

CATH-TECH™ Equipment Division of Cathodic Technology Limited

10 McEwan Drive, Bolton, Ontario, Canada L7E 1H1

Phone 1 800 368-9907 or (905) 857-1050 Fax (905) 857-3499

Web Site www.corrosion-rust.com Email ctl@corrosion-rust.com

OPERATION

MANUAL

COMPUTERISED RECTIFIER CONTROLLER

SRC-255

DESIGNED AND BUILT BY

CATHODIC TECHNOLOGY LIMITED

Bolton, Ontario, Canada, L7E 1H1



Reference: SRC-255T.DOC

TABLE OF CONTENTS

| | |
|--|----|
| 1. UNPACKING AND ASSEMBLING THE EQUIPMENT..... | 4 |
| 2. ELECTRICAL CONNECTIONS..... | 4 |
| 3. CONNECTING THE ANODE SYSTEM AND THE STRUCTURE TO THE SRC-255..... | 6 |
| 4. SETTING UP THE SRC-255 FROM THE KEYPAD..... | 7 |
| A. SRC-255 KEYBOARD..... | 7 |
| 5. START UP MENUE SCREENS..... | 8 |
| 6. INITIAL PARAMETER SET-UP..... | 10 |
| 7. MAIN MENU (LEVEL 5)..... | 10 |
| 8. PARAMETERS..... | 11 |
| A. MENU SCREEN 5-5 | 11 |
| B. MENU SCREEN 5-5 | 12 |
| <i>i. Menu screen 5-5-1.....</i> | 13 |
| 9. CONSTANT CURRENT OPERATION..... | 15 |
| 10. CONSTANT VOLTAGE OPERATION..... | 16 |
| 11. MODE 1 -- REFERENCE POTENTIAL CONTROL..... | 16 |
| B. MENU SCREEN 5-5 | 18 |
| <i>i. Menu screen 5-5-2.....</i> | 20 |
| <i>ii. Menu screen 5-5-3.....</i> | 21 |
| <i>iii. Menu screen 5-5-4.....</i> | 21 |
| C. MENU SCREEN 5-5 | 23 |
| D. MENU SCREEN 5-5 | 24 |
| E. MENU SCREEN 5-5 | 24 |
| <i>i. Menu screen 5-5-4.....</i> | 24 |
| <i>ii. Menu screen 5-5-5.....</i> | 25 |
| <i>iii. Menu screen 5-5-6.....</i> | 25 |
| 12. MENU SCREEN 5..... | 26 |
| A. MENU SCREEN 5-6 | 27 |
| <i>i. Menu screen 5-6-1.....</i> | 28 |
| 13. MENU SCREEN 5..... | 29 |
| 14. MENU SCREEN 6..... | 30 |
| A. MENU SCREEN 6-1 | 30 |
| <i>i. Menu screen 6-1-1.....</i> | 30 |
| <i>ii. Menu screen 6-1-2.....</i> | 31 |
| <i>iii. Menu screen 6-1-3.....</i> | 32 |
| <i>iv. Menu screen 6-1-4.....</i> | 32 |

| | |
|--|-----------|
| v. Menu screen 6-1-5..... | 33 |
| B. MENU SCREEN 6-2 | 34 |
| C. MENU SCREEN 6-3 | 35 |
| D. MENU SCREEN 6-4 | 36 |
| E. MENU SCREEN 6-5 | 37 |
| F. MENU SCREEN 6-6 | 37 |
| 15. PRINTER..... | 38 |
| <u>16. BOOTING FROM ROM OR FLOPPY DISK.....</u> | 39 |
| 17. CONNECTING A PC TO THE SRC-255..... | 41 |
| A. LOCAL CONNECTION TO THE SRC-255 | 41 |
| B. REMOTE CONNECTION TO THE SRC-255 | 42 |
| C. COMMUNICATION WITH THE SRC-255 SYSTEM (LOCAL OR REMOTE) | 43 |
| 18. SYSTEM ACTIVATION..... | 44 |
| A. LOCAL OR REMOTE ACTIVATION | 44 |
| <u>19. REMOVING AND REPLACING CONTROL CARDS.....</u> | 61 |
| 20. CHANGING THE DIP SWITCH SETTING..... | 61 |

INTRODUCTION

Please read this manual completely prior to connecting or activating the computerized rectifier controller. This rectifier has been subject to a "burn-in" period prior to shipping and has been rigorously tested to ensure proper operation prior to shipping.

NOTE

The CMOS circuitry used in this computerized rectifier controller is sensitive to static electricity. Please ensure that you are grounded prior to touching any circuit board or component.

1. UNPACKING AND ASSEMBLING THE EQUIPMENT

Inspect the equipment for damage as you unpack it from its shipping carton(s). If any damage is apparent, contact the carrier immediately to file a claim.

In most instances, the unit will be shipped completely assembled. If the racks, circuit boards and power supply are not shipped in the cabinet, install the racks in the cabinet with the hardware supplied referring to the drawing which will be attached to the cabinet. The hardware for this installation will be located in the correct position in the mounting racks of the cabinet. **DO NOT REMOVE ANY OF THE CIRCUIT CARDS FROM THE RACKS.** The rack containing the keyboard, CPU and up to 5 control cards is at the top, additional control card racks, if any, are located below the CPU rack and the power supply is located at the bottom of the cabinet. Filler panels are provided as necessary.

To install the racks and power supply, place the cabinet on a table or other working surface and open the front and back access doors or panels. The rear access panel or door may have long threaded bolts accessible only after the front door is open. Install the racks and power supply. Ensure that all unconnected wiring is protected from damage and directed to the back of the cabinet.

2. Electrical Connections

If your unit was shipped disassembled, then it will be necessary to make the electrical connections from the power supply to the control racks.

Colour Codes

The power supply output is direct current or DC. The power supply has 2 DC output wires. In all cases, the positive output wire is **RED** and the negative wire is **BLACK**. The racks containing the circuit boards have **BLACK** and **RED** leads attached. The **RED** leads are positive and the **BLACK** leads are negative.

Power Supply Connections

In smaller systems the **RED** and **BLACK** wires may already be connected to a terminal block mounted on the power supply panel. On larger systems there are copper buss bars labelled '**POSITIVE**' and '**NEGATIVE**'. In this case, connect the **RED** power supply lead to the buss labelled '**POSITIVE**' and the '**BLACK**' power supply lead to the buss labelled '**NEGATIVE**', using the hardware installed on the buss bar.

Control Card Rack Connections to the Power Supply

Each rack of control cards has **RED AND BLACK** wires soldered to the large circuit board called the backplane. For small systems, where there are no copper buss bars, find the terminal block on the back of the power supply panel which has a single **RED** and single **BLACK** wire attached to one side of the terminal block. Attach the **RED** wires from the all backplanes to the terminal block lug with the **RED** wire from the power supply and the **BLACK** wires to the terminal block lug with the **BLACK** wire from the power supply. *Never attach wires of different colours. Damage to the power supply and control card circuits will result.*

3 .CONNECTING THE ANODE SYSTEM AND THE STRUCTURE TO THE SRC-255

The anode system and the structure connections will vary, in number, from structure to structure. The anode leads will be fed to terminal blocks at the rear of the SCR-255 unit. The terminal blocks for the anode leads will have a single red wire attached to the control card side of the block. There will be one terminal block for each control zone supplied with the rectifier. Each terminal block will be numbered from 1 to the total number of control cards in the system.

The installer must connect the anode lead from the structure to the appropriate control card terminal block. It is imperative that the control card number matches the structure zone number so that the physical (structure) zone numbers match the logical (SRC-255) card numbers.

The ground or structure leads must be attached to the copper grounding buss located at the rear of the SRC-255 cabinet. This buss will contain the black ground leads from the backplane unit.

4.SETTING UP THE SRC-255 FROM THE KEYPAD

a.SRC-255 KEYBOARD

The reader is advised to examine the menu flow chart appended to this document since the balance of this manual will refer to menu screens by the number indicated on this flow chart.

To start the SRC-255 system it is necessary to turn on the AC breaker and the DC breaker located on the power supply front panel. These breakers are labelled 'AC BREAKER' and 'DC BREAKER'. Turn on the AC breaker first, followed by the DC breaker. In most cases the memory backup will have protected the factory settings and the unit will commence operation on its own. If the LCD display does not light up solid black followed by a 'MODEM OK' or 'MODEM FAULT' message, then the memory backup has been lost. In this case refer to the section on **BOOTING FROM ROM OR FLOPPY DISK** on page 47. In most cases if memory backup has failed, the LCD screen will contain two horizontal bars.

The following screens will be displayed every time the system is reset or the power is turned on.

5 .START UP MENUE SCREENS

Menu Screen 0



Menu screen 0 appears after every reset or power up situation. The entire screen will turn black and then clear from the centre outwards.

Menu Screen 1



Menu screen 1 is the result of a modem test. The SRC-255 has sent a character string to the RS232 port 1 at 2400 BAUD. If the modem responds correctly, then this message appears. If the modem fails to respond, then the message 'MODEM FAULT' will appear indicating that no communication was established.

A 'MODEM FAULT' message will appear under the following conditions

- There is no modem
- There is a BAUD rate conflict
- The cable from the SRC-255 to the modem is not connected or is incorrectly wired

Menu Screen 2

```
WRITE ENABLE  TRACK 0
DISK FORMATTED
XXX BLOCKS FULL
```

Menu screen 2 is the result of the floppy disk test. The message indicates that the disk is write enabled (data can be written), the disk is properly formatted and there are XXX blocks of data already recorded on the disk. All systems are shipped with a properly formatted disk in the drive so no action should be required at initial start up. An empty (no data) disk will show 1 block full.

Menu Screen 3

```
SRC 255   24 01 95
CATHODIC  TECHNOLOGY
LIMITED   7-SHUTDOWN
*.-MENU   XXX ZONES
```

Menu screen 3 is the first display that requires user action. The screen displays the controller model (SRC 255) and the software creation date on the first line. The XXX ZONES is an information message indicating that the controller has tested all the zone control cards and has found XXX zones. If this number does not match the expected number of control zones then see the section on trouble shooting on page XXX.

There are two user selectable parameters in the screen.

- 7-SHUTDOWN -- Entering a 7 will inhibit all power output from the control cards. This option is placed at this point in the unlikely event the user wants to perform an emergency shutdown for some reason.
- *-MENU -- The user has 5 seconds to enter '*' from this point to select the set up menus. For initial set up this is the required action.

If no action is taken the SRC 255 will automatically proceed to system regulated output. The operating parameters will be those established at the factory which are conservative with respect to the output capacity of the system but may exceed the desired output for the particular structure.

6. INITIAL PARAMETER SET-UP

When the power is turned on, screens 0 (zero) through 3 will appear. There is a 5 second pause at screen 3 to allow the user time to select the * (asterisk) key on the keypad. This will give access to the set-up menu screens as detailed in the following sections. If the * key is not depressed within 5 seconds, the processor will automatically continue to a regulation state using the factory set parameters and screen number 4 will be displayed. Should this happen unintentionally, then the operator must depress the 'C' and '*' keys simultaneously to reset this processor and repeat the display sequence from screen 0. Depressing the '*' key will result in the following screen appearing on the display:

7. MAIN MENU (Level 5)

Menu screen 5

| | |
|---------------------|--------------|
| TIME-I-SET | C-DISPLAY |
| F-GOOD-ZONES | 1-SEND |
| *-PARAMETERS | E-RS232 |
| 0-RUN | 7-SHUTDOWN N |

Menu screen 5 permits access to all necessary set up and data transmission features. For the initial set up it is necessary to enter '*' to gain access to the **operational parameters** section. When the user enters '*', the following screen will appear:

8 .PARAMETERS

a.Menu screen 5-5

| | |
|------------------|----------|
| C-ALL-ZONES | E-1-ZONE |
| *-DEPOLARIZATION | |
| F-OTHER | 0-RUN |
| I-ZONE-1->ALL | N |

Menu screen 5-5 presents the user with 6 options.

- **C-ALL -ZONES** automatically loops through all zone parameters, beginning with zone one and ending with the last zone. It then automatically enters the **F-OTHER** parameter to complete the set up
- **E-1-ZONE** asks the user to enter a zone number and then proceeds to ask for the parameters for that zone. When the zone parameters are entered, screen 5-5 is re-displayed
- ***-DEPOLARIZATION** permits the user to set a depolarization time window. The system output will be shut down during this time but monitoring and logging of the volts, amps and reference potentials will continue.
- **F-OTHER** permits the user to set the disk log frequency, the printer log frequency and the interrupt time for IR drop free reference potential readings.
- **0-RUN** immediately switches the system out of set-up MODE and initiates regulated output based on the currently set parameters. Screen 4 will be displayed.
- **I-ZONE-1->ALL** is a feature which permits copying of all zone 1 parameters to all other zones in the system. This is an extremely useful tool when there are many zones which will be operating at the same voltage, current and/or reference limits. It is recommended that the user select the **E-1-ZONE** and the **I-ZONE-1->ALL** features to avoid the repetitive parameter entry of the **C-ALL-ZONES** option. Single zones which have different operating limits may be set discretely by using the **E-1-ZONE** option and selecting the particular zone by number. This must be done **after** copying the zone 1 parameters to all zones.

- **N** - entering 'N' returns control to menu screen 5

The following is a detailed description of all options in menu screen 5-5

b. Menu screen 5-5

| | |
|--------------------|-----------------|
| C-ALL-ZONES | E-1-ZONE |
| *-DEPOLARIZATION | |
| F-OTHER | 0-RUN |
| I-ZONE-1->ALL | N |

C-ALL-ZONES and E-1-ZONE

As detailed above there are two ways of setting control zone parameters, the **C-ALL-ZONES and E-1-ZONE** method. If the **E-1-ZONE** is selected, the following screen will appear. If **C-ALL-ZONES** is selected, then the following screen will be skipped

i.Menu screen 5-5-1

| |
|------------------------|
| 001 |
| ZONE |
| C-hange N-ext |

The value shown is the default value established by the re-set or power on, or the value of the last zone number entered if several zones have been selected.

The user must specify the control zone number for which parameters are to be entered. For the initial set-up, the parameters for zone 1 can be entered and then copied to all other zones using the **I-ZONE-1->ALL** command. This single zone set-up (preparation for the copy command) is done by performing the following:

- If 001 is the correct zone, then enter 'N' and the system will proceed to the next screen (5-5-1-1)
- To change the value enter 'C' and the number will disappear. Enter the desired number followed by a 'N' to proceed to the next screen

Entering 'N' will result in the following requests from the system.

(1) Menu screen 5-5-1-1

```
000
MODE
C-hange      N-ext
```

The user has a choice of two MODES of operation. The default is MODE 0 which will result in either constant current or constant voltage operation. Subsequent parameter entry will determine constant current or constant voltage operation. To operate in autopotential control it is necessary to change the mode of operation to MODE 1. To accomplish this enter 'C'. The '000' will disappear. Enter 001 to change to MODE 1. If you make an error enter 'C' again. To accept the default or proceed from a MODE change enter 'N'

(2) Menu screen 5-5-1-2

```
050
SHUNT IN 0.1A UNITS
C-hange      N-ext
```

Screen 5-5-1-2 requires that the user enter the shunt calibration of the control zone card. The system is set up such that the value entered is equal to the output capacity of the control card in tenths of amps. For example if the system contains 5 amp control cards, then the 050 (5.0 amps) is the correct entry. 2 amp cards would require an entry of '020'. If the value on the screen does not coincide with the card for that zone then the value must be changed by entering 'C' and entering the appropriate value. As before, the 'N' is used to accept the default or proceed from a change to the next screen. This entry permits the use of different capacity control cards within the same unit.

(3) Menu screen 5-5-1-3

```
V 000.0MIN 000.0MAX
A 00.00MIN 00.00MAX
SEmV +0000MIN +0000MAX
ckt XXX C-hange N-ext
```

This screen sets the operational limits for the zone. The first line contains the minimum and maximum voltage permitted, the second, the minimum and maximum current and the third, the minimum and maximum reference potential. The fourth line contains the circuit number or control zone being altered followed by the change and proceed options.

9 .CONSTANT CURRENT OPERATION

To set up for constant current it is necessary to provide the value of the desired current output. In addition, the voltage must be limited to a maximum value. These values will be determined by the designer of the cathodic protection system and are dependant on the anode material, the electrolyte characteristics etc.. For example, assume that we want a constant current of 2 amps with a maximum voltage of 10 volts, then the following actions must be taken:

- Enter 'C' to change the parameters
- A black cursor will appear over the fist character of VMIN. In this case the 000.0 setting is correct.
- Enter 'N' for next and the cursor will move to VMAX.
- The upper voltage limit must now changed. Enter 'C' to change this parameter. The 000.0 will disappear. Enter 100 (10.0 volts). The characters will appear in the blank space as they are entered. Observe the location of the decimal point to ensure that the correct value is entered. An error can be corrected by re-entering 'C'.
- When the correct value is displayed, enter 'N' to proceed
- The cursor will move to the AMIN position. Since we wish to hold the current at 2 amps, enter 'C' followed by 198 (1.98) in the resulting blank space. Enter 'N' to proceed to AMAX.
- Change the AMAX parameter and enter 202 (2.02) in the blank space and enter 'N' to proceed.
- ***The AMAX must never exceed the control card rating ****
- The cursor will now move to the third line which defines the reference potential limits. In the context of MODE 0 operation (constant current/constant voltage), these limits are not used. The user must enter 'N' twice to accept the +0000 defaults and complete the screen entries.

* The small difference, or window between AMIN and AMAX is required to speed up the processor and allow it some latitude in current output without going out of the range. Should the output exceed the rating of the control card due to a short circuit or any other reason, then a sensing circuit will automatically shut down the card's output. The processor will then slowly ramp the output back from 0.00 amps until AMAX is reached.

The control zone is now set up for constant current operation. Operation of the circuit will remain within these limits unless the maximum voltage is reached. Should this occur, then the micro processor will reduce the current and maintain the upper voltage limit, effectively switching to constant voltage operation. If the circuit resistance becomes less, then constant current operation will automatically resume when the required voltage to produce the constant current becomes 10 volts or less.

10 .CONSTANT VOLTAGE OPERATION

To set up a circuit for constant voltage operation requires the same procedure as for constant current with the exception that the voltage window is now small. Using the same numbers as in the example above, the operator would perform the following:

- Set VMIN to 9.98 volts and VMAX to 10.02 volts
- Accept the 00.00 AMIN setting and set AMAX to 2.00 amps
- Accept both default settings for reference potential limits

The operational characteristics in this instance will be a constant 10 volts of output unless the current exceeds 2 amps. In that case, the voltage would be reduced to maintain the upper current limit

11 .MODE 1 -- REFERENCE POTENTIAL CONTROL

If the user has selected MODE 1 in screen 5-5-5-1, then the processor will use reference cell feedback to control the output of the system. In this case all parameters must be set. The system designer must decide what reference limits are applicable as well as the permissible voltage and current ranges. The reference potential circuits have a limit of +/- 1.999 volts, so any reference feedback must be in this range. For example, to set up potential control between 1.000 and 1.100 volts, the following steps must be taken:

- Set the VMIN to 000.0 volts and the VMAX to 10.00 volts
- Set the AMIN to 00.00 amps and the AMAX to 2.00 amps
- Set the SEmVMIN to +1000 and the SEmVMAX to +1100

The micro processor will adjust the voltage and current upward until the reference feedback is in the selected range. This potential range will be maintained unless **either** the maximum current or maximum voltage limits are reached. If the voltage limit is reached first, then no further increase in voltage will be made and the current will be below 2 amps. If the current limit is reached first, then the voltage will not be increased. In both cases, the minimum reference potential will not be achieved.

The reference potential value entered must take into consideration the type of reference cell being used and its potential in the electrolyte. This is explained in the following menu screen 5-5.

The following screen allows the user to provide reference cell corrections or offsets. These may be used to shift the reported reference potential (i.e. move a silver-silver chloride reference to the equivalent copper-copper sulphate value.)

If reference cell corrections are entered, the user is cautioned that under mode 1, reference control, the corrections or offsets will be applied BEFORE the processor sets the output voltage. If corrections have been entered to offset a zinc reference to a copper-copper sulphate value, then the mode 1 potential limits should be set with respect to copper-copper sulphate values, NOT zinc values.

(1)Menu screen 5-5-1-4

| | | |
|-----------|-----------|--------|
| 1+0000 | 2+0000 | 3+0000 |
| 4+0000 | 5+0000 | 6+0000 |
| REF IN mV | *-REF OFF | |
| ckt XXX | C-hange | N-ext |

This screen allows the user to add or subtract a specified correction factor to the reference cell reading. It is particularly useful for adjusting the reported reference values from the actual embedded reference value to that of a copper-copper sulphate or silver-silver-chloride for example. In the example above, the offsets are all 0.

An important option is the ***-REF-OFF**. The system is set up to report on up to 6 references per control zone. If there are fewer than 6 references, it is recommended that this option be used to turn the unused references off. This will decrease the volume of stored data as well as the data transmission time under

remote monitoring since NULL or 'off' references are ignored. For example, if we assume that there are only two references in the control zone, and we wish to give reference 1 and offset of +100 mV and reference 2 an offset of -100 mV, the following actions would be required.

- Enter 'C' to change and the cursor will appear over the 0000 of reference 1.
- Enter 'C' and the '0000' will disappear. Enter '100' followed by 'N' for next.
- The cursor will appear over the '+'. The sign can be toggled from '+' to '-' by depressing the 'C' key. In this case the '+' is correct, so the user will enter 'N' and move to reference 2
- The offset for reference 2 is -100 so the user will change the 0000 to 100 as before, but for this reference, the sign must be toggled to '-' using the 'C' key
- References 3 to 6 are turned off by entering 'N' to go to reference 3 and entering '*' to turn reference 3 off. The 'N' is used to move to reference 4 and the '*' is used to turn it off and so on. As each reference is turned off, the sign and offset values will disappear. Only the reference number will remain. To turn a reference on, the cursor is moved to the reference position on the screen by using the 'N' key. The 'C' key is then used and a value and sign added as above. The reference will then be reported in the data history.

After the reference offsets are completed, depress the 'N' Key.

If the user has selected the **C-ALL-ZONES** option, then the next screen to appear will be 5-5-1-1 and the above steps will be repeated for each zone in the system. After all zone parameters have been entered, the **C-ALL-ZONES** option will directly transfer control to the **F-OTHER** option without displaying screen 5-5

If **E-1-ZONE** has been selected, then control will return to menu screen 5-5. The next step is to select the **F-OTHER** option from screen 5-5. This option sets system wide parameters and is not repeated for each zone in the system.

b.Menu screen 5-5

| | |
|------------------|----------|
| C-ALL-ZONES | E-1-ZONE |
| *-DEPOLARIZATION | |
| F-OTHER | 0-RUN |
| I-ZONE-1->ALL | N |

F-OTHER

There are three additional parameters that are system parameters as opposed to zone parameters. These are set using the **F-OTHER** option.

i.Menu screen 5-5-2



The disk log parameter determines the frequency of data storage to the floppy disk. It is suggested that this parameter be set to a low value during the initial set-up phase in order to closely monitor changes in voltage, current and reference potential. It is usual to set the disk log interval to 15 minutes (96 sets of stored readings per day) initially and expand the interval once the cathodic protection system has stabilised and the structure has polarised. A suggested maximum value would be 1440 minutes which is equivalent to 24 hours, or one set of stored readings per day. To change the disk log interval perform the following:

- Enter 'C' followed by the desired interval in minutes.
- Enter 'N' to accept the value and proceed to the next screen

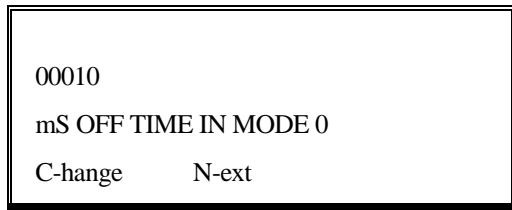
ii.Menu screen 5-5-3



The SRC-255 has the capability to print a hard copy of the readings directly to a local line printer. In practice, this option is rarely used, since all data is retained on the system disk. If no printer is attached to the serial port of the SRC-255, then a high interval is set so that the system will not attempt to write to a non-existent printer. To set this parameter perform the following:

- Enter 'C' to change, followed by 65000.
- Enter 'N' to accept the value and proceed to the final screen

iii.Menu screen 5-5-4



This parameter determines the interrupt time in **milliseconds** when the system is operating under constant current or constant voltage control. The designer of the Cathodic Protection System will determine the required interrupt setting based on the particular installation. This setting determines the length of current interrupt required to achieve an **instant off** reading of the monitored references in the system. The interrupt occurs every 30 seconds of operation while the system is checking the control parameters and adjusting control card outputs. It is visually apparent by flashing control card lights and a change in the zone parameters displayed on operating screen 4 . To change the interrupt perform the following;

- Enter 'C' followed by the desired interrupt in **milliseconds**
- Enter 'N' to accept the value or 'C' to correct an error

Menu screen 5-5 will now appear, and **if the user has selected C-ALL-ZONES**, all system parameters are set. **If the user initially selected E-1-ZONE**, then it is now necessary to copy all zone 1 parameters to the other zones in the system

c.Menu screen 5-5

| | |
|-------------------------|----------|
| C-ALL-ZONES | E-1-ZONE |
| *-DEPOLARIZATION | |
| F-OTHER | 0-RUN |
| I-ZONE-1->ALL | N |

Copying the zone 1 parameters to all other zones involves only depressing the 'I' key. A blank screen will appear followed by a single row of black rectangles beginning in the upper left corner of the screen and proceeding right. When complete, screen 5-5 will re-appear and all zones will have the same parameters as zone 1. If any zones require different parameters they can now be changed individually by using the

E-1-ZONE option from screen 5-5. It is necessary to change only those zones which are different from zone 1.

CAUTION -- This option will ONLY copy parameters from zone 1. Do NOT set individual zone parameters prior to using this option, since they will be replaced by the zone 1 parameters as soon as the 'I' key is depressed.

d.Menu screen 5-5

| | |
|------------------|--------------|
| C-ALL-ZONES | E-1-ZONE |
| *-DEPOLARIZATION | |
| F-OTHER | 0-RUN |
| I-ZONE-1->ALL | N |

0-RUN

Selection of this parameter will result in the SRC-255 system immediately entering the regulation mode and screen 4 will be displayed containing the current operating parameters for zone 1. Every 30 seconds the screen will change to display the current operating parameters for the next zone in sequence. This is the normal operating condition of the control system. Data will be automatically logged at the interval previously set by the operator.

e.Menu screen 5-5

| | |
|--------------------------|----------|
| C-ALL-ZONES | E-1-ZONE |
| *- DEPOLARIZATION | |
| F-OTHER | 0-RUN |
| I-ZONE-1->ALL | N |

***-DEPOLARIZATION**

A depolarization test is the standard method of checking the effectiveness of a cathodic protection system. In this mode, the output of the rectifier system is shut down and the SCR-255 monitors and logs the volts, amps and reference potentials. A depolarization test is set up by specifying a start and end time. These times are at the discretion of the individual performing the test but the duration of the test is usually a minimum of four hours.

Depressing the '*' key will result in the following:

i.Menu screen 5-5-4

```
wymmddhhmmss
DEPOLARIZATION FROM
C-lear
```

The user must enter the start or 'FROM' time for the test. If an error is made, use the 'C' key to clear the entry and re-enter. As they are entered, the values will appear over the appropriate letter in the screen. The letters correspond to the following:

w -- weekday - Monday is 1, Tuesday is 2 ... Sunday is 7
yy -- year
mm -- month
dd -- day of month
hh -- hours on a 24 hour clock (midnight - 00, 6am - 06, noon - 12, 6pm - 18)
mm -- minutes
ss -- seconds

Once the value for seconds has been entered the next screen will automatically appear. Corrections must be made prior to entering the last digit of the 'seconds' value.

ii.Menu screen 5-5-5

```
wymmddhhmmss
DEPOLARIZATION TO
C-lear
```

The operator now enters the end or 'TO' time for the test. The operation is identical to that described above for the start time. Once the end time is entered the following screen will appear:

iii.Menu screen 5-5-6

| | |
|---------------------------|-------|
| XXXXXX minutes depol. log | |
| C-hange | N-ext |

The SRC-255 control system will have had a disk logging frequency set under the **F-OTHER** option. This may be as high as once per day for older systems. This parameter changes the disk logging frequency for the duration of the depolarization test only. Once the test is complete, then data logging resumes at the previous logging frequency. To set the depolarization log enter 'C' to change and then enter the desired logging interval in minutes. It is usual to use a 10 or 15 minute logging interval during a depolarization test. This interval will yield a good potential decay curve for the embedded references. In order to obtain a set of 'Instant Off' readings prior to shutdown, it is necessary to delay the start of the depolarisation sequence by a minimum of the depolarising logging interval plus 1 minute. It is suggested that the operator delay the start by one hour from the time the set-up is performed.

Depress 'N' to return to screen 5-5 followed by '0' to enter run mode.

To return to the main menu screen 5 depress 'N'

12.Menu screen 5

| | |
|------------------|----------------|
| TIME-I-SET | C-DISPLAY |
| F-GOOD-ZONES | 1-SEND |
| *-PARAMETERS | E-RS232 |
| 0-RUN 7-SHUTDOWN | N |

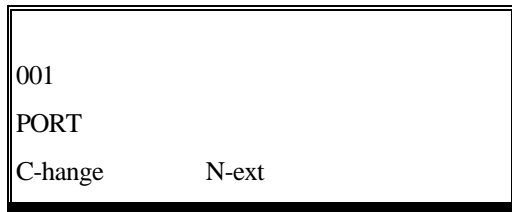
The balance of menu screen 5 and all of menu screen 6 deals with system housekeeping and testing. The SRC-255 cathodic protection system operating parameters have now been set. The balance of this section deals with testing, calibration and set-up for remote output.

E-RS232

This option allows the user to temporarily select a different RS-232 port or temporarily change the transmission speed of the ports. The RS-232 ports are located on the front panel beneath the display. There are two RS-232 ports provided and one parallel port. In most cases only port one will be used. Port one must be connected to a modem for remote monitoring and control. Port one is also used for attaching a PC to perform local set-up as described in the following sections or to retrieve data from the system disk.

Depress 'E' to change the ports or the port's BAUD rate.

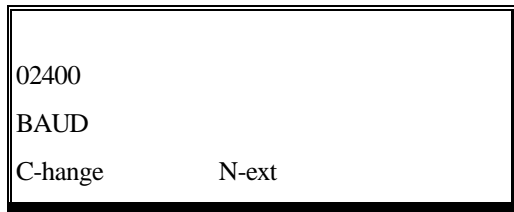
a.Menu screen 5-6



Port 001 is the default RS-232 port. To change the port number enter 'C' followed by the port number (1 or 2)

Enter 'N' to proceed

i.Menu screen 5-6-1



The BAUD rate is the speed at which data is transferred. The higher the number, the faster the rate. The most common rates are 1200, 2400, 9600 and 19200. Present modem technology and non-dedicated phone line noise levels make 2400 the optimum setting for remote operation and control. If the operator intends to hook a PC to the port then transmission speeds up to the 19200 rate can be used.

- Enter 'C' to change followed by the desired BAUD rate.
- Depress 'N' to return to main menu level 5.

Caution: when the SRC-255 is reset ('C' and '*' depressed) or when power is interrupted, the default port (1) and BAUD rate (2400) will be re-instated.

13.Menu screen 5

| | |
|------------------|-----------|
| TIME-I-SET | C-DISPLAY |
| F-GOOD-ZONES | 1-SEND |
| *-PARAMETERS | E-RS232 |
| 0-RUN 7-SHUTDOWN | N |

A second screen of options is available for testing, calibration and disk changing. It is entered by depressing 'N' at menu 5

Menu screen 6

Menu screen 6 permits the user to perform the following functions

- Change the floppy disk
- Test the memory
- View the current value of the relative humidity and temperature sensors (if so equipped)
- Calibrate the relative humidity sensor (if so equipped)
- Perform a visual test of the control card circuits

14.Menu screen 6

```
E-CHANGE-DISK C-MEM
F-RH&T      *-CAL-RH
I-VISUAL-TEST
N
```

E-CHANGE-DISK

The change disk function is the most commonly used feature of this screen. For systems where the remote monitoring has not been activated by the installation of a phone line and a modem, the only way to recover historical data is to either download the data to a PC on site, or retrieve the data disk for analysis. Entering 'E' will result in the following requests from the SRC-255 system. No parameters are set during this operation and the user must follow the requests as they are made and enter an 'N' to proceed to the next step.

a.Menu screen 6-1

```
WRITE ENABLE TRACK 0
DISK FORMATTED
XXX BLOCKS FULL      N
```

Menu screen 6-1 represents the status of the old disk. The system reports that the disk is write enabled, formatted and contains XXX blocks of data. At this point, any data stored in the memory buffer of the SRC-255 has been written to the disk. Depress 'N' to proceed

i.Menu screen 6-1-1

```
TAKE OLD DISK OUT
N
```

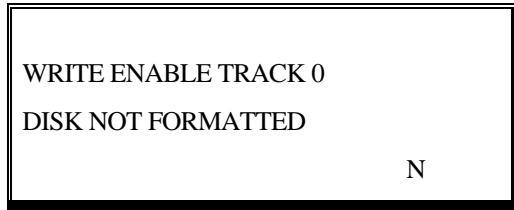
Remove the old disk and write the time and date on the label. It is good practice to move the write protect/enable tab to the protect position.

ii. Menu screen 6-1-2



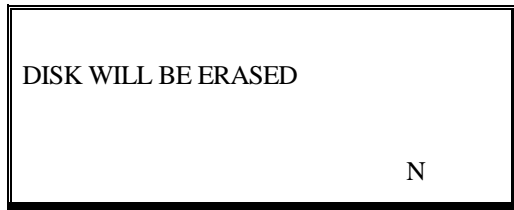
Write the installation location, time and date on the new disk label and ensure that the write protect/enable tab is in the write enable position. Insert the new disk and depress 'N' to continue.

iii.Menu screen 6-1-3



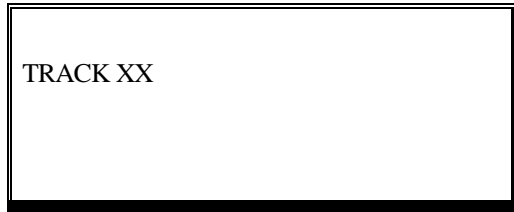
This screen gives the new disk status. Most disks will report that the disk is not formatted. However, some disks come pre-formatted. If the disk is pre-formatted, then the SRC-255 will report a series of 'DISK ERROR XX' messages, where XX is a two digit number. In this case screen 6-1-2 will be substituted but the BLOCKS FULL message will contain random characters. In the event that the user inserts an old SCR-255 disk as the "new" disk, screen 6-1-2 will appear without error messages but with a legible 'BLOCKS FULL' value. Previous data disks can be used but the operator is cautioned that all data on the disk will be lost. Depress 'N' to proceed.

iv.Menu screen 6-1-4



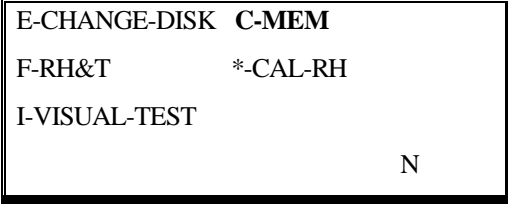
This screen is the final caution concerning lost data. The SRC-255 is about to format the disk and regardless of existing format (none, pre-formatted, old SRC-255 disk or IBM formatted with data), the formatting will proceed as soon as the 'N' key is depressed and all data on the disk will be erased.

v.Menu screen 6-1-5



Menu screen 6-1-5 is an information screen which reports the progress of the formatting operation. XX will start at 00 and end at 79 as each track is formatted. Following the formatting operation the system will perform a soft boot and the display sequence will commence at screen 0.

Menu screen 6

A rectangular box with a double-line border containing the following text:

E-CHANGE-DISK C-MEM
F-RH&T *-CAL-RH
I-VISUAL-TEST
N

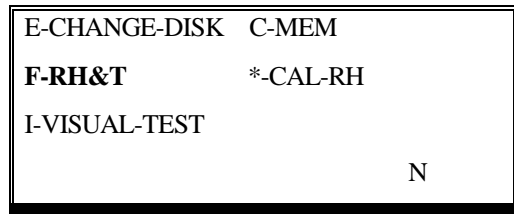
b.Menu screen 6-2

A rectangular box with a double-line border containing the following text:

32K OK
N

When this message appears, the system has verified the 32K memory. Enter 'N' to return to screen 6. If any other message appears, there is a memory error and the operation and historical data may be compromised. ***In this case notify Cathodic Technology Limited immediately so that proper corrective action may be taken.***

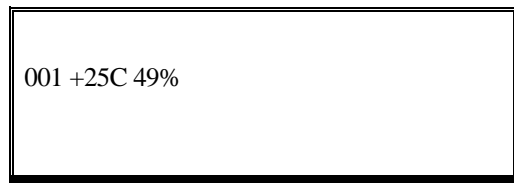
Menu screen 6



F-RH&T

Some systems are equipped with temperature and relative humidity sensors. These sensors are usually embedded in the concrete and report on the conditions within the slab. This menu item displays the current value of the temperature and relative humidity.

c.Menu screen 6-3



The first number shown i.e. the zone number containing the probe, the second number is the temperature in degrees Celsius and the third number the relative humidity. If more than one probe is present, then multiple lines will appear on the display.

Menu screen 6

```

E-CHANGE-DISK  C-MEM
F-RH&T          *-CAL-RH
I-VISUAL-TEST

N

```

***-CAL-RH**

It is necessary to calibrate the relative humidity probe. The probe itself has a lower limit of 11% and as such in extremely dry conditions, will not report values below this number. Since fluctuations in humidity can be significant in Cathodic Protection, measure the relative humidity and enter the value.

d.Menu screen 6-4

```

enter real %RH
zone 001
C-lear  E-nter

```

To calibrate the probe, enter 'C' to change followed by the measured value.

Menu screen 6

```

E-CHANGE-DISK  C-MEM
F-RH&T          *-CAL-RH
I-VISUAL-TEST

N

```

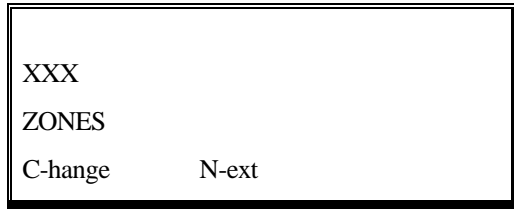
I-VISUAL-

TEST

The visual test, is a means of displaying all of the control zones in sequence from zone one to the highest zone. The test is particularly useful for confirming that the zone control cards are in the correct slot in the SRC-255 system and that there are no control cards with address errors. To perform this test

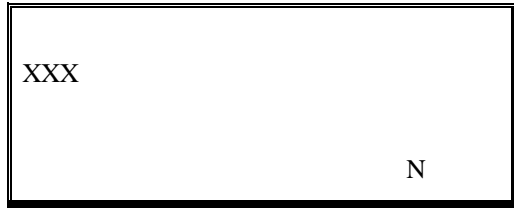
depress the 'I' key. If two or more card lights come on at the same time, then they have the same logical address and the dip switch setting on the card must be changed. See page 68 for the instructions on how to set the control card address. If cards light in the incorrect sequence, then the cards were placed in incorrect slots. Change the position of the cards in the card rack. Refer to page 68 for instructions.

e. Menu screen 6-5



This menu permits the user to specify the number of zones to be tested. It is rarely used. The default condition is 'all zones'. To test all zones enter N to proceed.

f. Menu screen 6-6



The value XXX will commence at 1 and increment upwards to the maximum zone number. As the number is displayed on the screen, the LED in the control card containing that address will be lit. The lights should go on in order from the lowest logical zone number to the highest logical zone number. The test will continue endlessly until the 'N' key is depressed.

If two or more zone control cards light simultaneously, then they have the same address. The dip switch on the incorrect control card must be changed.

If the cards light in an unexpected order, then the cards are out of order in the control rack. Either switch the control card positions, or correct the address by changing the dip switch settings.

15 . PRINTER

The printer communicates with the computerized rectifier controller through a parallel cable, which is supplied with the printer equipment. We would recommend the use of tractor feed paper to allow continuous form printing.

The printer is connected to the computerized rectifier controller via the parallel cable. It must be plugged into the parallel port, i.e. the 25-pin D connector closest to the keyboard (see front panel layout).

16. BOOTING FROM ROM OR FLOPPY DISK

The SRC-255 micro-processor has a power backup system that maintains the contents of memory as well as the system clock. The power backup will retain the memory status for approximately 4 weeks. After this time, the contents of the memory are lost and it will be necessary to perform a 'Hard Boot'. The software, or program that runs the system is contained in a read only memory that is not affected by power loss. In addition, it is possible to perform a 'hard boot' from the floppy disk drive. In order to boot from the floppy disk, it will be necessary to remove the data disk from the drive and insert the disk containing the program. In both cases, the operating software is re-loaded into memory and system operation can then be restored.

The following sequence will permit the operator to load new software from a floppy disk or to reload the existing software from ROM.

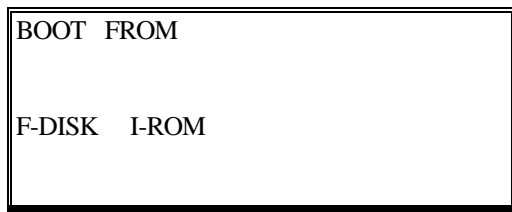
Depress and hold the 'I' and 'N' keys

With the 'I' and 'N' keys held, depress the 'C' and '*' simultaneously.

Release keys C and *.

When display starts self-test, release the I and N keys.

The following screen will appear.



```
BOOT FROM
F-DISK I-ROM
```

Press I to load software from ROM.

After the software has been loaded, the system will perform a soft boot and automatically commence at menu screen 0

CAUTION: If it is necessary to restore system operation using a hard boot from ROM or Floppy Disk, then all system parameters must be reset as described in the preceding sections. Do not allow the control system to enter the regulation mode without setting parameters since the parameter values following a hard boot could be random numbers.

17. CONNECTING A PC TO THE SRC-255

FOR LOCAL OR REMOTE CONTROL, TESTING OR MONITORING

a. Local Connection to the SRC-255

Some computers, particularly notebooks and laptops have different RS-232 cable configurations. The communication protocol used by the SRC-255 system is called XON-XOFF. Cathodic Technology will provides a cable to connect a modem to the SRC-255 but does not provide a cable to connect a PC to the SRC-255 system. The owner of the computer used to communicate should ensure that the cable being connected to the unit is wired for the RS-232 XON-XOFF protocol. This information is contained in the PC's manual.

The RS-232 cable is connected between **SERIAL PORT No. 1**, on the left side of the front panel of the computerized rectifier controller and the communication port on the PC (either COM 1 or COM 2). This connection is made with an RS232 cable which contains 25 pin D connector on the SRC-255 and a 9 or 25 pin connector on the PC end depending on the requirement of the PC. For local communication, it is recommended that the SRC-255 serial port 1 and the IBM compatible PC be configured for maximum communication speed.

Baud rate - 19,200

The IBM compatible PC requires communication software such as MIRROR, PC TALK or PROCOM in order to communicate with the SRC-255. The communication software must be configured as follows in order to establish the data path.

Baud rate - 19,200 (must match the SRC-255 port setting)

Parity - NONE

Data bits - 8

Stop bits - 1

Com port - 1 or 2 (PC communication port)

b. Remote Connection to the SRC-255

For remote communication with the SCR-255, it is necessary to install an optional modem with a phone line in the SRC-255 cabinet. The local phone company must be contacted to arrange for the installation. Many phone companies have special rates for phone lines where no outgoing calls are made. The modem required must be HAYES compatible and is a standard computer modem. It must have a BAUD rate of 2400 in order to match the default setting of the SRC-255

An RS232 modem cable is connected between **SERIAL PORT No. 1**, on the left side of the front panel of the installed modem. The remote installation must be configured for modem communications with access to a phone line. For remote communication, it is recommended that the SRC-255 serial port 1 and the IBM compatible PC be configured for the default communication speed of 2400 BAUD. The remote IBM compatible PC requires communication software such as MIRROR, PC TALK or PROCOM in order to communicate with the SRC-255.

*IMPORTANT: The communication software MUST be set to emulate a VT100. This is an industry standard emulation and is contained in all major communication software. **Failure to do so will result in a unintelligible display***

The communication software must be configured as follows in order to establish the remote data path.

Baud rate - 2400 (must match the SRC-255 default port setting)

Parity - NONE

Data bits - 8

Stop bits - 1

Com port - 1 or 2 (PC communication port)

c. Communication with the SRC-255 System (Local or Remote)

The operator is ready to initiate communication with the SRC-255 immediately in the case of local connection (directly to the SRC-255) or upon receipt of the 'CONNECT' message from the Hayes compatible modem in the case of remote connection. To initiate communication with the SRC-255 through an IBM compatible PC, the PC keyboard must be set in 'CAPS LOCK' so that only capital letters are transmitted. To initiate communication type a '?'. The SRC-255 will then request you send a password. Enter your **PASSWORD**. Failure to enter your **PASSWORD** within 5 seconds will result in rejection of communication with the SRC-255 and a message 'ACCESS DENIED'. This is a security feature to prevent repetitive unauthorised attempts to access the system. After three unsuccessful attempts, the SRC-255 software security system will issue the message 'SECURITY SHUTDOWN'. The system will then not respond to the '?' prompt for the next 30 minutes.

18. SYSTEM ACTIVATION

a. Local or Remote Activation

It is usual to activate a system locally using the keypad approach described in the previous sections. However, local activation from a PC is equally feasible and requires the steps described below. The text below is a copy of an actual communication session with an SRC-255 system. The system has 4 control zones and is operating under MODE 0 with constant current set to 1.95 to 2.00 amps and voltage control set at 0.00 to 10.00 volts. There is one reference per zone. All of the parameters displayed have been defined in the previous section of this document. Text in normal letters represents data from the SRC-255. Text in italics represents keyboard entered text. Any text following a '!' are comments describing the entry and **MUST NOT BE ENTERED**. The symbol <CR> means the 'ENTER' key on the keyboard.

NOTE: If the operator wishes to keep a PC hard disk record of the communication session, or wishes to download historical or depolarization data from the SRC-255 disk, then a data capture file MUST be opened. The file open operation is unique to the communication software being used. Refer to the communication software manual for instructions on how to open and close the capture file. Some software systems may refer to this file as a 'LOG FILE'. Be certain that the file has been closed PRIOR to exiting the communication software at the end of the system. Failure to do so may result in the loss of transmitted data.

AT <CR> ! TEST LOCAL MODEM
OK ! LOCAL MODEM RESPONSE
ATDT18005551212 <CR> ! ENTER PHONE NUMBER
CONNECT 2400 ! CONNECTION ESTABLISHED AT 2400 BAUD

! The above text is specific to remote communication and establishes connection to the front panel of the SRC-255 via modem. From this point on, local and remote communication are identical

? ! PROMPT
password please ! SRC-255 REQUESTING USER PASSWORD
(your password) <CR> ! PASSWORD FOR THE SYSTEM

Welcome to Cathodic Technology Limited SRC-255 11 I 95

SRC255 23 MAY 95 14:04:00

| zone | Volts | Amps | ref1_mV | ref2_mV | ref3_mV | ref4_mV | ref5_mV | ref6_mV |
|------|-------|--------|---------|---------|---------|---------|---------|---------|
| 001 | 07.08 | 01.984 | +0129 | | | | | |
| 002 | 06.83 | 01.991 | +0216 | | | | | |
| 003 | 06.67 | 01.968 | +0305 | | | | | |
| 004 | 06.62 | 01.970 | +0157 | | | | | |
| 005 | | | | | | | | |
| 006 | | | | | | | | |
| 007 | | | | | | | | |
| 008 | | | | | | | | |
| 009 | | | | | | | | |
| 010 | | | | | | | | |
| 011 | | | | | | | | |
| 012 | | | | | | | | |
| 013 | | | | | | | | |
| 014 | | | | | | | | |
| 015 | | | | | | | | |
| 016 | | | | | | | | |
| 017 | | | | | | | | |
| 018 | | | | | | | | |
| 019 | | | | | | | | |
| 020 | | | | | | | | |

U-up D-down M-menu

! The above screen shows the current operating output values. There is capacity to display up to 20 zones per screen. For zones above 20 enter 'D' to go down in the list and 'U' to move up in the list. The screen will display all zones in groups of 20. To access the parameter section for setup the following steps must be performed:

M

*! REQUEST MENU SCREEN
(NO <CR> NEEDED)*

!The following display is the level 'A' software access menu. It permits the user to perform only the functions listed. This level is provided for the use of those who would not normally be permitted to change the system settings. It is strongly suggested that access to the system level B be restricted to those knowledgeable in the operation of the SRC-255 as well as Cathodic Protection. At this level, data can be retrieved and depolarization tests can be set up and run.

A-DEPOLARIZATION TEST

E-EXPORT DATA

G-BYE

Z-RETURN TO OPERATION

SRC-255 11 I 95 Cathodic Technology Limited

! To access the parameter level it is necessary to enter the level 'B' password.

?

! PROMPT

password please ! SRC-255 REQUESTING USER PASSWORD

(your password) <CR> ! SECOND PASSWORD FOR THE SYSTEM

Welcome to Cathodic Technology Limited SRC-255 11 I 95

A-DEPOLARIZATION TEST ! LEVEL B OPTION MENU

B-DATA LOGGING FREQUENCY

C-PRINTER LOGGING FREQUENCY

D-PARAMETERS

E-EXPORT DATA

F-OFF TIME IN MODE 0

G-BYE

H-SET-TIME

p-PASSWORDS

Z-RETURN TO OPERATION

SRC-255 11 I 95 Cathodic Technology Limited

! The above screen shows the options available at this level. To access a particular option enter the appropriate letter shown at the beginning of the display line

D ! SELECT PARAMETERS OPTION
 Z M S
 O O H
 N D U
 E E N
 | / T
 | | |
 V V V

| zo | mo | .1A | Vmin | Vmax | Amin | Amax | SEmin | SEmax | ref1 | ref2 | ref3 | ref4 | ref5 | ref6 |
|-----|----|-----|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|
| 001 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 002 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 003 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 004 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 005 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 006 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 007 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 008 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 009 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 010 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 011 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 012 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 013 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.10 | +0000 | +0000 | +0000 | | | | | |
| 014 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 015 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 016 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 017 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 018 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 019 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |
| 020 | 0 | 50 | 00.00 | 10.00 | 01.95 | 02.00 | +0000 | +0000 | +0000 | | | | | |

C-change-parameter X-disable-reference A-zone1->all P-print
 M-menu U-up D-down R-right L-left

! To set or change any of the parameters in the above display, use the 'U', 'D', 'L' or 'R' keys to move the cursor over the desired parameter. Enter 'C' followed by the new value. Initially, all values must be set. All zone 1 values can be copied to all other zones by entering 'A'. To disable a reference, position the cursor over the appropriate reference value and depress 'X'. To access zones over number 20 move the cursor down to zone 20. Depress the 'D' key and the next 20 zones will appear on the display (i.e. 21 to 40). To return to the level B option menu depress 'M'. Note: User must enter the same number of characters as shown on the display. Do NOT enter the decimal point.

M ! RETURN TO LEVEL B OPTION MENU

Welcome to Cathodic Technology Limited SRC-255 11 I 95

A-DEPOLARIZATION TEST ! LEVEL B OPTION MENU

B-DATA LOGGING FREQUENCY

49

C-PRINTER LOGGING FREQUENCY

D-PARAMETERS

E-EXPORT DATA

F-OFF TIME IN MODE 0

G-BYE

H-SET-TIME

p-PASSWORDS

Z-RETURN TO OPERATION

SRC-255 11 I 95 Cathodic Technology Limited

*! The above screen shows the options available at this level. To access a particular option enter the appropriate letter shown at the beginning of the display line. **To complete the setup options B, C and F must be selected.***

B *! DATA LOGGING FREQUENCY SELECTED*

01440 minutes disk log *! EXISTING DATA LOGGING FREQUENCY*

C-change M-menu *! ENTER 'C' TO CHANGE FOLLOWED BY THE
NEW VALUE OR 'M' TO RETURN TO THE
LEVEL B OPTION MENU. ALL FIVE
CHARACTERS MUST BE ENTERED*

M *! RETURN TO LEVEL B OPTION MENU*

C *! PRINTER LOGGING FREQUENCY SELECTED*

65000 minutes print log *! EXISTING PRINTER LOGGING FREQUENCY*

C-change M-menu *! ENTER 'C' TO CHANGE FOLLOWED BY THE
NEW VALUE OR 'M' TO RETURN TO THE
LEVEL B OPTION MENU. ALL FIVE
CHARACTERS MUST BE ENTERED*

! RETURN TO LEVEL B OPTION MENU

F *! OFF TIME IN MODE 0*

00010 mS off time in mode 0 *! EXISTING OFF TIME IN MODE 0*

C-change M-menu *! ENTER 'C' TO CHANGE FOLLOWED BY THE
NEW VALUE OR 'M' TO RETURN TO THE
LEVEL B OPTION MENU. ALL FIVE
CHARACTERS MUST BE ENTERED*

M *! RETURN TO LEVEL B OPTION MENU*

A-DEPOLARIZATION TEST ! LEVEL B OPTION MENU

B-DATA LOGGING FREQUENCY

C-PRINTER LOGGING FREQUENCY

D-PARAMETERS

E-EXPORT DATA

F-OFF TIME IN MODE 0

G-BYE

H-SET-TIME

p-PASSWORDS

Z-RETURN TO OPERATION

SRC-255 11 I 95 Cathodic Technology Limited

! At this point the system operating parameters have all been set. These parameters constitute the 'Remote Control' portion of the SRC-255 software and the system is now ready to be placed in operation. Individual zone parameters can be changed remotely depending on the ongoing system performance requirements.

The balance of this section deals with remote monitoring and testing.

A *! DEPOLARIZATION TEST*
1 95 021410 00 00 *! ENTER THE DATE AND TIME TO START*
THE TEST
wyyymmddhhmmss
from

1 95 021414 00 00 *! ENTER THE DATE AND TIME TO END THE*
TEST
wyyymmddhhmmss
to

01440 minutes disk log *! EXISTING DISK LOG FREQUENCY*

C-change M-Menu *! ENTER 'C' TO CHANGE FOLLOWED BY THE*
NEW VALUE OR 'M' TO RETURN TO THE
LEVEL B OPTION MENU. ALL FIVE
CHARACTERS MUST BE ENTERED THE
EXISTING DISK LOG FREQUENCY WILL BE
REINSTATED AT THE COMPLETION OF THE TEST
! THE TIME FORMAT IS
w -- weekday - Monday is 1, Tuesday is 2 ... Sunday is 7
yy -- year
mm -- month
dd -- day of month
hh -- hours on a 24 hour clock (midnight - 00, 6am - 06, noon - 12, 6pm - 18)
mm -- minutes
ss -- seconds

H

!SET-TIME

wyymmddhhmmss

! GUIDE FOR SETTING DATE AND TIME

ITEMS

! THE TIME FORMAT IS

w -- weekday - Monday is 1, Tuesday is 2 ... Sunday is 7

yy -- year

mm -- month

dd -- day of month

hh -- hours on a 24 hour clock (midnight - 00, 6am - 06, noon - 12, 6pm - 18)

mm -- minutes

ss -- seconds

p

! PASSWORDS -- NOTE LOWER CASE 'p'

! REMOVE CAPS LOCK AND ENTER 'p'

! REINSTATE CAPS LOCK

PASSWORD 1 (password)

! EXISTING LEVEL A PASSWORD

PASSWORD 2 (password)

! EXISTING LEVEL B PASSWORD

C-change M-menu

C

! 'C' TO CHANGE

PASSWORD 1 (*new password*)

! OPERATOR ENTERS NEW PASSWORD

*! PASSWORDS **MUST BE UPPER CASE***

LETTERS AND CONTAIN NO MORE

THAN 6 CHARACTERS

PASSWORD 2 (*new password*)

! OPERATOR ENTERS NEW PASSWORD

C-change M-menu

! ENTER 'C' TO CHANGE OR ;M; TO ACCEPT

M

! PASSWORDS ACCEPTED

Z

*!RETURN TO OPERATION -- DISPLAY
VALUES OF VOLTAGE, CURRENT AND
REFERENCE POTENTIAL IN REAL TIME.*

Welcome to Cathodic Technology Limited SRC-255 11 I 95

SRC255 23 MAY 95 14:04:00

| zone | Volts | Amps | ref1_mV | ref2_mV | ref3_mV | ref4_mV | ref5_mV | ref6_mV |
|------|-------|--------|---------|---------|---------|---------|---------|---------|
| 001 | 07.08 | 01.984 | +0129 | | | | | |
| 002 | 06.83 | 01.991 | +0216 | | | | | |
| 003 | 06.67 | 01.968 | +0305 | | | | | |
| 004 | 06.62 | 01.970 | +0157 | | | | | |
| 005 | | | | | | | | |
| 006 | | | | | | | | |
| 007 | | | | | | | | |
| 008 | | | | | | | | |
| 009 | | | | | | | | |
| 010 | | | | | | | | |
| 011 | | | | | | | | |
| 012 | | | | | | | | |
| 013 | | | | | | | | |
| 014 | | | | | | | | |
| 015 | | | | | | | | |
| 016 | | | | | | | | |
| 017 | | | | | | | | |
| 018 | | | | | | | | |
| 019 | | | | | | | | |
| 020 | | | | | | | | |

U-up D-down M-menu

! The above screen shows the current operating output values. There is capacity to display up to 20 zones per screen. For zones above 20 enter 'D' to go down in the list and 'U' to move up in the list. The screen will display all zones in groups of 20. To access the parameter section for setup the following steps must be performed:

E *! EXPORT DATA*

O-oldest-day D-directory G-get-data

M-menu

O *! oldest day THE USER MUST ENTER A DATE
WINDOW TO RETRIEVE DATA FROM THE
SYSTEM. THIS PARAMETER DISPLAYS THE
OLDEST DATE ON THE SYSTEM DISK*

029502 *! OLDEST DAY (MMYYDD FORMAT)*

D *! directory THIS IS A LISTING OF ALL
AVAILABLE DAYS ON THE SYSTEM DISK.
THE MINIMUM AMOUNT OF DATA WHICH
CAN BE RETRIEVED IS ONE DAY*

950202 005 0000 *! DATE (YYMMDD), DISK BLOCK AND
950203 005 1002 DISK BLOCK OFFSET
950204 006 0980
950205 006 1795
950206 007 2051
950207 007 2307
950208 008 2563
950209 008 3535
950210 009 1789
950211 010 0562
950212 010 1735*

950202 ! DATE -- FIRST DAY SELECTED
 1015,004 ! TIME (HHMM FORMAT) & NUMBER OF ZONES
 07.08V,01.984A,1+0129 ! VOLTS AMPS AND REFERENCE VALUE ZONE 1
 06.83V,01.991A,1+0216 ZONE 2
 06.67V,01.968A,1+0305 ZONE 3
 06.62V,01.970A,1+0157 ZONE 4
 950203 ! NEXT DAY
 1015,004
 07.08V,01.993A,1+0131
 06.83V,01.968A,1+0216
 06.67V,01.968A,1+0302
 06.62V,01.970A,1+0157
 950204
 1015,004
 07.08V,01.993A,1+0128
 06.83V,01.968A,1+0220
 06.64V,01.968A,1+0297
 06.62V,01.970A,1+0157

.
 .

950211
 1015,004
 07.08V,01.993A,1+0132
 06.81V,01.968A,1+0218
 06.67V,01.968A,1+0301
 06.62V,01.970A,1+0157
 950212 ! LAST DAY SELECTED
 1015,004
 07.08V,01.993A,1+0130
 06.83V,01.968A,1+0216
 06.67V,01.968A,1+0302
 06.62V,01.970A,1+0157

AT&FS0=1S23=23&W ! MODEM RESET SEE EXPLANATION BELOW

! Following retrieval of all data selected, the SRC-255 will automatically return to regulation. This return requires a system reset or 'soft boot'. Accordingly, the modem at the SRC-255 end will be reset which will end the current logon session. If the user wishes to continue, then it is necessary to log in as described at the beginning of this section. To continue local or remote communication enter '?' and password. Any new passwords will now be in effect.

G !BYE -- SESSION ENDED LOGGING OFF

bye ! SRC-255 ACKNOWLEDGES END OF SESSION

AT&FS0=1S23=23&W ! SRC-255 RESETTING MODEM AT ITS END

Passwords are provided for system security as well as for restricting certain parts of the system operation to designated individuals. Systems are shipped with passwords in place. It is recommended that the user of the system establish passwords that are unique to that system. Should a password(s) be forgotten then access to the entire system or the second level will be denied. In this event the user must contact Cathodic Technology Limited. There is an unreleased third level password common to all SRC-255 systems which will permit designated Cathodic Technology Limited staff to reinstate forgotten passwords. This third level also contains a system of high level remote diagnostics which our staff can execute for remote trouble shooting and hardware analysis. **Under no circumstances will this password be released.**

19. Removing and replacing control cards

Occasionally it may be necessary to remove and replace circuit board cards. To remove and replace any circuit card, the following steps must be taken:

Turn off the AC power to the SRC-255 system. This may involve a switch within the cabinet or in an adjacent cabinet in large systems. All systems have an AC disconnect switch.

When the LCD on the SRC-255 is blank and all control card lights are out, it is safe to remove individual cards. Prior to touching any of the cards in the rack, it is necessary to touch the metal rack frame of discharge static electricity and remove any voltage difference between the operator and the control card frame.

All cards are removed from the front of the unit by grasping the 0.5 inch diameter hole on the front edge of the card and pulling forward. This will release the card from the rear socket and allow it to slide forward in the guide rails.

Hold the card by its edges and do not touch the components or the foil traces as the circuitry is sensitive to static electricity when removed from its backplane connector.

20. Changing the Dip Switch Setting

A dip switch is located on the component side of each control card. The setting on the switch uniquely identifies that control card to the processor for communications and output regulation. If a control card must be replaced due to component failure or an addressing error, then the correct switch setting must be made.

The dip switch will be the only red or blue component with 8 white switches on top.

With the component side of the card up, and the backplane connector facing away, switch position number 1 is on the LEFT and OFF or OPEN it towards the FRONT of the card.

If a defective card is being replaced, then it is only necessary to duplicate the settings of the defective card on the new card and replace the new card in the rack.

If only a zone or card number is known, then the BINARY equivalent of the zone or card number must be calculated and the appropriate switches set ON or CLOSED. While this may initially sound intimidating, the calculation is simple and straight forward.

Each of the 8 dip switches has a value that is twice the preceding switches value as shown in the table below.

| Switch Number | SWITCH POSITION | |
|---------------|-----------------|--------------|
| | Off or OPEN | On or CLOSED |
| | VALUE | VALUE |
| 1 | 0 | 1 |
| 2 | 0 | 2 |
| 3 | 0 | 4 |
| 4 | 0 | 8 |
| 5 | 0 | 16 |
| 6 | 0 | 32 |
| 7 | 0 | 64 |
| 8 | 0 | 128 |

The sum of the values determines the card or zone number. If all switches are off then the value is 0 (this is an illegal case since the minimum value will be 1). If all the switches are on then the value will be 255 which is the maximum value permitted.

The following examples show how to calculate which switches must be set to the ON position. The operation is simple. Turn ON the highest numbered switch whose value does not exceed the desired value. Next turn on the next highest numbered switch so the TOTAL value of all 'ON' switches does not exceed the desired value. Repeat this operation until the TOTAL value of all ON switches EQUALS the desired value

Assume we want to set 3 card addresses. The card numbers to be set are 31, 56 and 139.

Card Address 31

| Turn ON | Switch | |
|---------------|--------|------------|
| Switch Number | Value | Card Value |
| 5 | 16 | 16 |
| 4 | 8 | 24 |
| 3 | 4 | 28 |
| 2 | 2 | 30 |
| 1 | 1 | 31 |

Turn ON 1,2,3,4 and 5 all others OFF

Card Address 56

| Turn ON | Switch | |
|---------------|--------|------------|
| Switch Number | Value | Card Value |

| | | | |
|---|----|-----------|-------------------------------------|
| 6 | 32 | 32 | |
| 5 | 16 | 48 | |
| 4 | 8 | 56 | Turn ON 4,5 and 6 all others |

OFF

Card Address 139

| Turn ON | Switch | | |
|----------------------|--------------|-------------------|--------------------------------|
| <u>Switch Number</u> | <u>Value</u> | <u>Card Value</u> | |
| 8 | 128 | 128 | |
| 4 | 8 | 136 | |
| 2 | 2 | 138 | |
| 1 | 1 | 139 | Turn ON 1,2,4 and 8 all |

others OFF