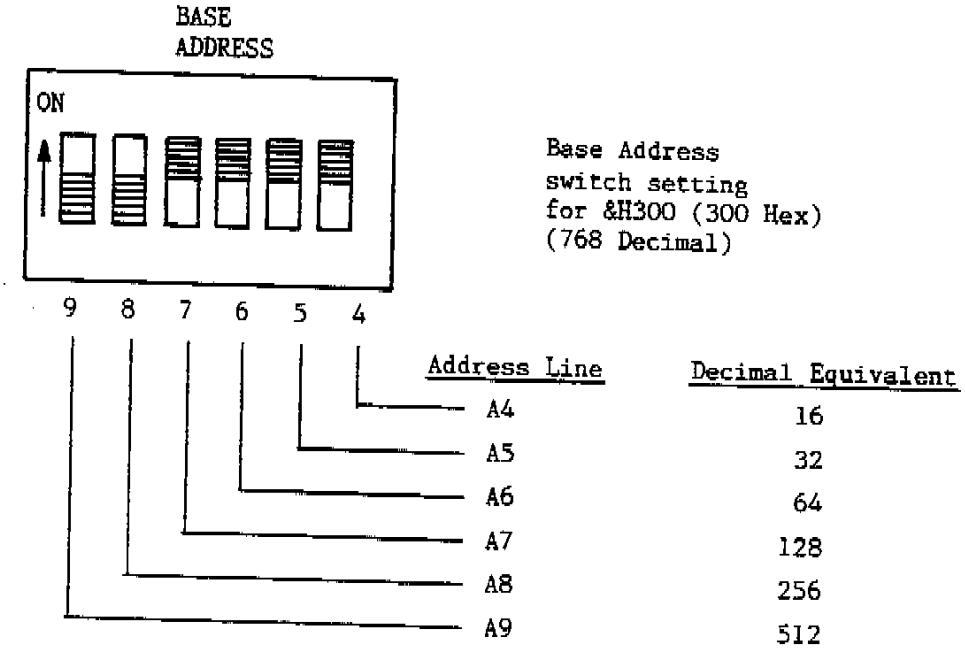
TURN OFF THE POWER on your computer and remove the case (See IBM "Guide to Operations" pages 5.5 & 5.6 if you are not already expert at this maneuver). Remove a vacant back plate by undoing the screw at the top and press in the card guide supplied with the DASCON-1 on the opposite side of the case (some models may not require this). Slip the DASCON-1 in and secure the backplate. That completes installation. You may plug any of the DASCON-1 accessories or your own cable into the 37 pin D connector on the rear. **Remember the golden rule, whenever removing or re-installing any peripheral board including the DASCON-1 always TURN OFF THE POWER.** Failure to observe this precaution may cause costly damage to the electronics of your computer.

Two more precautions concerning storage and handling of the DASCON-1 board. MetraByte recommends that you retain the special electrostatically shielded package and use it for storage of DASCON-1 when not in your computer. Also after removal, the nickel-cadmium clock backup battery will be charged and will remain charged up to several months. Try to avoid shorting it out by placing DASCON-1 on conductive metal surfaces as the large short circuit currents that can flow are detrimental to the life of the battery.

Fig. 2.2 shows the locations of switches and functions on the DASCON-1 board.



Switches have decimal values as above in the "off" position
In the "on" position decimal value is zero.

Fig. 2.1: BASE ADDRESS SWITCH SETTING

Chapter 3

PROGRAMMING

3.1 PROGRAMMING DASCON-1

There are two ways of inputting and outputting data from the DASCON-1. The direct method uses the BASIC functions INP and OUT. Use of these functions usually involves formatting the data and dealing with absolute I/O addresses. Although not difficult, it can involve many lines of code and requires an understanding of the devices, data format and architecture of the DASCON-1. The second method uses a special I/O driver routine "DASCON1.BIN" which is accessed via a CALL statement. This allows selection of all functions on the DASCON-1 and avoids writing many lines of INP's and OUT's and formatting routines. The driver looks after all formatting and does a certain amount of error checking. The driver also supports data collection on interrupt from an external source or the DASCON-1 clock. This capability is not supported by the IBM P.C. BASIC as it has no interrupt processing functions and is only available through the CALL routine.

Both methods of programming using BASIC alone or the CALL routine are described and you are free to choose either although usually the CALL routine is far easier to implement.

3.1.1 I/O ADDRESS MAP OF DASCON-1

First of all let's take a look at the I/O address map of the DASCON-1:-

ADDRESS	READ	WRITE
Base Address + 0	A/D CH0 Lo byte	D/A 0 Lo byte
+ 1	A/D CH0 Hi byte	D/A 0 Hi byte & LOAD
+ 2	A/D CH1 Lo byte	D/A 1 Lo byte
+ 3	A/D CH1 Hi byte	D/A 1 Hi byte & LOAD
+ 4	A/D CH2 Lo byte	-
+ 5	A/D CH2 Hi byte	-

+ 6		A/D CH3 Lo byte	-
+ 7		A/D CH3 Hi byte	-
+ 8		PA Digital In	PA Digital Out (used by clock)
+ 9		PB Digital In	PB Digital Out (user port)
+ 10	{A}	PC Digital In	PC Digital Out (user & clock)
+ 11	{B}	-	PPI Control Reg.
+ 12	{C}		
+ 13	{D}	PPI image i.e. identical	
+ 14	{E}	to locations 8 - 11.	
+ 15	{F}		

Note that some addresses do double duty. A/D converters only output data and D/A converters only require input data so a read of address base + 0 fetches A/D Channel 0 data and a write to base + 0 outputs D/A #0 data. Since both the A/D and D/A are 12 bit devices, it requires 2 bytes to handle each word of data. These are arranged in the order lo byte/hi byte which is mainly a convenience for assembly language programmers since the the 8088 processor in the IBM PC accesses data in this sequence. Now we know what's where, let's start talking to each device in turn using INP's and OUT's.

3.1.2 INP A/D DATA

If no connections are made to the LOAD CH.ADR., CH.AD#0, CH.AD#1, and RUN/HLD (pins 21-24) on the rear connector, the A/D cycles thru each channel 0 to 3 and repeats continuously. Since the A/D performs about 16 conversions/sec. each channel is updated every 1/4 second. This is called "free scan" mode and is very simple to use. The data from the A/D is stored in registers on the DASCON-1 board, one register for each channel. They are arranged so that no conflicts between read and writes can occur. What this amounts to is that you can read A/D data at any time and always be sure of obtaining valid data from a conversion that took place no longer than 1/4 second ago. In this mode you are free from initiating conversions and checking A/D status, worrying about A/D timing etc. and this is ideal for low speed data logging. All you have to do to obtain data is:-

```
xxx00  XL% = INP (Base + 0,2,4 or 6)
xxx10  XH% = INP (Base + 1,3,5 or 7)
```

If the base address was at &H300, INP(&H300/301) returns CH0, INP(&H302/303) gets CH1 etc. The variables XL% and XH% contain the data, which is formatted as follows:-

BIT POSITION	(MSB) 7	6	5	4	3	2	1	0 (LSB)
XL% Low byte:	B8	B7	B6	B5	B4	B3	B2	B1 (LSB)
XH% High byte:	Pol.	O/R	0	0	B12 (MSB)	B11	B10	B9

The A/D data bits B12-B1 are true binary. The Pol. (polarity or sign) bit is 1 (high) if the input is positive and 0 (low) if negative. The O/R (overrange) bit is 1 (high) if the input exceeds positive or negative full scale (+/-4095 decimal). Extracting the data can be performed by a few lines of BASIC as follows:-

```
xxx20 CH0% = XL% + 256*(XH% AND &HF)                          ;get magnitude
xxx30 IF (XH% AND &H80 ) = 0 THEN CH0% = -CH0%                ;mask sign,
                                                               change if negative
xxx40 IF (XH% AND &H40 )=1 THEN OLF=1 ELSE OLF=0 ;set overload flag
                                                               if required.
```

Channel 0 data is now in integer variable CH0% as a signed number of bits of A/D output. If we wish to change this to volts, remember with direct input +/-4095 bits correspond to +/-2.0475 volts i.e. 0.5 millivolt/bit. To scale into volts (a real variable is required) :-

```
xxx50 CH0 = 0.0005 * CH0%
```

Obviously if we were working with gains of 10,100,1000 etc. or attenuators on Channel 0/1 we could change line xxx50 to compensate for the scaling. If we were using the RTD thermometers on Channel 2 or 3 each bit would correspond to 0.2 degree Centigrade.

3.1.3 OUT D/A DATA

Since the D/A converters output 12 bit data, they require 2 bytes of input data. The first task of any BASIC program is to form the data into a low byte and high byte. Coding for the D/A converters is complementary binary or complementary offset binary for bipolar output ranges. Data format is:-

BIT POSITION	(MSB) 7	6	5	4	3	2	1	0 (LSB)
Low byte:	$\overline{B8}$	$\overline{B7}$	$\overline{B6}$	$\overline{B5}$	$\overline{B4}$	$\overline{B3}$	$\overline{B2}$	$\overline{B1}$
High Byte:	IO3	IO2	IO1	IO0	$\overline{B12}$ (MSB)	$\overline{B11}$	$\overline{B10}$	$\overline{B9}$

The top nybble (4 bits) of the high byte appears on the auxiliary I/O header (DAC I/O 04-07 & 14-17), a total of 8 bits for the 2 channels. Let's assume we want to output X% (0 <= X% <= 4095). Decimal 4095 corresponds to Hex FFF or 12 binary bits. A sequence of BASIC commands to output X% to D/A #1, (BASADR = DASCON-1 base address), would be as follows:-

```
xxx00 X% = 4095 - X%          'complements data
xxx10 XH% = INT(X%/256)       'generates high byte
xxx20 XL% = X% - 256*XH%      'generates low byte
xxx30 OUT BASADR + 2, XL%     'write low byte
xxx40 OUT BASADR + 3, XH%     'write high byte
```

Note that due to the double-buffering of the D/A, the output voltage of the D/A will not change until line xxx40 is executed. Line xxx30 writes the low byte to a temporary storage latch. When the high byte is written in line xxx40 the temporarily stored low byte and high byte are loaded 12 bits broadside into the D/A. This "double buffering" gives a single step change of the D/A output instead of 2 sequential steps. In some applications e.g. driving plotters and servos this characteristic is important. If you want to output data on the auxiliary I/O, it can be summed with XH% before line xxx40.

3.1.4 DIGITAL I/O WITH OUT AND INP

The main digital I/O is via an 8255-5 P.P.I. (Programmable Peripheral Interface) integrated circuit. For detailed technical information on this device, consult the "Intel Component Data Catalog"[3] or equivalent manufacturer's data sheet. The 8255 has 24 digital I/O lines divided into 3 ports of 8 bits each. These are called PA,PB and PC. The PC port is further divided into 2 independent 4 bit ports, PC0-3 is termed PClower and PC4-7 is called PCupper. In DASCON-1, the PA and PCupper ports are dedicated to controlling the clock/calendar. The PB and PClower ports are available as main digital I/O on the rear connector.

All the ports may be programmed as whole groups of inputs or outputs under software control. This is is done via the P.P.I. control register at BASADR + 11. The PA,PB and PC ports are read/write i.e. data written to them can be later read back. The control register is a write only register, reading it will not yield the data that it contains. On powerup all ports are cleared and reset to be inputs. Also note that any change of configuration i.e. write to the control register will clear data on all ports.

---

3. Available from Intel Corporation, 3065 Bowers Avenue, Santa Clara, CA. 95051. Phone [408]-987-8080

The clock/calendar normally operates with PA as an output and PCupper as an input except when it is being set, in which case PCupper is programmed as an output. Usually all time and date information will be transferred to the system (DOS) clock on powerup by running CLKPWRUP through an AUTOEXEC.BAT file. After this is done access to time and date is much more direct through BASIC's TIME$ and DATE$ functions than by access to the DASCON-1 clock/calendar through the P.P.I. although such access is possible, see Appendix D. Six possible combinations of I/O are possible with the PB and PClower external I/O. These are:-

	CONTROL REGISTER WORD
PB output - PClower input	137 (Hex 89)
PB output - PClower output	136 (Hex 88)
PB input - PClower output	138 (Hex 8A)
PB input - PClower input	139 (Hex 8B)
PB strobed output - PClower handshake	141 (Hex 8D)
PB strobed input - PClower handshake	143 (Hex 8F)

One of the first steps in any program should be setting the configuration i.e. whether PB/PClower is input/output. This is done by writing the appropriate control register word e.g.:-

```
xxx00 OUT BASDADR + 11, &H89  'sets PB output, PClower input
```

Note that a characteristic of the 8255 P.P.I. is that a write to the control register clears all ports, so be prepared to store or rewrite your data if you later change the port configuration. After the configuration is set, you can then write or read PB and PC by:-

```
xxx10 OUT BASADR + 9, X%       'output data on PB
xxx20 INP (BASADR + 9),X%      'read PB
xxx30 OUT BASADR + 10, Y%      'output data on PC
xxx40 INP (BASADR + 10),Y%     'read PC
xxx50 Y% = Y% AND &HF          'mask out clock
```

When reading PC, you will normally get the clock/calendar data in the upper nybble of PC. Line xxx50 masks this out to return the lower nybble, PClower. The strobed or handshake modes are best used through the CALL routine.

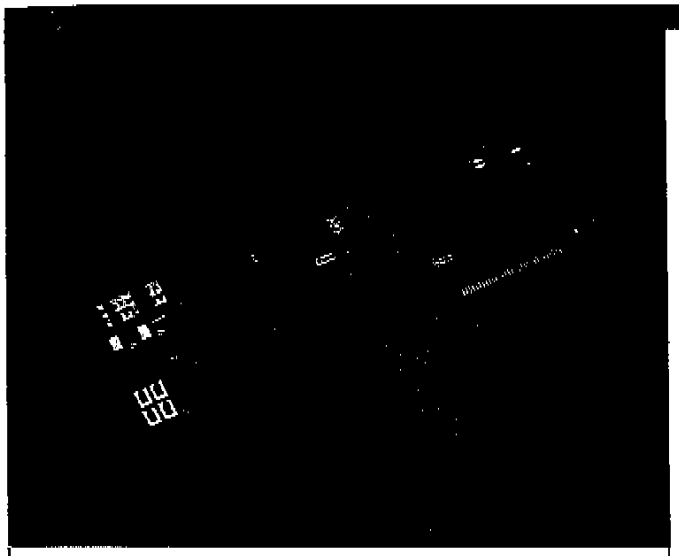
3.1.5 OTHER USEFUL BASIC COMMANDS

Some BASIC commands which you may not have used frequently in the course of ordinary programming, but that are useful with DASCON-1 are:-

KEITHLEY METRABYTE

ANALOG AND DIGITAL I/O INTERFACE BOARD MODEL DASCON-1

DATA ACQUISITION AND CONTROL FOR IBM PC/XT/AT AND COMPATIBLE COMPUTERS



FEATURES

- One YEAR WARRANTY
- SOFTWARE INCLUDED
  - Data Acquisition and Control
  - Graphics-plotting and storing graphs (real-time and later analysis)[1]
  - Transducer and RTD Linearization
  - CRT-Assisted Board Calibration/Set-Up Procedures
  - Examples and Demonstration Programs
  - Strip-Chart Recorder & Data-Logger Programs
  - 1 CALL Statement accesses all Analog and Digital I/O
- EASY TO USE
- Board plugs directly into the I.B.M. PC/XT/AT
- 12 Bits of Digital I/O
- 12 Bit resolution of Analog I/O
- 4 Analog Input Channels with OverVoltage Protection to 120 Volts rms
- 4 Analog Input 30 dB (60Hz) Switchable Filters
- 2 Switch Selectable RTD Interfaces
- 2 Analog Output Channels (optional)
- 2 Precision Adjustable Voltage References
- 2 Precision 1mA Constant Current Sources
- 2-3-4 Wire RTD Bridge Operation
- Battery Backed-Up Clock/Calendar
- External Interrupt Capabilities
- 30 Channels Per Second Throughput
- Easy to Understand Instruction Manual With Practical Examples

[1]IBM Color Adapter Board Required

FUNCTIONAL DESCRIPTION

MetraByte's DASCON-1 is a multifunction analog/digital I/O expansion board for the IBM Personal Computer. It is designed to allow use of the IBM P.C.[1]/XT/AT in low speed, high precision data acquisition and control.

Using state of the art data conversion components, the DASCON-1 has been designed to combine in a single board most of the features usually provided as plug in options to expensive external data acquisition systems and with a significant saving in cost. Some applications include: data logging, process control, robotics, meteorology, energy management, product testing, laboratory and medical instrumentation etc. but provision of the combination of analog and digital functions has been carefully selected to provide considerable flexibility in application.

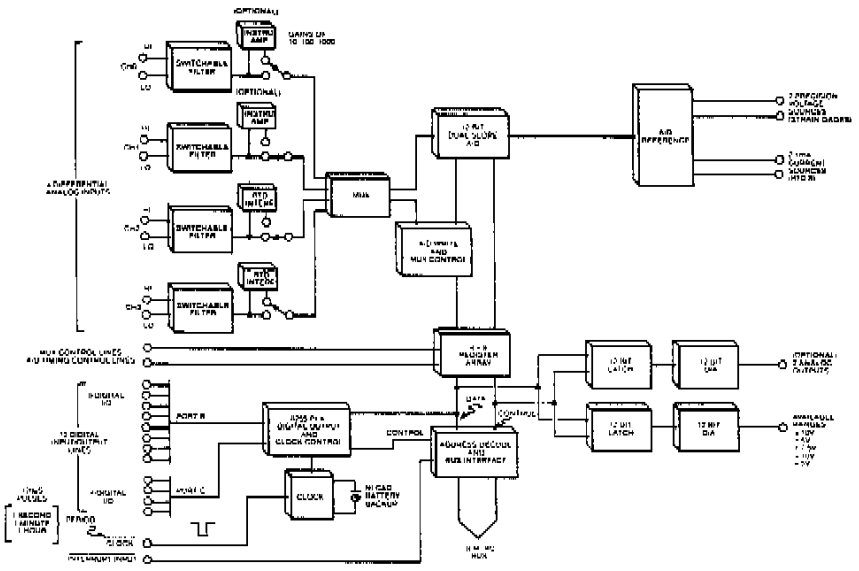
Throughout this data sheet is a complete section-by-section description of all the capabilities of the DASCON-1.

1. IBM IS A REGISTERED TRADEMARK OF INTERNATIONAL BUSINESS MACHINES INC.

APPLICATIONS

- Energy Management
- Strain Gauge Inputs
- Pressure Measurement
- Flow Measurement
- Level Monitoring And Control
- Product Testing
- Measuring Resistance

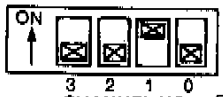
BLOCK DIAGRAM



*MBC and MetraByte are trademarks of MetraByte Corp.

ANALOG INPUTS

Channels 0 and 1 of the A/D converter may be equipped with optional LM363D instrumentation amplifiers by plugging into the sockets provided and selecting appropriate gains of 10,100 or 1000 by switches. The instrumentation amplifiers provide gain scaling for thermocouples and all types of resistance bridge transducers e.g. load cells and strain gages and extend F.S. range down to ± 2.0475 millivolts with a resolution to 0.5 microvolt/bit. System noise at this level is approximately ± 1 microvolt and drift typically 1 microvolt/deg C.. 2 other inputs, channel 2 and 3 are switch selectable for direct input or use with the built-in interfaces for 2, 3 or 4 wire RTD's for temperature measurement.



ANALOG INPUT FILTER SWITCH

CHANNEL 1 SHOWN IN THE ABOVE SWITCH CONFIGURATION IS THE ONLY ONE WITH THE 30db (60 Hz) FILTER INSTALLED.

If input signals are unavoidably noisy, an additional 30 dB of attenuation at 60 Hz can be switched into each channel with the 4 position filter dipswitch located beneath the bank of trimpots on the top left of the board (please note that the channels run from right to left on this switch). Switching to the "ON" position engages a single pole passive RC filter (20 dB/decade attenuation slope). The filter time constant will introduce a 0.9 second settling time penalty for 0.01% settling to a full scale step input. Note that the filter can be engaged on any channel and any input configuration (direct/RTD/instrumentation amplifier) without interacting with other channels.

VOLTAGE/CURRENT SOURCES

2 Precision, adjustable voltage reference outputs are included and each output can be adjusted between +/−6.8 Volts at 5mA. These references are useful for exciting Strain Gauge Bridges and other user supplied circuits.

2 Precision 1mA constant current sources are provided (−10 to +2.5 Volts compliance) for purposes of exciting RTD's, semiconductor temperature sensor's, measuring resistance or providing user selected offsets.

DIGITAL I/O

12 bits of digital I/O on the main connector are composed of one port of 8 bits and another of 4 bits. Each port may be independently programmed as an input or output and is TTL/CMOS compatible. The electromechanical relay board and the solid-state I/O module board accessories utilize these ports as a means to monitor and control various AC and DC loads.

INTERRUPT CAPABILITIES

External interrupt control is provided so that the user can select any of the I.B.M. PC interrupt levels (2-5) for programmed interrupt routines. This will then allow background Data Acquisition and interrupt control.

ANALOG OUTPUT CHANNELS

There are 2 optional channels of 12 bit D/A output available. The industry standard DAC-80-Z-CBI-V converters are a user option, and are easily installed by plugging into the sockets provided. Output ranges of ±10, ±5, ±2.5, ±10, +5 v are D.I.P. switch selectable and digital inputs are double-buffered to provide instantaneous single step update.

RTD INTERFACES

2 built in R.T.D. (Platinum resistance thermometer) interfaces can be switched into ANALOG INPUT Channels 2 & 3. These provide built in temperature measurement capability from −200 deg.C to +650 deg.C with 0.2 deg.C resolution using industry standard 100 ohm platinum RTD probes (Alpha = 0.00385). Lead resistance compensation is included for 3 and 4 wire probes.

BASE ADDRESS SWITCH

DASCON-1 requires 16 consecutive address locations in I/O space. Some I/O address locations will be occupied by internal I/O and your other peripheral cards, so to provide flexibility in avoiding conflict with these devices DASCON-1's I/O address can be set by the Base Address D.I.P. switch to be anywhere in the I.B.M. P.C. decoded I/O space. This also allows use of more than one DASCON-1 in a single computer.

Usually, a good choice is to put the DASCON-1 at base address Hex &H300,&H310 or &H320 (Decimal 768,784,800). (Note if you are using an IBM prototype board, it uses the Hex 300-31F address space and would conflict). As an aid to setting the base address D.I.P. switch located just to the left above the gold plated edge connector, type:-

A> BASICA BASWITCH

When you get the "Desired base address?" prompt, type in your choice in decimal or IBM &H— format and press return. The program will round your address to the nearest 16 bit boundary, check for possible conflicts with standard IBM I/O devices and warn you if so, **draw a picture of the correct positions of the toggles on the base address DIP switch and ask you if you want to generate a DASCON1.ADR file.**

BASE ADDRESS SWITCH SETTING FOR &H300 (300 HEX) (768 DECIMAL)

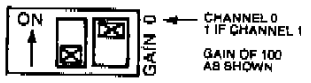
ADDRESS LINE	DECIMAL EQUIVALENT
A4	16
A5	32
A6	64
A7	128
A8	256
A9	512

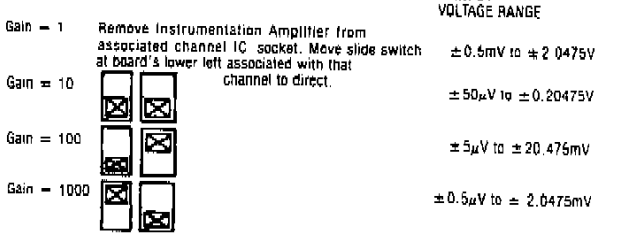
SWITCHES HAVE DECIMAL VALUES AS ABOVE IN THE "OFF" POSITION. IN THE "ON" POSITION, DECIMAL VALUE IS ZERO.

BATTERY BACKED-UP CALENDAR CLOCK

The board also contains a battery backed-up real time clock/calendar. This clock is used to automatically update the I.B.M. PC's time and date functions thus eliminating DOS prompts for manual entry upon power-up, and is accurate to 2 seconds per month. Under normal use the batteries will keep the module's time and date for 2 months without recharging on the system's power. The clock also provides reference pulses of 1 Second, 1 Minute, or 1 Hour intervals or outputs a frequency of 1024 Hz which can be used as a source of processor interrupts or to initiate external timing.

GAIN SWITCH CONFIGURATION





INSTRUMENTATION AMPLIFIER GAIN SETTING SWITCHES

SOFTWARE

MetraByte Software is included with the purchase price of the DASCON-1. One of the items the software contains is a simple to use I/O driver subroutine accessed by a single BASIC "CALL" statement. Also included are utility programs for installation assistance, graphics, a polynomial approximation to linearize most transducers (RTD's, Strain Gauges, Thermistors, thermocouples), and step-by-step CRT-assisted Calibration/Set-Up procedures for the entire board.

The single CALL statement is used to access all Analog and Digital I/O on the board. Of course the INP and OUT Commands standard with I.B.M.'s bASIC can also be used to access all I/O and is explained in detail in the comprehensive User's Instruction Manual.

Each mode of the CALL statement listed below has an example program provided for easy understanding and rapid use of the DASCON-1.

The Graphics package includes a provision which lets the user plot predicted vs. actual measured data from an experiment in real time, and store the entire graph for retrieval at a later date.

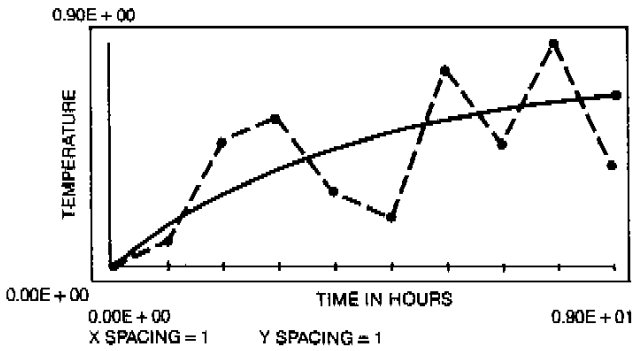
The following table illustrates the 11 MODES of the CALL statement available to the DASCON-1 user.

CALL DASCON1 (MD%, CH%, DIO% (0), DIO% (1), BASADR%)

The values contained within the parentheses are integers.

MD% = Mode CH% = Channel number
DIO% (8) = A Data I/O Integer Array
BASADR% = The Baseaddress of the DASCON-1 currently accessed

MODE	FUNCTION	CHANNEL	DATA I/O INTEGER ARRAY
0	Free Scan of all Analog Inputs	Doesn't Matter	DIO% (0-3) Channel 0-3 Data DIO% (4-7) Channel 0-3 Error Flags DIO% (8) Mode, Channel Error Flags
1	Conversion on One Analog Input. Data Transferred When Finished	0-3	DIO% (CH%) Channel Data DIO% (CH% + 4) Channel Error Flag DIO% (8) Mode, Channel Error Flag
2	Conversion on all Analog Inputs. Data Transferred When Finished	Doesn't Matter	DIO% (0-3) Channel 0-3 Data DIO% (4-7) Channel 0-3 Error Flags DIO% (8) Mode, Channel Error Flags
3	Conversion on all Analog Inputs Initiated by Interrupt. Data Transferred When Finished	Interrupt Level (2-5)	Use Mode 6 To obtain Data After Interrupt DIO%(8) Mode, Interrupt Level Error Flag
4	Terminates Interrupt Processing Initiated By Modes 3 and 5	Doesn't Matter	DIO% (8) Mode Error Flag
5	Free Scan Of All Analog Inputs. Data Collected on Interrupt	Interrupt Level (2-5)	Use Mode 6 To Obtain Data After Interrupt DIO% (8) Mode, Interrupt Level Error Flag
6	Collect Data After An Interrupt Using Modes 3 or 5	Doesn't Matter	DIO% (0-3) Channel 0-3 Data DIO% (4-7) Channel 0-3 Error Flags DIO% (8) New-Old Data Flag
7	Single Channel Analog Output	0 or 1	DIO% (0) Channel 0 or 1 Output DIO% (1) Not Used DIO% (8) Mode, Channel Error Flag
8	Output Data To Both Analog Output Channels	Doesn't Matter	DIO% (0) Channel 0 Output Data DIO% (1) Channel 1 Output Data DIO% (8) Mode Error Flag
9	Digital I/O On 8 Bit Port PB And 4 Bit Port PC	0-PB Output, PC Input 1-PB Output, PC Output 2-PB Input, PC Input 3-PB Input, PC Output 4-PB Strobed Output, PC0-2 Handshake PC3 Input 5-PB Strobed Input, PC0-2 Handshake PC3 Input	DIO% (0) If PB Output, Data (0-255) If PB Input, Data (0-255) DIO% (1) If PC Output, Data (0-15) If PC Input, Data (0-15) DIO% (8) Data Range, Mode, Channel Error Flag
10	Enables/Disables Clock Output Pulse	Enabled, CH% = 1 Disabled, CH% = 0	DIO% (8) Mode Error Flag



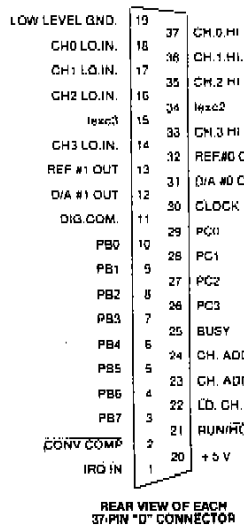
A TYPICAL GRAPH OF TEMPERATURE Vs. TIME

PROGRAMMING EXAMPLE — ENERGY MANAGEMENT

```
 10 CLEAR, 32768!
 20 DEF SEG=0
 30 SG=256*PEEK (&H511) + PEEK (&H510)
 40 DASCON1=0
 50 SG=(32768!/16)+SG
 60 DEF SEG=SG
 70 BLOAD "DASCON1.BIN", 0
 80 DIM DIO% (8)
 90 DIM REL% (8)
100 BASADR%=&H300
110 MD%=0
120 RD%=9
130 RH%=0
140 CLS
150 FOR J=1 TO 100
160 FOR I=1 TO 1000
170 NEXT I
180 CALL DASCON1 (MD%, CH%, DIO% (0), DIO% (1), BASADR%)
190 IF DIO% (2)/5>20 THEN RIO% (0)=1:GOTO 220 'Turn on Air
    Conditioner
200 IF DIO% (2)/5<19 THEN RIO% (0)=2:GOTO 220 "Turn on
    Heater
210 RIO% (0)=0
220 CALL DASCON1 (RD%, RH%, RIO% (0), RIO% (1), BASADR%)
230 NEXT J
240 END
```

The Above program example illustrates the ease at which the DASCON-1 can be utilized in the controlling of temperature. Each Bit is equivalent to 0.2 Degree C. Resolution. Therefore, 5 bits is equivalent to one degree C. Program line #190 examines the value of the temperature read from the RTD (Resistive Temperature Detector) on Channel 2's Analog Input. If the temperature in degrees C. is greater than 20 (68°F) then turn on the Air Conditioner or Chiller. If (on line #200) the temperature is less than 19 Degrees C. (66.2°F), then turn on the heater. If the temperature is between 19 and 20 Degrees, then write a "Zero" onto the port connected to the relays controlling the environment, and de-energize both units.

CONNECTOR PIN ASSIGNMENTS



REAR VIEW OF EACH 37-PIN "D" CONNECTOR

All Analog and Digital I/O from the DASCON-1 connects via a ribbon cable to the STA-01's 37-Pin male D Connector located near the LED drivers. The other 37-Pin male D Connector's function is to daisy-chain to one or the other optional accessory boards available for the DASCON-1, namely: the ERA-01 and SRA-01. Instead of the optional 18" ribbon cable available (Model # C1800), longer lengths may be obtained from MetraByte. For soldered connections a standard 37 pin D female (ITT/Cannon DC-37S or equivalent) is the correct mating part, and can be ordered from MetraByte as part # SFC-37. Insulation displacement (flat cable) connectors are available from Amp (#745242-1), 3M, Winchester, Robinson-Nugent etc.

SPECIFICATIONS

ANALOG INPUT SPECIFICATIONS

4 analog input channels each with the following specification:-

Resolution	12 bits plus sign, (0.5 mV/bit)
Accuracy	0.01% of reading ± 1 bit.
Full scale	±2.0475 volts
Polarity	Automatic
Zero	Automatic
Overvoltage	Continuous single channel to 120 v. R.M.S. 5 seconds all channels to 120 v R.M.S.
Configuration	Full differential
Common Mode Range	± 2 v min.
Common Mode Rejection	60 dB min., 70 dB. typ.
Input current	1 nA max at 25 deg.C.
Input filter	Switchable on each channel. 30 dB attenuation at 60 Hz. 0.9 sec. settling time to 0.01% for F.S. step
Temperature Coefficient	Gain or F.S., ±25 ppm/deg.C. max. Zero, ±10 microvolt/deg.C. max.

A/D SPECIFICATION

Type	Integrating dual slope with auto-zero.
Resolution	12 bits plus sign
Conversion rate	30 conversions/sec. max
Monotonicity	Guaranteed over operating temperature range.
Linearity	±1 bit.
Zero drift	1 microvolt/deg.C. max.
Gain drift	5 ppm/deg. C. max.

OPTIONAL INSTRUMENTATION AMPLIFIERS

Specification using commercial grade LM363D instrumentation amplifiers as follows:-

Allocated channels	Channels 0 and/or 1 (Maximum number 2)
Switchable gain ranges	10, 100 or 1000
Gain error	Gain = 10, error 1.5% max, 0.6% typ. Gain = 100, error 0.5% max, 0.1% typ. Gain = 1000, error 1.5% max. 0.4% typ.
Gain non-linearity	0.01% typ., 0.05% max.
Drift	Gain = 10, 10 uV/deg.C. typ, 100 uV/deg.C. max. Gain = 100, 2 uV/deg.C. typ, 10 uV/deg.C. max. Gain = 1000, 1 uV/deg.C. typ, 5 uV/deg.C. max.
Gain temperature coefficient	Gain = 10 or 100, 5 ppm/deg.C. typ. Gain = 1000, 15 ppm/deg.C. typ.
Input current	10 nA max., 2 nA typ. at 25 deg.C.
Common Mode Range	−2.7 v to +3.8 v min.
Common Mode Rejection	Gain = 10, 105 dB typ., 90 dB min Gain = 100, 120 dB typ., 94 dB min. Gain = 1000, 130 dB typ., 114 dB min.
Overload capacity	120 v. RMS continuous single channel

RTD INTERFACES

Allocated channels	2 and/or 3 (Maximum 2)
RTD type	100 ohm. Alpha = 0.00385 (DIN or European) platinum 2/3/4 wire.
Temperature range	−200 to +650 deg.C. with 0.2 deg.C. resolution (MetraByte standard probe has +260 deg.C. upper limit due to epoxy seal)
Excitation current	1.000mA
Lead resistance compensation	Included for 3 & 4 wire RTD types.

D/A OUTPUT CHANNELS

D/A output channels use industry standard DAC-80 D/A converters with a voltage output. These should be of a type characterized for satisfactory operation from ±12v supplies.

Switch selectable output ranges	0 to +10 v (unipolar) 0 to +5 v (unipolar) −2.5 to +2.5 v (bipolar) −5 to +5 v (bipolar) −10 to +10 v (bipolar)
Output current	±5 mA min.
D.C. output impedance	0.05 ohm typ.
Short circuit protection	Continuous
Coding	Complimentary binary or offset binary
Resolution	12 bits (1 part in 4095)
Differential linearity	1/2 LSB typ., 3/4 LSB max.
Linearity	1/4 LSB typ., 1/2 LSB max.
Monotonicity	Guaranteed in operating temperature range.
Buffering	Double buffered, single step update.
Zero drift	±3 ppM of F.S./deg.C. max
Gain drift	±30 ppM of F.S./deg.C. max.
Setting time	5 microsec. to 0.01% for F.S. step.

DIGITAL I/O

Main digital I/O is via The PB and PC ports of an 8255-5 programmable peripheral interface.

Output low voltage	0.45v max at Isink = −1.7 mA (1 standard TTL load)
Output high voltage	2.4v min at Isource = 200 uA
Darlington drive	4 mA max, 1 mA min with Rext = 750 ohm (available on any 8 outputs together)
Input low voltage	0.8 v max, −0.5 v min
Input high voltage	2.0 v min, 5 v max
Input current	±10 uA max.

The auxiliary I/O connector has the same output specifications as above except that the output sink current capacity is 24 mA.

VOLTAGE AND CURRENT SOURCES

2 independent voltage sources (Ref 0 & 1) and 2 independent current sources (Iexc2 & 3) have the following specifications:-

Voltage sources	±6.8 v at 5 mA max. (User adjustable)
Current sources	1.000 mA with 1000 Megohm output impedance at D.C.
Compliance of current sources	−10 v to +2.5 v min.
Temperature coefficient	±30 ppm/deg.C. max.

ENVIRONMENTAL

Operating temperature range	0 to 50 deg.C.
Storage temperature range	−20 to +70 deg.C.
Humidity	0 to 90% non-condensing.
Weight	10 oz. (284 gms)

POWER SUPPLIES

+5 v supply	450 mA typ. / 600 mA max.
−5 v supply	8 mA typ. / 15 mA max.
+12 v supply	70 mA typ. / 100 mA max.
−12 v supply	60 mA typ. / 100 mA max.

WARRANTY 1 YEAR

ORDER: DASCON-1

STA-01 Optional Screw Terminal Board

C-1800 STA-01 to DASCON-1 Cable