

PATHFINDER 360 Alpha & Alpha Comms



**Permanently Installed Overhead Line FPI with
local indication and optional
communications for alarms & control**

TECHNICAL DESCRIPTION & SPECIFICATION

SupaRule SA 26 Simba Street, Sebenza, Edenvale Tel No: +27(0)11 452 9800 Fax +27(0)11 452 9828

Contents

	Page
1.0 OVERVIEW	3
2.0 OPERATIONS	
2.1 Monitoring residual field – Auto gain	3
2.2 Magnetising Inrush Current	3 – 4
2.3 Fault Sensing	4
2.4 Permanent – Transient Fault	4
2.5 Timed Reset	4
3.0 MODEL TYPES	
3.1 ‘S’ Type	5
3.2 ‘D’ Type	5
3.3 ‘F’ Type	5
3.4 ‘FD’ Type	5
3.5 ROSCO Type	5
3.6 Model Change	5
4.0 INSTRUMENT DESCRIPTION	6
4.1 Environmental	6
4.2 Battery	6
5.0 COMMUNICATIONS	6 - 7
5.1 Ordering Options	7
5.2	
5.3 Receiver & Data mangement	7
5.3.1 Mobile Telephone Application	7
5.3.2 Stand Alone P.C. or Laptop – Software Options	8
5.4 Communications Type	8
6.0 FUNCTIONALITY	8
7.0 COMMISSIONING	9
7.1 Local Testing	9
7.2 Battery Connection	9
7.3 Actions with Magnet	9
7.4 Magnet actions for Comms Options	10
7.5 Data Entry	10
7.6 Pre-Commissioned	10
7.7 Commissioned via Powerwatch Ecoms software	10
7.8 Commissioned via Web-site	10 – 12
8.0 TROUBLESHOOTING	12 – 13
8.1 Base Station modem	13
8.2 Telephone numbers	13
8.3 Diagnostics	13
9.0 INSTALLATION LOCATION	13
9.1 Position on Pole	14
9.2 Where not to use Pathfinder	14
10.0 TEST SPECIFICATIONS	15
11.0 STATEMENT OF GUARANTEE	16
12.0 TECHNICAL SPECIFICATION	16
LITHIUM BATTERY - SAFE HANDLING	17
GENERAL ASSEMBLY - FIG 1.	18
ROSCO OUTPUT - FIG 2	19
MODEL SELECTION CHART- FIG 3.	20

**This document should be read in conjunction with the following:
Powerwatch Ecoms Data Management System - Technical Description V1.**

1.0 OVERVIEW

PATHFINDER 360 ALPHA

Pathfinder 360 Alpha is an inductive overhead line Fault Passage Indicator, designed to be installed on the pole 3 metres below the conductors, that senses out of balance of electro-magnetic field in a single or 3 phase, solidly earthed HV network at between 6 to 36KV (or equivalent voltages). It will sense both phase to phase and earth faults of values down to a nominal 7 amps, sensing also the surrounding voltage field, to determine whether a fault has been transient or permanent. The presence of the voltage field will also reset Pathfinder on restoration of HV supply.

The instrument continuously monitors the residual current and voltage fields from the overhead line conductors and is triggered when it detects fault current above the current/time threshold curve, passing in the line conductors.

In the 'alarmed' state it will 'flash' a super bright white LED, which can be seen over long distances at night as well as by day to give local indication, as well as dial up a modem to modem call for the 'Comms' option to give a remote indication. A network fault can therefore be found by following the Pathfinders that have tripped, as it must lie between the last one to trip, and the first not to have tripped.

The standard model will automatically reset with restoration of the system voltage or it can be manually reset. There are, however, other models of the *ALPHA* which will respond and reset according to the type of fault and system protection.

Pathfinder is operated from a Long Life Lithium Thionyl Chloride battery which gives over 600 flashing hours during its 10 year operating life.

2.0 OPERATION

2.1 MONITORING RESIDUAL FIELD - AUTO-GAIN

The *ALPHA* 360 incorporates an AUTO-GAIN feature which enables the instrument to continuously monitor the residual electromagnetic field from the conductors. The residual field, will vary as the load changes, and according to line geometry. The Auto-gain compensates for these variations, so that it sees a zero field, until a fault interrupts the field. In this way Pathfinder may react to quite small increases in magnetic field, as a result of low values of fault current.

2.2 MAGNETISING INRUSH CURRENT

Bowdens have undertaken a considerable amount of work into the possible cause of an overhead line fault passage indicator tripping beyond a fault. This work has investigated exactly what electro-magnetic fields can be experienced both upstream and downstream during either an earth fault, or a phase to phase fault on an overhead line distribution network.

From a live line, the upstream parameters are relatively easy to define in terms of load and fault current, and calculations can be done to establish electro-magnetic fields at a point 3 metres below the conductors under differing line constructions.

Downstream of a fault the position is not so clear. One has to consider the out of balance of load currents, but also, where voltage fluctuations occur, high values of magnetising current can flow to remote transformers, and may be interpreted by an FPI as fault current.

Magnetising currents, however, contain no zero sequence component and so it is only the mathematical resultant from the physical phase separation to which an FPI will be sensitive.

Depending upon the installed transformer capacity, and whether it be single phase or three phase, the magnetising current can be of a high value with a rapid half life decay, or it can be of a lower value, but having a longer time period on the network.

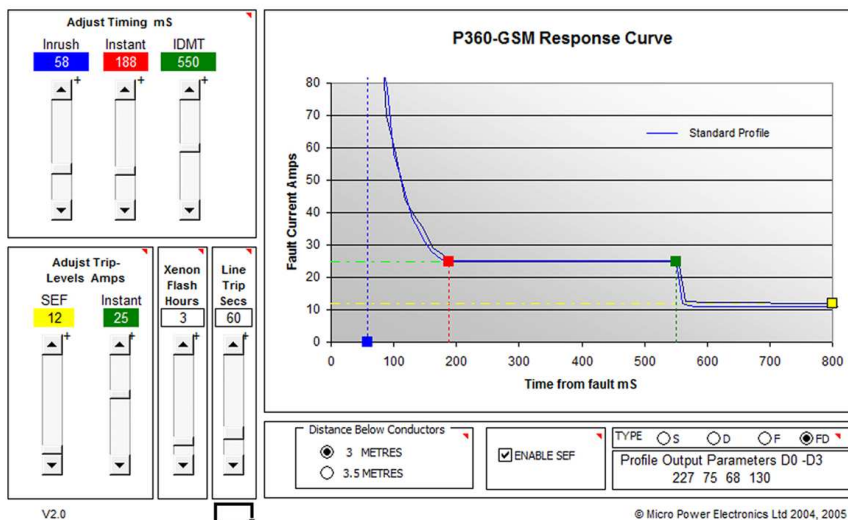
The occurrence of such magnetising currents is also dependant on point of wave at which the voltage fluctuation commences, and how the currents are distributed within a network with a number of both single and three phase transformers connected.

If an FPI is designed as a threshold device and is set to a sensitivity level to capture the lowest fault currents experienced on an SEF fault, then even with a built in time delay, magnetising currents which have a long time duration on the system could be seen by the FPI as fault current. If the time delay is extended the danger is of missing the fault altogether due to the fast clearance times of modern circuit breakers.

2.3 FAULT SENSING

The Pathfinder 360 Alpha adjusts its sensitivity during the duration of a fault. The instrument will trip on an initial fault value of a nominal 12 Amps. It will go 'deaf' for 50msecs to allow magnetising currents to disperse, but during this period the sensitivity is reduced to a nominal 300 amps. As the fault progresses, the sensitivity is increased, so at the end of the 'Instantaneous' phase of protection clearance, the sensitivity will be at a nominal 25 amps after 150msecs. It then is looking for 'Earth Faults' cleared on IDMT before at 550 msecs moving into the final SEF phase, increasing sensitivity to a nominal 10 amps.

In this way the Pathfinder mirrors the protection curve, so that low values of fault current have to be present on the network for over ½ sec to be recognised by Pathfinder as a genuine fault. This method of sensing has dramatically reduced the 'false tripping' as a result of system disturbances and spikes.



The values of current and time can be changed individually or set up as a profile. The profile can be downloaded at manufacture or downloaded remotely if the GSM option is available. The operating responses can therefore be tailored to the prevailing conditions, if the standard settings are not suitable.

2.4 PERMANENT OR TRANSIENT FAULT.

Pathfinder, having sensed the fault current on the response curve will wait for 30 seconds, to allow all switching activity to be completed, before it registers its voltage signal. If the Voltage signal is present, the fault is a Transient, if the voltage is absent, the fault is permanent, and the instrument will respond accordingly (see Model Types.)

2.5 TIMER RESET

The Pathfinder 360 ALPHA super bright WHITE LED flashing light will reset automatically after a fixed period of time if the restoration of system voltage does not occur within the reset period. This reset period is a standard 3 hours, although, the timer can be extended on request, at the time of manufacture, or can be set via the GSM option. If the timer does reset the WHITE LED, then a secondary flashing bright RED LED will continue to provide a visual alarm indication depending on the ALPHA model.

3.0 PATHFINDER 360 ALPHA - MODEL TYPES

- Type 'S' - main line permanent faults only.
- Type 'D' - main line permanent, transient and intermittent faults
- Type 'F' & 'FD' - all single or multiphase faults downstream of fuses
- Type 'ROSCO' - incorporates a telecom interface for system automation

Note: All of the above models may have the 'Comms' option added.

3.1 PATHFINDER 360 ALPHA 'S'

Is designed for main line permanent faults only. The *ALPHA* will enter the 'alarm' mode and flash its bright WHITE LED until the line voltage is restored or for a 3 hour period (which ever occurs first) when it will automatically reset to the 'alert' mode.

Should the line remain dead beyond the 3 hour flashing period a bright RED LED will flash inside the beacon lens to give a long term indication of fault current flow. This will reset on restoration of system voltage or after 48 hours, whichever occurs first.
The 'S' Model will not respond to Transient Faults.

3.2 PATHFINDER 360 ALPHA 'D'

Many overhead line faults are transient which cause auto- reclose operations and no obvious signs of damage, and as a result are hard to find.

The 'D' model will detect all faults, but if the fault is a transient, the voltage signal will only reset the primary bright WHITE LED, it will however leave the secondary bright RED LED flashing for 24 hours giving the engineer a chance to inspect the line. Once a transient fault has been indicated, the Pathfinder is reset to its alert mode, and is waiting to respond to the next fault.

3.3 PATHFINDER 360 ALPHA 'F'

On fused networks where there is the chance that a single phase fault will rupture only one fuse element, the volts on the remaining two phases will reset the standard *ALPHA* 'S'.

The *ALPHA* 'F' has been developed to compensate for these conditions and provide a clear indication for fuse protected single phase faults as well as multi - phase faults.

The *ALPHA* 'F' monitors the residual current field in common with all Pathfinder 360 models, but when a fault occurs downstream the indicator only detects the change in current residual and ignores the voltage. The indicator then alarms and the Xenon flashes for 3 to 8 hours, depending on the manufactured time setting of the unit. The Red LED does not alarm for any fault condition.

Fault currents on a fused spurs can be below the level to rupture a fuse, but sufficient to operate the SEF at the source breaker. In these instances the *ALPHA* 'F' will still respond correctly and alarm to the fault current.

3.4 PATHFINDER 360 ALPHA 'FD'

The application and function is the same as the 'F', except when the Xenon resets the Red LED continues flashing for 24 hours. The LED is not reset by restoration of system voltage.

3.5 PATHFINDER 360 ALPHA 'ROSCO'

The 'ROSCO' version has the addition of a volt free alarm output in the form of N/O N/C changeover relay. The relay follows the bright RED LED in terms of operation. All the above models may be a ROSCO version. (see Figure 2)

3.6 MODEL CHANGE

The model type can be changed by selected the appropriate links on the PCB of the Pathfinder 360 Alpha board.

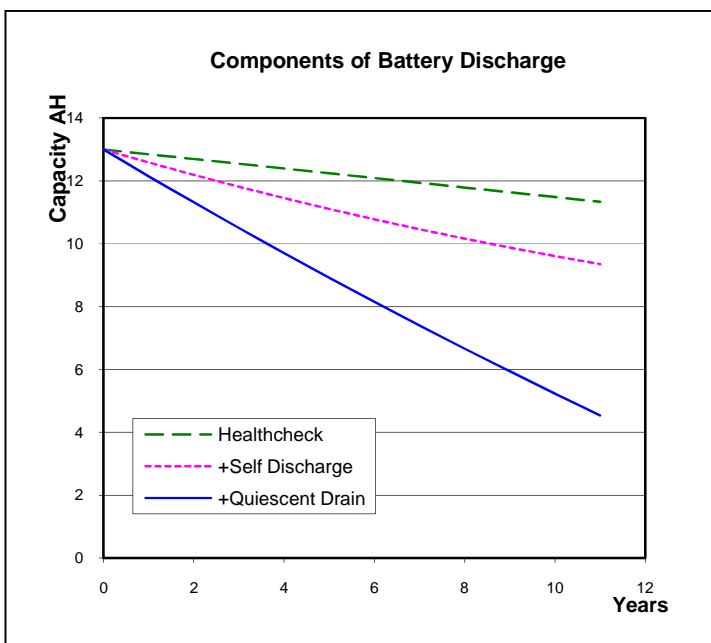
4.0 INSTRUMENT DESCRIPTION

4.1 ENVIRONMENTAL

The body and lens of the *ALPHA* case is a single polycarbonate moulding with an 'O' ring sealed Polycarbonate screw cap, giving an IP rating of >67.

The 'O' ring is of Nitrile, which possess high temperature and pressure resisting qualities, is fitted inside the screw cap to a high pressure withstand standard (BS 1806). This provides a high quality seal suitable for internal pressures caused by the combined effects of ambient temperature variations and the effects solar heating. The integrity of the 'O' ring pressure seal of each unit checked at the time of manufacture by pressurising the enclosure to 10lbs/sq in.

4.2 BATTERY



Designed for at least 10 years under the following conditions:

Average temperature 16 °C giving average self discharge of 2% remaining capacity per annum.

Weekly health check message of 20 seconds at 350 mA average current.

Quiescent drain is 40 micro amps typical.

Gives over 400 flashing hours with Comms Option

Gives over 600 hours without Comms Option

Power Source

Self powered using a single SAFT LSH20 3.65 volt 13 AH R20 (D-size) lithium thionyl-chloride primary cell.

Connector is BERG 65406-001 Polarised gold plated.
Battery plus connector assembly is designated SAFT LS6493.

Similar SAFT cells (LSH14 and LS33600) are used in our Pathfinder P360 products 13,500 units in the field in UK.

5.0 COMMUNICATIONS OPTION

Various communications options are available with Pathfinder including quad band GSM for data-call and text messaging, GPRS to IP address on a private server or Web page base station, or integral RTU cooperate within a private network.

Modem to Modem communications are available from Pathfinder outstation to a P.C. or laptop running the Bowdens Ecom alarm data management software which gives flexibility of alarm data management, and offers call forwarding to mobile telephone for on-call engineers. Otherwise Pathfinder can use SMS text messaging to forward data direct to a mobile telephone or phones if data management is not required.

Pathfinder uses its own protocol which has been integrated with other manufacturer's data management platforms. Upward integration with NMS or SCADA systems is also possible and has been achieved in a number of cases.

5.1 ORDERING OPTIONS

The user must decide which Pathfinder and which communications type will be most effective. The options to consider can be described as:

PATHFINDER: Model Type - Permanent, Transient, or both.

RECEIVER FOR MESSAGES: Stand Alone P.C or Laptop - Mobile Telephone only - Both - SCADA NMS

ALARM DATA MANAGEMENT: Bowdens Ecom Alarm Data Management - Nortech I-Host Data Management – Schneider Alarm Data Management - Others

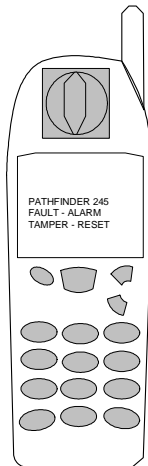
COMMUNICATIONS MEDIUM: SMS Text message - GSM Data-Call dial up modem to modem – GPRS web pages or IP address based - RTU dedicated protocol.

COMMISSION OPTIONS : Pre-Commissioned - Web-Based Commissioned - Ecoms Software Commissioned.

5.3 RECEIVER & DATA MANAGEMENT

5.3.1 MOBILE TELEPHONE APPLICATION.

In its simplest form, a local system with only a few Pathfinders may best be used straight to a mobile telephone, without the complication of a data-management centre. However, this is quite limiting and maybe difficult to decipher if a number of Pathfinders are reporting into a mobile phone at the same time. Data may be directed to up to two Engineer's mobile telephones, by entering the correct number during the commissioning routine, (see 5.0) and without the need to purchase the Bowdens ECom software.



Having followed the COMMISSIONING routine when the message is sent from the Web-site, a message of acknowledgement will be received at the mobile telephone, indicating 'setup complete.' The message received will contain the information:

P360 – GSM	- Instrument Type
12345	- ID entered on Web-page
Daily or 7 days	- Frequency of Healthcheck chosen
Battery OK or Low	- Battery Status
Signal 22 *****	- Signal strength (must be over 9)
Permanent >>	
Alarm or Reset	- Status of permanent fault condition

If the Pathfinder experiences a change of state, and alarm or rest condition will give rise to the following message:

P360 – GSM	or	P360 – GSM	Depending on whether the fault is a
12345		12345	permanent or transient fault the
Permanent >>		Transient >>	relevant information is shown. With a
Alarm or Reset		Alarm	permanent fault a reset is sent, but not
			with a transient.

Battery status and signal strength is only given with the healthcheck not with an alarm message.

5.3.2 STAND ALONE P.C. or LAPTOP – SOFTWARE OPTIONS.

BOWDENS POWERWATCH ECOMS DATA MANAGEMENT SOFTWARE

Pathfinder 360 Alpha Comms will report to a P.C. or Laptop using an external modem running Powerwatch ECOMS Data Management software. Bowden Bros supply a licence to use our software, which allows alarm and heartbeat data to be managed, as well as giving the features for call forwarding (alarm messages forwarded to on-call engineers) and programming the Pathfinder outstations to alter the operating parameters if required. Commissioning can be done direct from the software platform, without the need for an account to use the Bowdens FAULTWATCH Website to commission.

Bowdens Ecom software will run on any P.C. or laptop with Windows 2000 or later and Access 2000 or later. The Modem is supplied by Bowdens for operating compatibility.

Details of the operation of the Bowdens Ecom software can be found on the Ecoms Technical Description.

I-HOST OR OTHER DATA MANAGEMENT SOFTWARE.

Pathfinder can be adapted to operate on other software platforms, and retain the ability to programme the outstations remotely. This has been achieved on both GMS and GPRS.

SCHNEIDER – T1 RTU to TALUS C10

Pathfinder has been integrated to the Schneider communications network with the Schneider T1 mini RTU incorporated into the Pathfinder which talks directly to the nearest TALUS C10 at a primary substation, and up onto the main NMS control system.

GE HARRIS ENMAC

Bowdens Ecom software and I_Host both offer compatible routes to enable GE Harris ENMAC to display alarm messages on the NMS control system.

5.4 COMMUNICATIONS TYPE:

This will depend largely on the system chosen. For Mobile Telephone applications SMS Text messaging will be used. For P.C. or laptop applications GSM Data-call or GPRS can be used taking full advantage of the quad band antenna supplied with the Pathfinder. Proprietary protocol communications can be developed to suit different applications.

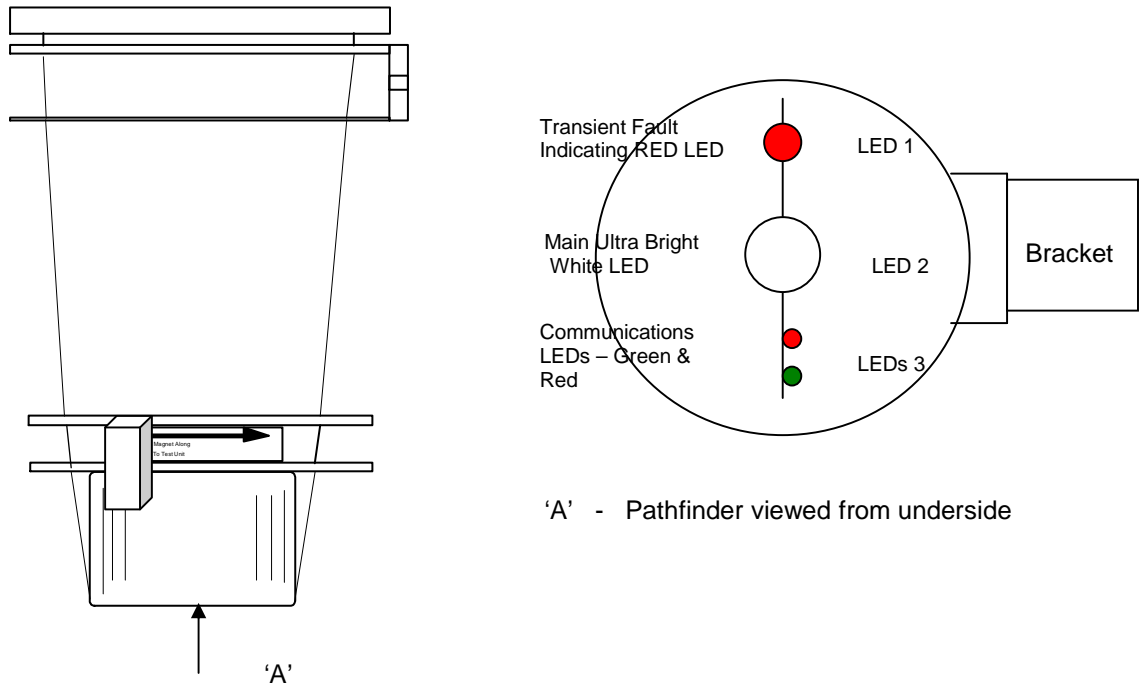
6.0 FUNCTIONALITY

The table below gives the functions available for each receiving medium.

Receiver	Permanent Indication	Transient Indication	Trip Type	Heartbeat	RSSI	Low Batt	Prog	Call Forward
Mobile Telephone	Yes	Yes	No	Yes	Yes	Yes	No	No
EComs	Yes	Yes	Earth Fault IDMT SEF	Yes	Yes	Yes	Yes	Yes
I-HOST	Yes	Yes	No	Yes	Yes	Yes	Yes	No
Schneider T1.	Yes	Yes	No	Yes	Yes	Yes	No	No

7.0 COMMISSIONING

COMMISSIONING MODE - There are THREE methods of commissioning Pathfinder. Unless it has been PRE-COMMISSIONED, Pathfinder will need to be put into COMMISSIONING MODE.



7.1 LOCAL TESTING:

A suitable bar magnet must be used, ideally 25 x 15 x 5 mm as supplied with the Pathfinder. All actions require the magnet to be approached towards the Pathfinder arrowed area, at right angles and with the widest dimension (15mm) presented across the arrow (see diagram)

NOTE: All the actions below must be carried out away from the influence of any voltage fields or any electro-magnetic fields. An office environment with computers and fluorescent light will give unpredictable results.

7.2 BATTERY CONNECTION

Remove lid to Pathfinder and plug in battery. The battery plug is polarity sensitive, and has one off-set socket. Ensure the plug is aligned, with the off-set socket on the correct side. The plug should push into the pins on the pcb until it is flush with the battery holder. Replace lid making sure that the 'dimple' on the lid is aligned with the centre of the support bracket. This ensures the correct pressure on the 'O' ring seal to achieve the necessary IP rating.

7.3 ACTIONS WITH MAGNET

1. Battery Test: Bring magnet up to arrowed section, hold for 1 – 2 seconds and remove. Transient Fault RED LED will flash a few times, and the white LED will flash once for a successful battery test.
2. Test Alarm Strike the magnet along the line of the arrowed area, as if striking a match. Pathfinder will go into alarm with the bright WHITE LED flashing at approximately 12 second intervals.

7.4 MAGNET ACTIONS FOR COMMS OPTIONS ONLY

3. Reset & Heartbeat: Bring magnet up to arrowed section and hold for 6 seconds (or until GREEN Coms LED is lit), and remove. This will reset Pathfinder and send a heartbeat message to confirm status.
4. Commission Mode: Bring the magnet up to arrowed section for approx 10 secs and observe LED 3. As soon as it lights red, remove the magnet. Continue to observe LED 3 which should go to flashing green.
Observations: LED 1 will light and LED 2 will flash as the unit is set into commissioning mode. Both will be extinguished when in commissioning mode.
Result: The Pathfinder communications is set to receive commissioning data from either the web-site or the Powerwatch P.C.
5. Out of Commission: Bring the magnet up to and place on the arrowed area, keeping it in place until the flashing green LED 3 goes out. Remove the magnet.
Observations: LED 1 will light and LED 2 will flash as the unit is reset.
Result: Pathfinder will be in the reset state, as action 2 above.
5. Manual Alarm: Swipe the magnet briskly over the arrowed area moving it from left to right to activate an alarm signal. If no Voltage field is detected a Transient alarm will be sent, if a voltage field is detected, a Permanent will be sent.

7.5 DATA ENTRY

If using a P.C. or Laptop running ECOM or other data management software, ensure the Pathfinder data is entered on the software database before the unit is commissioned.

7.6 PRE-COMMISSIONED:

If the SIM Cards or the SIM Card telephone numbers for the Base Station and the Outstations are supplied to the manufacturer in advance, then the Pathfinders can be supplied pre-commissioned. Plug in the Pathfinder battery as above, and the unit will automatically register to the P.C. giving its status, and confirm the commissioning message. This can apply to commissioning to mobile telephones also, where a message will be received at the mobile on connecting the Battery.

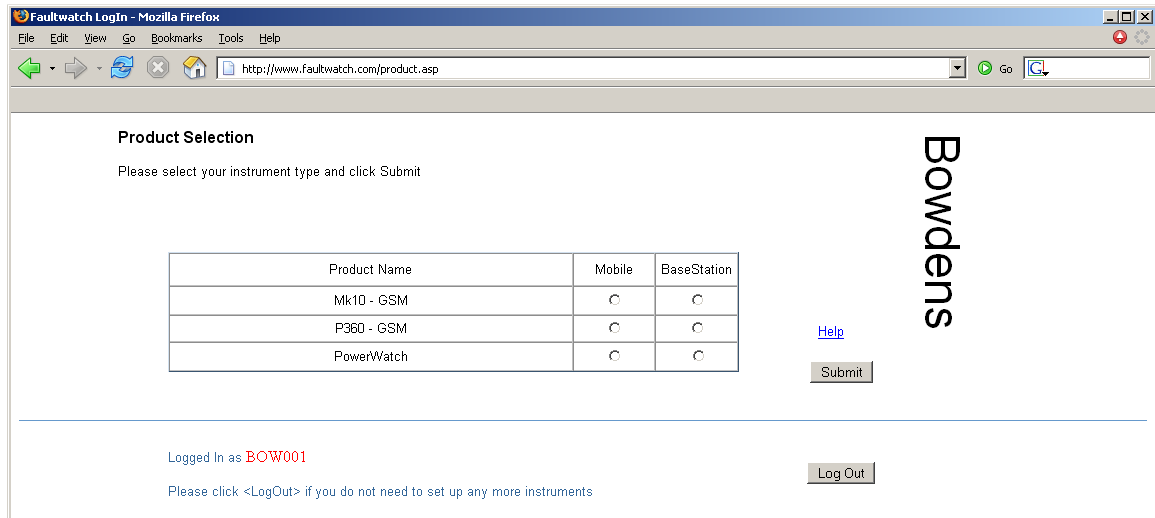
(See also Pre-Commissioned Set up Guide – Sept 07.)

7.7 COMMISSION VIA ECOM SOFTWARE ON BASE STATION.

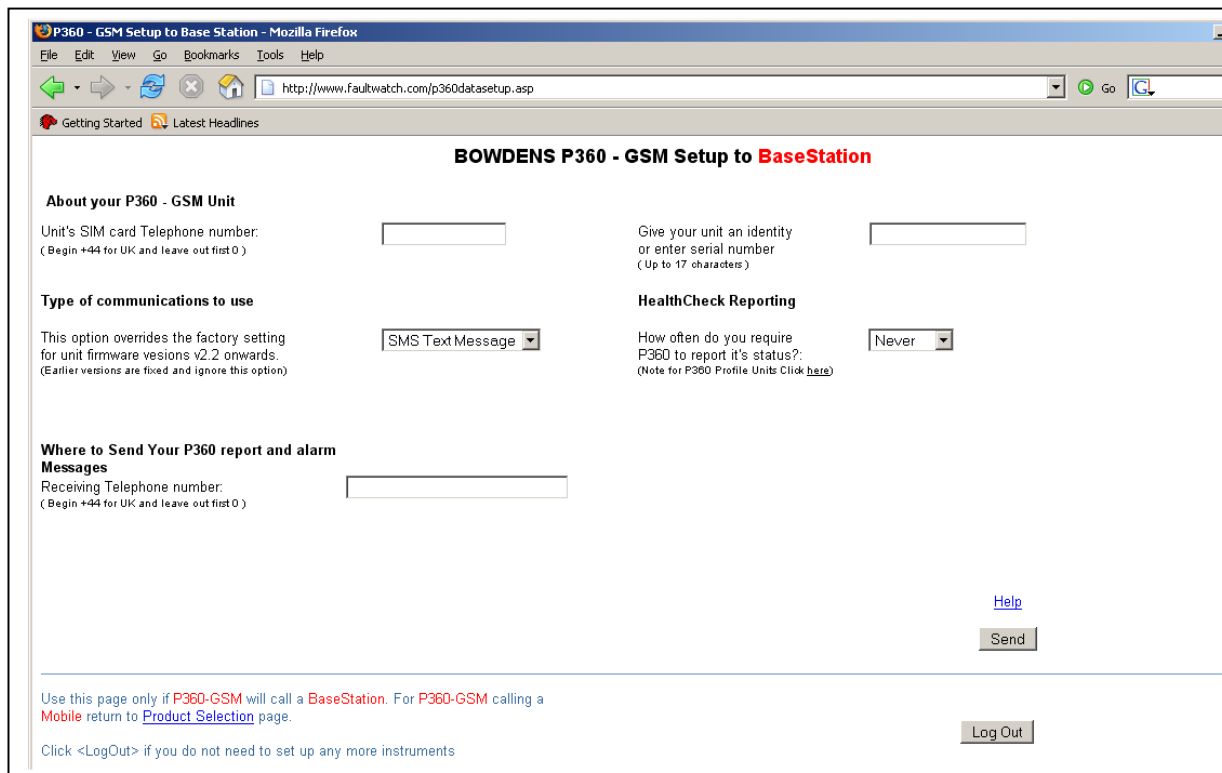
The Commission page can be accessed through the Ecom software, and details can be found on the Ecoms Technical Specification. Once details of the unit are entered on this page, and the unit is in commissioning mode, the message can be sent to the unit, and will be confirmed back on the Ecoms main page. NOTE: Once a Pathfinder has been commissioned, if the battery is removed, the commissioning data is held in non volatile memory, and does not have to be re-entered when the battery is re-connected.

7.8 COMMISSION VIA WEBSITE:

To commission via the Bowden Bros Website, you must first have purchased some credits, against which you are given a User name and Password. On the internet, connect to www.faultwatch.com and enter your user name and password in exactly the same format as it was supplied to you (all entries are case sensitive)



Having logged onto the site, make the selection of product, and whether the receiving message will be to the base station, or to a mobile telephone. In this document we shall only consider the Pathfinder 360 Alpha-COMMS. Press submit.



The Pathfinder 360 Alpha Comms can be selected either to a mobile telephone, or to a base station. The screen above shows the Base Station option chosen.

Select the Communication Type from the drop down menu.

SMS or DATA CALL: Enter the Telephone number of the Pathfinder SIM Card (using the International +44 format followed by 10 digits). Enter the Telephone number of the Base Station modem. Give your Pathfinder an identity (serial number) and select how often the heartbeat

should report. This time should match the time entered on the Data Management software, so that the Pathfinder will generate a message to coincide with the software expecting to receive the heartbeat message.

When you know the Pathfinder is in COMMISSIONING MODE press send to initiate the commission message. It will be confirmed at the mobile phone (for SMS applications) or at the P.C. or laptop fro GSM applications.

GPRS If the GPRS option is chosen, fields for the Server type and the Service Provider appear. The following details will need to be known before commissioning can take place.

Server Type: The IP address and the IP port of the Remote Server .

Service Provider details: Access Point Name (APN) Authentication User ID and Password and PDP (Packet Data Protocol) type

When you know the Pathfinder is in COMMISSIONING MODE (see 'Summary of Actions with Magnet) press send to initiate the commission message. It will be confirmed at the server.

8.0 TROUBLESHOOTING

SIM CARDS: More problems occur with SIM Cards than any other component that goes to make up the Pathfinder 360 Alpha-COMMS system. The following are faults to look out for if your Pathfinder does not communicate as it should.

Is the SIM Card correctly installed within the modem or SIM Card reader?

Make sure the corner cut out matches the holder, and the plated connections are facing towards the pcb within the modem or reader.

Is the SIM Card activated? - Is the telephone number issued correct?

It will not be possible to put the Pathfinder into COMMISSION MODE (flashing green LED) Prove activation by putting the SIM card into a mobile phone and calling another mobile. If the call gets through it proves the SIM Card activation, and will give confirmation of the number.

Is the SIM Card PIN enabled?

The SIM Card should be PIN disabled or the PIN should be set to '0000'

Does your SIM Card support Data-call or GPRS?

Not all cards will support Data-call or GPRS messages. Ensure that your SIM card is enabled for the correct communications type. Check with your SIM Card supplier if in doubt.

Has your SIM Card got any Credit if it is 'pay as you go'?

Check credit on SIM Card.

Are the telephone numbers entered correctly on the EComs base station?

Check the numbers, and make sure that they are entered as local calls for the base station, but in International format if commissioned from the Website.

Does your local service provider support calls from a U.K. based server?

In certain parts of the world some local network providers do not support this service. Either talk to your local network provider, or change providers for this application. Using the POWERWATCH software to commission units involves only local calls. If a local mobile to mobile telephone call works then a Pathfinder to Base station call will work.

8.1 BASE STATION MODEMS

Different modems use different engines, each of which work in very slightly different ways. The Base Station Modem should be supplied through Bowden Bros Ltd, or must be approved before use.

8.2 TELEPHONE NUMBERS

Have the telephone numbers been entered correctly on the Data Management software?

Local format telephone numbers for Ecom Base Station commissioning eg: 07775349125
International Format for Webpage commissioning eg: +447775349125

Have you checked that the telephone number is correctly entered on the Base Station. If in doubt remove the SIM Card and put it into your mobile. Text another telephone to make sure the message gets through.

8.3 DIAGNOSTICS

With the EComs Base Station diagnostics are available in the following form.

Activity Log: An activity log is created automatically every month which monitors the events within Powerwatch software. To access the log, in Windows explorer\Program Files\Powerwatch folder open the Activity Log in Notepad format.

Comms Log: The Comms log can be opened in a similar manner to the activity log, but this monitors the messages in and out of the Modem.

For advanced diagnostics the GSM Manager can be accessed through the 'view' command in the Main Application Screen on Powerwatch.

Using GSM Manager you can force AT commands and observe the serial data returned, as well as monitor the modem response.

9.0 **INSTALLATION LOCATION**

Conductor formation

Flat, triangular and wishbone formation lines.
Three phase or single phase circuits.
Open radial feeders only.

Poles

Wood poles or concrete pole lines only. (Concrete poles should not have re-inforcing rods in direct contact with the earth)
Clean, single circuit, intermediate poles.
Angle section poles with stay wire.

Types of Protection

ALL MODELS - Beyond all types of source breaker and pole mounted recloser with over current/earth fault protection and sensitive earth fault protection to 7 amps.
Fused spur lines - use the *ALPHA 'F'* ONLY.

9.1 **POSITION ON POLE**

The *ALPHA* must be placed directly below and in line with the centre phase conductor and about 3 metres from the lowest conductor. It should be in the same relative position on single phase lines. The indicator can face either up or downstream depending on the best line of vision from the likely viewing point

9.2 **WHERE NOT TO USE THE *ALPHA***

Pathfinder 360 *ALPHA* indicators should not be used on poles in the following situations

- a) with underground cables
- b) with transformers
- c) with double circuit lines
- d) with tee off lines
- e) closer than 300 metres to 275 - 400 KV lines
- f) closer than 150 metres to 132 KV lines
- g) closer than 100 metres to 66 KV lines
- h) closer than 50 metres to 33 KV lines
- i) closer than 30 metres to 22 KV and 11KV lines
- j) closer than 100 metres to Railtrack HV overhead conductors

Conductor formation

Vertical formation lines or double circuit 'H' poles.
Closed ring circuits.

Other equipment

Poles supporting underground cables or aerial bunched conductors. (ABC)
Poles supporting underslung earth wires, telecoms circuits and low voltage power lines.
Poles supporting transformers or switchgear unless method of application is approved by the manufacturer.

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10.0 TEST SPECIFICATIONS

10.1 ELECTROMAGNETIC COMPATIBILITY

The PATHFINDER 360 *ALPHA* has been fully EMC tested to the following standards:

BS EN 50081-1 : 1992 Generic emissions standard (Heavy industrial) - none detected

BS EN 50082-2 : 1992 Generic immunity standard (Heavy industrial)

To IEC 801-2 :1991 Electrostatic discharge
Standard requirement - Air 4KV, Contact 8KV
Actual testing completed - Air 4KV, Contact 15KV

IEC 801-3 :1984 Radiated Electromagnetic Fields.
27MHz - 1GHz @ 15V/M
Standard requirement 10V/M

IEC 801-4 :1988 Fast Transient/Bursts
Standard requirement +/- 1KV
Actual testing completed +/- 4KV

10.2 ENVIRONMENTAL – BS EN 60068

The Pathfinder is housed in a factory sealed water proof housing that has been pressure tested to 10 p.s.i. Nitrile 'O' ring to B.S. 1806 : 1989 'Specification for toroidal sealing rings and their housings.'

10.3 TEMPERATURE TESTS – IEC60943 : 1998

Temperature function tests have been carried out on a representative Pathfinder 360 *ALPHA* instrument between the temperature range -50°C and $+70^{\circ}\text{C}$.

The tests demonstrated stability of operation of the instrument for both Earth Fault and Instantaneous threshold trip levels against temperature.

Operational stability was also demonstrated through the temperature range for the 40msec 'DEAD' time and the Electrostatic field. A full report is available on request.

10.4 VIBRATION ENDURANCE TESTING – BS EN 60068

Three Pathfinder 360 *ALPHA* instruments in different attitudes, were bolted to a section of 11KV wood pole which was mounted on the jig of a Vibration Machine Table.

A resonant frequency was established for the set up and Vibration Endurance Tests carried out for a period of 24 hours.

At the conclusion of the testing the Pathfinder 360 *ALPHA*'s were tested and found to be working correctly. No mechanical stressing or chaffing was observed on any stress point or part of the instrument enclosure and bracket.

A full report is available on request.

10.5 IMPACT TESTING – BS EN 60068

A standard impact test rig, with a pivoted weight, was used to impart a force of 2 Joules on any part of the Pathfinder 360 *ALPHA* instrument casing.

No damaged or marks were recorded during the test. A full report is available on request.

10.6 IMPACT TESTING - AIRGUN TESTS

Tests were carried out using a 0.22 BSA air-rifle.

Multi-hits at 6 metres from the lens did not cause damage to the polycarbonate casing. The tests demonstrated that at 3 metres from the conductors the Pathfinder is ideally positioned to minimise the impact effects of airgun pellets. A full report is available on request.

10.7 PATHFINDER CASING CHEMICAL RESISTANCE

Detail of the chemical resistance of the materials used in Pathfinder casing is available on request. The casing is manufactured to our specification of Polycarbonate, which includes an Ultra Violet inhibitor. The lid is manufactured from UPVC, which also has a high degree of resistance to chemical action.

11.0 STATEMENT of GUARANTEE

These tests underpin our claims of a satisfactory service life in excess of ten years, although longevity cannot be guaranteed by Bowden Bros. Ltd.

Our standard guarantee of parts and labour, or a replacement instrument, as deemed fit, will apply to any instrument that fails to perform its function tests under normal operating parameters due to component failure within 12 months of the delivery date to the company.

We are not able to guarantee goods that have been mishandled in storage, during installation or through poor packing if goods are returned to Bowden Bros. Ltd.

12.0 TECHNICAL SPECIFICATION

Line Voltage	-	6KV to 36KV
Installation	-	3 metres from lowest conductor and positioned directly below the centre phase facing towards or away from source of supply
Instrument Material	-	Polycarbonate body with UPVC screw lid and Nitrile Enclosure sealed to IP67.
Phase to Phase and Earth Faults	-	All current levels above 7 amps
Sensitive Earth Fault level	-	Minimum sensitivity 7 amps
Live/dead line Trip Level	-	7 to 20 amps depending on Automatic Gain Control.
Initial time delay	-	40 msecs
Voltage reset time	-	60 seconds
Temperature Range	-	- 50 ⁰ C to + 70 ⁰ C.
Humidity	-	0 - 100%
Sampling Rate	-	Continuous full wave sampling
Quiescent drain	-	40uA nominal
Bright WHITE LED	-	360 degree visibility.
Energy	-	0.24 joules of flash
Flash rate	-	10 - 12 seconds between flashes
Power demand	-	15mA.hrs 3hrs = 45mAH
Bright RED LED	-	3000 milli candela (normal LED 18 milli candela)
Power demand	-	25mA pulsed 40mS every 1.6 seconds
	-	0.65mA.hrs 24hrs = 16mAH
Battery	-	1 x Lithium Thionyl Chloride 16.5AH - 'D' cell
Battery Life	-	10 years at 20 degrees C
	-	Shelf life 15 years (nom)
Flash Rate	-	10/15 second intervals
Reset time	-	3 hours standard (6 hours optional)
Flashing Capacity	-	up to 600 hours nominal at 20 degrees C

NON-RECHARGEABLE LITHIUM CELLS and BATTERIES ADVICE on SAFE HANDLING

Lithium cells are very high energy systems and as such should be treated with respect. However, cells are designed with a safety vent, which will allow the quiet release of electrolyte under conditions of abuse. To ensure the trouble free use of lithium batteries, the following safety considerations must be observed:

1. TEMPERATURE

Cells and batteries should not be exposed to temperatures in excess of 70C (158F)

2. FUSES

Lithium multi-cell batteries are fused by the manufacturer. In some batteries a replacement fuse may be fitted.

UNDER NO CIRCUMSTANCES SHOULD THE FUSE BE REPLACED BY A HIGHER RATED FUSE OR A FUSE BY-PASSED. If in doubt about replacing fuses, contact the battery manufacturer. Particular care should be taken that unfused single cells are not overloaded or shorted.

3. DISCHARGING

Do not attempt to discharge a lithium cell or battery at a greater rate than that recommended by the manufacturer. Do not force the discharge of single cell or multi-cell batteries as this may result in overheating.

4. DO NOT CHARGE

Never attempt to charge a lithium cell or battery. In the event of accidental charging, the cell or battery may overheat and vent.

5. MULTI-CELL BATTERIES

Do not use single cells to make up a multi-cell battery. If a multi-cell battery is required, consult with the manufacturer who will design and supply to specification.

6. DESTRUCTION

Do not open, puncture, crush or tamper with the cells or batteries as this will release the electrolyte and also expose materials which are potentially flammable.

7. CONTAINERS

Never use lithium cells or batteries in a completely sealed pressure container. A suitable relief device must be incorporated in the container.

8. PRECAUTIONS

In the event that a cell or battery is accidentally shorted or starts to heat up, it should be disconnected immediately and removed to the outdoors or to a well ventilated area to cool down, taking care to protect personnel and surroundings. Once stabilised to a safe condition, the cell or battery can be disposed of in the normal manner.

Suitable protective clothing should be worn when handling suspect cells/batteries. If the skin has become in contact with the electrolyte, it must be washed with water.

9. DISPOSAL

Cell and batteries must be disposed of by a licenced disposal specialist. A certificate is issued following correct disposal. **DO NOT DISPOSE OF IN A FIRE.**

10. COSSH

Information is available from the battery manufacturer in connection with COSSH. Further information is also available from the battery manufacturer on battery safety and handling.

PATHFINDER 360 ALPHA

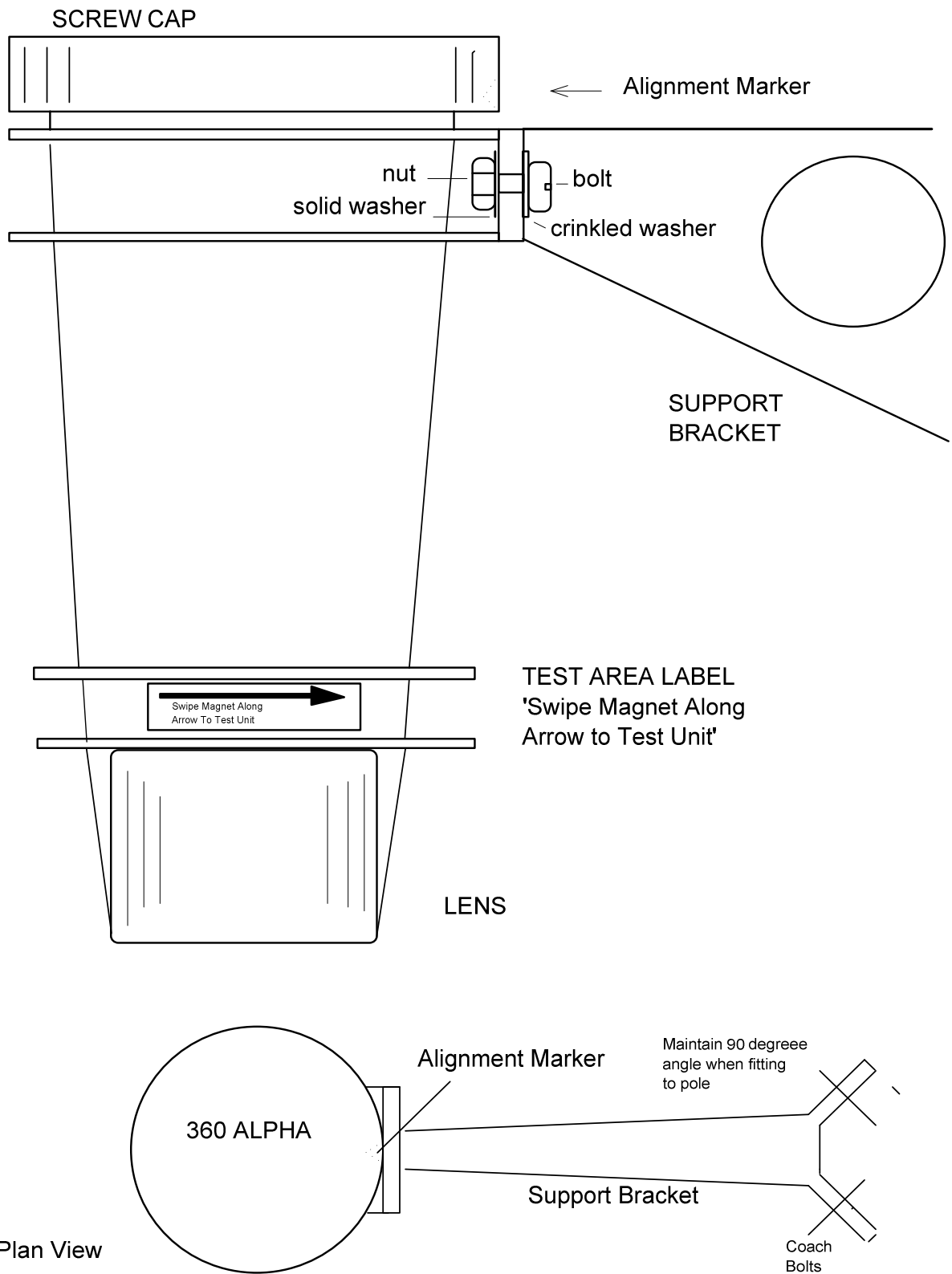
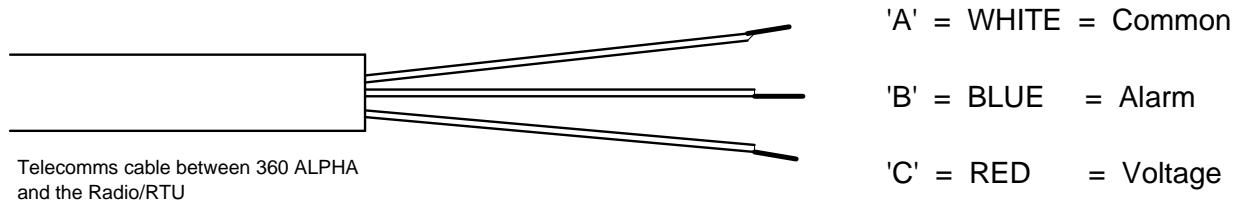


FIGURE 1

ROSCO SYSTEM

PATHFINDER 360 ALPHA TELECOMS PLUG



The Pathfinder 360 ALPHA Model RR is supplied with a 3.5 metre standard length of telecomm cable, which is supplied complete with a weathertight IP65 plug to fit the Pathfinder socket. The above colour code data is for connection to the radio/RTU.

If present the GREEN core is not connected.

The outer cable screen is not connected to the Pathfinder in the factory made plug.

To make the screen effective it must be only wired to the equipment at the radio/RTU end.

TERMINATING THE CONNECTOR CABLE IN THE RADIO/RTU

As a precaution to prevent to possibility of water passing from within the cable sheath into the radio/RTU cabinet it is advisable to seal the area between the cores just before the cores emerge from the gland with a silicon compound sealant.

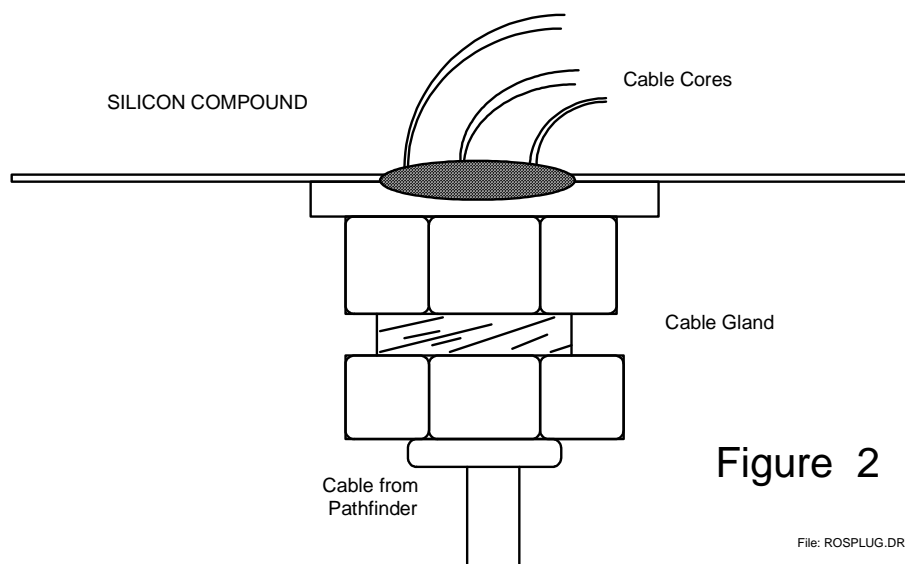
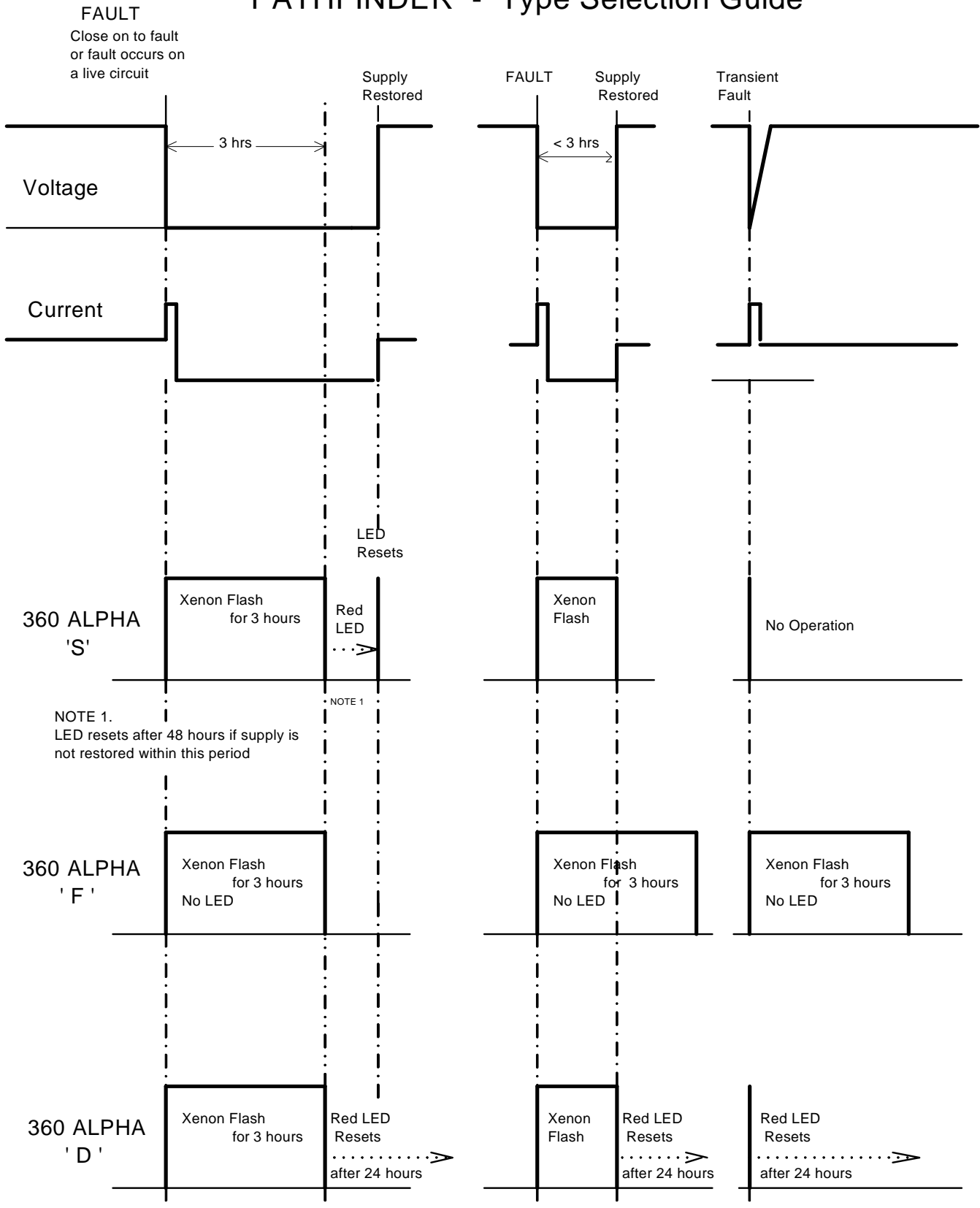


Figure 2

File: ROSPLUG.DRW

PATHFINDER - Type Selection Guide



File: PATHSEL.DRW

FIGURE 3