



Portable Interrupter 1 (Pi-1)

Configuration and Operation Guide

PI1-MAN-001, 1.07

Print Date
March 20, 2024

PI-1



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CURRENT REVISION APPROVALS (Revision 1.07)

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REVISION HISTORY

REV	START DATE	APPROVAL DATE	DESCRIPTION	PREPARED BY
Draft 0.01	June 28, 2021		First draft.	Lucas Holzen
1.00	July 12, 2021		Initial release	Tony da Costa
1.01	July 14, 2021		Minor edits	Tony da Costa
1.02	July 19, 2021		Updated the spec section	Lucas Holzen
1.03	January 6, 2022		Minor edits, updated input power spec.	Tony da Costa
1.04	April 14, 2022		Added Pi-1 fixed version.	Anas Alsalahi
1.05	Feb 2, 2023		Update SRL part number	Phil Daum
1.06	Feb 28, 2023		Add interruption timing specifications.	Phil Daum
1.07	Feb 27, 2024		Add output resistance of int OP specs	Phil Daum

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1 Introduction

The Mobiltex Pocket Interrupter One (Pi-1) is a handheld, light weight two channel GPS time synchronized cathodic protection (CP) current interrupter. By itself, the Pi-1 is capable of interrupting two CP current sources of up to 1 Amp and 20 Volts each. All interruption channels provide standard On/Off cycles from 1 second to 30 seconds long. Compatible with Mobiltex's existing Smart Relays (SRL1 & SRL2), a Pi-1 can interrupt up to 100 Amps and 100 Volts. In addition, the Pi-1 can provide a programmable external relay control for most relays on the market today. The Pi-1 is available in two physical configurations, portable and fixed mount.

This document details the configuration and operation of the Pi-1 product.

2 General Safety Information

The following safety precautions must be reviewed to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Only qualified personnel should perform service procedures.

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component's manuals for warnings and cautions related to operating the system.

To Avoid Fire or Personal Injury

- **Connect and Disconnect Properly.** Do not connect or disconnect terminal wiring while the wires are connected to a voltage source.
- **Observe All Terminal Ratings.** To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product. Do not use an input marked with measurement category I for measurements within measurement categories II, III or IV. Do not connect category II inputs directly to mains—a Class 2 CSA/UL transformer must be used for isolation.
- **Do Not Operate Without Covers.** Do not operate this product with covers or panels removed.
- **Avoid Exposed Circuitry.** Do not touch exposed connections and components when power is present.
- **Do Not Operate With Suspected Failures.** If you suspect there is damage to this product, have it inspected by qualified service personnel.

Symbols and Terms

These terms may appear in this **manual**:

TERM	MEANING
WARNING	Warning statements identify conditions or practices that could result in injury or loss of life.
CAUTION	Caution statements identify conditions or practices that could result in damage to this product or other property.

These terms may appear on the **product**:

TERM	MEANING
DANGER	Danger indicates an injury hazard immediately accessible as you read the marking.
WARNING	Warning indicates an injury hazard not immediately accessible as you read the marking.
CAUTION	Caution indicates a hazard to property including the product.

3 Pi-1 Variations

3.1 Pi-1 Portable

The Pi-1 Portable is battery operated and can be installed by placing in a location or simply held by an operator. The battery is rechargeable using the micro-USB port or using external power through the multiport. The portable version has a built-in GPS antenna facing in the same direction as the LCD. GPS needs to be synced with the internal antenna having a clear view of the sky.



Figure 1 Pi-1 Portable Interrupter

3.2 Pi-1 Fixed

Pi-1 Fixed is designed to be permanently mounted inside rectifiers and can be mag-mounted as it has three magnets on the backside of its enclosure (opposite the LCD side). A steel bracket is provided as a mounting accessory. The Pi-1 Fixed is not battery powered and uses external power provided through the multiport. It also uses an external GPS Antenna provided with the basic kit. This allows for mounting the GPS antenna outside the rectifier enclosure. The GPS antenna cable may be extended with an additional RF cable if the additional cable has a loss of less than 20dB at 1575MHz.



Figure 2 Pi-1 Fixed Interrupter

The Pi-1 Fixed is magnetically secured to a steel mounting plate. This mounting plate is attached to a surface by two 1" #10-32 studs with a spacing of 2" (50.8mm).

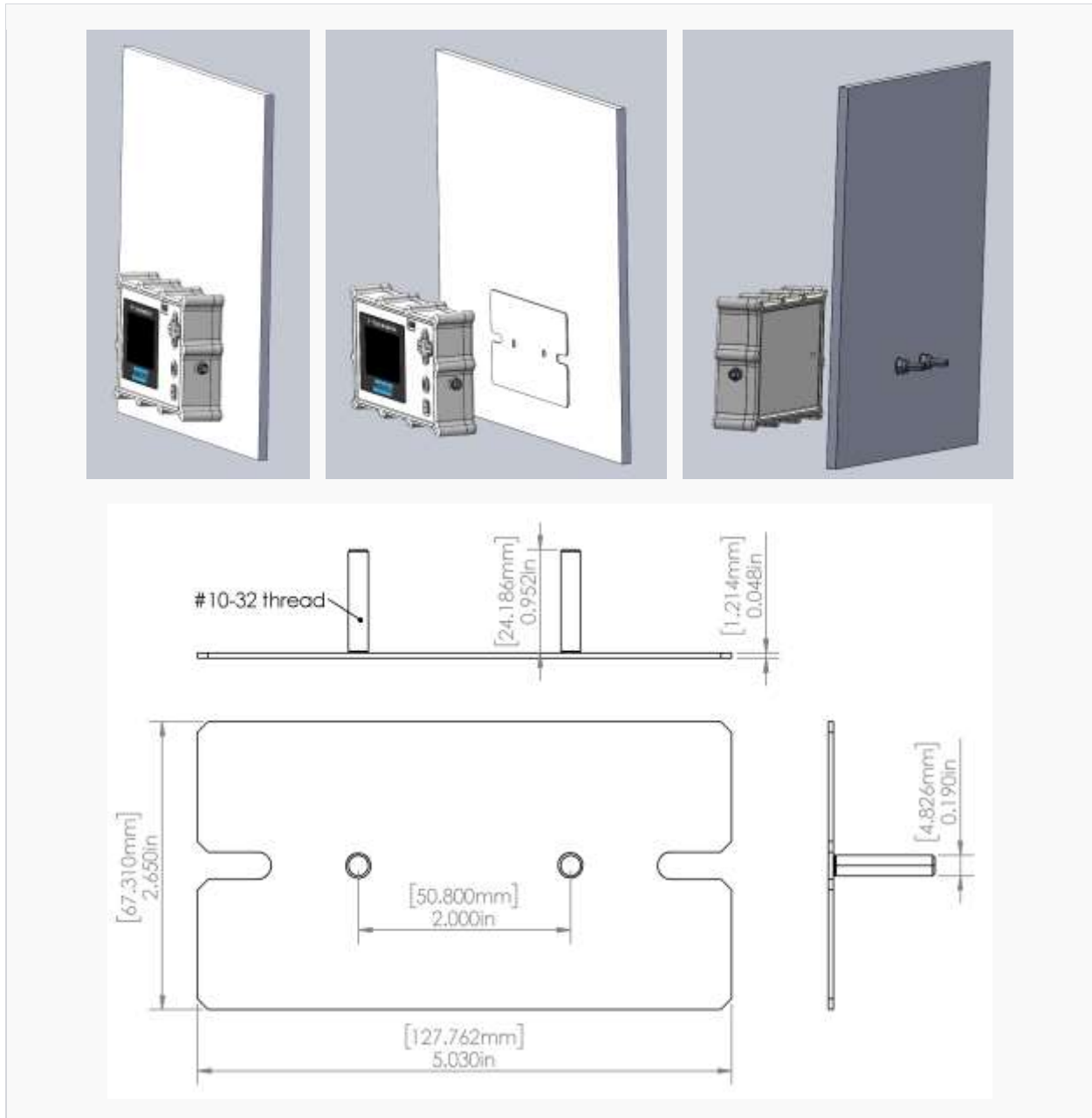


Figure 3 Pi-1 Fixed Mounting

For the fixed variant, and internal battery is not present in the unit. It must be powered from an external power source (typically 12VDC or 12AC). A class 2 transformer may be installed to step down from AC line power to 12VAC—please refer to the accessory list for an appropriate part number.

Cables W16400PI001 and W16400UGI07 must be connected to the Pi-1 circular connector for fixed installations. Four flying wires are present, two for input power (yellow wires, not polarity sensitive) and two for relay coil drive (red+/black-). Connect the yellow wires to the input power source (typically the 12VAC output of a class 2 transformer). The red and black wires are connected to the coil drive terminals on the external relay. Ensure that the Pi-1 is programmed with the appropriate coil drive voltage (6V/12V) and polarity (NC/NO).

4 Pi-1 Kit Contents

4.1 Pi-1 Portable Kit A20A0337201 (Basic Kit)

PICTURE	DESCRIPTION
	1 pc – Pi-1 Portable Interrupter Base unit. Mobiltex P/N A1506037201
	1 pc – USB Charger Mobiltex P/N P11606UDL01
	1 pc – USB A to Micro-B charging cable (1m/3ft) Mobiltex P/N W160DGK003F
	1 pc – Red/Black Banana Jack Male-Male cables (1m/3ft) Red Mobiltex P/N W011031001N Black Mobiltex P/N W011011002N
	1 pc – Small Red/Black Alligator clips Red Mobiltex P/N H27404UDL01 Black Mobiltex P/N H27404UDL02
	1 pc – Medium Red/Black Alligator clips Red Mobiltex P/N H27400112RD Black Mobiltex P/N H27400112BK
	1 pc –Black Soft Case Mobiltex P/N H20712PI101










Table 1 Pi-1 Portable Basic Kit

4.2 Pi-1 Fixed Kit A20A0337202 (Basic Kit)

PICTURE	DESCRIPTION
	1 pc – Pi-1 Fixed Interrupter Base unit. Mobiltex P/N A1506037202
	1 pc – External GPS Antenna Mobiltex P/N E01380TANGO
	2 pc – Stainless Steel Flat Washer #10 Mobiltex P/N H045430010S
	2 pc – Stainless Steel Lock Nut 10-32 Mobiltex P/N H055331032S
	1 pc – Steel Mounting Bracket - White Mobiltex P/N H22121PI1001
	1 pc – Multiport to Mobiltex Smart Relay Cable Mobiltex P/N W16400PI001
	1 pc – External Relay Interface Cable Mobiltex P/N W16400UGI07

Table 2 Pi-1 Fixed Basic Kit

4.3 Pi-1 Optional Installation Items

PICTURE	DESCRIPTION
	<p>1 pc – Multiport to Banana Jacks Provides access to channel 2 internal relay. Mobiltex P/N W16400PI002</p>
	<p>1 pc – Multiport to Mobiltex Smart Relay Cable Mobiltex P/N W16400PI001</p>
	<p>1 pc –External Relay Interface Cable (Requires a Multiport to Mobiltex Smart Relay Cable) Mobiltex P/N W16400UGI07</p>
	<p>1 pc – USB Charger Mobiltex P/N P11606UDL01</p>
	<p>1 pc – USB A to Micro-B charging cable (1m/3ft) Mobiltex P/N W160DGK003F</p>
	<p>1 pc – Red/Black Banana Jack Male-Male cables (1m/3ft) Red Mobiltex P/N W011031001N Black Mobiltex P/N W011011002N</p>
	<p>1 pc – Small Red/Black Alligator clips Red Mobiltex P/N H27404UDL01 Black Mobiltex P/N H27404UDL02</p>
	<p>1 pc – Medium Red/Black Alligator clips Red Mobiltex P/N H27400112RD Black Mobiltex P/N H27400112BK</p>
	<p>1 pc - 3 Meter (10') Relay Extension Cable Mobiltex P/N W16400UGI02</p>

	<p>1 pc – 8 Meter (26') Relay Extension Cable (Do not use with Mercury relays) Mobiltex P/N W16400UGI03</p>
	<p>1 pc – SRL1 AC/DC Smart Relay Mobiltex P/N A1506031502</p>
	<p>1 pc –Medium Heatsink to Increase SRL1 Capacity to 50A Mobiltex P/N X03912B150A</p>
	<p>1 pc – SRL2 DC Smart Relay Kit (100VDC/100ADC Max) Includes SRL2 Relay P/N A1506033801, Control Cable P/N W16400SRL20, Power Cable P/N W16400SRL21 and 2 Yellow Clips P/N H27400112YL. Mobiltex P/N A20A0333801</p>
	<p>1 pc – SRL2 DC Smart Relay (100VDC/100ADC Max) Mobiltex P/N A1506033801</p>
	<p>1 pc – SRL2 Control Cable Mobiltex P/N W16400SRL20</p>
	<p>1 pc – SRL2 Power Cable Mobiltex P/N W16400SRL21</p>
	<p>1 pc – Yellow Clip For SRL2 Power Cable (2 Required Per Cable) Mobiltex P/N H27400112YL</p>
	<p>1 pc – Optional High Current Jumper Cable Kit for SRL2 Includes 600mm (24") Red Superflex 6AWG ¼" to 3/8" Lug Cable (A02100SRL04) and 600mm (24") Black Superflex 6AWG ¼" to 3/8" Lug Cable (A02100SRL03)</p>

	Mobiltex P/N A20103SRL20
	1 pc –Solid State AC Relay - 24-280 VAC RMS 50 Amps max (0-8A=No Heatsink, 8-50A=Needs HE-54) Mobiltex P/N K0513245010
	1 pc – Solid State AC Relay - 24-280 VAC RMS 110 Amps max (0-8A=No Heatsink, 8-60A=HE-54, 60-110A=HE-90) Mobiltex P/N K0513211010
	1 pc – Solid State AC Relay - 48-530 VAC RMS 50 Amps max (0-8A=No Heatsink, 8-50A=Needs HE-54) Mobiltex P/N K0513285010
	1 pc – Solid State AC Relay - 3 phase, 48-530 VAC RMS 50 Amps max (0-4A=No Heatsink, 4-30A HE-90 & special holes) Mobiltex P/N K05232R5016
	1 pc – Small Heatsink for Solid State Relay - HF92B-80 (Max 15 Amps with any of the above Solid State AC Relays) Mobiltex P/N X0301292B80
	1 pc – Medium Heatsink for Solid State Relay - HE-54 Mobiltex P/N X03912P5400
	1 pc – Large Heatsink for Solid State Relay - HE-90 Mobiltex P/N X030320HE90
	1 pc – Class 2 Transformer 120 or 230 VAC to 12VAC 20VA (Fixed) Lightning resistant 5,000V insulation. Foot or ½” conduit hub mount. Mobiltex P/N T01A42TR201
	1 pc – 12VA 12VAC Wall Plug-in Transformer for 120VAC (Fixed) Mobiltex P/N P10309A121A
	1 pc – Class 2 Transformer 120/240/277/480VAC Primary to 12VAC 20VA (Fixed) Mobiltex P/N T01A422512C

Table 3 Pi-1 Accessories

5 Configuration

5.1 Configuration Equipment Requirements

The following items will be needed when configuring a Pi-1.

- Pi-1 Unit

5.2 Controls and connections



Figure 4 Pi-1 Controls and Connections

The Pi-1 is operated via the directional pad, enter, and back buttons located on the right-hand side of the display. The directional pad has four positions, they are up, down, left, and right. On the bottom left-hand side, end panel there is a Multiport connector that is used for charging, external relay control and channel two interrupter connections. On the top left hand side end panel there are a pair of banana jack connections used for channel one internal interruption. A Micro B USB port is provided on the front for charging and future updates. On the right-hand side, there is an external GPS antenna SMA connector that is only available on the Pi1-1 Fixed version.

The Pi-1 presents a small operating impedance of 530 mOhm on its built-in interruption relay contacts. In cases where system source impedance is very small, the Pi-1 can materially affect current flow from the current source during operation. In cases where contact resistance must be less, the Pi-1 may be paired with an external SRL1 Smart Relay to meet that requirement.

5.3 Main Screen

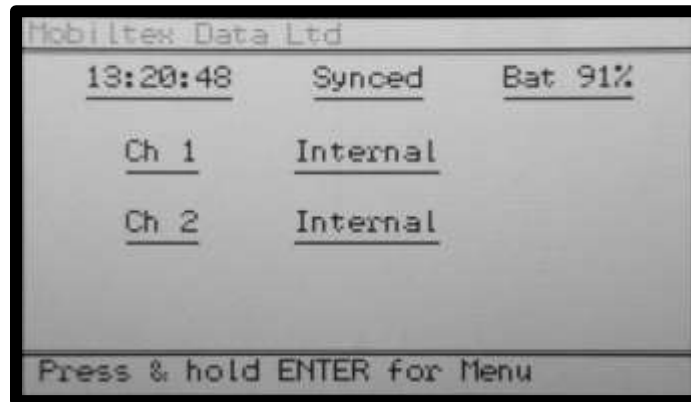


Figure 5 Pi-1 Main Screen

The main screen displays operational information in the middle area bracketed by two horizontal solid double lines. This area is divided into four rows and three columns. The areas above and below the double bars are also used for information. The following table shows the purpose of each information space:

Contact Information & Menu Path		
Local Time	GPS Time Synchronization	Remaining Battery Percentage
Channel 1 Function	Channel 1 System Type	(Blank)
Channel 2 Function	Channel 2 System Type	(Blank)
(Blank)	(Blank)	(Blank)
Operation Instructions		

Table 4 Screen Layout

5.4 Interruption

Channel 1 and Channel 2 can operate on different cycle times and with different Off times. The interruption Start and End times apply to both channels together. The unit will show “No Sync” and not start interrupting until the unit gets GPS acquisition. Once the unit has GPS acquisition it will immediately start interrupting according to its settings.

5.5 Channel One (Ch 1)

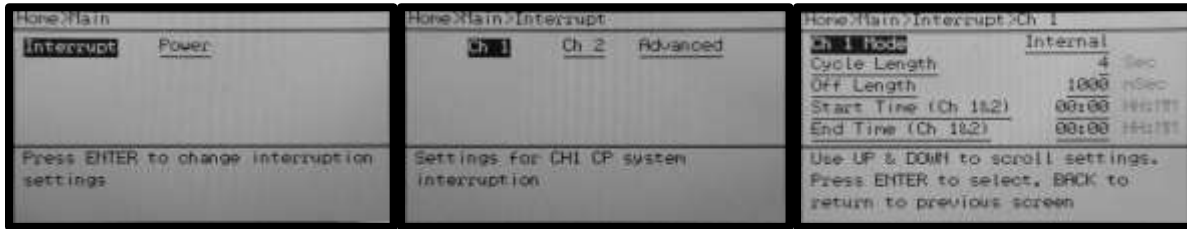


Figure 6 Pi-1 Channel One (Ch 1) Settings

Channel one (Ch 1) is the main interruption channel and is used for everyday instant off survey interruption. This channel can be used for internal interruption or disabled. When set to “Internal”, the internal solid-state relay is engaged. The maximum current handling of the Ch 1 internal relay is 1 amp, and the maximum voltage is 20 volts. The banana jack connections for this channel are on the left-hand side of the unit and are not polarity sensitive.

Settings:

- **Ch 1 Mode** – Enables either the ‘Internal relay’ or ‘Disabled’ if you do not want the relay to operate.
- **Cycle Length** – The total length of the cycle (on + off) in seconds.
 - 0 to 30 seconds.
 - Should be evenly divisible into 60.
- **Off Length** – The length of the off portion of the cycle in milliseconds.
 - 0 to (Cycle Length – 100ms) ms.
- **Start Time (Ch 1&2)** – The time of day at which interruption will start.
 - 00:00 to 23:59 24-hour local time.
 - Applies to both channels 1 & 2.
- **End Time (Ch 1&2)** – The time of day at which interruption will stop.
 - 00:00 to 23:59 24-hour local time.
 - Applies to both channels 1 & 2.

Set ‘Start Time’ and ‘End Time’ to the same values to enable continuous 24-hour interruption.

5.6 Channel Two (Ch 2)

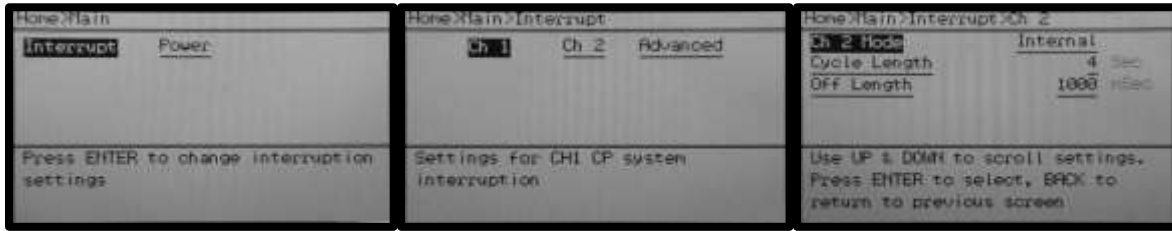


Figure 7 Pi-1 Channel One (Ch 2) Settings

Channel two (Ch 2) is a special testing/coupon interruption channel. The maximum current handling of this channel is 1 amp, and the maximum voltage is 20 volts. The connections for Ch 2 are provided via the Multiport connector located on the bottom left-hand side of the interrupter. These connections are broken out to banana jack leads with an adapter cable and is also not polarity sensitive. When set to 'External', the interrupter can be used with an external high current relay to interrupt impressed current systems.

Settings:

- **Ch 2 Mode** – Enables the 'Internal relay', 'External relay' or 'Disabled' if you do not want the relay to operate.
- **Cycle Length** – The total length of the cycle (on + off) in seconds.
 - 0 to 30 seconds.
 - Should be evenly divisible into 60.
- **Off Length** – The length of the Off portion of the cycle in milliseconds.
 - 0 to (Cycle Length – 100ms) ms.

5.7 Advanced

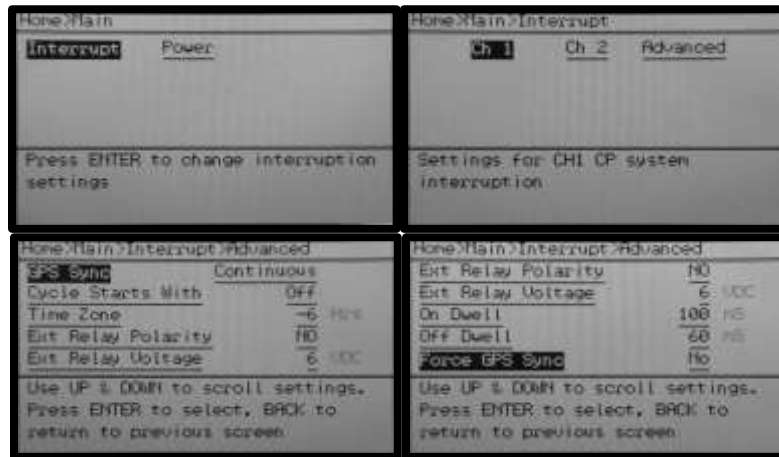


Figure 8 Pi-1 Advanced Settings

The advanced menu contains settings that are not typically changed during normal everyday CP survey tasks.

Settings

- **GPS Sync** – ‘Continuous’ allows the unit to update the GPS time synchronization every three hours. ‘Once’ establishes GPS time synchronization only once at startup. This allows the unit to be GPS time synchronized in full view of the sky, then moved to a location with no GPS reception (inside a building for example) and interrupt based on the internal high accuracy real time clock.
- **Cycle Starts With** – Allows the unit to be set to start interruption cycles with the ‘Off’ (industry standard) or ‘On’ (uncommon) for both channels.
- **Time Zone** – Allows the user to change the time offset in hours for the time zone in which the unit will be used (Daylight savings time will be automatically compensated).
- **Ext Relay Polarity** – Allows the external relay to be setup for a normally closed (NC) or normally open (NO) relay.
 - Use (NO) for Mobiltext Smart relays.
- **Ext Relay Voltage** – Set the output voltage to 6VDC or 12VDC depending on the relay.
- **On Dwell** – Adjusts the on dwell time compensation for the external relay in milliseconds.
 - 5 to 150 ms.
 - Use 5 ms for Mobiltext Smart relays.
 - The ‘On Dwell’ is how long it takes for a switch to change to On.
- **Off Dwell** – Adjusts the off dwell time compensation for the external relay in milliseconds.
 - 5 to 150 ms.
 - Use 5 ms for Mobiltext Smart relays.

- The 'Off Dwell' is how long it takes for a switch to change to Off.
- **Force GPS Sync** – Force a GPS time synchronization. By setting the option to Yes, it will stay as Yes until the GPS synchronization is complete at which point it will revert to No.

A. Pi-1 Portable Equipment Specifications

ENVIRONMENTAL

Operating temperature	-40° to +60°C (-40° to +140°F)
Charging temperature	0° to +40°C (32° to +104°F)
Storage temperature	-40° to +70°C (-40° to +158°F)
Humidity	0 to 100% RH non-condensing
Pollution degree	1
Maximum altitude	5000 meters above sea level
Ingress protection	IP68, 1 meter, 3 hours

PHYSICAL

Size	150mm x 88mm x 30mm (5.9" x 3.5" x 1.2")
Weight	300 grams (0.6 lb)
Enclosure	UV stable, wide temperature polycarbonate
Display	2.7" 400x240 px

POWER

Battery	Internal Li-Ion (3.7V 3500mAh, not user replaceable)
Charge time	8 hours maximum
Charging power	6-34V AC/ 8-48V DC Multiport 5 V, 500 mA USB Micro B
Battery life (continuous internal interruption & GPS)	15 days, 12 hours / day

INTERRUPTION

Relay drive voltage	6 VDC / 12 VDC User selectable
Relay drive current	100 mA @ 6VDC / 300 mA @ 12VDC Maximum
Relay contact close dwell	5-150 ms
Relay contact open dwell	5-150 ms
Relay contact type	NO or NC
Relay type	Solid state or mechanical
Internal relays (Ch 1 & Ch 2)	20V AC/DC, 1A max
Internal relays contact resistance	530 mOhm
Cycle time (Ch 1 & Ch 2)	1-30 s (1 second steps)
Off time (Ch1 & Ch 2)	100-29900 ms (100 ms steps)

TIMING

GPS receiver	72-channel uBlox 8 series (internal patch antenna)
GMT time-zone offset	+/- 12 hours
Maximum drift	+/- 36.7 ms over 3 hours

CONNECTIONS

USB	USB B Micro 2.0
Red/black banana jacks	Channel 1 Interruption
Multiport	Custom connector, requires adapter for Channel 2, external power and Mobiltext Smart Relays (SRLs)

B. Pi-1 Fixed Equipment Specifications

ENVIRONMENTAL

Operating temperature	-40° to +85°C (-40° to +185°F)
Storage temperature	-40° to +85°C (-40° to +185°F)
Humidity	0 to 100% RH non-condensing
Pollution degree	1
Maximum altitude	5000 meters above sea level
Ingress protection	IP54

PHYSICAL

Size	150mm x 88mm x 30mm (5.9" x 3.5" x 1.2")
Weight	300 grams (0.6 lb)
Enclosure	UV stable, wide temperature polycarbonate
Display	2.7" 400x240 px

POWER

Input power	6-34V AC/ 8-48V DC Multiport 5 V, 500 mA USB Micro B
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INTERRUPTION OUTPUT

Relay drive voltage	6 VDC / 12 VDC User selectable
Relay drive current	100 mA @ 6VDC / 300 mA @ 12VDC Maximum
Relay contact close dwell	5-150 ms
Relay contact open dwell	5-150 ms
Relay contact type	NO or NC
Relay type	Solid state or mechanical
Internal relays (Ch 1 & Ch 2)	20V AC/DC, 1A max
Internal relay contact resistance	530 mOhm
Cycle time (Ch 1 & Ch 2)	1-30 s (1 second steps)
Off time (Ch1 & Ch 2)	100-29900 ms (100 ms steps)

TIMING

GPS receiver	72-channel uBlox 8 series (external antenna with LNA)
GMT time-zone offset	+/- 12 hours
Maximum drift	+/- 36.7 ms over 3 hours

CONNECTIONS

USB	USB B Micro 2.0
Red/black banana jacks	Channel 1 Interruption
Multiport	Custom connector, requires adapter for Channel 2, external power and Mobiltext Smart Relays (SRLs)

C. Technical Assistance

Technical assistance may be obtained from:

Attn: Service Department
Mobiltex Data Ltd.
#36, 56 Freeport Cres. NE
Calgary, Alberta
Canada T3J 0T7

Tel: (403)291-2770

Main Website: <https://www.mobiltex.com/>

Service Website: <https://www.mobiltex.com/support/>