



REMOTE MONITORING SOLUTIONS

Hardware Installation Guide

OBSERVANT[®]

Observant Hardware Installation Guide

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Observant would like to thank the many customers who have offered valuable feedback and suggestions for content, both in this Guide and in the Observant Observant Desktop software.

This guide is updated on a regular basis and your feedback is appreciated and included in each edition. Please contact us if you require the latest version or have any questions.

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Before you start

Symbols and notation conventions

The following symbols are used throughout this User Guide:



Notes providing additional or vital information to the topic being discussed.



This icon indicates helpful hints, suggestions and short cuts.



A **caution** indicates a condition that may lead to equipment damage, malfunction or inaccurate operation.

Product care

While the components of the Observant system are designed with extreme environmental conditions in mind, there are a number of additional steps that can be taken to ensure the long life of the equipment.



Ensure an antenna or dummy load is plugged into a C1 unit's antenna post at all times. Leaving the antenna post open can cause damage to the radio unit.



Water level sensors are not designed to be completely immersed in water. The top of the level sensor must always be kept out of the water.



- Observant recommend that sensor cables be protected from UV light, birds and insects by containing them within a protective housing such as PVC and/or electrical conduit.
- To ensure the best possible reliability and long life of the system, carefully read this guide prior to installation.

Safety information

There are no power sources in a field unit or its associated sensors that can cause harm to people or animals. Inputs are protected against reverse polarity and outputs are current limited. Regular inspection of the connecting cables at the base unit and field units is recommended and any damaged cabling should be replaced to ensure reliable operation.

Terminology

Serial Port:

Also referred to as a COM port, the 9-pin socket on the rear of your computer that allows communication with the Observant C1 base unit.

If the computer does not have a Serial Port installed (pictured right), one can be added with either a USB-Serial Port adaptor or an add-on card.



Serial port socket.

Observant Desktop:

Observant Desktop is the name of the software used to manage the field units. It can be configured to manage the field units either through a base unit connected directly to the computer or over the internet.

C1 unit:

The base communication unit that connects to a management computer running the Observant Desktop software. It communicates with the C2 units using a UHF antenna.

C2 unit:

The main component of the Observant system, the C2 is responsible for managing and retrieving data from the measurement and control devices attached to it. The C2 units in a system communicate with one another using an inbuilt UHF radio module.

Base unit:

The base unit is the C1 unit directly attached to your computer.

Field unit:

A field unit is a remote C2 unit that sends data via the radio to the base unit.

RS485:

The communication method used by many of the devices attached to a field unit. One of the major strengths of RS485 is that many devices can be attached to a single cable run, simplifying the installation process.

Port output:

The Port Output pins on the C2 provide the power required by some external sensors

Port input:

The Port Input pins on the C2 count pulses from certain types of external sensor.

Introduction

Increasingly, the “old ways” of farm infrastructure management are becoming too expensive. The pressures to reduce costs, improve efficiency and update management practices, along with the increasing cost of fuel and the costs of OH&S mean that a growing number of managers are turning to automation to lower costs, improve practices and at the same time provide better information. The growing trend of unoccupied farms is also creating new issues that need cost effective solutions.

The Observant system can provide all the information needed to manage your water assets. The system is versatile, robust, and a huge time saver. Staff who once spent 40 to 80 hours a week driving between watering holes, just to check that there is sufficient water and everything is working as it should, can now be assigned to other tasks without any loss of information. With the historical data provided by the Observant Desktop software, much more use can be made of the collected data than if it were collected manually.

In order to achieve the holy grail of the virtual bore run, you need to consider your water management needs. The C2 has been designed to be extremely versatile and suit individual needs.

Introducing the C2 unit

The C2 is the affordable backbone of the system. With its built in UHF radio it can communicate with other field units over wide areas. If the field units are further than 25km or have terrain interference, the system will pass information between intermediate field units to get it there. The system can utilise a wide range of sensors and control devices such as rain gauges, flow meters, engine controllers, Mono solar pump controllers and it can even track the GPS positions of your fleet of vehicles.

The versatility of the system is one of its great strengths and makes it potentially very powerful. Not only will you see that the dam is getting low, but also why it is getting low. If the pump has broken down or, worse, the bore has run dry, the Observant Desktop software will show the full picture.



The C2 field unit.

In order to achieve the most from your new system you need to look at your overall requirements and ask, *what are the objectives that I want to achieve?* It could be as simple as the remote monitoring of dam and tank levels, or as advanced as the complete automation of your water assets.

Example: I want to make sure all my cattle or sheep have water and that my water assets are effectively managed and serviced while ensuring that my bore runners aren't wasting their time checking water holes that are functioning correctly.

Initial planning

In the initial planning stages, you need to look at what existing assets are on your property and how they can be best used. The Observant system takes full advantage of what you have and might wish to develop in the future. Your assets might look like this:

Policeman's Bore:

- 1 Turkey nest
- 1 Kubota RK-95 with a Mono Helical rotor pump
- 2 Troughs
- 17.4 kilometres from base station
- 8 kilometres from Jacks bore
- GPS co-ordinate

8 Mile:

- 2 interconnected 20,000 litre tanks
- 1 Mono Solar controller
- 1 trough
- 27 kilometres from base station
- 8 kilometres from Joe's bore
- GPS co-ordinate

While you are taking account of your assets, you should also make a sketch and mud map of the layout surrounding the bores noting such things as pipe inlets and outlets, distances between individual assets and any local terrain issues. Also take note of the distance between the base station and the nearest bore. The use of GPS is usually the best way of doing this, as UHF works in a direct line, i.e. "how the crow flies". GPS co-ordinates will also help if you wish to take advantage of a full UHF radio coverage survey. Observant are able to assist with planning services if required.

Appendix A at the back of this document contains a simple form that can be used to note the required information. The form should also be used as an installation record during the installation. It will assist both yourself and Observant if you have any problems in the future. Please send a copy of any completed forms and any photos to us, for use by our support personnel. Should you ever have a problem, this information can be extremely useful and will enable our support staff to solve your problem more efficiently.

Spend some time reading through the list of devices that can be connected to the C2 and think about what you could implement on your property and how this could help your management of the assets under your control.

Devices supported by the C2 field unit

The C2 includes support for a wide range of devices, and new devices and applications are always under development. Devices currently supported or nearing completion include:

Observant L1 level sensors: Level sensors monitor the water level in a dam or tank, and are available in 2400mm, 2000mm or 400mm lengths. Other lengths are available on special request.

Observant M1 motor controller: has been designed for either the Kubota or Yanmar range of motors but will work with just about any type of motor that has a fuel solenoid fitted. The M1 features automatic start/stop with watchdog automatic shut down if a fault is triggered by oil pressure, water temperature or water flow. Other sensors can be added if required. Note that the motor must be electric start with a fuel shut off solenoid fitted to the fuel pump.

Flow Meters: The C2 will interface to many standard flow meters that support a pulse output.

Camera: Useful to confirm that the cattle are using the water hole and checking on their visual condition when you can't get access to the water point.

Well Depth meters: Check that the flow rate from your bore is sustainable and measure the height of the ground water table.

Electric fence monitors: Provides a voltage reading to ensure the fence is working correctly, and raises an alarm if the voltage drops below a certain level.

Rain gauges: Monitor how much rain has been falling in that inaccessible paddock out the back of your property. With the correct software, the data can also be exported and used to predict pasture growth.

Mono solar pump interface: Interfaces directly with a Mono Solar pump controller to provide full control and data from the pump (model dependant). The interface can provide information such as flow rate and effective pumping time per day, depending on the model of pump controller as well as remote switching dependant on the model.

Nutridose water medicators: Monitor water and nutrient usage and view its history.

Windmill: Monitor windmill activity and by comparing this with flow data, diagnose windmill wear or faults as soon as they happen.

Northern Design Multicube: Monitor the health and consumption of your 3-phase power supply.

Tru-Test XR3000 Livestock monitor that tracks eartags and stock weight.

3G Modem: Where Telstra NextG coverage is available, the C2 field units can connect directly to the internet via a 3G modem. The C2 can then be managed remotely via Observant Desktop, or directly from the Observant web server. See *Remote Monitoring using the internet* below.

Supervisory pressure switch: Monitors either a rising pressure above a pre-set point or a falling pressure below another set point on a pipeline. Alarms are generated if either condition occurs.

Vaisala Automatic Weather Station: Using ultrasonic wind detection and solid state rain fall detection, with no moving parts this is the first maintenance-free weather station ever produced.

Developing the concept

Once you have a full inventory of your assets, consider how you can make the best use of them.

For example, the C2 interface to the Mono solar motor controller can inform you that the bore is currently producing 1200 gallons per hour and is operating for 9 hours per day on average. While this information is useful, it doesn't provide the full picture. Adding a level sensor to the tank, as well as a flow meter to the water trough, would allow you to assess whether the system is functioning correctly and free from abnormal situations.

Some specific problems can be identified remotely if you have enough information from the site. The use of a flow meter will provide information such as low flow rates, burst pipes and simple information such as what time the stock are coming in to have a drink.

Adding a rain gauge or weather station now or in the future can assist with predicting pasture growth rate data. Remember, new features can be added in future as the need arises.

All sensors can be compared to each other on a history graph. It is very easy to simply overlay the water level in the tank to the outflow to the trough. For example, if you see the tank water level decreasing with little or no flow to the trough, it may indicate a leak. Combine this with the information from the C2's inbuilt temperature sensor and you will have a more complete picture from which you can base your management decisions.

Radio Communication Overview

The C2 units use UHF radio on channel 22 to communicate with each other. The C2 units can be configured to use channel 23 where 22 may be congested. A zone number is assigned to your installation to prevent any miscommunication when the system is also in use on a neighbouring property. Each C2 on your system has a unique serial number and will ignore any data not intended for it.

As with any UHF radio use, there are limits imposed by the terrain and government regulation. UHF works in a line-of-sight manner with a limit of around 25km. This limit is imposed by the curvature of the earth and the natural limits of the power produced by the UHF system.

To work around this issue, the C2 can act as a router. When a signal needs to be passed to a location that is out of range of the base station, a C2 in an intermediate location can forward the data to the intended C2. This routing ability is configured using the Observant Desktop software. Multiple "jumps" are possible between routers to reach distant locations.

When planning your system, you need to take into account the distances and terrain to properly establish effective communication. In some circumstances this will require a C2 to be set up in a router configuration. Sometimes the router C2 will require a base station type antenna with a larger battery and solar panel to cope with the increased radio usage as it retransmits the data.

Remote Monitoring using the internet

A typical installation uses a computer at the homestead running the Observant Desktop management software, which is connected to a base C1 unit which provides the link to the field units. In cases where a nearby computer is impractical to install or if monitoring when away from the homestead is required, the field units can connect to the Observant website. Your Observant

system can then be remotely monitored and managed by logging into the website and viewing your system from there.

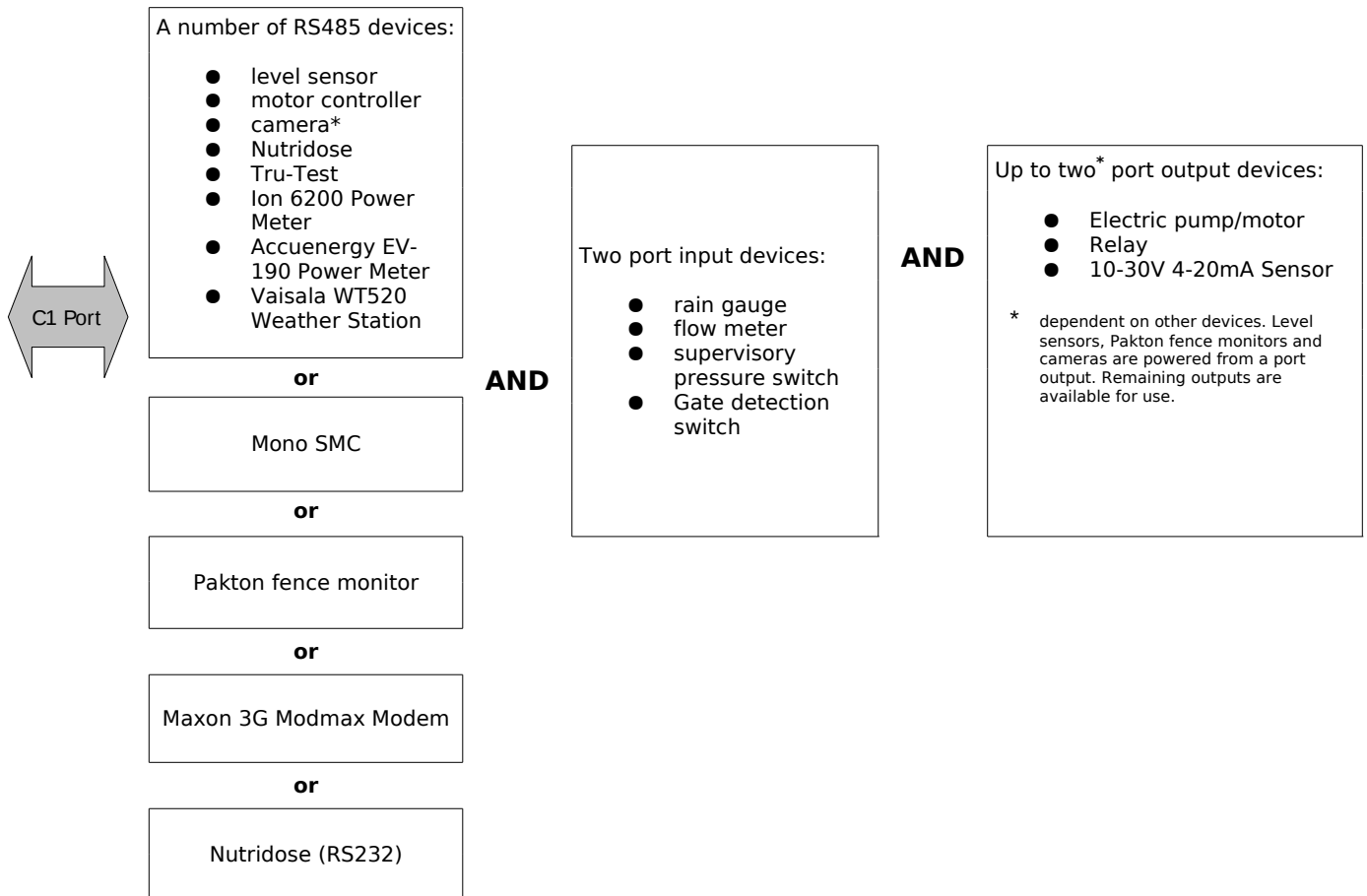
3G Modem: The Observant system can be accessed remotely through a 3G modem installed directly into a single C2 unit. The modem is powered directly from the C2 and all data to and from the remote sites is then transferred via UHF to and from this unit. This unit then retransmits the data across the Telstra NextG network to the Observant web server so it can be accessed remotely by any internet connection. The only requirement is a NextG service available at one of the locations that requires monitoring. Observant is able to supply and organise the required Telstra Sim Card and account on request.

Serial-Ethernet Bridge: The Observant system can also be monitored using a Serial to Ethernet Bridge utilising the clients existing internet connection. This device simply plugs into the base unit installed at the homestead and the internet router attached to network. The advantage to using this system is that it uses a pre-existing internet service at the homestead. The modem used for the internet connection must support port-forwarding and may require some additional configuration. Observant's Technical Support is able to assist with the correct models and configuration settings if required.

Combining devices

Each port of a C2 unit can have a number of attached devices. While many devices can be connected to a single port via a single cable run, there are some device types that can not be combined on the same port. In addition, adding some devices will affect the options for other devices. For example, a level sensor obtains its power from a port output and this output is then unavailable for other purposes.

The following chart outlines the combination of devices that can be attached to each port.



Examples:

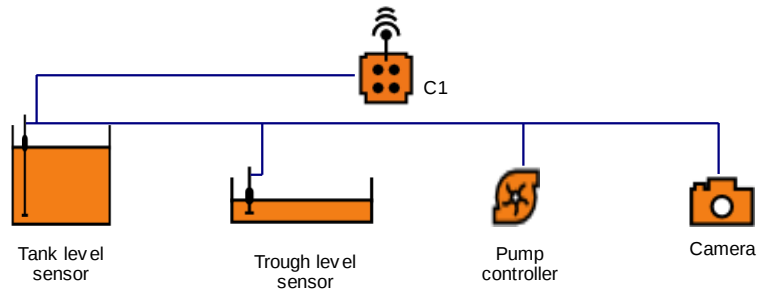
- A tank level sensor, M1 motor controller, a camera and a flow meter can all be connected to one C2 port. As the camera and level sensor each use a port output for power, there are then no port outputs available for other purposes.
- A Mono SMC, a rain gauge and a flow meter can all be connected to a single port.



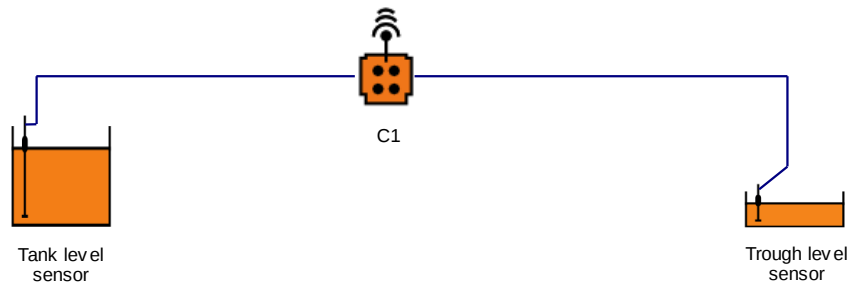
Older Nutridose medicators may be equipped with an RS-232 serial port rather than RS-485. Check which type you have before planning the cabling to your field unit.

If you are unsure whether you can connect a particular combination of devices, please contact Observant support for advice and a custom wiring diagram for your application.

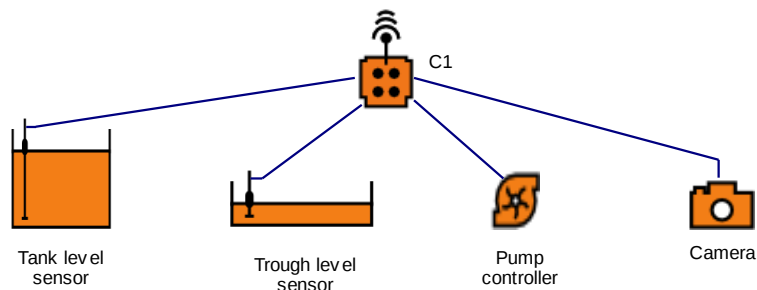
Cable run examples



Where there are multiple devices, the RS485 cable should be run in a daisy-chain configuration where a single cable runs from the C2 to the farthest device via all the other devices. i.e. a straight cable with the short links wired in a 'T' format from the four separate wires.



In cases where a daisy-chain is not practical (e.g. a trough level sensor on one side of the C2 and a tank level on the other) a star formation has been proven to work at short distances (up to 20m in each direction) - in this case a the C2 port terminal block can be used to cable all devices to the port.



The star formation should be avoided where possible, as it can result in communication problems.



- When using a daisy-chain configuration, ensure that the cable joint is as close to the device as possible. A general rule is to have no more than 12 inches of wire between the device and main RS485 cable. To ease installation, Observant can supply a short cable with exposed ends that plugs directly into the RS485 lead from the device. It is then a simple process of joining the same coloured wires together and then plugging it into the device.
- Observant have tested the RS485 communications up to 400 metres. In theory, the RS-485 cable should give reliable communications over a kilometre with appropriate termination, cabling and device placement (i.e. short 'stubs').



Multiple device type cable being spliced using the suggested connectors

Preparing for the installation

When planning your installation, keep in mind that the equipment needs to be mounted and protected from animals and the harsh Australian environment. Some locations will be very simple to install, needing no more than a concreted post to mount the C2, with a cable enclosed within conduit. Other equipment may require the construction of more elaborate cages to protect such things as trough level sensors from the cattle. Further examples include:

- Cantilever Level sensor mounts for turkey nests and tanks.
- Fencing to protect the C2 field unit when being used as a standalone repeater in a location that is exposed to animals.
- Flow meter protection.
- Trenching for cables.
- Additional protection for areas that suffer from high levels of bird activity. This is highly recommend around open sources of water such as dams and creeks.
- Pipe works for installation of water meters.
- Motor controllers will often require mounting brackets for RPM sensors and posts to mount the equipment on.
- Mounting Brackets to Fix the C2 unit on to the tops of tanks.
- Poly fittings to suit your pipelines.

As with any electronic equipment installed outdoors, It needs to be protected from sunlight, water, animal, and insect damage. Observant have designed the hardware to be compatible with industry standard 25mm conduit fittings. It is strongly recommended that grey conduit is used at all times to protect any cable that is exposed to the elements.

Most hardware for protection and mounting can be manufactured on site to reduce installation costs. If you require any help with the design of any protection or mounting equipment, please contact us.

Cabling recommendations

- Use 25mm outdoor conduit. Grey conduit is more UV stable than orange conduit.
- Conduit should be painted where exposed to direct sunlight to provide additional UV protection.
- Use of 'flexible' conduit is discouraged as it is more prone to cracking when exposed to sunlight and bird damage. Stainless steel flexible conduit may be a solution were flexibility is required for such connections as the motor to M1 motor controller cabling.
- Joints should always be made using the appropriate glue.
- Use of standard conduit junction boxes is recommended for housing plugs and connections. A product such as the Tyco 2/5 pair gel-filled enclosure is suggested to protect the joint when using direct burial cable. This will provide a degree of mechanical protection to the cable and also help provide waterproofing to the physical junctions.
- Conduit drain holes should be cut into low points wherever vertical sections are exposed to the elements to assist with drainage.
- 3M Scotchlok UR2 connectors - 3 wire, are recommended wherever bare wire connections need to be made, such as inside junction boxes. Most electrical supplies outlets stock these items.
- Telstra type direct burial, lead in cable is suggested. This cable does not require the use of conduit when buried in suitable conditions. The cable also features a water blocking gel and is termite resistant. For longer runs a minimum conductor size of 0.64mm is recommended. Conduit is required where ever the cable is exposed to the elements.
- Tyco 2-5 pair Gel filled enclosures are recommended to protect any junctions in the cable. These enclosures are filled with a water blocking gel and will prevent any water damaging the connections.



Always leave excess cable present around any junctions that need to be made. It's easier to trim cable than add more later on if you have a problem or need to make a modification or repair.



Remember that each device needs a unique address on each individual circuit and that the addresses do not need to be placed in order.



Builders expanding foam or Silicon sealant should be used where-ever insects or moisture could enter the installed conduit. Termites, Lizards and other pests will work their way into any equipment that is not sealed correctly.

RS485 devices such as level sensors and the Mono solar pump interface are wired with pre-made cable sets in the simplest configuration, with one device per port. If you intend to install multiple devices on a single port, please inform us when you order so we can program them with a unique address. For example, it is possible to cable three 2000mm level sensors to a single port, but each must be assigned a unique address.

Radio communications

Overview: Data communication and how it differs to voice

The Observant system uses the UHF CB channel 22 or 23 to communicate with each unit. This system works in a similar way to normal voice transmission, with only one unit being able to communicate at a time; this is called half-duplex communication.

The C2 transmits its data in the form of a *packet* that contains an address. Each packet is broadcast to all C2 units and the packet is ignored by all C2 units except the unit with the specified address. When a packet is received by the intended unit it is then processed and a checksum value (the mathematical sum of the information) is then transmitted back to the original unit to verify that the information received was correct. If the information was not correct (based on the checksum) it will be retransmitted until the correct data is received. If this fails over a period of time or number of tries, the system then produces a “communications time out error” and notifies you of the problem.

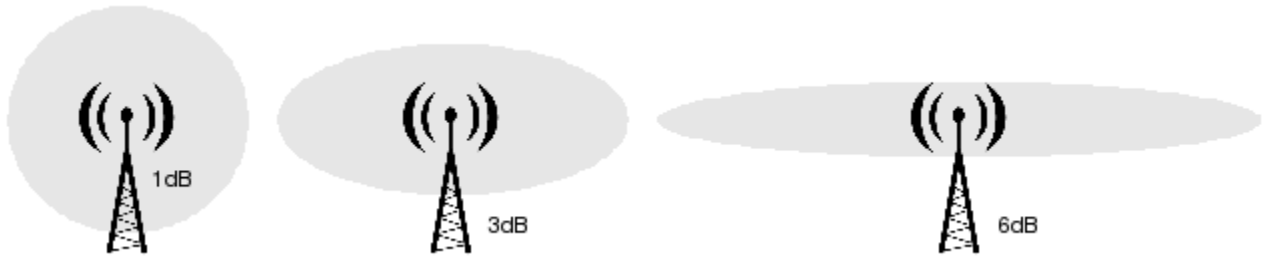
Routing and how it differs to a conventional UHF repeater

Most UHF users are familiar with the use of repeaters to transmit voice signals over a long distance. This works by using one channel to transmit and another channel to receive. For example, channel 5 uses channel 5 to transmit the voice signal and channel 35 to receive. Generally, repeaters are geographically located in the middle of the intended signal area and are located on large towers to provide the required coverage. The cost of these systems can be prohibitive to install. The Observant system produces the same outcome, but uses a technique called routing, where data for a C2 field unit is sent via one or more intermediate field units. When a C2 receives a packet of data, it contains an address. When the C2 unit receives a packet and has decoded the address data to find a further address, it will then retransmit this data to the intended C2. Routing can be used to extend the range, using multiple hops between the C2 units without the added expense of a repeater. Routing is also useful when direct communication with a field unit is blocked by hills. The use of routing also reduces the radio channel requirements from two to one.

Antennas

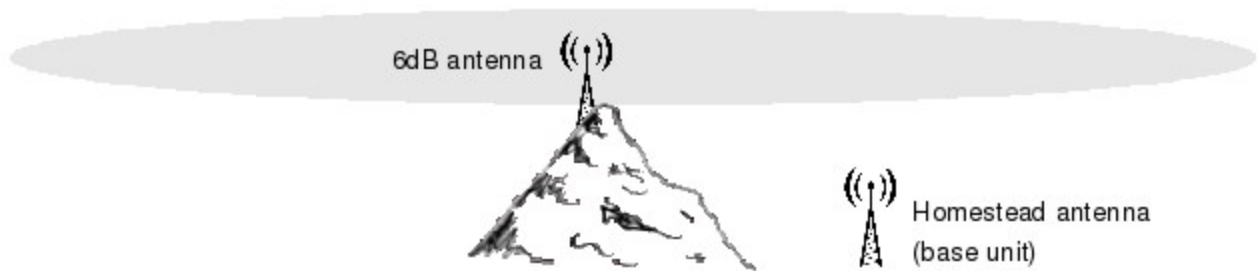
Many different types of antennas exist and their selection depends on several factors: the type of terrain, distance, environmental considerations and cost. Specific antennas have properties that are suitable for use in some circumstances and not others. The two main types of antenna that Observant use are the Raised Feed and Collinear. Other types of antennas may be required in extreme circumstances.

An antenna's main feature is measured by a mathematical factor called gain. Gain is measured using dB (Decibel) which is a measurement of radio signal power and also describes how flat the signal from the antenna is. A gain of 1dB will produce a 'round ball' of signal that is projected in all directions and elevations. A higher gain gives a signal that is projected into a concentrated horizontal plane and not vertically. Most base antennas have a 6 dB gain and thus project or receive the signal on a fairly flat horizontal plane. These antennas are good for using over a wide area that has little in the way of interference. An antenna that has a lower gain will tend to transmit and receive the signal over a wider angle, so it is more suited to hilly or undulating terrain. The lower figure also means that the signal will be dissipated over a wider area thus the signal will not be as strong at the receiver.

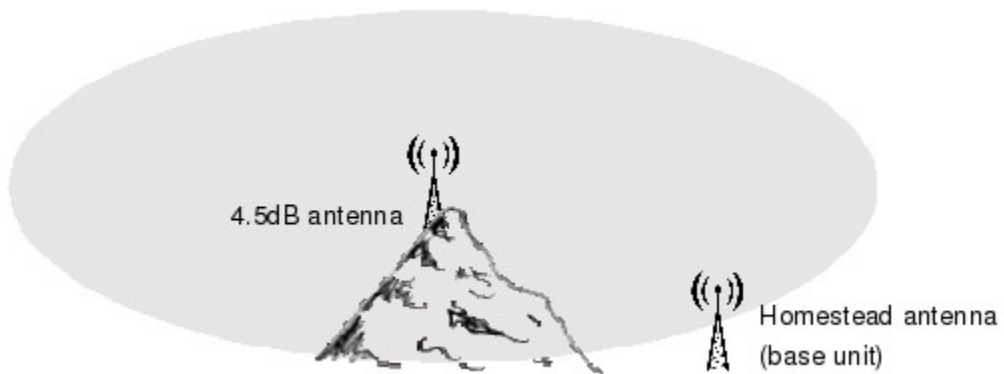


The general effect of using antennas with various gains. A lower gain antenna spreads the signal equally in all directions, whereas a higher-gain antenna sends a much stronger signal along a much narrower path.

The following diagram shows an example of incorrect antenna selection. Although there is a clear line of sight between the two locations, by incorrectly installing a 6db antenna on the top of the hill, the site below is underneath the signal area. The antenna on the top of the hill will provide a wide area of coverage, but anything below its transmission area will not be able to receive it.



Installation of the correct antenna now gives clear communications between the field unit and the homestead. Often a lower-gain antenna will do the job better in hilly terrain, because of its wider signal spread:



Antenna types

A **Raised feed antenna** is designed for use where a limited metallic mounting area is available. They are mainly found when mounting a UHF antenna to a bull bar or similar surface. Typically this is a 4.5dB gain antenna which provides a good balance of range and signal strength in most terrains. A lower gain antenna is available for use in hilly terrain when conditions require it, but these are limited to around 7 kilometres in range.

Collinear antennas tend to be longer than the raised feed and are made by winding a set length of wire around a fibreglass rod. These windings need to be wound in a special manner. These antennas produce a gain from around 6db and are suitable for use over open areas. Because the

signal is concentrated onto a flat, narrow plane the signal will travel a long distance but will not travel well over obstacles such as rock outcrops or hills.

A **Yagi** antenna is a highly directional antenna and is shaped like a UHF TV reception antenna. These produce a signal that is transmitted in one direction only and the signal is shaped like a cone in that direction. These antennas have a gain of around 12-18db but as they only transmit and receive in one direction they are unsuitable for use as a router antenna. The one advantage these antennas have is the increased range over other types of antennas. A Yagi antenna mounted at the right elevation can reach more than 50km with minimal signal loss. This advantage must be balanced with other needs and the significant installation skills required. The cost difference can also be significant.

Effects of terrain and antenna heights

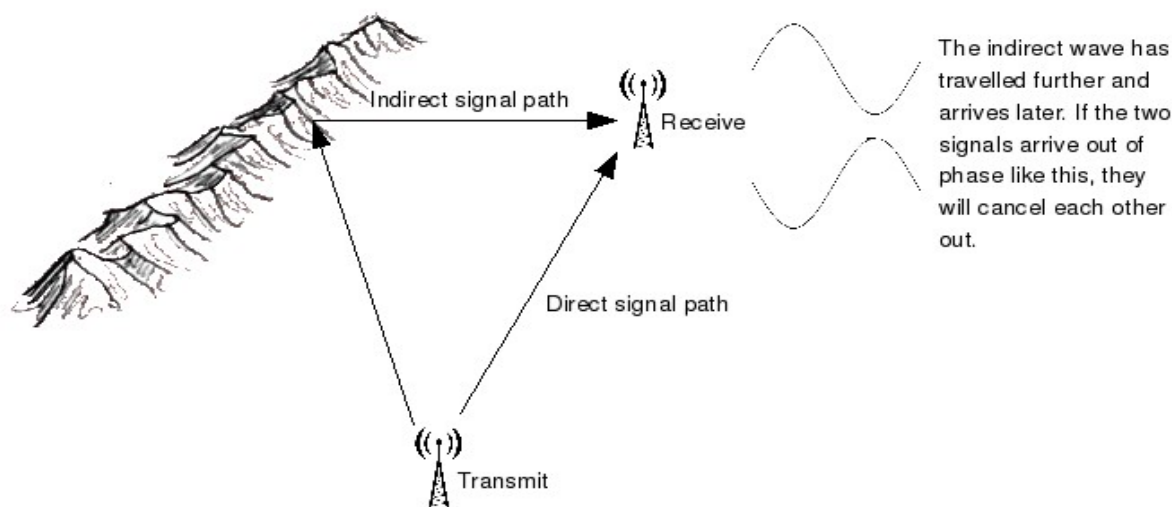
All radio frequencies will be affected by the terrain and to a lesser extent by the weather. UHF has the advantage of providing a crisp, clean signal over a fairly wide area, but it comes with some disadvantages. UHF is limited to a line of sight (the horizon on flat ground and the visible side of hills). In hilly areas the UHF system does not perform well over a very long range as the signal will be blocked by the terrain.

As the horizon forms the natural limit of UHF transmissions, the only way of increasing the transmission distance is to increase the distance to the horizon by lifting the height of the antenna. However, lifting the antenna results in higher loss from the cable. There is a point where the advantages gained from lifting the antenna will be negated by the loss from the extra cable.

Line of sight and why it doesn't always work

Many people will have experienced the frustration of voice based radio systems and the apparent "I can see you, but the radio doesn't work" problem. Often this is caused by the reflection (Fresnel) effect. This is the same effect that you see on a television with ghost images, and is caused when the signal arrives after travelling two different paths - one direct and another after bouncing off cliffs or mountains, for example.

In most cases radio signals will travel in a straight line until they run out of energy, but when that signal is "bounced" off an object (hill or curve of the earth) the reflected signal will produce a phase cancelling effect as the reflected wave will arrive at a different time to the original signal. This effect can also have some limited positive aspects if both signals arrive at the same time, as this will magnify the strength of the signal. The closer the object is to the centre of the line of sight the more pronounced the effect will be.



Antenna cable types

Observant uses two main types of cable for radio antennas.

RG58(u) cable is suitable for short runs of up to 4 metres. These cables have a high predictable loss over a set distance and are unsuitable for longer distances. As these are a higher signal loss cable, any length over 4 metres will nullify or even reduce the effect of raising the antenna. RG58(c) is a lower grade cable only suitable for UHF television antennas, as the loss of signal is too high to be used with radio frequency transmissions.

RG213 is a heavier cable with vastly improved properties for transmitting a signal and are thus better suited when the antenna is located more than 4 metres from the C2 unit. RG213 cable is suitable for runs of up to 15 metres; longer runs will suffer a signal loss effect that negates the effect of raising the antenna.

If higher antenna heights or longer cable runs are required, a higher grade cable is available (RU400 and Helimax) but cost becomes a major consideration and it may be less expensive and more practical to relocate the C2 unit.



Observant can provide a radio coverage survey to show what communication quality can be expected based on the terrain of the area and the location of the C2 units. Based on the results of this survey, Observant will recommend the appropriate methods to work around terrain and distance limitations. Often a combination of correct antenna selection, antenna height and routing can be employed to give excellent results, even in adverse geographic conditions.

The only information required for this survey is a set of GPS points for each field unit location and the base unit.



This site provides a very simple explanation of basic radio communication:

<http://www.zytrax.com/tech/wireless/intro.htm>

Another useful site, with a more technical aspect is:

<http://www.radio-electronics.com/info/antennas/index.php>



Radio equipment installation golden rules:

- Ensure all connectors are free from dirt and any build up of corrosion.
- Ensure the connections are weather proof and have a solid mechanical connection. Adhesive backed heat shrink tubing is recommended to weather proof any RF connections that are exposed.
- Keep the cable run as short as possible. The longer the cable, the weaker the signal transmitted from the antenna.
- Put a loop in the cable next to the antenna as this helps to prevent water ingress through the cable into the receiver. The loop should never be smaller than 4 times the thickness of the cable.
- Leave the tails on any cable ties that are exposed to birds. This acts in two ways: to discourage birds from landing on the cable and also as a diversion when the bird decides that the cable looks edible.
- Observant suggest running the cable on the inside of the post to reduce the chance of bird damage.

Hardware installation

The Observant field and base unit kits have been designed to be easy to install and configure, and should require little more than securely mounting the equipment and connecting the relevant devices and base PC.



- Before commencing the installation process please cross check all items on the installation requirements check-list attached.
- Before installing any field units in their final locations, set them up near the base unit and configure them. Configuration of field units is described in the Software section of this user guide. If any problems arise during configuration, it will aid troubleshooting if all units are in the same location.

Important installation notes



Do:

- Mount the base unit antenna at least 10 metres above ground.
- Use a low loss coaxial cable if the antenna cable is over 4 metres long. Observant recommend RG213 antenna cable as a minimum for this purpose.



Don't:

- Don't position the base or field unit antenna near metallic objects or water storages that absorb radio signals, e.g. water tanks. As a general rule the field unit needs to be placed on the northern side of a water tank to capture the sun but it also needs a direct line of sight to the router or base unit to allow radio communications.
- Don't position base or field unit antenna within 3 metres of other transmitting or receiving devices, e.g. UHF antennas, TV antennas, satellite dishes and HF transceivers.
- Don't use a cable splitter on base or field unit antenna cables. i.e. don't attempt to use an existing antenna with a splitter.



Observant remote management system in use at Pigeon Hole Station, NT

Allocating time for the installation

The Observant system has been designed for installation by station employees using basic mechanical skills and simple logic. Many installations will be fairly simple and will only require the attachment of pre-made cables.

Observant is able to provide installation training service based on your needs. The time taken to install your system depends on the complexity; a simple C2 connected to a trough and tank level sensor could take as little as two hours including all the conduit work after the completion of any mounting work that is required.

Most people find the following methodology to be the fastest and most effective.

1. Mounting equipment: concreting and the placement of any required poles or mounting hardware. Initially placing the mounting hardware at all sites in one run will allow the concrete to dry during installation of the base unit.
2. Base unit Installation. The installation of the base unit at this time will allow radio testing from each location to be conducted during installation of each individual unit.
3. Field unit assembly and testing before the units are physically installed into their remote locations. By using a bulk testing and assembly method, many problems can be resolved at the homestead, saving unnecessary trips back to remote locations to resolve the issues. Ensure that the field units are located a reasonable distance from the base unit to allow for the antenna reception and transmission patterns. If the field unit is placed directly underneath the base antenna it is likely that communications be poor.
4. Installation of each individual site. Once each field unit is known to be operating, it can be installed at their final location. After completing the installation in each location be sure to run a series of tests to ensure everything is operating as expected.

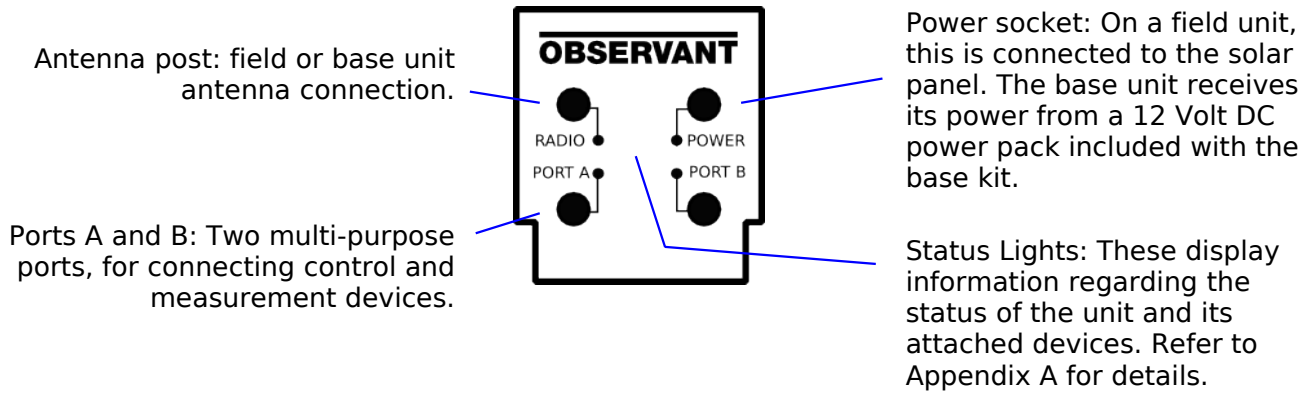
As a indicative guide the following installation times could be achieved.

Item	Time	Work required
Base unit	<ul style="list-style-type: none"> ● 3-4 hours for one person. ● 2-3 hours for two people. 	<ul style="list-style-type: none"> ● Antenna mounted on the roof or on a pole. ● Cable run into the office from the antenna. ● Mounting of the base unit ● Software installation.
Basic field unit	<ul style="list-style-type: none"> ● ½ hour for one person. 	<ul style="list-style-type: none"> ● Mounting the C2 onto a 2 1/2" or 3" pipe concreted into the ground.
Camera	<ul style="list-style-type: none"> ● 1 ½ man hours. 	<ul style="list-style-type: none"> ● Manufacture of a suitable mounting bracket and attachment of the camera to a suitably stable pole and placement of the cable into 25mm conduit.
Level Sensor	<ul style="list-style-type: none"> ● ½ hour for a plastic tank. ● 2 - 3 man hours for a dam using the suggested cantilever mounting. 	<ul style="list-style-type: none"> ● The tank will require a 28mm hole drilled next to the access cover with a U-bolt and piece of flat bar bent into a 'L' shape to prevent movement. ● See the Installation notes series for cantilever level sensor installations.

Item	Time	Work required
Flow meter	<ul style="list-style-type: none"> ● 1 ½ man hours depending on trenching requirements. 	<ul style="list-style-type: none"> ● Cut into poly-pipe and install the flow meter using standard female poly fittings. ● Run cable into the C2 via conduit. ● Attach cable and test functionality.
Motor controller	<ul style="list-style-type: none"> ● 4-5 man hours dependent on type and model of engine. Yanmar TF - ASP used as an example. 	<ul style="list-style-type: none"> ● Install motor controller onto mounting surface. ● Run cables to motor (using wiring loom for Yanmar TF - ASP motors). ● Mount RPM sensor ● Mount Flow switch. ● Mount supplementary power kit. ● Test and configure motor controller. ● For further details of work required see M1 hardware manual.
Nutridose	<ul style="list-style-type: none"> ● 1 man hour dependent on distance to C2. 	<ul style="list-style-type: none"> ● Plug in the supplied cable, install the cable protection and test.

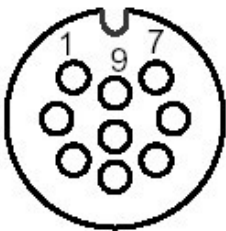
All the times listed are cumulative when multiple devices are being installed at a site. Times exclude the time required to install and concrete the required mounting equipment.

C1 unit connections



Field unit port pin out diagram

Looking into the socket of the field unit, the pin connections are defined as follows:



Pin	Function
1	RS232 RX (marked with a dot)
2	Input 1
3	Input 2
4	Ground
5	Output 2
6	Output 1
7	RS232 TX
8	RS485+ (A) (middle pin)
9	RS485- (B)

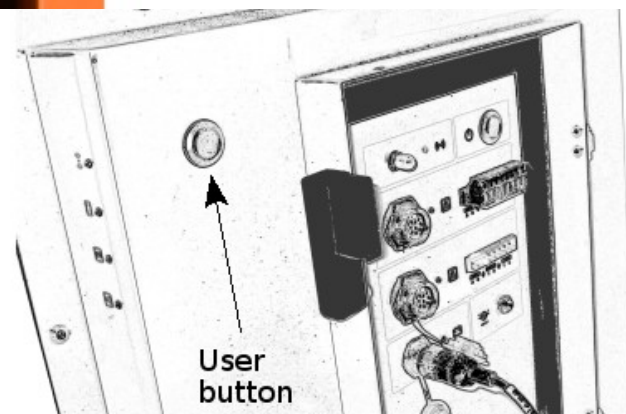


Output 1 is often used as the power source for RS485 devices such as level sensors and cameras. Before attempting to connect any other device to a port output, ensure it is not being used as the power source for these sensors.

C2 unit connections



The C2 user button is the silver button located at the top left corner of the front panel housing. The user button is used for resetting the C2 to factory default settings (see *Appendix E - Recovery Mode*) or can be used to show that the unit has been visited. Future revisions of the C2 will also support other functions.



Port terminal blocks

The C2 field unit duplicates a number of port connections on the terminal block for each port.

The RS485, port input and port output connections are available on the terminal block to simplify wiring multiple devices to a port. By convention, wire colours for RS485 device connections (e.g. level sensors) are:

Pin	Function	Wire colour
RS485A	RS485+	Blue
RS485B	RS485 -	Yellow
Ground	Ground	Black
Output 1	General purpose output	Red
Output 2	General purpose output	none (arbitrary)
Ground	Ground	Black
Input 1	General purpose input	none (arbitrary)
Input 2	General purpose input	none (arbitrary)

Resetting the C2 unit

In cases where the C2 unit becomes unresponsive, it may be necessary to reset the unit. To reset the unit, hold in both buttons on the rear of the front panel until the unit switches off (all LEDs will turn off). Release the buttons and an amber indicator will confirm the successful reset. This will be followed by the start up sequence.

Radio location considerations

C2 units communicate with the base unit using UHF radio (usually on channel 22). To ensure trouble free operation, check that the installation location has adequate UHF radio coverage from the base unit site.



- The field unit antenna should not be mounted close to large metallic structures as this will reduce the range of the radio. This includes water tanks or buildings containing corrugated iron or steel-reinforced concrete.
- The C2 unit's antenna should be located as far as practical (minimum 3 metres) from any other radio antenna, particularly other UHF radio antennae.
- Do not place a field unit antenna in any hollows where the terrain can prevent effective radio transmission.



- Mount the base kit C1 using the base mount provided. Ensure that it is in close proximity to the base computer and that the serial cable reaches the PC's serial port.
- Install the base unit antenna in a convenient location (e.g. on the roof of the building). Ensure that the antenna is close enough to the base C1 to be reached by the provided cable.
- Secure the base antenna to the pole or roof using the u-bolts provided. (You may require further means of security to ensure that the antenna is safe and not obstructing anything.)
- Connect the base antenna to the C1 using the cable provided. (A standard 12m cable is supplied, longer lengths can be supplied on request.)
- Power up the C1 using the power pack supplied. To confirm the unit is powered, check the indicators on the front panel. After a start-up sequence, you should observe a series of flashing green indicators. If this is not the case, please refer to Appendix A *Interpreting the Status Indicators*.
- Connect the serial cable to a free serial port on the base PC. Connect the other end to Port B on the base unit.



If the base unit antenna is secured using guide wires, ensure that insulation blocks are used to help safeguard against lightning and interference with other radio equipment. In areas of high lightning activity a lightning arrester is recommended to protect equipment from lightning strikes.



Field kit installation - C2 field unit

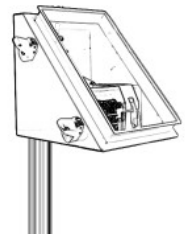
The C2 field unit contains an integrated battery, solar panel, charger, radio and computer housed in a casing that provides protection against the elements and pests.

The C2 consists of two main components: the battery box, which contains the battery, mounting bracket and hinges for attaching the front panel, and the front panel, which includes the solar panel, port and radio connections.

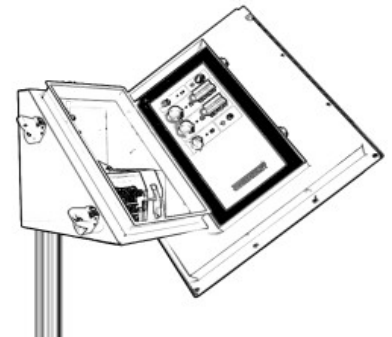
Installation

1. Securely drive or concrete a 2" or 3" gal pipe into the ground, or securely attach it to another structure. The C2 includes additional mounting holes if it is preferable to mount the field unit to an existing structure. Note that in this case, there must be sufficient clearance for the C2 door to swing open.

2. Mount the field unit onto the pole using the three supplied cable clamps. Cut the pole so that it does not protrude more than 10-20mm above the top of the solar panel as this may affect the performance of the antenna.

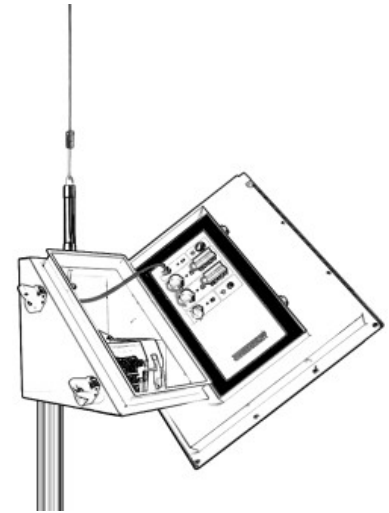


3. Attach the front panel to the battery box using the hinges on the right-hand side of the battery box and front panel.

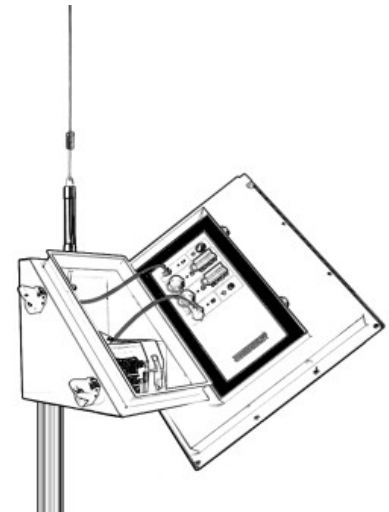


4. Position the field unit so that the solar panel is orientated with its face pointing towards true north. True north is approximately 10 degrees east of magnetic north.

5. Attach the antenna passing the cable through the antenna mounting hole on the top of the battery box. Use the supplied tube spanner to tighten the antenna mounting nut. connect the antenna to the antenna port on the rear of the front panel.



6. Plug the battery cable into the power port. If there is adequate sunlight, the system will power up and after the start up sequence the front panel indicators should flash green. If this is not the case, please refer to Appendix A "Interpreting the Status Indicators". Note that a C2 that has been without charge for some weeks might start up with its port LEDs flashing orange. This is normal and indicates that the battery is not sufficiently charged for the unit to start. Leave the C2 attached to either a power pack or its solar panel. It will return to its normal operation once the battery is sufficiently charged, normally within an hour.



7. Close the front of the unit and secure it using the two black clips.

Special notes for field units used as routers

- A C2 unit used as a router may require a larger battery and/or use of a high-gain base station antenna with an adapter cable for the antenna.
- A C2 unit used as a router can and does work like a normal C2 field unit, allowing a full range of monitoring and control facilities.

Nutridose	State	ok
	Set Point	380 ms
	Last Nutrient	Today, 9:37
	N since refill	30 L
	Last Water	Today, 9:37
	W since refill	980 L

Description

In conjunction with the C2 field unit and the Observant Desktop software, real-time and historical data is displayed for full system status, including water flow, nutrient usage, dosing set-points and battery condition.

Cabling requirements

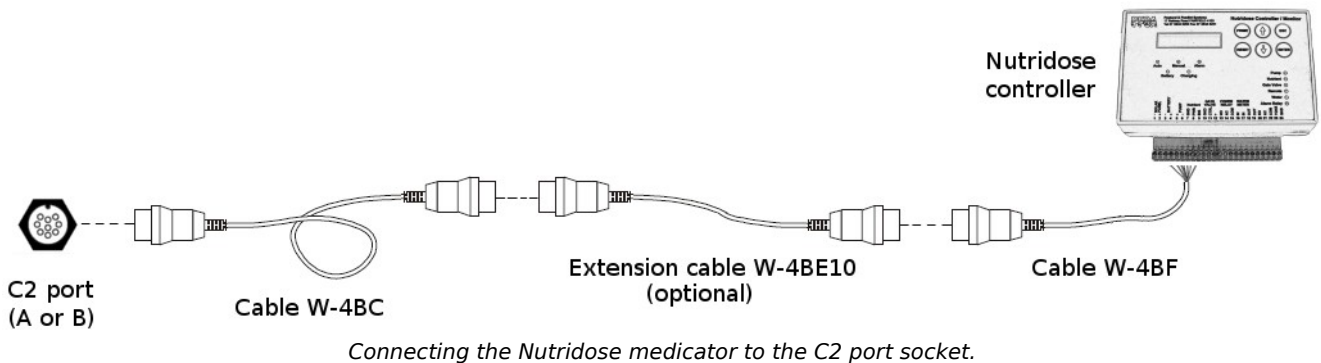
The Nutridose can share a single C2 port with other devices (see *Device Combinations* earlier) on a single RS485 cable run. Some early models of the Nutridose are limited to RS-232 communications.

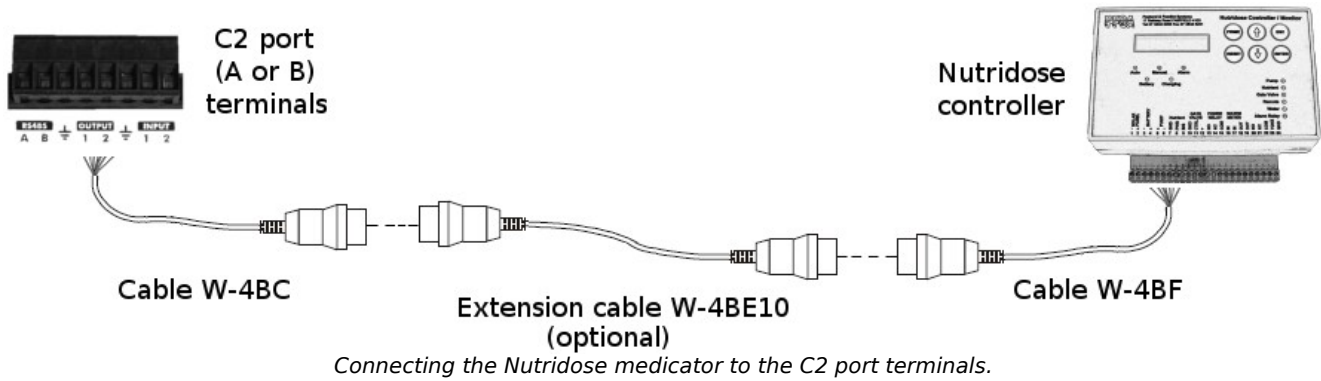
Special notes

- Be sure to follow the earlier recommendations for cable runs. If you have multiple devices on a single cable run, be sure that each has a unique address. If required, the address can be changed as described below.
- There are two versions of the Nutridose unit, one with only a serial connection and one including both serial and RS485 connections.
- Models with firmware version 5 or earlier may need an upgrade to operate reliably with the Observant system. The version number is shown on the second line of the Nutridose screen. As an example, V10.21 indicates version 10 of the firmware.

Connection to the field unit

The Nutridose medicator is connected to the C2 field unit using the supplied RS485 cable. It can be connected directly to the 9-pin C2 port socket or to the terminal block to allow other devices to share the port.





Terminal connections

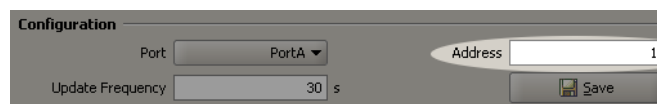
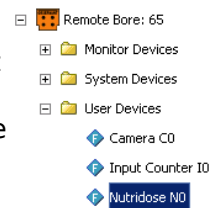
Nutridose terminal	Wire colour
GND	Green
RS485 A	Blue
RS485 B	Yellow
-	Red (not connected)

C2 port terminal	Wire colour
	Green
RS485 A	Blue
RS485 B	Yellow
-	Red (not connected)

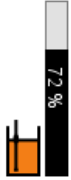
Setting the serial address of the Nutridose

The Nutridose medicator is assigned an address that must match the address set in the Observant Desktop software. If the addresses do not match, the Observant Desktop software will show a **device communication time out** error. To verify that the settings match:

1. On the Nutridose unit, press the button until the display shows SERIAL 01
2. In this example, the serial address is 1.
3. In the Observant Desktop software, enter Advanced Mode.
4. In the Navigator view at the left of the screen, select the field unit then select **User Devices, Nutridose**.
5. From the menu, select **Edit, Refresh** to retrieve the current settings from the field unit.
6. The configured address for the Nutridose device is shown to the right of the screen:



7. The address must match the address seen on the Nutridose screen in step 1. If it does not, change the address to match, then click **Save**.



Description

The L1 level sensor is a robust and maintenance-free water level sensor designed to suit a range of installations, including dams, overflow pipes and water troughs. The L1 measures water level down to 20 mm resolution with a 400 mm, 2000 mm or 2400mm range.

Electrical and Diesel pumps can be automated based on the position of the float. All automation is based on the Observant Desktop software and as such the software must be running at all times to enable this feature. If this is not practical then a remote Observant webserver solution may be possible, and more detail is available in the section *Remote Monitoring using the internet* on page 9.

Cabling requirements

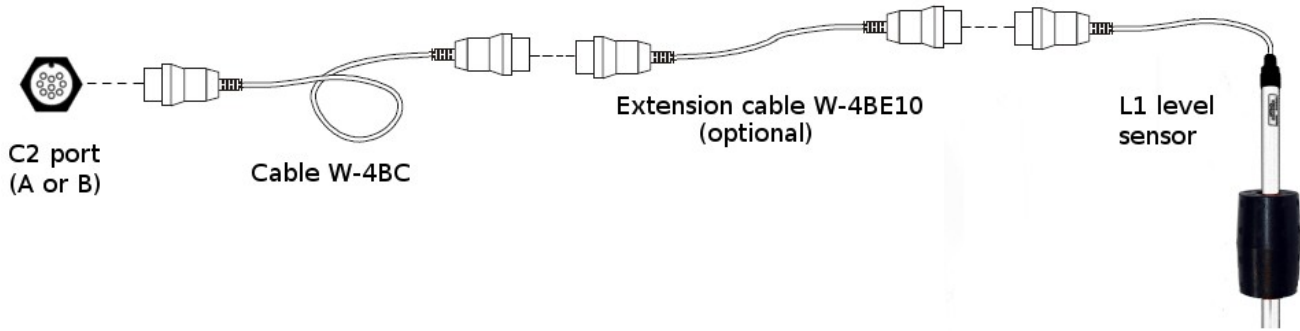
The L1 can share a single C2 port with other devices (see *Device Combinations* earlier) on a single RS485 cable run.

Installation

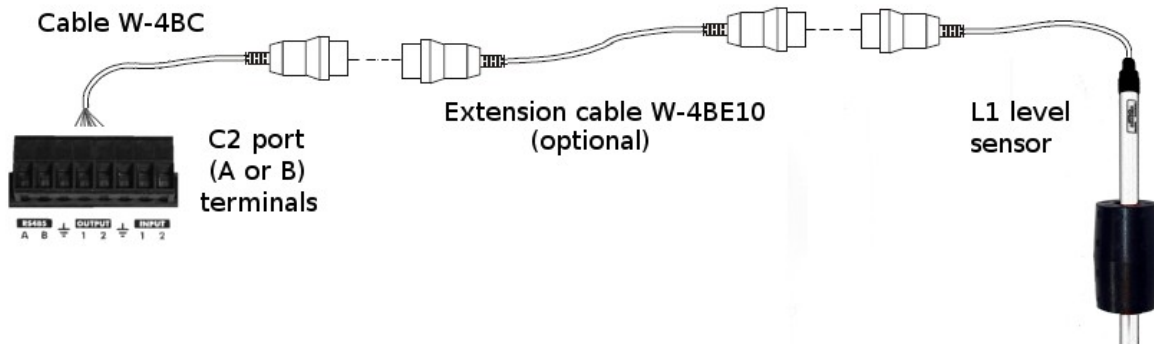
As the L1 is designed for use across a variety of installations, the instructions below are a guideline to be used as the basis for any installation.

1. Secure the level sensor with a u-bolt to ensure that it is held in a vertical position. An L-shaped bracket is recommended to avoid any movement when attached to a Poly tank. Other tanks will require a bracket to be made.
2. Ensure that the float is clear of any obstructions (i.e. tank walls etc.) and moves freely through the full range of the sensor.
3. Ensure that the maximum water level corresponds with a point 150mm (or more) below the top of the level sensor tube, as there are no sensors in the first 150mm. If the level sensor is not an exact fit for your tank, it can be calibrated later in the Observant Desktop software.
4. Try to keep the level sensor away from any areas that are subject to high levels of movement.
5. Connect the L1 to the C2 using the cable included and plug it into an available port on the C2. If the port indicator flashes amber and then green every 30 seconds (after the software driver has been installed), this indicates that the C2 is communicating with the L1. If this is not the case, please refer to Appendix A "Interpreting the Status Indicators".

Connection to the field unit



Connecting the level sensor to the C2 port socket.



Connecting the level sensor to the C2 port terminals

Terminal connections

C2 port terminal	Wire colour
	Green
RS485 A	Blue
RS485 B	Yellow
Output 1	Red

Special notes

- Water level sensors are not designed to be completely immersed in water. The top of the level sensor must always be kept out of the water.
- The top 150mm of the level sensor is not used for registering the water level. Ensure that the L1 is mounted in a way that the float does not rise into this region as this will prevent the L1 from reading the position of the float.
- Be sure to follow the earlier recommendations for cable runs. If you have multiple devices on a single cable run, be sure that each has a unique address.
- Observant recommend that the level sensor cable be protected from UV light, birds and insects by containing it within a protective housing such as PVC and/or electrical conduit.



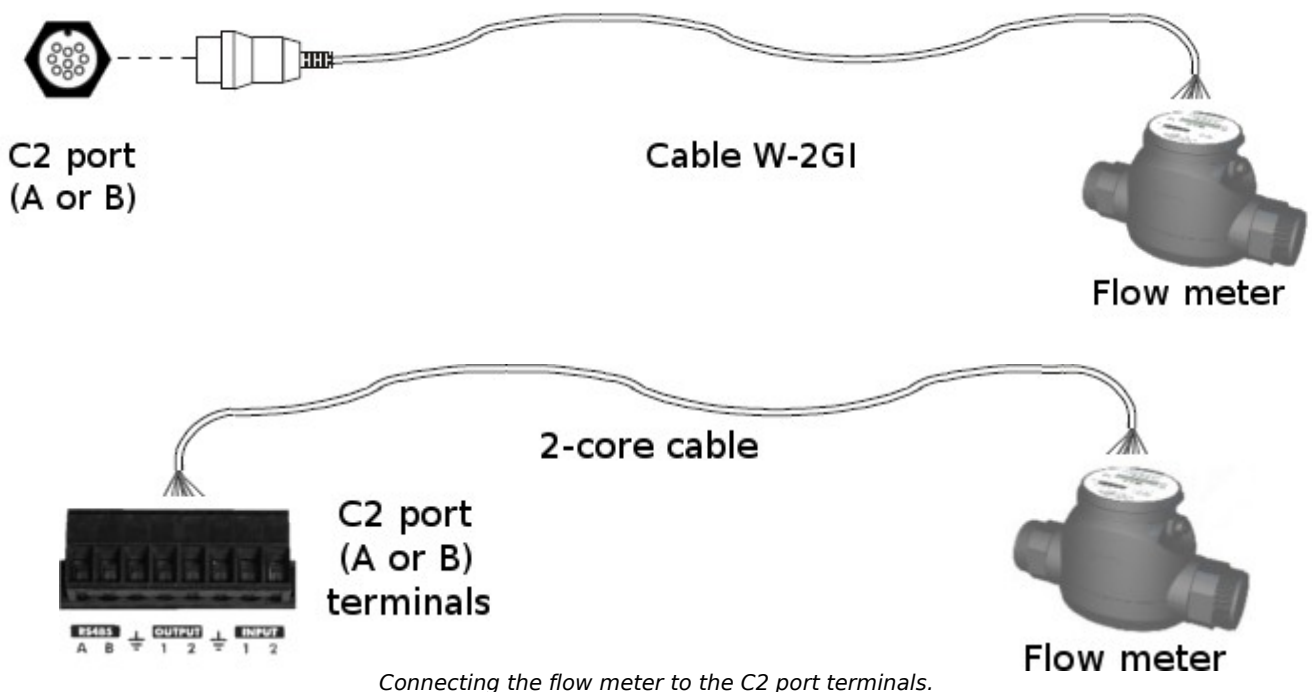
Description

The C2 unit measures water flow by counting pulses from a water meter. The number of litres represented by each pulse is determined by the manufacturer of the flow meter and will be described in the documentation accompanying the meter. The C2 uses one of its port inputs to count these pulses and the Observant Desktop software converts this to a measurement of water flow over time.

Cabling requirements

A flow meter is connected directly to a C2 port input via 2-core cable.

Connection to the field unit



Terminal connections (traditional 2-wire flow meter)

C2 port terminal	Wire colour
	Black
Input (1 or 2)	Red

Special notes

- Use of a reputable brand of flow meters such as “Arad” is recommended. Arad manufacture a range of flow meters for differing applications. Arad also manufacture a specialised flow meter suitable for use with bores. These flow meters have a high flow rate and are designed for use with bore water.
- The use of an in-line filter is required whenever a mechanical flow meter is used. Most dam water will contain a high level of sediment and organic matter which will cause blockages in the flow meter.
- In situations where a high degree of accuracy is required a Woltman type multi jet flow meter, sometimes referred to as Helix meters, will provide a balance between flow rates and accuracy. An in-line filter and preventative maintenance will be required to be used with these meters as they are very susceptible to blockages.
- Flow meters need to be matched to the water volume required and the quality of the water.
- All flow meters need to be installed in a straight section of pipe whose length is at least 10 times the diameter of the pipe upstream from the meter and five times the diameter downstream. This reduces turbulence and makes the meter more accurate.
- Standardising on one type of water meter simplifies maintenance and makes emergency parts sourcing easier.
- Observant can assist with the sourcing of flow meters if required.



- Observant recommends that you should contact your local water hardware supplier for advice as to the best type of meter for your situation.
- Further reading on the correct selection of Water Meters can be found at: http://www.derm.qld.gov.au/services_resources/item_details.php?item_id=29024&topic_id=23



It is possible in some cases (with optional additional interfaces) to interface to high end flow meters such as the Mace Agriflow, ABB and Tyco ultrasonic or magnetic type meters. Some set-up configuration is required to ensure accurate readings. Please contact Observant for further information.



Arad WMR bore water meter.

Description

The C2 unit measures rainfall using a tipping bucket rain gauge. For each fixed amount of water that flows into the rain gauge, a pulse is generated. The quantity of rain represented by each pulse is determined by the manufacturer of the rain gauge and will be described in the documentation accompanying the gauge. The C2 uses one of its port inputs to count these pulses and the Observant Desktop software converts this to a measurement of rainfall over time.

Cabling requirements

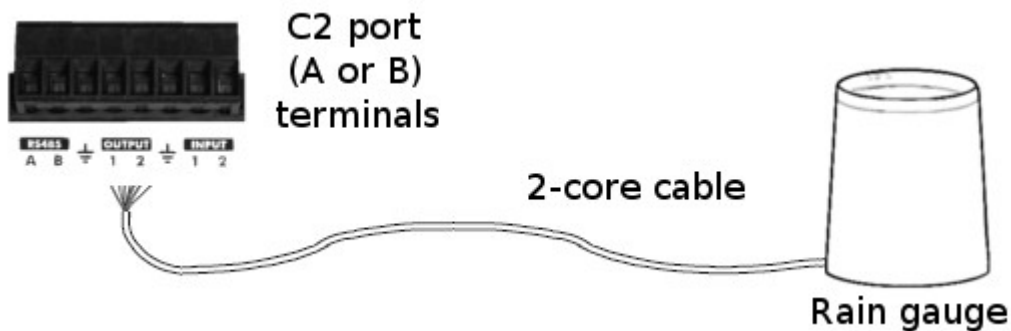
A rain gauge is connected directly to a C2 port input via 2-core cable.

Connection to the field unit


Connecting the rain gauge to the C2 port socket.



C2 port
(A or B)



Terminal connections

C2 port terminal	Wire colour
	Black
Input (1 or 2)	Red

Special notes

- The Hydrological Services TB5 rain gauge has two pairs of terminals suitable for connection to the C2. Either pair can be used; select either the first two or last two terminals.
- The Davis tipping rain gauge has a simple cable attachment system. Only two of the wires are required to be connected. The green and white wires are a common ground.



Any automatic weather equipment that generates data that is relayed to the Bureau of Meteorology will have special installation requirements that are governed by set standards. For further details, refer to Section 3.8 (Precipitation Gauges) of the Bureau of Meteorology document:
<http://www.bom.gov.au/inside/oeb/networks/20131.pdf>



Description

The Axis 225FD camera is the model currently supported by the C2 hardware and software. The camera is connected to a C2 port and can be configured to take still photographs periodically, or on demand via an option in the Observant Desktop software.

Cabling requirements

The camera can share a single C2 port with other devices (see *Device Combinations* earlier) on a single RS485 cable run although it will require its own power supply separate from any other devices.

Focusing the camera

The Axis camera has a variable focus lens and as such it requires focusing to achieve a suitable quality of image.

The primary way to focus the camera is to connect a notebook computer to the camera with an ethernet cable and run the supplied Axis camera software to take photos and adjust the camera accordingly.

If the Axis software is not available, the camera runs a web interface at 192.168.0.90. This can only be reached by a direct ethernet connection with a notebook, as it cannot be reached via the C2 unit. Observant Support can describe a procedure to help you arrange a notebook to talk to the web interface.

If the camera cannot be connected to by an ethernet cable, the camera can be instructed to take photos using the Observant Desktop software, then physically manipulating the camera to improve the image. Although the base unit computer could be used for this, it is recommended to take a notebook running Observant Desktop to the field unit and connect on-site to allow for immediate feedback.

Whichever method is used, the camera will need to be powered while set up. This power can be provided by using the timed output feature in the advanced mode of the Observant Desktop.

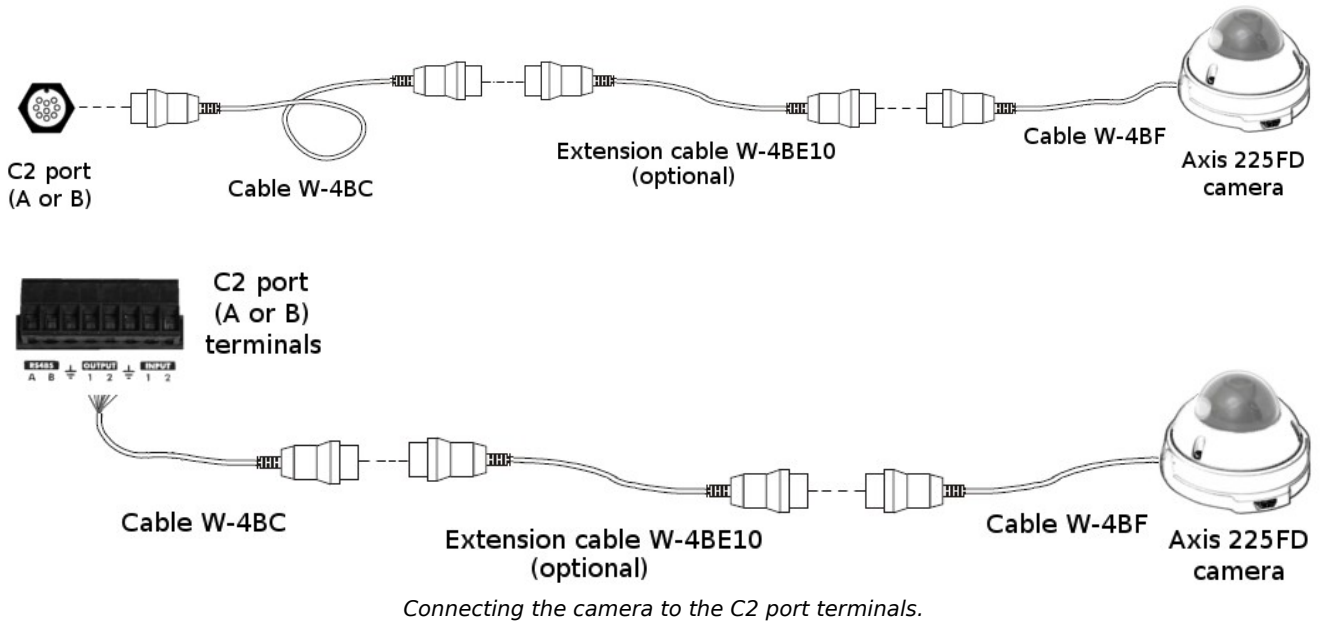
Special notes

- The pre-set address of the Axis camera is 187.
- The camera should be mounted where it will provide a clear view of the object or objects that you wish to monitor.
- The camera tends to need more radio transmission time than other devices, due to the size of the data it collects. In very limited circumstances the C2 that is hosting the camera may require the use of a larger battery to support the higher use of the UHF radio.
- If two cameras are to be connected to a single C2 unit, they must be attached to separate C2 ports.
- Older Axis camera models (2100 and 2120) can not share a C2 port with other devices, and must be the only device on a port.
- Avoid installing the camera facing directly into the sun as this may cause damage to the optics installed in the camera.
- A camera should be installed face-down or as close to it as possible while still obtaining a good picture. This helps protect the protective plastic dome from environmental and bird damage which can interfere with picture quality. The actual camera has a 180° mounting

pitch within the domed enclosure.

- If the camera is installed on a C2 port that also has other powered sensors installed, ensure the camera is powered from port Output 2. Output 1 is commonly used to power the level sensor and other similar devices.

Connection to the field unit



Terminal connections

C2 port terminal	Wire colour
	Green
RS485 A	Blue
RS485 B	Yellow
Output 1	Red

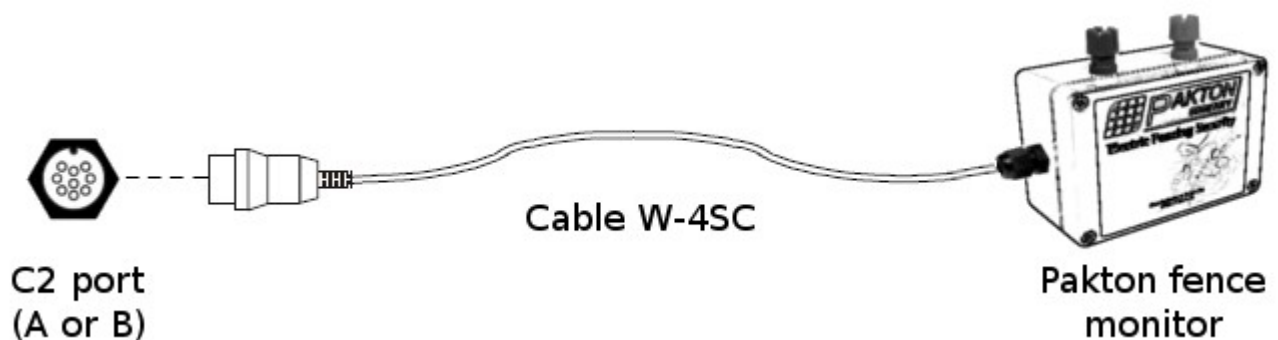
Description

The Pakton PTE0703 fence monitor allows monitoring of the fence voltage. In conjunction with the Observant Desktop software, it will generate an alarm if the fence voltage decreases or drops to zero. Real-time and historical fence voltage data can also be viewed from the Observant Desktop software.

Cabling requirements

The Pakton unit must be the only serial device attached to a port. The supplied cable is designed to connect directly between a C2 port socket and the serial port of the Pakton unit.

Connection to the field unit



Special notes

- The serial cable has a maximum cable run of eight metres. If the electric fence is further than this it is suggested that a 'hot' wire is run from the fence to the Pakton fence monitor. A ground wire should also be run to the fence's ground wire, otherwise unreliable data may result due to lack of a common ground.
- The Pakton fence monitor can not be connected to the C2 port terminal block.

Maxon Modmax modem

The Maxon Modmax™ 3G modem allows the Observant monitoring system to communicate via the Internet using the Telstra NextG mobile network. The Maxon modem is supplied preconfigured by Observant and individual installation instructions are shipped with each unit.



Additional charges may be applicable for internet monitoring. Please contact your authorised Observant reseller for further information.

Description

The M1 engine controller enables remote operation and supervision of a range of pumping equipment. Water can be pumped when required, and the pump monitored remotely to ensure proper operation. The M1 provides the ability to start and stop the motor locally, as well as remotely via the Observant Desktop software.

Cabling requirements

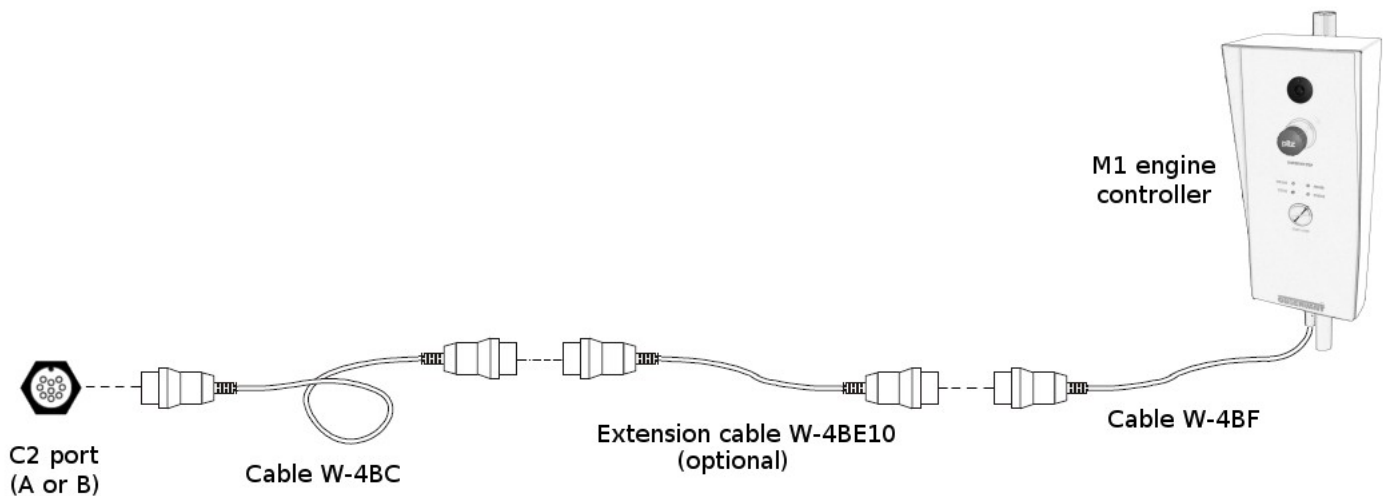
The M1 can share a single C2 port with other devices (see *Combining devices* earlier) on a single RS485 cable run.

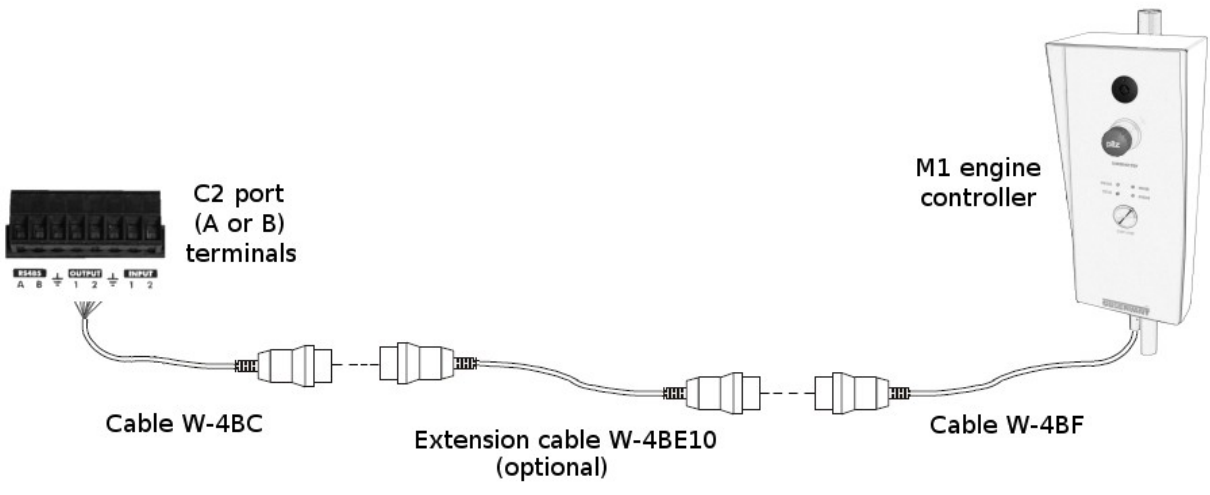
Refer to the wiring diagram for details of cabling to the motor and its sensors.

Connection to the field unit



For detailed instructions for connection of the M1 to the engine, refer to the M1 Installation and User Guide.





Terminal connections





C2 port terminal	Wire colour	M1 terminal
	Green	C1 Ground
RS485 A	Blue	C1 RS485+
RS485 B	Yellow	C1 RS485-
-	Red (not connected)	-

Special notes

- Be sure to follow the earlier recommendations for cable runs. If multiple devices are on a single cable run, be sure that each has a unique address.
- The M1 motor controller requires that the motor is fitted with electric start capability and a fuel cut off solenoid fitted to the fuel pump.
- Kubota motors require a specialised conversion kit, the Macquarrie kit, which adds the remote start/stop capability. Please contact your local dealer if this is required.
- Observant recommend using Yanmar Engines with the M1. Observant manufacture a wiring harness suitable for connection to the Yanmar ASP wiring option.
- An extra solar panel, provided as a supplementary power kit, is also recommended to ensure a fully charged battery as most motors are not producing the required voltage at the normal working RPM. Most motors have been designed to run at around 2400 RPM while most users tend to run them at around 1800 RPM which does not produce a voltage that effectively recharges the battery.
- Please speak to your consultant if you are thinking of replacing any of your motors. We can offer recommendations on the most suitable motor to use with the M1.
- Special care should be taken when setting the M1 up to operate with the automation feature of the Observant Desktop software. Additional sensors can be attached to the M1, pump and motor to ensure that the equipment can be operated in safe and efficient manner.
- All connections between the battery, starter motor, fuel shutoff solenoid and the M1 should be of a 12G or 4mm wire size. Sensor wiring is able to make use of smaller sized conductors but a 16G or 3mm size is recommended. We strongly recommend the use of professional quality automotive crimp connectors and tools to ensure reliability.
- When using an after-market fuel cutoff solenoid, careful note should be made of its power requirements. If the solenoid draws more than 20 Amps then a secondary relay will be required.



DO NOT disconnect the battery terminals of Yanmar or Kubota electric start motors while the motor is running or ignition is in the on position. **This will result in damage** to the voltage regulator.

	State	Motor Run
	Array Power	60W
	Pressure	30m
	Flow Rate	40 L/min
	Flow (Today)	37 kL
	Flow (7 Days)	184 kL
	Flow (Month)	184 kL

Mono solar motor controller

Description

Interfacing the C2 to a Mono solar motor controller (SMC) enables the full remote monitoring of all critical performance characteristics of the solar pump including totalised flow, current flow rate, current RPM, pressure and important operating status and alarm codes. The solar mono pump can also be switched on or off via the Observant Desktop software and the automation system.

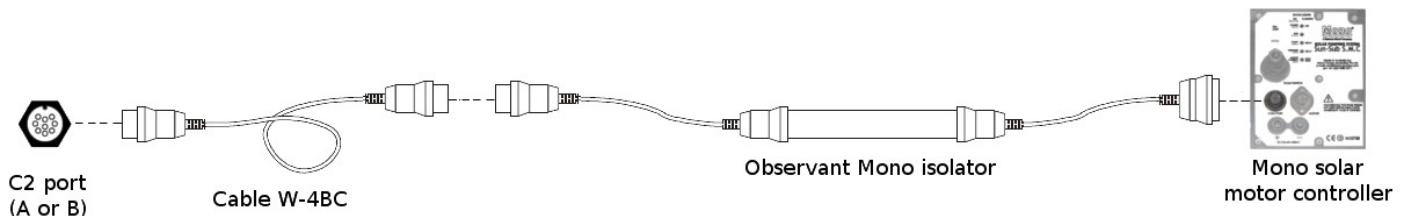
Cabling requirements

The Mono SMC can only share a C2 port with other Mono SMC devices; no other devices can be connected to the same cable run. The supplied Mono interface cable is designed to connect a single Mono SMC to a C2 port, and can be cut and joined if more than one SMC is to be joined on the same cable run.

Special notes

- Ensure the cable has full freedom of movement that exceeds any tracking devices that are fitted.
- The Mono controller should not share a port with any other RS485 devices such as level sensors or motor controllers.

Connection to the field unit



Description

The Vaisala WXT520 is a compact, maintenance-free weather station. It is capable of measuring wind speed and direction, precipitation, pressure, temperature and humidity without using moving parts. The WXT520 comes with an optional spike set to discourage birds roosting on the unit.

Data from the weather station can be viewed within the Observant desktop software or exported for use in reports or analysed using third-party software such as Microsoft Excel.



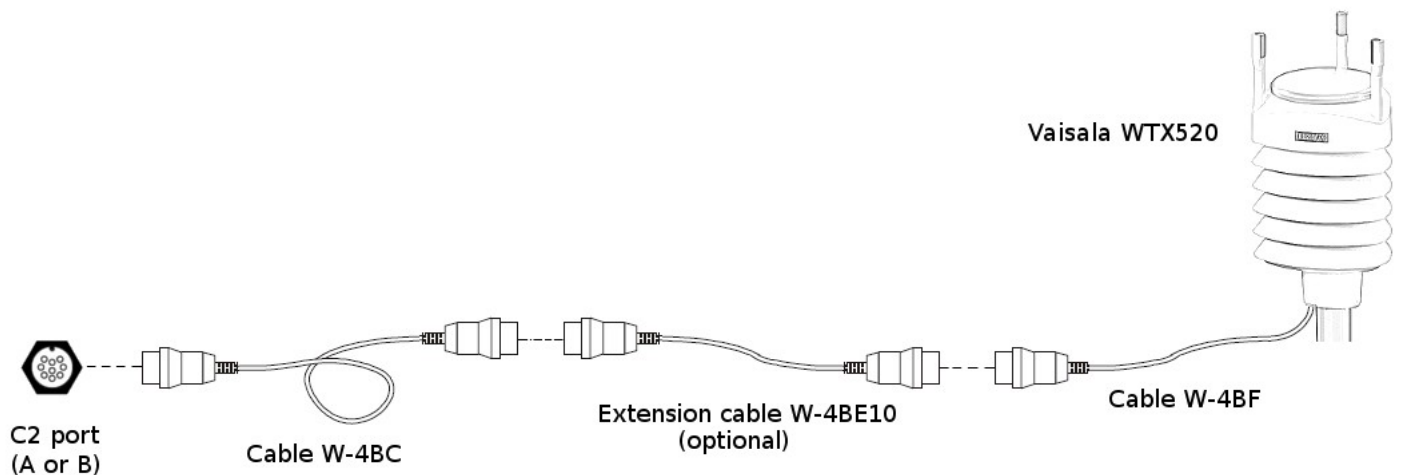
The Vaisala WXT520 reports barometric pressure, not atmospheric pressure. Atmospheric pressure as reported by the Bureau of Meteorology is adjusted for altitude to match a sea-level equivalent, allowing synoptic charts to appear consistent. Barometric pressure is the direct measure of pressure and naturally decreases as altitude increases.

As a rule of thumb, the effect of altitude on air pressure is approximately 1hPa per 8 meters. For a site at an altitude of 200m, the barometric pressure measured by the Vaisala would be approximately 25hPa less than the atmospheric pressure reported by the Bureau of Meteorology for that site.

Cabling requirements

The Vaisala WXT520 can share a single C2 port with other devices (see *Combining devices* earlier) on a single RS485 cable run.

Connection to the Field Unit



Record Count	101
Current File	0
Current Record	50
Average Weight	370.2 kg
Last Weigh	10 Oct 2007 15:30

Tru-Test electronic weighing indicator

Description

By connecting a Tru-Test indicator to a field unit, data from the Tru-Test can be exported for use in reports or analysed using third-party software such as Microsoft Excel.

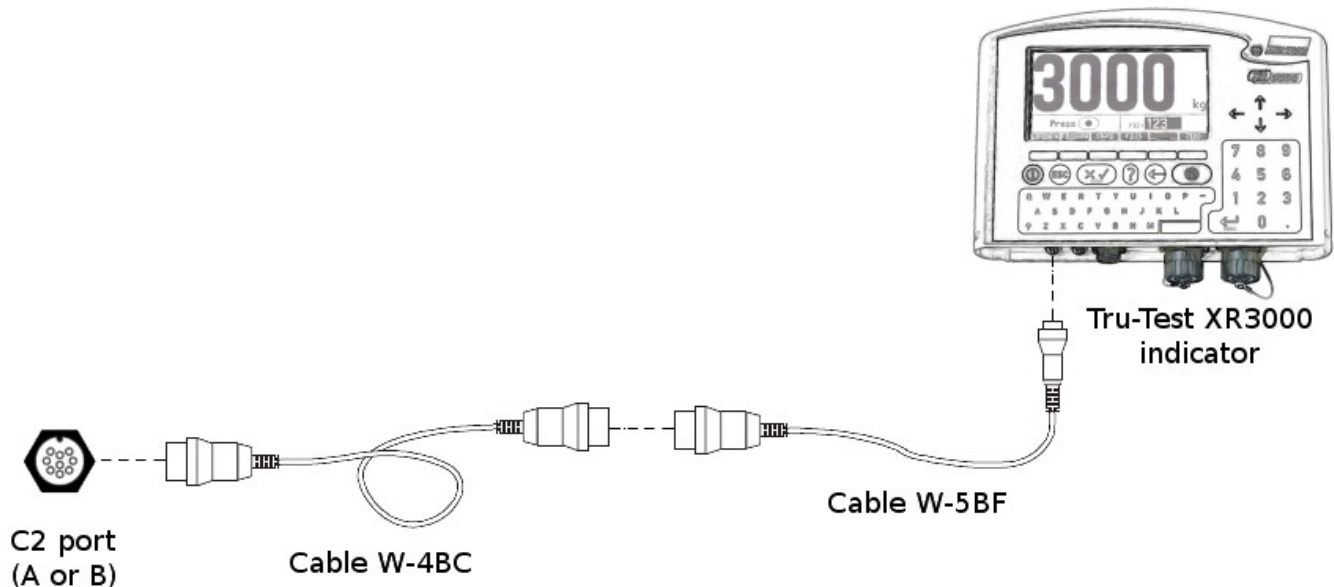
Cabling requirements

Using the Observant Tru-Test interface cable (W-5BF), connect the C2 field unit to to the CON1 socket of the Tru-Test indicator.

Special notes

- The Tru-Test must be configured to communicate with the field unit. To do this:
 1. In the Tru-Test menu, select Setup > Serial, then using the arrow keys select CON1 and use the Enter key to change the setting to **RS485**.
 2. In the same menu screen, ensure the RS485 port is set to 9600bps. This is shown at the lower right of the serial setup screen.
 3. Ensure the address (labelled *SCP* at the lower right) is set to **20**.
- The Tru-Test indicator should not share a port with any other RS485 devices such as level sensors or motor controllers.
- The Observant system supports the following fields, which must keep their default names in order to be recognised and recorded by the C2 unit:
 - EID
 - WEIGHT
 - DATE
 - TIME

Connection to the field unit



Connecting the Tru-Test indicator to the C2 port socket.

Description

A C2 port output can be switched via the Observant Desktop software. Each C2 unit has two port outputs per port and these are typically used for powering devices such as level sensors and cameras. Unused port outputs can be used as a general-purpose output that can control electrical devices such as electric pumps, motors or lighting. Automation of Electrical Pumps is possible when used in combination with a L1 level sensor.

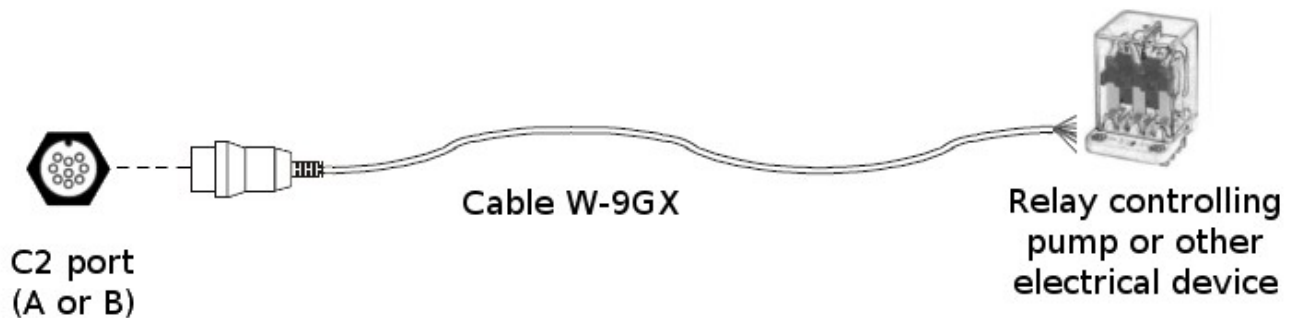
Cabling requirements

A relay, or the device to be directly powered, is connected directly to a C2 port input via 2-core cable.

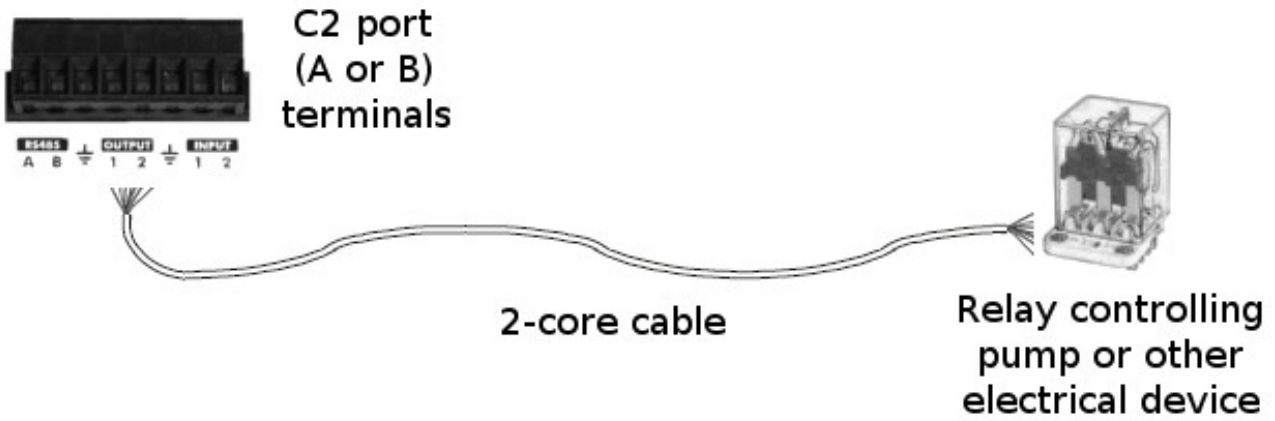
Special notes

- The port output sensor is not related to the M1 Motor Controller. Although both can be used to control a motor, the port output sensor does not in any way monitor the device being controlled and only displays the status of the C2 port output (on or off).
- Note that powering devices directly from a C2 port output for an extended period of time may quickly discharge the battery. When powering devices for extended periods (more than one hour per day) or with a current requirement of more than 100mA, Observant recommends using the port output to energise a relay that in turn controls power to the device from a separate power source.
- Observant recommends that a secondary monitoring device is used to confirm the operation of the powered device. These devices could include items such as a flow meter or flow switch to confirm the remote operation of a mains powered pump.


Connection to the field unit



Connecting a relay to a port output via the C2 port socket.



Terminal connections

C2 port terminal	W-9GX wire colour	Relay connection
	Black	Ground
Output 1	Red	+12v*
Output 2	Pink	+12v*

* The relay can be powered from output 1 or output 2; select the appropriate coloured wire from the W-9GX cable.

Description:

Each field unit has two port inputs per port and these are typically used for counting pulses from rain gauges and flow meters. Unused port inputs can be used to monitor the state of any device with a switched output. Examples are:

- monitoring a switch on a gate to display its state (open or closed).
- monitoring the speed of a windmill or a motor.
- counting the pulses from a sensor to display the daily number of vehicles travelling along a road.
- Interfacing directly to flow meters or other equipment equipped with a 'pulse' output.
- A visual confirmation is provided to show that the input sensor is working correctly. When activated by a pulse or state the port indicator will flash green with each input on Input 1 or red for each pulse on Input 2.

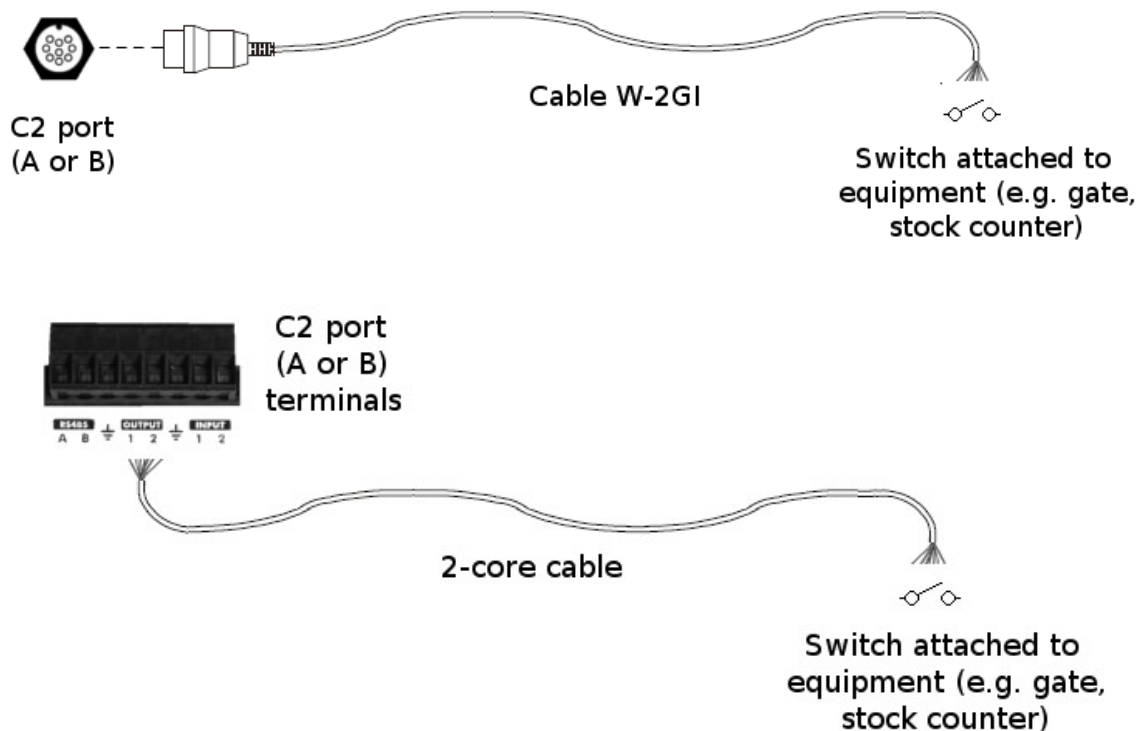
Cabling requirements:

The output of the device to be monitored is connected directly to a C2 port input via 2-core cable.


Special notes:

The port input should only be used to monitor the opening and closing of a switch. Do not directly connect a power source to a port input.

Connection to the field unit



Terminal connections

C2 port terminal	Wire colour	Switch terminal
	Black	Terminal 1
Input (1 or 2)	Red	Terminal 2

Appendix A: Installation planning details

Property name:	Location name:
GPS co-ordinates:	Date installed:
Field unit serial number:	Distance from base:
Routed via:	Distance from nearest field unit:

Assets:

- Camera Brand _____ Serial number _____
 Pump Type _____ Approx Flow _____
 Motor Brand _____ Model _____ Electric start
 M1 Serial number _____

Trough and connections:

Inlet pipe size _____ Flow meter Model _____

Dam / turkey nest and connections:

Capacity _____ Depth _____ Level sensor

Inlet pipe size _____ Flow meter Model _____

Outlet pipe size _____ Flow meter Model _____

Tank and connections:

Capacity _____ Depth _____ Level sensor

Inlet pipe size _____ Flow meter Model _____

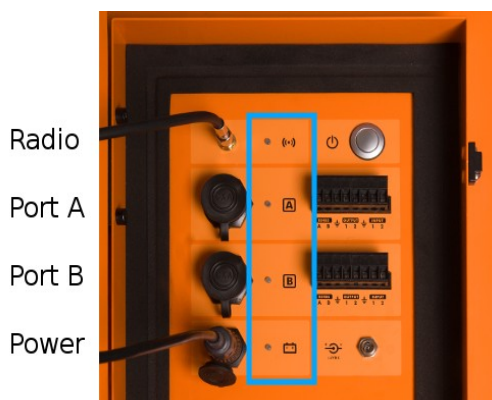
Outlet pipe size _____ Flow meter Model _____

Type of mounting systems used**Sketch of area**

Please show details of approximate conduit run and label meters and gauges as installed

Appendix B: Interpreting the Status Indicators

Outlined below are the various states of the C2 unit as shown by the indicator lights (LEDs) on the backplane. These indicators will communicate to the user a number of different states and conditions that might be affecting the performance of the unit.



Radio indicator

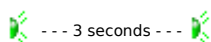
Green:

Single green flash:



Received data, but ignored because the data is destined for a different field unit

Single, short green flash every 3 seconds:



Radio on, waiting for data

Amber:

Flashing amber:



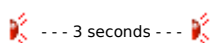
Receiving data

Red:

Solid red:

Transmitting

Single, short red flash every 3 seconds:



Radio off. Typically caused by very low battery state.

Continuously flashes red:



Internal radio fault

Flashes red, alternating with the Power indicator:

Dire power mode. The battery is at a critically low level and the unit will not transmit via the radio. The C2 unit will remain in this mode until the battery is sufficiently charged for normal operation.

Port A and Port B only

Flashing amber:	Switch activated
Solid green:	Input1 is active
Solid red:	Input2 is active
Fast red flash:	Over-current protection
Green:	Sending data
Amber:	Receiving data
Three red flashes:	Receive data failure
Red:	Receive corrupted or error

RS485 transmission and receive indicator codes

If a port has one or more RS-485 devices (e.g. level sensor, motor controller) configured, the port indicator will show when communication is taking place by displaying three yellow flashes. Three green flashes indicate that the devices are in correct working order and the C2 has received the expected data. If a device fails to provide the correct signal back to the C2 unit a series of three red flashes will be displayed.

Power indicator

The power indicator shows the system heartbeat, charger status and battery status. There are 11 total states:

Completely off:	System switched off
Continuous red flash	Charger fault

The following 9 states are indicated by both colour and number of flashes.

Green:

Single flash:		Battery OK, Not charging
Double flash:		Battery OK, Charging
Triple flash:		Battery OK, Fast charging

Amber:

Single flash:		Battery low, Not charging
Double flash:		Battery low, Charging
Triple flash:		Battery low, Fast charging

Red:

Single flash:		Battery critical, Not charging
Double flash:		Battery critical, Charging
Triple flash:		Battery critical, Fast charging

Appendix C: Troubleshooting

Resolving radio coverage issues

If you experience radio communication problems either during or after your installation, follow these steps to establish the likely cause:

The ping utility: The Observant Desktop software provides the ability to 'ping' a field unit. A 'ping' is a short message sent to the field unit, and the field unit replies to this ping. The ping utility can be started from Observant Desktop by entering Advanced Mode and selecting **C1, Ping**.

If the ping utility receives a reply: radio communications are working correctly.

If the ping utility does not receive a reply: either the field unit is not receiving the ping, or the base unit is not receiving its reply.

Listen for UHF radio traffic: If the ping utility shows that no reply has been received from the field unit, leave the ping utility running and use a hand-held or in-vehicle UHF radio (channel 22), and listen for the radio transmission to the field unit. Take the radio to the field unit in question and listen for the ping transmission, which will be a short burst every 10 seconds. If the field unit is attempting to reply, you will also hear the reply immediately after the transmission (total 2 short bursts every 10 seconds).

If you do not hear the pings over the radio: Transmission is not reaching the field unit. Check the base unit antenna connections and cabling and verify that the terrain between base and field units is not blocking radio transmission.

If you hear a single short burst every 10 seconds: The base unit is transmitting but the field unit is ignoring the transmission, possibly because the signal is too weak. Again, check for problems related to the base unit antenna and terrain.

If you hear two short bursts every 10 seconds: The field unit is receiving the ping from the base unit, and sending a reply. If the base unit is not receiving the reply, check the field unit antenna positioning.

Possible solutions for troublesome radio coverage

When obvious factors such as damaged cabling or proximity to metal objects have been ruled out, other causes such as distance and terrain that are causing poor radio performance can be alleviated in one of several ways:

- Install a base unit antenna at the field unit. The base unit antenna is a higher-gain antenna and should improve coverage in most situations.
- Use a closer field unit, or install an additional field unit as a router to forward the messages to the troublesome field unit.
- Raise the base unit antenna. Observant recommend that the base antenna be mounted 10m from ground level.



To establish the best way to improve radio communications, Observant can have a detailed radio coverage survey performed. This survey will show the likely cause of any radio performance issues and will recommend methods to improve performance.

Resolving common hardware and installation issues:

Symptom: When powering on a C2 for the first time, the port LEDs flash orange and then fade.

Possible Cause	Solution
This indicates that the C2 has started to power up, but has detected a very low battery and will now wait until the battery is charged to a usable level before fully starting up. This would often be seen after a C2 has been without power for a number of weeks.	Leave the C2 attached to either a power pack or its solar panel. It will return to its normal operation once the battery is sufficiently charged, normally within an hour.

Symptom: No radio communications with a given field unit, signified by the field unit constantly showing the stale icon. When refreshing the field unit, a **No Response** message is displayed.

Possible Cause	Solution
The field unit has entered a low power state due to low battery.	<ul style="list-style-type: none">● Wait for the battery to charge sufficiently, or● “Wake up” the field unit by holding a magnet or pressing the button near the Port B side of the unit for several seconds until the radio indicator turns green.

Symptom: Poor or intermittent radio communications, signified by field units showing the stale icon.

Possible Cause	Solution
Base unit antenna mounted close to metallic objects.	Ensure the base unit antenna is mounted well away from metallic structures such as water tanks.
Base unit antenna mounted close to other radio antennae.	Ensure the base unit antenna is mounted a minimum of 3m from any other radio antenna.
Long cable run is causing high signal losses.	Use a low loss coaxial cable if the antenna cable is over 12 metres long. Observant recommend RG213 antenna cable for this purpose.

Symptom: In the Observant Desktop software, a field unit shows the stale icon at the beginning of each day.

Possible Cause	Solution
Overcast conditions in the past 2-3 days have prevented the battery from charging fully. As the battery discharges during the night, the field unit disables the radio to conserve power.	Wait for the battery to charge sufficiently to power the radio.
The solar panel is not correctly orientated to make best use of the available sunlight.	Ensure the solar panel is correctly aligned. Position the field unit so that the solar panel is orientated with its face pointing towards true north (this is approximately 10 degrees east of magnetic north).
	In regions to the far north of Australia, the sun is often located to the south for much of the day during December and January and a solar panel oriented North will not effectively charge the C2 battery. In this the case, the solar panel should be realigned to make better use of the available sunlight.

Symptom: The Observant Desktop software displays an error for a level sensor: “The position of the float cannot be determined”

Possible Cause	Solution
The float may be stuck at the very top or bottom of the sensor, or the sensor may not be positioned correctly.	Ensure the top of the sensor is at least 150mm above the maximum water level. Check that the float is not jammed by a foreign object or touching nearby housing.

Appendix D: Upgrading Firmware

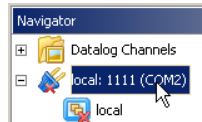
Each C2 unit contains a program that controls how it operates. Everything the unit does from the time it powers on is controlled by this program, which is known as firmware. In order to improve or add new features to the C2, Observant regularly release updated firmware for the C2. You might receive the new firmware in a number of ways: it could be sent by email, downloaded from the Internet or installed as part of your Observant Observant Desktop software.



- The process of upgrading firmware requires that all C2 units are reachable via the radio. Before starting the upgrade process, make sure that you can communicate with all C2 units. The simplest way to establish this is to open the Observant Desktop software and check that all C2 units have the green tick above them.
- If you have received the updated firmware via email or downloaded from the Internet, save the file somewhere convenient such as the Desktop and take a note of its location.

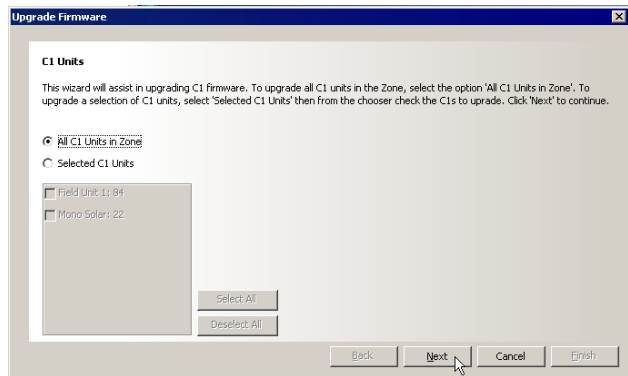
To upgrade the firmware in all C2 units at once:

Enter advanced mode and highlight the zone in the Navigation panel:

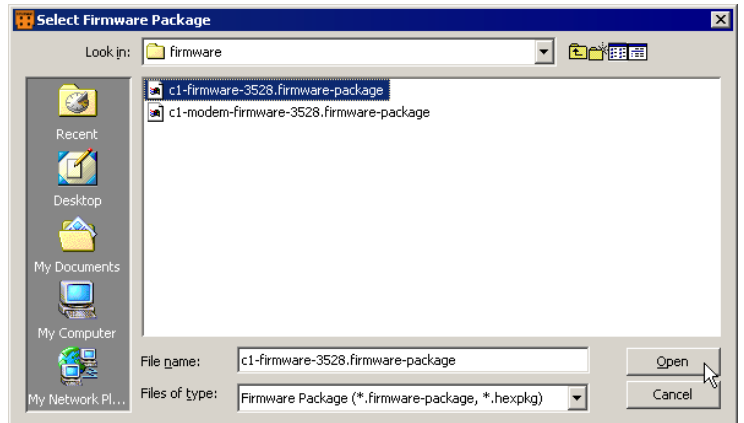
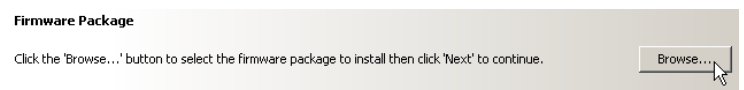


From the menu, select **Zone, Upgrade Firmware**.

Select the option **All C1 Units in Zone** and click **Next**:



Click the **Browse** button, locate your firmware file and click **Open**.



A summary of the selected firmware will be displayed, including its version number.

Click **Next**.

Firmware Details	
Name	griffin-3528
Type	CPU
Build	3528
Build Time	Fri Nov 24 14:17:36 EST 2006
Firmware Version	2.10
Hardware Version	5.3
Total Pages	486

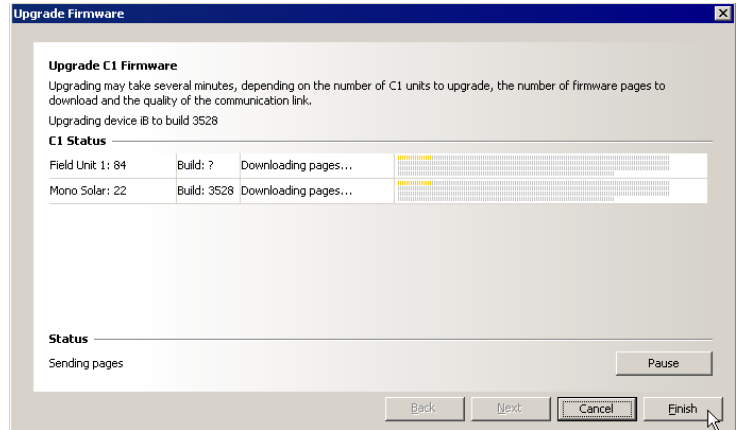
The options **Reinitialise** and **Reprogram** will be selected. Leave these options selected and click **Next**.

- Reinitialise
- Reprogram

On the following screen, click Next to begin sending the updated firmware to the C2 units. A graphical summary will show the progress of the upgrade.

The graph is colour coded and shows the status of segments of the firmware as they are sent to the C2 unit. The colours represent:

- Grey: Not yet sent.
- Amber: Sent but not yet verified.
- Red: Failed, will be sent again.
- Green: Successfully sent, verified.



When the upgrade process is complete, the graph will be entirely green and the status will indicate that the upgrade was successful.



To upgrade the firmware for a single C2 unit, follow the above process but begin by right-clicking the C2 unit in the Navigation panel and selecting **Upgrade Firmware**.

Appendix E: Recovery mode

Recovery mode is used in special cases where it is not possible to communicate with a field unit using the Observant Desktop software. This might happen when a computer is not available at a site, or a field unit has become unresponsive. Recovery mode is controlled on a C1 using magnets to activate switches inside the unit. The C2 uses buttons to achieve the same function.



Recovery mode is a special mode designed only for emergency use and troubleshooting. It should only be used on advice from Observant support staff.

Improper use of recovery mode can result in the field unit losing its history and other configuration data and may result in it being unable to communicate with the base.

Recovery Mode (C2 units):

1. Restart the C2 by holding both the user and system buttons until all indicators switch off (5 seconds), then release the system button and continue pressing the user button.
2. Continue holding the user button until only the radio indicator is lit.
3. Release the user button. The radio and Port A indicators should now be lit.
4. Pressing the user button will step through three options, indicated by indicators on the front panel:
 - Port A indicator: Install 'last known good' software
 - Port B indicator: Install current software
 - Power indicator: Master reset
5. After selecting the required option, press the system button to confirm the choice, and the C2 will restart.



Recovery mode can be cancelled at any time by releasing both buttons. After 15 seconds the field unit will restart and continue normal operation, with no changes made.

Recovery mode (C1 units):

C1 units sold or serviced after March 2008 have a different startup sequence and a slightly different operation in recovery mode to earlier models. To distinguish between the two types, restart the C1 by holding a magnet next to each port until all indicators switch off, then remove the magnets and watch the startup sequence of indicators on the front panel.

Model sale/service date	Startup sequence
March 2008 or earlier	Port indicators both light up in the sequence amber, green, green, amber.
After March 2008	Port indicators both light up amber, followed by six flashes of the power indicator.

Recovery mode (C1 models from March 2008 or earlier):

1. Reset the unit by holding a magnet near Port A and Port B for 5 seconds.
2. When the indicators turn off, remove the magnet from Port A, keeping the one near Port B
3. Note the following sequence:
 - the port indicators will glow amber once
 - the Port A indicator will glow green (or red if the battery is low) twice while the Port B indicator flashes amber (signifying presence of a magnet).
 - the Port A indicator will glow solid red, signifying that the unit has entered gesture mode.
4. Remove the Port B magnet.
5. Swiping a magnet past port A will step through a number of options, indicated by indicators on the front panel:
 - Right red: Install current software
 - Left amber: Master Reset
 - Right amber: Install 'last known good' software
6. Confirm the selection by swiping the magnet past Port B. The Port A and Port B indicators will flash green and C1 will restart.

Recovery mode (C1 models after March 2008):

1. Restart the C1 by holding a magnet at each side of the C1, near the port indicators. Keep the magnets in place until all indicators switch off (5 seconds), then remove the magnet from port B, keeping the one near port A.
2. Wait several seconds, until only the radio indicator is lit.
3. Remove the magnet. The radio and Port A indicators should now be lit.
4. Swiping a magnet past port A will step through three options, indicated by indicators on the front panel:
 - Port A indicator: Install 'last known good' software
 - Port B indicator: Install current software
 - Power indicator: Master reset
5. After selecting the required option, swipe a magnet past port B to confirm the choice, and the C1 will restart.



Recovery mode can be cancelled at any time by removing any magnets. After 15 seconds the field unit will restart and continue normal operation, with no changes made.

Cable label scheme

Part numbers for Observant cables are selected to indicate the cable type, according to a simple key. As an example:

W - 4 B E 10

Wiring	Number of wire cores	Family:	Other specification(optional)	Length
		G - General	:	
		B - Bus (RS485)	:	
		S - Serial (RS232)	F - female	
		P - Power supply	E - extension	
		R - Radio Frequency	M - Male	

In this case, we have a 10-metre, 4-core extension cable for RS485 devices. This would typically be used to extend the run from a field unit to a level sensor or camera, if required.

The length suffix is appended if two cables have identical function, but different lengths.

Cable part numbers

Following is a list of all Observant cables and their usage. Old part numbers have been included to assist in identifying existing cables installed on older systems.

Part Number	Old part number	Description	End A	End B	Length	Cable type	Usage
W-9GX	CSE-W9-A	C1 port to bare ends	Male 9 Pin Conxall	Bare ends	4m	9 core custom	Devices that have screw terminals or general Input/Output and field wiring
W-4BC	W4L-B-EN3	RS485 device to C1 port	Male 4 pin switchcraft	Male 9 Pin Conxall	6m	4 core custom	as above
W-4BE10	W4L-C-EN3	RS485 extension	Male 4 pin switchcraft	Female 4 pin switchcraft	10m	4 core custom	extension for above
W-2GI	W2-IO	Rain gauge/ flow meter to C1 port	Male 9 Pin Conxall	Bare ends	10m	2 core custom	rain gauge, flow-meter, contact switch, other general input device
W-4SC	W4-232	RS232 device to C1 port	Male 9 Pin Conxall	Cut and stripped bare ends	4m	4 core custom	Pakton fence monitor and other RS232 devices
W-2PA	W2P-AM	AC power supply	Female 2 pin Conxall	Amtex power supply	As supplied	As supplied	C1 base station power supply
W-2PV	W2P-CA	C1 car supply	Female 2 pin Conxall	Cigarette lighter plug	2m	2 core custom	C1 mobile power supply, from vehicle
W-5SD	WD9	C1 PC serial cable	Male 9 pin Conxall	Female DB9 as supplied	2m	As supplied	PC connection and old Nutridose
W-2RE25	-----	RG (antenna) extension cable	Male inline BNC	Female inline BNC	25m	RG213	Base Aerial extension

Cable colour codes

W-9GX

9 Core Field Wiring Cable

- 9-pin Conxall (PN 3282-09PG-315) to bare ends
- 4000mm in length
- 9 core 24AWG cable (Black)

Conxall 9 Pin Pin number	C1 Function	Wire colour
1	RS232Rx	Green
2	In1	Brown
3	In2	Violet
4	Ground	Black
5	Out2	Pink
6	Out1	Red
7	RS232Tx	White
8	RS485+	Blue
9	RS485-	Yellow

W-4BC

4 Core Level Sensor Cable

- 4-pin switchcraft EN3 inline PIN to 9-pin Conxall
- 2000mm in length
- 2 pair (4 core) twisted pair 22 AWG gauge cable

Conxall 9 Pin Pin number	L1 Function	Colour	Switchcraft Pin number
4	Ground	Green	2
9	RS485-	Yellow	1
8	RS485+	Blue	4
6	Power	Red	3

W-4BE10

4 Core Level Sensor Extension

- 4-pin switchcraft EN3 inline PIN to 4-pin switchcraft EN3 inline SOCKET
- 4000mm in length
- 2 pair (4 core) twisted pair 22 AWG gauge cable

L1 Function	Colour	Switchcraft Pin number
Ground	Green	2
RS485-	Yellow	1
RS485+	Blue	4
Power	Red	3

W-2GI**2 Core General IO
rain gauge or flow
meter**

- 9-pin conxall to bare ends
- 10000mm in length
- 2 core 22 AWG gauge cable

Conxall 9 Pin Pin number	C1 Function	Colour
Ground	4	Black
Input 1	2	Red

W-4SC**4 Core RS232 Device
Cable**

- bare ends to 9-pin Conxall (PN 3282-09PG-315)
- 4000mm in length
- 2 pair (4 core) twisted pair 22 AWG gauge cable

Conxall 9 Pin Pin number	C1 Function	Colour
4	Ground	Green
7	RS232TX	Blue
1	RS232RX	Yellow
6	Power (output 1)	Red

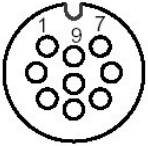
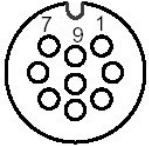
W-5SD**9 Pin Conxall to DB9
connector (serial cable)**

Conxall 9 Pin Pin number	C1 Function	PC Function	DB9 pin number	Colour
1	Rx	Tx	3	Orange
2	In1	DTR	4	Yellow
4	Ground	GND	5	Green
6	Out1	DSR	6	Blue
7	Tx	Rx	2	Red

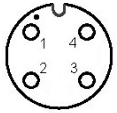
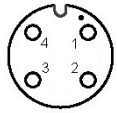
Plug and socket pin outs

The following diagrams represent the plug or socket as viewed from its front face.

Conxall 9 pin (C1 port)

Female (C1 port)	Male	Pin number	Function
		1	RS232 RX (marked with a dot)
		2	Input 1
		3	Input 2
		4	Ground
		5	Output 2
		6	Output 1
		7	RS232 TX
		8	RS485+ (A) (middle pin)
		9	RS485- (B)

Switchcraft (RS485 devices)

Female	Male	Pin number	Function
		1	RS485-
		2	Ground
		3	Power
		4	RS485+

Appendix G: Observant device listing

Base station communication

Product code	Description
BK-12	Base kit (UHF) C1 Telemetry unit (including battery and radio) 12v mains transformer (1.5amp) Wall Mounting bracket Heavy duty GME COL6db base antenna and 12m RG213 cable to suit 9 pin serial cable, 2 meters long USB to serial converter, 35cm lead Reset magnets Observant Desktop software and user manuals
MMM	3G Data Modem (Telstra NextG)* Cables to suit Observant Desktop software and user manuals
COL2194	4db Base station mount Multi-band 3G antenna
CD2194	4db spring mount Multi-band Antenna - suitable for direct case fitment to C2 unit.

Telemetry

Product code	Description
	Observant C2 Fully self contained telemetry unit including steel, Integrated 12W solar panel, UHF radio and 12 Amp Hour battery. See configurations below for antenna mounting options
C2-2	C2 with heavy duty 4.5db UHF antenna for mounting at 2m above ground level
C2-6	C2 with heavy duty 6db GME base antenna. Includes 6m RG213 cable to suit.
C2-8	C2 with heavy duty 6db GME base antenna. Includes 8m RG213 cable to suit. Suitable for use as a dual purpose router / monitoring station.
C2-R8	C2 with heavy duty 6db GME base antenna. Includes 8m RG213 cable to suit. Specialised router configuration and cannot be used for monitoring.
C2-12	C2 with heavy duty 6db GME base antenna. Includes 12m RG213 cable to suit. Suitable for use as a dual purpose router / monitoring station.

Visual monitoring

Product code	Description
CAMK	Axis Digital camera kit <ul style="list-style-type: none"> • Axis 225FD Fixed dome weather proof digital camera All observant software and cables to capture on demand and periodic still images

Pump Control and monitoring

Product code	Description
M1	M1 motor controller <ul style="list-style-type: none"> • Full remote start / stop engine protection system for diesel based pumps • Full watchdog functions and alarms for no-flow, RPM, Oil and water faults. • Fully integrated with the Observant desktop • Enables automation of Diesel pumps based on water levels in tanks. **
M1-SUP	Motor controller accessory kit for remote operation <ul style="list-style-type: none"> • 12w Solar panel and post mount for trickle charge of motor battery • Kelco flow switch
YWH	Yanmar TF and TNV ACP wiring harness <ul style="list-style-type: none"> • Suitable for use with Factory fitted ACP wiring harness's. • RPM sensor bracket and the required hardware. • Harness to suit Yanmar TF and TNV series motor
MNK	Mono SunSub(tm) SMC interface kit Cables and software to Integrate the Mono SMC with the Observant Desktop
FLOW	Kelco F25B paddle type flow switch
	Finder 12V DC → 240v AC normally open 20 amp relay <ul style="list-style-type: none"> • Suitable for use where shutdown time exceeds run time. EG submersible downhole pump.
	Finder 12V DC → 240v AC normally closed 20 amp relay. Suitable for use where run time exceeds the shutdown time. EG. Pressure based pump that is left on.

Equipment Management

Product code	Description
NIK232	<ul style="list-style-type: none"> • RS-232 Nutridose Interface kit • Cables and software to Integrate with the Observant Desktop
NIK485	<ul style="list-style-type: none"> • RS-485 Nutridose Interface Kit • Cables and software to Integrate with the Observant Desktop
TTK	Tru-Test XR-3000 Interface <ul style="list-style-type: none"> • Interface to Walk over weighing Indicator. • Cables and software to Integrate with the Observant Desktop
FMK	Electric fence monitoring Kit <ul style="list-style-type: none"> • Pakton PTE-703 Electric fence monitor. • Cables and software to Integrate with the Observant Desktop

Sensors

Product code	Description
L1-2400	Level sensor (2400mm range) <ul style="list-style-type: none"> • Total length 2795mm • 6m cable • High density EPS foam float with embedded magnets • Mounting U Bolts
L1-2000	Level sensor (2000mm range) <ul style="list-style-type: none"> • Total length 2265mm • 6m cable • High density EPS foam float with embedded magnets • Mounting U Bolts
L1-400	Level sensor (400mm range) <ul style="list-style-type: none"> • Total length 685mm • 6m cable • High density EPS foam float with embedded magnets • Mounting U Bolts
DRGK	“Davis Instruments” Rain Gauge kit <ul style="list-style-type: none"> • Tipping bucket Rain Gauge Kit with 0.2mm accuracy • Molded plastic construction
HRGK	“Hydrological services” Rain Gauge kit <ul style="list-style-type: none"> • Tipping bucket Rain Gauge Kit with 0.254mm accuracy • Metal construction

Accessories

Product code	Description
	Direct Burial two pair cable per meter <ul style="list-style-type: none">• Water blocking gel• 0.64mm conductor size• Does not require conduit when buried• Suitable for use with RS-485 devices
	Scotchlok Connector UR2 <ul style="list-style-type: none">• Water blocking gel• Suitable for connecting wires from 0.39mm to 0.90mm• Recommended for use with RS-485
	Two / Five pair termination enclosures <ul style="list-style-type: none">• Designed for joining or splitting cables underground• Creates a water proof and mechanical joint• Designed for use with the Direct burial cable
	Narva Cable ties <ul style="list-style-type: none">• 4.88 x 300mm (12") cable ties• UV weather resistant

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