

# INTRODUCTION

The SinCorder is a digital DATALOGGER designed especially to facilitate rapid and accurate gathering of DC Millivolt and Voltage readings associated with corrosion and cathodic protection testing of underground or underwater, metallic structures such as pipelines, cables, tanks, ship hulls, etc. Accessory shunts are available to enable the SinCorder to measure DC amperes or milliamperes. There are many other possible uses for this versatile meter not covered in this manual. The SinCorder is designed for either outdoor or indoor use over a wide temperature range. It is powered by an internally mounted rechargeable battery. Where AC power is available, the meter may be operated using the AC adapter which is supplied. An external source of 8V to 18 VDC may also be used to extend battery life.

NO KNOWLEDGE OF COMPUTERS IS REQUIRED for personnel to be able to make use of most of the capabilities of this instrument. It is already preprogrammed. This operating manual thus assumes that you have no training or experience in the use of computers or computerized test equipment.

## What is a datalogger?

We define it as a device which is able to perform the following four functions:

- **READ** a value appearing at the input terminals.
- **REPORT** or display that value to the operator in some meaningful fashion.
- **REMEMBER** or store the data.
- **RECALL** or transmit the data to some external device.

The SinCorder does all these things and much more.

We suggest that you first read Chapter 1, and then spend a couple of minutes trying out the **ON/OFF**, **DISP**, **PRGM**, **OUTPUT**, **ROLL**, and the four arrow keys. You can't possibly harm the meter, and you will begin to feel comfortable with it. If you press the wrong key, the meter lets you know it with an appropriate message. At first reading, this will all be very new, but not really difficult once you understand the use of these keys. The **ESC** (escape) key allows you to back up to a previous screen when you find that you have made a wrong choice.

### **WARNING: Beware of electric livestock fences.**

When the SinCorder or its inputs are grounded to an electrified fence, one of three things may occur: (1) No reaction at all; (2) Scrambling of the SinCorder's memory (requiring a user-implemented system re-set); (3) Damage to the A/D converter, which would necessitate extensive repairs. This situation could occur because an electric fence operates on the same principal as an automotive spark plug coil. The discharge voltage is around 18,000 volts. The solution to the potentially dangerous situation is to remove the input wires and data probe from the SinCorder before crossing an electric fence. Once across, tape the test lead to the fence post so it cannot accidentally come in contact with the fence. Then reconnect the SinCorder and possible damage to the SinCorder has been avoided.

The version number of your SinCorder will be displayed when the unit is first turned on.

The SinCorder which accompanies this manual is a new, upgraded design, V1.5, with the following enhanced features.

- » The Memory has been expanded from 64K to 128K.
- » The Battery connector has incorporated the latest connector design.
- » The system reset time has been extended to 20 minutes.

With 128K of RAM versus the previous versions which had 64K, it has twice the logging capacity of the original SinCorder, with a few restrictions. Any one data set can have at most 32K time history period before a new data set must be initiated. With 128K and each reading requiring two bites per reading, the total number of readings which may be stored is 64K. However, with the 32K barrier per data set, a second data set must be initiated to take full advantage of the increased memory, i.e. there may be at most 32750 triggers in a single mode data set; therefore another data set should be created and an additional 32750 triggers may be stored in the SinCorder.

As an additional feature, to save power, the LCD display shuts off after five minutes in logger mode with sampling of 4/second. This feature is automatically enabled but can be user-controlled by rolling to a new screen under PRGM and DATA. This feature, when used, should extend battery life in the logger mode.

There is a new battery with an improved connector for more positive contact. Battery characteristics are otherwise the same. Spare batteries may be ordered under MCM part number SIN012.

System reset has been extended from 5 minutes to 20 minutes to improve system stability during voltage transients. This means that when the battery is replaced or a system reset is required the SinCorder MUST be left unpowered for at least 20 minutes before plugging in the charger, then replacing the battery, then turning the unit on. For further details on system reset see chapter 7-3 in the manual.

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1

# FUNCTION KEYS

## GENERAL OPERATION

The **ON/OFF** key alternately turns the meter on and off. Press it once and the display screen should immediately show

SINCORDER V 1.5  
M C MILLER 9/98

(The version and date may be different on your particular meter). After several seconds the display will change to:

SERIAL NUMBER  
XXXX

BATTERY IS OK  
LOGGER READY

If you do not get these displays, plug in the battery charger to a convenient source of 110 to 120 VAC and allow to charge 10 hours or over night. The **ON/OFF** key will not allow you to turn off the meter while it is logging or is in an impending logging mode. In order to conserve batteries the meter is programmed to automatically turn off the display if no key is pressed during a 6 minute period.

Each one of the three **MODE** keys (**PRGM**, **DISP** & **OUTPUT**) is used in conjunction with the keys (**ROLL**, **I arrow**, **I arrow**, **--** or **-- arrow** or **ENTER**) to produce a desired action.

Press **PRGM** and the screen will now display

PROGRAM OPTION  
SELECT: CHANNEL

PROGRAM OPTION  
SELECT: DATA

PROGRAM OPTION  
SELECT: TIME

PROGRAM OPTION  
SELECT: OUTPUT

PROGRAM OPTION  
SELECT: ALARM

These are the program selections available in your meter. The particular selection (**CHANNEL**, **DATA**, **TIME**, **OUTPUT**, or **ALARM**) which is displayed is the one which was selected the last time the meter was used. Press **I** or **I arrow** key to obtain the desired selection.

When the SinCorder displays the word "SELECT" it is requesting the **I** or **I arrow** keys to be used to make a selection.

Then press the **ENTER** key so that the meter will implement the selection which has been made.



**BY THE WAY:** The letter, number and symbol keys are inactive except when they may be needed for entering information called for in the display window or when a descriptor, range change, may be entered during operation in SINGLE, MULTIPLE modes.

In order for you to make this simple selection you will need to know what these five functions do (in greatly simplified form). We will go into greater detail in later chapters.

The **PROGRAM/CHANNEL** selection permits you to use **ROLL** and **I** or **I** arrow keys to set meter on a V or mV range, to enter special user units, make a zero offset, and to enter a full scale calibration formula such as  $2.0V = 2,000mV$ . (We will explain these later).

The **PROGRAM/DATA** selection permits you to erase previously logged data, to set up mode of data collection (**LOGGER**, **SINGLR** or **MULTIPLE**) and to make further choices based on which mode of data collection is chosen. In addition this selection features the **DOWNLOAD** option which permits the downloading of an assigned list of proposed tests from a computer with the SinCorder operating in the **SINGLE** or **MULTIPLE** test mode

The **PROGRAM/TIME** selection permits you to easily set the internal clock of your SinCorder to the correct time and date. This clock is used to date acquired data with great precision. It also allows you to set up a scheduled logging run at some time in the future.

The **PROGRAM/OUTPUT** selection permits you to choose the baud rate for transferring data, to choose output format and to choose a combine output factor so as to output report in a more condensed form, if desired. It also permits you to enter a report header of up to 4 lines of up to 16 characters each.

The **PROGRAM/ALARM** selection allows the setting of optional upper and lower alarm levels and to turn this option on or off.

The **DISPLAY/CHANNEL** selection allows you to view the present reading as it might be on any indicating type digital meter.

The **DISPLAY/DATA** selection permits you to view each reading which has been entered into memory along with time and date. If data has been obtained using the **SINGLE** or **MULTIPLE** modes, you will be able to correct data while you still are at the test site.

The **DISPLAY/TIME** selection displays current time and data and the amount of time the unit will log data in its present **LOGGER** configuration. In the single or multiple modes the display indicates the remaining number of trigger events.

The **OUTPUT** selection permits you to choose to output your choice of data obtained in **LOGGER**, **SINGLR**, or **MULTIPLE** modes.

The **LOG/STBY** key is used to turn logging on and off by successive key operation. It should be emphasized that your SinCorder will only log data after you have pressed the **LOG/STBY** key. When you wish to stop the logging operation you must again press the **LOG/STBY** key. When the meter is logging, a letter "L" will appear in upper left corner of display. If the "L" is flashing, the meter is in a pending logging mode. In other words, it is waiting for you to press a trigger switch (or **ENTER** key) or waiting for a programmed time to arrive. In the case of **ALARM** logging it is waiting for readings to fall outside certain limits before it will automatically start logging.

The **SHIFT** key is of the toggle type. Pressing the **SHIFT** key will alternatively change keyboard entries between upper and lower case (or between the symbols shown on upper and lower positions of the number and symbol keys). If meter is in the upper case mode the letter "s" will appear in upper left corner of the display window.

The **SPACE** key is an erase key which is used only to change displayed information which is accompanied by a flashing cursor. When pressed, it erases the character on which the flashing cursor is imposed.



**BY THE WAY** - When using the keyboard, a letter "s" in upper left corner of display indicates that keyboard is in shift or upper case mode.

**HELPFULL HINT:** Before you go any further, sit down with a SinCOrder and try pressing each of the key combinations listed above. Just press the desired **MODE** key followed by the desired function key. You will find that each of the several valid **MODE/FUNCTION** key combinations will lead you into a series of selections which are usually made using the **ROLL**, **ARROW** or **ENTER** keys. **Don't worry if you press the wrong key.** The meter will usually tell you. You always have another chance. The displayed questions which come up in the window are in loop form, so that if you continue pressing the **ROLL** key, the same question will come up again.

## 2

## PROGRAM

## CHANNEL PROGRAMMING

To program the input CHANNEL, you must first use the **ON/OFF** key to turn on the SinCorder if it is not already on. Don't let the word "PROGRAM" worry you. It is not programming in the usual computer terminology but rather a selection of one of a number of test methods and timing factors which are already built into the meter (we just couldn't think of a better word). The word "CHANNEL" just means that you are being allowed to set up certain test parameters of the voltage input terminals.

The best way to learn the operation of the SinCorder is to press the keys as you read the text below.

&gt;&gt;

It should be remembered all test parameters and timing selections remain unchanged in the SinCorder until someone changes them. In other words, you don't have to make a lot of key entries unless you keep changing methods of gathering test data.

With your SinCorder in front of you and turned on, press **PRGM**. the screen will now display -

```

SELECT OPTION
SELECT: CHANNEL
  
```

(or one of the other four options listed in Chapter 1)

If the word CHANNEL does not appear, use the **l** or **l** arrow keys until the word CHANNEL appears. Then press **ENTER** and the screen will now display -

```

RANGE:    2 V
SELECT:   2 V
  
```

(or some other range)

If the displayed range is not the desired one, use the **l** or **l** arrow key until the desired range is displayed on the lower line, then press **ENTER** and bottom and top lines will display the same range. This means that the meter is now set on the displayed range.

&gt;&gt;

**NOTE:** The 20mV range has a separate positive terminal and is ment to be used only in low resistance circuits (less than 10 ohms) such as across potential terminals of a shunt or on an IR drop test span on a metallic structure such as a pipeline or cable. **DO NOT EVER USE 20mV RANGE IN CONJUNCTION WITH A REFERENCE ELECTRODE.**

Press **ROLL** and the display will now show -

```

USER UNITS: ***
ENTER:     ***
  
```

(units may differ depending on prior use)



This default symbol is \*\*\*. When the default symbol is displayed, all printout and displayed data will be in accordance with the selected range. For example, if you have meter set on 2V range all results will be in terms of volts. If the default units are satisfactory, press **ENTER** and the display will be

CALIBR. PT 1 0.00 V = 0. V
-------------------------------

(or mV if on the 20mV or 200mV range)

If some other units other than the default units are wanted, type in the abbreviation (3 characters max.) and press **ENTER** key.

>>

**EXPLANATORY NOTE:** Some companies prefer to record all potentials in mV rather than V. Also, there are times where the SinCorder may be utilized to log values from a transducer or shunt where the desired plot will be in units other than the units shown on a particular range of the SinCorder. For example, suppose that the SinCorder is connected to the potential terminals of a shunt and the readings are to be shown in amperes although the SinCorder is set on the 20mV or 200mV range. We would type in "space A space" (A for Amperes) on the enter line of the display and then press **ENTER**. Another example would be in measurement of wind velocity from an anemometer. In either case, we would have to know the relationship between the measured amount and the value that is to be displayed or plotted. This relationship is then entered later when the "CALIBR.PT 2" screen is displayed. WE SUGGEST THAT YOU ROLL PAST "CALIBR.PT 1" AND "CALIBR.PT 2" UNTIL YOU BECOME AT EASE IN USING THE OTHER FEATURES OF YOUR SinCorder

Press **ROLL** and the screen will display -

CALIBR. PT 2 0.00V = 0.000V
--------------------------------

(display may differ depending on prior use)

Usually you will want to **ROLL** past this display. However, there are times when it comes in handy. For example, suppose you are making a side drain or other measurement using two reference electrodes. You find that the two are not electrically matched. There is a difference in potential between the two electrodes. You can make use of the point 1 calibration feature to enter a value equal to the difference and call it "0". For example, you could type in "0.00V= .011V" to balance out or bias out the difference of .011 between the two reference electrodes. You would also have to make the same compensation at PT 2 (full scale calibration point).

In doing this you must be careful as to which electrode connects to which terminal, otherwise you will get double the error instead of canceling out the error between the two electrodes. When you have made the correction and connected electrodes correctly, the meter will read "0" or within a millivolt or two when electrodes are placed with porous plugs touching each other.

Be sure to press **ENTER** key any time you type in anything.

Press **ROLL** and the screen will display -

```

CALIBR. PT  2
2.0V = 2.000 V

```

(display may differ depending on prior use)

This gives you the opportunity to enter an equivalent formular. For Example, if the data is to be printed out in mV, type in "2.0V = 2000mV". If the meter is connected to the potential terminals of a shunt, use an appropriate formular which will not be considered as an overrange value by the SinCorder. If the shunt is rated at 50mV, 100A, use the 200 mV range and type in "200mV = 400A" We would actually use only the shunt to measure up to 100A in order not to damage it. (The first value must be the same as the meter range and the second number must be in the same ratio to the meter as the ampere rating is to the mV rating of the shunt).

>> BY THE WAY: You could have used the 20mV range if current is expected to be less than 40A. In this case you would type in "20mV = 40 A" and then press **ENTER** key. When using a shunt you must consider the ampere rating of the shunt, which should not be exceeded for more than a few seconds.

PLEASE NOTE: Most of the time you will probably not need any offset voltage and so the correction will not be needed either at PT 1 (zero) or PT 2 (full scale). If you have elected to enter an equivalent formular and later decide to change range, the screen may display an overrange error. When this happens, you should cancel out the equivalent formula before attempting to change ranges.

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## DATA PROGRAMMING

---

With your SinCorder turned on, press **PGRM** key, then use **↑** or **↓** arrow keys to select **DATA** and then press **ENTER** key. Display will now show -

```

CLEAR DATA? NO
SELECT:      NO

```

The SinCorder is asking you to select wheather or not to clear its memory of all accumulated data. Clearing memory refers **ONLY** to accumulated data and does not affect any of the internal programs. Be sure that there is no data in memory that should be transferred to a computer or a **DISK** as a permanent record. If you want to erase all the data from the internl memory, use the **↑** or **↓** arrow key to select **YES** and then press **ENTER** key. The display now show -

```

HIT ENTER TO
CLEAR DATA

```

>> (NOTE: If you change your mind at this point, just press **ESC** and display will display previous screen)

Then press the **ENTER** key again and display will return to -

CLEAR MEMORY?: NO  
SELECT: NO

The datbank of your SinCorder is now completely empty and is ready to ccept new data up-to about 32,000 readings

**WARNING:**

Make **VERY** sure before you clear memory. All previously collected data will be gone forever unless you have already successfully transmitted it to a computer or DISK drive. Remember that other people may have entered data into your SinCorder since you last used it. See Chapter 3 to find out what is stored in memory before taking the last step of clearing memory.

Regardless of whether or not you have elected to clear memory, now press the **ROLL** key. The Display will now be -

MODE: LOGGER  
SELECT: LOGGER

MODE: MULTIPLE  
SELECT: MULTIPLE

MODE: SINGLE  
SELECT: SINGLE

The display will indicate how the meter was last used. You now have to decide which of these three test modes you want to use. The choice depends upon the type of test which is desired. If the displayed test mode is **NOT** the one you want, just press the **l** or **l** arrow keys until the second line od the display shows the desired test mode, then press the **ENTER** key after which thetop and bottom lines will both indicate your choice.

>> (The top line indicates the present test mode, the bottom line indicates the test mode which you will get after pressing the **ENTER** key.)

Before going any further, let us explain the thtee different test modes (LOGGER, SINGLE AND MULTIPLE) and suggest some of the applications to various types of typical corrosion and cathodic protection tests.

---

**LOGGER MODE:**

---

This mode makes your SinCorder equivalent to a very accurate and versatile strip chart or circular chart recorder. The **LOGGER** test permits taking of data at a selected sampling rate of from 4 readings per second to as slow as 1 reading per minute. In addition, you have a choice of averaging length of from 1/4 seconds to 1 hour. This allows the collection of a large amount of significant data without excessive use of the memory(which is, after all, not unlimited).

>> **CAUTION:** When setting up for logging, you must select to save at least one of **MAX** or **MIN** or **AVG**. otherwise your meter will log no data and your time will have been wasted.

To set up for a logging run, press PGRM and use  $\uparrow$  or  $\downarrow$  arrow key to select DATA mode. Then press ENTER key and the display will show -

```
CLEAR DATA? NO
SELECT:      NO
```

Once again you are being given the opportunity to erase all the data from the SinCorder memory bank. Use  $\uparrow$  or  $\downarrow$  arrow keys to make your choice of YES or NO and then press ENTER key. Then press ROLL key and if necessary use  $\uparrow$  or  $\downarrow$  arrow keys until the word LOGGER appears on the bottom line of the display. Press ENTER key and then press ROLL key and the display will show -

```
SAMPLES:  1/MIM
SELECT:    1/MIN
```

(The same value as above or some other value)

Use the  $\uparrow$  or  $\downarrow$  arrow keys to select the desired sampling rate between 4/SEC and 1/MIN. Then press ENTER key. Both lines will now indicate the selected value. The sampling rate is how often the SinCorder will acquire a voltage reading from the terminals.

Now press ROLL key and the screen will display -

```
LENGTH:  1 MIN
SELECT:   1 MIN
```

( same value as above or some other value)

Use  $\uparrow$  or  $\downarrow$  arrow keys to select a value between 4/SEC and 1 HOUR. Then press ENTER and screen will display the selected value on both lines. The word LENGTH means the period length of time before which your SinCorder will sort and save maximum, minimum and average values it collected while SAMPLING e.g. if a sample rate of 1 sec. and a LENGTH of 1 min., the SinCorder will sample every second, but calculate and store a min., max., and average only once a minute. When an period LENGTH is the same as the selected SAMPLING interval, the min., max. and average for that LENGTH will be identical e.g. if the SinCorder is set to sample once a minute with a statistical LENGTH of once a minute the min., max. and average is the same because there is only one sample. Of course, the length of the averaging period must be at least as long as the sampling interval (in fact, the SinCorder will not let you do otherwise).

>>

**NOTE:** In determining the duration of logging time before the memory capacity is full press DISP, select "TIME" press ENTER and ROLL and ROLL again and the time history capacity will be displayed

Now press ROLL key and display will now show -

```
MIN: NOT SAVED
SELECT: NOT SAVED
```

```
MIN: IS SAVED
SELECT: IS SAVED
```

This means that you are being asked to select (using **I** or **I** arrow and **ENTER** keys) whether or not you want to save the minimum values obtained during the previously selected averaging length. If the values being measured are changing rapidly and minimum values are significant to you then **IS SAVED** should be your choice

Press **ROLL** key and the screen will display -

AVG: NOT SAVED  
SELECT: NOT SAVED

AVG: IS SAVED  
SELECT: IS SAVED

This means that you are being asked to decide whether or not to save the average values which will be obtained during the previously selected averaging length. Usually you should elect to save the average values, unless you are only interested in minimums and maximums.

Press **ROLL** key and the screen will display -

MAX: NOT SAVED  
SELECT: NOT SAVED

MAX: IS SAVED  
SELECT: IS SAVED

Once again, you are being asked whether or not to save the maximum values which will be obtained during the previously selected averaging periods.

>>

**IMPORTANT:** Any data which is not saved will be lost forever. However, you must remember that each of these options eats up memory. **YOU MUST SAVE AT LEAST ONE OF THESE OPTIONS** (maximum, average or minimum) otherwise you will end up with only three data points the minimum, maximum and average for the entire test period that was logged, which is embarrassing. There is no point in saving maximums or minimums if the sampling rate and averaging period are identical, since both would be identical to the average.

Let us show you several examples where the **LOGGER** mode can be put to use.

**Example # 1:**

---

You would like to measure structure-to-soil potentials on a buried pipeline or cable on the outskirts of a city which has known sources of considerable varying stray DC currents. Because there are commuter railroads involved, you would properly want to run the test for at least 24 hours on a weekday. We would suggest that you place channel on the 20 volt range (10 millivolt resolution) because use of a lower range might yield a number of overrange readings which would not damage the meter but whose value would be unknown. You would probably be interested in peak values as well as average values. We would, therefore, suggest using a high sampling rate of 4 per second along with an averaging period of 1 minute. The net result will be that the recorder will be able to take 240 readings per minute and will record max., min. and average readings for each and every minute along with highly accurate date stamping. You could not possibly accomplish this manually with such speed and accuracy.

---

**Example # 2:**

You are assigned to measure the effectiveness of a cathodic protection installation on an offshore installation which is subject to wide tidal variations and unpredictable wave conditions. For this application we might want to measure structure-to-water potentials over a period of perhaps two weeks. We could set meter on 2 V range, sampling rate at 1/minute and averaging period of say 15 minutes. This would yield plenty of data over a period which could exceed 1 month without using up available memory.

&gt;&gt;

See battery life chart and use external power source (AC or DC) if it appears that battery life might not permit such an extended logging run.

---

**Example # 3:**

You are about to go on vacation when you learn that a new rectifier is about to go into operation on a nearby pipeline. The scheduled cooperative interference tests will take place while you are away. Although your structure is not directly involved, you would like to obtain data to show whether or not your structure will be affected by the new rectifier. In this instance, we would use the 1 time scheduled logging feature which is built into your SinCorder (see PRGM/TIME below). Set the time schedule so that the SinCorder will turn on about an hour before tests are scheduled to begin and turn off a couple of hours after the tests would normally be concluded. Suggested sampling rate should be no slower than 1 per second and suggested averaging length should be fairly short (say 5 seconds) so as to catch the various on and off cycles of the current interrupter which might be set as fast as 5 and 10 seconds respectively. You could make use of more than one SinCorder along with an appropriate number of reference electrodes at different locations with respect to your structure.

---

**Example # 4:**

Test holes excavated along your pipeline show evidence of active corrosion, although nearly all potential measurements have been satisfactory. You suspect that there is an intermittent short between your line and a foreign structure. This might suggest that you use the SinCorder in the alarm logging mode. This involves turning on the alarm logging feature and setting the low level alarm on to be, for instance, .85V. The SinCorder would then only record potentials which were less negative than 0.85V along with the times when this condition occurred. An additional SinCorder could be used to measure IR drop on a calibrated span on your line or structure-to-soil potentials.

---

**SINGLE MODE**

---

The SINGLE MODE is equivalent to a digital meter used along with a pad and pencil. You go to a test point, hook up your test leads, and if the reading looks reasonable, you would write it down along with whatever descriptive information is necessary. This is essentially what the SinCorder does, only electronically. You take your SinCorder to the test site, hook up your test leads, and if the reading looks good, you press the trigger button on your M.C.MILLER DATA PROBE (or ENTER key) which stores the reading accurately into memory. To store Descriptive information such as test station number, mile post number, or station number, press "D", then type the information and then press ENTER key to store it in memory.

The single mode sets up the SinCorder to take a single reading when using an external trigger such as the push button switch on the M.C. Miller DataProbe (or alternatively the ENTER key). In addition you can enter as many 16 character lines of comments or special code numbers (or letters) as you need to identify locations, describe conditions, etc. The manual entries are called DESCRIPTORS and they will appear in the output report.

- » **NOTE:** The first reading recorded must be a voltage reading because descriptors follow voltages.
  
- » **NOTE:** While in the field the Flashing "L" goes solid for approximately two seconds when the trigger or enter button is depressed. The SinCorder requires only 1/4 second to acquire a reading but the human eye requires a greater period for recognition.

The following are some examples of typical applications where the SINGLE MODE can be used to best advantage:

#### **Example # 1:**

---

It is desired to make a potential survey on a buried metallic structure along which are installed a number of galvanic anodes which cannot be disconnected. With the SinCorder in SINGLE MODE, just press the ENTER key whenever you wish to take a reading. Press the "D" key (upper or lower case) whenever you want to insert a descriptor. After typing in the descriptor, then press ENTER key again to place the descriptor in memory.

#### **Example # 2:**

---

On a bare or poorly coated unprotected pipeline, a surface potential survey using two reference electrodes is conducted in order to find areas of active corrosion. The two electrodes are connected together at a fixed distance of 20' apart and are moved along over the pipeline. A reading of the electrode-to-electrode potential is taken every 20' using the push button switch in the M.C. Miller Data Probe (or alternately the ENTER key) as the triggering device. Side drain measurements are made on each side of the line where the surface potential measurement indicates the presence of an anodic area or "hot spot". Descriptors are used along with flags or paint marks to physically identify the suspected anodic area.

#### **Example # 3:**

---

Cathodic protection current for several miles of pipeline is found to be unusually high. An over-the-ground coating fault survey is suggested. With the cathodic protection rectifier energized, a survey is made utilizing the SinCorder in the single mode along with two reference electrodes spaced about 25' apart. One electrode is kept directly over the pipe and the other off to one side. Readings are taken approximately every 5'. When the results are plotted up, the peaks in the curve will show the location and relative magnitude of the coating faults.

---

**MULTIPLE MODE**


---

When you select MULTIPLE MODE and press ROLL key the screen displays -

TRIGGER LENGTH  
 ENTER: XX SECS

(a flashing number)

You are now expected to enter the desired test interval (01 to 60 seconds) using the number keys followed by the **ENTER** key

MULTIPLE MODE is similar to SINGLE MODE except that two readings are stored every time the trigger switch (or alternately the **ENTER** key) is pressed. One reading will be the maximum reading and the other will be the minimum reading sampled during the operator selected time interval (01 to 60 seconds). In essence the SinCorder will sample at a rate of 4 readings per second for a interval of xx second (user defined) then sort for minimum and maximum values which occurred and store just these two values. This mode is particularly useful in combination with one or more quartz controlled current interrupter(s) to measure both the "on" and "instant off" (polarized potentials) along a lengthy structure such as an pipeline or cable installation. The following is a typical example of where this mode can save time and manpower:

**Example:1**

A high pressure coated steel gas transmission main has impressed current cathodic protection with rectifiers spaced about every 10 miles. In order to take the desired "instant off" potentials it is necessary that all cathodic protection rectifiers which would be expected to have any influence on potentials in the test area be turned off briefly at the same instant. This is most easily accomplished by making use of two to four synchronized crystal controlled current interrupters set for a cycle of perhaps 4 seconds on followed by 1 second off. The SinCorder is then set to take a multiple reading over a trigger length of 5 seconds when the **ENTER** key or the trigger switch on an M.C.Miler Data Probe is pressed. The operator then moves on to the next test location which is typically from 2.5 to 10' further along the pipeline. The trigger length is selected by the operator to include one complete current interrupter cycle (in this case 4 plus 1 = 5 seconds). The length of the ON portion of the current interrupter cycle should preferably be at least 3 times the length of the OFF portion of the current interrupter cycle so that the structure does not lose its polarization during the test.

- » **NOTE:** Because the SinCorder requires 250 milliseconds to sample a reading the shortest "off" cycle must be greater than 250mS e.g. 300mS.
- » **NOTE:** While the SinCorder is being used in the field the "L" in the upper left hand corner of the screen is flashing, when the trigger is initiated the "L" goes solid for approximately the trigger length plus two seconds.

After you have selected SINGLE or MULTIPLE MODE along with trigger length press the **ROLL** key and the screen will display -



```

DOWNLOAD: NO
SELECT: NO

```

This function permits a suggested test sequence to be downloaded into your SinCorder from a computer. This usually consists of a list of test sites along with a description of the readings which are required to insure that cathodic protection rectifiers, bond connections, electrical isolation, galvanic anodes are all operational. We will not discuss this procedure in this chapter.

---

## PROGRAMMING OUTPUT

---

With SinCorder turned on, press **PRGM** and use the  $\uparrow$  or  $\downarrow$  arrow keys to select **OUTPUT** and then press **ENTER** key. Display will then show -

```

BAUD RATE: 1200
SELECT: 1200

```

(or 300 or 600 or 2400 or 4800 or 9600) Whichever was last used.

This means that the SinCorder wants you to select what rate it will use to transmit data to a printer, computer or storage disk via a direct connection or via a modem and phone line. Consult the instruction manual for the device to be used and then make your selection of BAUD rate. If you choose the wrong BAUD rate, no harm will be done except that the data will come out all garbled. Your original data will remain safe in the SinCorder memory bank until you intentionally erase it. For more detailed information regarding the communications protocol of the SinCorder please see the communications chapter number 8.

Use  $\uparrow$  or  $\downarrow$  arrow keys to select desired BAUD rate, then press **ENTER** key. Then press **ROLL** key and screen will display-

```

FORMAT: PRINT
SELECT: PRINT

```

```

FORMAT: COMP.
SELECT: COMP.

```

The display reflects the format which was last used. Use  $\uparrow$  or  $\downarrow$  arrow keys and **ENTER** key to enter the desired format. The **PRINT** format means that the output will be fully formatted with tabular listing of all data and a semi-graphical plot. **COMP.** format means that only the tabular data is output, without any graph.

>>

**NOTE:** The **COMP** mode only works in the logger mode and not in the **SINGLE**, **MULTIPLE**, OR **DOWN LOAD** MODES.

Press **ROLL** and the screen will display-

```

COMBINE OUTPUT
REPORT BY: 001

```

(or some number less than 255)

This feature gives you a chance to summarize large amounts of data without losing any essential information. If, for example, you choose a factor of 010, the printout will be 1/10th the original length but all of the maximums and minimums will be retained. For example, if you were in the LOGGER mode and had gathered 100 readings then combining time history by a factor of 10 would yield a printout of 10 lines of data. Each line would contain a max., min. and an average reading which occurred during the prior 10 readings.

» **NOTE:** This feature only works with the logger mode print format, and not the single or multiple modes.

Press **ROLL** key and the screen will display-

SELECT HEADER 1.5  
MC MILLER CO.

(or something else if the meter has been used previously)

You now have the option of using the keyboard to type out any desired header. It can include any upper or lower case letters, numbers or symbols up to a maximum of 16 characters. The 4 line header which you type in by means of the keyboard will be printed out as the header of every report until you change it. When the first line of the header is the way you want it, press **ENTER** key.

» **NOTE:** If the **ENTER** key is not pressed the typed information is not saved

Press **↑** or **↓** arrow key and screen will display-

SELECT HEADER 2  
AVIATION BOULEVARD

(or something else if meter has been used before)

Again you have the option of using keyboard to type out and **ENTER** any desired message for the second line of the header (16 characters max.)

Press **↑** or **↓** arrow key and screen will display-

SELECT HEADER 3  
VERO BEACH, FL

(or something else if meter has been used before)

Again, you have the same option as before to type in your own customized message as the third line of the header (16 characters max.).

Press **↑** or **↓** up arrow key and screen will display-

SELECT HEADER 4  
1-561-794-9448

(or perhaps something else if meter has been used before)

Again, as above, you have the option of typing in your own message of up to 16 characters in length which will be the fourth line of the header. Don't forget to press the ENTER key after you complete typing in EACH line of the header otherwise the line will revert to the original.

The header is a useful way of identifying structures, work order numbers, locations, name of test, names of personnel, etc. Some companies use code numbers so as to cut down on typing time and to keep the report confidential.

»

**NOTE:** The header which is present before a new data set is initiated is the one which is stored with that old data set. A new header can be typed for the current data set only. See the chapter covering memory for more information. (Chap. 7)

---

## PROGRAMMING TIME AND DATE

---

With SinCorder turned on, press PRGM key and display will show-

```

TIME: HH:MM:SS
ENTER: HH:MM:SS
  
```

(flashing cursor)

Use keyboard to type in correct time (Military) then press the ENTER key. Top line will then be changed to agree with bottom line. Then press ROLL key and then screen will display-

```

DATE: MM:DD:YY
ENTER: MM:DD:YY
  
```

(flashing)

Use keyboard to type in correct date and then press the ENTER key. Top line will then be changed to agree with bottom line which indicates that the entry has been accepted.

If you had selected LOGGER mode above, then pressing ROLL key will display-

```

SCHD RUN: MANUAL
SELECT: MANUAL
  
```

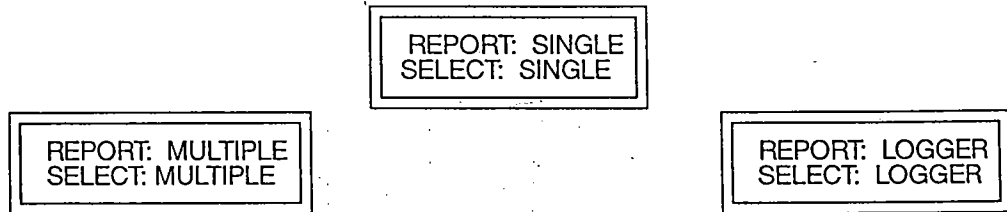
The SinCorder is asking you to select whether you prefer to manually turn the logging on and off or would rather utilize a one-time scheduled logging run. Most of the time you will use MANUAL mode which is the default selection. Use ↑ or ↓ arrow keys to make your selection, then press ENTER key. If you select 1 TIME, the next 4 times you press the ROLL key will give you the opportunity of typing in the desired times and dates for starting and stopping the scheduled logging run. Remember to press ENTER key after typing in each of these dates and times. After you have set the times and dates for the 1 TIME logging run, you will notice a flashing "L" in upper left of display window. This indicates a pending logging condition.

---

**OUT-PUTTING DATA**


---

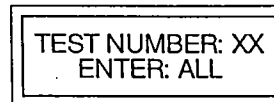
With the meter turned on, press **OUTPUT** key. Screen will display-



The display depends on how the meter was last used. Use the  $\uparrow$  or  $\downarrow$  arrow keys to select which type of report is desired to be output, then press the **ENTER** key. If there is only one file the screen will display-



If there is more than one file for a given output mode, the screen will display-



Where the "A" is a blinking cursor, requesting the number of the file or test which is to be output. The correct response if test number two is to be output would be **02 ENTER**. If all the tests are required to be output just press **ENTER**, "ALL" does not have to be typed.

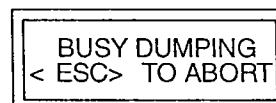
In either case when the following screen appears, for either the logger



or single, multiple modes,



press **ENTER** to output the report. The next screen will be



which indicates that the SinCorder is outputting information to an external device. At any time during this process the "**ESC**" key can be pressed to terminate the output process.

Before you attempt to start the output process make sure that you are properly connected to a suitable printer, computer or communications device, then press **ENTER** and the

## 3

## DISPLAY &amp; EDIT

## DISPLAYING ACTIVE INPUT

With meter turned on, press **DISP** key and screen will display-

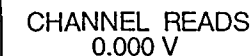


DISPLAY OPTION  
SELECT: CHANNEL

(or TIME or DATA or CHANNEL depending on how meter was last used.)

## TO OBTAIN AN INDICATING READING:

Use the  $\uparrow$  or  $\downarrow$  arrow keys to select CHANNEL, then press **ENTER** key. Screen will now display-



CHANNEL READS:  
0.000 V

(or whatever voltage is connected to input terminals)

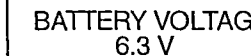
This makes your SinCorder into an indicating meter so that you can see present readings in real time. If polarity is negative a minus sign will be displayed. If meter is overranged, screen will display-



CHANNEL READS:  
INVALID

If this happens, use **PRGM/CHANNEL** keys and  $\uparrow$  or  $\downarrow$  arrow key to select an appropriate range.

To display voltage of the internal rechargeable battery, press **ROLL** key and screen will show-



BATTERY VOLTAGE  
6.3 V

(or some other value between 5.6 V and 7.4 V)

The battery should be charged if below 6.0 V, especially if you are about to make a number of readings. For more detailed information concerning the battery see the battery chapter.

---

**LOGGER**


---



---

**TO VIEW ACCUMULATED LOGGER DATA :**


---

With meter turned on, press **DISP** key and use the  $\uparrow$  or  $\downarrow$  arrow keys as necessary to select **DATA**, then press **ENTER** key. Screen will display-

MIN HH:MM:SS ON  
 MM/DD = 0.000 V

(time and date of overall minimum reading along with voltage value)

Press **ROLL** key and screen will display

OVERALL AVERAGE  
 0.000 V

(or some actual value)

Press **ROLL** key and screen will display-

MAX HH:MM:SS ON  
 MM/DD = 0.000 V

(time and date of overall maximum reading along with logged value)

Press **ROLL** key and screen will display-

PERIOD # : 01234  
 01234

(with a flashing cursor, and a number corresponding to number of readings logged during test run)

Use number keys if a particular reading is preferred, otherwise just press **ENTER** key and screen will display-

PERIOD # 01234  
 MM/DD @ HH:MM:SS

(time and date of reading at beginning of this averaging period)

Press the  $\rightarrow$  arrow key and screen will display-

PERIOD # : 01234  
 MIN 0.000 V

(or a number which is the minimum reading during this particular averaging period)

Press the → arrow key and screen will display-

```
PERIOD # : 01234
AVG 0.000 V
```

(or a number which is avg. reading during this particular averaging period)

Press the → arrow key and screen will display-

```
PERIOD # : 01234
MAX 0.000 V
```

(or a number which is maximum reading during this particular averaging period)

Press the → arrow key and screen will display-

```
PERIOD # : 01234
LENGTH: HH:MM:SS
```

(length of averaging period in hours, minutes and seconds)

You now have the choice of using the ← or → arrow keys to see display of max., min., or average values and length of period for the selected time period OR using the ↑ or ↓ arrow keys to scroll through different time periods.

**EXPLANATORY NOTE:** Since the screen can only display 16 characters on each of the two lines, we had to come up with some way of letting you see any of the data which has been entered into memory. Picture a large sheet of paper with columns labeled: MIN., MAX., AVG, & LENGTH. Then picture that along the left margin of the paper will be number of rows called TIME PERIODS. Each time period therefore will include pieces of information pertaining to that particular time period. Using the ← or → and ↑ or ↓ arrow keys is thus like moving a small window around on a sheet of tabulated data. Of course, it is easier to look at the complete printout of all the collected data, but that is not possible in a small hand-held meter so we provided this alternative.

---

## SINGLE MODE

---

### VIEW OR CORRECT SINGLE MODE DATA :

---

Press **DISP** key and screen will display-

```
DISPLAY OPTION
SELECT: DATA
```

(or some other mode)

Use the ↑ or ↓ arrow key to select **DATA** if it is not already displayed. Then press **ENTER** key and screen will display-

TRIGGER #: XXXXX  
ENTER: XXXXX

(where XXXXX is the number of times the trigger recorded data, type in the desired trigger number which is to be viewed, or press **ENTER** to go to the number showed on the display)

Press the **ENTER** key and screen will display-

TRXXXXX  
DESCRIPTOR

(Descriptor, if any, will be shown here)

Press → arrow key and screen will display-

(A) TRXXXXX  
DATA 0.000 V

(or some actual value)

Press the → key and screen will display-

(B) TRXXXXX FIX: NO  
SELECT: NO

The SinCorder is asking you whether or not you want to retake this particular reading. (This would usually be because you know the reading to be in error) Let us assume that you do want to make a correction. The meter is now giving you a chance to correct this reading. Press **LOG/STBY** then use ↑ or ↓ arrow keys to change selection to **YES** if a correction is needed. Then press **ENTER** key and screen will display-

(C) TRXXXXX FIX: PT  
SELECT: PT.\*

The SinCorder is asking you to select between **PT** (meaning point) or **SET** (meaning all of the readings including this point to end of test run). If you want to correct this reading without changing other readings, press **ENTER** key and screen will **BRIEFLY** display-

(D) CORRECTION  
ENABLED

You should now press **LOG/ STBY** key and then enter the corrected reading by pressing trigger on the **DATA PROBE** (or alternatively the **ENTER** key). The screen will now display-



(E)

CORRECTION  
DONE

Then press **LOG / STBY** to turn off logging. Screen will now display-

(F)

LOGGING ABORTED

TRXXXXX DATA  
0.000 V

(or whatever value was connected to the terminals)

\*If instead you had wanted to erase data from a given point to the end of the data string, use up arrow key to select SET and then press ENTER key. This will erase all data from the chosen trigger event to the end of the data run and thus allow you to redo this portion of the survey.

Use the ↑ or ↓ arrow keys to scroll through the data for the various trigger event numbers and make corrections wherever necessary.

**MULTIPLE MODE**

**VIEW OR CORRECT MULTIPLE MODE DATA:**

Press **DISP** key and screen will display-

TRIGGER # : XXXXX  
ENTER: XXXXX

(where XXXXX is the trigger event number)

If the number shown (it is trigger number for the last set of readings obtained) is desired, press the **ENTER** key. If another number is desired, type it in and then press **ENTER** key. The screen will now display-

TRXXXXX DESCR:  
NONE

(a descriptor if previously typed will appear)

Press the → arrow key and screen will display-

TRXXXXX MINIMUM  
Y.YYY V

(this is min. value obtained during the selected trigger interval)

Press the → arrow key and screen will now display-

```
TRXXXXX MAXIMUM
Z.ZZZ V
```

(this is max. voltage obtained during the selected trigger interval)

Press the → arrow key and the screen will display-

```
TRXXXXX FIX: NO
SELECT: NO
```

- >> If the previous min. and max. reading need to be corrected, proceed as in (A) through (F) correction procedure as in the single mode.
  
- >> BY THE WAY: In performing these corrections you will undoubtedly encounter several instances where the SinCorder will tell you where you have forgotten to turn the logging on or off or have used some illegal keystroke. Don't let it worry you. Just keep trying.
  
- >> It is not possible to correct data which has been obtained using the logger mode.

---

**DISPLAYING BATTERY VOLTAGE, TIME AND DATE**

---

With the SinCorder turned on, press **DISP** key and then use  $\uparrow$  or  $\downarrow$  arrows to obtain CHANNEL, then press **ENTER** key then press **ROLL** key. Screen will display-

BATTERY VOLTAGE  
6.3 V

(or some other value between 5.6 V and 7.4 V)

If you are going out for a day's testing, the battery should be charged during the previous night. You can't harm the battery by leaving charger connected for an extended period of time although 16 hours should be completely sufficient.

To display time and date, use  $\uparrow$  or  $\downarrow$  arrow keys to display TIME, then press **ENTER** key and screen will display the current time and data. If it does not agree with your watch (which we assume reads correct time) switch to PRGM TIME mode and reset clock to read accurate time and date. The internal clock is quite accurate.

Press the **ROLL** key and screen will display-

ELAPSED TIME:  
XXX DAYS HH:MM:SS

(this is the elapsed time since the start of the current logging run)

Press the **ROLL** key and screen will display-

TIME HIST. CAPACITY  
XXX DAYS HH:MM:SS

(this is how long it will take to use up the remaining memory for a logging run at present settings)



NOTE: You will only get a TIME HISTORY display if your meter is in LOGGER mode.

## 4

## DOWNLOADING

## DOWNLOADING WORK ASSIGNMENTS

DOWNLOADING is the name we give to transferring a previously prepared list of tests from a computer or disc to the SinCorder. Usually this would consist of a series of measurements to be made in the next several weeks. Optionally the last readings at the same location may be included for sake of comparison. The work of entering this work assignment into a computer would normally be done by a supervisor in a main or branch office. Ideally a printout of the work assignment should be given to each of the involved field test personnel so that the entire assignment can be viewed at one time.

The field engineer or technician would then proceed with the testing. He or she would transfer data to the office computer at intervals which ideally should be not more than one week. The field testing does not have to be done in any specific order as far as the SinCorder is concerned.

## SOFTWARE

## PREPARING THE ASSIGNMENT FILES ON COMPUTER

There are many ways to create a downloadable file on a personal computer. The fastest method would be to purchase speciality software from a corrosion / software company. These companies have invested thousands of hours creating software which will create a data base, communicate these files to the SinCorder, retrieve the updated SinCorder information, and process the information into management reports. The addresses and phone numbers of these companies follows.

**M. C. Miller Co.**  
3020 Aviation Blvd.  
Vero Beach, FL 32960  
561-794-9448

**Corrpro Companies**  
7000 B Hollister  
Houston, TX 77040  
713-460-6000

**BASS ENGINEERING**  
P.O. Box 5279  
Longview, TX 75608  
214-759-1633

There are several other methods of creating the downloadable file utilizing off the shelf software, or software which may be already installed on your PC. A few examples of this software would be Lotus<sup>®</sup> dBase<sup>®</sup>, or WORDSTAR<sup>®</sup> to create the files and Smartcom<sup>®</sup> or Crosstalk<sup>®</sup> to send the files to the SinCorder. Another option would be to use integrated software such as Symphony<sup>®</sup> or Framework<sup>®</sup> which could create and send the files from within the same program.

---

**SAMPLE DOWNLOAD FILE**

---

```
ST 125+15 SW 3 & CUTTER PLACE @  
PIPE TO SOIL #-.772 V  
  
STATION 126 MOUNTAIN AV & LONG@  
RECTIFIER 15346 STRUCTURE PL7#-1.575 V  
mV DROP ACROSS 0.001 SHUNT#-16.63 mV  
IR-DROP #-110.3 mV  
  
STATION 127 @  
PIPE TO SOIL #-1.750 V  
REMOTE #-1.60 V  
  
MANHOLE 2849 5TH & 9TH AVE.  
UP STREAM IR DROP #15.75 mV  
DOWN STREAM IR DROP #-2.48 mV  
  
!
```

The above example is an ASCII text file which is composed of test location headers and site prompts. There are four location headers (the first line of each paragraph) e.g. STATION 126 MOUNTAIN AV & LONG@ is the second header in the above example. Each station location has beneath it site prompts which indicate the type of test to be performed at this specific location. At the MOUNTAIN location there are three site prompts, rectifier, mV drop, and IR drop. At these site prompts new filed data is to be gathered.

---

## SPECIFICATIONS OF THE DOWNLOAD FILE

---

- Location headers must be less than or equal to 30 characters.
- Site prompts must be less than or equal to 30 characters
- The @ and # signs are special characters which must not be used within a header or prompt.
- The maximum number of prompts per location header is 99
- The @ and # signs may be the 31st character
- CR LF (Hex 0D 0A) terminate each line in the file
- CR LF (Hex 0D 0A) separate the last site prompt from the next location header
- the exclamation point ! terminates the download file
- CR LF (Hex 0D 0A) must precede the !

---

### THE @ SIGN

---

The @ sign instructs the SinCorder to automatically record the time and date when data was last collected at a location header.

- The use of the @ sign is optional.
- The @ sign is the last character of the location header.
- The @ sign can be the 31st character of the location header.
- The @ sign can not be used with prompts.
- There is one date and time recorded per location header.
- The time and date stamp corresponds to the very last voltage reading taken at a location.

---

### THE # SIGN

---

The # sign instructs the SinCorder to automatically display (next to a site prompt) previously recorded data. For example if STATION 126 had IR DROP of -110.3 mV that was stored in the PC data base, the # sign allows the -110.3 mV to be displayed alongside the prompt IR-DROP # -110.3 mV so the field operator could compare it to the real time voltage applied to the terminals.

- The use of the # sign is optional.
- The # sign is the last character of the site prompt.
- The # sign can be the 31st character of the location header.
- The # sign can not be used in a header location.
- The # sign can be followed by 9 data characters.
- The SinCorder does not check for valid data values
- The user may enter any 9 characters after the # sign.

---

### THE ! SIGN

---

The ! is the end of file mark, it instructs the SinCorder that this is the end of the download file.

- The ! must appear at the end of the download file.
- The end of file marker must be preceded by CR LF (Hex 0D 0A).
- The ! may be used in the location header and site prompt as long as it does not appear as the first character.

**DOWNLOAD DATA FORMAT**

```

Location header (@) (CR LF)
Site prompt #sXXX.XUNI (CR LF)
Site prompt #sXXX.XUNI (CR LF)
Site prompt #sXXX.XUNI (CR LF)
Site prompt #sXXX.XUNI (CR LF)
End of site prompts (CR LF) (a blank line)

Location header (@) (CR LF)
Site prompt #sXXX.XUNI (CR LF)
Site prompt #sXXX.XUNI (CR LF)
Site prompt #sXXX.XUNI (CR LF)
Site prompt #sXXX.XUNI (CR LF)
End of site prompts (CR LF) (a blank line)

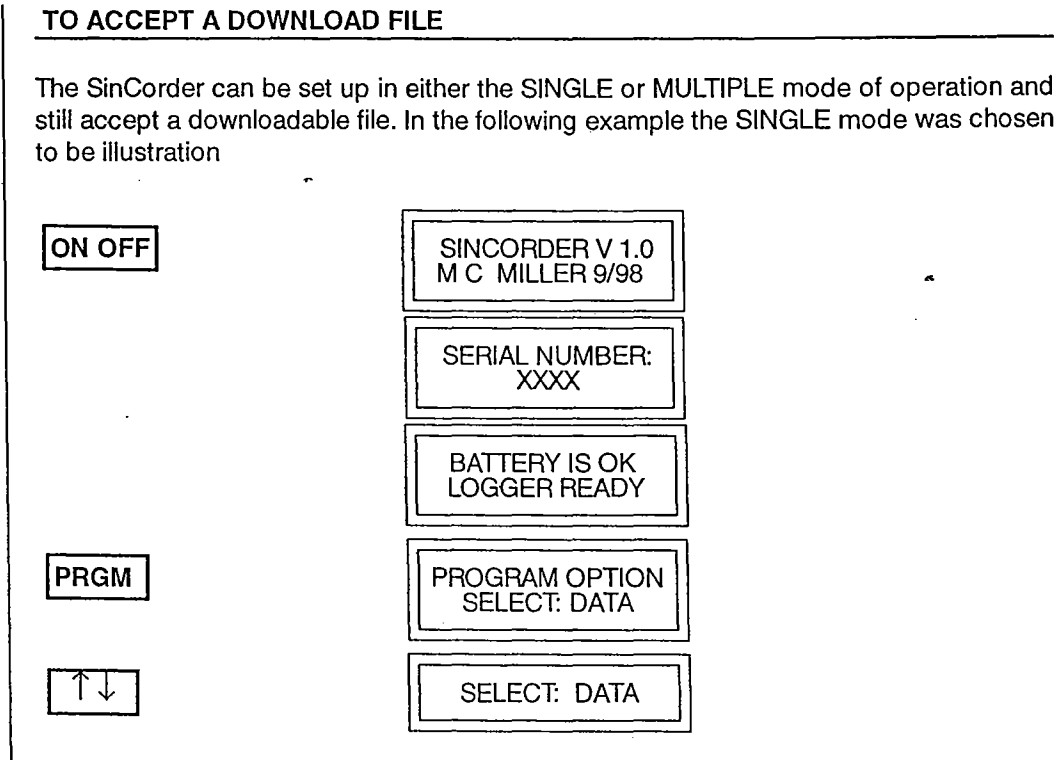
Location header (@) (CR LF)
Site prompt #sXXX.XUNI (CR LF)
Site prompt #sXXX.XUNI (CR LF)
Site prompt #sXXX.XUNI (CR LF)
Site prompt #sXXX.XUNI (CR LF)
End of site prompts (CR LF) (a blank line)

! End of downloaded file marker
    
```

**CONFIGURING THE SINCORDER**

**TO ACCEPT A DOWNLOAD FILE**

The SinCorder can be set up in either the SINGLE or MULTIPLE mode of operation and still accept a downloadable file. In the following example the SINGLE mode was chosen to be illustration



ENTER

CLEAR DATA? NO  
SELECT: NO

↑↓

SELECT: YES

- In the down load mode the SinCorder can only accept one file, therefore the memory must be cleared.

ENTER

HIT ENTER  
TO CLEAR DATA

ENTER

MEMORY CLEAR

CLEAR DATA? NO  
SELECT: NO

ROLL

MODE: SINGLE  
SELECT: SINGLE

↑↓

SELECT: SINGLE

ENTER

MODE: SINGLE  
SELECT: SINGLE

ROLL

DOWNLOAD: NO  
SELECT: NO

↑↓

SELECT: YES

ENTER

HIT ENTER FOR  
DOWNLOAD PROMPTS

ENTER

WAITING...  
< ESC > TO ABORT

- At this point the download file would be transmitted from the computer, and the following screen will be displayed.

WAITING...  
< ESC > TO ABORT



- The following will appear if the download was successful.

DOWNLOAD  
DONE

- NOTE: Spaces count as character, therefore if download fails due to "prompts too long", examine for trailing spaces.

**DISPLAYING**

**A DOWNLOAD FILE.**

Assuming that the example download file from the beginning of this chapter was transferred to the SinCorder the following key sequences will illustrate viewing and entering data.

DISP

DISPLAY OPTION  
SELECT: CHANNEL

↑↓

SELECT: DATA

ENTER

SITE #: 00003  
ENTER:00003

- Site #3 indicates that there were a total of three location headers received by the SinCorder. The flashing cursor is requesting a number be typed and the ENTER key depressed. This allows the user to go directly to a specific location or press ENTER to go to site #3.

ENTER

STATION 127

- This is the location header from the download file. If this is not the location that is desired use the ↑ ↓ arrow key to scroll through the available locations.

↓

STATION 126 MOU  
NTAIN AV & LONG

- In order to see the site prompts for this location press.

ENTER

RD01 -0.00 V  
RECTIFIER 15346 STRUCTURE PL7

- The above screen is scrolling past in order to read all 30 characters on the 16 character screen. RD01 indicates that this is the first site prompt reading (recall there can be up to 99 site prompts). If other site prompts are to be viewed use the ↑ ↓ arrow keys. The -0.00 V is the voltage applied to the terminals. In order to capture a voltage reading proceed as follows.

LOG/  
STBY

L RD01 -0.00 V  
RECTIFIER 15346 STRUCTURE PL7

- A flashing "L" appears in the upper left corner, this indicates that the SinCorder is ready to accept data. To record a voltage press the ENTER key and the "L" will go solid for 1 1/2 seconds. This indicates that a reading has been recorded. To inspect the recorded data press the ← arrow key.

←

L RD01 DATA  
-0.00 V

- If it is appropriate at this point to add a descriptive message to the last reading press "D" followed by the intended message.

D

NEW DESCRIPTOR

- when the message is complete press ENTER.

ENTER

DESCRIPTOR  
HAS BEEN SAVED

L RD01 DATA  
-0.00 V

←

L RD01 DESCR:  
FENCE CROSSING

- The above is the descriptor which was previously entered. If more than one descriptor is entered for a site prompt, only the first will be displayed, the others will appear when they are output to the computer or printer.

←

L RD01 -0.00 V  
PAST: -1.575 V

- This display indicates the voltage applied to the terminal along with the past reading which was download with this sight prompt. e.g. # -1.575 V

←

RD01 -0.00 V  
RECTIFIER 15346 STRUCTURE PL7

- The display is now back to the beginning. Practice with the ← → arrow keys to get a feel for how the display moves. The arrow keys are configured in a loop, therefore eventually the beginning display will reappear.
- In order to change voltage ranges proceed with the following steps.

R

L RANGE: 2 V  
SELECT: 2V

↑ ↓

SELECT: 20 V

ENTER

RANGE HAS  
BEEN CHANGED

L RD01 -0.00 V  
RECTIFIER 15346

- To exit from these site prompts and choose another location press

ESC

L STATION 126 MOU  
\*NTAIN AV & LONG

- Let it be noted at this location a new symbol has been added, a sight visitation delineator, the \* indicates that data was collected at this sight. The asterisk does not mean that all the data was collected but only at least one voltage was recorded. The purpose for the \* is to assist the person using the SinCorder which sites have been visited and have not had reading taken.
- Use the ↑ ↓ arrow keys to scroll thou the header locations, but return to the above screen before proceeding.

ESC

SITE # :00003  
ENTER:00002

- The display is now back at the beginning screen requesting which location to proceed to next. Please note that the bottom line indicates site # 00002; the 2 is present because that is the site which was just exited, a helpful reminder of where you were and where you might like to go.

5

EXAMPLES

WHO CARES WHY - JUST SHOW ME

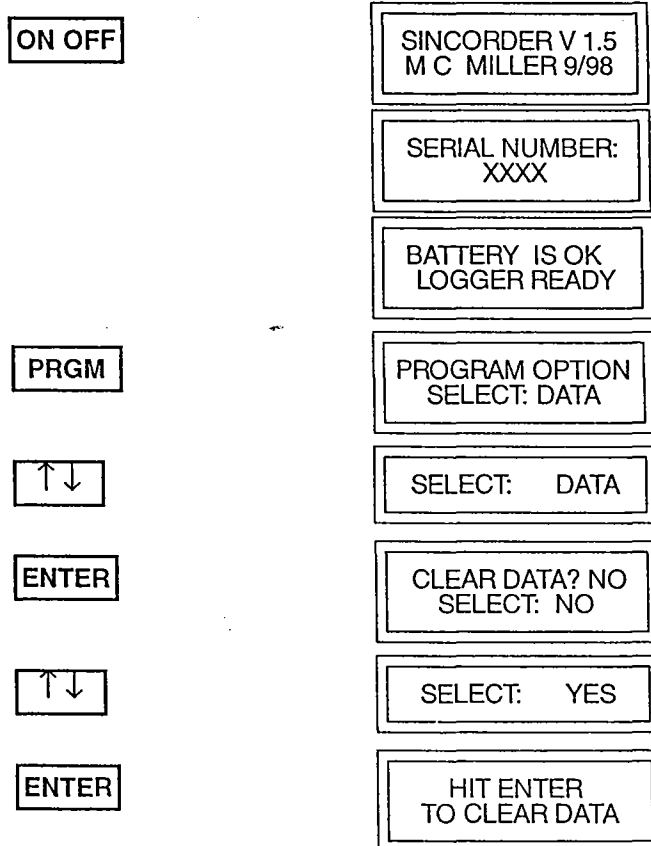
The following examples are detailed step by step illustrations of the first examples from the previous chapters.

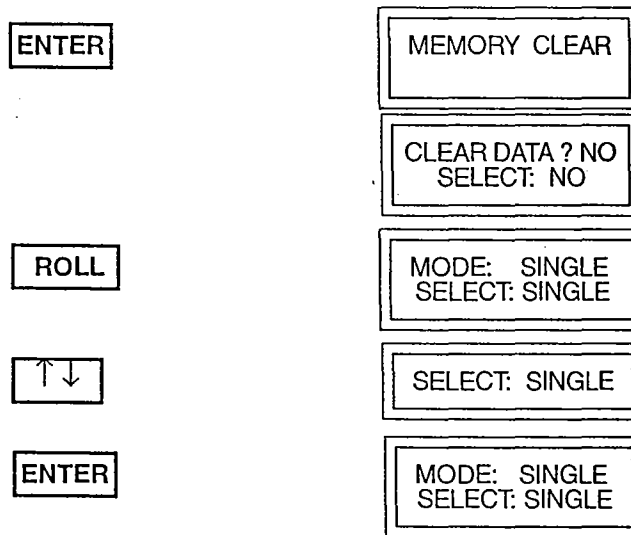
SINGLE MODE

It is desired to make a close interval potential survey on a buried metallic structure along which are installed a number of galvanic anodes which cannot be disconnected. With the SinCorder in SINGLE MODE, just press the ENTER key whenever you wish to take a reading. Press the "D" key (upper or lower case) whenever you want to inset a descriptor. After typing in the descriptor, then press ENTER key again to place the descriptor in memory.

What follows is the key strokes and the corresponding SinCorder displays to achieve the close interval survey.

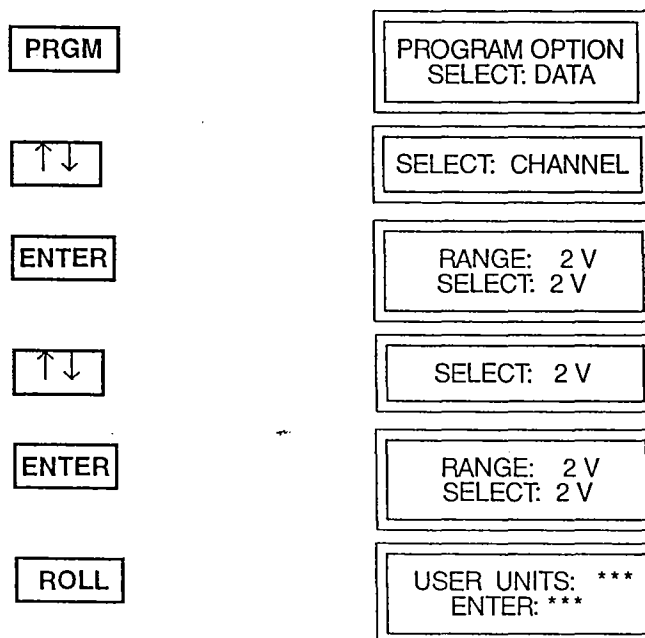
STEP 1: PROGRAMMING THE TYPE OF DATA COLLECTION





Setting the SinCorder to collect **SINGLE** data is now complete.

#### STEP 2: PROGRAMMING THE CHANNEL



- If the three asterisks are not displayed type them in using the SinCorder key pad. The upper and lower case may be toggled with the shift key, an "S" in the upper left corner of the display indicates the upper case, top half of the numeric keys are active.
- If the three asterisks are present there is no need to re-enter them, press roll to move to the next display.

ROLL

CALIBR.PT 1  
0.0 V= 0.000 V

- If the SinCorder does not display 0.000 V use the key pad to make the 0.000 V entry followed by pressing the **ENTER** key. If the display is correct proceed with the following steps.

ROLL

CALIBR.PT 2  
2.0 V= 2.000 V

- If the SinCorder does not display 2.000 V use the key pad to make the 2.000 V entry followed by pressing the **ENTER** key. If the display is correct proceed with the following steps.

ROLL

RANGE: 2 V  
SELECT: 2 V

Programming the channel / voltage range is now complete

**STEP 3: DISPLAYING THE CHANNEL VOLTAGE**

The next step will be to connect the reference electrode to the red banana jack on the top right of the SinCorder and the structure test lead to black banana jack on the top center of the SinCorder. If the optional DATA PROBE (walking stick with a reference electrode on the bottom and a bottom on top) is available it may be plugged into the trigger port on top right of the SinCorder and used in place of the **ENTER** key.

- In order to display the structure to soil potential press the following keys.

DISP

DISPLAY OPTION  
SELECT: CHANNEL

↑↓

SELECT: CHANNEL

ENTER

CHANNEL READS:  
-0.850 V

- This is just displaying the active voltage. In order to record the reading the SinCorder must be put into the pending log status, a flashing "L". Press.

LOG/STBY

LCHANNEL READS:  
-0.850 V

- When a reading is to be recorded press

ENTER

```

LCHANNEL READS:
-0.850 V
  
```

- The "L" will stop flashing and remain solid for approximately 1 1/2 seconds. This indicates that the displayed voltage has been recorded.

D

```

LNEW DESCRIPTOR
  
```

- At this point a descriptive notation would be typed in using the SinCorder keys.

ENTER

```

DESCRIPTOR HAS
BEEN SAVED
  
```

```

LCHANNEL READS:
-0.850 V
  
```

- Descriptive phrases can only be 16 characters long, but any number of descriptors can be entered one right after the other. Press "D" again then type the next descriptor.
- In order to change voltage ranges proceed with the following steps.

R

```

L RANGE: 2 V
  SELECT: 2V
  
```

↑↓

```

SELECT: 20 V
  
```

ENTER

```

RANGE HAS
BEEN CHANGED
  
```

```

LCHANNEL READS:
- 0.85 V
  
```

It would now be appropriate to practice taking voltage readings, entering descriptors, and changing ranges.

#### STEP # 4: DISPLAYING READINGS AND DESCRIPTORS WHICH HAVE BEEN SAVED

DISP

```

DISPLAY OPTION
SELECT: CHANNEL
  
```

↑↓	SELECT: DATA
ENTER	L TRIGGER # :00023 ENTER:00023

- This display is requesting that a trigger event be entered by way of the numeric keys or by pressing the enter key to move to the last reading captured.

ENTER	L TR00023 DESCR: FENCE CROSSING
-------	------------------------------------

- This is the 23rd trigger voltage which was captured with its' corresponding descriptor if any was typed and saved. If more than one descriptor had been typed (for trigger 23) only the first will be able to be viewed. The remainder will appear when the data is output.
- To view the voltage reading associated with trigger event 23 press

→	L TR00023 DATA: 0.885 V
---	----------------------------

- Use the ↑ or ↓ arrow keys to scroll through the data for the various trigger event numbers and make corrections wherever necessary. The ESC key can be pressed at any time to return you to the trigger history

ESC	L TRIGGER # :00023 ENTER:00023
-----	-----------------------------------

**CORRECTING PREVIOUSLY SAVED DATA**

---

- The next set of screens will indicate the procedure for correcting either an individual point of data or entire set.

→	TR00023 FIX: NO SELECT: NO
↑↓	SELECT: YES

- The SinCorder is asking whether or not you want to retake this particular reading. (This would usually be because you know the reading to be in error) Let us assume that you do want to make a correction. The meter is now giving you a chance to correct this



reading. First press **LOG/STBY** then use  $\uparrow$  or  $\downarrow$  arrow keys to change selection to YES if a correction is needed. Then press

**ENTER**

TR00023 FIX: PT  
SELECT: PT\*

- The SinCorder is asking you to select between PT (meaning point) or SET (meaning all of the readings including this point to end of test run). If you want to correct this reading without changing other readings, press

**ENTER**

CORRECTION  
ENABLED

- Preparation must now be made to display and record the new reading.

**DISP**

DISPLAY OPTION  
SELECT: CHANNEL

$\uparrow\downarrow$

SELECT: CHANNEL

**ENTER**

CHANNEL READS:  
-0.850 V

- This is just displaying the active voltage. In order to record the reading proceed to the SinCorder must be put into the pending log status, a flashing "L".

**LOG/STBY**

<sup>L</sup>CHANNEL READS:  
-0.850 V

- When a reading is to be recorded press

**ENTER**

<sup>L</sup>CHANNEL READS:  
-0.850 V

**ENTER**

CORRECTION  
DONE

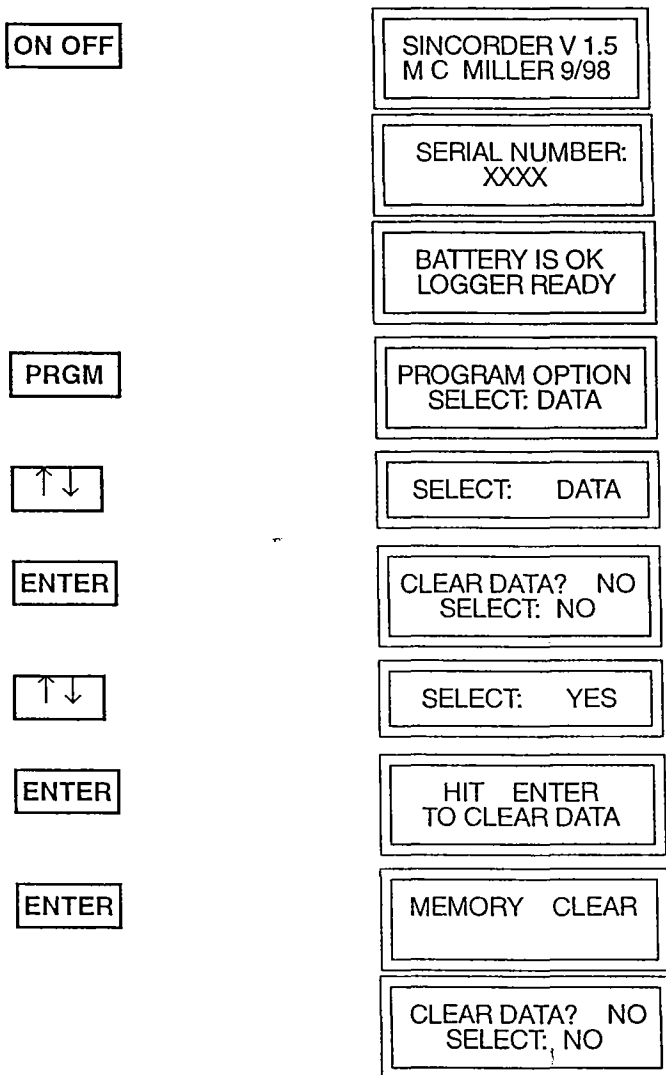
CHANNEL READS:  
-0.850 V

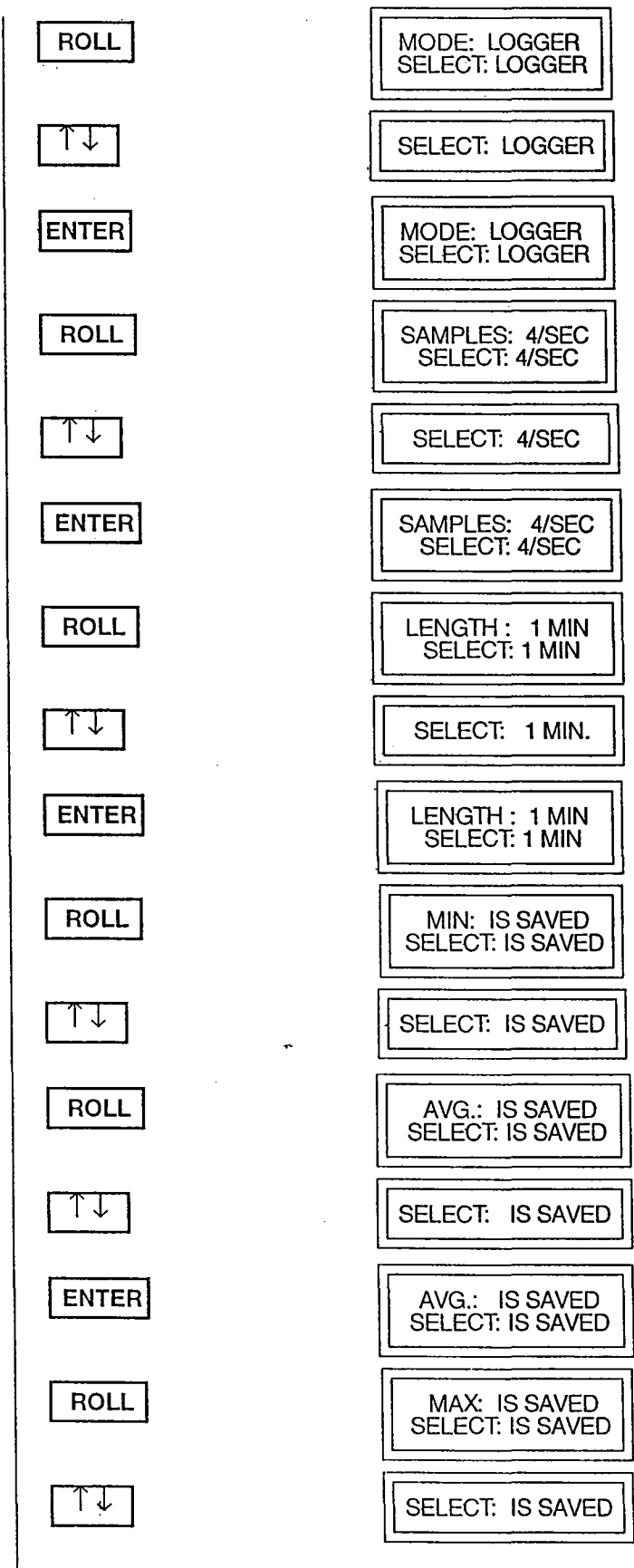
\* If instead you had wanted to erase data from a given point to the end of the data string, use up arrow key to select SET and then press ENTER key. This will erase all data from the chosen trigger event to the end of the data run and thus allow you to redo this portion of the survey.

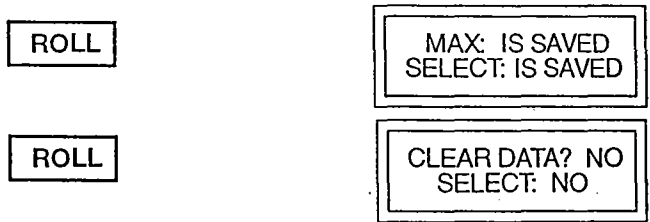
**LOGGER MODE:**

You would like to measure structure-to-soil potentials on a buried pipeline or cable on the outskirts of a city which has known sources of considerable varying stray DC currents. Because there are commuter railroads involved, you would probably want to run the test for at least 24 hours on a weekday. We would suggest that you place channel on the 20 volt range (10 millivolt resolution) because use of a lower range might yield a number of overrange readings which would not damage the meter but whose value would be unknown. You would probably be interested in peak values as well as average values. We would, therefore, suggest using a high sampling rate of 4 per second along with an averaging period of 1 minute. The net result will be that the SinCorder will be able to take 240 readings per minute and will record max., min, and average readings for each and every minute along with highly accurate date stamping. You could not possibly accomplish this manually with such speed and accuracy.

**STEP 1: PROGRAMMING THE TYPE OF DATA COLLECTION**



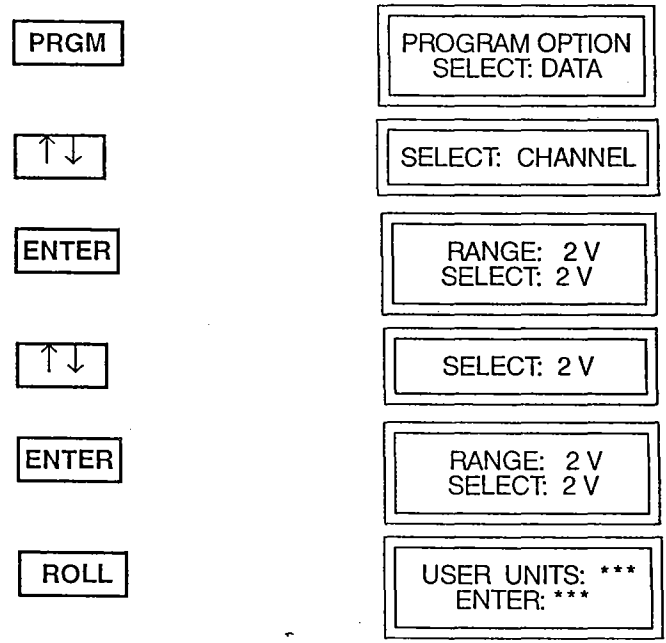




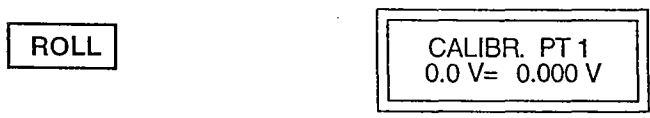
- **NOTE:** Whenever the roll or the ↑ and ↓ keys are used and press often enough the first display will reappear. In other words rolls are horizontal loops and the arrow keys are vertical loops

Setting the SinCorder to collect **LOGGER** data is now complete.

**STEP 2: PROGRAMMING THE CHANNEL**



- If the three asterisks are not displayed type them in using the SinCorder key pad. The upper and lower case may be toggled with the shift key, an "S" in the upper left corner of the display indicates the upper case, top half of the numeric keys are active.
- If the three asterisks are present there is no need to re-enter them, press roll to move to the next display.



- If the SinCorder does not display 0.000 V use the key pad to make the 0.000 V entry followed by pressing the **ENTER** key. If the display is correct proceed with the following steps.

ROLL	CALIBR.PT 2 2.0 V= 2.000 V
------	-------------------------------

- If the SinCorder does not display 2.000 V use the key pad to make the 2.000 V entry followed by pressing the **ENTER** key. If the display is correct proceed with the following steps.

ROLL	RANGE: 2 V SELECT: 2 V
------	---------------------------

Programming the channel / voltage range is now complete

**STEP 3: DISPLAYING THE CHANNEL VOLTAGE**

The next step will be to connect the reference electrode to the red banana jack on the top right of the SinCorder and the structure test lead to black banana jack on the top center of the SinCorder.

- In order to display the structure to soil potential press the following keys.

DISP	DISPLAY OPTION SELECT: CHANNEL
↑↓	SELECT: CHANNEL
ENTER	CHANNEL READS: -0.850 V

- At this point it would be very helpful to know the amount of time the SinCorder will run for before the memory is full.

DISP	DISPLAY OPTION SELECT: CHANNEL
↑↓	SELECT: TIME
ENTER	DATE: 12/06/98 TIME: 15:03:55
ROLL	ELAPSED TIME: 000 DYS 00:00:00

ROLL

TOTAL CAPACITY  
007 DYS 07:44:00

- This is far more capacity than is required for this test, but illustrates a helpful tool for planning logging duration.
- The next objective is to return to displaying the input channel and begin logging data.
- In order to display the structure to soil potential press the following keys.

DISP

DISPLAY OPTION  
SELECT: TIME

↑↓

SELECT: CHANNEL

ENTER

CHANNEL READS:  
-0.850 V

- This is just displaying the active voltage. In order to start recording the readings the SinCorder must be put into the log status, a solid "L" in the upper left hand corner.

LOG/STBY

L CHANNEL READS:  
-0.850 V

- Data is now being recorded
- To stop logging data press

LOG/STBY

LOGGING  
ABORTED

CHANNEL READS:  
-0.850 V

- The "L" is no longer present in the upper left hand corner
- In order to enter a descriptive tag to the previous gathered data press the following keys.

ROLL

BATTERY VOLTAGE  
5.9 V

ROLL

SELECT TAG:

- Type in the appropriate descriptor and press **ENTER** to store the message. Only one tag per data group may be entered therefore keep the tag short and concise. The tag will appear in the output report next to the time and date the logging started. A new tag can be entered each time logging is restarted.

**STEP # 4: DISPLAYING READINGS AND DESCRIPTORS WHICH HAVE BEEN SAVED**

DISP

DISPLAY OPTION  
SELECT: CHANNEL

↑↓

SELECT: DATA

ENTER

MIN 15:17:38 ON  
12/06= - 5.85 V

ROLL

OVERALL AVERAGE  
- 2.69 V

ROLL

MAX 15:18:54 ON  
12/06= 1.85 V

- The above three screens indicate the overall statistics for data logged under this file.

ROLL

PERIOD #: 00045  
ENTER: 00045

ENTER

PERIOD #: 00045  
12/06 @15:28:23

→

PERIOD #: 00045  
MIN -4.83 V

→

PERIOD #: 00045  
AVE -2.65 V

→

PERIOD #: 00045  
MAX -1.39 V

- These are the min., max., and averages which were recorded during the 1 minute period # 45.



PERIOD # : 00045  
LENGTH: 00:00:20

- The length of 20 seconds means that logging was aborted 20 seconds through period # 45.
- Use the ↑ or ↓ arrow keys to scroll through the data for the various period event numbers and statistics. The ESC key can be pressed at any time to return to the period #.

**MULTIPLE MODE :**

A high pressure coated steel gas transmission main has impressed current cathodic protection with rectifiers spaced about every 10 miles. In order to take the desired "instant off" potentials it is necessary that all cathodic protection rectifiers which would be expected to have any influence on potentials in the test area be turned off briefly at the same instant. This is most easily accomplished by making use of two to four synchronized crystal controlled current interrupters set for a cycle of perhaps 4 seconds on followed by 1 second off. The SinCorder is then set to take a multiple reading over a trigger length of 5 seconds when the ENTER key or the trigger switch on an M.C.Miller Data Probe is pressed. The operator then moves on to the next test location which is typically from 2.5 to 10' further along the pipeline. The trigger length is selected by the operator to include one complete current interrupter cycle (in this case 4 plus 1 = 5 seconds). The length of the ON portion of the current interrupter cycle should preferably be at least 3 times the length of the OFF portion of the current interrupter cycle so that the structure does not lose its polarization during the test.

**STEP 1: PROGRAMMING THE TYPE OF DATA COLLECTION**

ON OFF

SINCORDER V 1.5  
M C MILLER 9/98

SERIAL NUMBER:  
XXXX

BATTERY IS OK  
LOGGER READY

PRGM

PROGRAM OPTION  
SELECT: DATA

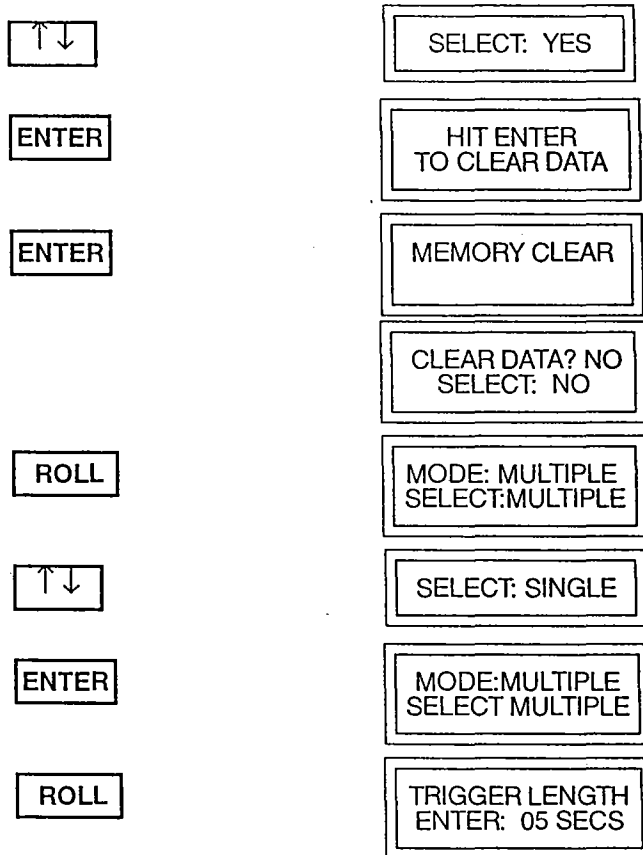
↑↓

SELECT: DATA

ENTER

CLEAR DATA? NO  
SELECT: NO

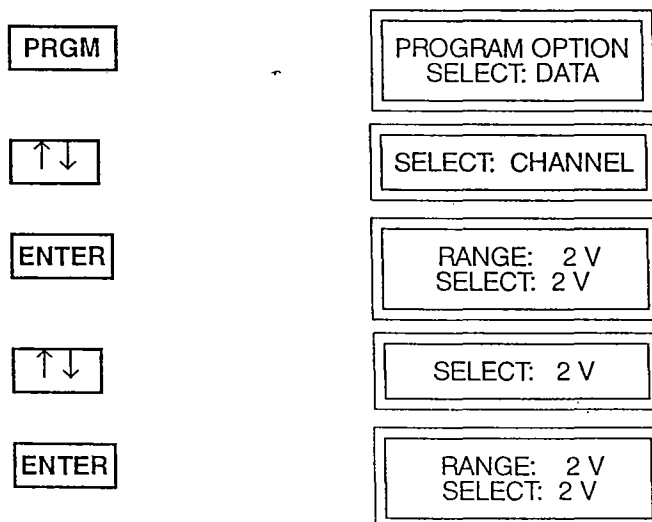




- Using the SinCorder key pad type 05 then press enter.

Setting the SinCorder to collect **MULTIPLE** data is now complete.

**STEP 2: PROGRAMMING THE CHANNEL**





PERIOD # : 00045  
LENGTH: 00:00:20

- The length of 20 seconds means that logging was aborted 20 seconds through period # 45.
- Use the ↑ or ↓ arrow keys to scroll through the data for the various period event numbers and statistics. The ESC key can be pressed at any time to return to the period #.

**MULTIPLE MODE :**

A high pressure coated steel gas transmission main has impressed current cathodic protection with rectifiers spaced about every 10 miles. In order to take the desired "instant off" potentials it is necessary that all cathodic protection rectifiers which would be expected to have any influence on potentials in the test area be turned off briefly at the same instant. This is most easily accomplished by making use of two to four synchronized crystal controlled current interrupters set for a cycle of perhaps 4 seconds on followed by 1 second off. The SinCorder is then set to take a multiple reading over a trigger length of 5 seconds when the ENTER key or the trigger switch on an M.C.Miller Data Probe is pressed. The operator then moves on to the next test location which is typically from 2.5 to 10' further along the pipeline. The trigger length is selected by the operator to include one complete current interrupter cycle (in this case 4 plus 1 = 5 seconds). The length of the ON portion of the current interrupter cycle should preferably be at least 3 times the length of the OFF portion of the current interrupter cycle so that the structure does not lose its polarization during the test.

**STEP 1: PROGRAMMING THE TYPE OF DATA COLLECTION**

ON OFF

SINCORDER V 1.5  
M C MILLER 9/98

SERIAL NUMBER:  
XXXX

BATTERY IS OK  
LOGGER READY

PRGM

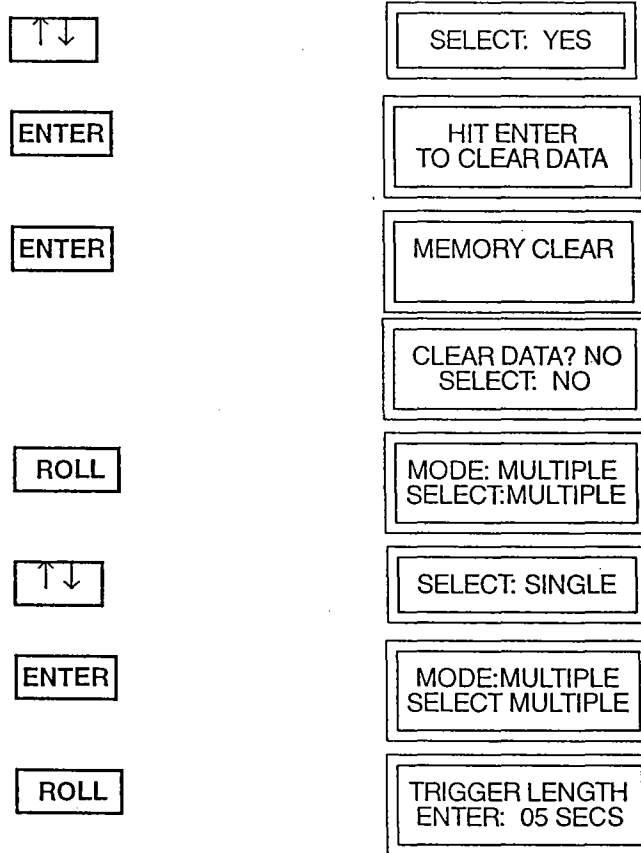
PROGRAM | OPTION  
SELECT: DATA

↑ ↓

SELECT: DATA

ENTER

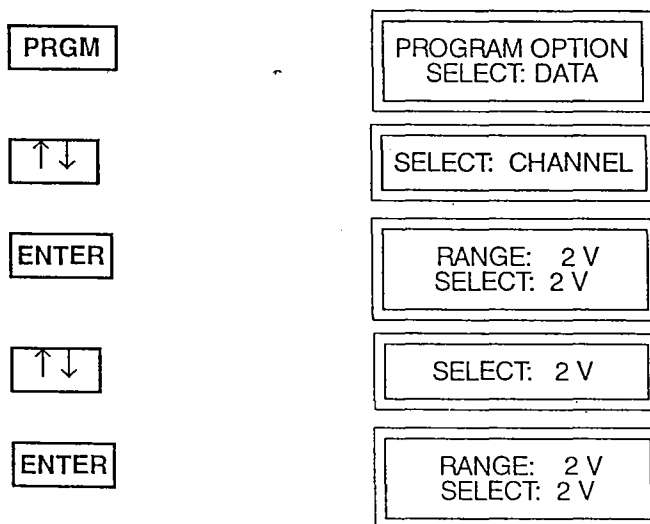
CLEAR DATA? NO  
SELECT: NO



- Using the SinCorder key pad type 05 then press enter.

Setting the SinCorder to collect **MULTIPLE** data is now complete.

**STEP 2: PROGRAMMING THE CHANNEL**



ROLL

USER UNITS: \*\*\*  
ENTER: \*\*\*

- If the three asterisks are not displayed type them in using the SinCorder key pad. The upper and lower case may be toggled with the shift key, an "S" in the upper left corner of the display indicates the upper case, top half of the numeric keys are active.
- If the three asterisks are present there is no need to re-enter them, press roll to move to the next display.

ROLL

CALIBR. PT 1  
0.0 V= 0.000 V

- If the SinCorder does not display 0.000 V use the key pad to make the 0.000 V entry followed by pressing the ENTER key. If the display is correct proceed with the following steps.

ROLL

CALIBR. PT 2  
2.0 V= 2.000 V

- If the SinCorder does not display 2.000 V use the key pad to make the 2.000 V entry followed by pressing the ENTER key. If the display is correct proceed with the following steps.

ROLL

RANGE: 2 V  
SELECT: 2 V

Programming the channel / voltage range is now complete

**STEP 3: DISPLAYING THE CHANNEL VOLTAGE**

The next step will be to connect the reference electrode to the red banana jack on the top right of the SinCorder and the structure test lead to black banana jack on the top center of the SinCorder. If the optional DATA PROBE (walking stick with a reference electrode on the bottom and a bottom on top) is available it may be plugged into the trigger port on top right of the SinCorder and used in place of the ENTER key.

- In order to display the structure to soil potential press the following keys.

DISP

DISPLAY OPTION  
SELECT: CHANNEL

↑ ↓

SELECT: CHANNEL

ENTER

CHANNEL READS:  
-0.850 V

- This is just displaying the active voltage. In order to record the reading proceed to the SinCorder must be put into the pending log status, a flashing "L".

LOG/STBY

<sup>L</sup>CHANNEL READS:  
-0.850 V

- When a reading is to be recorded press

ENTER

<sup>L</sup>CHANNEL READS:  
-0.850 V

- The "L" will stop flashing and remain solid for approximately 1 1/2 seconds plus the five second trigger length, in this case a total of approximately 7 seconds. While the "L" is solid the SinCorder is sampling at a rate of 4 times per second for a trigger length of 5 seconds. At the end of the five seconds the data is sorted and the minimum and maximum are recorded in memory.
- In order to enter a field descriptor press

D

<sup>L</sup>NEW DESCRIPTOR

- At this point a descriptive notation would be typed in using the SinCorder keys.

ENTER

DESCRIPTOR HAS  
BEEN SAVED

<sup>L</sup>CHANNEL READS:  
-0.850 V

- Descriptive phrases can only be 16 characters long, but any number of descriptors can be entered one right after the other. Press "D" again then type the next descriptor.
- In order to change voltage ranges proceed with the following steps.

R

<sup>L</sup> RANGE: 2 V  
SELECT: 2V

↑↓

SELECT: 20 V

ENTER

RANGE HAS  
BEEN CHANGED

LCHANNEL READS:  
- 0.85 V

It would now be appropriate to practice taking voltage readings, entering descriptors, and changing ranges.

**STEP # 4: DISPLAYING READINGS AND DESCRIPTORS WHICH HAVE BEEN SAVED**

DISP

DISPLAY OPTION  
SELECT: CHANNEL

↑↓

SELECT: DATA

ENTER

LTRIGGER #:00023  
ENTER:00023

- This display is requesting that a trigger event be entered by way of the numeric keys or by pressing the enter key to move to the last reading captured.

ENTER

LTR00023 DESCR:  
FENCE CROSSING

- This is the 23rd trigger voltage which was captured with its' corresponding descriptor if any was typed and saved. If more than one descriptor had been typed (for trigger 23) only the first will be able to be viewed the remainder will appear when the data is output.

- To view the voltage reading associated with trigger event 23 press

→

LTR00023 MINIMUM  
0.885 V

→

LTR00023 MAXIMUM  
1.253 V

- Use the ↑ or ↓ arrow keys to scroll through the data for the various trigger event numbers and make corrections wherever necessary. The ESC key can be pressed at any time to return you to the trigger history

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**6**

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**BATTERY & CONNECTIONS**

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**CHARGING BATTERY:**

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The battery should be charged for 10 hours at least once every 3 months or any time the battery voltage falls below 6.0 V, or if you are about to begin a lengthy survey. A charger is furnished with your SinCorder. Alternatively any DC source of from 8 V to 18 V can be used. An automobile cigarette lighter charging adapter is available from the M.C. Miller Co. for charging your meter while it is in a vehicle having a 12 V negative grounded electrical system (nearly all modern vehicles meet these criteria).

Correct operation of the SinCorder depends upon the condition of the battery. If it is permitted to discharge too deeply, there is a probability of malfunction. Properly maintained, the battery will provide more than a year of service, abused, they will fail within a few months.

Don't discharge the battery below 5.7 volts. If a situation demands logging for longer than 30 hours between recharges, connect a 12 vdc source to the charger. If ac is available, the charger may be left plugged in for the duration of operation. Internal circuit design prevents overcharging.

Charge the battery frequently. If the SinCorder is used during the day, charge it overnight.

The SinCorder can not be over charged due to the internal circuitry automatically drops into trickle charge when the battery nears capacity 6.9 V.

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**TYPICAL BATTERY LIFE AND SPECIFICATIONS**

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A fully charged SinCorder will operate for 24 hours between recharges, assuming the battery is not misused by excessive deep discharges.

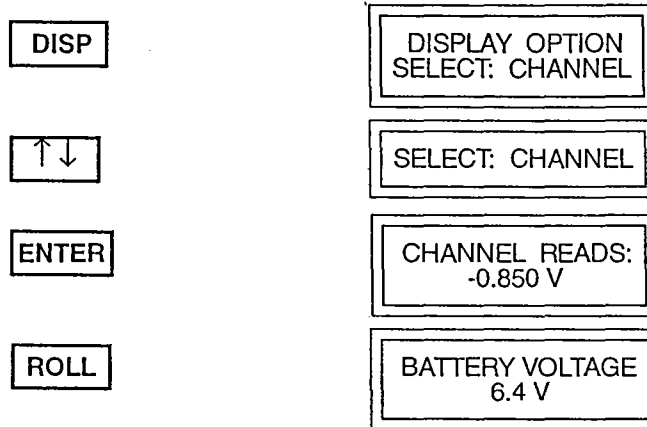
- TYPE: Rechargeable sealed lead-acid battery. Nominal capacity 20 hours (25mA to 5.25 V) 0.5AH. M.C. MILLER CO Part Number SIN010 or SIN012 with leads.
- CHARGING: The SinCorder displays 6.7 V to 6.6 V when full charged and the charger disconnected. Charging from 5.5 V to 6.9 V with charger connected will require approximately 10 hours.
- DRAIN: The SinCorder draws from its' internal battery 125 microamperes when turned off and 15 millamperes when fully operating. A fully charged SinCorder will drain on the average 50 millamperes (100 mA max., 2mA min.) from the external source.
- CHARGER: The output of the external charger is 250 mA @ 12 VDC.

---

**DISPLAYING THE INTERNAL BATTERY VOLTAGE**

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The SINCORDERs' internal battery voltage can be viewed by pressing the following keys.



This screen displays monitors the internal battery voltage of the SinCorder, and can be viewed at any time. This voltage ranges between 7.2 V and 5.4 V. The upper voltage of 7.2 V only appears when the battery is completely charged and the external power supply is still attached. At the lower voltage of 5.4 V the SinCorder powers

LOW BATTERY  
PLEASE RECHARGE

If this warning is not heeded there is only approximately one month of energy to keep the memory intact.



---

**REPLACING BATTERY:**

---

Normally, when the SinCorder is charged and used in accordance with our recommendations, your 6V rechargeable battery should last for a year. If, for any reason, the battery appears to require replacement, contact the M. C. Miller Co. giving the Model and **serial number** of your meter so that they can send you a proper replacement. Great care must be taken to make sure that the replacement battery is properly oriented (polarity observed). Otherwise damage will be done to the internal circuitry. It is suggested that the old battery not be removed until you have carefully noted its orientation.



**IMPORTANT:** Make sure that you have saved all data to a disk or computer before removing the old battery. Removing the battery causes loss of stored data and resets all functions of the SinCorder to their default values.

The battery can be replaced without losing memory if the battery charger is connected and the display is turned off.

---

**Follow these steps to replace the battery**

---

- Always plug in the charger.
- turn the SinCorder OFF.
- Invert the unit so the bottom is facing upwards.
- Loosen two screws in the bottom (the screws are captive and will not come completely out. If the screws bind when loosening gently pull on the end cap to release the gasket.
- When the screws are loose remove the cover.
- Invert the unit until the battery drops out.
- Prepare to insert the fresh replacement battery. **Polarity must be observed or the unit will be severely damaged.** Viewing the inside of the unit a nickel plated post will be seen furthest in on the left (key pad up). The battery has a notch on the top negative side. The post should prevent improper polarity, in that the post slips into the notch. **The negative, notched side of the battery slides into the SinCorder on the left (key pad up).**
- The battery has a foam pad adhered to the bottom. This is to keep constant force between the battery and the SinCorder voltage taps. If the foam pad is not in place the battery may not always make contact, resulting in the loss of data.
- Replace the end cap by slightly rotating from side to side until the aluminum housing is captive on all sides by the end cap.
- Tighten the screws by first backing them out then screwing them in, this should prevent cross threading.
- Tighten the screws firmly but not over tight or the threads will strip out. The proper amount of torque can be obtained by using only two finger tips and thumb on the screw driver.
- To RESET Sincorder and install new battery:
- Remove battery and charger from Sincorder, allow unit to sit for (10) ten minutes.
- Plug charger into unit. Install new battery, observing correct polarity. Remove charger.
- Unit is now ready for operation.

If during operation the SinCorder internal battery voltage falls below 6.4 volts, the unit is programmed to display the message.

LOW BATTERY  
PLEASE RECHARGE

Then turn off. If the unit is not recharged but turned on again the above warning will be displayed

The above will occur even during the middle of operation. The memory will not be lost, but if the message is not heeded in approximately one month the memory may fail.

---

## POWER SAVING FEATURES

---

If the SinCorder is not actively being operated or logging data solid or flashing "L" the unit will automatically power down after 6 minutes. This feature is one which will conserve power and prolong battery life.

When the SinCorder is in the logger mode and has a sampling period longer than 4 times per second the unit will power down between samples. This mode is automatically entered 6 minutes into logging. This is indicated by a pulsing display indicating when a sample is being read. To temporarily halt this flashing press the **ON/OFF** key.

---

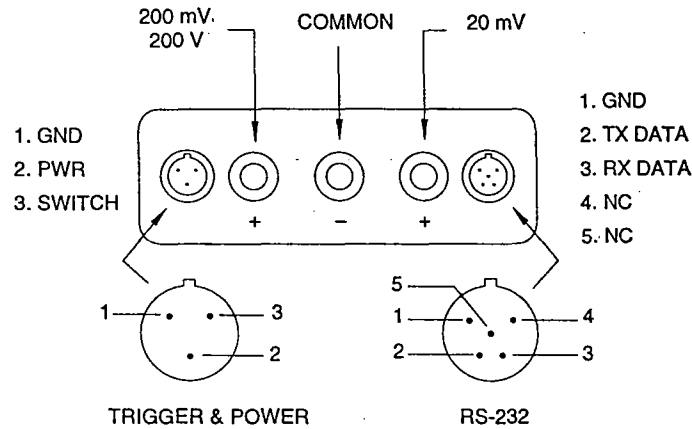
## EXTERNAL DC VOLTAGE CHARGING

---

The black wall transformer may be removed from the charging cable. Once removed the positive and negative spade lugs may be connected to a DC source capable of 8 to 18 VDC @ 100mA or greater. The ideal battery would be a **12 volt** lantern battery or automotive battery. If by chance the polarity is accidentally reversed no harm will come to the SinCorder but the unit will certainly not charge. For best results always start with a completely recharged SinCorder, because the SinCorder actually recharges its' internal battery from the external source.

## CONNECTIONS

The following illustration appears on the back of the SinCorder.



- The TRIGGER & POWER port is used by the charger cable and the remote enter switch on the DATA PROBE. Pin 1 is the negative VDC and data probe ground. Pin 2 is positive VDC from the charger or external battery. Pin 3 is DATA PROBE high, or when the external enter button is pressed pin 3 is switched (shorted) to pin 1. The three pin plug on the charger and data probe is M.C. MILLER CO. part # CON077.
- The next port is a standard (red) banana jack accepting the voltage for the input ranges of 200mV, 2.0 V, 20 V, and 200 Volts DC which will be displayed and logged by the SinCorder.
- The next port is a standard (black) banana jack accepting the common (negative) voltage for all the DC voltage inputs which will be displayed and logged by the SinCorder.
- The next port is a standard (red) banana jack accepting only the 20 millivolt input range of the SinCorder.
- The RS-232 port is used by the communications cable supplied with the SinCorder. Pin 1 is communications system ground. Pin 2 transmits data from the SinCorder. Pin 3 receives data from an external source. Pins 4 & 5 are not used.

## MAINTENANCE OF THE SINCORDER

As with most any piece of electronic equipment, it is best to store your SinCorder in a clean, dry place at room temperature or somewhat less. For extended storage the battery should be fully charged before storage and charged at least every 4 months, or for simplicity remove the battery.

The SinCorder is a rather rugged piece of equipment but it is suggested that it be transported or shipped in a clean, dry padded container where it will not be subject to continual heavy vibration or chaffing which might scuff up the keyboard and display window.

Maintaining the SinCorder is really quite simple. Use a damp cloth to wipe off dirt from the meter. Do NOT use any abrasive cleaner or solvents to remove dirt, since they may scratch or craze the plastic viewing window.

## 7

## MEMORY AND SYSTEM

## MEMORY ALLOCATION

The SinCorder is equipped with 64 K CMOS STATIC RAM. In all modes of operation except the download mode the remaining memory may be viewed by entering the following sequence **DISP TIME ENTER ROLL**. Information is displayed which indicates either the elapsed and remaining time while in the logger mode or remaining trigger events in the single or multiple modes.

When the SinCorder stores a voltage reading two bits of ram are used. For example in the single mode approximately 32,000 voltage reading could be recorded. When a descriptor is entered one bite per character is used.

When sending a download file, the SinCorder allocates two bites per test site prompt voltage reading. There is no memory set aside for descriptor which may be added. This means that if the download file fills memory there will be enough room to take voltage readings at each site prompt but not enough room for descriptors which may be added in the field. The amount of memory used by the download file can be determined by using DOS to inspect the file size before it is sent and add two bites per each site prompt in the file.

## FILE CREATION

Each time a mode change occurs in the SinCorder a new files is created. For instance, if data had been logged in the single mode, and then the multiple mode is selected, a new file will be created. When a mode of operation is changed and a new file is created a message is displayed ...



NEW DATA SET  
INITIATED

Up to 10 of these data sets may be created before the SinCorder displays

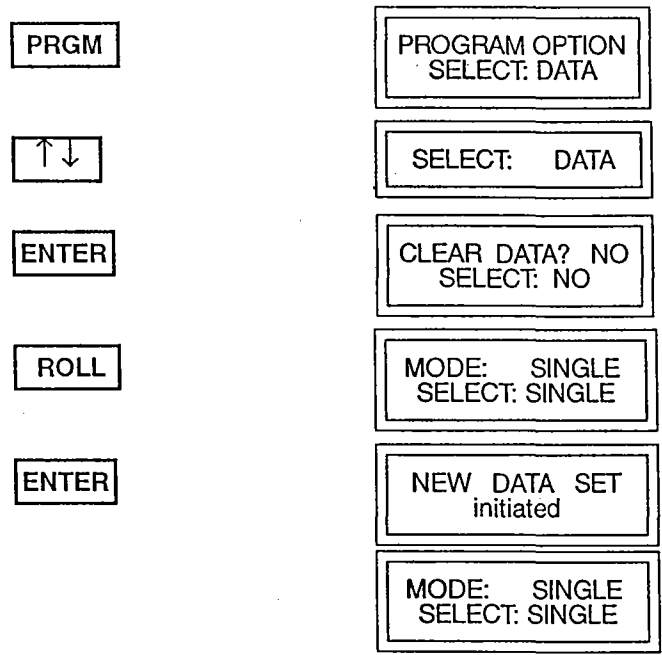


OUT OF  
MEMORY

When out of memory is displayed the data must be dumped or all the memory cleared. Selective files may not be erased.

The four lines of header information created during the **PRGM OUTPUT** sequence must be edited and correct before a new data set is initiated. This is because once a a new data set is created the previous set can not be displayed or edited through the SinCorder window.

In order to create a new data set without changing mode e.g. a new single mode file for a different close interval survey location.



When the above ENTER button was pressed a new data set was created.

The following is a list of parameters will (YES) or will not (NO) create a new data set.

- ON/OFF . . . . . NO
- UNITS . . . . . NO
- CALIBRATION . . . . . NO
- MINIMUM IS/NOT . . . . . YES
- AVERAGE IS/NOT . . . . . YES
- MAXIMUM IS/NOT . . . . . YES
- UPPER ALARM . . . . . NO
- UPPER ALARM LEVEL . . . . . NO
- LOWER ALARM . . . . . NO
- LOWER ALARM LEVEL . . . . . NO
- CLEAR MEMORY. . . . . NO
- TEST MODE . . . . . YES
- TRIGGER LENGTH . . . . . YES
- SAMPLING RATE . . . . . YES
- PERIOD LENGTH . . . . . YES
- ALARM LOGGING . . . . . NO
- BAUD RATE . . . . . NO
- OUTPUT FORMAT . . . . . NO
- COMPRESSION FACTOR . . . . . NO
- HEADER INFORMATION . . . . . NO
- TIME . . . . . YES
- DATE . . . . . YES
- START DATE . . . . . NO
- START TIME . . . . . NO
- STOP DATE . . . . . NO
- STOP TIME . . . . . NO
- SCHEDULED RUN . . . . . NO

## SYSTEM RESET AND DEFAULTS

In the unlikely event the SinCorder were to lock-up or cease to perform in the customary manner. No matter what keys are pressed and still the system no longer responds, it is time for drastic measures. Try the following.

- Press the **ESC** key
- Turn the unit on and off

If the above do not work it is time to perform a system reset. The system reset **will erase all** memory therefore try to dump the data to storage, either by pressing the output key or remotely requesting data through the RS-232 ESC codes.

The system reset is easily performed; 1) remove the battery from the SinCorder. 2) allow five minutes to elapse. 3) Plug in the battery charger. 4) Replace the battery, observing proper polarity. (See page 6-3 for detailed battery replacement) This resets all the system points to their default values. A list of these values appears below.

```

UNITS . . . . . ***
CALIBRATION . . . . . M= F.S. B= 0.0
MINIMUM IS/NOT . . . . . NOT
AVERAGE IS/NOT . . . . . NOT
MAXIMUM IS/NOT . . . . . NOT
UPPER ALARM . . . . . OFF
UPPER ALARM LEVEL . . . . . F.S.
LOWER ALARM . . . . . OFF
LOWER ALARM LEVEL . . . . . -F.S.
CLEAR MEMORY . . . . . NO
TEST MODE . . . . . LOGGER
TRIGGER LENGTH . . . . . 1 SEC
SAMPLING RATE . . . . . 4/SEC
PERIOD LENGTH . . . . . 4/SEC
ALARM LOGGING . . . . . OFF
BAUD RATE . . . . . 1200
OUTPUT FORMAT . . . . . PRINT
COMPRESSION FACTOR . . . . . 001
HEADER INFORMATION . . . . . MC MILLER
TIME . . . . . 00:00:00
DATE . . . . . 01/01/88
START DATE . . . . . 01/01/88
START TIME . . . . . 00:00:00
STOP DATE . . . . . 01/01/88
STOP TIME . . . . . 12:00:00
SCHEDULED RUN . . . . . MANUAL
    
```

When the SinCorder is first turned on after a system reset the following will be displayed.

ON OFF

POWER LOST  
 PLEASE REPROGRAM

At this point it would be advisable to program the current time and date. Then hopefully proceed as normal.

The SinCorder can communicate with the outside world via RS-232 cable supplied with the unit. One end of this cable plugs into the left hand port of the SinCorder (see the diagram on the back of the SinCorder or the BATTERY, CONNECTIONS, & MAINTENANCE CHAPTER) the other (DB 25) end plug into the communication adapter of the computer, modem, printer. The DB 25 has both a male and female side to make adapting to any device easy. There is also a switch on this connector to facilitate switching pins 2 and 3. The setting for this switch is trial and error, if one way does not work try the other way.

There are five requirements which must be met in order for communication to result.

- Serial RS-232 communication using at least the transmit (TX, pin 2), receive (RX, pin 3), and system ground (gnd, pin 7) pins of the DB 25 connector.
- X-ON/X-OFF software handshaking. X-ON/X-OFF is also known as DC1/DC3 or Control S/Control Q.
- Accepts at least one of the following baud rates: 300, 600, 1200, 2400, 4800, or 9600.
- Word format of 10 character bites composed of 1 start bit, 8 data bits, 1 stop bit, and no parity.
- Accepts the standard ASCII character set.

---

## REMOTE COMMUNICATIONS

---

REMOTE mode permits the SinCorder to be completely programmed via a remote device through the RS-232C interface. REMOTE mode is entered by sending [ESC]0 to the SinCorder, leaving REMOTE mode is accomplished by sending [ESC]0 via the RS-232 interface. OUTPUT REPORTS may be requested remotely by sending the proper sequence of commands, and may be terminated prematurely by sending a CTRL- C to the SinCorder. Once in REMOTE mode, all keys on the keypad are completely inactive. Thus, when in the REMOTE mode the display shows:



REMOTE MODE  
KEYBOARD LOCKED

Programming the SinCorder remotely is very similar to programming the SinCorder from the keypad. The only difference is that the command keys (top two rows) require two characters to be sent for each key. All other keys are programmed by sending the corresponding ASCII character. To distinguish command keys from ordinary numbers and letters, all command keys must be preceded by an ESCAPE ASCII (\$1B). Thus to press PRGM remotely, [ESC]E would be sent to the SinCorder. The following list provides the [ESC] sequences used to mimic the command keys remotely.

ON/OFF . . . . .	[ESC]A
↑ . . . . .	[ESC]B
↓ . . . . .	[ESC]C
DISP . . . . .	[ESC]D
PRGM . . . . .	[ESC]E
LOG/STBY . . . . .	[ESC]F
ESC . . . . .	[ESC]G
← . . . . .	[ESC]H
→ . . . . .	[ESC]I
ROLL . . . . .	[ESC]J
OUT PUT . . . . .	[ESC]K
SHIFT . . . . .	NOT REQUIRED
ENTER . . . . .	ASCII CR (13)
OTHERS . . . . .	NORMAL KEYS (A-Z, 0-9, act.)

## Special command keys:

[ESC]0 . . . . .	Enter/exit remotely
[ESC]S . . . . .	Show current display
[ESC]R . . . . .	Reset default screen
[CTRL C] . . . . .	CANCEL DATA OUTPUT

THREE additional remote commands have been added to aid in programming the SinCorder remotely. The first command, [ESC]S (an ASCII 41B followed by an 'S') causes the SinCorder to send to the remote device the screen that is currently active. For example, after entering REMOTE mode, if you send [ESC]E[ESC]S, the SinCorder sends out

SELECT FUNCTION TO PROGRAM

since you had effectively pressed the PRGM key by sending the [ESC]4 command.

The [ESC]S command ('S' for show) may be used at any time to help you program the SinCorder. The [ESC]S command does provide cursor position, so those screens that use a cursor must be programmed more carefully.

The second remote command is [ESC]R. The [ESC]R command should ONLY be used for 'select list' screens. This command resets the select list pointer to the default value. For example, if you were programming the sampling rate, sending an [ESC]R followed by an ASCII \$0D (carriage return) would reprogram the sampling rate to 1/4 second. The SYSTEM RESET AND DEFAULTS CHAPTER lists the default values for all programmable features.

The third addition is the "control C" command which cancels the output of a data dump from the SinCorder.

When in REMOTE mode, the SinCorder always echoes the commands it receives. Echoing received characters lets you verify that the SinCorder received the command that was sent. This is especially important when remote communication links are noisy.



## SINCORDER

- Input channels: 1 analog: banana, 3/4" spacing
- Memory size: 64K approx. 32,000 entries
- Size: 3.5 x 8.25 x 1.5 in.
- Weight 1.75 lb.
- Display: 2-line , 16-character alpha numeric LCD
- Keypad: Sealed,alpha numeric, plus function keys
- DC Voltage Range/Resolution
 

Range . . . . .	Resolution (mV)
20mV . . . . .	0.01
200mV . . . . .	0.10
2V1.00	
20V . . . . .	10.00
200V . . . . .	100.00
- Accuracy: + - 0.1 % FS, + - 1 count, 2000 counts FS
- AC Rejection @ 60Hz (50Hz optional)
 

Range . . . . .	Rejection
20mV . . . . .	200mV
200mV . . . . .	5V
2V . . . . .	50V
20V . . . . .	200V
200V . . . . .	200V
- Rejection is defined as the 60Hz (50Hz) peak voltage required to cause a + - 1 count change on the respective range.
- Input impedance: 20 mV 1K ohm, all other ranges 20M ohm
- Power: Field replaceable 6V, rechargeable, sealed lead acid battery
- External charging-voltage: 8-18 VDC @ 200 mA
- Battery life: 24-240 hrs. depending on usage
- Memory retention: 1month after automatic low battery shut down
- Operating temp.: 15° F to 140° F
- Storage temp.: -20° F to 160° F
- Short term water immersion IEC 529-1978
- Digital Communications: 3-wire RS232C serial X-ON, X- OFF, ASCII, 8 data, 1 stop, no parity
- Baud Rate: 300, 600, 1200, 2400, 4800, 9600
- Calendar time: Day/month/year; Hr.:Min.:Sec., 0.01% accuracy
- Sample rate: 4/Sec., 1 sec., 2sec., 5sec., 10 sec., 1 min.
- Averaging: 4/sec., 1 sec., 5 sec., 10 sec., 1 min., 2 min., 5 min., 10 min., 15 min., 20 min., 30 min., 1hr.
- Specifications subject to change without notice

# 10 REPLACEMENT PARTS & ACCESSORIES

## REPLACEMENT PARTS

SinCorder Manual . . . . .	SIN100
RS-232C Communications cable . . . . .	TRI008
Internal 6 V Battery . . . . .	SIN010
Internal 6 V Battery with leads . . . . .	SIN012
Charger w/ Cable . . . . .	SIN025
Charger Cable Only . . . . .	SIN020
Trigger & Power Plug . . . . .	CON077
RS232 Plug . . . . .	CON075

## ACCESSORIES

Leather Case & Strap . . . . .	SIN005
Auto lighter charger . . . . .	SIN007
Backpack, w/ Wire Measure & Data Probe . . . . .	TRI010
Hip Pack Wire Dispenser . . . . .	HIP010
Hip Pack Wire Dispenser W/ Ft. Counter . . . . .	HIP020
Continuous Read Data Probe (W/out Button) . . . . .	TRI014
Data Probe, w/ RE-5C Electrode . . . . .	TRI015
Dual Data Probe Adapter . . . . .	SIN016
Wire for Backpack, # 30 AWG, 5 Miles . . . . .	TRI020
Wire for Hip Pack, # 30 AWG, 1 Miles . . . . .	TRI021
Wire for Hip Pack, # 34 AWG, 3 Miles . . . . .	TRI022
Shunt, .001 ohm, 25 Amp, 1mV drop . . . . .	TRI050
Shunt, .01 ohm, 8 Amp, 10mV drop . . . . .	TRI055
Shunt, .1 ohm, 2 Amp, 100mV drop . . . . .	TRI060

## SOFTWARE

SinCorder COMPANION, All 4 Modules . . . . .	SCS010	(DOS VER. 2.45)
SC Conversion Module . . . . .	SCS001	
SC Communications Module . . . . .	SCS002	
SC Interrupted Survey Module . . . . .	SCS003	
SC Close Interval Survey Module . . . . .	SCS004	
Sincorder Companion Windows 95 Version . . . . .	SCS020	(WINDOWS 95 VER)
SC Conversion Module WIN95 . . . . .	SCS011	
SC Communications Module WIN95 . . . . .	SCS012	
SC Interrupted Survey Module WIN95 . . . . .	SCS013	
SC Close Interval Survey WIN95 . . . . .	SCS014	

BCL 10/4/88

MCM 12/16/88

MCM 1/23/90

# SinCorder Upgrade and Modifications

## Version 1.1

The operating software written permanently to the SinCorder's EPROM has had some major improvements. The easiest way to determine if your SinCorder has been modified is to view the system header information when the unit is first powered up. Simply turn the unit on and observe the version number.

```
SINCORDER V 1.1
MC MILLER 2/91
```

This addendum covers the new firmware version 1.1. Firmware is the combination of hardware EPROM and software.

## Display Number Of Trigger Reads

When in the single or multiple mode, viewing a potential reading, an upcounter has been added to identify the number of readings stored or recorded.

The counter is displayed directly above the real time voltage reading. In other words when viewing the voltage the number of events recorded is also displayed.

```
TRIGGER # 03235
1.125 V
```

Two reasons for this addition:

First is to improve the accuracy by allowing the operator to know the number of readings taken while conducting a close interval survey.

The next and maybe the more important is to prompt the operator when the reading has been saved and it is safe to proceed to the next reading. In the single mode this is nearly instantaneous, to be exact, 250 milliseconds.

But in the multiple mode, it becomes much more apparent. For example, if the trigger length were five seconds and the enter button is pressed, the display will not increment until after a five second interval has been completed, thereby indicating that the reading has been stored and the operator can safely proceed.

## Instant Scrolling to Site Prompts

In the download database prompt mode the time it takes to move up and down between very large quantities of prompts has been made nearly instantaneous.

Before when there were large numbers of downloaded prompts there was a two to five second pause when scrolling between test station field prompts. The firmware was rewritten to allow immediate arrowing from one site to the next.

This enhancement saves time and improves performance thereby decreasing inconvenience.

## Decreasing Status Time

Whenever a descriptive message is typed and entered into the SinCorder a screen is displayed.

```
DESCRIPTOR HAS
BEEN SAVED
```

This is to inform the user that the descriptor has been saved into memory. Called a status line, this prompt now remains on the display for a shorter duration of only two seconds instead of five.

Whenever a different voltage range is selected a status screen indicates that range had been changed.

```
RANGE HAS
BEEN CHANGED
```

This screen has been eliminated altogether in that it is readily apparent that the change has occurred due to the position of the decimal point. For example while in the 2 Volt range, 1.732 V has three places to the right of the decimal point; where 1.73 V has two places to the right of the decimal point and is in the 20 Volt range.

## StrayGraphics Compatible

The aforementioned upgrade and enhancements include all the features and capabilities of the M. C. Miller StrayGraphics software.

## 1

## ADDENDUM

## INTRODUCTION

This addendum to the Operations and Maintenance Manual for the SinCorder version 1.0 has been prepared to familiarize you with the new enhancements for stray current logging. The SinCorder version 1.1 has a New additional mode of operation which we call, **AMPLITUDE DISTRIBUTION**. This new mode of operation is designed to function in conjunction with the standard **LOGGING** mode of operation, for collection of stray current data.

The SinCorder version 1.1 has retained all the capabilities, advantages, uses and storage capacity of the original version. The addition of the **AMPLITUDE DISTRIBUTION** mode along with substantial improvements in the operation of the SinCorder was accomplished through permanently written software to the EPROM.

The **AMPLITUDE DISTRIBUTION** mode of operation is an aid for stray current analysis. This mode of operation was added as a separate operation for the collection of data and to operate with the standard **LOGGER** mode. In the **AMPLITUDE DISTRIBUTION** mode of operation, the operator is required to enter an Upper and Lower voltage limit. Those limits would be expected to be the maximum and minimum voltages that would be anticipated to be found at the test site. However any voltage limits could be entered. For example, if 0.00 volts was chosen as a Lower limit and 2.00 volts as an Upper limit, the SinCorder would take these limits and configure 100 equally proportional **BINS**, between these limits. Each **BIN** would have a value of 20 millivolts (0.02 volts) i.e. **BIN 1**; 0 to 20 mv, **BIN 2**; 21 to 40 mv, **BIN 3**; 41 to 60 mv etc. As stray current is sampled and recorded for the **Logger** mode of operation the samples are "looked at" by the **AMPLITUDE DISTRIBUTION** mode. As these samples are viewed, the SinCorder will interpret the reading/voltage measurement and place the sample in an appropriate **BIN** (originally created). If you are sampling at a rate of 4/sec, four individual readings will be placed in a created **BIN(S)** of a corresponding or matching voltage range. As data is collected and viewed the appropriate **BIN** will be incremented. No individual numeric value would be saved for **AMPLITUDE DISTRIBUTION**; instead, the reading/measurement would be stored as an integer, increasing as matching (**BIN** value) readings/measurements are viewed. Continuing with our example, if the sample rate was set for 4/sec and the test was to be conducted for 12 hours, there would be:  $4 \text{ smp/sec} \times 60 \text{ sec/min} \times 60 \text{ min/hr} \times 12 \text{ hr} = 172,000$  sample/readings taken. Each of these samples will be placed in one of the 100 **BINS** originally established. Each sample is analyzed separately and is not dependent on the sample length as is the **Logging** mode for data retention.

In addition to the 100 **BINS** established by the SinCorder between the entered Upper and Lower limits, two additional **BINS** will be established. One will be for all those readings/measurements that fall below the Lower limit and the other for all those readings/measurements that fall above the Upper limit.

## FUNCTION KEYS

The key pad for the SinCorder V1.1 has not been changed or modified. Operation of the special function keys as well as the alpha-numeric keys are the same as always except for the PRGM (program) key. Incorporated in this key select is the special function for AMPLITUDE DISTRIBUTION logging.

When you turn on the SinCorder the display will show:

ON/OFF

SINCORDER V1.1  
MC MILLER 02/91

SERIAL NUMBER  
XXXX

VOLTAGE IS OK  
LOGGER IS READY

Pushing the PRGM (program) key at this point with Version 1.1 you have the following options to program:

CHANNEL, DATA, OUTPUT, TIME, ALARM AND DIST

The actual display will show:

PRGM

PROGRAM OPTION  
SELECT: XXXX

↑ ↓

PROGRAM OPTION  
SELECT: DIST

**DIST:** The AMPLITUDE DISTRIBUTION function is the new addition to the SinCorder V1.1. In choosing this option, you are requested to set an upper and lower voltage limit into which the SinCorder will automatically divide into 100 equally proportioned 'BINs' for information storage

>>

**REMEMBER:** Make sure you have programmed the LOGGER mode of operation. See instructions on pages 2-4 to 2-7 of this manual for specific details. To take full advantage of the AMPLITUDE DISTRIBUTION mode of operation, for stray current logging and M.C.M. StrayGraphics software, both the LOGGER and AMPLITUDE DISTRIBUTION modes of operation must be fully programmed.

---

**EXAMPLES**

---

Continuing with the illustration as presented in Chapter 2, page 2-6 (example 1) of this manual for the LOGGER mode of operation, with the AMPLITUDE DISTRIBUTION mode we are now able to define the exact amount of time certain events (voltage levels) were logged during the tested period.

You know your structure is being affected by stray DC currents but are unable to tell exactly how long and at exactly what magnitudes your structure is being influenced. With an analytical approach for data dissemination of the collected data, 100 equally divided voltage BINS will be configured within your programmed Upper and Lower AMPLITUDE DISTRIBUTION limits. In addition, data (voltages) outside the programmed limits, will be collected in two additional 'BINS', - one for all those above the Upper limit and a second for all those below the Lower limit.

When data is processed with the M.C.M. StrayGraphics software, a bar graph can be generated from the logged data. This graph will show Voltage on the abscissa (x axis) plotted against time as a percentage of overall test time, along the ordinate (y axis). 100 bars of information will be graphically displayed and can be printed and /or plotted. Each defined bar will display the voltage values (range, 1/100 of limit) and the time, in overall percentage of the test duration. The individual range of the voltage for each bar will/may vary from test to test because it is dependent on the operators entered Upper and Lower Distribution limits. The closer together the limits are the smaller the voltage range per bar will be, the further apart the Distribution limits are the larger the voltage range per bar will be. Time as plotted on the abscissa of the graph is in percent of logged time regardless of the test length.

Shown along the base of the graph, will be a display of the Lower limit and the percentage (%) of all reading obtained below this level. Likewise there will be another display showing the Upper limit and percentage (%) of reading obtained above this level. The left and right arrow keys can be used to scan through the presented data. Inherent in the program are the capabilities of either printing the data out or plotting it.

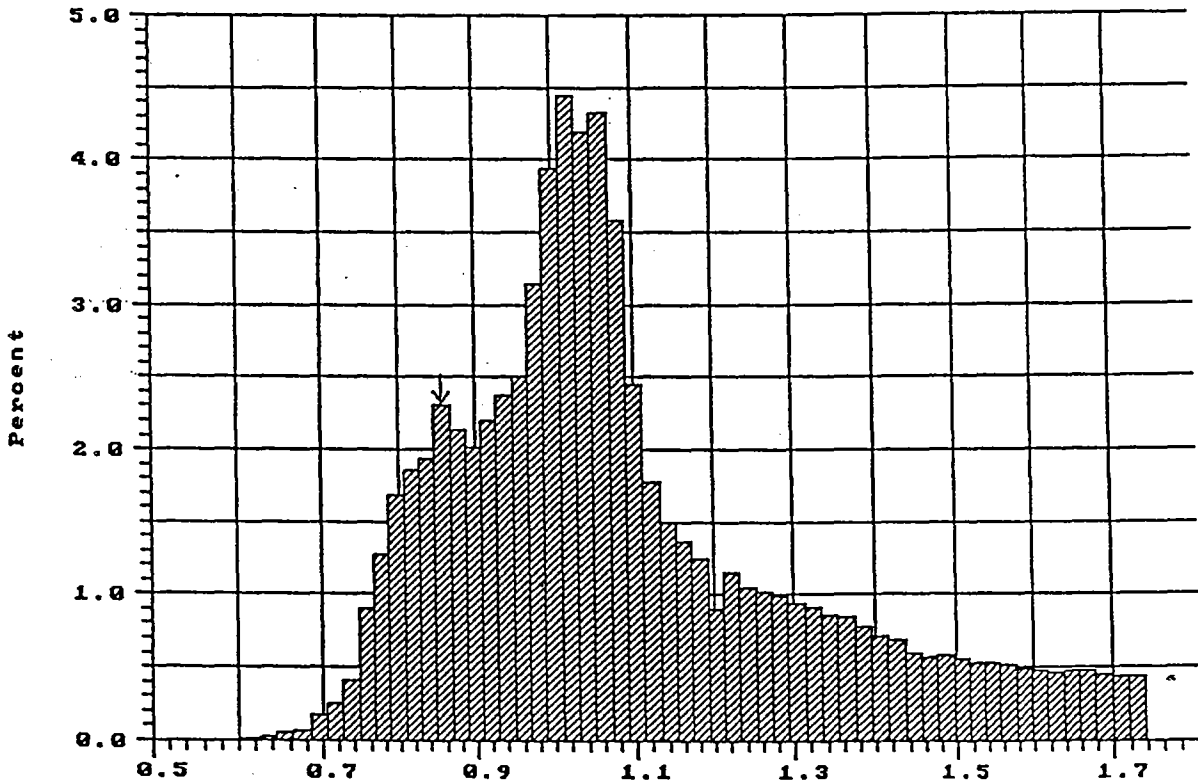
Following on the next two pages are typical examples of:

- a) GRAPH OF TIME HISTORY
- b) GRAPH OF HISTOGRAM (AMPLITUDE DISTRIBUTION)

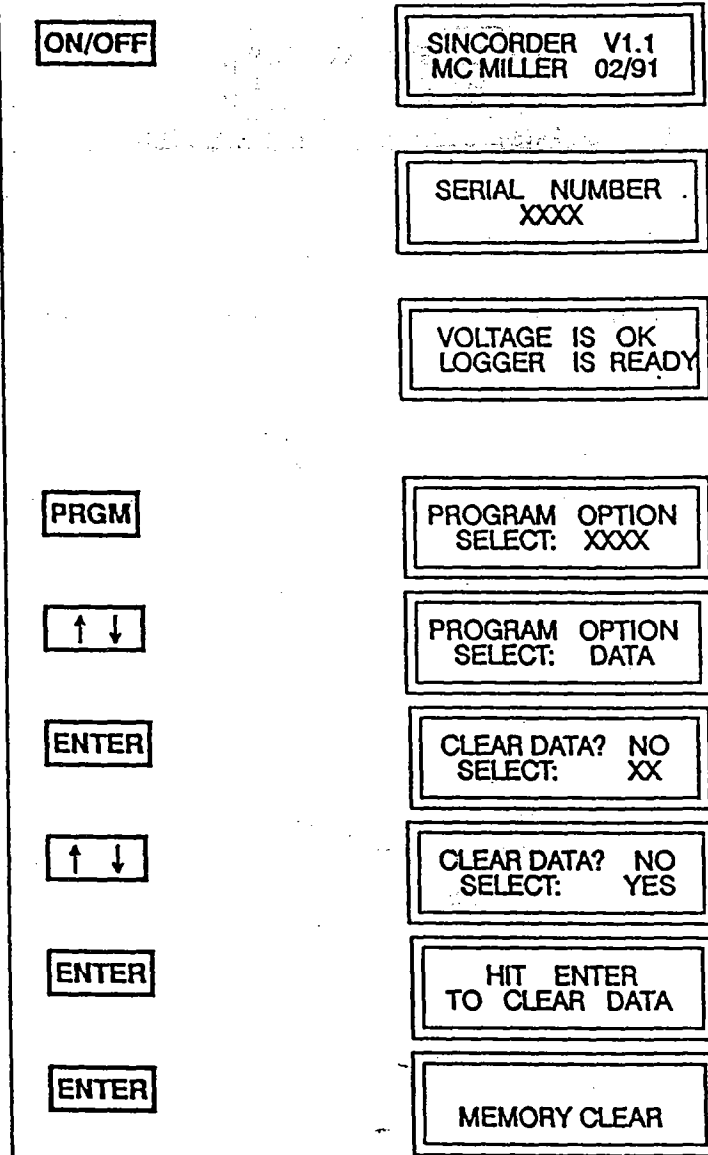
**TYPICAL AMPLITUDE DISTRIBUTION REPORT from M.C.M. StrayGraphics**

File Name.....SIN13  
 Test Location.....Fortress Pond Sub-Station  
 Employee Name.....  
 Employee Number...Reverse Current Switch  
 Department.....Engineering  
 Comment Field 1...Off-Set Vg  
 Comment Field 2...Example  
 Numeric Code #1...25      #2...15      #3...      #4...      #5...

Amplitude Distribution Data For Channel 1



< 0.85: 8.61%      0.85 to <sup>u</sup> 0.87: 2.31%      > 0.87: 89.08%  
 Over-range (1.740): 27.42%



>>

NOTE: Although it is not necessary to clear the data for use in the DIST / LOGGER mode of operation, it is recommended that it be done to maximize the available storage space (memory) in the SinCorder.



\* Use the ↑ ↓ arrow keys to select logger and then ENTER



\* Use the ↑ ↓ arrow keys to select sample rate and then ENTER



Programming the SinCorder V1.1 for stray current logging is now complete. It is suggested at this point, before the unit is set in the field, that a check be made on the :

- 1) CHANNEL setting to verify the correct range has been set and the calibration is correct.
- 2) TIME setting to see if the correct date and time are shown. A one time start and stop can be entered if desired in this mode.
- 3) ALARM setting to verify that it is off since alarm logging is not required here.

See appropriate section in main text for additional information.

- » **REMEMBER:** After making a selection or changing a value, press the ENTER button on the key pad to retain these new parameters. If the ENTER button is not pressed after each choice selection the SinCorder will assign its default values or retain the previous settings at the appropriate location.
  
- » **REMEMBER:** In the LOGGER mode of operation it is not necessary to save all three MAX, MIN & AVG values. However if none are saved, NO data will be collected and saved for the test period. For more information on the LOGGER mode of operation see page 2 - 4 of this manual.

## USING StrayGraphics

Programming the SinCorder for the purpose of this addendum will concern itself only with the M.C.M. StrayGraphics PC program. All parameters concerning the AMPLITUDE DISTRIBUTION mode of operation can however be operator entered from the keypad of the SinCorder Version 1.1. All entries can be changed and/or modified from the keypad, ONLY before actual logging begins.

Downloading information into the SinCorder for this mode of operation is a relatively simple process with M.C.M. StrayGraphics software. With the M.C.M. StrayGraphics loaded into your PC just follow the screen menu to make your choices. This PC program was written for programming both the LOGGER mode of operation and the AMPLITUDE DISTRIBUTION mode of operation. Below is depicted the PC screen menu you will see with M.C.M. StrayGraphics software.

From this screen menu, decide what you would like to do. Use the F1 through F10 keys to make your selection.

### StrayGraphics - MAIN MENU

THE MAIN MENU	
OPTION	RESULT
F 1	HELP
F 2	CONFIGURE StrayGraphics
F 3	VIEW STORED TEST RESULTS
F 4	VIEW STORED LOGGER CONFIGURATION FILES
F 5	CREATE NEW LOGGER CONFIGURATION FILE
F 6	VERIFY LOGGER COMMUNICATIONS
F 7	GET/VIEW TEST RESULTS FROM LOGGER
F 8	REMOTELY CONTROL LOGGER
F 9	TERMINAL EMULATION MODE
F10	EXIT

To begin or start a new test, press the F5 Key. This will allow you on a single screen to create a new logger configuration file which will program the SinCorder for you. Simply move the cursor around the screen with the arrow keys and select and/or fill in the appropriate information in the space where the cursor stops. Following is depicted a reproduction of the StrayGraphics Software SinCorder setup (F5) screen.

## SINCORDER START & TEST

(1) TURN UNIT ON, VERIFY SERIAL #, WAIT FOR LAST MESSAGE "BATTERY POWER LOST PLEASE REPROGRAM".

PRGM -"CHANNEL"-ENTER-DOWN ARROW KEY-"20MV"-ENTER. DISP-"CHANNEL"  
-ENTER- CHECK TO BE SURE IT ZEROES.

(2) PRGM-"CHANNEL" -ENTER-UP ARROW KEY-"200MV"-ENTER. PRGM-"DATA"  
-ENTER-ROLL, ROLL-UP ARROW KEY TO 1/SEC -ENTER- (SHOULD SAY "PERIOD  
LENGTH REPROGRAMMED"). ROLL-SELECT "IS SAVED" -ENTER-ROLL-SELECT "IS  
SAVED" -ENTER-ROLL-SELECT "IS SAVED" -ENTER. ROLL THRU MENU AND  
VERIFY PROGRAM.

(3) APPLY 101 MV TO UNIT. PRGM-"ALARM"-ENTER-ROLL-SELECT "ON" -ENTER-  
ROLL, ROLL-SELECT "ON" -ENTER- ROLL-SELECT "ON" -ENTER- (SHOULD HAVE  
FLASHING "L"). DISP-"TIME" -ENTER-ROLL. TURN CALIBRATOR TO 0 FOR 5  
SEC. (DISPLAYED ON SCREEN AS SOLID "L") TURN CALIBRATOR BACK TO KVD.  
FLIP CALIBRATOR TO 201MV FOR 5 SEC. (ELAPSED TIME SHOULD NOW BE AT 10  
SEC.) TURN CALIBRATOR TO 101MV. DISP-"CHANNEL"-ENTER. PRGM-"ALARM"  
-ENTER- ROLL, ROLL, ROLL, ROLL-SELECT "OFF" -ENTER- SHOULD READ "LOGGING  
ABORTED".

(4) PRGM-"DATA"-ENTER-ROLL-UP ARROW KEY-"SINGLE"-ENTER- SHOULD SAY "NEW  
DATA SET INITIATED" DISP-"CHANNEL"-ENTER-R-DOWN ARROW KEY -ENTER-  
LOG/STBY-APPLY 20MV TO 20MV TERMINALS INSERT TRIGGER AND ACTIVATE TWICE  
IN 1 SEC. CHECK FOR TRIGGER COUNTS. R-UP ARROW KEY-"200MV"-ENTER-APPLY  
200MV TO 200MV->200V TERMINALS (TRIGGER TWICE IN 1 SEC). REPEAT FOR 2,  
20 AND 200V RANGES. NOTE: @ 20V APPLY 37VAC AND CHECK FOR AC REJECTION.

(5) AFTER ENTERING 200V READING YOU SHOULD HAVE 10 TRIGGER EVENTS. D-  
PRESS 1->D KEYS -ENTER- SHOULD SAY "DESCRIPTOR HAS BEEN SAVED". D-PRESS  
E->T KEYS -ENTER- (SAME MESSAGE). LOG/STBY SHOULD SAY "LOGGING ABORTED"  
-PRGM "DATA"-ENTER-ROLL-DOWN ARROW KEY-("LOGGER")-ENTER SHOULD SAY  
"NEW DATA SET INITIATED". TURN UNIT OFF.

(6) CONNECT TO COMPUTER IN (SYMPHONY COMMUNICATIONS) PRESS SPACE BAR/ANY  
KEY ON COMPUTER UNIT SHOULD TURN ON. ON COMPUTER-ESC/0, ESC/S-MONITOR  
(CAPS) SHOULD SAY "REMOTE KEY BOARD LOCKED"-ESC K-ENTER- (2 TIMES FOR  
V1.0 AND 3 TIMES FOR V1.1) ALARM LOGGING DATA SHOULD APPEAR.

(7) ON COMPUTER-ESC/E-ENTER-ESC/J, ESC/B-ENTER-ESC/S MONITOR SHOULD  
READ "MODE: SINGLE SELECT: "SINGLE"-ESC/K-ENTER- (TWICE FOR V1.0 AND  
THREE TIMES FOR V1.1) TRIGGER DATA SHOULD ALSO APPEAR WITH DESCRIPTOR AT  
THE END.

(8) ON COMPUTER-ESC/A-UNIT SHOULD TURN OFF. TURN UNIT BACK ON  
IMMEDIATELY FROM THE KEYPAD. THEN (THRU THE SINCORDER KEYPAD) PRGM  
-"DATA"-ENTER- CLEAR MEMORY-ROLL, ROLL-SELECT "YES" -ENTER-ENTER-.

(9) ON COMPUTER-F10-T-TABLOCK-RIGHT ARROW TWICE-DOWN ARROW UNTIL HIGH  
LIGHT IS DOWN TO AND INCLUDING THE EXCLAMATION POINT. -ENTER-