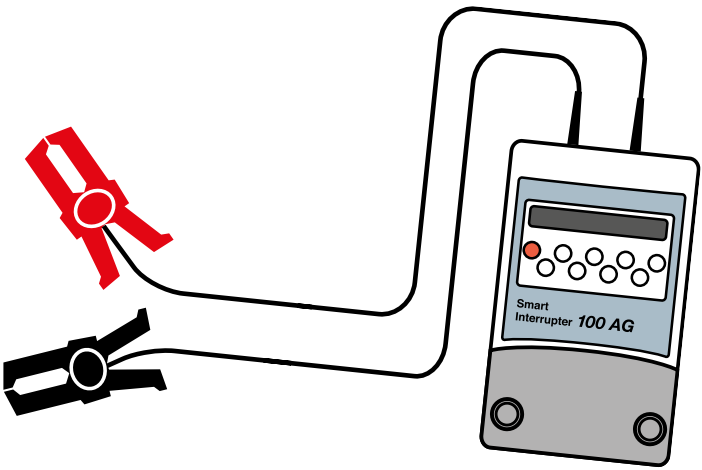
RADIODETECTION

Smart Interrupter

USER GUIDE 90/NUG046/04



The Smart Interrupter provides a means of placing a characteristic signature on pipes by interrupting the flow of cathodic protection (CP) current.

The Smart Interrupter is specifically designed for use with the Radiodetection Stray Current Mapper (SCM) and Pipeline Current Mapper (PCM+) but can also be used as a stand-alone interrupter.

SPX

The Smart Interrupter is a solid state interrupter, designed for use by the trained corrosion technician on cathodic protection systems in outdoor locations. For safe operation of the equipment please ensure you read, understand and follow the instructions in this guide.

User Controls

Power On/Off

Selects Stray Current Mapper (SCM).

Changes a field, adjusts a time or changes a selection and selects individual SCM signals.

Stops and starts the Smart Interrupter running.

Selects pulse mode. You can define on and off pulsing periods – for example, On period 3 seconds, Off period 8 seconds. Assists in signal identification when using more than one Smart Interrupter at the same time.

With the timer function (GPS version only) you can activate and de-activate the Smart Interrupter at defined times of the day – for example, activate at 7 a.m., and de-activate at 5 p.m., every day until you disconnect the Smart Interrupter or you change the timings.

Explanation of symbols used

Confirms all selections.

Enables LCD contrast control.

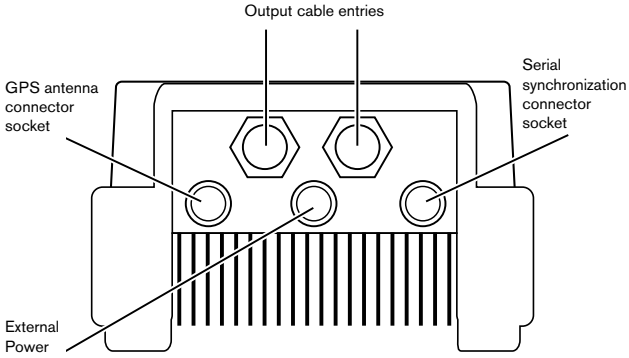
Caution symbol / Read manual

Double insulation symbol

CE mark

WEEE symbol

External connections



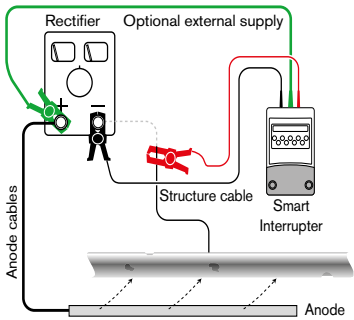
Connecting the Smart Interrupter

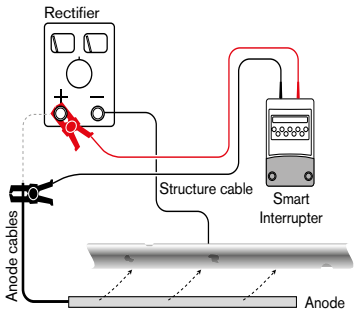
⚠ Always switch off the CP system before connecting and disconnecting the Smart Interrupter.

⚠ Before connecting the Smart Interrupter to the CP supply, measure the maximum CP voltage. Ensure that this voltage is below the Smart Interrupter's peak limit before connecting it.

Peak voltages:
DC 100VDC
AC 70VAC (average or RMS).

Connection to CP voltages in excess of these limits may cause damage to the Smart Interrupter.





When connecting the Smart Interrupter to either the anode cable or to the structure cable ensure that the red clip is connected to the most positive connection point and the black clip to the most negative connection point. If the Smart Interrupter is connected the wrong way round it will indicate incorrect connection with a warning tone.

⚠ The Smart Interrupter must only be used by suitably trained personnel.

⚠ When connecting the external supply lead, always connect it to the anode wire before plugging it into the Smart Interrupter.

⚠ **When disconnecting the external supply lead, always remove it from the Smart Interrupter before disconnecting it from the anode wire.**

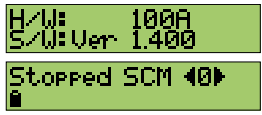
⚠ **To prevent unauthorized access keep the Smart Interrupter secure if it is left unattended when in use.**

Operating the Smart Interrupter (non-GPS version)

Note: Operating procedures are the same for both the 50 amp and 100 amp versions.

Press the Power On/Off button.

The first screen is displayed for approximately 2 seconds, after which time the second screen is displayed. This screen displays the mode that the Smart Interrupter was in when it was last switched off.



SCM

If the screen shows anything other than “Running SCM” or “Stopped SCM” press the SCM button to return to the SCM screen. The following screen is displayed.

Modes

The capability of the Smart Interrupter to generate any one of 4 unique SCM output signals is a particularly helpful feature if you are using the SCM with more than one Smart Interrupter at the same time.

SCM Mode

The 4 selectable SCM output signals are numbered 0-3.

◀ ▶

Press the right or left arrow button to cycle through the output signals until the desired signal number is displayed. If using several Smart Interrupters ensure they have different signal output numbers.

The ‘Running SCM’ screen is displayed.

PPL Mode

Do not use this mode.

Pulse Mode

In pulse mode the Smart Interrupter puts a simple on/off pulse onto the line and assists in signal identification when using more than one Smart Interrupter at the same time. If using more than one Smart Interrupter make the pulse On/Off times different for each unit.

Press the pulse mode button to select pulse mode. The following screen is displayed with the On time highlighted. Press the OK button to toggle between On time and Off time.

To set the 'On' time, press the left/right buttons until the desired time is displayed and press OK. The Off time is now highlighted.

To set the 'Off' time, press the left/right buttons until the desired time is displayed.

Note: From 0 to 10 seconds the time increases in steps of 0.1 seconds. From 10 to 100 seconds the time increases in steps of 1 second. Times can be changed with the Smart Interrupter running or stopped.

Once you have set the On and Off times press the Run/Stop button to start the Smart Interrupter running and apply the signal to the pipe.

Pulse Switching Inversion

It is possible to invert the switching order of the pulse mode patterns (this feature only works in pulse mode). This is useful for dataloggers that require the CP potentials to be in a specific order. The normal mode of operation is to switch the CP On, then Off.

To make the unit switch the voltage Off and then On: Press and hold the Pulse Key, press the OK key and then release both keys. The display will toggle the On and Off times as shown below. To revert to the previous switching mode, repeat the key press sequence. The order of switching (On-Off or Off-On) is stored with the pulse pattern and will be recalled if using the previous mode recall feature.

Previous Settings

To retrieve any one of the last ten settings in pulse mode, press and hold down the pulse button and at the same time press either the left or right arrow button. The screen will cycle through the last ten settings, showing the number of each setting (1 is the most recent). When you have selected a setting, release the pulse button and press the OK button. The pulse mode screen is displayed with the selected settings.

Timer Mode

It is not possible to activate the timer unless you are using the GPS version.

If you press the timer button on a non-GPS unit, nothing will happen and the button press will be ignored.

Contrast Screen

Press the contrast button to adjust the screen contrast. The Contrast screen is displayed.

Press the left/right arrow buttons to adjust the contrast to the desired level. Contrast settings are from 1 (lightest) to 20 (darkest). The setting 'wraps' round from 1 to 20. To select the desired setting, press OK or leave the buttons untouched for 5 seconds.

Over Temperature Warning

If the Smart Interrupter overheats and operates the thermal cut-out, the Over Temperature warning screen is displayed. The Smart Interrupter keeps displaying this screen and all buttons, except the power- off button, are disabled until the thermal cut-out resets. Once the cut-out has reset the Smart Interrupter resumes normal operation in stopped mode.

Thermal Fuse

A thermal fuse is incorporated into the design to protect against thermal runaway under fault conditions.

This fuse is not a user replaceable part. If it operates then the complete smart interrupter must be returned to an authorised service centre for repair.

Master-Slave Synchronization using the synchronization lead

Note: This method is not recommended when using the Smart Interrupter with the SCM.

When using several Smart Interrupters at the same time they must be time synchronized with each other to ensure signal compatibility. Use this method to synchronize non-GPS units or a GPS unit and non-GPS unit.

Each Smart Interrupter is supplied with a synchronization cable labelled “Master” at one end.

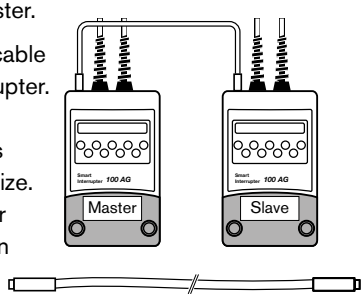
Synchronization symbols are:


Master (serial synchronization)


Slave (serial synchronization)

To synchronize two Smart Interrupters, using the synchronization lead, proceed as follows:

- Switch on the two Smart Interrupters and ensure they are in the same mode and are both set to ‘Running’. They will not synchronize if in different modes.
- Plug the synchronization cable “Master” end into the serial synchronization cable socket on one of the units. This unit becomes the Master.
- Plug the other end of the cable into the other Smart Interrupter. This becomes the Slave. The two Smart Interrupters will automatically synchronize. The slave Smart Interrupter will emit a short beep when a time mark is received.



If there is a mismatch between master and slave patterns the slave will emit a continuous tone until the mismatch is corrected. When synchronization is complete the following screen will be displayed.

To synchronize another slave unit remove the slave end of the cable from the slave unit and fit it into the next slave unit. Repeat the synchronization procedure until all slave units have been synchronized with the master. The master and slave units will remain synchronized for a minimum of 24 hours or until a unit is switched off or you change its settings. When a Smart Interrupter is a slave synchronized unit, an ‘s’ is displayed on the screen. When the synchronization cable is removed from a

master synchronized Unit, an ‘m’ is displayed on the screen.

If you attempt to change a setting that would make the master/slave patterns incompatible, the Smart Interrupter emits a 2-second tone and the following screen is displayed.

Pressing the OK button will allow the settings to be changed but with no further warnings being displayed, and synchronization may be lost. The unit will remain synchronized if any other button is pressed or 5 seconds have elapsed.

If you attempt to switch off a Smart Interrupter that has been synchronized with a serial lead the following screen is displayed accompanied by a warning beep. If you select Yes and press OK the unit will switch off. If you select No and press OK the unit remains switched on and synchronized.

If synchronizing a non-GPS version and a GPS version use the synchronization cable method to synchronize units. Using the GPS antenna to synchronize a GPS Smart Interrupter overrides cable synchronization.

Operating the Smart Interrupter (GPS version)

Note: Use this method when using the Smart Interrupter with the SCM.

The GPS Smart Interrupter can be individually synchronized. The unit will synchronize and stay in synchronization as long as the antenna is plugged in to the GPS antenna socket on the Smart Interrupter, has a clear view of the sky, and is receiving a GPS signal. Synchronization is automatically updated every 30 minutes.

Note: If the unit has not been used for some time (over 4 weeks) it may take several minutes for the Smart Interrupter to obtain a GPS signal. This is normal and does not require any user action.

GPS operation symbols are:


GPS standby-GPS asleep (no action required)


GPS searching


Timer active

Antenna

Fault (flashing symbol)-replace antenna

Position (steady symbol)-move Smart Interrupter to a better GPS reception area

Signal level

Minimum signal strength / Maximum signal strength

Synchronization being determined

Synchronization to GPS OK last time

No synchronization to GPS last time (“free running”)

Timer Mode

Note: The Smart Interrupter clock is automatically adjusted every time a GPS signal is received. The clock automatically adjusts to local time.

You can instruct a GPS Smart Interrupter to activate at a certain time and de-activate at another.

Press the timer button. The Use Timer screen is displayed.

Press the left/right arrow buttons to select either Yes or No. If you select No the unit reverts to the main screen and the timer will not operate. If you select Yes the timer screen is displayed.

If there is no GPS signal or the GPS antenna is not connected, the timer cannot be enabled and the following screen is displayed.

Press OK to return to the previous screen without setting the timer.

Setting the timer

Press the timer button and use the left/right arrows to select Yes. The following screen is displayed:

Press the left/right buttons to change the set time. Press OK to toggle from start time to stop time. Once the start/stop times have been set press OK to display the Local Time Now screen.

Press the left/right arrows to adjust the current time in steps of 1 hour (this allows for adjustment due to daylight saving, for example). Press OK. The screen reverts to the previous mode with the addition of the flashing timer symbol. The run/stop button is disabled as the timer now has control.

When the start time is reached the screen shows the unit running as normal. When the stop time is reached the display shows stopped.

Smart Interrupter Functional Check

To check the switching function:

Switch off the Smart Interrupter and disconnect it from the CP supply.

Connect a DMM set to measure the resistance between the output leads, meter +ve to the Red lead and meter -ve to the Black lead (if connected backwards the Smart Interrupter will emit a warning tone and the resistance readings will be erroneous).

With the unit off, the resistance measured should be greater than 100kΩ. Switch the Smart Interrupter On and set it to Stopped.

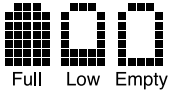
The resistance measured should now be very much less than 10Ω.

Switch the Smart Interrupter Off and disconnect the meter.

Note: If the unit is set to Running, the resistance value will fluctuate between these readings as the switch turns On and Off. If either resistance measurement is outside the limits stated above, the unit should be returned to Radiodetection for service.

Smart Interrupter Maintenance

The Smart Interrupter is powered by 2 x LR20 (D-cell) batteries.

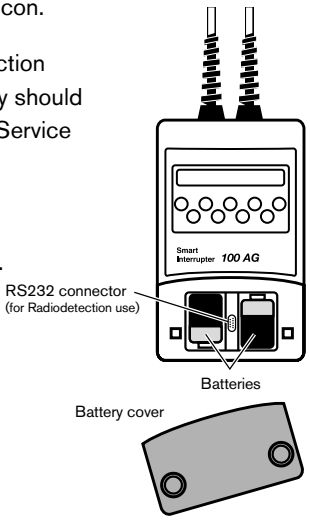


Battery level indication.

When the battery level is full the battery symbol remains black. When the battery level becomes low the battery icon shows a single bar. When there is no bar replace the batteries. The battery compartment can be accessed by removing the battery cover, as shown in the diagram.

External power operating. When using the external power supply the battery level indicator is replaced by the external power icon.

If the Smart Interrupter connection cables become damaged, they should be returned to an Authorised Service Center for replacement.



Cleaning

Wipe down with a moist cloth.

Maintenance

There are no user serviceable parts within the equipment.

Specifications

This equipment is intended to be connected to a secondary source isolated from CATII 300Vrms mains by reinforced insulation	
CP Current Output:	**Model 50AG 50A/100V peak (Continuous)** **Model 100AG 100A/100V peak (Continuous)**
Frequency (of CP system being switched):	**DC to 60Hz**
Connection Outputs:	**CP supply** **CP switched** **External Power**
Switching Patterns:	**On/Off Time 0-100s** **0.1 sec increments up to 10 secs**
Synchronisation:	**Master Slave 100ms in 12 hour period** **GPS (option) +/- 4ms**
Batteries:	**2 x 1.5V D cells** **300 hours @ 20°C**
CP Power:	**Will run from CP supply if above 5V**
Environmental:	**IP56**
Temperature:	**14°F (-20°C) to140°F (60°C)**
Humidity:	**80% up to 31°C decreasing to 50% at 40°C**
Altitude:	**Up to 2000m**
Dimensions:	**12" (300mm) x 6" (150mm) x 3" (80mm)**
Weight:	**2.5kg (5.5lb)**
Compliance:	**2004/108/EC, 1999/5/EC (GPS Option), 2006/95/EC, FCC CFR Part 15**

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