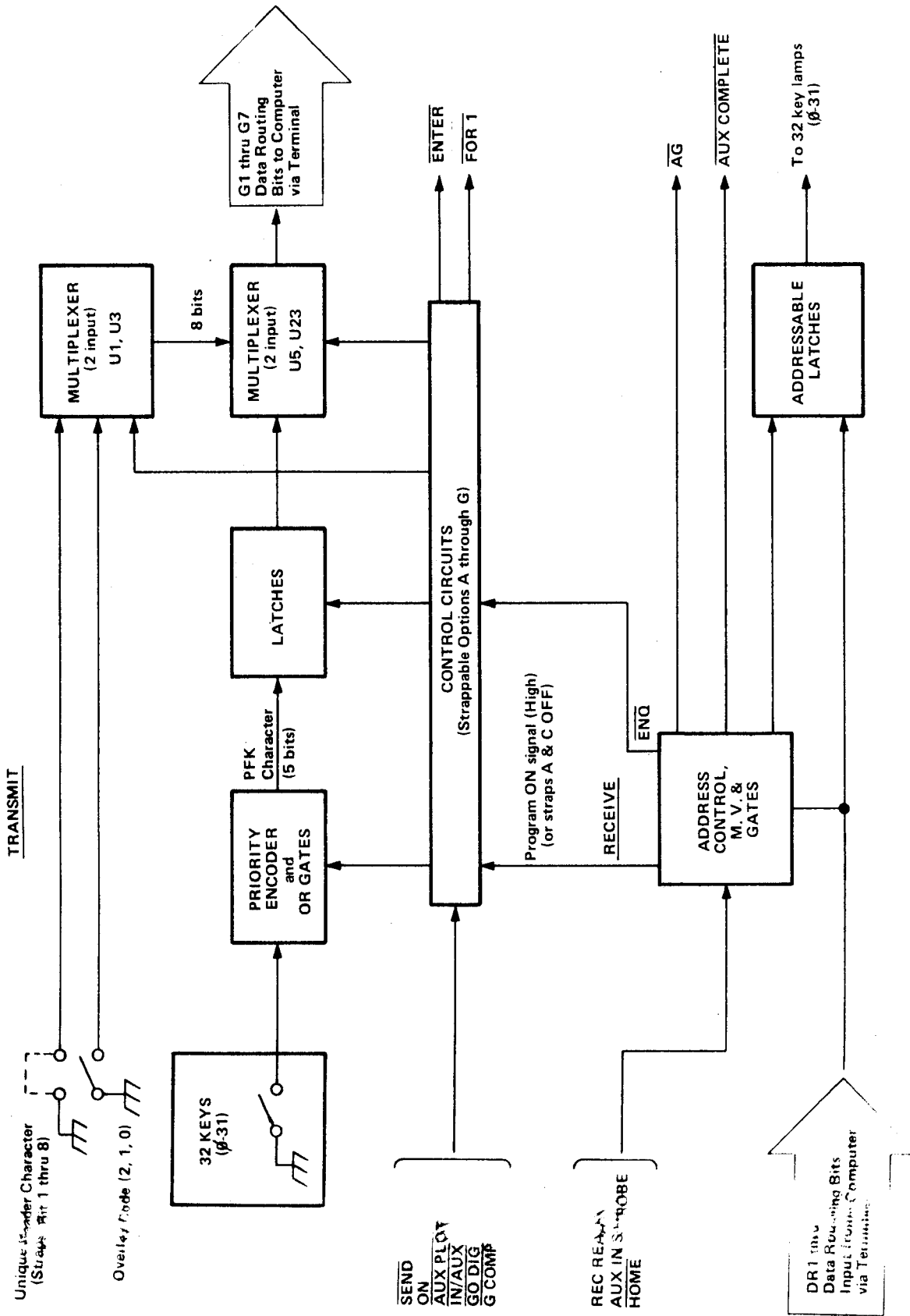
NOTE 2 - Do not send the terminal an ESC-ENQ sequence when the keyboard is locked.

NOTE 3 - When the PFK is used to enter graphic cursor coordinates, the PFK does not append any carriage return or EOR character to the message regardless of the position of the CR and EOR straps. Instead, the terminal card TC-2 strap option determines what characters the terminal will append to the graphic input character string. See the terminal manual for details.

PROGRAMMING EXAMPLES:

The following character string will turn out all lights. Light Keyboard lights \emptyset and 31 and unlock the keyboards for entry:

```
ESC
  5 ← Keyboards lock if not already locked (if strap is on)
CAN ← Turn out all lights
Space ← Turn on  $\emptyset$ 
  ? ← Turn on 31
CR ← Exit mode
ESC
  6 ← Unlock Keyboards
```



PROGRAM FUNCTION KEYBOARD



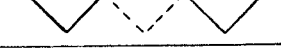
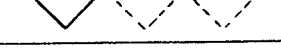
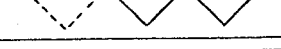

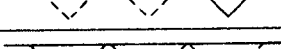
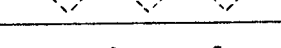
BLOCK DIAGRAM

015-0205-00

Figure 2. Block Diagram.

TABLE 1

Overlay Code Designations

Overlay Number	Notch-out Code			Lamp Code			Overlay Code Character
	(2)	(1)	(0)	(2)	(1)	(0)	
0				0	0	0	@
1				0	0	1	A
2				0	1	0	B
3				0	1	1	C
4				1	0	0	D
5				1	0	1	E
6				1	1	0	F
7				1	1	1	G

Notch out for
0 (lamp off).

Lamp on with
1 code.

TABLE 2

Key Transmit Code
(G1 through G7 output lines)

Key	Binary*	Decimal	Octal	Hexadecimal
0	0 100 000	32	40	20
1	0 100 001	33	41	21
2	0 100 010	34	42	22
3	0 100 011	35	43	23
4	0 100 100	36	44	24
5	0 100 101	37	45	25
6	0 100 110	38	46	26
7	0 100 111	39	47	27
8	0 101 000	40	50	28
9	0 101 001	41	51	29
10	0 101 010	42	52	2A
11	0 101 011	43	53	2B
12	0 101 100	44	54	2C
13	0 101 101	45	55	2D
14	0 101 110	46	56	2E
15	0 101 111	47	57	2F
16	0 110 000	48	60	30
17	0 110 001	49	61	31
18	0 110 010	50	62	32
19	0 110 011	51	63	33
20	0 110 100	52	64	34
21	0 110 101	53	65	35
22	0 110 110	54	66	36
23	0 110 111	55	67	37
24	0 111 000	56	70	38
25	0 111 001	57	71	39
26	0 111 010	58	72	3A
27	0 111 011	59	73	3B
28	0 111 100	60	74	3C
29	0 111 101	61	75	3D
30	0 111 110	62	76	3E
31	0 111 111	63	77	3F

* Assume bit 8 = 0

TABLE 3

Key Lamp Code
(DR1 through DR7 input lines)

Key Lamp	On				Off			
	Binary*	Decimal	Octal	Hexadecimal	Binary*	Decimal	Octal	Hexadecimal
0	0 100 000	32	40	20	1 000 000	64	100	40
1	0 100 001	33	41	21	1 000 001	65	101	41
2	0 100 010	34	42	22	1 000 010	66	102	42
3	0 100 011	35	43	23	1 000 011	67	103	43
4	0 100 100	36	44	24	1 000 100	68	104	44
5	0 100 101	37	45	25	1 000 101	69	105	45
6	0 100 110	38	46	26	1 000 110	70	106	46
7	0 100 111	39	47	27	1 000 111	71	107	47
8	0 101 000	40	50	28	1 001 000	72	110	48
9	0 101 001	41	51	29	1 001 001	73	111	49
10	0 101 010	42	52	2A	1 001 010	74	112	4A
11	0 101 011	43	53	2B	1 001 011	75	113	4B
12	0 101 100	44	54	2C	1 001 100	76	114	4C
13	0 101 101	45	55	2D	1 001 101	77	115	4D
14	0 101 110	46	56	2E	1 001 110	78	116	4E
15	0 101 111	47	57	2F	1 001 111	79	117	4F
16	0 110 000	48	60	30	1 010 000	80	120	50
17	0 110 001	49	61	31	1 010 001	81	121	51
18	0 110 010	50	62	32	1 010 010	82	122	52
19	0 110 011	51	63	33	1 010 011	83	123	53
20	0 110 100	52	64	34	1 010 100	84	124	54
21	0 110 101	53	65	35	1 010 101	85	125	55
22	0 110 110	54	66	36	1 010 110	86	126	56
23	0 110 111	55	67	37	1 010 111	87	127	57
24	0 111 000	56	70	38	1 011 000	88	130	58
25	0 111 001	57	71	39	1 011 001	89	131	59
26	0 111 010	58	72	3A	1 011 010	90	132	5A
27	0 111 011	59	73	3B	1 011 011	91	133	5B
28	0 111 100	60	74	3C	1 011 100	92	134	5C
29	0 111 101	61	75	3D	1 011 101	93	135	5D
30	0 111 110	62	76	3E	1 011 110	94	136	5E
31	0 111 111	63	77	3F	1 011 111	95	137	5F

* Assume bit 8 = 0

TABLE 4

Overlay Transmit Code
(G1 through G7 output lines)

Overlay Number	Binary*	Decimal	Octal	Hexadecimal
0	1 000 000	64	100	40
1	1 000 001	65	101	41
2	1 000 010	66	102	42
3	1 000 011	67	103	43
4	1 000 100	68	104	44
5	1 000 101	69	105	45
6	1 000 110	70	106	46
7	1 000 111	71	107	47

* Assume bit 8 = 0

Characteristics

The following table lists the Electrical Characteristics (including the line voltage requirements and the input and output signal line information), the Environmental characteristics, and the Physical characteristics of the PFK.

TABLE 5
Characteristics

Electrical			
Power Source			
Line Voltage (RMS)	95 V to 132 V		
Line Frequency	60 Hz		
Power	30 watts maximum		
Output Signals	The pin locations for the output and the input lines are shown for J2010 on the Program Function Diagram. Signals are TTL or open collector compatible as given.		
	TTL Loads	Output	Pull-up Resistor to +5 V
G1 through G7	5	TTL	
<u>ENTER</u>	30	OC	4.7 kΩ
<u>FOR 1</u>	30	OC	4.7 kΩ
<u>AG</u>	30	OC	4.7 kΩ
<u>AUX COMPLETE</u>	30	OC	1 kΩ
Input Signals (Lines)			
<u>SEND</u>	1	TTL	
<u>ON</u>	1	TTL	
<u>AUX PLOT</u>	1	TTL	
<u>GODIG</u>	2	TTL	
<u>G COMP</u>	3	TTL	
<u>REC READY</u>	1	TTL	
<u>AUX IN STROBE</u>	2	TTL	
<u>HOME</u>	3	OC	
<u>DR1 through DR7</u>	1 ea.	TTL	
Environmental			
Temperature			
Storage	-40° C to +65° C		
Operating	0° C to +40° C		
Altitude			
Storage	to 50,000 feet		
Operating	to 15,000 feet		

TABLE 5 (cont)

Characteristics

Physical	
Height	approximately 4 inches
Width	approximately 10 1/2 inches
Length	approximately 12 inches
Weight	approximately 6 3/4 pounds

Accessories

Standard accessories supplied and optional accessories for the PFK are listed in the Mechanical Parts List.

PARTS LIST

The following is a list of parts included in the Program Function Keyboard for 4010-Series Terminals. These items may be ordered from Tektronix, Inc.

Quantity or Circ. No.	Description	Part Number
1	Keyboard Logic Circuit Board	CM 670-1924-00
C9, C69	Capacitor, .001 μ f, 100V	283-0065-00
C1 thru C32 and C430 thru C437	Capacitor, 1 μ f, 25V	283-0177-00
C54	" 33 μ f, Elect., 10V, 20%	290-0535-00
C56	" 0.47 μ f, Cer, 50V, 20%	283-0203-00
C65, C82	" 470pf, Cer, 500V, 10%	281-0580-00
C67	" 0.0022 μ f, Cer, 50V 20%	283-0119-00
Q19, Q32 thru Q39, Q52 thru Q59, Q72 thru Q79, Q92 thru Q99	Transistor, Silicon, NPN, 2N5308	151-0254-00
Q82	" Silicon, NPN, 2N3904 or TE3904	151-0190-00
R1 thru R43, R52, R58, R62, R64, R65, R69, R71, R72, R73, R75, R77, R80, R86	Resistor, 4.7k Ω , $\frac{1}{2}$ W, 5%	315-0472-00
R51	" 10k Ω , $\frac{1}{2}$ W, 5%	315-0103-00
R54, R56, R59	" 15k Ω , $\frac{1}{2}$ W, 5%	315-0153-00
R67	" 100 Ω , 1/8W, 1%	321-0097-00
R84	" 1k Ω , $\frac{1}{2}$ W, 5%	315-0102-00
R88, R89, R103, R104, R123, R124, R133, R134, R143, R144, R153, R154, R163, R164, R173, R174, R183, R184, R193, R194, R203, R204, R213, R214, R223, R224, R233, R234, R243, R244, R253, R254, R263, R264, R273, R274, R283, R284, R293, R294, R303, R304, R313, R314,		

(continued, next page)

PARTS LIST (cont.)

Quantity or Circ. No.	Description	Part Number
R323, R324, R333, R334, R343, R344, R353, R354, R363, R364, R373, R374, R383, R384, R393, R394, R403, R404, R413, R414, R423, R424	Resistor, 20k Ω , $\frac{1}{4}$ W, 5%	315-0203-00
U1, U3, U5, U23	Integrated Circuit, U7B9322 Quad 2-input Multiplexer	156-0125-00
U7, U9, U11, U19	Hex. Inverter, SN7404N	156-0058-00
U13	Quad 2-input positive nand buffer, SN7438N	156-0145-00
U17, U83, U85	Single monostable multivibrator- one shot, SN74121N	156-0072-00
U21, U41, U61, U81	Dual 8-bit input priority, U7B931859X	156-0219-00
U25	Dual 2-bit bistable latch, SN7475N	156-0040-00
U27, U65	Dual 15 MHz d-type pos. -edge -trig. flip-flop, SN7474N	156-0041-00
U29, U49	Quad 2-input pos. and gate SN7408N	156-0129-00
U31, U51	Triple 3-input pos. nand gate SN7410N	156-0047-00
U33, U53, U73, U93	Dual 8-bit addressable latch, U7B9334S9X	156-0218-00
U43, U63	Dual 4-input pos. Nand gate SN7420N	156-0034-00
U45, U67	Quad 2-input pos. Nand gate SN7400N	156-0030-00
U47	Quad 2-input pos. nor gate, SN7402N	156-0043-00
U69, U71, U89, U91	Single 8-input pos. nand gate, SN7430N	156-0035-00
U87	Dual 15MHz j-k master-slave flip-flop, SN7473N	156-0039-00

PARTS LIST (cont.)

Quantity or Circ. No.	Description	Part Number
7	Terminal, pin 0.46" long	131-0589-00
130	Terminal, pin 0.365" long	131-0608-00
15	Link, terminal connecting	131-0993-00

PARTS LIST (cont.)

Quantity or Circ. No.	Description	Part Number
C440	Capacitor, 6,000µf, Elect., 15V, +100% -0%	290-0510-00
C445	Capacitor, 100µf, EMT, 6V	290-0105-00
R47, R48, R49	Resistor, 100Ω, ¼W, 5%	315-0101-00
U440	I.C. 5V regulator, LM309K	156-0176-00
CR47, CR48, CR49	Diode, light emitting, 2V, 70mA	150-1001-00
CR440, CR445	Diode, Silicon, W601	152-0406-00
DS1 thru DS32	Bulb, incandescent, 10V, .04A: Serial No.'s equal to or greater than B02131 - Serial No.'s equal to or less than B01130 -	150-0108-00 150-0125-00
F1	Fuse, 5A, 3AG, slo-blo	159-0032-00
S1 thru S32	Switch, push	CS 260-1451-00
S47, S48, S49	Switch, push 2-1-0	CM 260-0516-02
S440	Switch, Rocker, OFF ON	260-1334-00
T440	Transformer: Serial No.'s equal to or greater than B02131 - Serial No.'s equal to or less than B01130 -	120-1007-00 120-1005-00
1	Panel, rear	CM 386-2161-00
1	Cover, keyboard	CM 200-1337-01
1	Plate, switch mounting	CM 386-2160-00
1	Plate, mounting	CM 386-2159-00
1	Block, switch mounting	CM 391-0096-00
4	Foot, Rubber	348-0013-00
8	Plate, Identification	CM 334-1977-00
1	Cabinet, wraparound, with brackets	CM 390-0252-01
1	Cover, insulating	200-0692-00
1	Plate, insulator, mica	386-0978-00

PARTS LIST (cont.)

Quantity or Circ. No.	Description	Part Number
1	Socket, transistor	136-0280-00
1	Connector, 37 pin, female	131-0408-00
1	Connector, sliding lock post (pair)	131-0976-00
2	Spacer, .125 lgth.	166-0024-00
1	Cover, Fuse	200-0237-01
1	Retainer, capacitor	386-0254-00
1	Base, capacitor mounting	432-0048-00
2	Post, metallic, 1.75" long	129-0137-00
3	Post, connecting, insulated	129-0006-00
1	Cord, power	161-0049-00
1	Busing, strain relief	358-0161-00
1	Holder, fuse	352-0362-00
1	Kit of ribbon cables and power supply wires	CM 644-0058-01
1	Wiring Harness, main	CM 179-2049-00
95	Connector, terminal	131-0707-00
6	Connector, terminal	131-0621-00
1	Holder, term. conn., 3 wire	352-0161-00
7	Holder, term. conn., 8 wire (black)	352-0166-00
1	Holder, term. conn., 8 wire (orange)	352-0166-03
1	Holder, term. conn., 9 wire	352-0167-00
1	Holder, term. conn., 10 wire (brown)	352-0168-01
1	Holder, term. conn., 10 wire (red)	352-0168-02
1	Holder, term. conn., 7 wire	352-0203-00
1	Wiring Harness, Power: Serial No.'s equal to or greater than B02131 -	CM 179-2050-01
	Serial No.'s equal to or less than B01130 -	CM 179-2050-00
1	PFK Interface Circuit Board and Cable -or-	CM 018-0090-00
1	PFK Interf. Circ. Bd. & Cable for RE4012	CM 018-0090-01

NOTE: ALL PULL-UP RESISTORS ON INPUT LINES TO 9318'S ARE BYPASSED BY A 1µF CAP. (C1 THRU C32)

