GENERAL DESCRIPTION

The Digital Pathways Timing Control Unit (TCU-150) is a self supporting time keeper designed to operate in a small peripheral slot of the PDP-11.

● The Timing Control Unit is fully operational when it arrives at your premises and can be interrogated by the computer to give you the:

a) year, month and day

b) hour and minute

c) second

● The TCU continues to operate on its own rechargeable battery power, with the computer off, for a period of up to three months.

● The TCU is initialized by simple commands from the computer.

● TCU addresses are determined by jumpers.

		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
76XXX0	READ YR/MO/DAY	YEAR							MONTH			DAY					
	SET YR/MO/DAY	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
76XXX2	READ HR/MINS	X	X	X	HOUR					X	X	MINUTE					
	SET HR/MINS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
76XXX4	READ SECONDS	X	X	X	X	X	X	X	X	X	X	SECOND					
	RESET FAST CLOCK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
76XXX6	READ STATUS						REFER TO FIGURE 2										

Figure 1. Word Format

INTERROGATING THE TCU

The date and time are available to the user by simply
addressing the TCU with 76XXX0 for Year/Month/Day, 76XXX2
for Hour/Minutes and 76XXX4 for Seconds. Figure 1 illustr-
ates the address field used by the timer. No sequence of
operations is required: any one of the three addresses will
present the user with the date/time as a binary number.

You may want to interrogate the "ready bit (7)" of the
status register (address 76XXX6) before reading the timer.
The ready bit is in the $\emptyset$ state only during the "set date,
time" operation and is 1 at all other times.

INITIALIZING THE TCU

Initialization of the TCU-150 to the correct date and time
is accomplished by means of the three "commands" SET YEAR/
MONTH/DAY, SET HOUR/MINUTE and RESET FAST CLOCK, and a very
simple software routine. Each of these commands is issued
to the TCU-150 by writing any word into the appropriate
address as listed in Figure 1.

The effect of the SET YEAR/MONTH/DAY command is to make the
YEAR/MONTH/DAY counters cycle rapidly through all possible
days, months and years in sequence.

The effect of the SET HOUR/MINUTE command is to make the
HOUR/MINUTE counters cycle rapidly through all possible min-
utes and hours, in sequence. The SECOND counter is reset

during this operation.

The effect of the RESET FAST CLOCK command is to turn off the rapid cycling of either the YEAR/MONTH/DAY counters or the HOUR/MINUTE counter.

The procedure then for initializing either the YEAR/MONTH/ DAY or HOUR/MINUTE counter is as follows:

1. Write the value desired in the correct format into some storage register in the PDP-11.

2. Issue either the SET YEAR/MONTH/DAY or SET HOUR/ MINUTE command as appropriate.

3. Enter a software loop in which you compare the contents of your storage register with the YEAR/MONTH/ DAY or HOUR/MINUTE values as read from either Address 76XXX0 or 76XXX2, respectively.

4. When the comparison is true, issue the RESET FAST CLOCK command.

As long as your software loop takes less than 30 microseconds for execution, the value set in the TCU-150 will now equal the desired value.

A sample software routine is given below.

SAMPLE PROGRAM

Set the TCU to August 26, 1978

```
START:   MOV   #116432,RO        August 26, 1978
         MOV   #76XXX0,R1        Device Address
         MOV   RO,(R1)           Starts fast clock


AGIN:    CMP   (R1),RO
         BNE   AGIN
         MOV   RO,@#76XXX4       Resets fast clock
         CMP   (R1),RO           Is the correct date set?
         BNE   START             Try again
         HLT                     Date correct
```

```
                              15      0  1  0

                              14      1  0  0

                               7      0  0  1


HOUR/MINUTE BEING SET -
   FAST CLOCK ON

YEAR/MONTH/DAY BEING SET -
   FAST CLOCK ON

TCU READY
```

Figure 2. Status Word -
(76XXX6) Read Only

TCU-150 JUMPERS

```
┌─────────────────────────────────────────────────────────────────────┐
│                                                                       │
│  ┌──────────┐                                    ┌──────────────┐     │
│  │  FRONT   │                                    │ 3 BATTERIES  │     │
│  └──────────┘                                    └──────────────┘     │
│                                                                       │
│              DEVICE ADDRESS  (76077X)                                 │
│                                                                       │
│         A16                    A14                   A12              │
│                                                                       │
│        1     16               1    14               1    14           │
│   (1)  ●─────●┐AO6           ●     ●                ●     ●           │
│   (0)  ●     ●┘        (1)    ●     ●┐A12       AO7 ┌●     ●  (0)      │
│   (1)  ●─────●┐AO3     (0)    ●─────●┘              └●─────●  (1)      │
│   (0)  ●     ●┘        (1)    ●     ●┐A11       AO8 ┌●     ●  (0)      │
│   (1)  ●─────●┐AO5     (0)    ●─────●┘              └●─────●  (1)      │
│   (0)  ●     ●┘        (1)    ●     ●┐A10       AO9 ┌●─────●  (0)      │
│   (1)  ●─────●┐AO4     (0)    ●─────●┘              └●     ●  (1)      │
│   (0)  ●     ●┘               7     8               7    8            │
│        8     9                                                        │
│                                                                       │
└──┐  ┌──────┐  ┌──────────┐  ┌──────────┐  ┌────────────────────────┐─┘
```
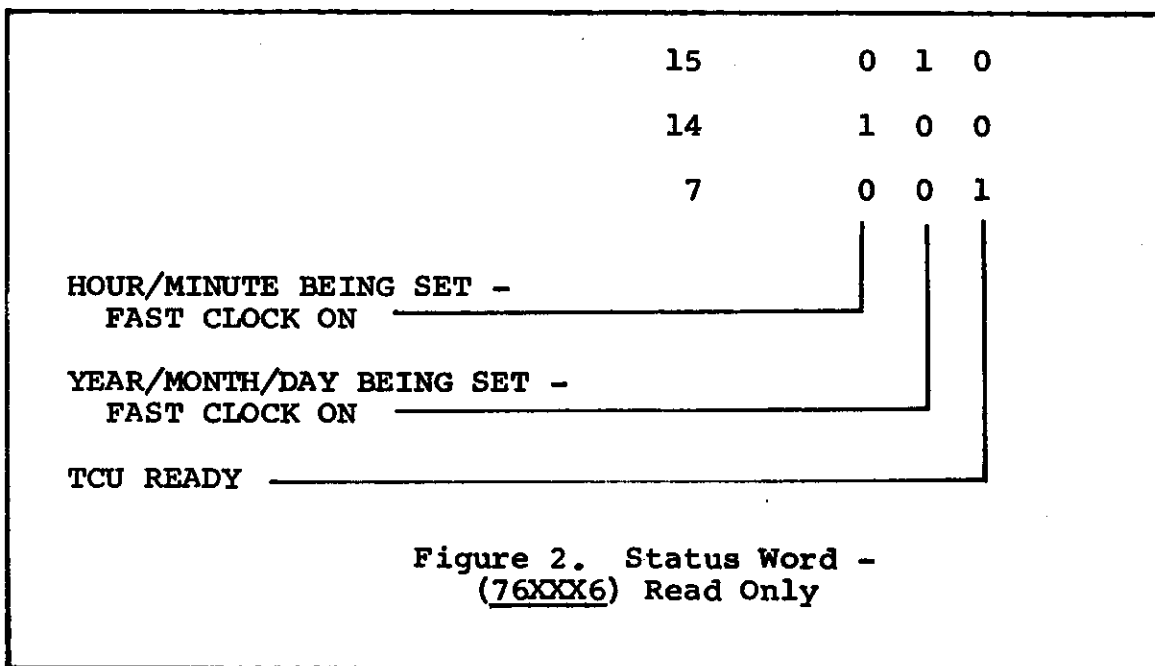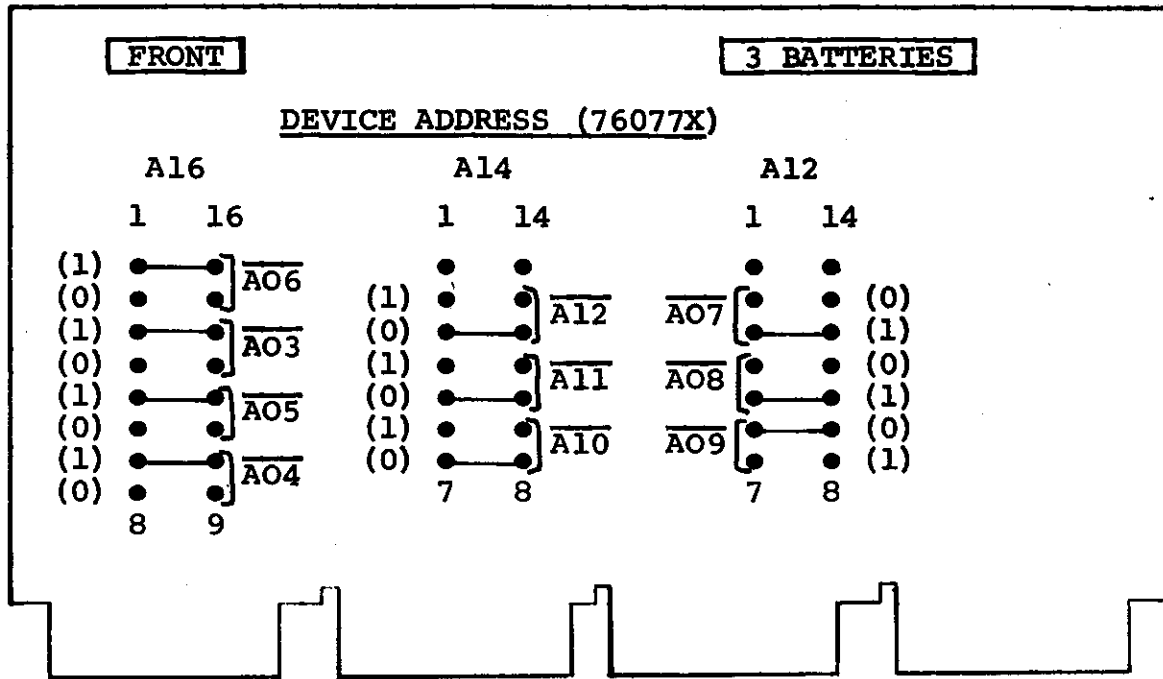
Note: Examples shown in paren.

SPECIFICATIONS

Battery power - three 150mAH Nickel Cadium
Operating life, without computer power - three months*
Accuracy - ± 5 seconds per month*
Current PDP-11 on - 400mA @ +5 volts*
Current PDP-11 off - 20uA @ +3.5 volts*
TCU requires four addresses
Operating temperature - 0-50°C
TCU address selected via jumpers

*at 40°C

WARRANTY

DIGITAL PATHWAYS, INC. hereby warrants each of its products to be free from defects in materials and/or workmanship for a period of 90 days from date of purchase. In the event of the occurrence of malfunction, or other indication of failure attributable directly to faulty workmanship and/or material, then upon return of the product to Digital Pathways, Inc. at 4151 Middlefield Road, Palo Alto, CA 94306 (postage prepaid), DPI will, at its option, repair or replace said products or components to whatever extent DPI shall deem necessary, to restore said product to proper operating condition. All such repairs or replacements shall be made by DPI, without charge to the customer.

This warranty contains the limits of responsibility of DPI, with regard to its products, and no other liability is expressed, implied, or should be assumed by the purchaser.

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