

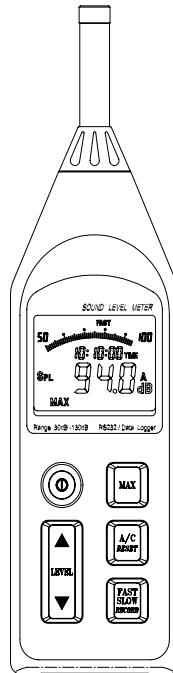
User's Manual



Datalogging Sound Level Meter

Model 407764

- Range: 30dB to 130dB
- 4-digit LCD Display with 0.1dB resolution
- A and C Frequency Weighting
- RS-232 PC Interface with 16,000 point datalogger and Date / Time Stamp
- Auto-Ranging



Introduction

Congratulations on your purchase of Extech's Datalogging Sound Level Meter. The meter is capable of performing all your noise measurements needs in addition to it's capabilities for data acquisition (direct data storage to a PC) or datalogging (data storage to internal memory for later download). Data storage enables the user to save data, analyze data and generate reports. This professional meter, with proper care, will provide years of safe reliable service.

Specifications

Applicable Standards	IEC651 Type 2, ANSI S1.4 Type 2
Accuracy	±1.5dB (under reference conditions)
Frequency range	31.5Hz - 8KHz
Measuring level	30 - 130dB
Frequency weighting	A and C
Microphone	0.5" Electret condenser microphone
Display	4-digit LCD Resolution: 0.1dB Display period: 0.5 sec.
Bargraph	50dB scale (1dB steps). Display period: 50mS; Auto-ranging: 100dB scale, 2dB steps
Sampling rate	50mS
Memory size	16,000 records / 255 sets (non-volatile memory)
Datalogging sample rate	1 to 86,400 seconds per record
Time weighting	FAST: 125mS, SLOW: 1 sec.
MAX	Maximum reading held
Level ranges	30-80dB, 40-90dB, 50-100dB, 60-110 dB, 70-120dB, 80-130dB (Total of 6 ranges)
Auto range	30 to 130dB
Linearity range	50dB
Alarm function	OVER indicator for readings higher than high limit. UNDER indicator for readings lower than low limit.
AC output	0.707 Vrms at Full Scale Output impedance approx. 600Ω
DC output	10mV / dB Output impedance approx. 100Ω
Power supply	Four 1.5V 'AA' batteries
Battery life	Approx. 30 hrs continuous operation
AC adapter	Voltage: 6VDC Voltage Ripple: < 100mVpp Supply Current: > 100mADC Socket: Pin Ground Casing: Positive External Diameter: 3.5mm
Operating temperature	32 to 104°F (0 to 40°C)
Operating humidity	10 to 80%RH
Storage temperature	14 to 140°F (-10 to 60°C)
Storage humidity	10 to 80%RH
Memory size	16,000 data records with Date and Time Stamping
RS-232 Interface	Baud rate: 9600bps
Dimensions	10.4 x 2.8 x 1.4" (265 x 72 x 35mm)
Weight	Approx. 11.5 oz. (358g) including battery
Accessories	Batteries, carrying case, screwdriver, windscreen, 3.5mm plug, RS-232 cable, 9- to 25-pin gender changer, Windows™ compatible software.

Safety symbols



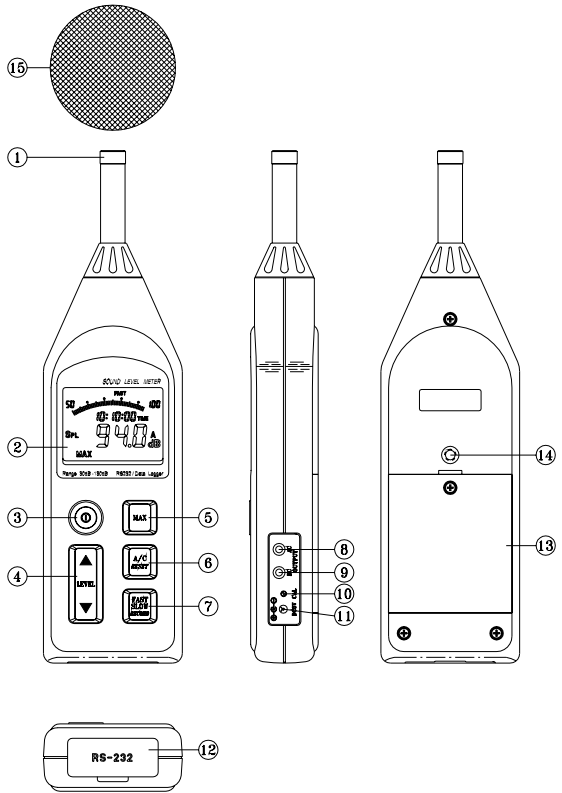
Meter is protected throughout by double insulation or reinforced insulation.

CE Complies with EMC

Meter Description

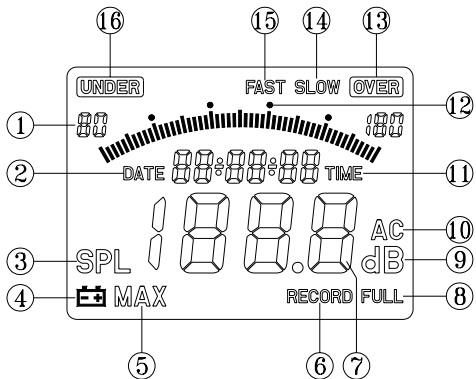
1. Microphone
2. Display
3. Power switch
4. Level range control switch
5. MAX hold switch
6. Frequency weighting switch
7. Response time select switch
8. AC output terminal
9. DC output terminal
10. CAL (calibration) pot.
11. External DC 6V power
12. RS-232 interface connector
13. Battery cover
14. Tripod mounting screw
15. Wind-screen

(Figure 1)



Display Description

1. Range selection
2. Date information
3. SPL: Instantaneous sound pressure level
4. Low-Battery
5. MAX: Maximum SPL value is held
6. Data recording
7. Measurement value
8. Memory full
9. Units
10. Frequency weighting (A/C)
11. TIME function
12. 50dB level (Bargraph)
13. Over range
14. SLOW time response
15. FAST time response
16. Under range



(Figure 2)


Measurement Preparation

- Read the following safety information before attempting to operate the meter
- Use the meter only as specified or the meter's built-in protection may be impaired.

Maintenance & Cleaning

- Service not covered in this manual should be performed by qualified personnel
- Periodically wipe the case with a dry cloth. Do not use abrasives or solvents.

Battery Replacement

When the battery voltage drops to a critical level, the  symbol appears on the LCD. Replace batteries as soon as possible after the battery symbol appears. The batteries (4 AA) are located in the rear battery compartment. Remove the single Philips head screw (center rear) for access to the batteries.

Measurements

Default Configuration

1. The meter's default configuration is as follows: 40 to 90dB, 'A' Frequency Weighting, and 'FAST' Response Time
2. The LCD will reflect the meter's configuration.

Measurement Considerations

1. Use a windscreen to cover the microphone in windy conditions.
2. Calibrate the meter often, especially if the meter has not been used for a long time.
3. Do not store/operate the meter in high temperature/humidity for long periods of time.
4. Keep the meter and the microphone dry.
5. Avoid severe vibration when using the meter.
6. Remove the battery when the meter will be stored for long periods of time.

Frequency Weighting

Change the Frequency Weighting by pressing the 'A/C' button. The 'A' or 'C' icon will display on the right-hand area of the LCD.

Note: With 'A' weighting selected, the meter responds like the human ear (boosting and cutting the noise amplitude over the frequency spectrum - see Appendix). 'A' weighting is used for environmental measurements, OSHA regulatory testing, law enforcement, and workplace design. Select 'C' weighting for flat response measurements (no boost or cut). 'C' weighting is suitable for the sound level analysis of machines, engines, etc. Most OSHA related testing is performed using 'A' Weighting and SLOW Response Time settings.

Response Time

Change the Response Time by pressing the 'FAST/SLOW' button. The 'FAST' or 'SLOW' icon will display on the upper area of the LCD.

Note: Select FAST to capture noise peaks and noises that occur very quickly. In FAST mode, the meter responds in 200ms. Select the SLOW Mode (meter responds in 500ms) to monitor a sound source that has a reasonably consistent noise level or to average quickly changing levels. Selection of Fast or Slow is determined by the application and any directives or standards related to that application.

Auto/Manual Range

Press the LEVEL button up arrow to scroll through the following ranges: 30-80dB, 40-90, 50-100dB, 60-110, 70-120, 80-130 and 30-130dB (auto). The display will reflect the range for each button press.

Notes: Use Auto Range when the noise source is relatively steady. Use one of the Manual ranges may be required if the dB levels are changing over a wide range.

Operation

1. Power the meter and select the desired Response Time (Fast or Slow) and Frequency Weighting (A or C).
2. Select the desired range.
3. Hold the instrument comfortably in hand or position on tripod. Point the microphone toward the noise source, the sound pressure level will be displayed on the meter's LCD display.
4. When MAX (maximum hold) mode is selected by pressing the MAX key, the instrument captures and holds the maximum noise level reading on the display. Press the MAX key again to clear the MAX reading.

Calibration

Note that a Sound Level Calibrator is required. Set up the meter as listed in Step 1 below. To calibrate the meter;

1. Display: SPL (dBA)
Response Time: FAST
Disable the MAX function
Range: 70 to 120dB.
2. Insert the microphone carefully into the sound level calibrator.
3. Power the calibrator and adjust the Sound Level Meter's CAL potentiometer (as shown in figure at right) to match the Calibrator's output.
4. Typically, a Sound Level Calibrator will supply 94dB or 114dB at 1KHz. Adjust the Sound Level Meter's CAL potentiometer for a 94dB or 114dB LCD display



(Figure-3)

Analog output

The 407764 has two analog output jacks located on its right side; one for AC and one for DC. For DC, the meter transmits 10mv / dB. For AC the full scale value is 0.707V. The output impedance is 600 Ω for AC and 100 Ω for DC.

The supplied 3.5mm stereo mini-plug can be used to assemble a cable to connect to either of the meter's analog output jacks. When using a stereo plug, like the one supplied, short the Tip and the Ring (see diagram below). Ground (negative) connects to the Sleeve while the positive signal is taken from the Tip/Ring. For mono plugs, ground connects to the Sleeve while the positive signal is taken from the Tip. The meter output can then be transmitted to a chart recorder, datalogger, or other data storage device.

(Figure 4)



Data Logging

The internal memory of the meter can store up to 16,000 reading in up to 255 recording sessions (called sets). Prior to beginning data storage, the meter's real time clock and the datalogger's sample rate must be set using the supplied software. The clock is set in the Control Panel window and the sample rate is set in the Logger window.

1. Set the real time clock (if required).
2. Set the sample rate (if required).
3. To record data, press & hold the RECORD key for 3 seconds until the "RECORD" symbol flashes once per second on the LCD. Press the Record key again to stop recording data.
4. If the recording memory is full, the "FULL" symbol will appear on the LCD.
5. To clear the recording memory press and hold the RESET key and power the meter. The LCD will show the "dEL" icon letting the user know that the datalog memory has been cleared.
6. To Download or Record data via a PC refer to the PC Interface section below.

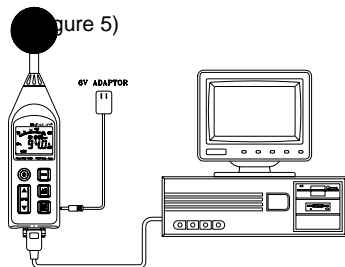
PC Interface

Connecting the Meter to a PC

Refer to Figure 5. Connect the 9-pin male connector to the Sound Level Meter, and connect the 9-pin female connector to the 9-pin COM1 PC port. If COM1 is used by the mouse, connect the 25-pin female connector to the 25-pin COM2 PC port (you'll need to use the included 9- to 25-pin adapter).

PC Requirements

- 486 IBM compatible PC or better
- One 3.5" high density disk drive
- Available serial port.
- 4M Bytes H.D. storage space
- EGA or VGA monitor
- Windows 95, 98, 2000, NT, XP Operating System
- 3-button or 2-button Microsoft compatible mouse. At least a 486 PC is recommended for displaying all software windows with a fast sampling rate (such as 1 second). If a 386/25 PC is used, you can only open one window (LIST, GRAPH, ANALOG) at a time when using fast sampling rates.

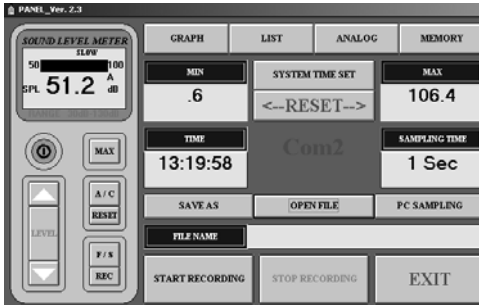


Installing the Windows Application Program

Follow the instructions on the disk for installation. When installing the software, please use the Visual Basic version (VB) on installation CD.

Software Control Panel Description

The Control Panel (Figure 6)



METER SIMULATION

The left side of the Control Panel window provides a replica of the meter's front panel and display.

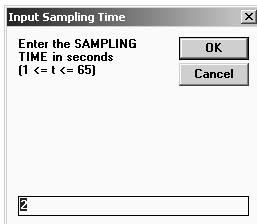
MAX:	Hold and update maximum value
A/C	A/C weighting selection
RESET	Reboot and clear the data memory
F/S	Fast/Slow selection
REC	Enable datalogging
LEVEL	Set range

DATA ACQUISITION CONTROLS and DISPLAYS

MIN:	Displays the minimum value recorded
MAX:	Displays the maximum value recorded
TIME:	Displays the Real Time Clock Setting
SAMPLING TIME	Display of data acquisition sampling rate (Fig 7)
PC SAMPLING:	Opens data acquisition sampling rate selection box. (Datalogging sample rate is set in the MEMORY "Logger" window)
<--RESET-->:	Resets the MIN and MAX stored readings
SYSTEM TIME SET:	Sets the meter's clock to the value of the pc clock
SAVE AS:	Opens the data file storage window (*.dat)
OPEN FILE:	Opens the data file retrieve window (*.dat) (Fig.8)
FILE NAME:	Displays name and location of data acquisition file
START RECORDING:	After opening a file, click to start recording.
STOP RECORDING:	Stop recording and close the file
EXIT	Close program

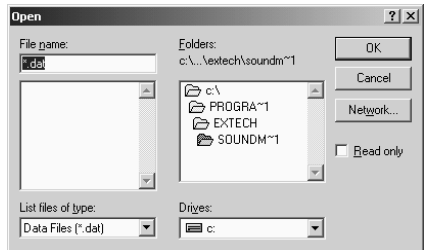
(Figure-7)

Selecting the datalog sample rate



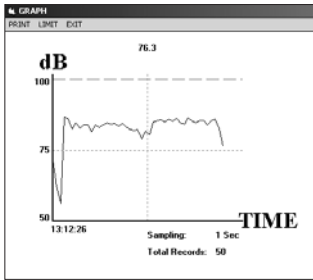
(Figure-8)

Opening a datalog file (*.dat)



DISPLAY SELECTIONS

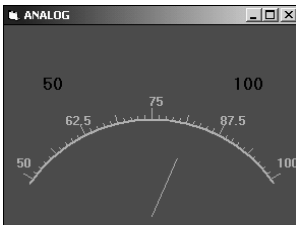
(Figure-9)
GRAPH



(Figure-10)
LIST

	Date	Time	Value	Type	Bat	Range	O / U
1	09-10-2001	14:01:59	86.3	A		50-100	
2	09-10-2001	14:02:00	83.9	A		50-100	
3	09-10-2001	14:02:01	84.7	A		50-100	
4	09-10-2001	14:02:02	84.7	A		50-100	
5	09-10-2001	14:02:03	84.7	A		50-100	
6	09-10-2001	14:02:04	84.6	A		50-100	
7	09-10-2001	14:02:05	85.2	A		50-100	OVER
8	09-10-2001	14:02:06	84.4	A		50-100	
9	09-10-2001	14:02:07	85.8	A		50-100	
10	09-10-2001	14:02:08	84.9	A		50-100	
11	09-10-2001	14:02:09	83.8	A		50-100	
12	09-10-2001	14:02:10	82.7	A		50-100	
13	09-10-2001	14:02:11	83.5	A		50-100	OVER
14	09-10-2001	14:02:12	84.2	A		50-100	OVER
15	09-10-2001	14:02:13	86.2	A		50-100	OVER
16	09-10-2001	14:02:14	83.5	A		50-100	OVER

(Figure 11)
ANALOG



Logger Window (memory setup/ data download)

The Logger window sets the sample rate of the meter's internal memory and provides the controls to download display and save stored data.

MEMORY

Displays memory size

REMAINING

Displays amount of unused memory

TIME OF METER

When clicked, downloads and displays the meter's date and time

ID CODE

Numeric Identification code. Enter the code in the box and click on the bar to store the code.

SAMPLING

Datalogger sample rate. Enter the sample rate in the box (in seconds) and click on the SAMPLING bar to store the value.

NUMBER OF SETS

Click on the bar to download the stored data

TIME OF RECORDING

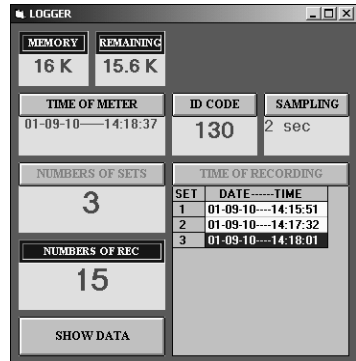
Click on the bar to display sets downloaded. Click on a set to select data for display

NUMBERS OF REC

Displays the number of records (data points) in the selected set.

SHOW DATA

Display, Save or Graph data from selected set

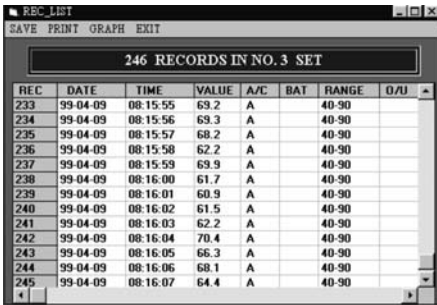


DATA DOWNLOAD PROCEDURE

1. Click the **MEMORY** icon in the Control Panel screen.
2. Click the **NUMBERS OF SETS** button, the number of sets will appear.
3. Click on the **TIME OF RECORDING** button to view each recorded set.
4. Click on a **SET** in the **TIME OF RECORDING** box. The number of records in the set will appear and the data will be downloaded from meter to PC. Save to disk if desired.
5. Click the **SHOW DATA** button for details on each record. Figure 13 shows the data list. Select SAVE, PRINT, GRAPH, or EXIT from the menu choices.

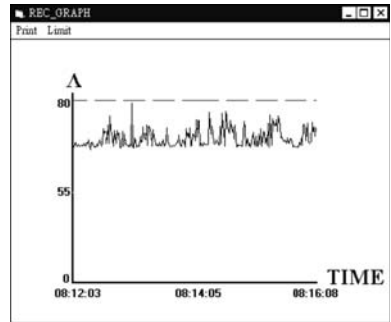
Note: In the example for Figure 12, there are 3 sets of recorded data in memory. Set No. 3 has 15 records. Note: If you need to change the **ID CODE** or the **SAMPLING** time, click on the desired parameter, type the changes and click on the bar.

(Figure-13) – List of datalogged set



REC	DATE	TIME	VALUE	A/C	BAT	RANGE	O/U
233	99-04-09	08:15:55	69.2	A		40-90	
234	99-04-09	08:15:56	69.3	A		40-90	
235	99-04-09	08:15:57	68.2	A		40-90	
236	99-04-09	08:15:58	62.2	A		40-90	
237	99-04-09	08:15:59	69.9	A		40-90	
238	99-04-09	08:16:00	61.7	A		40-90	
239	99-04-09	08:16:01	60.9	A		40-90	
240	99-04-09	08:16:02	61.5	A		40-90	
241	99-04-09	08:16:03	62.2	A		40-90	
242	99-04-09	08:16:04	70.4	A		40-90	
243	99-04-09	08:16:05	66.3	A		40-90	
244	99-04-09	08:16:06	68.1	A		40-90	
245	99-04-09	08:16:07	64.4	A		40-90	

(Figure-14) – Graph of datalogged set



(Figure-15) – Selecting a range of datalogged records



The dialog box has two tabs: 'NO OF RECORDS' and 'RANGE'. Under 'NO OF RECORDS', there are 'FROM' and 'TO' fields with values 1 and 246 respectively. Under 'RANGE', there are 'MIN' and 'MAX' fields with values 0 and 80 respectively. An 'OK' button is at the bottom.

Calibration / Repair Services

Extech offers complete repair and calibration services for all of the products we sell. For periodic calibration, NIST certification or repair of any Extech product, call customer service for details on services available. Extech recommends that calibration be performed on an annual basis to insure calibration integrity.

Warranty

EXTECH INSTRUMENTS CORPORATION warrants this instrument to be free of defects in parts and workmanship for one year from date of shipment (a six month limited warranty applies on sensors and cables). If it should become necessary to return the instrument for service during or beyond the warranty period, contact the Customer Service Department at (781) 890-7440 ext. 210 for authorization or visit our website at www.extech.com (click on Contact Extech and go to Service Department to request an RA number). A Return Authorization (RA) number must be issued before any product is returned to Extech. The sender is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit. This warranty does not apply to defects resulting from action of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification. Extech specifically disclaims any implied warranties or merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental or consequential damages. Extech's total liability is limited to repair or replacement of the product. The warranty set forth above is inclusive and no other warranty, whether written or oral, is expressed or implied.



Support Hotline (781) 890-7440

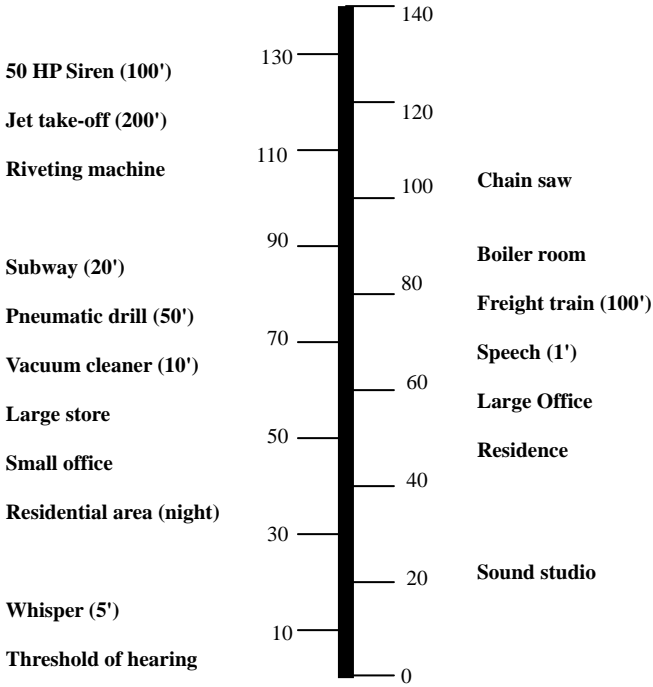
Tech support: Ext. 200; Email: support@extech.com

Repair>Returns: Ext. 210; Email: repair@extech.com

Website: www.extech.com

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Appendix - Typical 'A' Weighted Sound Levels



Software Protocol

Data Protocol Baud rate: 9600bps

Byte1	Byte2	Byte3	Byte4	Byte5
02	Status	Function		03
Leading byte				Ending byte

Status Byte2

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
0	Fast	C	Normal	Normal	Normal	0	0	0	30-80
1	Slow	A	Max	Full	Rec	0	0	1	40-90
						0	1	0	50-100
						0	1	1	60-110
						1	0	0	70-120
						1	0	1	80-130
						1	1	0	30-130
						1	1	1	

Function Byte3

	Bit7	Bit6	Bit5	Bit4 (x10 ²)	Bit3-0 (x10)
0	Normal	Normal	Normal	00-19	
1	OVER	UNDER	BT		

Function Byte4

	Bit7-4 (x 10 ⁰)	Bit3-0 (x10 ⁻¹)
0	00-99	
1		

Command Protocol

Set time and date - Send 7 bytes

D	YY	MM	dd	hh	mm	ss
leading byte	year	month	date	hour	min	sec

Set sampling rate - Send 3 bytes

W	high byte	low byte
leading byte	1 - 65535 sec	

Set ID code - Send 3 bytes

X	high byte	low byte
leading byte	1 - 65535	

Get software version - Output "V" - Receive 1 byte (0 - 255)

Get system argument - Output "Y" - Receive 10 bytes

ID Code	Version	ID code	Data sets	Last address	Sample rate
2bytes	1 byte	1 byte	1 byte	3 bytes	2 bytes

Get time and date - Output "C" - Receive 6 bytes (YY+MM+dd+hh+mm+ss)

Receive 6 bytes (Sets+YY+MM+dd+hh+mm+ss+Status+Sample rate+Records)

Get Record - Output "K"+N records"

Receive (YY+MM+dd+hh+mm+ss+Status+Sampling rate+Records+1st record+2nd record+...+nth record)

Erase Command: "EEE" (3 bytes)

Switch Fast/Slow: "F" (1 byte)

Switch A/C: "A" (1 byte)

Switch range: "U" (up), "P" (down) (1 byte)

Set MAX spl; "M" (1 byte)

Stop Recording: "T" (1 byte)

Start Recording: "S" (1 byte)