HP 3438A Digital Multimeter

◀ HP-IB ▶

HP 1000 Computer

Programming Guide

HEWLETT *hp* PACKARD

Device Introduction

The 3438A is a low cost, general purpose, 3-1/2 digit, single channel multimeter capable of measuring ohms and ac or dc voltage or current. When operating on the HP-IB, it can be programmed to trigger locally (internally) or remotely (at the command of the controller). All other functions must be selected manually from the instrument's front panel. Autoranging can be used for voltage and resistance measurements.

The device has a large dynamic range (millivolts to kilovolts) and its dual slope integration technique gives it very good noise rejection.

This note should be used with Application Note 401-1, *System Preparation, Procedures and Programs* (5953-2800).

Addressing

The 3438A is shipped from the factory with its address preset to octal 27. If a different address is desired, it may be changed by removing the top cover of the instrument and changing the address switches located on the A3 logic board. (See figure 6-1.)
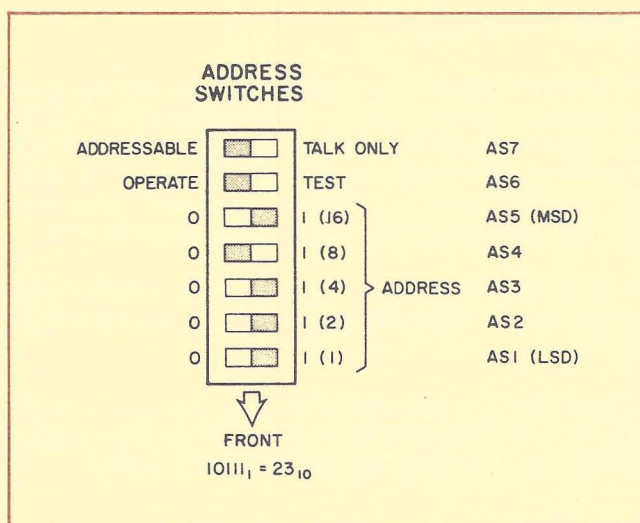

System Preparations

LU Assignment

Once the physical address has been set in the 3438A, an LU can be assigned from File Manager. LU 15 may be assigned to EQT 11, for example. If the 3438A address were set to 27B, the request would be:

    :SYLU,15,11,27B

Buffering

Buffering is not applicable to the 3438A because the device is not programmable.

Time-out

Time-out can be used to indicate an error condition within the 3438A. The usefulness of time-out will be application-dependent. Since the 3438A may often require manual connection of leads and manual selection of range and function, it may be desirable to have time-outs handled by a user program so the console can prompt the operator to check for the proper DVM settings.

In other cases where errors are expected infrequently, the handling of a time-out may be left to the operating system.

Since the integration technique of the DVM gives up speed for noise rejection and extra time is also required for range changes, the time-out value should be fairly long.

Figure 6-1. 3438A Address Switches

ADDRESS SWITCHES

ADDRESSABLE	TALK ONLY	AS7
OPERATE	TEST	AS6
O	I (16)	AS5 (MSD)
O	I (8)	AS4
O	I (4)	AS3
O	I (2)	AS2
O	I (1)	AS1 (LSD)

FRONT

$10111_1 = 23_{10}$

Remember that the time-out value must be a compromise for all devices on the bus. If other devices are present, make sure this longer time-out will not effect their operation. For EQT 11,

    :SYTO,11,400

will set a four-second time-out.

Configuration

The 3438A needs no special configuration on HP-IB. The configuration word should be checked and verified so that DMA is not allocated to the device.[1]

Remote

If the 3438A is not programmed for remote operation, it will operate in the local mode with internal triggering. In this mode it will continuously take readings and send the current reading to the controller when addressed.

When in the remote mode, the 3438A will take a reading only when it is triggered by the controller.

Programming

Measurements are taken by the device, and the measurement values are returned to the HP 1000 in ASCII.

When in remote, the 3438A measurement cycle is a two-step process. First the device is triggered, then the measurement is read. The 3438A can be triggered using the 'TRIGR' subroutine, then the measurement may be input into the computer using a FORTRAN "READ" request.

The 3438A returns both the reading and also the front panel function selected (i.e., DC volts, AC volts, etc.). The front panel shows the "listen" function on HP-IB, but this refers

only to its listening for a trigger message. The reading is sent in scientific notation followed by a comma and then the function as a single digit. Therefore, it should always be read into two variables, even if the function is not desired.

    INTEGR F
    CALL TRIGR(15)
    READ (15,*) X,F

will read the function into variable F and the actual reading into variable X.

The function can be decoded as follows:

    1 = DCV
    2 = ACV
    3 = DCA
    4 = ACA
    5 = OHM

The program in Figure 6-2 can be used to display the function value.

Note that free field input can be used instead of a format statement. Only one 3438A reading can be obtained per request; however, a loop can be used to make multiple readings.

The 3438A has no service request ability.

Performance

Since the 3438A is not programmable, measurement speed in most applications is not as critical as it might be in a fully automated system. The measurement speed of the 3438A can be expected to be in the range of a maximum of 2.4 to 4.7 readings per second to a mimimum of several seconds per reading depending on the function and ranges selected.

If more precise values are needed, the multimeter performance may be measured as described in Application Note 401-1.

If there are other devices on the HP-IB, it is recommended that the 3438A be used in the remote mode. Otherwise, all devices on the bus will also be under local control.

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[1]Use the BSCU, (AN 401-1, chapter 3) for checking device configuration.

```
0001  FTN4,L
0002        PROGRAM A3438(3),04-23-78 (GWG) TEST 3438A
0003        INTEGER F
0004        COMMON ILU,ILST,IDLU
0005        DATA NO/2HNO/
0006        IF(INPRM(ID).EQ.NO) GO TO 999          Get input parameters.
0007      6 CALL TRIGR(IDLU)                       Trigger the multimeter.
0008        READ(IDLU,*)X,F                        Read the measurement, and the
                                                   function type.
0009        IF(F.EQ.1) ASSIGN 1 TO IFORM
0010        IF(F.EQ.2) ASSIGN 2 TO IFORM
0011        IF(F.EQ.3) ASSIGN 3 TO IFORM
0012        IF(F.EQ.4) ASSIGN 4 TO IFORM
0013        IF(F.EQ.5) ASSIGN 5 TO IFORM
0014      1 FORMAT(1X,E14.6," DC VOLTS")
0015      2 FORMAT(1X,E14.6," DC VOLTS")
0016      3 FORMAT(1X,E14.6," DC VOLTS")
0017      4 FORMAT(1X,E14.6," DC VOLTS")
0018      5 FORMAT(1X,E14.6," DC VOLTS")
0019        WRITE(ILST,IFORM)X
0020        IF(IFBRK(ID))6,7
0021      7 STOP
0022    999 WRITE(ILU,8)
0023      8 FORMAT(" A3438: :RU,A3438,ILST,IDLU"/)
0024        END
```

Figure 6-2. 3438A Test Program

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