

CATH-TECH

CP Survey Instruments

Operation Manual for CI-200TS

Touchscreen GPS Synchronized Current Interrupter



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Limited Warranty

All Cathodic Technology Limited (Cath-Tech) instruments and equipment are warranted against defects in materials, design or workmanship for a period of two years from date of sale. This warranty excludes damage due to misuse, abuse, tampering or acts of God such as fires, floods, wind damage, lightning etc.

We will repair or replace at our option any defective component, after examination in our manufacturing facility, if the fault is due to defective materials or labour, within two years of the purchase date. For warranty repair, a Returned Goods Authorization (RGA) must be obtained from Cathodic Technology Ltd prior to shipping the defective unit pre-paid to our location.

Note: *There is no warranty expressed or implied on batteries.*

Cath-Tech Policy

- Cath-Tech extends a two-year in use warranty on all units, which have been designed and/or manufactured by Cath-Tech staff.
- Cath-Tech reserves the right to make any changes in design or specification which it deems an improvement, with no liability to make the same changes on existing equipment.
- This warranty is in lieu of all other warranties or guaranties, expressed or implied, which might otherwise exist. The purchaser is relying only upon this guarantee and not upon any representations not herein expressed.

Any material or equipment being returned to the factory must first have a Returned Goods Authorization (RGA) from Cath-Tech.

Safety

Do not operate the CI-200TS GPS synchronized current interrupter during electrical storms. Damage to both the CI-200TS GPS synchronized current interrupter and the rectifier could occur.

The installation of the CI-200TS GPS synchronized current interrupter requires electrical connections in the rectifier. Only personnel who are trained in electrical safety should undertake this.

The CI-200TS can interrupt DC or AC current. Please observe safety precautions when installing the interrupter. Turn the AC supply to the rectifier OFF and verify with a volt meter before making any connections to the rectifier.

Welcome

Thank you for selecting the CI-200TS GPS synchronized current interrupter. Cath-Tech is the world leader in electronic equipment for corrosion control.

The CI-200TS GPS synchronized current interrupter is equipped with a GPS engine to ensure accurate synchronization with other interrupters no matter how far apart.

Your CI-200TS GPS synchronized current interrupter is a precision instrument. It is designed to interrupt the current flow from your cathodic protection rectifier or sacrificial anode system on a cyclic basis.

Open and inspect your CI-200TS GPS synchronized current interrupter on receipt. If any damage occurred during shipping, take photos of the box and unit, file a claim with the carrier, and notify us immediately.

Rating Info

The CI-200TS is rated for a maximum of 200 Amps. As the voltage increases, the maximum amperage decreases as per the table below:

AC Voltage	Max Amps	DC Voltage	Max Amps
240 V AC	200 Amp	48 V DC	200 Amp
480 V AC	160 Amp	125 V DC	100 Amp
600 V AC	140 Amp	250 V DC	60 Amp

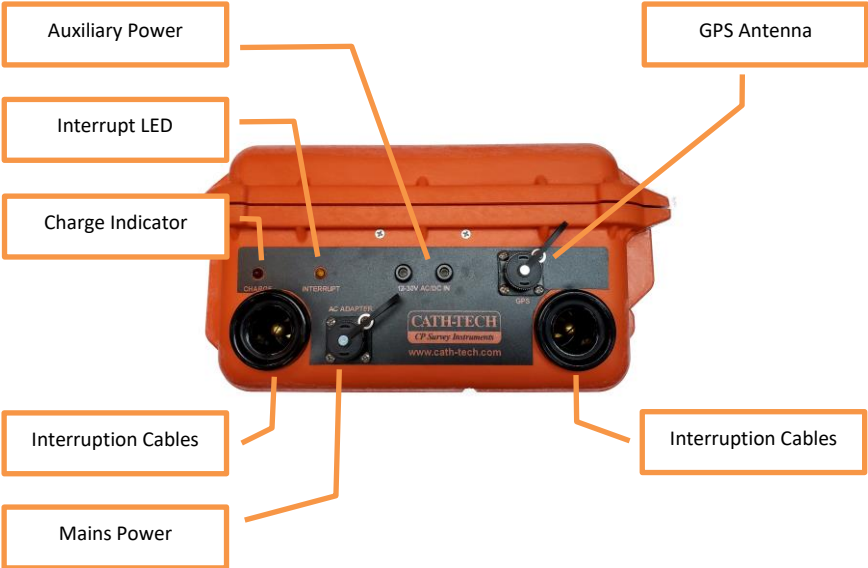
It is important to connect the current interrupter into the circuit properly; failure to do so may result in damage to the unit. See page 17 for details.

Electrical Input

The CI-200TS can be powered 3 ways:

- Internal rechargeable 9-cell Lithium Ion battery.
- Mains AC: 110-240V AC, 50 or 60 Hz through supplied adapter
- Auxiliary power: 12-30 volts, DC or AC. i.e. car battery or rectifier taps. If more than 30V is input, then the auxiliary power input will temporarily cease until the voltage drops back to the operation range.

Features



Charging

The unit will operate while the battery is charging. Charge your battery as required. During unit operation, the status of the battery will be displayed in the upper right corner of the screen.

For optimum battery life, charge the unit every 4 months. Cath-Tech does not provide any warranty on batteries.

Getting Started

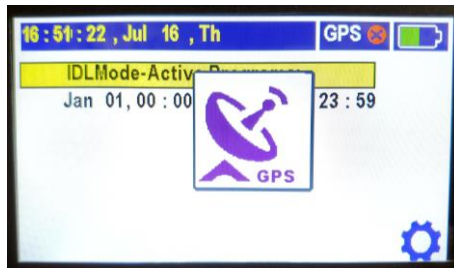
Prior to tuning on the unit, plug in the GPS antenna. The unit requires GPS for time synchronization. To turn the unit on, press the power toggle to the ON position. As the unit activates, the following message will appear on the screen:



The unit will perform a quick self-check, then the operation screen will be displayed.





Operation Screen

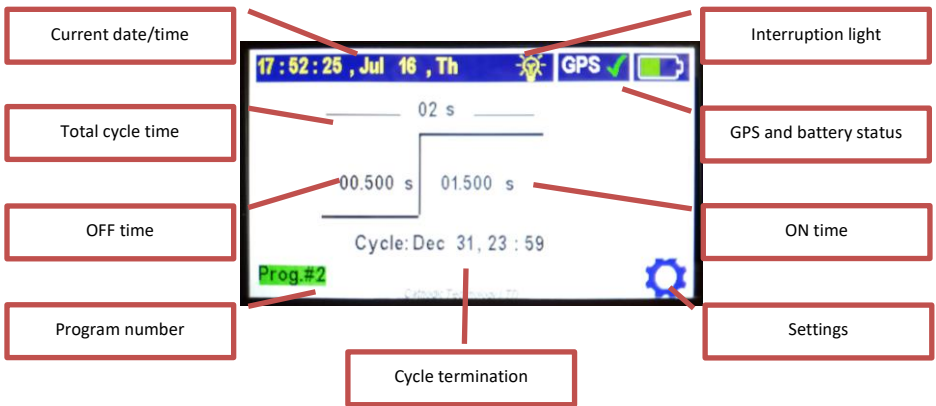
Before entering operation, the unit will pause for GPS synchronization. This may take a few seconds to a few minutes:



Upon successful GPS synchronization, the unit will go into operation and run whatever active programs it currently has stored. The amber INTERRUPT LED on the outside of the case will also begin to blink in time with the interruption cycle.

In the operation screen the following information will be displayed:

- **Current date and time**
- **Output state:** a yellow or gray light bulb indicates that the unit is interrupting
- **GPS state:** If device receives a GPS lock, a green check mark will be displayed  otherwise a red cross  will appear.
- **Cycle information:** the cycle parameters for running the program are displayed.
- **Program number:** indicates which program is currently active (a maximum five programs are allowed)
- **Settings icon:** Allows the user to enter the settings screen
- **Battery status:** Shows the battery charge, changes to a lightning bolt when plugged in to external power.  

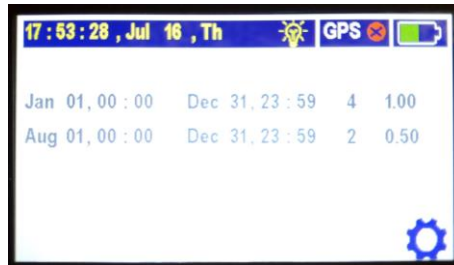


If the unit loses GPS lock, it will run off the internal clock until GPS is reacquired.

Once the unit is interrupting, the screen will turn off after a period of no user input. At any time, the user can tap the screen to wake it up again.

No Active Program

If there are no active programs in operation mode at the current time, the unit will list all existing program information:

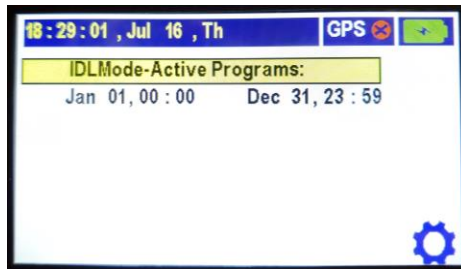


Dormant programs will be displayed in grey and active programs in green.

For each program the following information will be shown:

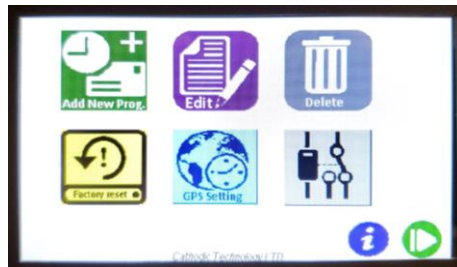
- Start date (month and day)
- Start time (hour and minute)
- End date (month and day)
- End time (hour and minute)
- Cycle time (the total time of interruption cycle including the OFF and ON time in seconds)
- Off time (in seconds)

If there is at least one active program but it is not interrupting at the moment (i.e. it has stopped interrupting for the night, as programmed), the unit will display “**IDLMode-Active Programs**” title followed by the list of active program(s).











Settings

Once the user selects the Settings gear icon, the following screen appears:



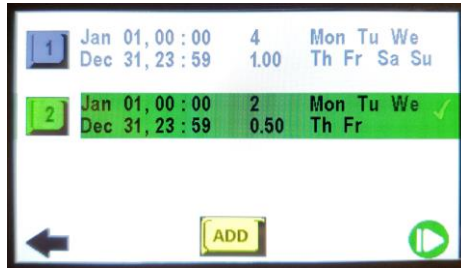
The options on the Settings menu are as follows:

	<p>Add New Program - This allows the user to define new program(s), activate or deactivate program(s).</p>	
	<p>Edit Existing Program - The user can edit existing programs</p>	
	<p>Delete Existing Program - This allows the user to delete existing program(s)</p>	
	<p>Factory Reset - This option will restore settings to the original manufacturer settings and all settings and data added by the user are removed. The original manufacturer settings are as described below:</p>	
	<p>Number of programs:</p>	<p>1</p>
	<p>Start date and time:</p>	<p>January 01, 00:00</p>
	<p>End date and time:</p>	<p>December 31, 23:59</p>
	<p>Working day:</p>	<p>Monday to Sunday</p>
	<p>Cycle time:</p>	<p>4 seconds</p>
	<p>Off cycle:</p>	<p>1 second</p>
	<p>On cycle:</p>	<p>3 seconds</p>
	<p>On/Off First:</p>	<p>Off first</p>
<p>Hold relay state:</p>	<p>ON</p>	
	<p>GPS Offset - Since GPS time is in Coordinated Universal Time (UTC), this option allows the user to add or subtract an offset to the UTC time to adjust the unit's date and time according to the local time zone.</p>	
	<p>Relay Setting – Choose to hold the cathodic protection ON or OFF when not interrupting. Typical operation holds the CP ON.</p>	
	<p>Unit Information - This option will inform the user about the unit Serial Number, the version of firmware currently installed, hardware version and GPS mode.</p>	
	<p>Return to Operations - The unit returns to the Operation screen.</p>	

Add new program



This screen will display all existing programs and their activity state. It lists the program parameters and allows the user to enter a new program.



In the above screen, there are two different programs and only one of them has been activated. The program number in green specifies activated programs whereas a grey button indicates that the corresponding program is dormant.

Note: If there are more than three programs in the unit, a forward arrow icon will appear and by tapping this icon the user can move on to the next page and see the other programs listed (a maximum five programs are definable)

In order to define a program(s) and operate according to defined program(s), the following steps must be done:

1. Define program
2. Activate defined program (page 13)

Define New Program

In order to define a new program, the user taps the **ADD** button and enter the desired program information. The following information must be inserted for each program:

- Cycle Information including Total Cycle time, OFF time, ON time, on/off First
- Start date and time of operation
- End date and time of operation
- Which days during week program runs

Navigation

At any time, the user can tap the Back arrow to exit program creation. The user can also tap the Operations icon to begin interrupting immediately. Once the icon is tapped, the following message will appear:

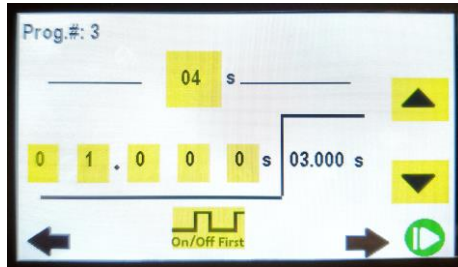


If the user selects **YES**, adding a new program will be canceled and all newly inserted data is removed. The user can tap **NO** to return and continue adding a new program.

Once the user has completed entering information on the current screen, tap the forward arrow to continue the process.

Cycle Information

Any parameter the user has tapped to change will be highlighted in blue. The cycle information is entered on the first screen:

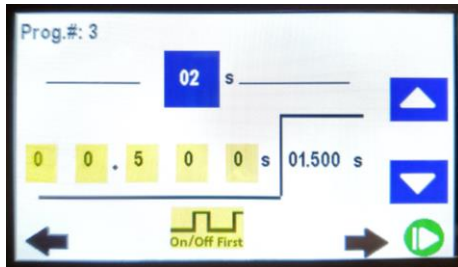


In this screen, the user must define the "Total cycle time", select "On/Off First" and define "OFF time". The "ON time" will be calculated according to the selected cycle time and OFF time.

Cycle Time

To set the total cycle time, tap on the total cycle time to select it, then the user can use the vertical arrows to scroll through the predefined cycle times and select the desired one.

The available cycles are: 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60 seconds.



OFF Time:

After selecting the total cycle, the length of the OFF time must be defined. The OFF time is defined in milliseconds. The user can define the desired OFF time by tapping each digit separately and using

the vertical scroll buttons. Whenever the OFF time is changed, the ON time is automatically calculated.

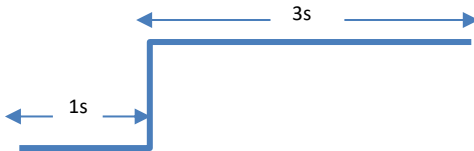
In the above picture, to change the OFF time to 200ms, the user should tap the third digit and scroll down to 2.

Note: Minimum value for OFF time is 100ms.

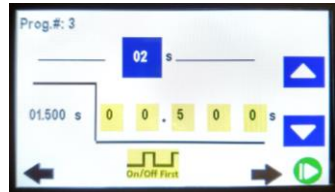
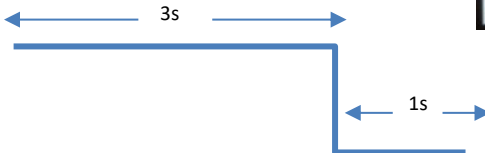
On/Off First:

The user can choose to have the interrupter start the cycle with the CP ON or OFF. This can be changed by tapping the **ON/OFF First** button, located at the screen bottom between the arrows.

For example, assume that OFF time is 1 second and ON time is 3 seconds, the user can select that once the operation is started, first turn rectifier 1 second off and then turn it on for 3 seconds:



Or, first turn rectifier 3 seconds on and then turn it off for 1 second:

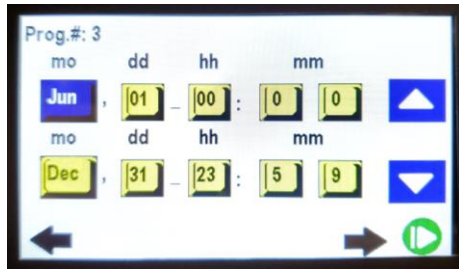


Once the user has finished with this screen, tap the forward arrow to save the program.

Time and Date:

The starting date and time of the program can be entered in the first row. The user can select the desired parameter and using the scroll up and down keys, select the desired value.

The second row represents the end of the cycle.



If you want the interrupter to run whenever it is turned on, set it to run Jan 1 – 00:00 to Dec 31 – 23:59.

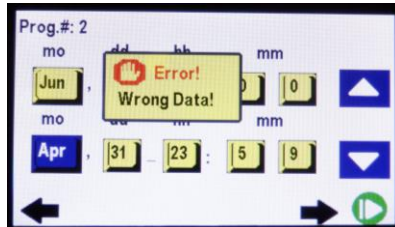
Weekdays:

Finally, the user can select the days of the week the program runs. In the example below, the interrupter will run its program on Monday to Friday and not Saturday or Sunday.



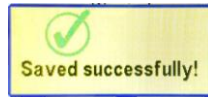
Finished program entry

Tap the forward arrow once you are satisfied to move on and save the entered program. The unit validates entered start/end date and time related information. If the entered data has a problem, for example start date is after the end date, an error message will be shown:



Once the user touches the screen, start/ end date and time page will appear and the user can enter and correct the start/end date and time information.

If all the entered data is correct, the program will be saved, and the following message appears for a short time:

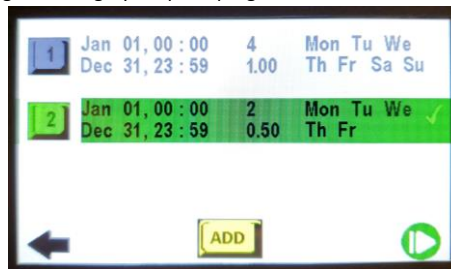


Then the unit will return to the **Add new program** screen. In the **Add new program** page, the new program will be added to the existing programs list.

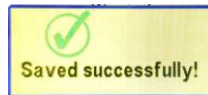
Please note, in this stage, the program is only defined. To complete the operation and add the new defined program to the activated program list and run, the user must activate the new program.

Program activation

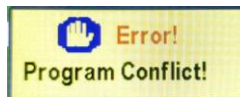
To activate a program, the user must tap the desired program index button from the existing program list in the **Add new program** screen and then tap forward arrow. Active programs are green and dormant programs are grey. Tap the program number to activate or deactivate.



If there are no conflicts between defined programs in terms of Start and End time, the selected program/programs will be activated, and the following message will appear:



If there is a conflict between the selected program and other active programs, an error message will be displayed and the user must resolve the conflict by entering the Edit screen from the setup



page and edit existing program/programs (page 14). Unless the conflict is removed, the user cannot activate that program.

Program deactivation:

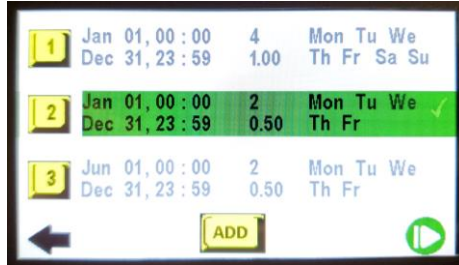
When the user wants to deactivate an activated program, the corresponding program index must be toggled (index button will turn grey). Tap the forward arrow to save and return to the settings screen.



Edit existing program

Using this option, the user can edit existing program information. Once the user selects the Edit icon in the setup page, all existing programs are listed and the user is able to select each program and make the desired changes.

On each screen a maximum of three programs can be displayed. If there are more, the forward arrow appears. The next page includes the rest of the programs. Green check mark in the right corner appears only for activated program, dormant programs are grey.



In order to edit a program, the user taps the corresponding program number button. Once the program is selected, the program information starting with Cycle Information, will be displayed.

In order to define a new program, the user taps the **ADD** button and enter the desired program information.

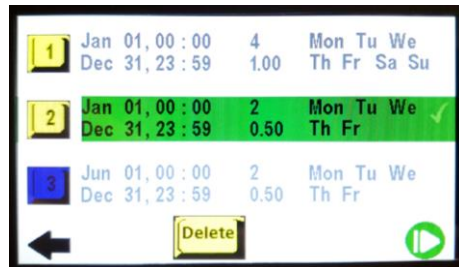
Once all programs are edited, the user must go back to the settings screen, then **Add Program** to activate the program(s) of their choice. See page 13 for details.



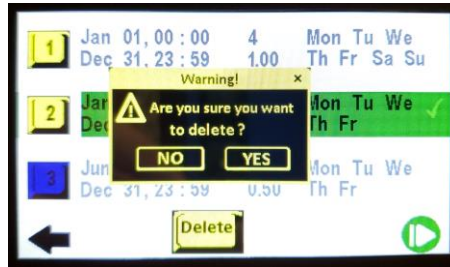
Delete existing program

This option allows the user to delete one or multiple existing program(s). Once the user selects the Delete icon in the settings page, all existing programs are listed.

In order to delete a program, tap the program number, then tap **Delete**. For example, program #3 has been selected to be deleted:



A warning message will be displayed once the **Delete** button is pressed:



Once the user selects the **YES** button, program(s) will be deleted:

Note: If the user deletes all existing programs, a factory default program with the following settings will be restored:

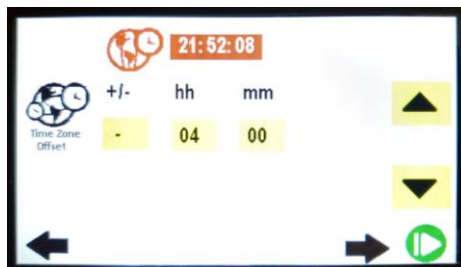
- Runs 24 hours per day, 7 days per week
- 4 second cycle, 1 second OFF, start with OFF



GPS offset setting

Since GPS time is in Coordinated Universal Time (UTC) or GMT, this option allows the user to add or subtract an offset to the UTC/GMT time to adjust the unit's date and time according to the local time zone. When the **GPS Setting** button is pressed, the unit starts searching GPS to receive the current UTC time.

If there is a valid GPS signal, after a short time the following page will appear:



The user will see the current UTC time at the first row (if there is a valid GPS signal) and in the next row there are options to determine the offset to add to or subtract from the UTC time to adjust the unit's date and time according to the local time zone.

"-" sign in the first button indicates that the offset is supposed to be subtracted from the UTC time and "+" sign indicates that the local time is ahead of UTC time. As the user taps this button, it will be toggled from "-" to "+" and vice versa.

Using two buttons which have been labeled as "hh" and "mm" and up and down arrows, the user is able to insert the proper offset in hour and minutes.

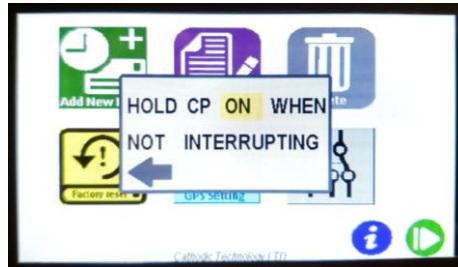
The up and down arrows will only be activated if the user taps either "hh" or "mm" buttons.

To save changes, the user must tap the **Forward** button. The inserted data will be saved and following message will be shown:



Relay Setting

This allows the user to define if the rectifier output is held either ON or OFF when the program is not interrupting the rectifier. The following page will be shown:



To toggle the relay hold status during idle time, tap the yellow button.

Common practice is to hold the Cathodic Protection (CP) on when interruption is not needed. This maintains the protection on the pipe or structure. If additional CP is required for a special survey (i.e. DCVG) then it may be desired to hold the additional CP off when not surveying.

Connection

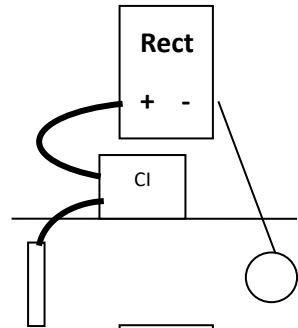
The CI-200TS are polarity independent, that is they can interrupt current flowing in both directions. The CI may be installed in series wherever the user wishes to interrupt CP current without worrying about the direction of current flow, or getting the leads reversed.

Before connecting the CI-200TS to the rectifier, turn the CI-200TS ON and program the CI-200TS. Always turn the rectifier OFF and check with a meter before performing any work inside the rectifier case. Follow your company procedures for rectifier access.

Alligator clips are not provided for the CI-200TS. Field testing has found that a direct lug connection at higher amperages is more secure and less likely to overheat.

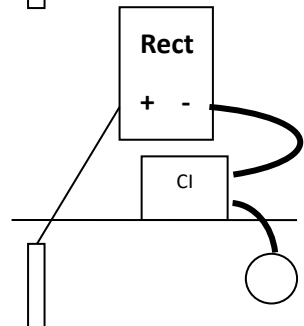
Rectifier Anode Circuit:

To connect to the anode or positive side of a rectifier, first turn OFF the rectifier. Then connect the CI-200TS in series between the + terminal of the rectifier and the anode lead. Turn the rectifier on and verify interruption by observing the rectifier gauges or with a handheld voltmeter.



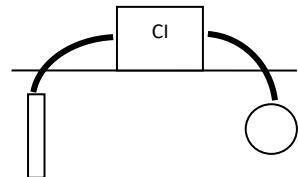
Rectifier Pipe or Structure Circuit:

To connect to the structure or negative side of a rectifier, first turn OFF the rectifier. Then connect the CI-200TS in series between the - terminal of the rectifier and the structure lead. Turn the rectifier on and verify interruption by observing the rectifier gauges or with a handheld voltmeter.



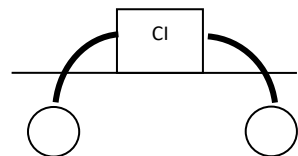
Sacrificial Anode Bed

To connect to a sacrificial anode bed, disconnect the anode bed from the structure at the test point. Connect the interrupter in series between the structure the sacrificial anode bed. Verify interruption with a handheld voltmeter.



Bonds Between Pipelines

To interrupt a bond, install the interrupter in series into the bond connection. Verify interruption with a handheld voltmeter.



Physical Orientation

To properly interrupt, the CI-200TS must be standing on its end with the carry handle at the top. It will not interrupt properly in any other position.

Using the Auxiliary Power

The unit can be powered by an external DC or AC source with a voltage range from 12 to 30 volts. This is done through the two banana jacks on the side.



DC Power

This could be a battery bank of some sort. A lead acid car battery is commonly used. Output from a solar panel could also work, provided the voltage is at least 12 V DC.

AC Power

The unit can be powered from the taps on the rectifier if they are available for connection. Use a DVM to determine which taps provide the correct voltage for the current interrupter. Depending on the rectifier transformer this may be the coarse or fine taps.

Shut the rectifier down and follow any relevant safety procedures before attempting to connect directly to the rectifier. Plug two leads into the banana jacks on the current interrupter. Attach the other ends to the taps identified by the DVM. Turn the rectifier on and re-confirm the voltage being provided to the auxiliary power input. The voltage will change as the rectifier is interrupted. Ideally, the taps chosen will maintain a voltage between 11V and 30V throughout the interruption cycle. Anytime they are out of this range, the interrupter is relying on the internal battery.

GPS (Global Positioning System)

The GPS antenna is equipped with a magnet base to allow the antenna to be placed on top of the rectifier. The GPS antenna must be placed in a location where it has a clear view of the sky. GPS Antenna extension cables are available from Cathodic Technology Limited in 30 metre lengths. In some situations, the GPS antenna can acquire a signal when indoors, we recommend placing the antenna near a window to improve the chances of signal acquisition.

If the CI-200TS has been moved more than 50 Km. it may take a few minutes for the GPS engine to re-establish its almanac and obtain a lock on the Global Positioning Satellites. When the GPS engine has acquired the minimum number of satellites and it has calculated its position the date and time will be shown on the screen and the unit will enter Operation mode.

Operating without GPS

The unit requires a GPS lock to acquire information about the current time and date. Once that lock is established, the user may unplug the GPS antenna or move the unit indoors and it will continue to interrupt based on the time from its internal clock. For long-term accuracy, maintaining a GPS signal is highly recommended.

Maintenance

There are no user serviceable parts on the CI-200TS. It is good practice to store the CI-200TS in a cool, dry place when not in use. For best battery life, the battery should be fully charged once every 4 months.

If the unit does not turn on:

- Ensure the battery is charged. Use a volt meter to check the voltage across the 12 V external power plugs, it should read above 9V.

If the unit does not interrupt:

- Check the program, it may not be programmed to interrupt that day.
- Check the Interrupt LED on the outside, it turns off and on with the cycle

For other problems, please contact Cathodic Technology at ++1-905-857-1050 or ctl@cath-tech.com .

Environmental Protection

Waste electrical products should not be disposed of with household waste. Please recycle where facilities exist. Check with your local authority or retailer for recycling advice.



