HEWLETT PACKARD

3078A TECHNICAL APPLICATION NOTE

APPLICATION NOTE No 412-1

INTERFACING A WEIGHSCALE TO THE HP 3078A DATA COUPLER

INTRODUCTION

In the data capture area the HP 3078A data coupler enables remote interfacing of HEWLETT-PACKARD peripherals as well as other devices such as weighscales to an HP 1000 computer.

This application note gives all necessary information to interface a METTLER weighscale (model PK 300) to a remote HP 1000 computer and demonstrate the use of the BCD interface card.

To achieve this goal this note is divided into 3 main parts. The first part describes all the hardware considerations which must be taken into account when interfacing a METTLER weighscale with a BCD interface card.
In the same way, the second part explains the software involved in this example.
The third part gives the listing of the program that was written as a support for this note.

GENERAL HARDWARE DESCRIPTION

Figure 2 shows a block diagram of the various elements involved in this application.
On one side is the system driving the DATA LINK and running the application program, and on the other side, up to 4 km away, is the HP 3078 data coupler interfacing the METTLER weighscale.

SYSTEM DESCRIPTION

The computer can be either an HP 1000-E or an HP 1000-F configured with the 12790A-001 multipoint terminal subsystem with modem cable. An HP 3074A hardwired data link adaptor drives the DATA LINK via the 92905A data-link-to-device cable.

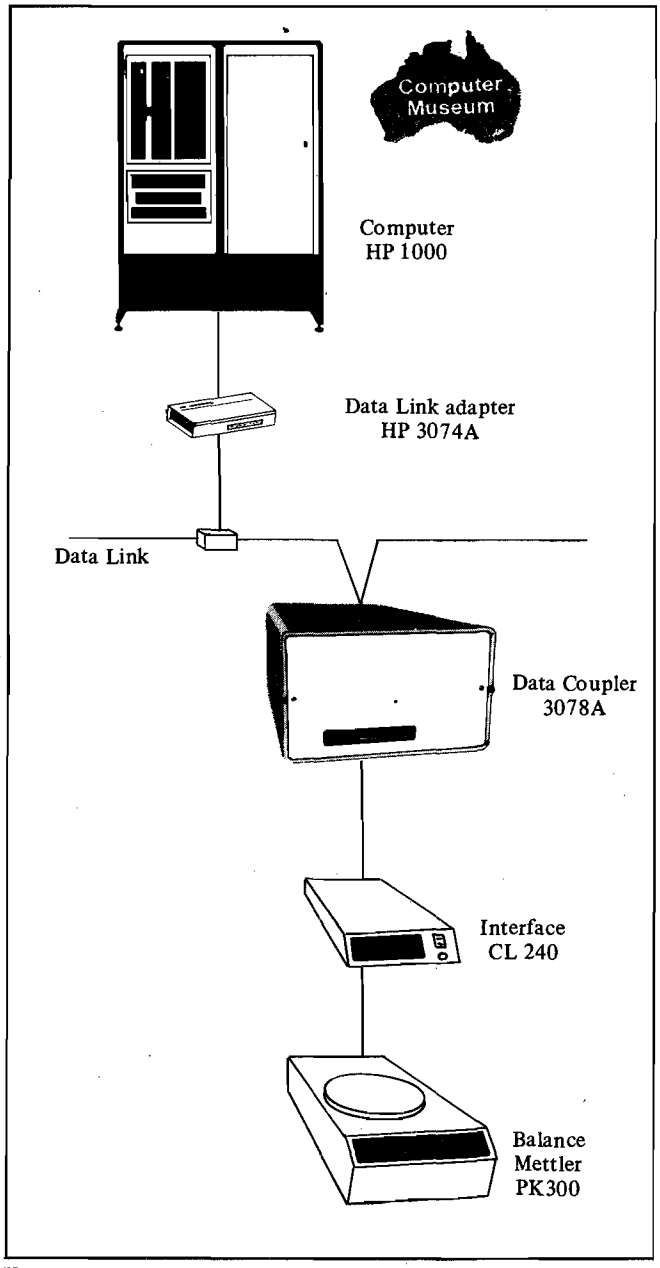

Figure 1.

METTLER PK 300 DESCRIPTION

The METTLER PK 300 weighscale is equipped with a METTLER CL 240 BCD interface and a foot pedal 46278. Although the PK 300 has a 20 mA current loop interface, the BCD interface CL 240 is used to interface the weighscale to the data coupler in this example.
As set up in the factory the PK 300 20 mA current loop works in asynchronous, full duplex mode at 2400 baud (1 stop bit - event parity). When transmitting weight data, the PK 300 sends a 6-digit result split into 3 data integer digits and 3 data decimal digits to the CL 240 BCD interface via the METTLER 42555 junction cable.
The foot pedal that commands the data transfer to the computer is connected to the PK 300 TRANSFER input.

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Errata

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(P/N 5953-0153)

Page 17, line 7

Change:

```
145   IF(IBUF(1) .NE. 2H8à) GOTO 150
      IF(IBUF(3) .EQ. 2Hbà) GOTO 160
```

To:

```
145   IF(IBUF(1) .NE. 2H8@) GOTO 150
      IF(IBUF(3) .EQ. 2Hb@) GOTO 160
```

Page 22, line 5

Change:

```
      IF(IBUF(1) .EQ. 2H8à) GOTO 30
```

To:

```
      IF(IBUF(1) .EQ. 2H8@) GOTO 30
```

Page 22, last 6 lines

Change:

```
      IF(IBUF(IBCD+1) .NE. 2HS=) GOTO 110
      IF(IBUF(IBCD+2) .EQ. 2Hàà) GOTO 100
      IF(IBUF(IBCD+2) .NE. 2HAà) GOTO 110
100   IF(IBUF(IBCD+3) .NE. 2Hàà) GOTO 110
      RETURN
110   WRITE(1,111)N,IBUF
```

To:

```
      IF(IBUF(IBCD+1) .NE. 2HS=) GOTO 110
      IF(IBUF(IBCD+2) .EQ. 2H@@) GOTO 100
      IF(IBUF(IBCD+2) .NE. 2HA@) GOTO 110
100   IF(IBUF(IBCD+3) .NE. 2H@@) GOTO 110
      RETURN
110   WRITE(1,111)N,IBUF
```

And move to bottom of page 23.

Page 23, line 23

Change:

```
      IF(IBUF(1) .NE. 2H8à) GOTO 100
      IF(IBUF(2) .NE. 2HS=) GOTO 100
      IF(IBUF(3) .NE. 2Hàà) GOTO 100
      IF(IBUF(4) .NE. 2Hàà) GOTO 100
```

To:

```
      IF(IBUF(1) .NE. 2H8@) GOTO 100
      IF(IBUF(2) .NE. 2HS=) GOTO 100
      IF(IBUF(3) .NE. 2H@@) GOTO 100
      IF(IBUF(4) .NE. 2H@@) GOTO 100
```

Page 24, line 23

Change:

```
      IF(IBUF(IHPIB+2) .EQ. 2Hàà) GOTO 100
      IF(IBUF(IHPIB+2) .NE. 2HAà) GOTO 110
100   IF(IBUF(IHPIB+3) .NE. 2Hàà) GOTO 110
```

To:

```
      IF(IBUF(IHPIB+2) .EQ. 2H@@) GOTO 100
      IF(IBUF(IHPIB+2) .NE. 2HA@) GOTO 110
100   IF(IBUF(IHPIB+3) .NE. 2H@@) GOTO 110
```

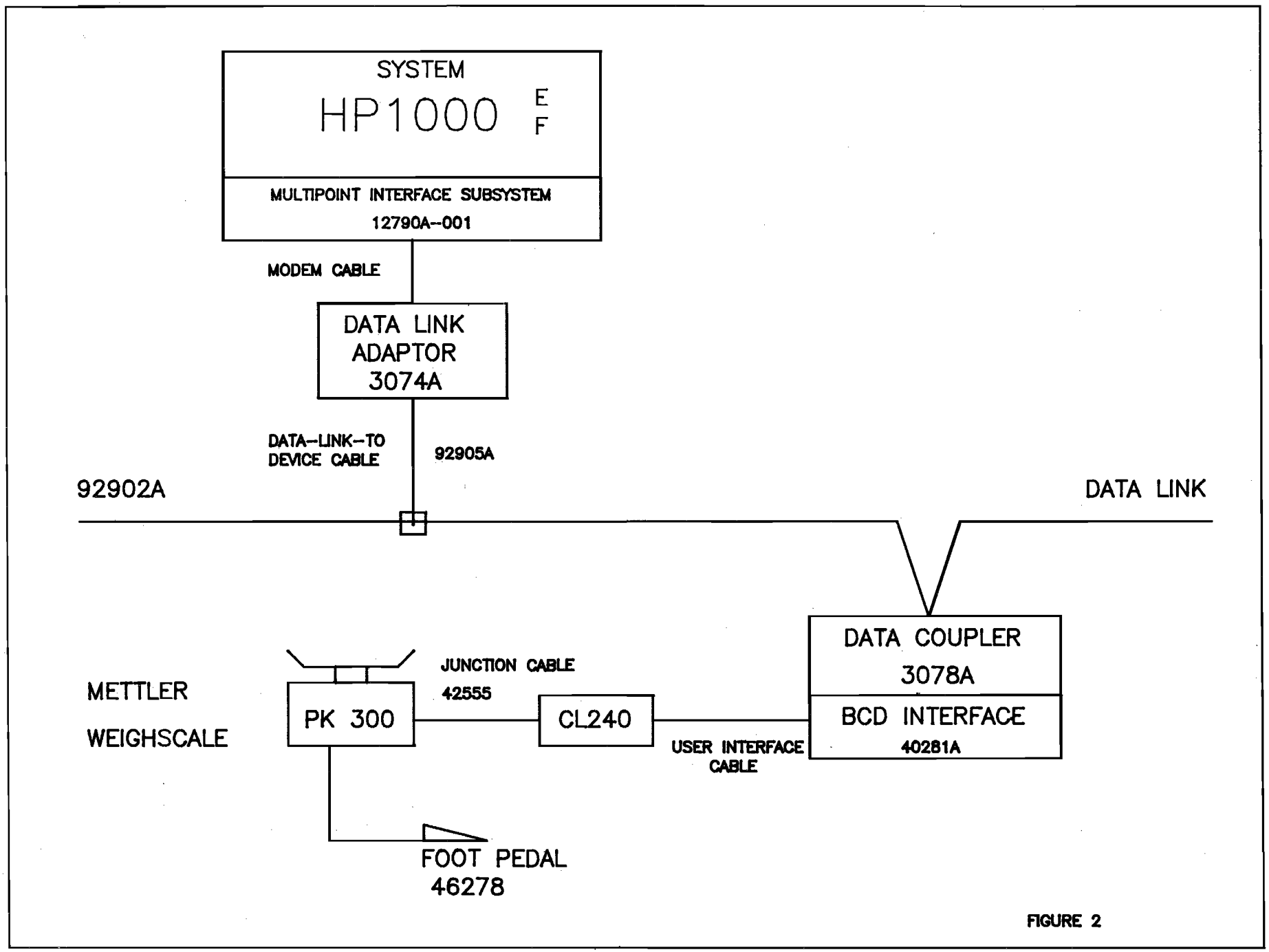
SYSTEM
HP1000 E F
MULTIPOINT INTERFACE SUBSYSTEM
12790A--001
MODEM CABLE
DATA LINK ADAPTOR 3074A
DATA--LINK--TO DEVICE CABLE
92905A
92902A
DATA LINK
DATA COUPLER 3078A
BCD INTERFACE 40281A
USER INTERFACE CABLE
CL240
JUNCTION CABLE 42555
PK 300
METTLER WEIGHSCALE
FOOT PEDAL 46278

FIGURE 2

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www.hpmuseum.net

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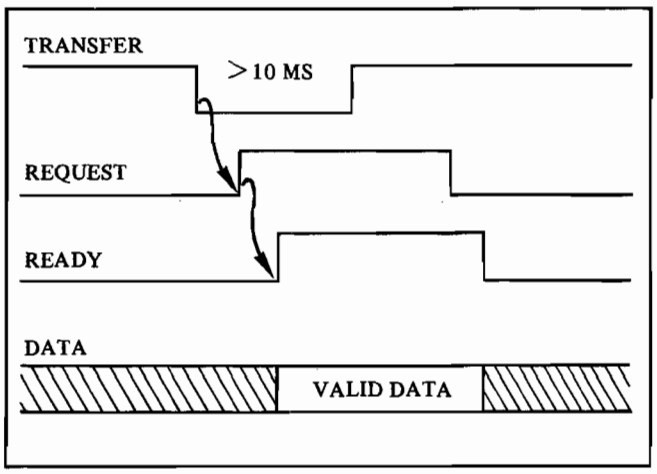
METTLER CL 240 DESCRIPTION

The CL 240 BCD interface is configured in "mode 3" which provides the ability to interface the PK 300 to an N200 interface like device. The N200 interface is an 8 decade parallel BCD interface defined by METTLER in which the data and handshake interface signals are distributed on a 50-pin AMPHENOL type micro ribbon plug 57-40500 as shown Figure 3.

The data signals include:
- 8 BCD digits labeled 10^0 to 10^7.
- 9 decimal points labeled DP1 to DP9.
- 1 polarity sign ±.

The handshake signals include:
- a TRANSFER line that tells the N200 device (i.e. 40281A BCD input interface) that a measurement is available.
- a REQUEST line that tells the weighscale that the N200 device is requesting the data.
- a READY line that tells the N200 device that data is ready on the bus.



When an operator presses the PK 300 foot pedal, it actives the CL 240 TRANSFER output.
Then the N200 device sends back a REQUEST to get the measurement.
The data is present on the bus when the READY signal is active.

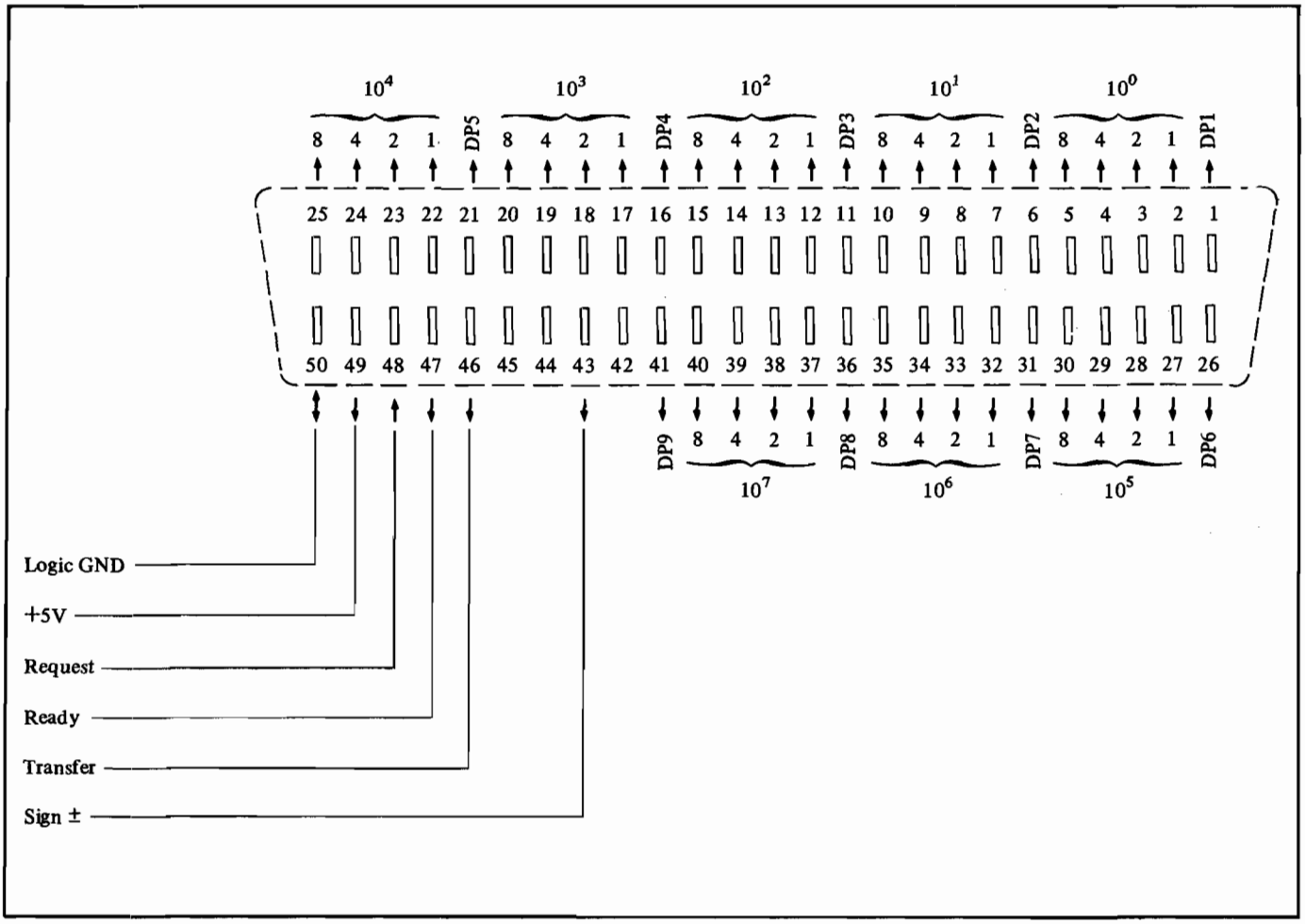


Figure 3.

HP 3078A CONFIGURATION

The HP 3078A data coupler is configured with a BCD controller card that interfaces the METTLER CL 240.

Master Processing Unit Board

In order to adapt the data coupler to the Data Link the S21 and S22 switches on the MPU card are set as follows:

S21-1 = 0 set the Data Link connection on.

S21-2 = 0 set no character
S21-3 = 0 parity.

S21-4 = 0 set primary address
S21-5 = 0 to A.
S21-6 = 0
S21-7 = 0
S21-7 = 1

Parity, baud rate primary address, secondary address setting correspond to the example program given at the end of this application note and may be set differently.

S22-1 = 0 set the baud rate at
S22-2 = 1 9600 baud.
S22-3 = 0

S22-4 = 0 set the secondary
S22-5 = 0 address to A.
S22-6 = 0
S22-7 = 0
S22-8 = 1

BCD Controller Board

Due to the CL 240 data output format the BCD interface card is configured in the wired floating point format (each data character comprises 4 BCD bits plus 1 line for the decimal point).

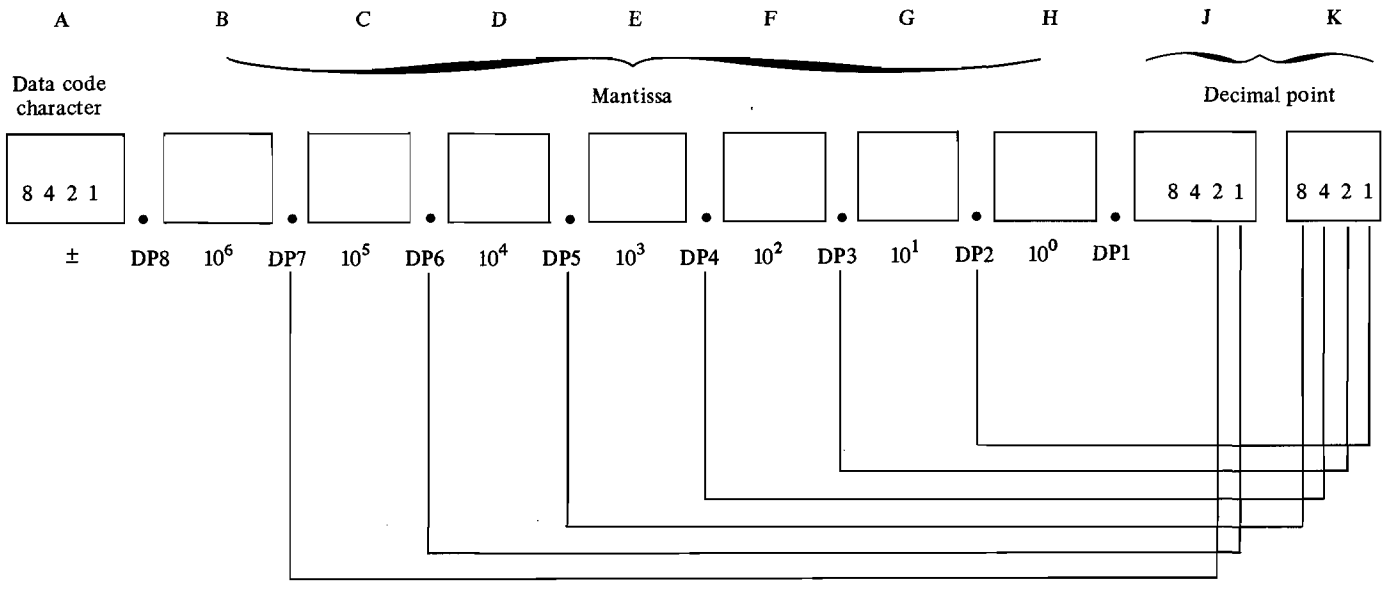
In this format the BCD card handles data as follows:
- A data code character monitors the mantissa sign (connector block A).
- 7 BCD data characters monitor the output lines 10^6 to 10^0 (connector blocks B to H).
- 2 data characters monitor the decimal point lines DP7 to DP2 (connector blocks J and K).

In the wired floating point format the least significant decimal point DP1 is not connected.

Due to the CL 240 handshake mode the BCD interface card is configured in full handshake mode.

In this mode the BCD card handles the handshake lines as follow:
- The TRANSFER line is connected to the output channel 1 flag line: FO1.
- The REQUEST line is connected to the input channel 1 control line: CI1.
- The READY line is connected to the input channel 1 flag line: FI1.

Wired Floating Point Connection



The interface cable wiring between the CL 240 and the 3078A is described in Table 1.

Connector 40281A	Panel	50-pin AMPHENOL type micro ribbon plug 57-30500
Decimal point	K1	6 DP2
	K2	11 DP3
	K4	16 DP4
	K8	21 DP5
	J1	26 DP6
	J2	31 DP7
	J4	not used
	J8	not used
Mantissa digits	H1	2 10^0
	H2	3
	H4	4
	H8	5
	G1	7 10^1
	G2	8
	G4	9
	G8	10
	F1	12 10^2
	F2	13
	F4	14
	F8	15
	E1	17 10^3
	E2	18
	E4	19
	E8	20
	D1	22 10^4
	D2	23
	D4	24
	D8	25
	C1	27 10^5
	C2	28
	C4	29
	C8	30
	B1	32 10^6
	B2	33
	B4	34
	B8	25
Data code character	A1	
	A2	43 Sign ±
	A4	
	A8	
Handshake lines	FO1	46 TRANSFER
	FI1	47 READY
	CI1	48 REQUEST
	GROUND	49 +5V
		50 LOGIC GROUND

Note: CI1 is an open collector output. As recommended in the BCD controller card manual a 3,9 kohms resistor should be connected between pins 48 and 49 of the AMPHENOL connector.

SOFTWARE DESCRIPTION

The following software handles the METTLER weighscale and refers to the example program listed in Paragraph 4.

SYSTEM SOFTWARE

In order to run the example program that drives the METTLER weighscale, the HP 1000 must be configured properly:

Driver DVR07 must be installed at generation time.

Once DVR07 is installed the multipoint interface can be configured with the following sequence:

SL,LUi,LUi	i is the logical unit associated with the multipoint interface.
CN,LUi,20B,100400B	Line initialisation.
CN,LUi,23B,104210B	Set NAK and WACK count.

The example program uses 2 logical units to access the 3078A.

The first LU corresponds to the primary address and is used to get result from the data coupler (READ).

The second LU corresponds to the secondary address and is used to send commands to the data coupler (WRITE).

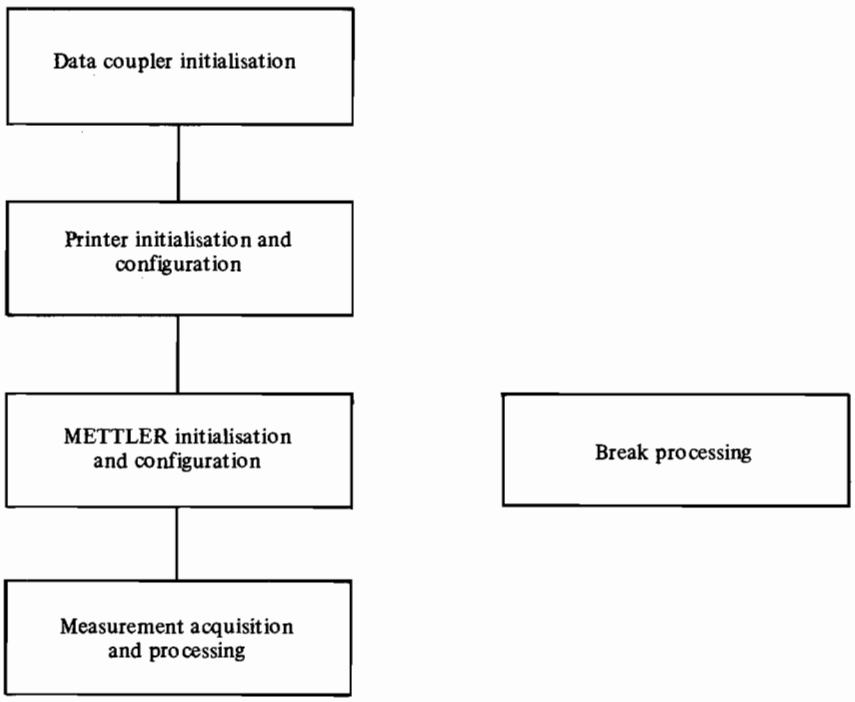
Both LU's can be configured with the following sequence:

SL,LUj,LUj	j is the logical unit associated with the primary address.
CN,LUj,20B,101B	Sets the primary address GID = A ; DID = A.
CN,LUj,23B,101000B	Disable polling.
SL,LUk,LUk	k is the logical unit associated with the secondary address.
CN,LUk,20B,141B	Sets the secondary address GID = A ; DID = a.
CN,LUk,23B,101000B	Disable polling.

EXAMPLE SOFTWARE

The following flow chart shows the general organisation of the program. Its modularity allows a user to adapt it to his specific requirements or equipment while conserving the main concept.

Although it does not appear in the hardware description the example program uses a 2631G printer which is interfaced with an HP-IB interface card. Certain explanations of the example program reference this card.



Data Coupler Initialisation

When starting up, the example program must first initialize the data coupler by sending a FULL RESET command to the 3078A.

This reset command checks all the boards installed and causes a POWER-ON BREAK to be sent to the computer.

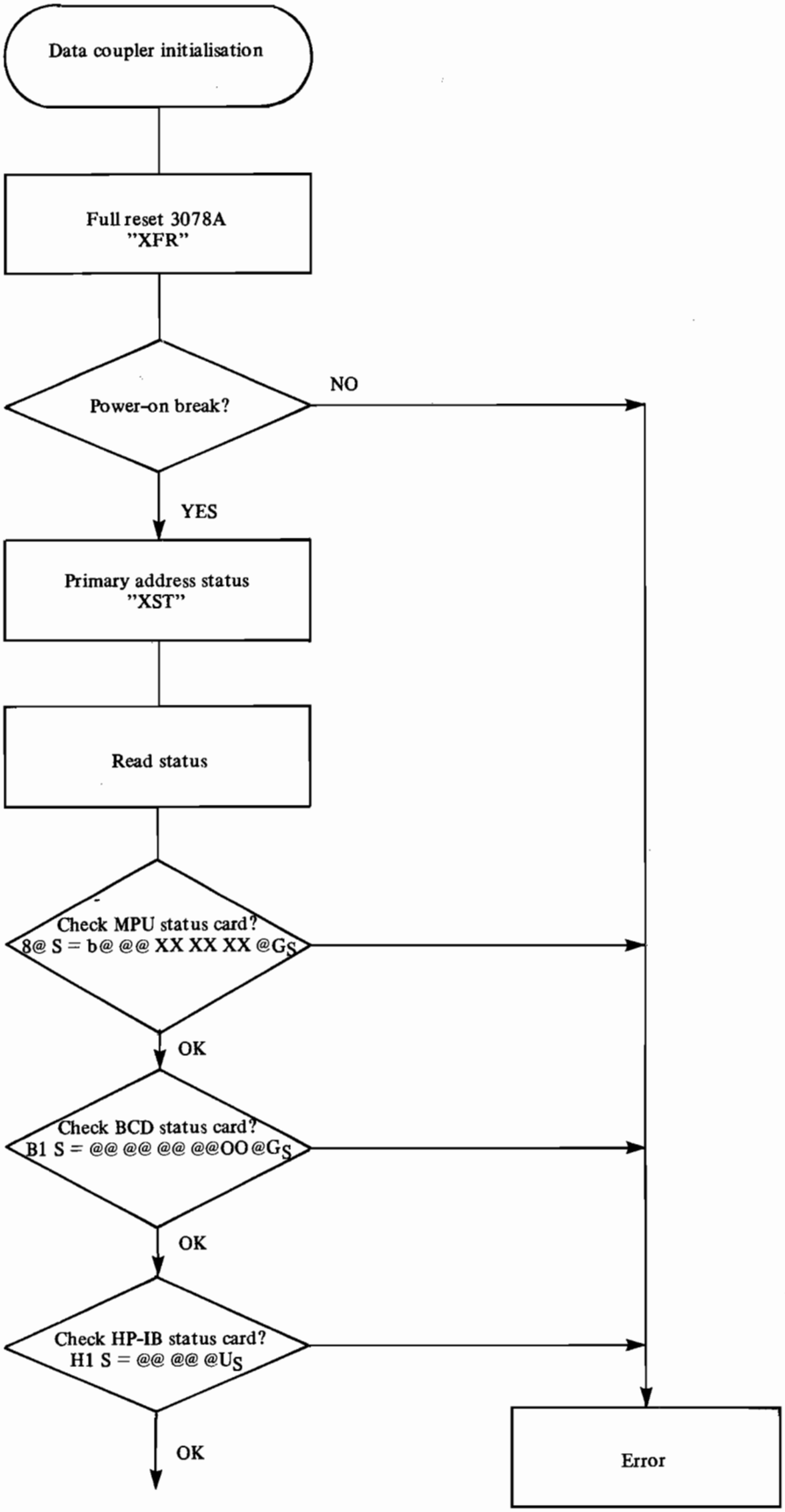
Upon POWER-ON BREAK reception the program requests the primary address status.

The primary address status has 3 parts:

- The expected MPU status part which has the following format:
  8@ S = b@ @@ XX XX XX @GS (X = don't care).
  8@ indicates that the result comes from the MPU card.
  b@ indicates that the break is due to a POWER-ON condition.
  The rest of the data is not significant at power-on.
- The expected BCD status part which has the following format:
  B1 S = @@ @@ @@ @@ OO @GS
  B1 indicates that the result comes from the BCD card 1.
  @@ indicates that the card is ok.
  The rest of the data is not significant at power-on.
- The expected HP-IB status part which has the following format:
  H1 S = @@ @@ @US
  H1 indicates that the result comes from the HP-IB card 1.
  @@ indicates that the card is ok.
  The rest of the data is not significant at power-on.

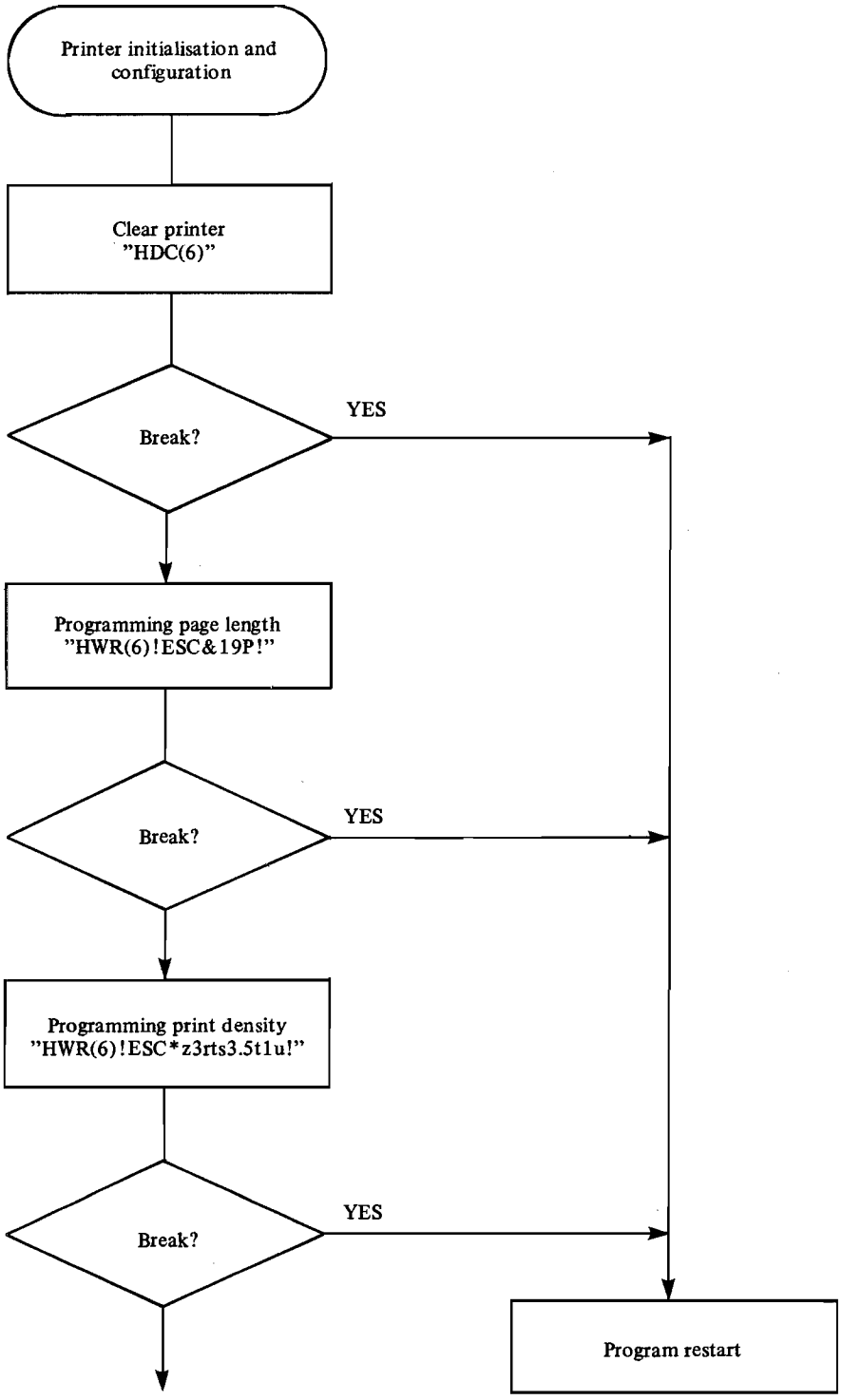
If one of the boards does not respond correctly the program aborts.

The following flow-chart details the initialisation operations.


Data coupler initialisation
Full reset 3078A
"XFR"
Power-on break?
NO
YES
Primary address status
"XST"
Read status
Check MPU status card?
8@ S = b@ @@ XX XX XX @GS
OK
Check BCD status card?
B1 S = @@ @@ @@ @@OO @GS
OK
Check HP-IB status card?
H1 S = @@ @@ @US
OK
Error

HP-IB Card Initialisation

Following is the flow-chart of the 2631G-200 initialisation and configuration.



METTLER Initialisation And Configuration

The BCD card must be configured according to the N200 interface requirements of the CL 240.

Handshake Programming. The CL 240 handshake signals are composed of 2 output signals: TRANSFER and READY; and 1 input signal: REQUEST.

The BCD card has 2 programmable channels which are able to send (output) and receive (input) data.

Each input and output channel ports has 2 handshake lines to control data exchanges: a control and a flag line.

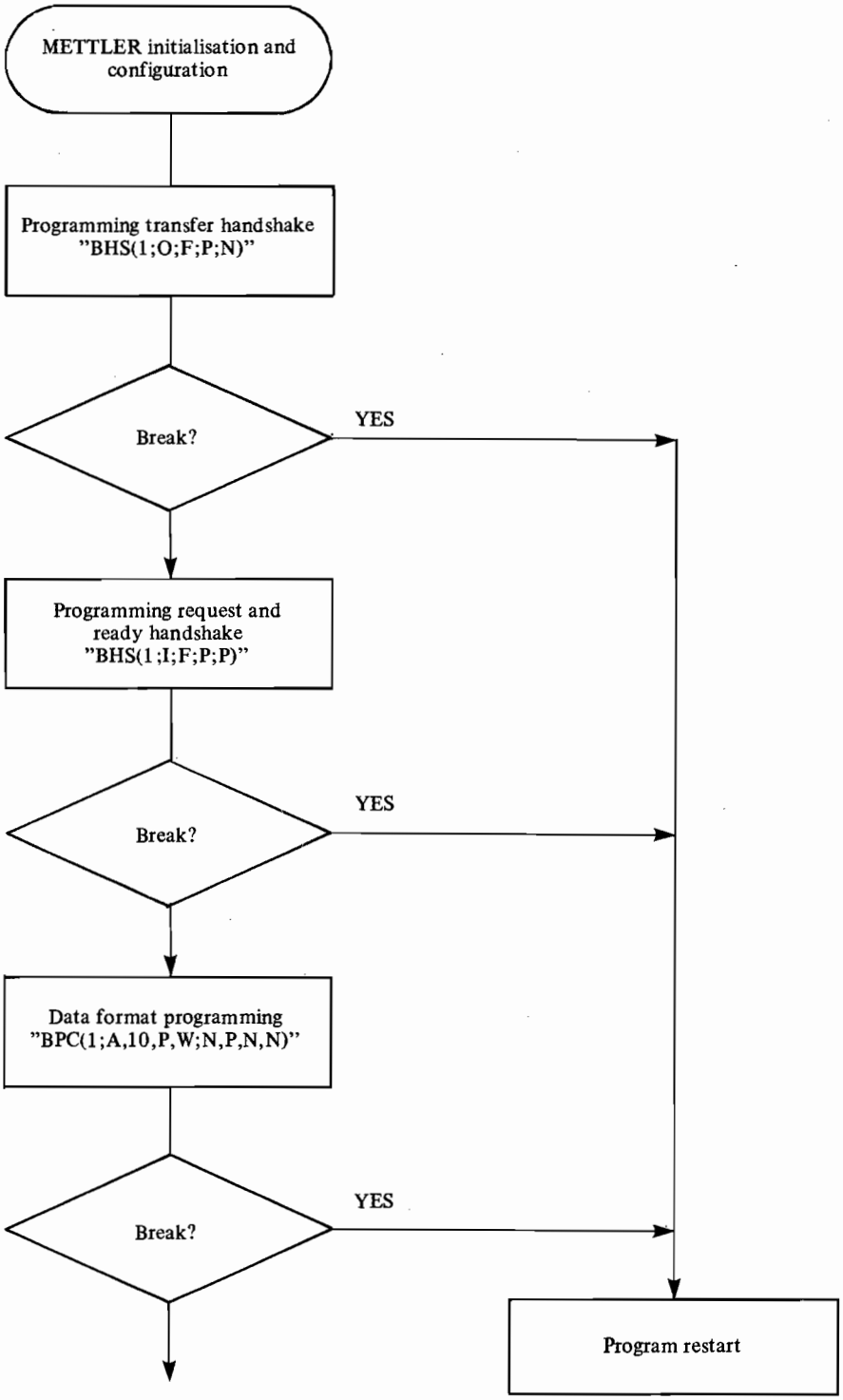
In order to handle the 3 CL 240 handshake signals properly:
- The output channel 1 is programmed in full handshake mode to control the TRANSFER line, this line being monitored by the FO1 line (active low).
- The input channel 1 is programmed in full handshake mode to control both REQUEST and READY lines, these lines being monitored respectively by the CI1 line (active high) and FI1 line (active high).

Data Format Programming. The BCD card accepts 7 BCD digits, 6 decimal points and a polarity sign coming from the CL 240 interface.

To handle this format the BCD channel is programmed in wired floating point.

The 10 connector blocks of the BCD card are allocated as follows:
- The polarity sign is handled by the data code character and is connected to connector block A.
- The BCD digits are handled by connector blocks B to H.
- The decimal points are connected to connector blocks J and K.

The following flow-chart gives the organisation of the METTLER initialisation and configuration programming.



Measurement Acquisition And Processing

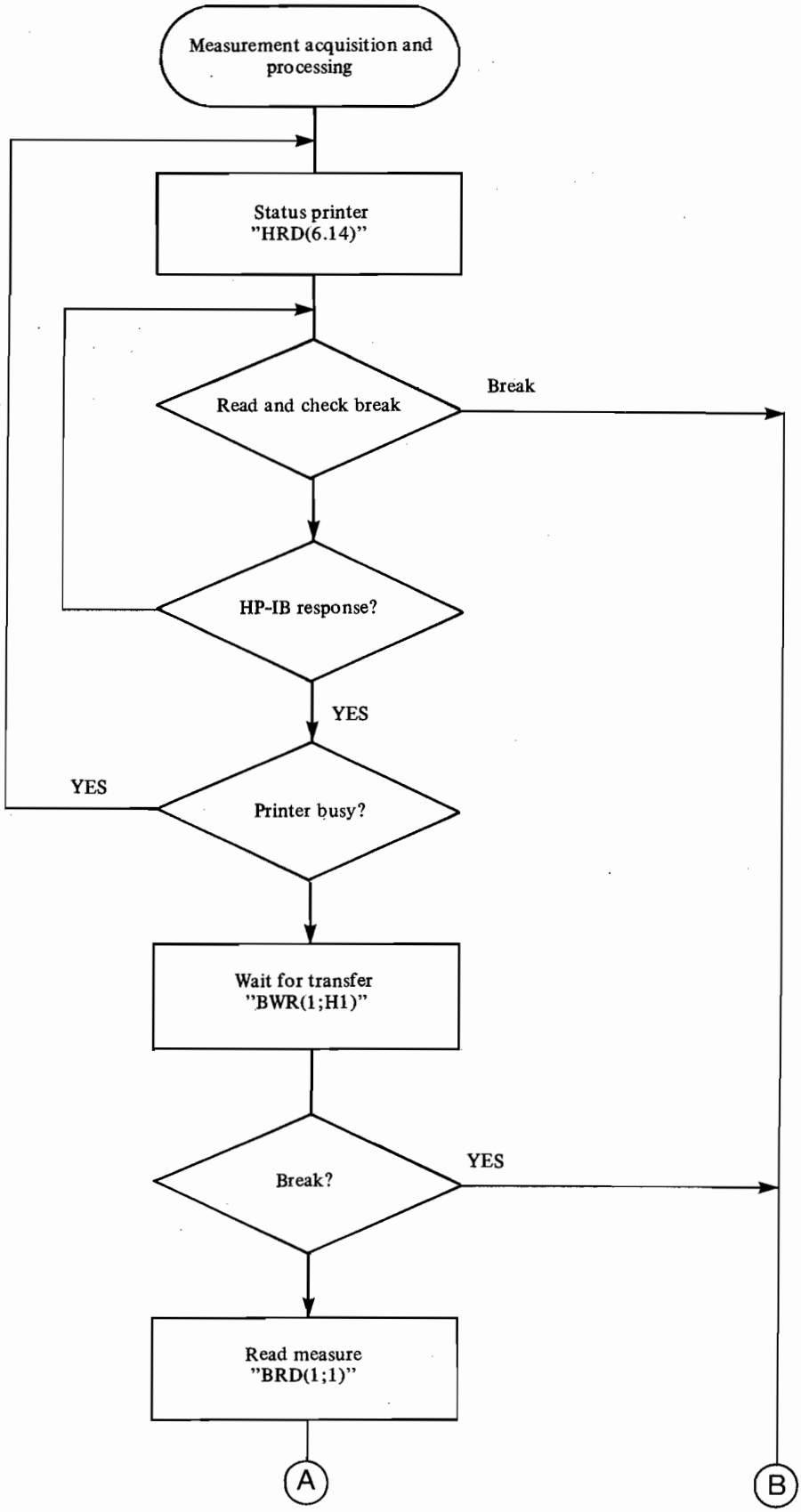
The main task of the example program is to read the measurement data coming from the weighscale to process it and to print it in bar code form on a 2631G-200 printer.

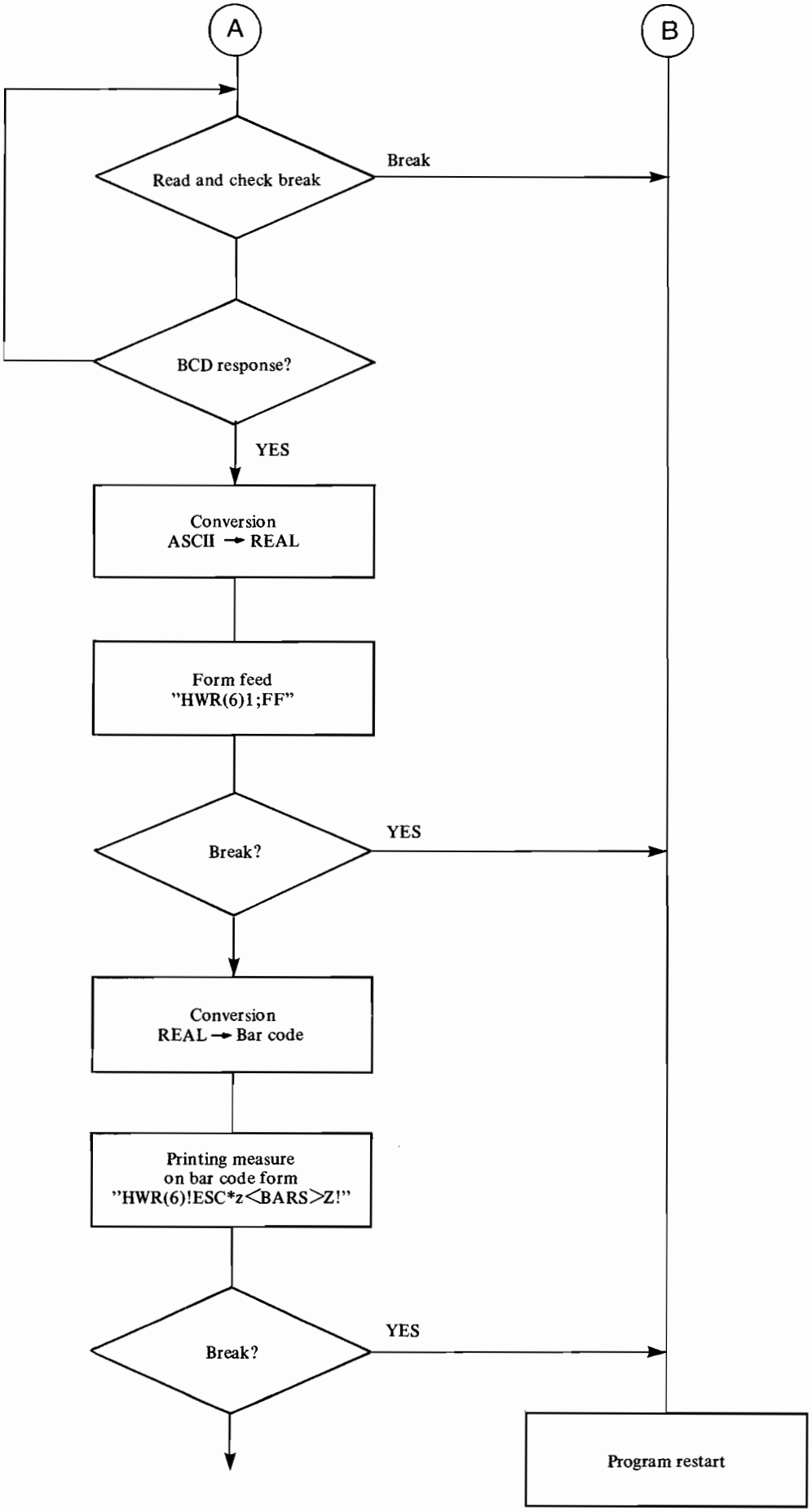
In order to get the measurement the program has to look at the transfer signal. When the transfer signal becomes active, then the program requests the measurement data from the 3078A and prints it.

Besides this external process description, is the internal description which consists of 3 independant processes running concurrently:

- The MPU process which controls inside and outside communications.
- The BCD process which controls the METTLER weighscale.
- The HP-IB process which controls the HP 2631G-200 printer.

It is the program responsibility to handle these processes in such a way that no results are lost.
The following flow-chart details the organisation of the measurement acquisition and processing module.




A
B
Read and check break
Break
BCD response?
YES
Conversion
ASCII → REAL
Form feed
"HWR(6)1;FF"
Break?
YES
Conversion
REAL → Bar code
Printing measure
on bar code form
"HWR(6)!ESC*z<BARS>Z!"
Break?
YES
Program restart

Break Processing

After each access to the data coupler the program checks that the 3078A did not send back a BREAK to the computer.

The BREAK condition allows the program to know if an error occurred during the execution of a command.

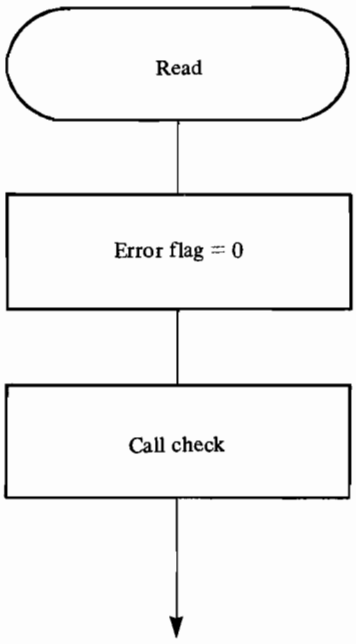
Because the 3078A sends back the character CAN on a WRITE operation and the characters DLE< on a READ operation, the FORTRAN program cannot detect these conditions but must examine the data coupler status to determine if a BREAK was sent or not.

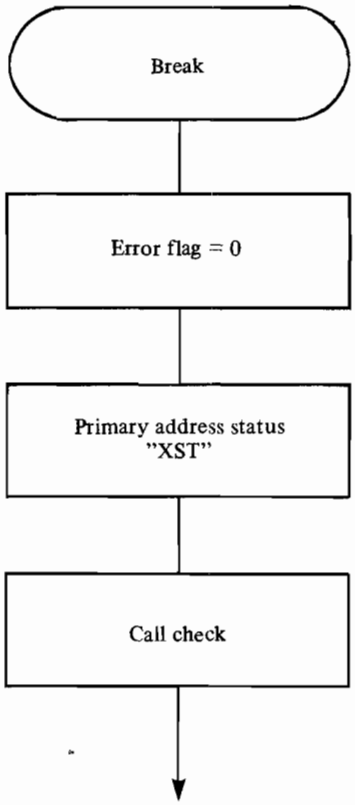
If the command generates a result, then the subroutine READ reads the result buffer and checks its validity.

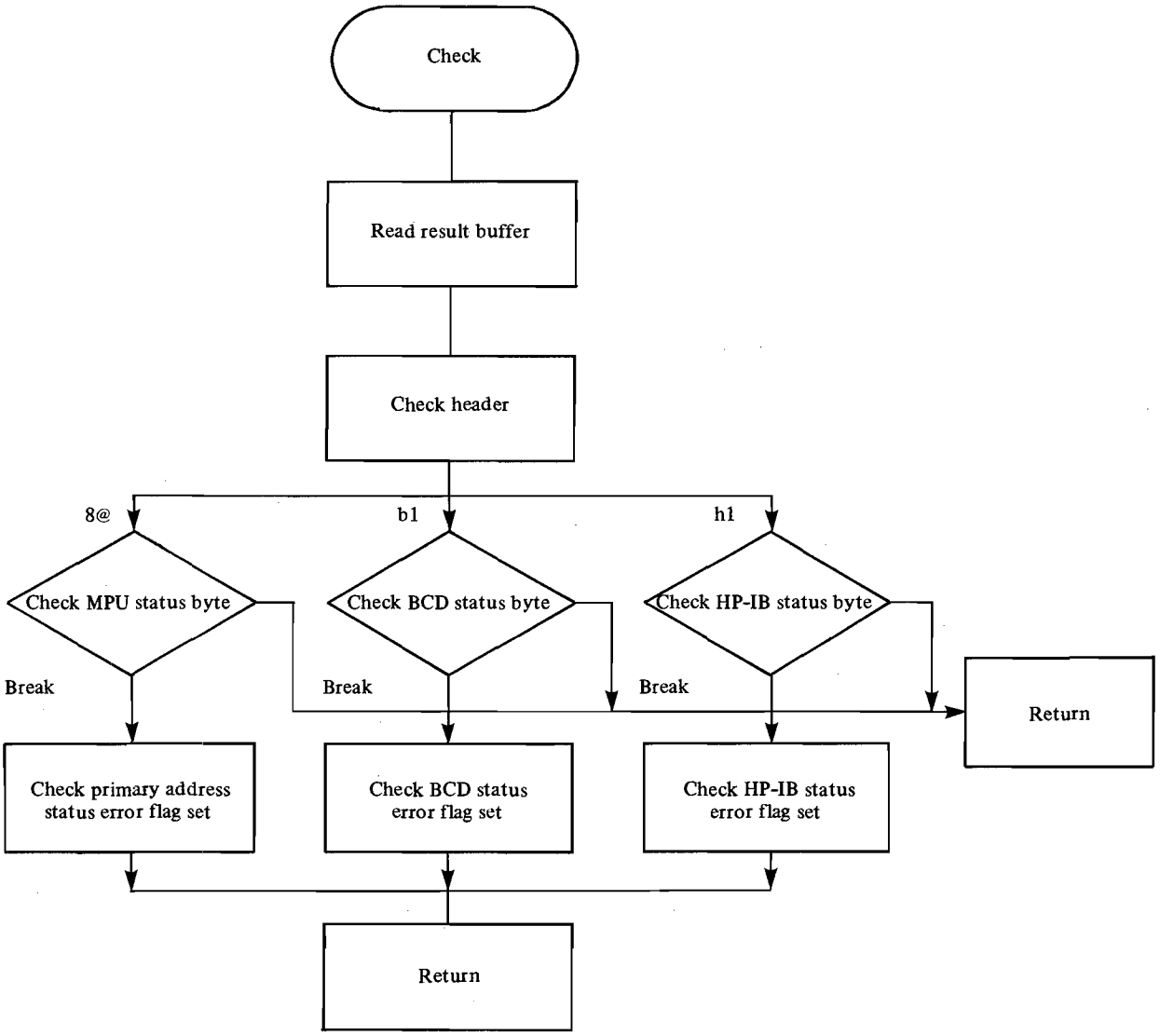
If the command does not generate a result, then the subroutine BREAK asks for the status of the data coupler and checks its validity.

Although commands are sent sequentially to the data coupler, responses arrive on a random order. So it is the responsibility of the program to check that the result buffer contains the expected result and then re-synchronize the processes.

The following flow-chart details the BREAK processing programming.

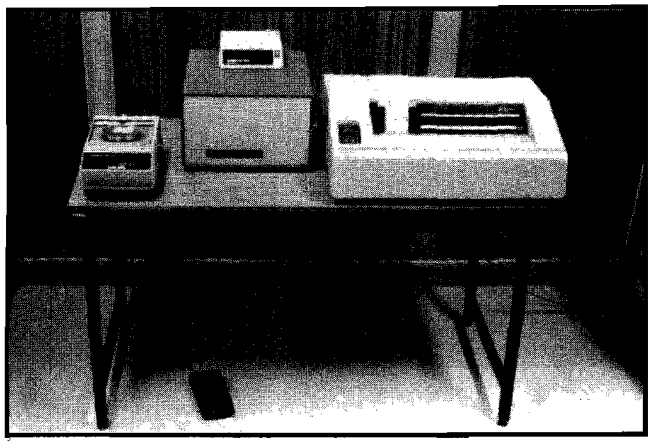






EXAMPLE PROGRAM

The following example program is written in standard FORTRAN and does not use specific HP FORTRAN statement.



```
FTN4
      PROGRAM METL
C
C
C  ****************************************************************
C        METTLER WEIGHSCALE EXAMPLE PROGRAM
C
C        HP GRENOBLE TERMINALS        11/13/1981
C  ****************************************************************
C
C
C
C     THIS EXAMPLE PROGRAM ALLOWS TO PRINT A WEIGHT MEASURED
C     ON A METTLER PK300 TO THE 2631G-200 ON A BARCODE FORM .
C
C
C     THIS EXAMPLE USES :
C
C     A 3078 CONFIGURED AS FOLLOWS :
C
C     ************************************************
C     * 3078 CONFIGURATION                           *
C     ************************************************
C     * SLOT 0  MPU                                  *
C     * SLOT 1  BCD CARD   INTERFACE TO METTLER      *
C     * SLOT 2  HPIB CARD  INTERFACE TO 2631G_200    *
C     * SLOT 3  UNUSED                               *
C     ************************************************
C
C     A METTLER WEIGHSCALE PK 300 EQUIPPED WITH A FOOT PEDAL AND
C     A BCD INTERFACE CL 240 .
C
C     A PRINTER HP 2631G-200
C
C     THIS PROGRAM USES 2 LOGICAL UNITS FOR READING AND WRITING
C     TO THE DATA COUPLER .
C     BOTH LOGICAL UNITS HAVE TO BE CONFIGURED AS FOLLOWS :
C     SL,LU1,LU1
C     CN,LU1,20B,101B        GID = A   ;  DID = A
C     CN,LU1,23B,101000B
C
C     SL,LU2,LU2
C     CN,LU2,20B,141B        GID = A   ;  DID = a
C     CN,LU2,23B,101000B
C
C     THE FOLLOWING COMMAND ALLOWS TO RUN THE PROGRAM
C     RU,METL,LU1,LU2
C
C     WHEN THE OPERATOR PRESSES THE FOOT PEDAL THE SYSTEM READS THE
C     MEASURE AND THEN SENDS IT BACK TO THE PRINTER THAT PRINTS IT
C     ON BAR CODE FORM .
C
C
C
C
C
C
      COMMON IBUF(128)
      COMMON IERR
```

```
      COMMON PRIMAD
      COMMON SCNDAD
C
      DIMENSION ILU(5)
      DIMENSION IBAR(5)
C
      INTEGER PRIMAD
      INTEGER SCNDAD
      LOGICAL RNUM
C
C   DATA INITIALISATION
C
      DATA IESC/015400B/
      DATA IFF/006000B/
      DATA ICAN/30B/
C
C
C   GET LOGICAL UNITS
C
      CALL RMPAR(ILU)
      PRIMAD=ILU(1)
      SCNDAD=ILU(2)
C
C
C
C
C
C  ********************************************************************
C        DATA COUPLER INITIALISATION
C  ********************************************************************
C
C
C   SEND XFR  - FULL RESET
C
10    IERR=0
      WRITE(SCNDAD,100)
100   FORMAT(" XFR")
C
C   LISTEN TO POWER ON BREAK
C
      IBRK=0
      READ(PRIMAD,110)IBRK
110   FORMAT(1A2)
      IBRK=IBRK/256
      IF(IBRK .EQ. ICAN) GOTO 120
      WRITE(1,115)
115   FORMAT(" DATA COUPLER IS NOT READY")
      GOTO 190
C
C   GET PRIMARY ADDRESS STATUS
C
120   DO 125 , I=1,40
      IBUF(I)=0
125   CONTINUE
      WRITE(SCNDAD,130)
130   FORMAT(" XST")
      READ(PRIMAD,135)IBUF
135   FORMAT(128A2)
      IF(IBUF(1) .NE. 0) GOTO 145
```

```
      WRITE(1,140)IBUF
140   FORMAT(" STATUS NOT READ",/," STATUS : ",128A2)
      GOTO 190
C
C   CHECK MPU CARD STATUS
C
145   IF(IBUF(1) .NE. 2H8à) GOTO 150
      IF(IBUF(3) .EQ. 2Hbà) GOTO 160
150   WRITE(1,155)IBUF
155   FORMAT(" MPU STATUS ERROR",/," STATUS :",128A2)
      GOTO 190
C
C   CHECK BCD CARD STATUS
C
160   CALL BCDCK(N)
      IF(IERR .EQ. 1) GOTO 190
C
C   CHECK HPIB CARD STATUS
C
      CALL HPICK(N)
      IF(IERR .EQ. 1) GOTO 190
C
C   SEND MESSAGE TO CONSOLE OPERATOR
C
      WRITE(1,180)
180   FORMAT(10X," INITIALISATION SUCCESSFULL")
      GOTO 200
C
190   WRITE(1,195)
195   FORMAT(" HARDWARE FAILURE")
      STOP 0001
C
C
C
C  ****************************************************************
C        INITIALIZING THE 2631G-200      ADDRESS = 6
C  ****************************************************************
C
C   CLEAR HPIB DEVICE
C
200   WRITE(SCNDAD,210)
210   FORMAT(" HDC(6)")
      N=1
      CALL BREAK(N)
      IF(IERR .EQ. 1) GOTO 10
C
C   PROGRAMMING PAGE LENGTH
C
      WRITE(SCNDAD,220)IESC
220   FORMAT(" HWR(6)!",A1,"&l9P!")
      N=2
      CALL BREAK(N)
      IF(IERR .EQ. 1) GOTO 10
C
C   PROGRAMMING PRINT DENSITY
C
      WRITE(SCNDAD,230)IESC
230   FORMAT(" HWR(6)!",A1,"*z3rls3.5t1U!")
      N=3
```

```
      CALL BREAK(N)
      IF(IERR .EQ. 1) GOTO 10
C
C
C
C  ****************************************************************
C       PROGRAMMING THE METTLER HANDSHAKE
C  ****************************************************************
C
C
C   SELECT OUTPUT HANDSHAKE MODE (DUMMY CHANNEL)
C   DEVICE 1/OUTPUT/FULL HANDSHAKE/C01 ACTIVE 1/F01 ACTIVE 0
C          /      /               / NOT USED    /TRANSFER LINE
C
      WRITE(SCNDAD,300)
300   FORMAT(" BHS(1;O;F;P;N)")
      N=4
      CALL BREAK(N)
      IF(IERR .EQ. 1) GOTO 10
C
C   SELECT INPUT HANDSHAKE MODE
C   DEVICE 1/INPUT/FULL HANDSHAKE/CI1 ACTIVE 1/FI1 ACTIVE 1
C           /     /               /REQUEST LINE/READY LINE
C
      WRITE(SCNDAD,310)
310   FORMAT(" BHS(1;I;F;P;P)")
      N=5
      CALL BREAK(N)
      IF(IERR .EQ. 1) GOTO 10
C
C   SELECT INPUT BCD DATA CONFIGURATION
C   DEVICE 1/1rst CONNECTOR/10 CONNECTOR/POSITIVE DATA/WIRED FLOATING
C           /PANNEL A      / BLOCKS     /POLARITY     /POINT BCD
C
C   DATA CODE CARACTER:OVERLOAD/EXPONENT SGN/MANTISSA SGN/1/2 DIGIT
C                      POLARITY/             /             /POLARITY
C                      NOT USED/NOT USED    /ACTIVE LOW  /NOT USED
C
      WRITE(SCNDAD,320)
320   FORMAT(" BPC(1;A,10,P,W;N,P,N,N)")
      N=6
      CALL BREAK(N)
      IF(IERR .EQ. 1) GOTO 10
C
C  ****************************************************************
C       MEASUREMENT ACQUISITION AND PROCESSING
C  ****************************************************************
C
C
C   PRINTER READY ?
C
330   WRITE(SCNDAD,335)
335   FORMAT(" HRD(6.14)")
      CALL READ(N)
      IF(IERR .EQ. 1) GOTO 10
      IF(IBUF(1) .NE. 2Hh1) GOTO 330
      IBF=(IBUF(3) .AND. 177400B)/256
      IF(IBF .GT. 0) GOTO 10
```

```
C
C    SEND MESSAGE TO CONSOLE OPERATOR
C
350    WRITE(1,351)
351    FORMAT(" SYSTEM READY TO ACCEPT A MEASURE")
C
C    WAIT FOR TRANSFER SIGNAL
C
       WRITE(SCNDAD,355)
355    FORMAT(" BWR(1;H1)")
       N=8
       CALL BREAK(N)
       IF(IERR .EQ. 1) GOTO 10
C
C    SEND READ COMMAND
C
       WRITE(SCNDAD,360)
360    FORMAT(" BRD(1;1)")
C
C    GET RESULT
C

       N=10
370    CALL READ(N)
       IF(IERR .EQ. 1) GOTO 10
       IF(IBUF(1) .NE. 2Hb1) GOTO 370
       IF(RNUM(IBUF,5,16,RESU)) GOTO 395
C
C    SEND RESULT TO CONSOLE
C
       WRITE(1,380)RESU
380    FORMAT(30X," WEIGHT : ",F10.2,"  gr")
C
C    SKIP TO NEXT LABEL
C
       WRITE(SCNDAD,385)IFF
385    FORMAT(" HWR(6)1;",A1)
       N=11
       CALL BREAK(N)
       IF(IERR .EQ. 1) GOTO 10
C
C    PROCESS RESULT
C
       IRESU=IFIX(RESU*100)
       DO 390 N=1,4
       IBAR(N)=(IRESU/(10**(N-1)))-((IRESU/(10**N))*10)
390    CONTINUE
       IBAR(5)=IRESU/(10**4)
       GOTO 400
395    WRITE(1,396)
396    FORMAT(" UNSUCCESSFULL CONVERSION")
       STOP 002
C
C    PRINTING MEASURE ON CODE 39 BARCODE FORM
C
400    WRITE(SCNDAD,410)IESC,IBAR(5),IBAR(4),IBAR(3),IBAR(2),IBAR(1)
410    FORMAT(" HWR(6)!",A1,"*z<",3I1,".",2I1,">Z!,")
       N=12
       CALL BREAK(N)
```

```
      IF(IERR .EQ. 1) GOTO 10
C
      GOTO 330
C
C
C
      END
C
C
C  ****************************************************************
C        BREAK WRITE PROCESSING
C  ****************************************************************
C
C        THIS ROUTINE RESETS THE ERROR FLAG IERR .
C        THEN SENDS A STATUS REQUEST OPERATION AND CALLS THE
C        ROUTINE THAT READS AND CHECKS THE RESULT BUFFER .
C
      SUBROUTINE BREAK(N)
C
C
C
      COMMON IBUF(128)
      COMMON IERR
      COMMON PRIMAD
      COMMON SCNDAD
C
      INTEGER PRIMAD
      INTEGER SCNDAD
C
C
C
      IERR=0
C
C   SEND XST STATUS 3078
C
      WRITE(SCNDAD,10)
10    FORMAT(" XST")
C
C   GET PRIMARY ADDRESS STATUS
C
      CALL CHECK(N)
      RETURN
C
C
C
      END
C
C
C   ****************************************************************
C        READ
C   ****************************************************************
C
C        THIS ROUTINE RESETS THE ERROR FLAG IERR AND CALLS THE ROUTINE
C        THAT READS AND CHECKS THE RESULT BUFFER .
C
       SUBROUTINE READ(N)
C
C
C
```

```
      COMMON IBUF(128)
      COMMON IERR
      COMMON PRIMAD
      COMMON SCNDAD
C
      INTEGER PRIMAD
      INTEGER SCNDAD
C
C
C
      IERR=0
      CALL CHECK(N)
      RETURN
C
C
C
      END
C
C
C  ***********************************************************************
C        READ AND CHECK ROUTINE
C  ***********************************************************************
C
C        THIS ROUTINE READS THE RESULT BUFFER OF THE 3078A .
C
C        IT CHECKS THE RESULT HEADER (WORD 1) .
C
C        IF THE RESULT HEADER CORRESPOND TO MPU STATUS WORD IT THEN
C        CHECKS THE GENERAL STATUS BYTE (BYTE 5) TO DETECT A BREAK
C        OCCURENCE . IF A BREAK IS DETECTED IT CALLS A ROUTINE THAT
C        SEARCH FOR THE DEFFECTIVE CARD , IF NOT IT RETURNS .
C
C        IF THE RESULT HEADER CORRESPOND TO AN INTERFACE CARD IT THEN
C        CHECKS THE RESPONSE HEADER (WORD 2) .
C        IF THE RESPONSE IS A STATUS IT CHECKS FOR THE BREAK OCCURENCE .
C        IF A BREAK IS DETECTED IT CALLS THE ROUTINE ASSOCIATED WITH
C        THE SPECIFIC CARD .
C        IF THE RESPONSE IS A RESULT OR IF THERE IS NO BREAK IT RETURNS .
C
      SUBROUTINE CHECK(N)
C
C
C
      COMMON IBUF(128)
      COMMON IERR
      COMMON PRIMAD
      COMMON SCNDAD
C
      INTEGER PRIMAD
      INTEGER SCNDAD
C
C
C
      DATA IBCD/9/
      DATA IHPIB/17/
C
      DO 10 I=1,128
      IBUF(I)=0
10    CONTINUE
```

```
C
      READ(PRIMAD,20)IBUF
20    FORMAT(128A2)
C
      IF(IBUF(1) .EQ. 2H8à) GOTO 30
      IF(IBUF(1) .EQ. 2Hb1) GOTO 40
      IF(IBUF(1) .EQ. 2Hh1) GOTO 50
      IERR=1
      RETURN
C
30    IBRK=(IBUF(3)/256) .AND. 40B
      IF(IBRK .EQ. 0) RETURN
      CALL STCK(N)
      RETURN
C
40    IF(IBUF(IBCD+2) .EQ. 2HS=) GOTO 45
      RETURN
45    IBRK=(IBUF(IBCD+3)/256) .AND. 40B
      IF(IBRK .EQ. 0) RETURN
      CALL BCDCK(N)
      RETURN
C
50    IF(IBUF(IHPIB+2) .EQ. 2HS=) GOTO 55
      RETURN
55    IBRK=(IBUF(IHPIB+3)/256) .AND. 40B
      IF(IBRK .EQ. 0) RETURN
      CALL HPICK(N)
      RETURN
C
      END
C
C
C
C   ************************************************************************
C         STATUS CHECK
C   ************************************************************************
C
C         THIS ROUTINE CHECKS ALL THE CARD INSTALLED IN THE 3078 A
C         AS LONG AS ONE CARD DOES NOT SET THE ERROR FLAG IERR .
C
      SUBROUTINE STCK(N)
C
      COMMON IBUF(128)
      COMMON IERR
C
      CALL MPUCK(N)
      IF(IERR .EQ. 1) RETURN
      CALL BCDCK(N)
      IF(IERR .EQ. 1) RETURN
      CALL HPICK(N)
      IF(IERR .EQ. 1) RETURN
      RETURN
C
      IF(IBUF(IBCD+1) .NE. 2HS=) GOTO 110
      IF(IBUF(IBCD+2) .EQ. 2Hàà) GOTO 100
      IF(IBUF(IBCD+2) .NE. 2HAà) GOTO 110
100   IF(IBUF(IBCD+3) .NE. 2Hàà) GOTO 110
      RETURN
110   WRITE(1,111)N,IBUF
```

```
C
C
      END
C
C
C
C     ***************************************************************
C          CHECK MPU STATUS
C     ***************************************************************
C
C          THIS ROUTINE CHECKS THE MPU STATUS CARD .
C          IF THE STATUS IS NOT CORRECT IT SETS THE ERROR FLAG IERR .
C
      SUBROUTINE MPUCK(N)
C
C
C
      COMMON IBUF(128)
      COMMON IERR
C
C
C
      IF(IBUF(1) .NE. 2H8à) GOTO 100
      IF(IBUF(2) .NE. 2HS=) GOTO 100
      IF(IBUF(3) .NE. 2Hàà) GOTO 100
      IF(IBUF(4) .NE. 2Hàà) GOTO 100
      RETURN
100   WRITE(1,101)N,IBUF
101   FORMAT(" MPU STATUS ERROR AT :",I4,/,"  STATUS : ",128A2)
      IERR=1
      RETURN
C
C
C
      END
C
C
C
C     ***************************************************************
C          CHECK BCD STATUS
C     ***************************************************************
C
C          THIS ROUTINE CHECKS THE BCD STATUS CARD
C          IF THE STATUS IS NOT CORRECT IT SETS THE ERROR FLAG IERR .
C
      SUBROUTINE BCDCK(N)
C
C
C
      COMMON IBUF(128)
      COMMON IERR
C
C
C
      DATA IBCD/9/
C
C
C
      IF(IBUF(IBCD) .NE. 2HB1) GOTO 110
```

```
111   FORMAT(" BCD STATUS ERROR AT :",I4,/," STATUS : ",128A2)
      IERR=1
      RETURN
C
      END
C
C   ***********************************************************************
C        CHECK HPIB STATUS
C   ***********************************************************************
C
C        THIS ROUTINE CHECKS THE HPIB STATUS CARD .
C        IF THE STATUS IS NOT CORRECT IT SETS THE ERROR FLAG IERR .
C
      SUBROUTINE HPICK(N)
C
      COMMON IBUF(128)
      COMMON IERR
C
      DATA IHPIB/17/
C
      IF(IBUF(IHPIB) .NE. 2HH1) GOTO 110
      IF(IBUF(IHPIB+1) .NE. 2HS=) GOTO 110
      IF(IBUF(IHPIB+2) .EQ. 2Hàà) GOTO 100
      IF(IBUF(IHPIB+2) .NE. 2HAà) GOTO 110
100   IF(IBUF(IHPIB+3) .NE. 2Hàà) GOTO 110
      RETURN
110   WRITE(1,111)N,IBUF
111   FORMAT(" HPIB STATUS ERROR AT : ",I4,/," STATUS : ",128A2)
      IERR=1
      RETURN
C
      END
C
      END$
```

REFERENCE MANUALS

METTLER PK 300 Operating Instructions	ME-700298
METTLER CL 240 Operating Instructions	ME-700340
METTLER N200 Description	ME-700027
HP 3078A Data Coupler Reference Manual	03078-90001
40281A BCD Input Card Reference Manual	40281-90001
91730A Multipoint Terminal Interface subsystem	91730-90002

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Printed in France - 12/81