



DIGITAL PATHWAYS INC.

Dear Digital Pathways' Customer:

Enclosed you will find the unit you have ordered. We are sure you will find it more than satisfactory, but if any problems should arise, please be sure to call us for assistance.

We would like to ask a favor of you which can be of real benefit to both of us. Basically, we need to ask you for about five minutes of your time to answer the enclosed questionnaire. Your answers will help us serve you better and will ensure that you are kept current on any and all product developments, both in hardware and software.

In order to compensate you for your trouble, we would like to offer you the following. Upon receipt of a completed questionnaire, within two months of time of shipment, we will extend your warranty period for an additional nine months beyond the expiration of our normal three month warranty. This of course, entitles you to nine extra months of free service, should you require it.

Once again, thank you for your order and for your time.

Sincerely,

Digital Pathways

Timing Control Unit

TCU-150

INTERROGATING THE TCU

The date and time are available to the user by simply addressing the TCU with 76XXXX0 for Year/Month/Day, 76XXXX2 for Hour/Minutes and 76XXXX4 for Seconds. Figure 1 illustrates 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 76XXXX6) before reading the timer. The ready bit is in the 0 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 minutes 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 76XXXX0 or 76XXXX2, 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        Resets fast clock
        BNE AGIN
        MOV RO,@#76XXX4     Is the correct date set?
        CMP (R1),RO        Try again
        BNE START
        HLT                 Date correct
```

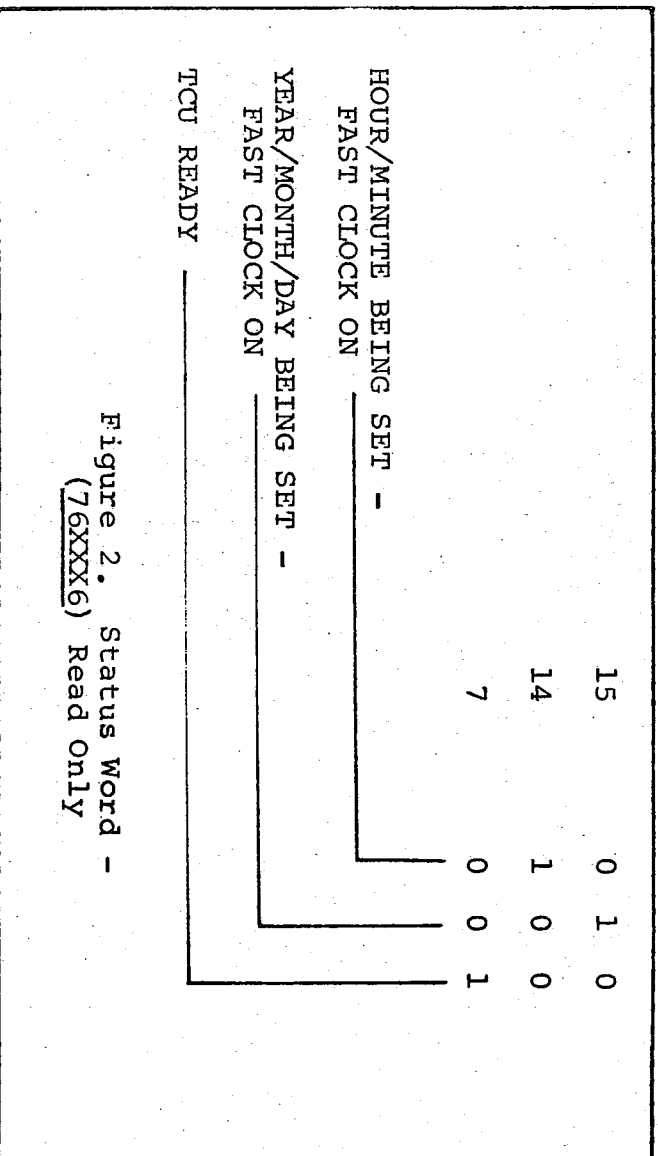
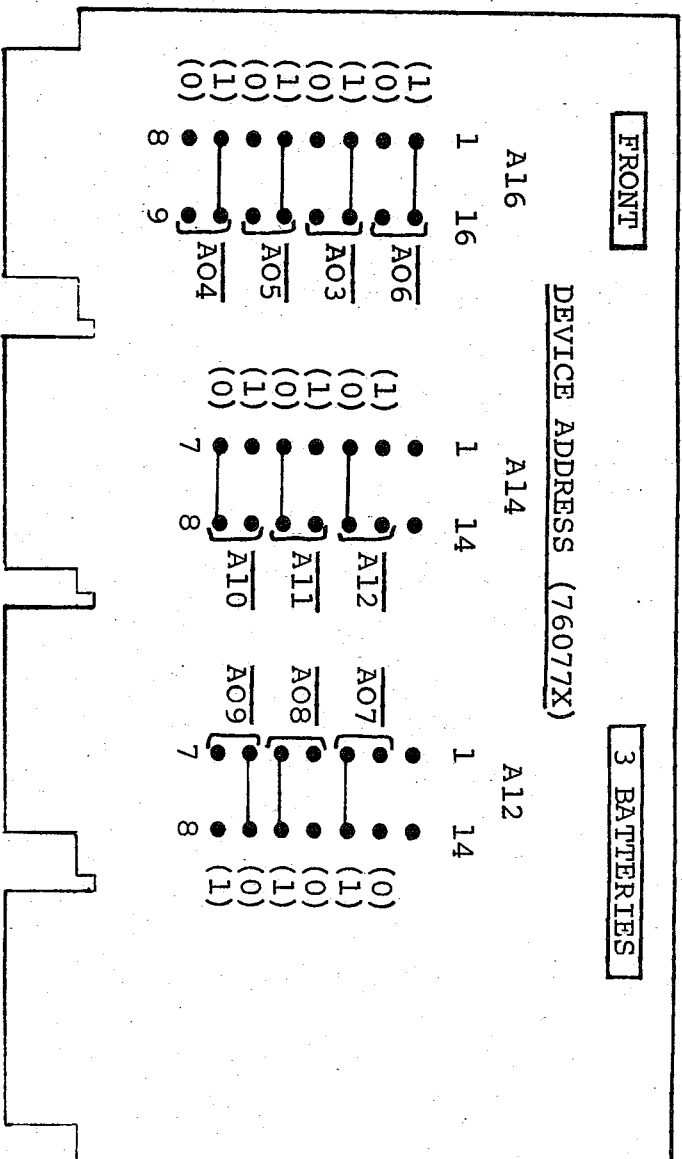


Figure 2. Status Word -
(76XXX6) Read Only

TCU-150 JUMPERS



Note: Examples shown in paren.

SPECIFICATIONS

Battery power - three 150MAH Nickel Cadmium
 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), DPL will, at its option, repair or replace said products or components to whatever

extent DPL shall deem necessary, to restore said product to proper operating condition. All such repairs or replacements shall be made by DPL, without charge to the customer.

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



DIGITAL PATHWAYS INC.

1060 EAST MEADOW CIRCLE • PALO ALTO CALIFORNIA 94303
(415) 493-5544

TCU-150

SUPPORT SOFTWARE FOR TCU-100

Date: 16-Jan-79

This software is supplied as a courtesy to our customer and is not warranted by CAPTRONIX. It is however believed to be reliable. Source on papertape or RK05 disk-cartridge are available for SFr. 150.- handling charges per operating system version. Customer should supply us RK05 cartridge. Allows 2-3 weeks for delivery.

These programs have been written by B. Mueller and H. Demieville from CIBA-GEIGY Basel.

RSX-11M SYSTEM I Version 3.1

-TCU-100 Installation Guide

=====

Date: 30-Jan-79 CAPTRONIX SA

The following steps must be performed with a privileged terminal and system UIC.

1. >INS \$FLX
>FLX
FLX>DEV:=PR:TIMBLD.COM/DO
FLX>DEV:=PR:TIMSET.MAC/DO
FLX>DEV:=PR:TCUBLD.COM/DO
FLX>DEV:=PR:TCUTSK.COM/DO
FLX>DEV:=PR:SETTC1.MAC/DO
2. Edit the file TIMSET.MAC so to include the RSX-11M system drive and the correct year.
3. >ASN DK?:=TD0: ;where DK? is the above RSX drive
4. >@TIMBLD
5. >@TCUBLD

THIS COPY HAS BEEN ADAPTED TO CONNECT THE TCU-150 TO THE RSX-11M OPERATING SYSTEM.

CL\$ YMD

CL\$ YR

CL\$ MD

CL\$ DY

CL\$ HRM

CL\$ HR

CL\$ Sec

CL\$ SC

CL\$ SIS

CS\$ HAS = 10 K

CS\$ YDS = 100 K

CS\$ RDP = 1

HR bin Set

TIMBLD.COMD

Date : 30-Jan-79

CAPTRONIX SA

PIP TIMSET.MAC/PU
MAC TIMSET,TIMSET=TIMSET
PIP TIMSET.LST;*/DE
TKB TD0:[1,54]TIMSET/PR=TIMSET
PIP TIMSET.OBJ;*/DE
PIP TD0:[1,54]TIMSET.TSK/PU

INSERT THE FOLLOWING LINES IN THE STARTUP-FILE

INS TIMSET
RUN TIMSET
JOB [1,54]SETTIM
PREM TIMSET
PIP [1,54]SETTIM.COMD;*/DE

TITLE
TIMSE
Dat

```

LIST TTM,SEX
TITLE TIMSET
*****

```

TIMSET.MAC

Date: 30-Jan-79 CAPTRONIX SA

```

.MCALL FRSZS,FDBDFS,FDATSA,FDRCSA,FDOPSA,FINITS
.MCALL OPENS,PUTS,CLOSES,EXITSS

```

```

TOPADS: OUTLUN=4
        FRSZS 1
FDBOUT: FDBDFS
        FDATSA R.VAR,FD.CR
        FDRCSA FD.PLC,OUTBUF,BUFSIZ
        FDOPSA OUTLUN,OFDSPT,,FO.WRT
OFDSPT: .WORD DEVNSZ,DEVNAM
        .WORD DIRNSZ,DIRNAM
        .WORD FILNSZ,FILNAM
DEVNAM: .ASCII /DK3:/
        DEVNSZ=-DEVNAM
DIRNAM: .ASCII /I1,54I/
        DIRNSZ=-DIRNAM
FILNAM: .ASCII /SETTIM.CMD/
        FILNSZ=-FILNAM
        .EVEN

```

;SPECIFY YOUR SYB DRIVE

```

OUTBUF: .ASCII /TIM /
TD:     .BLKB 20.
BUFSIZ=-OUTBUF

```

```

HOUR:   .WORD 0
MIN:    .WORD 0
SEC:    .WORD 0
YEAR:   .WORD 0
MONTH:  .WORD 0
DAY:    .WORD 0

```

;SPECIFY THE CURRENT YEAR

```

START:  FINITS
        OPENS# FDBOUT
        BCS   ERROR

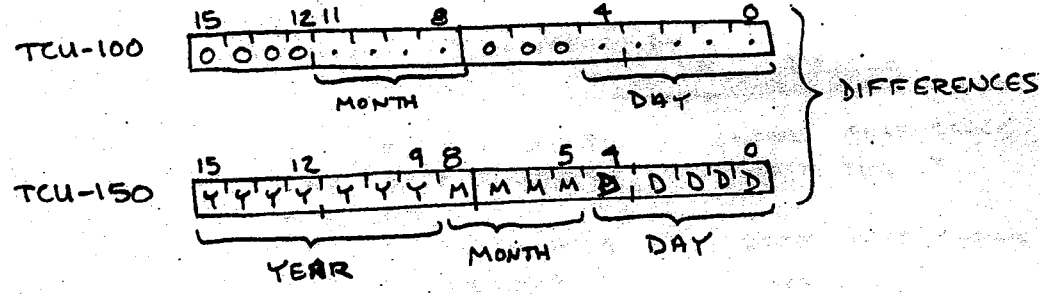
MOV     #160770,R1
MOVB   (R1)+,DAY
MOVB   (R1)+,YEAR
MOVB   (R1)+,MIN
MOVB   (R1)+,HOUR
MOVB   (R1)+,SEC
MOV     #TD,R0
MOV     #HOUR,R1
MOV     #3,R2
CALL   $TIM
MOVB   @11,(R0)+
CALL   $DAT

```

```

; extract month
BIC #177400, YEAR
ASR YEAR
MOV DAY, R1
ROB R1
ROB R1
ROB R1
ROB R1
ROB R1
ROB R1
BIC #177760, R1
MOV R1, MONTH
BIC #177740, DAY

```



;MSB OF MONTH IN CARRY BIT

;merge MSB with LSBs
;get to right

```

PUTS #FDBOUT,#OUTBUF,#BUFSIZ,ERROR
CLOSES #FDBOUT,ERROR
EXITSS

```

ERROR: MOV (SP),R3
SUB #TOPADS,R3
MOV \$DSW,R4
NEG R4
HALT

END START

D TCY *****
SY

TCUBLD.CMD

Date : 30-Jan-79

CAPTRONIX SA

To SET TCU-150

```

*****
;
PIP SETTC1.MAC/PU
MAC SETTC1,SETTC1=SETTC1
PIP SETTC1.LST;*/DE
;NOW TYPE @TCUTSK
TKB
PIP SETTC1.OBJ;*/DE
PIP TD0:[1,54]SETTC1.SYS/PU

```

```

; TO SET THE CURRENT DATE AND TIME IN THE TCU-100
; EXECUTE THE FOLLOWING STEPS:

```

```

;BOO $SETTC1
;SET THE CPU TO "HALT"
;LOAD THE MONTH IN LOC 1124
;LOAD THE DAY IN LOC 1126
;LOAD THE HOURS IN LOC 1130
;LOAD THE MINUTE IN LOC 1132
;PRESS "CONTINUE"

```

```

; THE TIME AND DATE BEING NOW SET, THE PROCESSOR HALTS AT PC=1122
; AND IS READY TO BOOT YOUR RSX-11 SYSTEM
; (THE YEAR [79] IS DEFINED IN THE PROG. TIMSET.MAC).

```

DATE:

a.) compose RI = YR|MONTH|DY
in format

15	98	54	0
YEAR	MONTH	DAY	

```

DATE: MOV RI, @#160770 ; START FAST CLOCK
LD: CMP RI, @#160770 ; WAIT FOR IT
BNE LD
MOV RI, @#160774 ; STOP FAST CLOCK
CMP RI, @#160770 ; MAKE SURE
BNE DATE ; TRY AGAIN
RTS PC ; END OF ROUTING

```

TIME:

a.) composed RI = HR|MIN
in format

15	07	0
HR	MIN	

```

TIME: MOV RI, @#160772 ; START FAST CLK
LT: CMP RI, @#160772 ; WAIT FOR IT
BNE LT
MOV RI, @#160774 ; STOP FAST CLK
CMP RI, @#160772 ; MAKE SURE
BNE TIME
RTS PC

```

TCUTSK:CMD

Date : 30-Jan-79 CAPTRONIX SA

```

*****
;
TD0:[1,54]SETTC1.SYS/-HD/-MM=SETTC1
/
PAR=DUMMY:0:10000
//

```

.NLIST TTM
.TITLE SETTC1.MAC

This program allows to set the initial values of the
date and time in the TCU-100 from the console board.

ATTENTION: To set the same value already present in
===== the TCU-100 may cause failure!

Date : 30-Jan-79 CAPTRONIX SA

VECT = 170 ;TCU-100 vector
TCUS = 160776 ;Status address

```
START: MOV    ..SP
        MOV    #RET,@#VECT      ;Load the vector
        BIC    #160100,@#TCUS  ;Disable the interrupt
        CLR    MONTH           ;Clear the month
WAIT:   TST    MONTH           ;This loop allows the user
        BEQ    WAIT            ;to halt the CPU
        MOV    #160770,R1      ;to load the 1. address
        MOV    MONTH,R2       ;Load
        SWAB   R2              ;the
        ADD    DAY,R2          ;month
        BIS    #100,R2         ;and
        MOV    R2,(R1)+        ;day.
WAIT1:  TSTB   @#TCUS          ;Is the TCU ready ?
        BPL    WAIT1          ;no
        MOV    HOURS,R2       ;Load
        SWAB   R2              ;the
        ADD    MINUTE,R2      ;hours
        BIS    #40100,R2      ;and
        MOV    R2,(R1)+        ;minutes.
WAIT2:  TSTB   @#TCUS          ;Is the TCU ready ?
        BPL    WAIT2          ;no
        TST    (R1)+          ;Seconds are cleared internally
        BIC    #160100,(R1)   ;Disable the interrupt
        HALT
```

RET: RTI

MONTH: .WORD 0
DAY: .WORD 0
HOURS: .WORD 0
MINUTE: .WORD 0

.END START