

M1/10X5010  
MAIN INTERCONNECT

NOTE: REFER TO SCHEMATIC 6  
IN M1/10X5010  
INSTRUCTION MANUAL

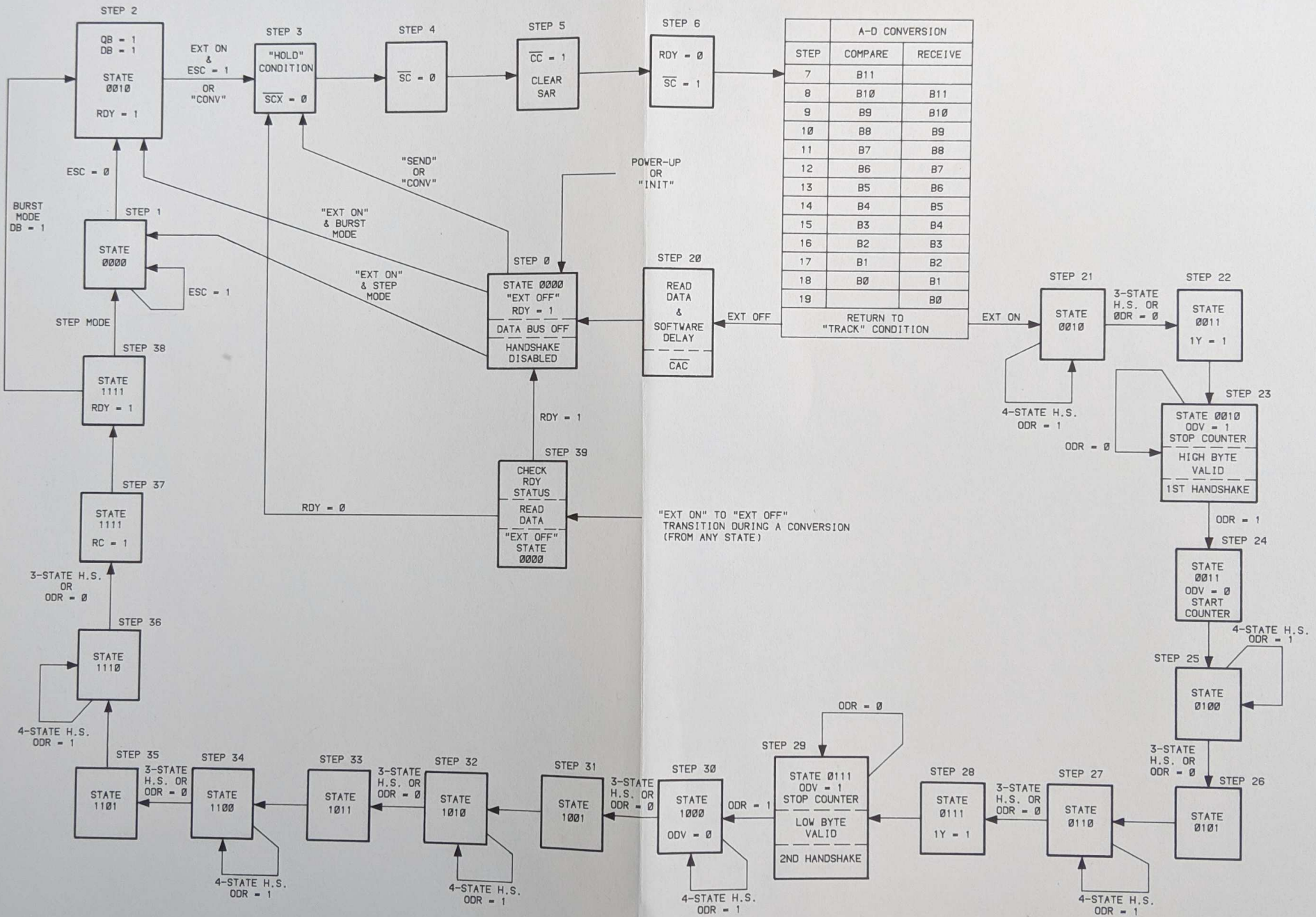
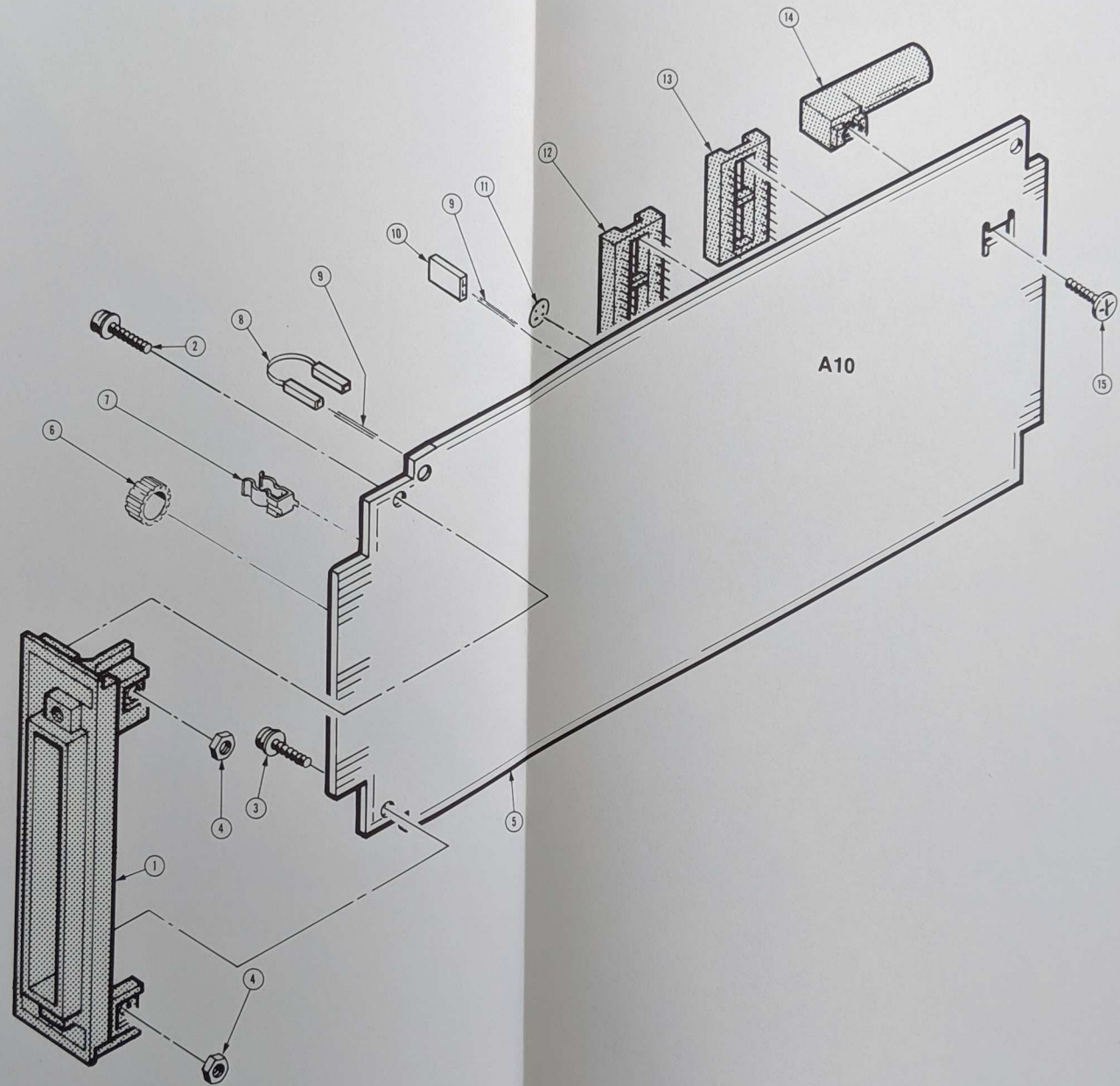


Fig. 8-1. 50M10 Functional sequence diagram for external and internal control mode operation.





DESCRIPTION

EFF SN B010100

TEXT CHANGES

SECTION 3, after page 3-10

ADD:

**PROGRAMMING EXAMPLES**

**Initial Conditions**

The MI 5010 address switches are factory set for decimal address 23. The message terminator switch is set for EOI ONLY. If the address switches are changed for a different address, so should the value of the program address. Refer to the MI 5010/MX 5010 Instruction manual for further details.

**Command Length**

Command headers and arguments must contain, as a minimum, the exact characters shown in the abbreviated examples listed in the Detailed Command List.

NOTE

*All of the following programming examples were developed for the Tektronix 4052A/R14 and 4041 controllers. If another controller type is used, the programs must be modified for that particular controller.*

**Applications Programs (samples)**

Refer to Fig. 3-1, Fig. 3-2, Fig. 3-3 and Fig. 3-4 for the following Applications programs.

```

100 | *****
110 | ***** ACQUIRE DATA FROM 50M10 ADC *****
120 | *****
130 | *****
140 | Vers. 1.0
150 |
160 | Copyright (c) 1983, TEKTRONIX INC.. All rights reserved.
170 | This software is provided on an "as is" basis without warranty
180 | of any kind. It is not supported.
190 |
200 | This program may be reproduced without prior permission, in
210 | whole or in part, by the original purchaser. Copies must
220 | include the above copyright and warranty notice.
230 |
240 | PURPOSE:
250 | Acquires data from the 50M10 in several modes:
260 | 1) A single reading converted immediately by the ADC card.
270 | 2) An average of 40 readings converted as quickly as the MI
280 | can buffer them.
290 | 3) A single reading triggered by an external signal.
300 |
310 | REQUIRED EQUIPMENT:
320 | MI/MX 5010 Programmable Multifunction Interface
330 | 50M10 Analog/Digital Converter card
340 | 4052A Controller with 4052R14-1A GPIB Enhancement Rompack
350 |

```

Fig. 3-1. Applications program to acquire data from the 50M10 ADC (4052A).



## DESCRIPTION

```

360 ! GLOBAL VARIABLES:
370 ! Stabyt: Status byte acquired by the serial poll handler
380 ! Addr: Address array of instruments found by Config routine
390 ! Coderet: Flag returned by Config routine
400 ! Errs: Report returned by instrument that requests service
410 ! Ad_slot: Number of MI 5010 slot where ADC card resides.
420 ! Miadd: MI 5010 primary address.
430 ! Adreadins: Value returned by ADC card.
440 ! Mi_opc: Flag that MI 5010 reported OPC status
450 !
460 ! SUBPROGRAM CALLED:
470 ! Ad_read: Averages 1 to 40 readings; may be triggered by
480 ! external trigger.
490 !
500 ! OPERATING INSTRUCTIONS:
510 ! 1) Connect 4052A and MI 5010 with GPIB cable.
520 ! 2) Change Miadd as needed to match MI 5010 primary address.
530 ! 3) Change Ad_slot variable assignment as needed to match slot
540 ! where ADC card is installed.
550 ! 4) Connect input signal to pin 6A and common to 6B.
560 ! 5) Connect external trigger to pins 15A (hi) and 15B (lo).
570 !
580 ! ERRORS:
590 ! GPIB timeout errors are trapped to alert the user.
600 !
610 ! INSTRUMENT CONTROL:
620 ! Polls and reports all instrument found on GPIB.
630 !
640 INIT
650 DIM Err$(50),Addr(15)
660 ON TIMEOUT THEN 930
670 CALL "config",Coderet;Addr
680 IF Coderet THEN
690   IF Coderet=1 THEN
700     PRINT "More than 15 devices connected to GPIB."
710     GO TO 970 ! Alert user to problem and quit.
720   ELSE
730     PRINT "No one home on GPIB."
740     GO TO 950 ! Quit after message.
750   END IF
760 END IF
770 !
780 Miadd=23
790 Ad_slot=2
800 !
810 ON SRQ THEN 1010
820 CALL "srqon"
830 !
840 CALL Ad_read(Miadd,Ad_slot,0,1,Adreadins)
850 PRINT "Single readings = ";Adreadins
860 CALL Ad_read(Miadd,Ad_slot,0,40,Adreadins)
870 PRINT "Average of 40 readings = ";Adreadins
880 CALL Ad_read(Miadd,Ad_slot,1,1,Adreadins)
890 PRINT "Externally triggered readings = ";Adreadins
900 END ! mainline
910 !
920 ! Handle GPIB timeout
930 PRINT "GPIB timeout occurred."
940 ! Message for GPIB transfer problem.
950 PRINT "Check power to instruments and GPIB cable connections."
960 ! General purpose user message.
970 PRINT "Fix problem and reRUN the program."
980 END ! The ball is back in the user's court.
990 !
1000 ! Sub to handle srq events
1010 POLL Index,Stabyt;Addr
1020 IF Addr(Index)=Miadd AND Stabyt=66 OR Stabyt=82 THEN
1030   Mi_opc=1
1040 ELSE
1050   PRINT @Addr(Index);"id?err?"
1060   INPUT @Addr(Index);Errs
1070   PRINT "Status=";Stabyt,"Address=";Addr(Index),Errs
1080 END IF
1090 RETURN
1100 !

```

Fig. 3-1 (cont.). Applications program to acquire data from the 50M10 ADC (4052A)



## DESCRIPTION

```

1110 ! + ***** +
1120 !           ACQUIRE 50M10 A/D CONVERTER READING
1130 !
1140 !   March 17, 1983
1150 !
1160 !   REQUIRED EQUIPMENT:
1170 !   MI 5010 Programmable Multifunction Interface
1180 !   4052A with R14 opt.1A GPIB Enhancement Rom
1190 !
1200 !   PURPOSE:
1210 !   Supplies a readings from the 50M10 acquired with the trigger
1220 !   mode and average of number of readings selected by user:
1230 !   1) Average of 1 to 40 readings, which may be
1240 !   2) Converted as quickly as the the MI can buffer the
1250 !   readings, or as
1260 !   3) Each reading is triggered by an external signal.
1270 !
1280 !   INPUT:
1290 !   Pr: MI 5010 primary address.
1300 !   Slot: MI slot where ADC card resides.
1310 !   Trsmode: 0=No wait--take readings and report average.
1320 !           1=Wait for external trigger for each readings.
1330 !   Navs: Number of readings to take for average.
1340 !
1350 !   OUTPUT:
1360 !   Readings: The average of n (n=navs) readings.
1370 !
1380 !   DECLARED LOCAL VARIABLES:
1390 !   Cmd$:      Command(s) for MI buffer
1400 !   Rdns:      Array used to hold data from MI
1410 !
1420 !   INSTRUMENT CONTROL:
1430 !
1440 !   The MI command buffer is overwritten.
1450 !   The 50M10 EXT, DT, and ARM functions are left off.
1460 !   The MI 5010 OPC function is left off and RQS is left on.
1470 !
1480 !   ROUTINES CALLED:
1490 !   An external GPIB int handler must report MI OPC
1500 !
1510 !   ERROR:
1520 !   The primary address must be valid. GPIB errors should
1530 !   trapped with error handlers or system errors can halt
1540 !   program execution.
1550 !   -*****-
1560 SUB Ad_read(Pr,Slot,Trsmode,Navs,Adreadings)
1570   LOCAL Cmd$,Rdns
1580   Navs=Navs MIN 40
1590   DIM Cmd$(14),Rdns(Navs)
1600   ! Build 50M10 command message
1610   Cmd$="SEND" ! "SEND"="CONVERT;VOLT?"
1620   IF Trsmode THEN
1630     Cmd$="WAI COND;"&Cmd$ ! Wait for Ext Trig
1640   END IF
1650   !
1660   ! Set up MI for measurement
1670   PRINT @Pr:"SEL ";Slot;"EXT OFF;DT OFF;ARM OFF;STOP;BUF ON"
1680   PRINT @Pr:Cmd$;"BUF OFF"
1690   IF Trsmode THEN
1700     PRINT @Pr:"ARM COND;COND 0"
1710   END IF
1720   Mi_opc=0 !      Init so loop until interrupted
1730   PRINT @Pr:"OPC ON/RQS ON/EXEC ";Navs
1740   !
1750   ! Loop until MI interrupts with OPC
1760   IF NOT(Mi_opc) THEN 1760
1770   !
1780   INPUT @Pr:Rdns
1790   Adreadings=SUM(Rdns)/Navs
1800   PRINT @Pr:"OPC OFF;ARM OFF" ! Clean up MI status
1810 END SUB

```

Fig. 3-2. Applications program to acquire data from the 50M10 ADC (4052A)



## DESCRIPTION

```

100 | *****
110 | ***** ACQUIRE DATA FROM 50M10 ADC *****
120 | *****
130 |
140 | Vers. 1.0
150 |
160 | Copyright (c) 1983, TEKTRONIX, INC. All rights reserved.
170 | This software is provided on an "as is" basis without warranty
180 | of any kind. It is not supported.
190 |
200 | This program may be reproduced without prior permission, in whole
210 | or in part, by the original purchaser. Copies must include the
220 | above copyright and warranty notice.
230 |
240 | PURPOSE:
250 | Acquires data from the 50M10 in several modes:
260 | 1) A single readings converted immediately by the ADC card.
270 | 2) An average of 40 readings covered as quickly as MI can buffer them.
280 | 3) A single reading triggered by an external signal.
290 |
300 | REQUIRED EQUIPMENT:
310 | MI/MX 5010 Programmable Multifunction Interface
320 | 50M10 Analog/Digital Converter card
330 | 4041 Controller (V2.0)
340 |
350 | GLOBAL VARIABLES:
360 | Stabyt: Status byte acquired by the serial poll handler
370 | Addr: Address of device reporting Stabyt
380 | Mistrem$: GPIB port and primary address portion of MI 5010 stream spec.
390 | Mi_lu: MI 5010 logical unit number.
400 | Ad_slot: Number of slot where ADC card resides.
410 |
420 | SUBPROGRAMS CALLED:
430 | Read_ad: Averages 1 to 40 readings, untriggered or triggered by
440 | external trigger.
450 | Pollinst: Handles srqs, returns device status and GPIB primary address.
460 |
470 | OPERATING INSTRUCTIONS:
480 | 1) Connect 4041 and MI 5010 with GPIB cable.
490 | 2) Change OPEN Mi_lu: statement as needed for port and primary address.
500 | 3) Change Ad_slot variable assignment to match slot where ADC installed.
510 | 4) Connect input signal to pin 6A and common to 6B.
520 | 5) Connect external trigger (if desired) to pins 15A (hi) and 15B (lo).
530 |
540 | ERRORS:
550 | A handler is linked and enabled for GPIB data transfer errors
560 | and allows RETRY.
570 |
580 | INSTRUMENT CONTROL:
590 | Selects the port where logical unit for the MI 5010 is OPENed.
600 | Polls all instruments on that port who assert SRQ.
610 |
620 | Init var all
630 | Dim mistrem$ to 30
640 | Integer stabyt,addr,mi_lu,ad_slot
650 | Mi_lu=99
660 | Ad_slot=2
670 | Mistrem$="GPIB0 (PRI=23):"
680 | Open #mi_lu:mistrem$
690 | Select mistrem$
700 | On error(811 to 812) then call spiberr
710 | On srq then call pollinst
720 | Enable srq
730 |
740 | Print "Single readings ";read_ad(mi_lu,ad_slot,0,1)
750 | Print "Average of 40 data is ";read_ad(mi_lu,ad_slot,0,40)
760 | Print "Externally triggered readings is ";read_ad(mi_lu,ad_slot,1,1)
770 | End
800 Function read_ad(lun,slot,trimode,naverage) local cmd$,readins,lun_padd

```

Fig. 3-3. Applications program to acquire the 50M10 A/D converter reading(4041).



## DESCRIPTION

```

810 | + ***** +
820 |           ACQUIRE 50M10 A/D CONVERTER READING
830 |
840 | March 11, 1983
850 |
860 | REQUIRED EQUIPMENT:
870 | MI 5010 Programmable Multifunction Interface
880 | 50M10 Analog/Digital Converter card
890 | 4041 (V2.0) Controller
900 |
910 | PURPOSE:
920 | Supplies a reading from the 50M10 acquired with the trigger mode
930 | and average of number of readings selected by user:
940 | 1) Average of 1 to 40 readings, which may be
950 | 2) Converted as quickly as the MI can buffer the readings, or as
960 | 3) Each reading is triggered by an external signal.
970 |
980 | INPUTS:
990 | Lun: MI 5010 logical unit number.
1000 | Slot: MI/MX 5010 slot number where 50M10 is housed.
1010 | Trismode: 0 = No wait--take readings now and report average.
1020 |           1 = Wait for external trigger for each readings.
1030 | Naverage: How many readings to take and average as the output.
1040 |
1050 | OUTPUT:
1060 | Read_ad: The average of n (n=Naverage) readings.
1070 |
1080 | ERRORS:
1090 | 1) The logical unit number for MI and the ADC slot must be valid.
1100 | 2) External trigger parameter >1 is treated as 1 (use ext. trig).
1110 | 3) Average parameter >40 is treated as 40 (average 40 readings).
1120 |
1130 | FUNCTIONS CALLED:
1140 | Lupaddr: Returns GPIB primary address contained in stream spec.
1150 | An external GPIB interrupt handler must report stabyt and addr.
1160 |
1170 | DECLARED LOCAL VARIABLES:
1180 | Lun_padd: integer primary address of MI logical unit number.
1190 | Cmd$: Command(s) used for MI command buffer.
1200 | Readins: Short floating point array used to hold data from MI.
1210 |
1220 | INSTRUMENT CONTROL:
1230 | The MI command buffer is overwritten.
1240 | The 50M10 EXT, DT, and ARM functions are left off at end of function.
1250 | The MI 5010 OPC function is left off and the RQS function is left on.
1260 |
1270 | *****
1280 |
1290 | Naverage=naverage min 40
1300 | Integer lun_padd
1310 | Dim readins(naverage),cmd$ to 14
1320 |
1330 | Build 50M10 command message
1340 | Cmd$="SEND" !           "SEND"="CONVERT;VOLT?"
1350 | If trismode then cmd$="WAI COND;"&cmd$ !   Wait for Ext Trig
1360 |
1370 | Set up MI for measurement
1380 | Print #lun:"SEL";slot,"EXT OFF;DT OFF;ARM OFF;STOP;BUF ON",cmd$,"BUF OFF"
1390 | If trismode then print #lun:"ARM COND;COND 0"
1400 | Stabyt=0 !           Init so program will loop until interrupted
1410 | Print #lun:"OPC ON;RQS ON;EXEC";naverage
1420 |
1430 | Loop until MI interrupts with OPC
1440 | Lun_padd=lupaddr(lun)
1450 | Loop!   if not((stabyt=66 or stabyt=82) and addr=lun_padd) then goto loop
1460 |
1470 | Input #lun:readins
1480 | Read_ad=sum(readins)/naverage
1490 | Print #lun:"OPC OFF;ARM OFF" !           Clean up MI status
1500 | Return
1510 | End

```

Fig. 3-4. Applications program to acquire the 50M10 A/D converter reading (4041).



DESCRIPTION

```

1600 Sub pollinst local over,i
1610 Inteser over,i
1620 On error(815) then sosub fallout
1630 For i=1 to 15
1640 Poll stabyt,addr ! Assume port with sra is selected
1650 If over then exit to 1740
1660 If stabyt=66 or stabyt=82 then exit to 1740 ! Skip error report if OPC
1670 Wbyte atn(unl,addr+32,mta),"id?ierr?",reoi,atn(unl,unt,mla,addr+64)
1680 Rbyte err$
1690 Wbyte atn(unl,unt)
1700 Print "Address=";addr,"Status=";stabyt,err$
1710 Next i
1720 Fallout: over=1
1730 Advance
1740 Resume
1750 End
1800 Function lupadds(logunit) local asklu$
1810 Inteser lupadds
1820 ! Returns primary address of GPIB instrument at lu logunit
1830 Dim asklu$ to 200
1840 Asklu$=ask$("lu",logunit)
1850 Lupadds=val(sess$(asklu$,pos(asklu$,"PRI=",1),7))
1860 Return
1870 End
1900 Sub $fiberr local port,e,con
1910 Inteser port,e,con
1920 Port=val(mistrem$)
1930 E=val(ask$("error"))
1940 If e=811 then print "GPIB transfer timed out."
1950 If e=812 then print "No listener on GPIB";port
1960 Print "Check that GPIB";port;" is connected to MI 5010 and the MI 5010 is powered on."
1970 Print "Press the SPACE bar to RETRY."
1980 Rbyte $ask$("console");con
1990 If con()=32 then goto 1980
2000 Retry
2010 End

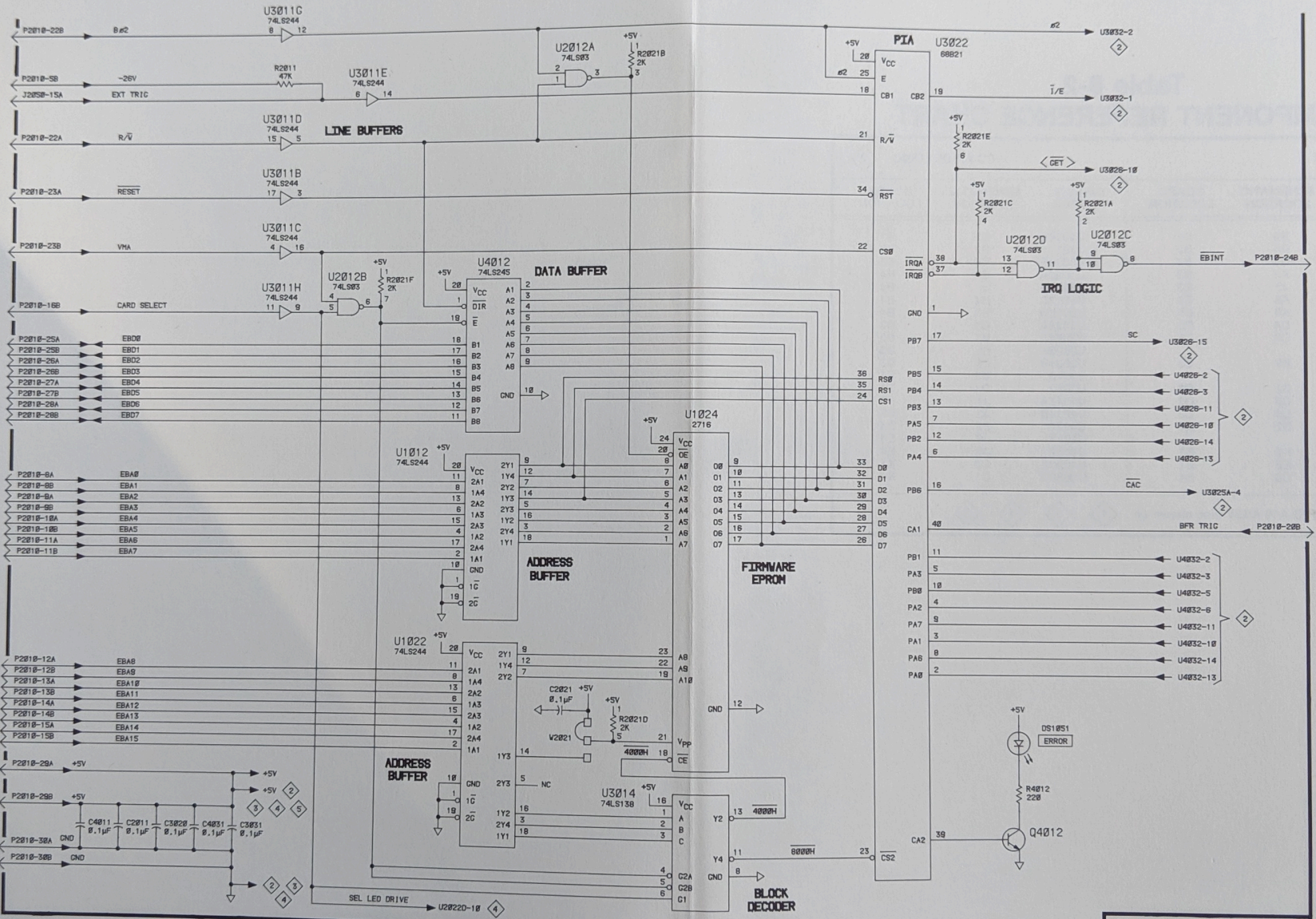
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Fig 3-4 (cont.). Applications program to acquire the 50M10 A/D converter reading (4041)



A | B | C | D | E | F | G | H | I | J | K | L | M

1  
2  
3  
4  
5  
6  
7  
8  
9



50M10

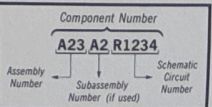
4495-30

P/O A18 ANALOG/DIGITAL CONVERTER BOARD

MI 5010 INTERFACE

Static Sensitive Devices  
See Maintenance Section

COMPONENT NUMBER EXAMPLE



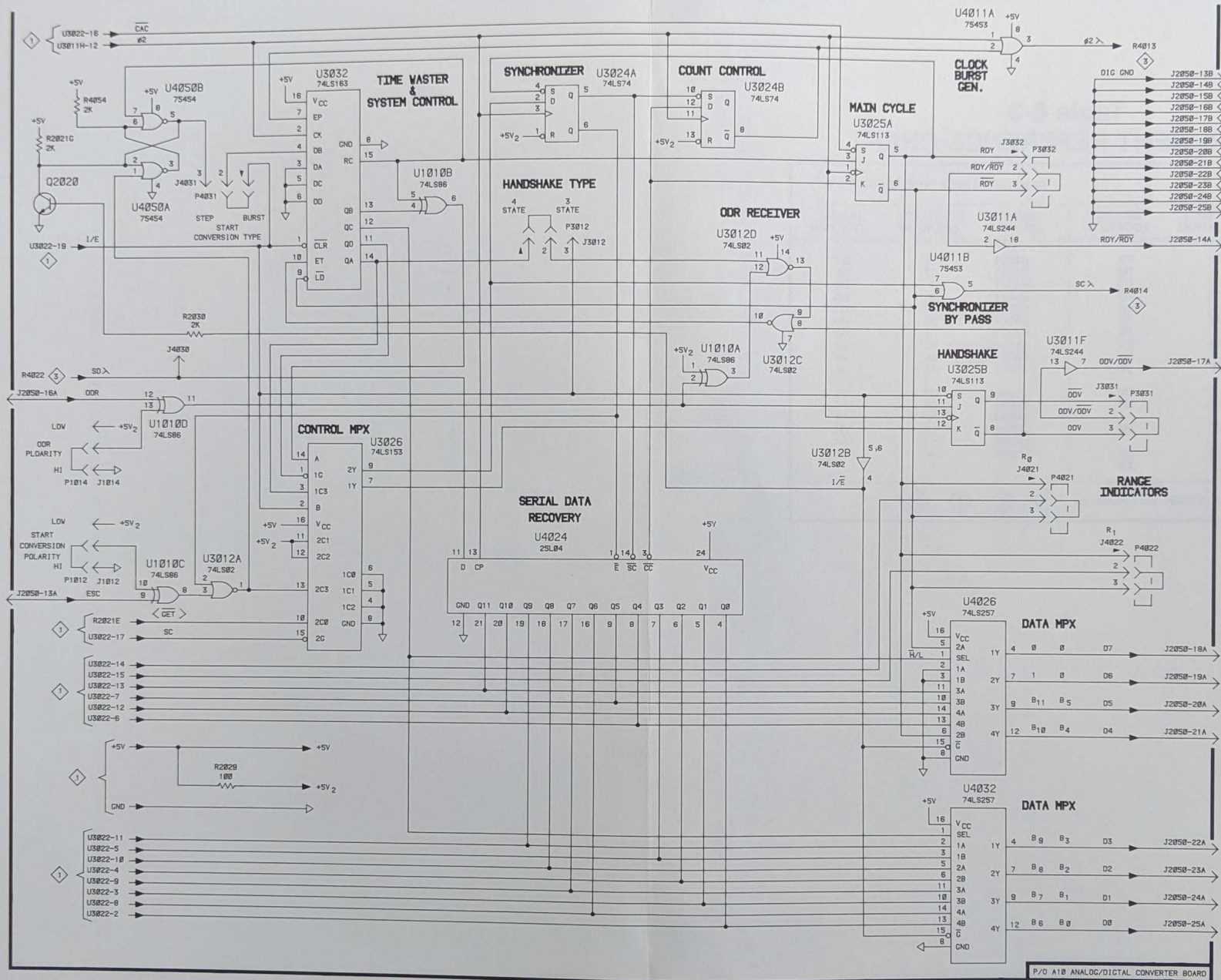
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

1 JP



A B C D E F G H I J K L

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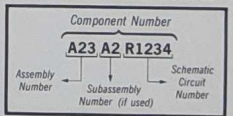


50M10

4495-31

P/O A1B ANALOG/DIGITAL CONVERTER BOARD  
CONTROL LOGIC

⊗ Static Sensitive Devices  
See Maintenance Section  
COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

JP

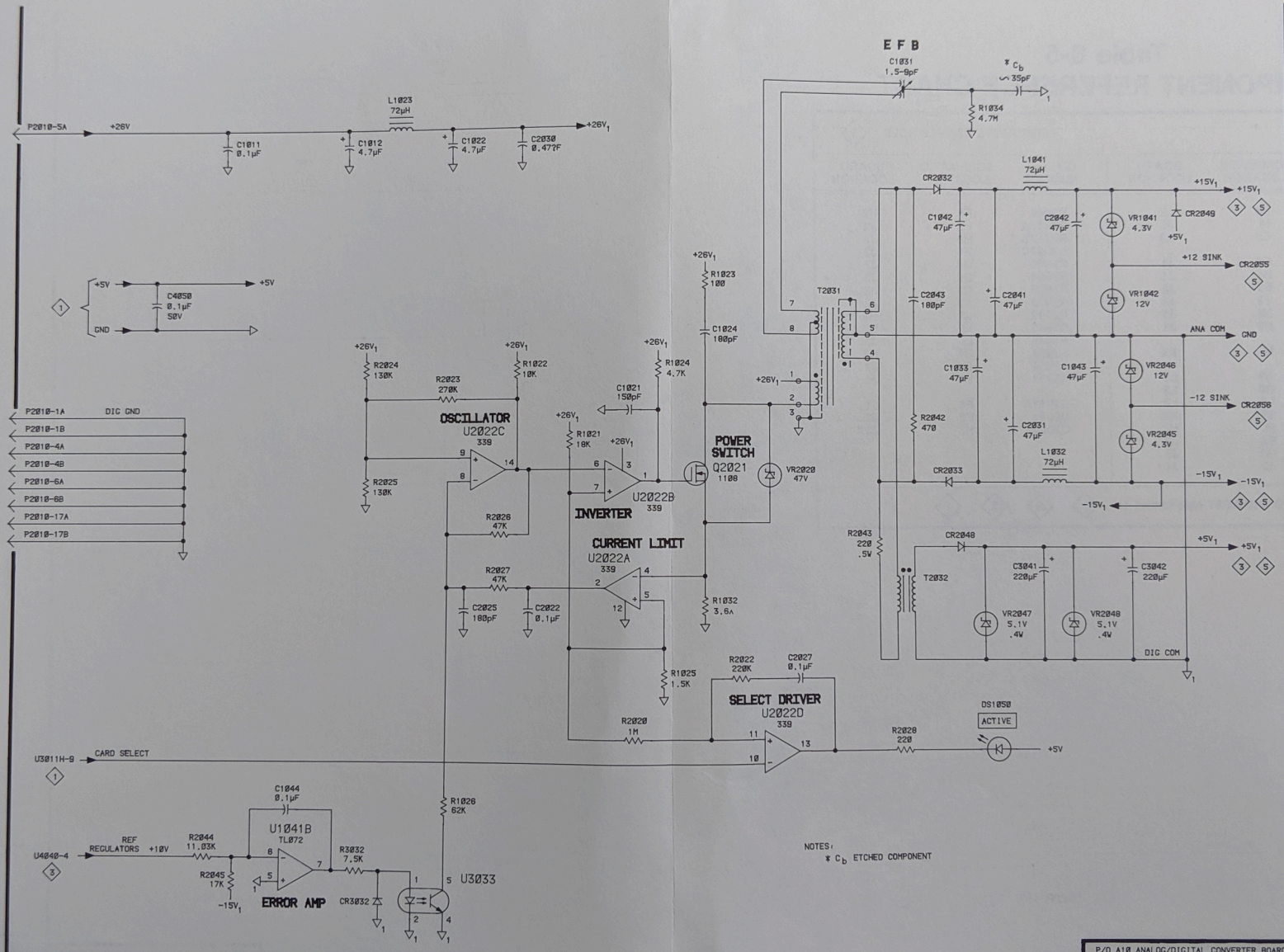






A | B | C | D | E | F | G | H | I | J | K | L

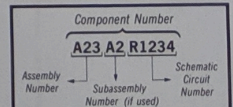
1  
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9



NOTES:  
\* C<sub>b</sub> ETCHED COMPONENT

⊗ Static Sensitive Devices  
See Maintenance Section

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

50M10

4495-33

P/O A10 ANALOG/DIGITAL CONVERTER BOARD

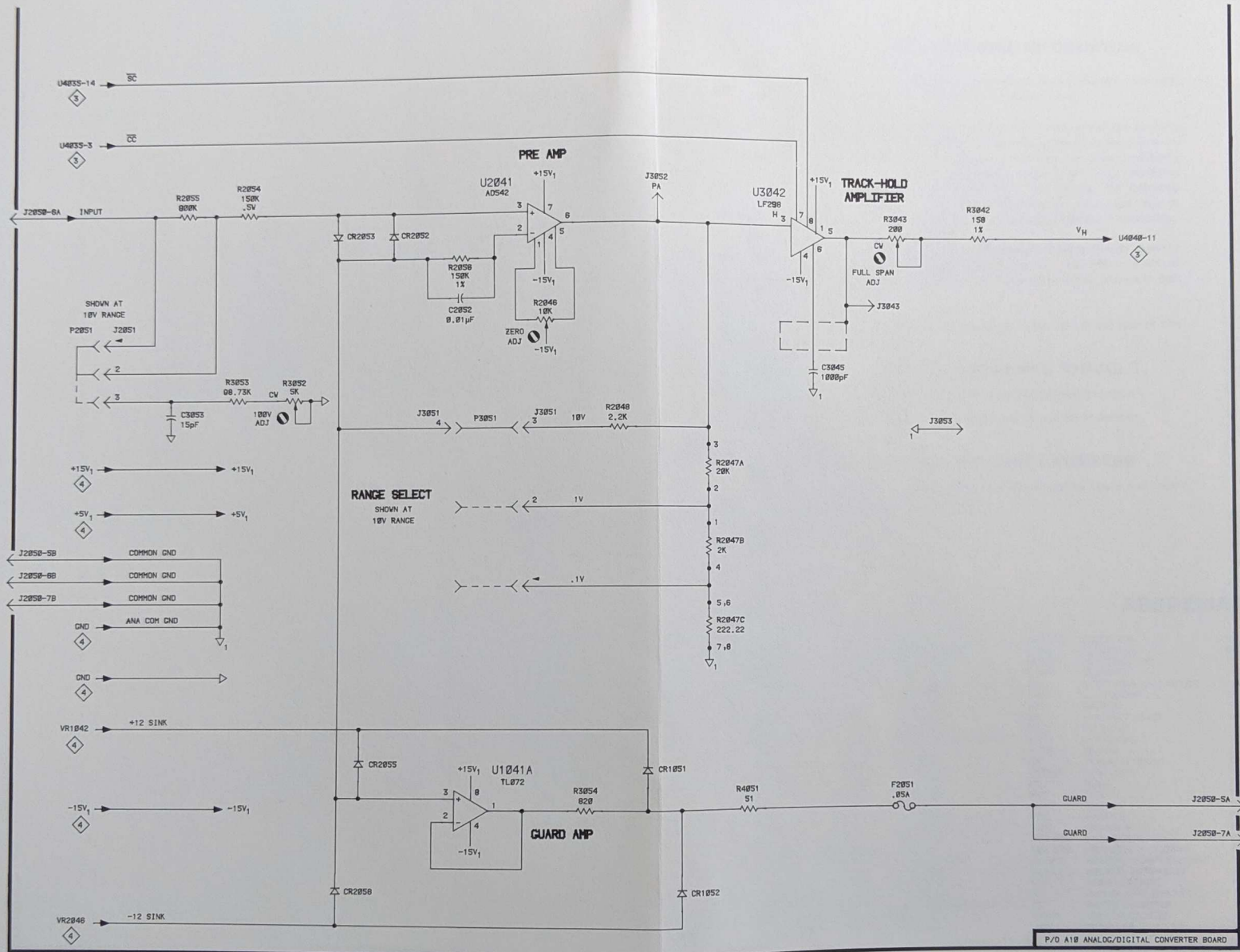
FLOATING POWER SUPPLY

4  
JP



A | B | C | D | E | F | G | H | I | J | K | L

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9

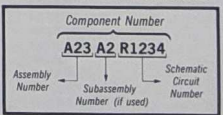


50M10

4495-34

INPUT AMP & SAMPLE HOLD

Static Sensitive Devices  
See Maintenance Section  
COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

5 JP