ERT-A2

USER MANUAL

VERSION - SEP, 2025

ERT-A2 ALERT1 / ALERT2

Battery powered wireless environmental monitoring

PUBLIC NOTICES

ATTENTION

INCORRECT TERMINATION OF SUPPLY WIRES MAY CAUSE INTERNAL DAMAGE AND WILL VOID THE WARRANTY. TO ENSURE THAT YOUR ERT-A2 ENJOYS A LONG LIFE, CHECK THIS USER MANUAL TO VERIFY THAT ALL CONNECTIONS ARE TERMINATED CORRECTLY BEFORE TURNING ON POWER FOR THE FIRST TIME.

SAFETY NOTICES

Exposure to RF energy is an important safety consideration. The FCC has adopted a safety standard for human exposure to radio frequency electromagnetic energy emitted by FCC regulated equipment as a result of its actions in Docket 93-62 and OET Bulletin 65 Edition 97-01.

CAUTION

TO COMPLY WITH FCC RF EXPOSURE REQUIREMENTS IN SECTION 1.1310 OF THE FCC RULES, ANTENNAS USED WITH THIS DEVICE MUST BE INSTALLED TO PROVIDE A SEPARATION DISTANCE OF AT LEAST 20 CM FROM ALL PERSONS TO SATISFY RF EXPOSURE COMPLIANCE. DO NOT OPERATE THE TRANSMITTER WHEN ANYONE IS WITHIN 20 CM OF THE ANTENNA. ENSURE THAT THE ANTENNA IS CORRECTLY INSTALLED IN ORDER TO SATISFY THIS SAFETY REQUIREMENT.

AVOID

- Operating the transmitter unless all RF connectors are secure and any open connectors are properly terminated
- Operating the equipment near electrical blasting caps or in an explosive atmosphere

Note: All equipment must be properly grounded for safe operations. All equipment should be serviced only by a qualified technician.

FCC Notice
Part 15.21—The grantee is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. Such modifications could void the user's authority to operate the equipment.

Part 15.105(b)—This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

Part 90—This device has been type accepted for operation by the FCC in accordance with Part 90 of the FCC rules (47CFR Part 90). See the label on the unit for the specific FCC ID and any other certification designations.

Manufacturer	Band	Model number	Description	Coax kit	Net Gain
ELPRO	148-174MHz	ANTB000300	VHF Dipole Whip 3dB Antenna c/w 5M Coax N type Connector	N/A	0 dB
ELPRO	148-174MHz	ANTUDP150-C	48-174Mhz Aerial Dipole with N Type Female	CCTAIL-SMA-M	2 dB
ELPRO	148-174MHz	ANTB000100	VHF 3 dBd collinear 5dBi N Type Female connector	CCTAIL-SMA-M	5 dB
ELPRO	148-174MHz	ANTB000100	VHF 3 dBd collinear 5dBi N Type Female connector	CC5-RG213	4.8 dB
ELPRO	340-540MHz	ANTUDP400-C	Dipole Antenna 2dB gain with 100mm RG58 cable and 'N' Type Female connector	CCTAIL-SMA-M	1.8 dB
ELPRO	340-540MHz	ANTUDP400-C	Dipole Antenna 2dB gain with 100mm RG58 cable and 'N' Type Female connector	CC3-N	1.1 dB
ELPRO	340-540MHz	ANTBU3-400	Antenna 3dB Collinear with 'N' Type Female Connector	CC10-N	1.9 dB
ELPRO	340-540MHz	ANTBU6-400	Antenna 6dB Collinear with 'N' Type Female Connector	CC10-N	4.9 dB
ELPRO	340-540MHz	ANTYU3-400	400Mhz Aerial 3 element 6dBi YAGI with 'N' Type Female connector	CC10-N	2.7 dB
ELPRO	340-540MHz	ANTYU6-400	400Mhz Aerial 6 element 9dBi YAGI with 'N' Type Female connector	CC10-N	5.7 dB
ELPRO	340-540MHz	ANTYU16-400	400Mhz Aerial 16 element YAGI 15dBi with 'N' Type Female connector	CC20-N	8.4 dB

ERT-A2 OVERVIEW

Overview

The ERT-A2 (ERTA2) battery powered wireless environmental monitoring unit is designed to provide reliable monitoring of environmental measurements in critical applications such as flood warning and other disaster management applications.

Input sensors to monitor environmental conditions such as rainfall, river heights, wind speed, wind direction, air temperature and humidity can be connected directly to the ERTA2 unit which will sample these inputs and on a detected change of value, send over VHF/UHF radio, cellular or satellite networks.

The ERTA2 is a compact and highly integrated unit which includes the capability to sample sensor inputs, manage battery power consumption, power supplies, MPPT smart solar regulator and one or two communication channels. All this functionality in enclosed in a weatherproof IP66 enclosure which can easily be installed directly outdoors, in a flood warning tree (standpipe) or in a separate enclosure with other monitoring equipment.

Communications protocols used in the ERTA2 are ALERT and ALERT2 which are international industry standards for flood warning and disaster management applications. ALERT2 offers benefits of allowing very large numbers of field sensors to be supported, very high level of data transmission reliability with data encoding and forward error correction, and flexible sensor data types/engineering units.

Cyber Security has been a strong consideration in the design of the ERTA2 unit. Features have been incorporated into the ERTA2 to provide effective device security. ELPRO continues to provide additional security features to the product as they become available in new additions of the ALERT2 protocol

The ELPRO ERTA2 unit provides an extremely versatile and feature packed unit allowing standalone installations with the addition of only sensor connections and possibly a battery charging source such as solar panel.

OPERATION

The ERTA2 unit is designed with features to allow the minimum power consumption to maximise the operational battery life.

In normal operation the ERTA2 switches between sleep and awake modes to sample sensors and internal inputs for a change. If nothing has changed then it goes back to sleep. If there is a change it will wake fully and send the new value over the communications channel.

To conserve the units power consumption the frequency of communications transmissions should be kept to a minimum. Sensor digital and analog inputs have a sensitivity value that can be configured that is the threshold of change before a communications transmission will be triggered.

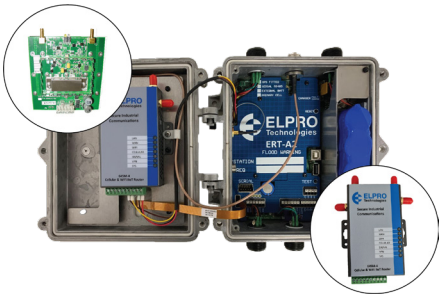
There is also a configurable paralysis time which will limit the frequency of transmissions. This is configured in seconds to wait before transmitting again.

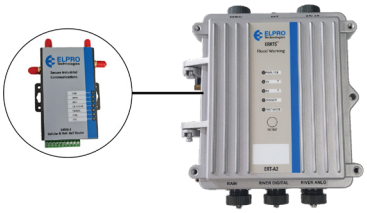
The ERTA2 includes a wide range of internal diagnostics and internal inputs that can be configured to send as ALERT2 messages. Internal inputs include battery voltage, power supply/solar voltage, received signal strength (RSSI), internal temperature and internal status bits.

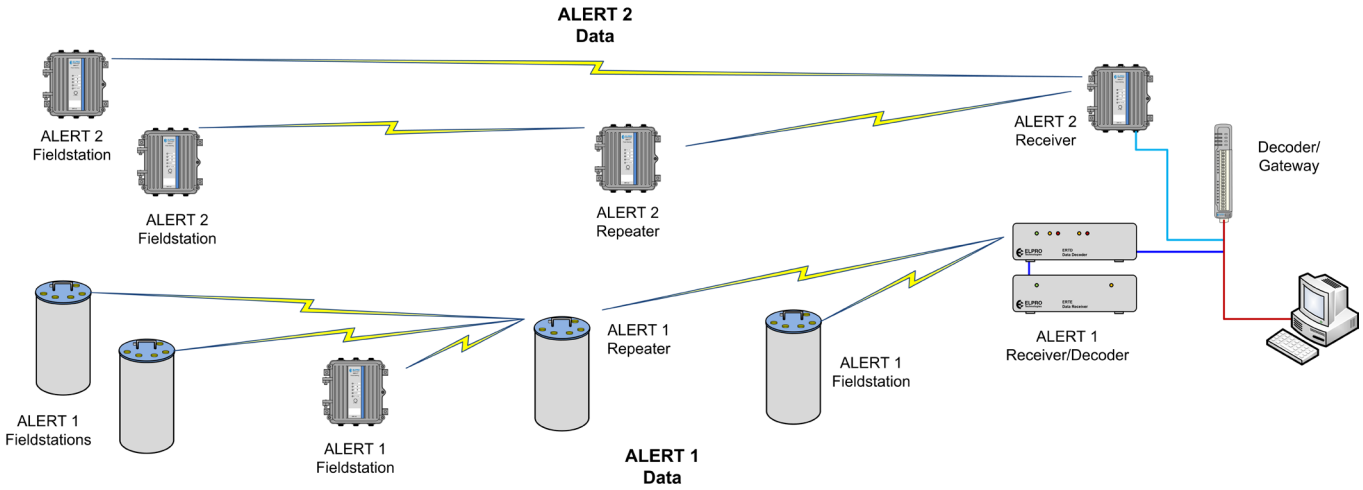
NETWORKING

Up to two internal communication channels are available. Primary channel supports VHF/UHF radio, 4G/LTE cellular or satellite networks. The secondary channel provides a redundancy mode and supports cellular 4G/LTE and satellite.

The operational modes of the ERTA2 unit can be configured for either Field Station, Repeater or Base Receiver when using primary VHF/UHF radio. The unit is also able to operate as a field station using 4G/LTE Cellular or Satellite primary radio.





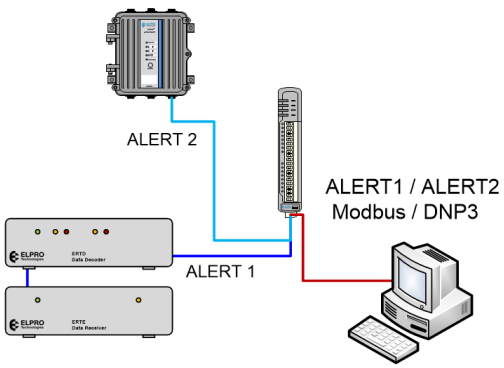


Legacy ALERT (ALERT1) & ALERT2 protocols are supported in any of the configuration modes for a Field Station, Repeater or Base Receiver.

Field Station is typically used for flood warning gauge sites or any other environmental monitoring site and has the lowest power consumption configuration.

Repeater units will store and forward communication messages from other Field Stations and/or Repeaters to increase the maximum transmission distance. Repeaters units include ability to configure station address whitelist/blacklist filtering to limit communications traffic in the network.

Base Receiver collects all the network communication messages directly from Field stations or Repeaters and transports them to the Decoder-Gateway which provides protocol or media conversion as required to data collection networks.
For more information on configuration of modes and features described above see relevant sections of this user manual below or refer to ELPRO web site for additional application notes.



ORDERING GUIDE

Model Overview

The ERT-A2 has several different models and/or options. To identify what model and options you have, locate the compliance label, which will be located inside the unit on the side opposite to the battery (if fitted).

The compliance label will look like the sample below but may have difference due to sales region/model.

The standard ERT-A2 supports ALERT / ALERT2 operation as a field station, repeater or receiver base station receiver through software configuration.
To decode or specify product ordering codes, use the table below:

	Part Number	**EL-ERT-A2-CGR-XA**	C	G	R	-	X	A
	Part Check	EL-ERT-A2						
Base Config	Enclosure	ERRTS Std Mil Spec	M					
		Cable Gland	C					
	GPS	Fitted (Standard)		G				
		Not Fitted Special Orders Only		X				
	Battery	Internal rechargable Except 25W			R			
		External			E			
Primary Comms	Licence Free/Licenced	150MHz 5W					1	
		300MHz 10W					3	
		400MHz 10W					4	
		500MHz 10W					5	
		900MHz 5W					9	
		150MHz 25W EXT BATT ONLY					H	
		915MHz ISM 1W					F	
	Cellular IOT	APAC					A	
		Americas					U	
		Europe					E	
		LORA					L	
		Not Fitted					X	
Secondary Comms	Cellular 4G LTE Gtway	APAC						A
		Americas						U
		Europe						E
	Satellite Gateway	Sat						S
	Satellite - No Modem	Sat-MOD						S
	LoRa WAN	LORA						L
	Not fitted	Blank						X

Order model guide Notes:

- Not all possible build options above are available for order. Please check with your ELPRO supplier.
- Example: Cable gland, internal rechargeable battery, secondary AU cell radio, EL-ERT-CXR-XA
- All models with primary VHF/UHF radio -1, -3, -4, -5 and -H require GPS option for ALERT2 TDMA operation.
- Cellular/Satellite options do not require GPS option, time clock sync performed through cell/sat network
- 150MHz 25W Power Amplifier (PA) option will not allow secondary communications Cellular or Satellite gateway fitment in single enclosure. If Cellular or Satellite gateway is required with 25W PA option, then the gateway unit is ordered separately as a standalone IP enclosure with RS232 link to ERT-A2 unit.

INSTALLATION

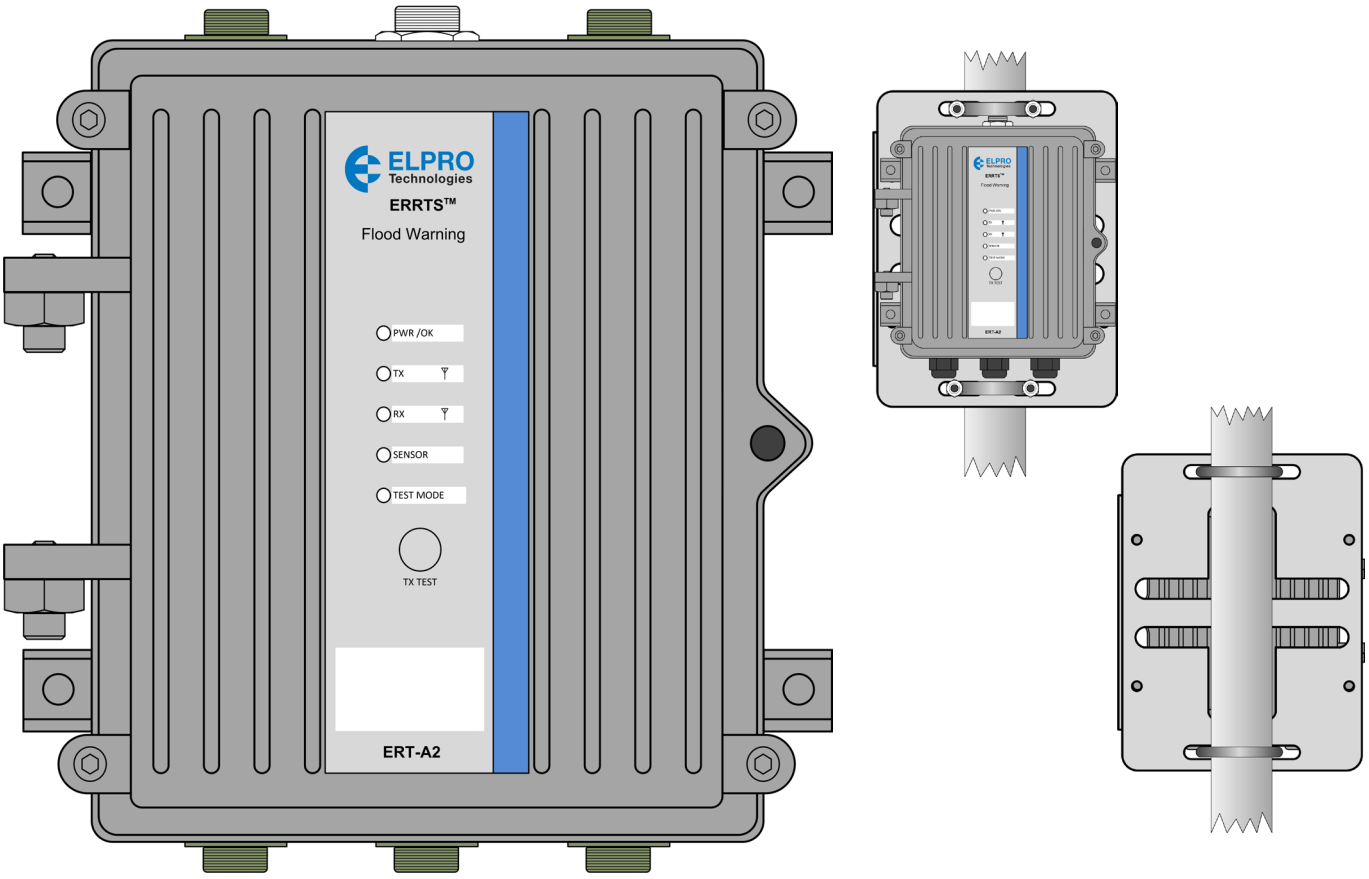
Enclosure and mounting

ELPRO ERT-A2 electronics and battery are enclosed in a rugged IP66 rated cast Aluminium 190mm x 197mm enclosure with an opening/removable door.

Sensor and power connection options are: Military specification screw-in connectors (MilSpec) or through cable entry glands with internal industrial push connect wiring terminals.

The MilSpec connectors are commonly used in legacy flood warning applications. Connectors are pin compatible with legacy ALERT ERRTS equipment to allow interchangeability in existing installations.

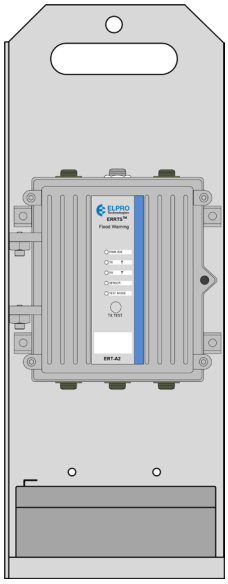
The enclosure is suitable to be installed in a variety of situations such as outdoor, indoor and cabinet installations and has the ability to be secured with padlock if required.



Mounting options are

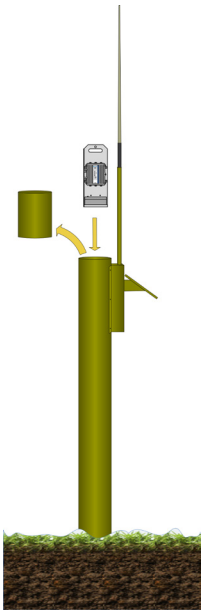
- Standard panel mounting via M6 mounting Holes 176mm x 119mm square provide by integrated mounting feet on the enclosure
- Pole or Rail (horizontal or vertical) mounted using an ELPRO supplied aluminium mounting plate (part no. BR-ERTA2-POLE) and either standard U clamps or s/s cable ties.

Enclosure and mounting



If the ERTA2 is to be mounted in a Tree, there is an aluminium accessory holder that allows the Radio and a battery to be housed on a plate that can then be lowered into the tree enclosure similar to the older Legacy cannister.

Tree bracket provide facility to restrain sensor cables, carry handle and location to connect rope or carabiner to secure the unit inside the rain tree.



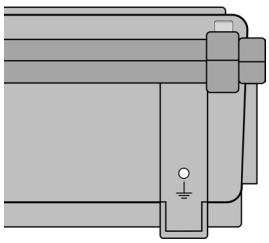
INSTALLATION

Grounding

To provide maximum surge and lightning protection for antenna connection and sensor inputs, each module should be effectively earthed/grounded via a GND terminal on the module. This is to ensure that the surge protection circuits inside the module are effective.

If the ERT-A2 is to be mounted in an enclosure you need to ensure the enclosure ground and the antenna mast/pole ground are connected to the same common ground point.

The ERT-A2 have a dedicated earth/ground connection M5mm screw on the side of the enclosure for this Earth connection. All earth/ground wiring should be minimum 14 AWG, 2.08 mm2 (0.0032 in2), Earth screw MAX length is 8mm.



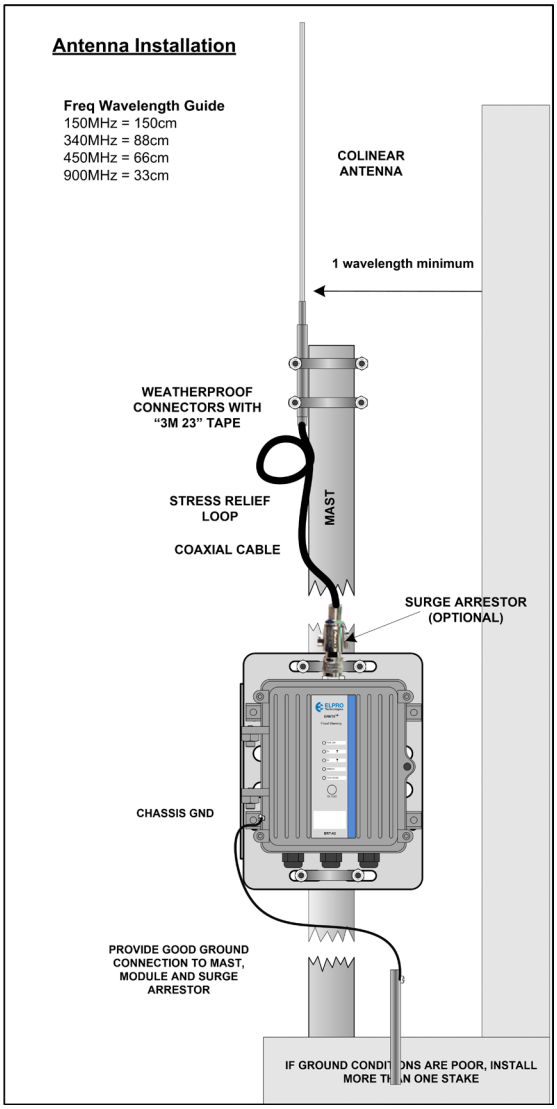
Antenna & Coax Cable connections

When installing the unit, it is important to ensure that all antenna cable connections are waterproofed as water ingress will affect its performance.

All external cable connections should be wrapped with “3M 23 Vulcanizing Tape”

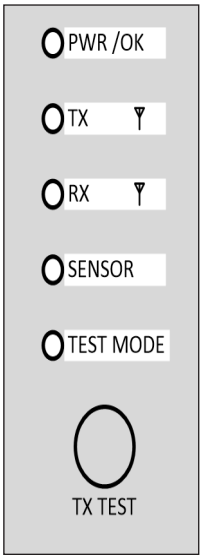
Antenna must be a minimum of 1 x wavelength from all surrounding structures (walls, towers, other antennas, etc) (Default for most ERRTS is 150cm)

Coax Surge Arrestor (if fitted) must also be suitably grounded to the most direct path to Earth.



INDICATIONS & BUTTONS

LED Indications (Front Panel)



The LED panel on the front of the ERTA2 will show operational and diagnostic indications.

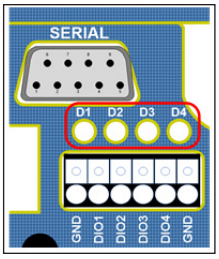
- PWR/OK Led - Indicates that the unit is powered and running, i.e. processor is operating normally (Green). This LED flashes briefly every 10 seconds when the unit is in Low power mode. Will also indicates any internal status alarms and failures (Red or Orange), see table below for possible alarm status reasons, connect to Diagnostic Menu and “Internal I/O status” to diagnose actual alarm reason.
- TX Led - Radio is Transmitting
  - Orange - Message Ready to send
  - Green - Transmitting
  - Red Flash - Failure to Transmit.
- RX Led - Green = Radio is Receiving, Red = Low RSSI Level <= -115dBm (ALERT) or Low RSSI Level <= -112dBm (ALERT2)
- Sensor Led - Analog sensor is being powered (24 Loop)
- Test mode - In Maintenance Mode. (ALERT & ALERT2)

TX Test Button (Front Panel)

Press for 1 Sec - Wait until “TEST MODE” LED turns Green then release the button. Forces a test transmission to be sent with all configured ID’s and values (Check transmission). If in maintenance mode, “TEST MODE” LED will turn from Green to Orange

Press for 5 Sec - Forces Unit into Maintenance Mode. Wait for TEST MODE LED to go RED then release. Press again for 5 seconds to exit Maintenance Mode (Wait for TEST MODE LED to go orange then red)

LED Indications (Internal)

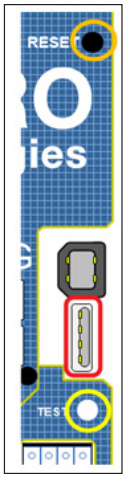


LED indication on each digital input - Led will turn ON when the Input is active, i.e. DI3 will flash with a Rain Tip.

DI-D4 LEDs are also used to indicate the status of firmware updates. Below table indicates the status, connecting an RS232 cable while performing this upgrade will show status on the menu (No via USB connection).

LED	Indication
1	Start Header Verification, Product ID Matched, Offset Matched, Entry/Destination Address Matched, Firmware Length Matched, Polynomial Matched, CRC Matched, Signature Length Matched
2	OK (the file signature is valid)
3	Firmware updating.....100.00%
4	Firmware update has been successful

Reset Button - Internal (Orange circle)



Press for 1 Sec - Forces the ERT-A2 to reset.

Test Button - Internal (Yellow circle)

Press for 1 Sec - Forces a test transmission to be sent with all configured ID’s and values (same as Front Panel Button).

Press for > 5 Sec - Writes all logged event log data to USB (if fitted).

SENSOR INPUT CONNECTIONS

The ERTA2 unit can be connected to several different types of external sensor inputs such as discrete on/off, pulsed, 4-20mA analog and SDI-12, allowing a large number of different sensors to be monitored in a single installation.

There are several internal sensor inputs and diagnostic data that can be transmitted or logged like battery health, power supply or solar, communications status and internal temperature.

Standard Available I/O

Type	Number	Configurations
Discrete (Digital/Pulsed)	4	Pulsed, ON/OFF or encoder configurable
Analog	2	4-20mA
DI-12	1 Channel	Up to max of 52 sensors and/or variables
Internal	4	Battery Voltage, Supply/Solar Voltage, Radio Received Signal Strength, Internal Temperature, Internal Status

The ERTA2 is available in two enclosure options to support different types of installations. Mil Spec connector enclosure provides a compatible connection with existing tree installations.

Cable gland enclosure option is available for installations where the Mil Spec connections are not required and is a very good option for outdoor pole mounting, elevated platforms or cabinet installations.

Below is a basic description on the different sensors and how they operate and can be connected.
See “CONNECTIONS MILSPEC & TERMINAL” below for actual connection details for both Milspec and Terminal connections.

Digital or Pulsed inputs

Digital Input channel 1 & 2 on the module modules can be used for a digital ON/OFF signal, a pulsed signal from a Tipping Bucket Rain Gauge, or a Shaft Encoder for measuring level.

In normal flood or environmental gauging applications digital Input 1 & 2 are used for a shaft Encoder. Shaft Encoders translate the rotation of an input shaft into a digital signal which can be read in the ERT-A2 inputs. A float connected to a beaded line over a pulley causes the shaft to rotate as it rises and falls with river level. Shaft encoders generally use some sort of “stilling well” in the river so that waves on the surface of the river do not cause the encoder to continually fluctuate. The ERTA2 unit supports incremental or quadrature type shaft encoders.

Digital Input 3 is a Pulsed input signal only, normally used for a Tipping Bucket Rain Gauge (TBRG) providing a dry contact closure through a small magnetic switch triggering for each increment of rain fall. Maximum Pulsed input rate is 10Hz

Digital Input 4 can only be used as Digital ON/OFF input, which could be used for a limit switch or intruder alarm.

The digital inputs whether a pulse, ON/OFF switch or encoder are activated by connecting the input terminal to GND or common, either by voltage free contact, TTL level, or transistor switch.

Analog inputs

The module provides two floating differential analog inputs capable of measuring 0-24mA for 4-20mA transducers/sensors.

It should also be noted that the analog inputs can be used to connect single ended current sinking or sourcing devices and can be connected in top or bottom of the analog loop.

The module also provides a switched 24V Analog Loop Supply (ALS) with a maximum of 50mA for any single ended current loops. To get the best battery life performance the ALS can be configured in the ERTA2 unit to only turn on during the sample period and can also provide a sensor warmup time before sampling the analog value.

The 4-20mA signal is normally used for measuring river level using a pressure transducer which detects water pressure at the riverbed or from a bubbler system which uses a constant flow of gas through a pipe to the water level. As the river level rises, the water pressure at the riverbed increases. The 4-20mA signal can also be used other types of sensors such as flow, temperature, etc.

SDI-12 Sensor Input

Smart sensors can be connected using the SDI-12 interface which can support a single channel with up to 52 sensors/variables.

SDI-12 is a three-wire serial sensor bus and allows reading of a number of variables from each sensor on the bus, which can be configured and reported by the ERTA2 unit. Connection to the SDI-12 bus can be made directly to internal terminals or through the 6-way “serial” Mil Spec connectors via the “River Digital” 5 pin Milspec connector, previously used for Shaft Encoders.

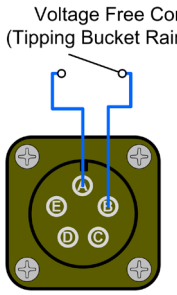
SDI-12 connectivity is shared with the RS-485 communications channel and is not available if the unit is configured as a base receiver.

CONNECTIONS (MILSPEC & TERMINALS)

Rain -Milspec

The Rain input connector on the ERT-A2 is for connecting a Tipping Bucket Rain Gauge (TBRG), which should be connected between pins “B” (Common) and “A” (Input).

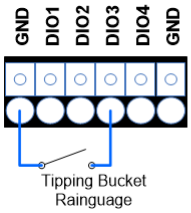
Rain



Rain Input

RAINGUAGE	
A	Contact Input (DIO3)
B	Common
C	N/C
D	Common
E	Common

If using the internal terminals you can connect a Tipping Bucket Rain Gauge (TBRG), across Digital input #3 and GND.



RAIN / DIGITALS	
GND	**Common Ground**
DIO1	DIO #1 (Shaft Encoder)
DIO2	DIO #2 (Shaft Encoder)
DIO3	**DIO #3 (Rain)**
DIO4	DIO #4
GND	Common Ground

River Digital SDI-12 & Shaft Encoder

Revision 4.0 ERT-A2 circuit boards (PCB) now have SDI-12 connectivity on this River Digital socket as well as being backward compatible with shaft encoders connections if required (with an internal cable change).

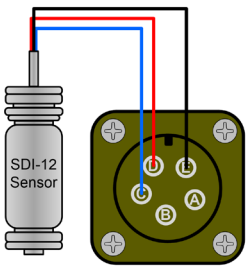
If position 1-4 = Standard Shaft Encoder.

If position 3-6 = SDI-12 compatibility.

Check Internal “River” socket position (Diagram below), from late Oct 2024 this default will change from position 1-4 (Shaft Encoder) to position 3-6 (SDI-12).

When wired for Shaft Encoder the ERT-A2 provides support for both Incremental and Quadrature types of encoders which is selectable via software configuration.

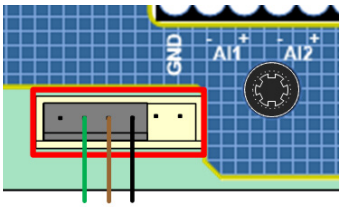
River Digital (SDI-12)



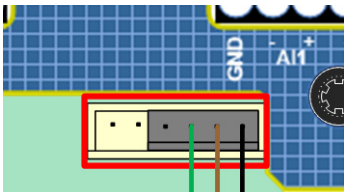
River

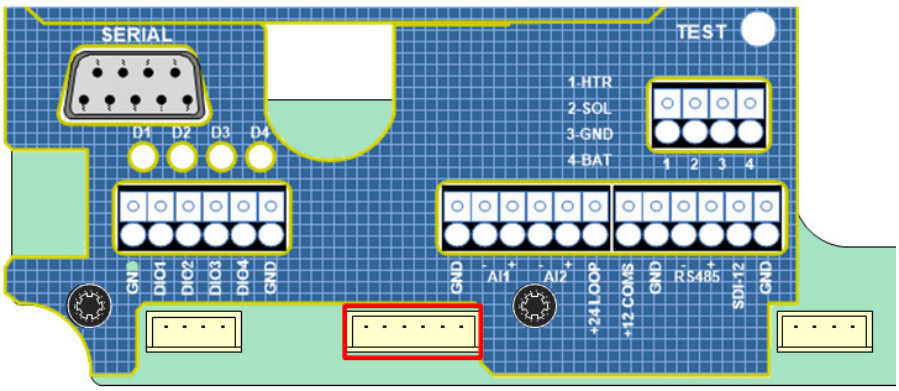
River Dig (SDI-12)	
A	SDI-12 Data
B	N/C
C	SDI-12 Data
D	Comms Supply (12V)
E	Common

Position 1-4

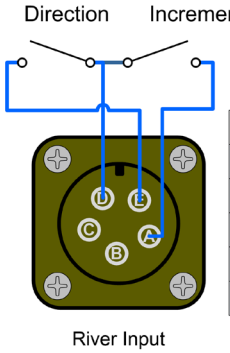


Position 3-6



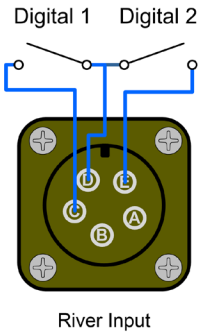


Shaft Encoder (Inc)



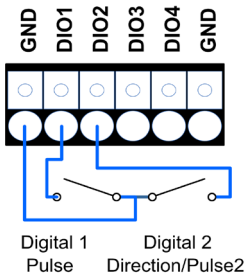
SHAFT ENCODER (Inc)	
A	Digital (DIO1)
B	N/C
C	Digital (DIO1)
D	Common
E	Direction (DIO2)

Shaft Encoder (Quad)



SHAFT ENCODER (Quad)	
A	N/C
B	N/C
C	Digital (DIO1)
D	Common
E	Digital (DIO2)

Terminal Wiring



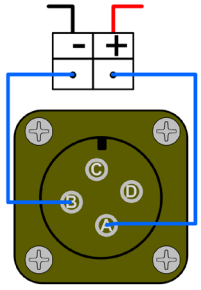
	SHAFT ENCODER (Quad)	SHAFT ENCODER (Inc)
GND	Common Ground	Common Ground
DIO1	DIO #1 (Pulse 1)	DIO #1 (Pulse)
DIO2	DIO #2 (Pulse 2)	DIO #2 (Direction)
DIO3	DIO #3 (Rain)	DIO #3 (Rain)
DIO4	DIO #4	DIO #4
GND	Common Ground	Common Ground

River Analog (Externally Powered)

Externally Powered devices can be connected directly to the AIN+ (A) & AIN- (B) Milspec connection pins or to the internal AIN+ & AIN- Terminals .

River Analogue (Ext Powered)

Externally powered sensor



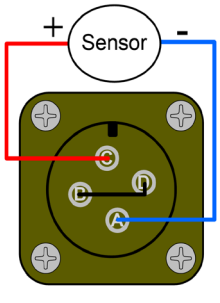
ANALOG	
A	AIN1+ Signal Loop
B	AIN1 – Signal Loop
C	Loop Supply (+24V)
D	Common

River Analog (ERT-A2 Loop Powered)

If connecting to a single ended device, the ERT-A2 can provide the +24V Loop supply and will need to be connected as per the diagram.

River Analogue (Loop Powered)

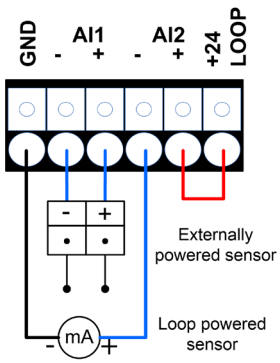
ERT-A2 powered sensor



ANALOG	
A	AIN1+ Signal Loop
B	AIN1 – Signal Loop
C	Loop Supply (+24V)
D	Common

Analog Terminal Wiring

The analog terminal has support for two 4-20mA Analog inputs, unlike the Milspec model which only has the one. It is possible to add second analog to the Milspec model but it would need to be wired directly to the internal terminals. Contact Elpro Support for a procedure on how to do this.

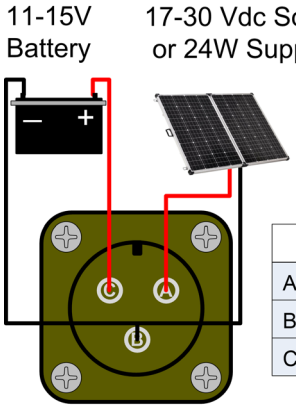


ANALOG	
GND	Common GND
-AIN1	AIN1 – Signal
+AIN1	AIN1+ Signal
-AIN2	AIN2 – Signal
+AIN2	AIN2+ Signal
+24V LOOP	Supply (+24V)

Solar

The Solar socket allows for the connection of a 5-30W solar panel connection or an external 24V power supply to power or charge the internal Lithium battery or an external fitted Lithium or Lead Acid battery.

Warning: The solar input is suitable for solar panels rated as 12V nominal only. 24V solar panel can produce open circuit voltages of up to 44Vdc which will exceed the rated input of the solar regulator and cause damage.

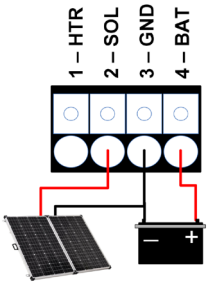


SOLAR	
A	Solar Input
B	Common
C	+12V Battery Output

Solar / Batt

Warning: Do not connect an External Battery to the "BAT" terminal when an internal lithium battery is fitted. Batteries have different charge levels that could result in excessive current and possible damage to the batteries and/or to the electronics.

Solar / Ext Supply



SOLAR / EXT SUPPLY	
HTR	Heater
SOL	17-30 Vdc Solar / 24W Supply
GND	Common
BAT	+11-15V Battery

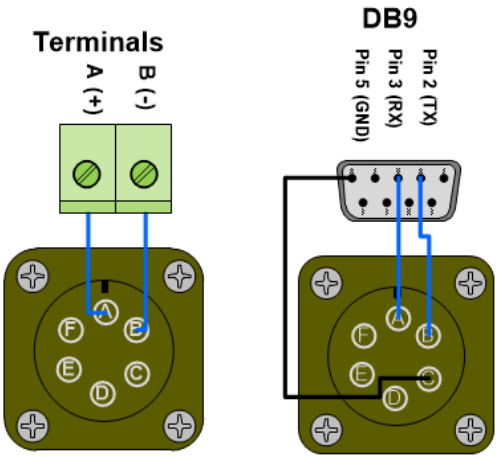
Serial (RS232 & SDI-12)

The ERT-A2 has serial communication connections available through both RS232 and RS485.

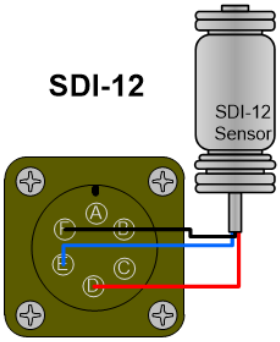
- RS232: (Default) is used for connecting to the unit for configuration/diagnostics through the Milspec connector or as an alternate ALERT2 communications Back-haul port via Cellular or Satellite modem. These would generally be internally connected inside the enclosure but connections are still available on the Milspec connector if needed to connect externally.

Note: SDI-12 is also available via this Serial Milspec connector is required, i.e. River Digital Connector is being used for Shaft Encoder connections
See SD-12 wiring details below for this connector.

Serial RS485 & RS232



Serial SD-12 (if required)



SERIAL SDI-12	
A	-
B	-
C	-
D	SDI-12 +12V
E	SDI-12 Data
F	SDI-12 GND

SERIAL

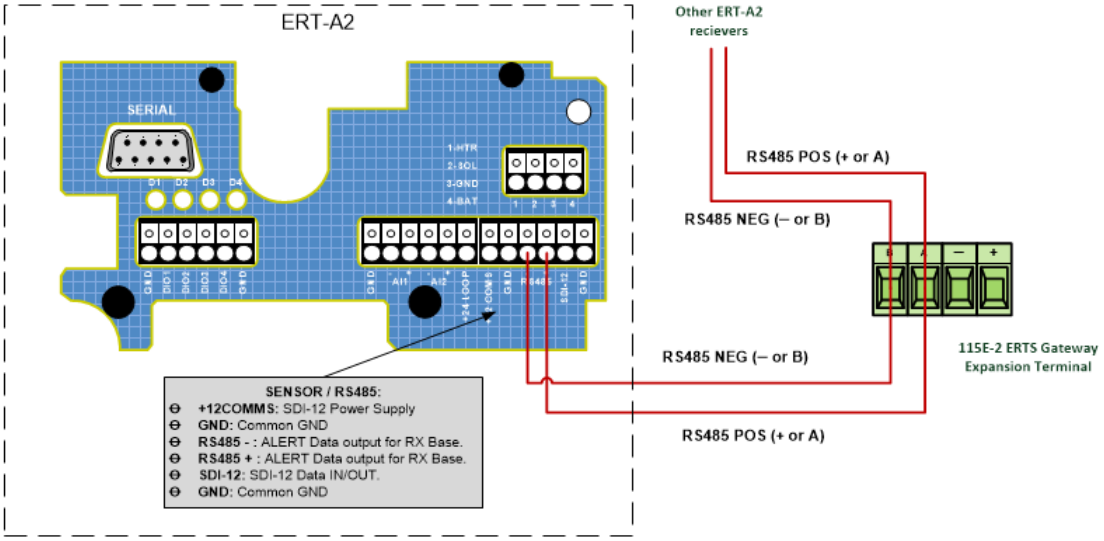
	RS485	RS232
A	RS485-A (+)	RX Data, Pin 3 DB9
B	RS485-B (-)	TX Data, Pin 2 DB9
C	GND	GND, Pin 5 DB9
D	SDI-12 +12V	SDI-12 +12V
E	SDI-12 Data	SDI-12 Data
F	SDI-12 GND	SDI-12 GND

Serial RS485 for Base Stations

The ERT-A2 RS485 serial communication is generally used for connecting to an ELPRO 115E-2 Gateway-decoder, which provides gateway functionality and sharing of data with environmental data servers and/or industrial applications (Scada/DCS) using Ethernet, RS-232 or RS-485 serial connectivity.

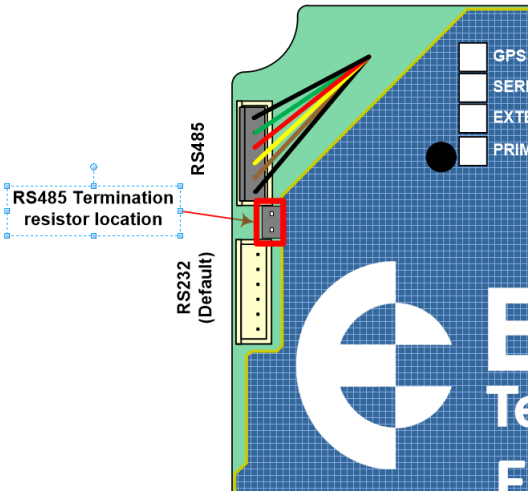
- RS485: Two wire connection, the default communication to the Elpro 115E-2-A2 Alert Gateway when used as a Receiver Base Station. Generally connection is made via the terminal strip, however it can also be made through the Milspec connector if this is the model you have.

ERT-A2 Terminal strip connection diagram below.

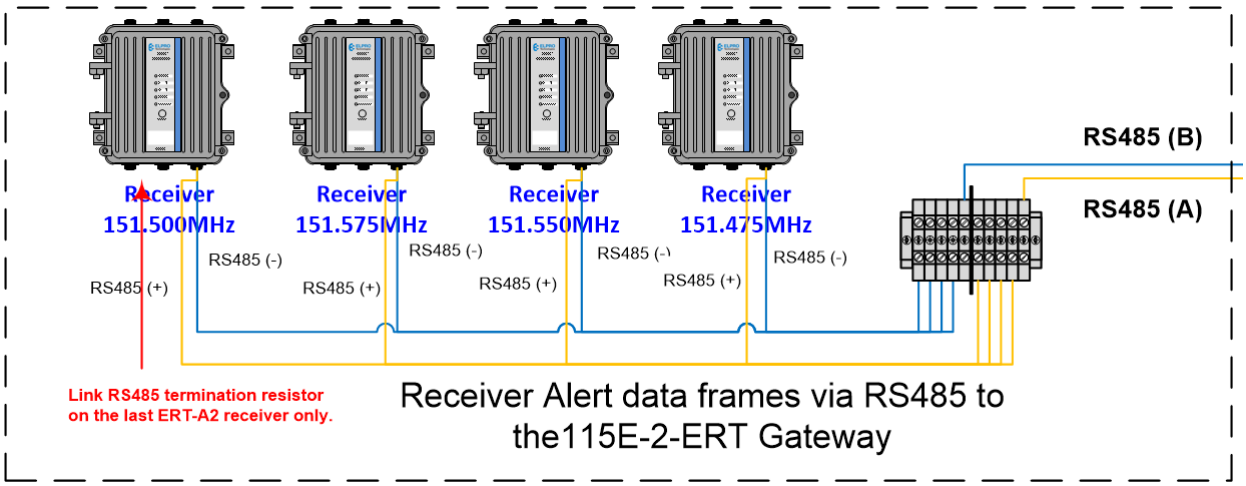


Note: If using the Milspec connector you will need to change the internal Milspec connection socket from the default (RS232 position to RS485 (see diagram) and then wire as per the previous sections Connection diagram.

Also if you have multiple ERT-A2 Receivers you must fit the RS485 termination resistor link on the last Receiver in the RS485 line.



If using multiple ERT-A2 receivers, RS485 is wired as multi-drop as per the diagram below.



SYSTEM DESIGN

Unit type overview

The ERT-A2 unit can be configured through the menu to support any of the three different unit types:

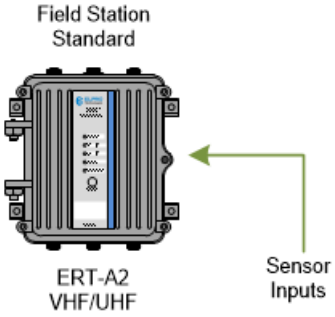
- **Field Station:** Very low power consumption unit which is in a sleep mode most of the time monitoring its sensor inputs and wakes to send data frames when events occur or on periodic update messages.
- **Repeater:** Low power unit that has its receiver powered to allow radio messages to be received and then re-transmitted and can also have sensor inputs connected which can be transmitted on event or periodic update messages.
- **Base Receiver:** This unit will receive radio messages and forward these messages to its RS-485 port which in a normal system is connected to the 115E-2-A2 decoder-gateway. The receiver is usually located close the Antenna and decoder-gateway is usually located remotely in server room or office where there is a network connection point. The base receiver also has sensor inputs which can be used to collect input values and transmit on events or periodic updates over the RS-485 interface.

For more complex systems or where there is a need to bring in remote station data on different frequencies or legacy ALERT1, Field Station, Repeater and Receiver units can be linked via serial to provide several very useful network consolidation tools.

Common Complex repeaters options:

- High Capacity ALERT2 or legacy ALERT repeater: In larger systems the network trunk or backbone can become very busy with field data messages and the capacity of these backbones can be increase twofold by use of a second radio frequency for this backbone. A high capacity repeater is enabled through the linking of a Receiver (frequency F1) and a transmitter (Frequency F2) via a serial link using two antennas.

Field Station



Field station units are the most commonly used configuration. The Field station type is setup by selecting this option in the communications menu.

Field stations support a wide range of sensor input types including discrete inputs which can be ON/OFF or pulsed types, 4-20mA analog inputs and smart sensors using SDI-12.

The field station supports both ALERT Binary or iFlows as well as ALERT2 protocol modes and again this can be configured in the communications setting of the unit.

A typical field station used in a flood warning application would normally provide the following basic measurements:

- Rain fall: pulsed input discrete from a tipping bucket rain gauge
- River height: Either 4-20mA analog input or from an SDI-12 smart sensor
- Battery Voltage: Internal or external battery voltage in Vdc

Field Station units will operate at the lowest current consumption modes and therefore in rain only applications can operate on the internal lithium battery for more than 1.5 years without replacement.

Field stations can be optioned with either VHF or UHF radio, 25W VHF radio, Cellular or Satellite communications options.

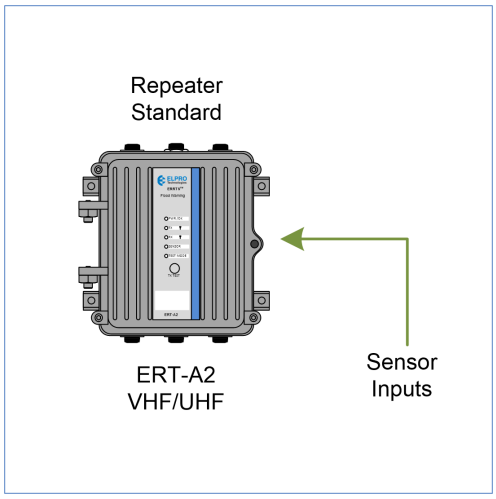
Summary:

- Single communications medium through either standard VHF, Cellular, Satellite, or RS232 interfaces
- Lowest power configuration with Rain (pulsed or digital) gives typically 1.5yr battery life.
- ALERT1 Binary or iFlows over radio (supports current legacy applications)
- RS232 support ALERT2 ASCII or Binary modes
- External pulse, digital, analog and SDI-12 IO
- Internal IO diagnostics:
  * Supply monitoring (Battery / Supply Voltage)
  * RSSI, temperature

Repeater Station

The standard repeater can be configured through the normal configuration menu. There is no special hardware required for repeater mode.

The repeater can be used either in ALERT2 or ALERT protocol modes and the protocol can be configured in the communications menu of the unit.



These units also allow for a secondary communications channel which is useful for redundant communications path through internal cellular modem. If redundant communications is required then this must be specified at time of ordering to include the internal cellular modem.

Repeater units can access all sensor input types the same way a transmitter station can. Repeater units operate with the radio receiver active, allowing sensor data to be received from other sites and therefore run at a higher power consumption than a field station.

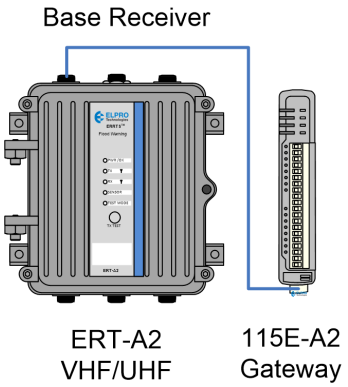
Repeater units also allow for receiving of ALERT2 messages into the RS-485 interface to be retransmitted by the repeater. This feature allows for more advanced repeating capabilities such as high capacity full duplex, multi-frequency or ALERT migration installations to be created as outlined later in this section.

Summary:

Single communications medium through either standard VHF, Cellular, Satellite, or RS232/RS485 serial interfaces

- Serial support ALERT2 ASCII or Binary input or output modes
- ALERT migration data to ALERT2 network though serial input (future update)
- Serial output allows for communications redundancy mode.
- External pulse, digital and analog IO
- Internal IO diagnostics:
  * Supply monitoring (Battery / Supply Voltage)
  * RSSI, temperature, internal status

Base Receiver Station



The base receiver station configuration mode is used for the collection of ALERT2 or legacy ALERT data at the network access point. It is normally used in conjunction with the 115E-2-A2 Decoder-Gateway unit.

Base receiver units are usually located very close to the receiving antenna to ensure shortest RF cable can be used and connects to the 115E-2-A2 decoder-gateway unit using a RS-485 link (twisted pair).

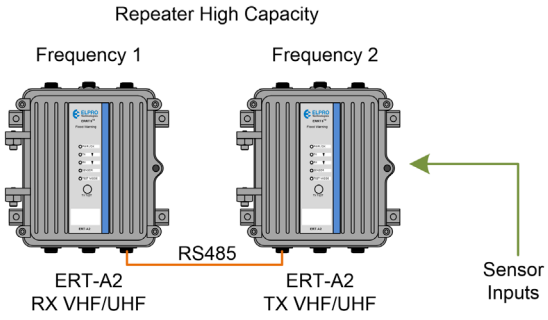
The 115E-2-A2 then receives this RS-485 data and allows host devices to connect via TCP to a standard ethernet connection. The decoder-gateway can also be used to accept legacy ALERT protocol through its RS-232 port to connect to existing ALERT decoders.

The ERT-A2 base receiver can also be installed with a RF splitter-combiner to allow single antenna to be shared between legacy ALERT system and the ALERT2 protocol unit. The 115E-2-A2 allows both connections and conversion of ALERT to ALERT2 as a concentration frame.

Summary:

- Base station receiver VHF/UHF radio
- RS-485 A2 data provides a medium distance connection up to 1km (4000ft) to decoder configurable data rate.
- Output communications can be either RS232 or RS485 could support ALERT2 Binary modes
- Decoder-Gateway connects RS-485/232 A2 data to Ethernet, HFEM, HyData, ALERT or converts into industrial protocols such as Modbus or DNP3 for Environmental or Industrial applications
- Internal IO diagnostics:
  * Supply monitoring (Battery / Supply Voltage)
  * RSSI, temperature, internal status

Repeater Station – Full Duplex High Capacity



Repeater and receiver units can be linked using the RS-485 interfaces which allows several useful configurations to be formed to solve more complex network design challenges.

For very large systems the backbone of the network data frame capacity can be increased twofold by using a second radio frequency and running in a full duplex mode.

The repeater will aggregate ALERT2 data frames when there is very high incoming data flows to achieve the most efficient use of radio channel a concentration frame.

Antenna systems would usually be installed separately, but if there is limited space on the mast structure then a duplexer can be used to run a single antenna. Using a duplexer typically requires a minimum frequency separation of 4MHz.

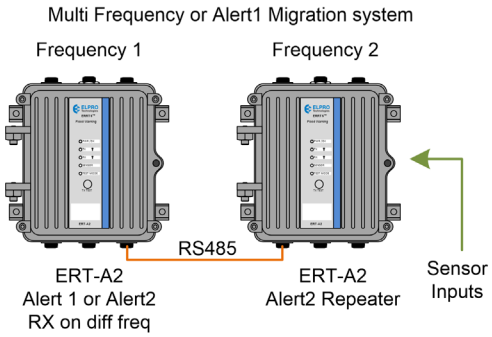
When using two antennas in the installation, take care to ensure there is adequate antenna separation. Recommended vertical antenna separate is 6m. Alternatively, a cavity filter can be used on the receiver, recommended to provide 20db of rejection on the transmit frequency of the repeater unit.

The SDI-12 Smart sensor interface is not available when RS-485 is used for data in this configuration.

Summary:

- High data capacity Repeater allowing full duplex frequencies with Rx-TX linked with RS-232 data connection.
- Simple configuration option to deploy using same electronics package as field station, repeater and receiver.
- Single communications medium through either standard VHF/UHF, Cellular, Satellite, or RS232/RS485 serial interfaces
- Dual antennas or single antenna using duplexer.
- Serial support ALERT2 Binary input or output modes
- Receiver supports ALERT allowing the migration of data to ALERT2 network though serial input to Transmitter or Repeater.
- External pulse, digital, analog
- Internal IO diagnostics:
  * Supply monitoring (Battery / Supply Voltage)
  * RSSI, temperature, internal status

Repeater Station – Multi Frequency or ALERT Migration



In systems there can be the need to bring data in from subnetworks that are operating on a different radio frequency.

With the ERT-A2 this can be achieved by using a receiver linked to a standard repeater by RS-485. The receiver can be operating on frequency F1 collect sensor data frames and passing them onto the repeater unit which will transmit on frequency F2.

When there is very high density of data frames the repeater will aggregate frames to get most efficient use of the radio frequency.

If there are multiple system frequencies several receiver units can be multi-dropped on the RS-485 to a single repeater.

This system configuration can also be used as a migration tool. The receiver can be configured to run in legacy ALERT mode which will output to the repeater as ALERT2 Concentration frames (encapsulated ALERT data) which is transported through the ALERT2 network.

Summary:

- Linked Repeater to second receive frequency network data.
- Allows merging of two or more frequencies into one stream in complex networks.
- Repeater will aggregate data frames in periods of high message density.
- Can also be used to create a High Capacity Repeater configuration for network backbone applications.
- Receiver can be configured as ALERT2 or ALERT to allow legacy site data to be transported on ALERT2 network.
- ALERT mode receiver can operate on same frequency as repeater in migration applications.
- Allows sensor inputs at repeater.
- Dual antennas can be used normally, or single antenna systems are support by using duplexer or splitter configuration.

UNIT CONFIGURATION

Connecting to the unit

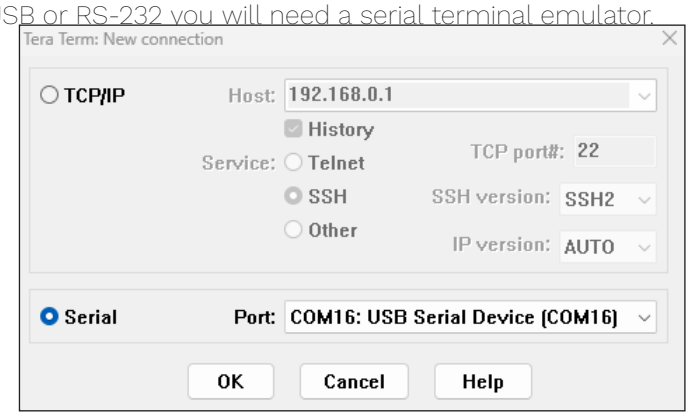
The ERT-A2 unit configuration can be performed through USB or RS232 serial ports.

For initial provisioning of the unit, it is recommended to use the USB port.

You will need a USB type A to type B cable to connect your laptop/computer to the ERT-A2 unit. This is commonly used for peripheral devices such as printers/scanners and is available from ELPRO, part number CBLUSB-ATOB.

You can access via RS232, using the standard serial cable that is used on the Legacy ERTS cannisters. You can either connect to the internal DB9 socket or if you have a "CBLSERERT" serial cable via the top 6 pin Milspec connector. **Note: If using RS232, you must disconnect any USB connection**.

To access the text-based configuration menu through USB or RS-232 you will need a serial terminal emulator. There are a number of Terminal emulation programs available such as Putty, Tera Term or Realterm. Tera Term is quite a simple application to install and setup and is the application we generally use and is what we have used to demonstrate in this document.



Setup a connection to the ERT-A2 using Tera Term by following these steps:

Google "Tera Term" and download and install.

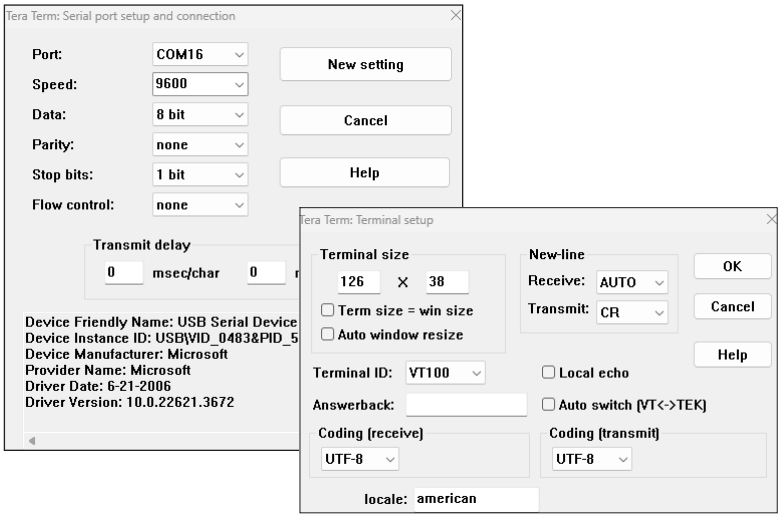
With the ERT-A2 powered, connect the USB cable from the PC's "USB A" socket to the ERT-A2's "USB-B" socket and wait a minute or two for the driver to install (this may only have happen the first time you connect).

Run Tera Term, select "New Connection" then "Serial".

If you do not see any available Ports, check your USB/Serial connections under Windows Device Manager. When the USB is connected to the PC the "PWR/OK" LED will come on indicating the unit is awake and ready.

Tera Term will default its serial settings to 9600, n, 8, 1 as below. But if you may need to change them, do so through the Setup/Serial Port menu.

Also it is best to set the Receive New-line to AUTO in the Setup/Terminal menu as shown.



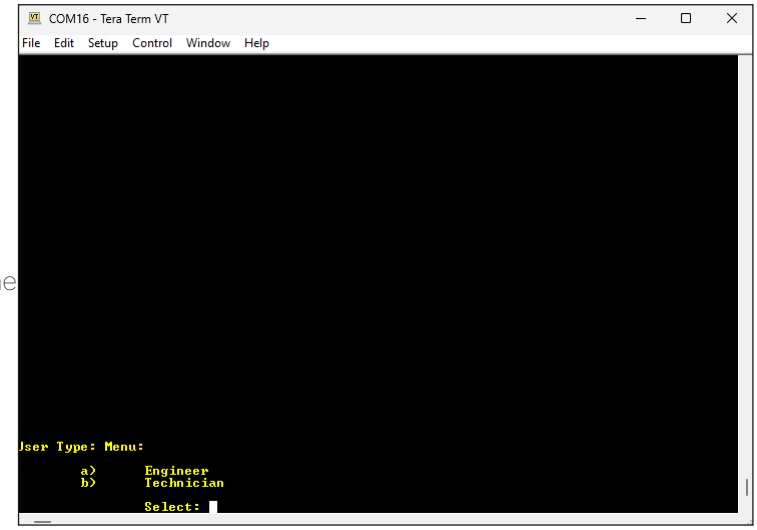
Click OK and hit enter on the keyboard and you should see the ERT-A2 login menu shown.

To login select option

- a) Engineer", default password "Elproeng",
- b) Technician, default password is "Elprotech".

Engineer access allows full read/write menu options, where as Technician is view only and some basic diagnostics.

You should then see the main menu as displayed on the right. There may be some slight menu differences due to model and firmware version.



Configuration Basic Guide

This guide is intended to give the user steps to follow to get a ERTA2 unit quickly up and running in an environmental or industrial monitoring application.

To access the user menu you will need to use a USB type A to Type B cable. This is usually the type of USB cable you would get with a printer or scanner or see your ELPRO dealer for this accessory.

See “connecting to the unit” above for the initial install of a terminal program on your PC and steps to connect to the ERTA2 units menu.

Once you have a connection with the terminal software you will see a user login menu.

User Type: Menu:

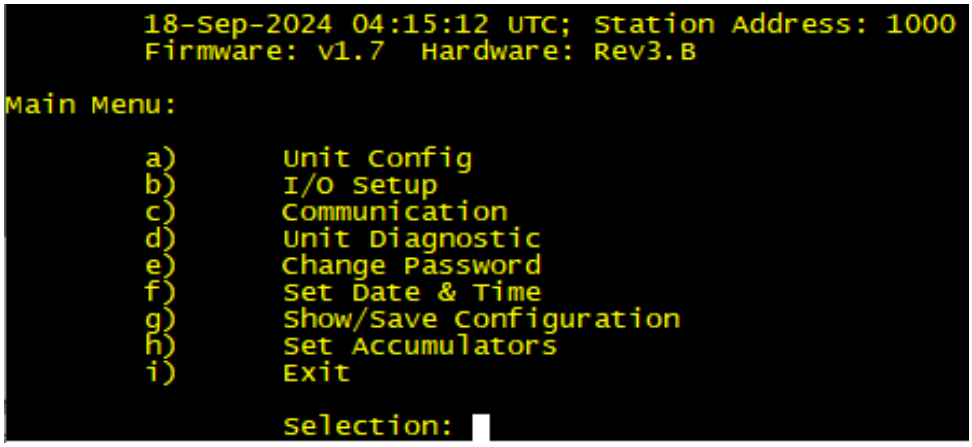
a) Engineer

b) Technician

There are two levels of login, Engineer which will give full access to configuration and Technician, which will allow you to view the configuration and to do some basic diagnostics only.

The default password for Engineer is “Elproeng” and the default password for the Technician is “Elprotech”.

You will then be presented with a menu like below (Engineer level):



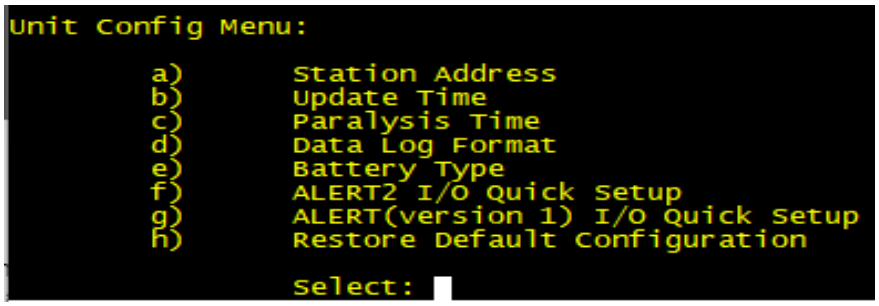
To navigate the menus simply press the letter corresponding to the menu option you wish to access.
If you want to return to the previous menu then hit the <enter> or any other key that is not a menu item.
The ERT-A2 has a number of configuration options, including configuration for both Alert1 or Alert2 communication protocols as well as a variety of communication methods and setup options which will be covered in the following sections.

Main menu

Menu Options	Description
Unit Config	This is where you setup the initial provisioning information, i.e. station address, update times, paralysis times, data formats, battery type, etc.
I/O Setup	This is where you can configure or adjust the various inputs, i.e. Physical Rain, River, Analog and Battery as well as any extra or I/O from SDI-12 devices.
Communications	Is where you setup how it communicates, i.e. If using Radio, Cellular, Satellite and any parameters associated with these communication methods, e.g. frequency, power, communication protocols, etc.
Unit Diagnostics	Range of diagnostic information and functions, firmware updates, test functions, etc.
Change Password	Allows you to configure the Engineering and Technician login passwords.
Set Date and Time	Manually Adjust the Date and Time. Note Unit will obtain Date/time from GPS or Cell/Satellite if fitted.
Show/Save config	Displays the full configuration and allows you to save any changes that have been made.
Set Accumulators	Allows you to manually adjust the current I/O accumulators to Reset or adjust.

Unit Configuration Menu

Unit Config menu is where all of the initial provisioning is done and it has the quick start options to allow basic setup of sensor Inputs, i.e. Rain, River and Battery.



UNIT CONFIGURATION

Menu Options	Description
Station Address	Unique identifying station address, only used in ALERT2 protocol, In ALERT the Station Address are based on the Sensor Input ID's, i.e. Rain, River & Battery and are setup from the Quick Start an/or I/O setup menus.
Update Time	The time the station will report its configured ID's as a check signal and it will send the current status of all configured I/O points. Note increasing the update time will increase current consumption which may affect overall battery time.
Paralysis	The time in seconds that the unit will wait after sending an event before it will send again. This feature will effectively limit the rate of event transmissions to conserve energy
Data Log Format	The format that all logged I/O changes are saves as. Default is ALERT2 ASCII but it can be saved as to CSV on change or CSV on sample.
Battery Type	Selects the type of battery that is connected to the station, i.e. Lithium or Lead Acid (Batteries have different charging characteristics)
ALERT2 I/O Quick Start	Quickstart to step through setting up the station for ALERT2. Sets up, units, Station ID's and analog parameters.
ALERT (v1) Quick Start	Quickstart to step through setting up the station for ALERT Protocol. Sets up, units, Station ID's and analog parameters.
Restore default configuration	Restores the device back to a default configuration, i.e. clears out I/O setup, SDI-12, and most of the timings.

Quick Start guides

The Quick Start menu options allows you to quickly and easily setup the basic Rain, River and Battery I/O points.

For a simple flood application gauging site it sets up a 4-20mA for river level, which will be on analog input 1, it also sets up a rain gauge (pulsed input) on DIO 3 and the Battery voltage. Each of these inputs will be configured with IDs that will be based off the Station Address for ALERT and the Standard Sensor IDs if using ALERT2.

Note: If you need to adjust the sensor settings or add extra I/O points you must do so through the I/O Setup menu. Running the Quick Start option again will overwrite any previous selections.

It is often quicker to start with this setup for either ALERT or ALERT2 applications and then use the I/O setup menu options to make minor adjustments or tailor sensor setting for the installation.

Quick Setup ALERT (Version 1)

If legacy ALERT or IFLOW protocol is used in the application, then select this menu item to setup the normal default sensor required for a standard gauging site.
ALERT quick setup will configure the following sensors:

Sensor	Input	ID
Tipping bucket rainguage	Digital input #3 (pulsed)	Station Address
River Height	Analog input #1	Station Address + 1
Battery	Battery Voltage (int or ext)	Station Address + 2

Steps through the following

- Unit selection where you can select Metric or Imperial units
- Enter ID for the Rain Channel, it will default to the configured Station Address (default 1000)
- Enter ID for the Analog Chanel, default to the Station Address+1, e.g. 1001
- Selection for Analogue (4-20mA), Incremental or Quadrature Shaft Encoders.

- If analogue, enter the Full range in mm or ft. (Default is 5000)
- Sample Time in minutes (default is 1 minute), Warmup time (default is 5 seconds)
- A sensitivity level, i.e. what threshold will force a transmission. (Default is 10mm or 0.1ft).
- Any Offset height that you may want to enter, i.e. an AHD Height datum. (Default is 0)
- Battery channel, default to the Station Address+2, e.g. 1002.

Quick setup ALERT2

This will setup the basic sensors required for a simple flood application gauging site based on using 4-20mA analog input 1 for river level, rain gauge input on DIO 3, Battery voltage and radio received signal strength. Each of these sensors will use the default ALERT2 sensor ID (refer to Inputs Configuration section for sensor ID table).

Steps through the following

- Unit selection where you can select Metric or Imperial units
- Configures a Rain sensor on ID 0 (Standard ALERT2 Sensor ID list is shown in the I/O setup section below)
- Analog sensor on ID 7 (Standard ALERT2 Sensor ID list)
- Asks you to enter the full analog range in mm or ft. (Default is 5000)
- Analog sample time in minutes (default is 15), Warmup time (default is 10 seconds)
- A sensitivity level, i.e. what threshold will force a transmission. (Default is 10mm or 0.1ft).
- Any offset height that you may want to reference, i.e. an AHD, Height datum, etc
- Battery on ID 8.

I/O Setup Menu

I/O Sensor configuration is best completed after you have configured the Unit Config and you have run the initial quickstart guide, then this will have already setup the basic I/O.

Once you have this basic setup completed, access the input setup through the I/O Setup option from main menu. This full menu is displayed below.

```
        DI1         DI2         DI3         DI4         AI1         AI2
Raw     0           0           6           Off         0.005 mA    0.000 mA
ID      -           -           1000        -           1001        -
Value   0           0           6mm         0           0mm         -25%

        Battery     Supply      RSSI        Int Tmp     Status
ID      1002        -           -           -           -
Value   14.1 V      24.104 V    0dBm        0 C         All OK

I/O Setup Menu:

        a)      Digital 1
        b)      Digital 2
        c)      Digital 3
        d)      Digital 4
        e)      Analog 1
        f)      Analog 2
        g)      Battery Voltage
        h)      Supply Voltage
        i)      RSSI
        j)      Internal Temp
        k)      Status Sensor
        l)      Input mode Din1/Din2
        m)      SDI-12 Device config
        n)      Analog Sampling

                Select:
```

The current status of all the inputs will be displayed in the header of this menu. Only Sensors that have an ID configured will be sent. The display will also show the current value for that sensors.

I/O Setup menu allows you to configure or adjust the I/O settings of each physical input sensor or SDI-12 device sensors. Each input will show the following configuration options. Selections may vary with what is shown, depending on they type of I/O.
The menu will show all physical inputs, and any internal diagnostic inputs, i.e. supplies, RSSI, Status I/P, etc as well as providing a location for configuration of SD-12 Sensors, Analog sample times and digital inputs mode selection for pulses (Rain) or a contact closure (switch)

The I/O Setup menu will display options like below.

I/O Setup Menu

Menu Options	Description
Digital Inputs	There are 4 digital inputs, DI1 & DI2 are used for Shaft encoder inputs or can be configured for contact closures or Pulses, DI3 is the primary Pulsed input for Rain, and DI4 an On/Off contact closure. See the "Input Modes" for selection and the Input Menu table below for more configuration details.
Analog Inputs	Each analog Input will show basic configuration parameters as well as some advanced. See the "Input Menu" table below for more details on the configuration options. Note: Default Quickstart River Analog input is on analog input #1
Battery Voltage	Battery voltage only allows configuration for the ID and the report format.
Supply Voltage	Supply voltage only allows configuration for the ID and the report format.
RSSI	RSSI only allows configuration for the ID and the report format.
Internal Temp	Internal Temp only allows configuration for the ID and the report format.
Status	Status allows configuration for the ID and the report format. Register show 16 alarm status bits, See table in appendix at end of manual for details.
Input Modes	DI1 & DI2 Input modes selection options for pulsed input or switch closure. The selections are. DI1 = Pulse & DI2 = ON/OFF (Rain Gauge on DI1, On/Off input on DI2) Both = On/OFF DI1= Incr & DI2 = Quad (Incremental values report at DI1. Quadrature values report at DI2) Both DI1 & 2 = Pulsed.
SDI-12 Config	SDI-12 Menu - See the SDI-12 section later in the manual for details.
Analog Sample Times	Change analog sample time and warmup time. Analog sample time is configured in minutes with a range of 1 to 1440 minutes. Sensor warmup time is the time that the ERTA2 will wait to allow sensor reading to stabilize before taking the value reading. It is configured in seconds and has a range of between 1 and 600 seconds.

Each Input menu option will show the following menu selections.

```
        AI1
Mode    4-20mA
ID      1001
Format  U-2
Scale   500
Offset  0(0mm)
Sens    1(10mm)
Display 10.00mm
Value   0mm

Analog 1 Menu:

        a)      Sensor ID '-' to disable
        b)      Report Format
        c)      Span / Range
        d)      Zero / Offset
        e)      Display Units
        f)      Display Scaling
        g)      Report Sensitivity

                Select:
```

Input Menu

Menu Options	Description
Sensor ID	This is where you can change the Sensor ID (enter a value of "-" to disable) if you need to manually edit the ID from the default quickstart configuration for ALERT or ALERT2. Note: It is recommended that ALERT2 Sensor ID's correspond to the standard Sensor ID's outlined in the following table and it is important if these IDs are used for environmental applications to maintain compatibility with other equipment and data recording requirements for users such as government agencies, etc.
Report Format	Report format is used to set the type of value that will be sent. You can choose ALERT, ALERT2 formats or choose a custom type and select the format type - unsigned, signed or floating point and then the byte length i.e. 1, 2, 3 or 4 bytes. Floating point values are fixed as 4 byte length only.
Scaling per count (Digital)	Scaling (per count) - Configuration for what each pulse counts represents and used in Conjunction with the Report Sensitivity, i.e. if you had a tipping bucket that was calibrated 0.2mm, configuring this for 0.2 would mean it requires 5 tips to register a count of 1 (the report sensitivity).
Span / Range (Analog)	The Span/Range & Zero/Offset menu items work together (for analog input sensors), to allow the setting of a custom span and zero for the sensor to allow scaling of sensor value before it is sent over the communications network. Generally the Quickstart menu is the simplest way to configure this. To scale manually - This is calculated from the full range of the Transducer, divided by the increment you need to report e.g. 5000mm / 10mm increments would be a scale of 500. Because the ALERT protocol displays a maximum of 11-bit values (0-2048) the value received would be shown as 0 -500 counts which represents 0-5000mm.
Zero / Offset	Zero is used to offset the zero point of the analog input. If you needed to offset the level to AHD (Australian Height Datum), this is where you would enter the offset level. E.g. if the "Span / Range" scale was used from above with an offset of zero the range received for a 4-20mA analog level would be 0-500, however if we were to configure an offset of say "1000" then the same 4-20mA range would show as 1000-1500.
Display Units	Sensor value units that are displayed internally within the configuration menu for diagnostics.

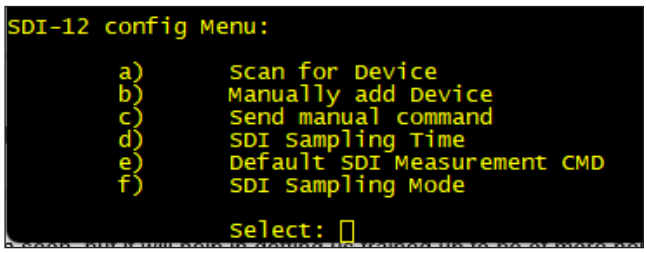
Display Scale	Allows scale multiplier to be applied to the sensor value that is displayed within the unit. This can be used to scale to engineering units, i.e. a URL height in meters, etc. This value is a float so will allow fractional scaling.
Report Sensitivity	The number of sensor value changes before an event is triggered and transmitted. The Default is 10 and may need to be changed if you wish to send every tip from a 1mm Rainguage. This value is a floating point, so fractional values are allowed.
Value	Displays the Current value.

ALERT 2 Standard ID list

Below is a listing of the standard ALERT2 IDs and recommended additional IDs for useful internal diagnostics. Sensor IDs 0-8 are dictated by the ALERT2 protocol standard and for the ERT-A2 unit sensor IDs 9-11 are recommended for useful diagnostic data.

ID	Sensor Type	Bytes	Format	Resolution	Default Units Metric	Default Units US
0	Rain	4	Unsigned Integer			
1	Air Temp	2	Signed Integer	0.1	Deg C	Deg F
2	Relative Humidity	1	Unsigned Integer	1	%	%
3	Barometric Pressure	2	Unsigned Integer	0.1	hPa	hPa
4	Wind Speed	2	Unsigned Integer	1	Km/hr	Mph
5	Wind Direction	2	Unsigned Integer	1	Deg	Deg
6	Peak Wind Speed	2	Unsigned Integer	1	Km/hr	Mph
7	River (Stage)	3	Signed Integer	0.001 or 0.01	m	ft
8	Battery Voltage	1	Unsigned Integer	0.1	V	V
9	Supply Voltage (solar)	1	Unsigned Integer	0.1	V	V
10	Receive Signal (RSSI)	1	Signed Integer	1	dBm	dBm
11	Internal Temp	2	Signed Integer	0.1	Deg C	Deg F
12	Internal Status	2	Unsigned Integer	1	bit	bit

SDI-12 Device Configuration menu



This configuration allows SDI-12 sensors to be added and variables configured, which are then sent via the ERTA2 communications port.

TIP: If you are adding multiple sensors to the SDI-12 port it is best to connect one sensor at a time and scan to add sensor variables, then change the SDI-12 address to unique value. Then connect the next sensor and do the same, and so forth until all sensors have been added.
The SDI-12 configuration menu has the following options.

SDI-12 Menu

Menu Option	Description
Scan for Device	Send out address query to identify any connected sensor and then automatically adds them to the configuration. This may take 60 seconds or so as it needs to power the device, scan and read any sensor variables. When completed you will see the Sensor will be added to the end of the SDI-12 Menu as a configurable item.
Manually Add Device	Sends manual command to add sensors. You can only use this if you know the SDI-12 unit Address. Useful if you have multiple devices.
Send Manual Command	Allow you to sends manual commands to the Device, generally used for diagnostic. A list of commands is shown in the “Manual Command list” table below.
SDI Sampling Time	Configure the SDI sensor system sample time in minutes and warmup time in seconds. This is common for all connected sensors and warmup time should be configured to allow for the slowest device.
Default SDI Measurement CMD	Allow you to change the default measurement command (M!) to R! or C! and with CRC and either Continuous or Concurrent. Generally best to leave at default if unsure.
SDI Sampling Mode	**Note: By default this will be Disabled.** Can be either Controller (Read values from a sensor) or Listener (Listen for data between another SDI-12 Controller and a sensor). As a Listener it still requires configuration, i.e. Scan for Sensors and configure ID’s, etc. When configured, switch to listener and whenever it hears data scanned from the other Controller it will send the configured values.
Setup Sensor XXX	The entries at the end of the SDI-12 menu are only added after the devices have been scanned and added to the configuration. See “Scanned Device Menu” below for Sensor details.

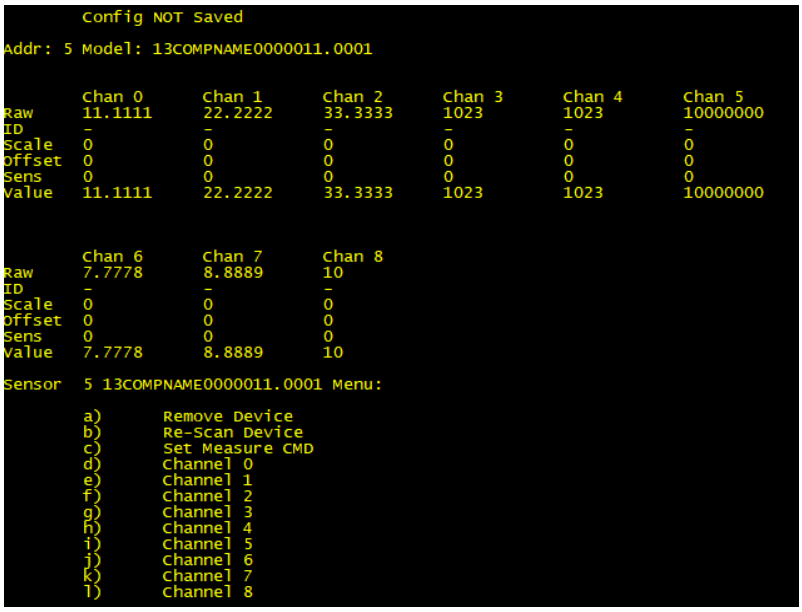
Scanning for Devices (Automatic)

When you select “Scan for Device” or “Manually add” (if you know Address) the ERTA2 will power the sensor and send a query command using the default warmup time. For very slow sensors you may need to adjust this longer to get a response (SDI Sampling Time).
The scan can take quite some time as it powers sensor, waits for the warmup time (default is 20 seconds), then request address, number of measurement variables and waits the measurement time to get the current variable values.

Selecting option a) to “Scan for Device” you should see something similar to below.

Warming up the Sensor (any key to skip) .....
Getting SDI Params structure (address, time, variables,)....
Sending M! ...
Response return (is this atttn on the device (It should be..)): 50219
5
Reading and mapping the sensor values....
Sensor Addr: 5
Time Required (Sec): 021
Returned Values: 09
Waiting for Variables....

Once the scan is complete the sensor will be added to the bottom of the SDI-12 Config Menu as an item.
Selecting this from the menu you will see a configuration menu followed by a number of configuration channel options. You will see something like shown screenshot.



From the above example sensor you can see that there was 8 variables channels reported and these can be mapped as an ID by the ERTA2 unit. By default each of these variables is disabled and indicated by a “–” in the ID row.

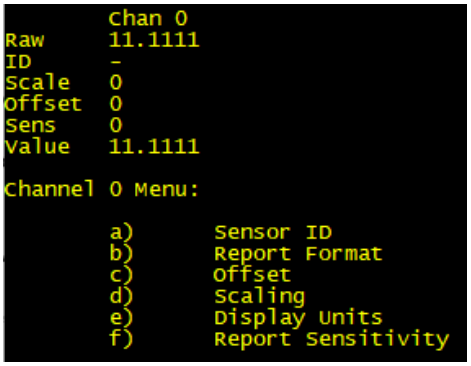
This menu also allows you to Remove the Sensor, Rescan and change the default measurement command.
Note: All SDI-12 measurement variables for ALERT2 is reported as Floating point, for ALERT, the floating point is rounded to the nearest integer. You normally need to scale the value before sending as an ALERT (version 1) message.

You can now configure the ERTA2 sensor ID to enable transmitting of data and then configure the sensitivity, zero/offset, display units parameters as per Analog Input configuration, shown in previous chapters.

Select the letter corresponding to the measurement variable that you need to configure and the menu below will be displayed to allow the setup of each individual sent ALERT2 sensor IDs.

SDI-12 Scanned Device Menu

Menu Option	Description
Sensor ID	Configure the transmitted sensor ID.
Report Format	For SDI-12 this is fixed as F-4 which is a float single precision value.
Offset	Offset adjustment value if required.
Scaling	Scale the value if required. This is most useful for ALERT Version 1 where the value should be scaled to work with the 0-2047 range available in ALERT messages.
Display Units	Engineering units to display, e.g. mm, ft, PSI, deg C
Report Sensitivity	Value of change before a event will be triggered and value is sent.



Manual Commands menu and SDI-12 Diagnostic Menu (same menu)

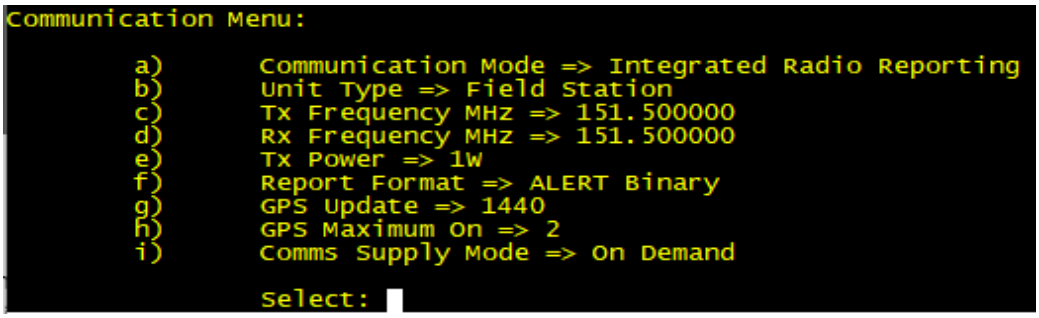
This menu allows to you manually interrogate sensors. Generally the Automatic Scan or the Manual Scan should suffice, however if you are having trouble getting connected to the device you can try some of the these diagnostic commands

Note: "IO Setup" - "SD-12 Device Config" & "Diagnostics" - "SDI-12-Value and Test" menus (are the same).

SDI-12 Manual command Menu

Menu Option	Description
Set sensor Address to use	Sets the Sensor Address to send manual commands to.
Query single attached Sensor Address	
Acknowledge Active - a!	Send an Acknowledge Active message out SDI-12. Sensor should respond with an address. Useful if you do not know what the address of the device is.
Get Sensor Identification - aI!	Scans for the Sensor Identification string.
Change Sensor Address - aAb!	Can change the Address of the SDI-12 Sensor
Start Measurement - aM!	Advanced measurement scan commands. Depending on the device connected it may require a specialised command. When the right command is known it can be configured as the default for all Scans.
Start Measurement with CRC - aMC!	
Continuous Measurement - aR0!	
Continuous Measurement with CRC - aRC0!	
Concurrent Measurement - aC!	
Concurrent Measurement with CRC - aCC!	

Communication Menu



The Communication menu is where you setup how the station communicates. The ERT-A2 can have a variety of options, depending on the model. The basic ALERT model is generally a VHF Integrated radio but there is also UHF radio option as well as Cellular modem or Satellite modem.

Note: The menu directly below shows “Integrated Radio” and the various unit type options and other communication modes are shown in the tables following these.

Integrated Radio - Field Station

Integrated Radio Menu Options	Description
Communication Mode	This is where we can change the reporting mode and it will depend on what hardware you have fitted. The menu options are 4G Cellular modem, RS232 reporting, Serial Menu and Satellite.
Unit Type	Configuration of the unit type, available options are Field Station (normal remote rain or river level stations), Repeater (store and forward repeater) or Receiver Base. Note: Repeater and Base Receiver options will change some menu selection and adds a repeater delay in msec, Repeater pass/reject lists as well as an Agency ID and a Secondary communication method which will be explained in a separate section below.
TX Frequency	Enter the transmitter & receive frequency in MHz. Field Station generally do not need an RX frequency and Base Stations do not need a TX frequency, however it is best to make the TX & RX Frequencies the same. Repeaters may have a different TX and RX frequency depending on how the network is setup.
RX Frequency	
TX Power	Configure the transmitter RF power in Watts. If the ERT-A2 is fitted with a 25 Watt PA Amplifier (Separate module fitted to the enclosure door), TX power must be set to 100mW.
Report Format	This is where you select what protocol format the station is communicating. Available selections are ALERT2, ALERT Binary and ALERT IFLOWS. The later two being the standard legacy ALERT formats.
GPS Update	The time the ERT-A2 will synchronise its internal clock with GPS satellites. Not used in ALERT, required for ALERT2
GPS Maximum On	Maximum time in minutes the GPS Synchronise will stay on if no GPS signal is found.
Comms Supply Mode	Selection for Supply (for Cellular Modem communications) to be either “On Demand”, “always ON”, or “timed”. Timed will then also provide some timing parameters to be configured, i.e. Wake time, repeat time and On time.

Integrated Radio - repeater

Integrated Radio Menu Options	Description
Communication Mode	This is where we can change the reporting mode and it will depend on what hardware you have fitted. The menu options are 4G Cellular modem, RS232 reporting, Serial Menu and Satellite.
Unit Type	Configure the type of unit, available options are Field Station (normal remote rain or river level stations), Repeater (store and forward repeater) or Receiver Base. As a Repeater you will notice extra menu options become available for repeater functionality, these will need to be configured.
TX Frequency	As a Repeater the station does need to Receive and Transmit so you will need to enter both frequencies. Quite often they are the same, however it is possible that the Repeater may need to have a different TX and RX frequency depending on how the network is setup.
RX Frequency	
TX Power	Configure the transmitter RF power in Watts. If the ERT-A2 is fitted with a 25 Watt PA Amplifier (Separate module fitted to the enclosure door), TX power must be no greater than 100mW.
Report Format	This is where you select what protocol format the station is communicating. Available selections are ALERT2, ALERT Binary and ALERT IFLOWS. The later two being the standard legacy ALERT formats. In Repeater mode, the ERT-A2 will receive both ALERT Binary and ALERT IFLOWS messages when either of these formats is selected. Messages are Re-transmitted in the selected format.
GPS Update	The time the ERT-A2 will synchronise its internal clock with GPS satellites. Not used in ALERT, required for ALERT2
GPS Maximum On	Time in minutes the GPS Synchronise will stay on for.
Repeater Delay	Used if you have multiple Repeaters and is needed so that when a message is received by the repeaters, the transmission is time staggered by the delay time, in order to prevent clashing of data, this delay is normally set greater than 200 ms. Note: For single repeaters, no delay is required.
Address List	Allows you to select one of four configurable ID lists. Each List can hold up to 32 address ranges.
Address List status	Enables/disables Address Lists. Note: if not enabled the address list does not affect the repeater function.

Address List Action	Allows the address list to be configured for Pass or Reject IDs. **Note: Can only configure 1 x pass list, but can have multiple (max 3) reject Lists.**
Address List Entries	Where you enter the ID filter ranges. Can have a maximum of 32 entries within each address list, which is used in conjunction with the List action option above (Pass/Reject).
Agency ID	Used only for ALERT2 and Describes the agency or authority responsible for the data.
Secondary communications	Allows configuration of a secondary communication method, i.e. for back-haul via Cellular or Satellite modem.
Comms Supply Mode	Selection for Supply (for Cellular Modem communications) to be either “On Demand”, “always ON”, or “timed”. Timed will then also provide some timing parameters to be configured, i.e. Wake time, repeat time and On time.

Integrated Radio - Base Station receiver

Integrated Radio Menu Options	Description
Communication Mode	This is where we can change the reporting mode and it will depend on what hardware you have fitted. The menu options are 4G Cellular modem, RS232 reporting, Serial Menu and Satellite.
Unit Type	Configure the type of unit, available options are Field Station (normal remote rain or river level stations), Repeater (store and forward repeater) or Receiver Base. As a Base Receiver you will notice the menu options have changed based on the unit type
TX Frequency	Enter the transmitter & receive frequency in MHz. As a Base Station receiver, its main roll is to receive data frames from Field Stations and Repeaters. Generally it would not need a TX frequency, however it is best to make the TX & RX Frequencies the same.
RX Frequency	
TX Power	Configure the transmitter RF power in Watts. If the ERT-A2 is fitted with a 25 Watt PA Amplifier (Separate module fitted to the enclosure door), TX power must be no greater than 100mW.
Report Format	This is where you select what protocol format the station is communicating. Available selections are ALERT2, ALERT Binary and ALERT IFLOWS. The later two being the standard legacy ALERT formats. You can select either ALERT Binary or ALERT IFLOWS for ALERT (version1). The Base Station Receiver will receive both message types.
GPS Update	The time the ERT-A2 will synchronise its internal clock with GPS satellites. Not used in ALERT, required for ALERT2
GPS Maximum On	Time in minutes the GPS Synchronise will stay on for.
Agent ID	Used only for ALERT2 and Describes the manufacturer
Secondary communications	Allows configuration of a secondary communication method, i.e. for back-haul via Cellular or Satellite modem.
Comms Supply Mode	Selection for Supply (for Cellular Modem communications) to be either “On Demand”, “always ON”, or “timed”. Timed will then also provide some timing parameters to be configured, i.e. Wake time, repeat time and On time.

4G modem Reporting Menu selection below, which is used for both Cellular or Satellite Modem options.

4G Modem Reporting

Menu Options	Description
Communication Protocol	Base Communication protocol that will be sent via the cellular or Satellite modem, options are ALERT2 ASCII or ALERT2 Binary
Unit Type	Only available for a Field Station
4G Destination IP address	Enter the IP address of the Host, that the ALERT2 data will be sent to, i.e. Bureau of Meteorology Server.
4G Destination TCP Port	TCP Port used in conjunction with the above Destination IP Address

RS232 Reporting Menu selection below, allows the local I/O to be sent via a third party external RS-232 based device like a serial modem. This option is not a common communication method, however it is possible.

RS232 Reporting

Menu Options	Description
Serial Baud Rate	Serial baud rate used for the communication. Needs to match the baud rate of the RS232 Device that is connecting.
Communication Protocol	Base Communication protocol that will be sent via the cellular or Satellite modem, options are ALERT2 ASCII or ALERT2 Binary
Unit Type	Only available for a Field Station

Lastly: The “RS232 Serial Menu” Communication option is only used for Diagnostic purposes.

Communications Configuration Options

The ERTA2 unit has two communications channels that can be configured for the transport of sensor data messages, designated: primary and secondary communications. In most applications only the primary communications channel is used however the secondary communications can be enabled and configured as a redundant backup channel in the event of a failure or unavailability of the primary communications channel.

Integrated Radio Communications Configuration

ERTA2 units that ship with either VHF (148-174MHz) or UHF (340–960MHz) radio will use this configuration option to setup the primary communications.

VHF radios also can have the option for a 25W power amplifier (PA) which is fitted to the enclosure door.
If this PA is fitted then it excludes the use of a secondary communications option.

If there is a requirement for secondary communications as well as a 25W VHF PA then it would require the use of a second outdoor enclosure kit. See your supplier for details.

Configuration of frequency and radio RF power should be done as per your license conditions with step sizes to 1Hz. The ERTA2 unit supports channel Bandwidth of 12.5kHz.
After selecting the communication mode as Integrated Radio Reporting, configure the VHF/UHF radio using the menu options described in the previous tables.

Field Station

This configuration type is usually used for remote gauging stations or remote sensor stations in the system. A field station can be used for monitoring of rain only or rain/river sites. This has the lowest power consumption, and a rain site can operate from an internal lithium primary battery for approx than 1.5 years with appropriate configuration.

Field stations can be configured to operate in ALERT or ALERT2 protocol mode and will send the data messages via either VHF, UHF, cellular or satellite communications (depending on model).

ALERT protocol modes supported are ALERT Binary (standard legacy ALERT protocol) and ALERT Enhanced (IFlows).

ALERT2 protocol can be transmitted in binary for VHF/UHF radio and binary or ASCII for cellular or satellite communications.

Repeater

When the unit is configured as a repeater then it acts as a store and forward repeater for ALERT or ALERT2 received messages. Because repeater mode requires the radio receiver to be powered, then this mode will consume more power than a field station. Please refer to specifications section of this manual.

A repeater can also be configured with up to 4 address list filters. Filters are 1 x pass & up to 3 x reject and include up to 32 address ranges in each single list. Each address range entry can be a single address or a range. Ranges are automatically merged or split entries are added or removed from the each list.

By default, a repeater will also accept ALERT concentration messages in via the RS-485 port, then store and forward over the radio. This feature can be used to setup a ALERT system migration unit at a repeater site by using another ERTA2 running as a receiver in ALERT mode and linking it to the repeater with a short, twisted pair link. See system design section for overview of migration options. When using this configuration type the two units can share the same antenna by using a splitter/combiner. See your reseller for more information.

Note: The RS-485 input is not available when SDI-12 is configured as a sensor input.

Secondary communication port allows a secondary or redundant communications path to be created to use cellular, satellite or through some other third party RS-232 communications medium.

Base Receiver

The configuration type is generally used for a unit that is located at the system Base or network end point.

The base receiver unit is usually located near the antenna to allow antenna cabling to be as short as possible to minimise losses. The receiver RS-485 will output ALERT2 data frames which is usually connected by RS-485 to an ELPRO 115E-2-A2 ALERT2 Decoder-Gateway unit that can be located at a network access point in a server room or IT cabinet.

A receiver can also be configured with address filtering in a similar way as a repeater with Id Pass/Reject filtering as explained in the above section.

The base receiver can be configured for either ALERT2 or ALERT (Binary and Enhanced-IFLows).

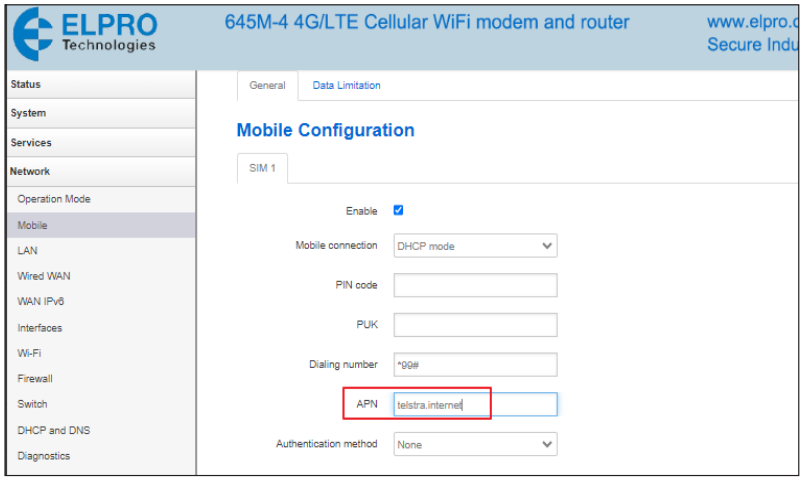
4G Modem Reporting

When selecting "4G Modem Reporting" from the communications menu it will change to allow for 4G/LTE cellular modem (Elpro 645M-4) configuration parameters and its network connection details to be configured. See the available menu options in the communication section above under "4G modem Reporting". Configuration of both the 645M-4 cellular modem and ERTA2 is required for correct operation of this communications channel.

645M-4 Cellular Modem

First install the SIM card, to do this the cell modem must be removed to access the SIM holder underneath the unit. Remove the two Philips screws that go through the holes in the cell modem bracket and loosen the two screws that are in the key way. One of the screws will have a cable restraint clip, remove this also. See diagram on right.

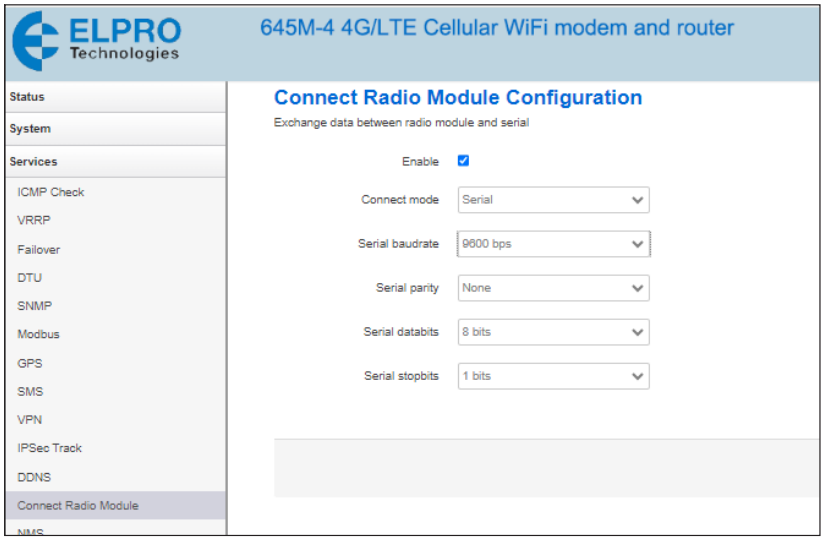
Carefully turn the cell modem over and you will see an access hatch and two small screws that secure it. Remove these two screws and insert the SIM card into the holder. Replace the SIM card hatch and screws, followed by the four screws that hold the cell modem onto the ERTA2 door plate.



Now you can configure the APN of the cellular modem. Connect a computer using an ethernet cable to one of the RJ45 ports on the cellular modem. Use the diagnostic menu option "Comms Supply Mode" to power the modem and wait for approximately 2 minutes for modem to finish booting before connecting to it.

Go to the Network configuration menu, then select "Mobile" from the left menu options and enter the APN:

Next select the Services menu, then click on "Connect Radio Module", tick enable box and enter 9600, no parity, 8 data bits, 1 stop bit items. See screenshot on the right:



Once this is complete you can power the ERTA2, and it will power the cellular modem to make a startup transmission. The ERTA2 will only power the +12V switched supply for 2 or 3 mins so go to the Communication menu and select the menu item Comms Supply Mode and configure one of the options, "On Demand" which will turn on the supply when it needs to communicate, or "Always ON" which will permanently power the modem but note: this will draw excessive power so this needs to taken into account.

The last menu option is "Timed" mode which allows you to configure a set time period the modem will turn on, either daily, hourly, etc and for a particular time. This generally is used for Remote Cellular connection for configuration and diagnostics via a Cellular modem. Contact Elpro if you need more information on this option.

For applications where the 645M-4 is used as a secondary communications channel then its usually best to configure the modem to run permanently powered. Setup the modem to run in DTU mode with TCP parameters to connect to the server as required.

Remove the +12 connect from modem and use some insulation tape to protect the terminal from shorting and then wire the modem +12 directly to push terminals BAT. This will power modem permanently, so the system power calculations need to include the 120mA 654M-4 draw.

4G/LTE Primary Communications Operation

When the cellular modem is optioned for primary or secondary communications it will be located as a separate module on the door of the ERTA2 unit.

Connection between the ERTA2 and the cellular modem is made with a cable providing a switched +12Vdc regulated power supply and RS232 communications.

Note that this switch power supply is shared with the SDI-12 sensor power, so both will be powered together for a cell modem transmission or SDI-12 input sample.

The modem is only powered when on an input event from the host ERTA2. Events can be triggered by an input reaching the sensitivity, paralysis timeout or update time.

When an event is triggered the modem's power supply will be switched on and the ERTA2 will wait for the modem to boot and make a connection with the network. Once the modem is connected the ERTA2 will synchronise its time/date with the cell network and make a TCP connection to send the A2 data packet.

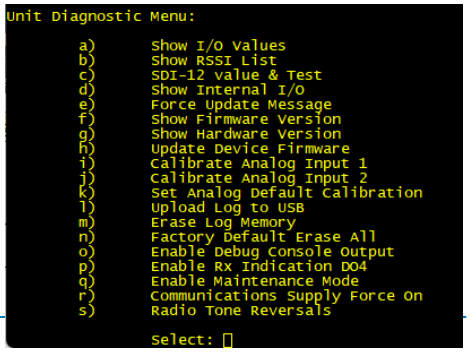
If another event occurs while the modem is powered the ERTA2 will send this while the modem is powered.

Note: ensure that the inputs sensitivity and paralysis times are configured carefully to ensure best current consumption and that multiple events are not keeping the modem powered longer than necessary.

Once all data is sent the modem will be powered down.

Diagnostics menu

The ERT-A2 provides a range of diagnostic features to allow quick and successful installation, commissioning and fault finding in the field.



Diagnostics Menu

Menu Option	Description
Show I/O values	Display current external input values for discrete, pulsed and analog inputs. Will force analog loop supply on and display a running sample off all Digital I/O and any configured analog I/O with ID's (like below) *DI1 DI2 DI3 DI4 AI1* *Raw 0 0 14 Off 12.009 mA* *Raw 0 0 14 Off 12.230 mA* *Raw 0 0 14 Off 14.084 mA* *Raw 0 0 14 Off 14.477 mA*
Show RSSI List	Repeater or Receiver Base station only: Displays a list of Station IDs with the last RSSI value and the time it was heard. An ID of 65535 indicates the RSSI for the last received message was corrupt.
SDI-12 Value & Test	Test functions for SDI-12 sensor to allow reading/changing of sensor address, info commands, etc to allow fault diagnosis. See SDI-12 Section above for Diagnostic Menu Details.
Show Internal I/O	Display current values for internal inputs, Battery Voltage, Solar/Supply Voltage, RSSI, Internal Temperature, Internal Status *Internal I/O:* *Battery Supply RSSI Int Tmp* *Raw 14.1268 V 24.104 V 0 dBm 28 deg C* *Internal Status: ALL OK.* *Radio Status : ALL OK.*
Force Update Message	Force an update message to be sent with all configured ID's and their current values.
Show Firmware Versions	Display Firmware versions of host, bootloader and radio. *Firmware: v1.7 Sep 20 2024 17:32:50 : 10366* *Host Bootloader: v1.3 - 9967:0:15:2:0* *Radio Firmware: v1.4 [Jul 26 2024 17:27:44] (10301) FI:6015*
Show Hardware Version	Display hardware revision of the hosts electronics printed circuit board (PCB) assembly. *Hardware: Rev3.B Serial Number: 00049920*
Update Device Firmware	From this me nu option you can upload new firmware. It will display a secondary menu selection for the various firmware's within the unit, e.g. Bootloader, Host (main processor), Radio, Function Image (RX Chip). See Firmware Update section below for more details.
Calibrate Analog Input 1	Calibrate analog input 1 – requires a precision 4-20mA current source simulator. Calibration is a two step process, i.e. connecting a precise low mA value (4.00mA) and sampling and the same for a high (20.00mA) value.
Calibrate Analog Input 2	Calibrate analog input 2 – requires a precision 4-20mA current source simulator. Same as above.
Set Analog Default Calibration	Resets analog inputs 1 and 2 to factory defaults calibration.
Upload Log to USB	Manually upload logged files to a USB. DI1-4 will flash to indicate copying. - Note: this process could take some time (10's of minutes) as it will depend how long the unit has been logging. Log file format will be a CSV with the format that has been saved on the Unit config menu.
Erase Log Memory	Erase all Log memory only
Factory Default Erase all	Erase all log files and configuration. Doing so will default Communications to RS232 Serial Menu.
Enable Debug Console Output	Turns on diagnostic console messages to the terminal screen. This will display all raw received and transmitted frames.
Enable RX Indication DO4	Enable Digital Output #4 to come on with valid RX messages - is used to drive a piezo to indicate a message has been received in the Field Testset.
Enable Maintenance Mode	Enable maintenance mode – flags sent messages as maintenance in ALERT2 protocol.
Comms Supply Force ON	Used to manually turn on communications port power supply system to allow external configuration of cellular or satellite modem units.
Radio Tone Reversals	Used to force the internal radio to transmit continuous tones for testing of VSWR and antenna systems.

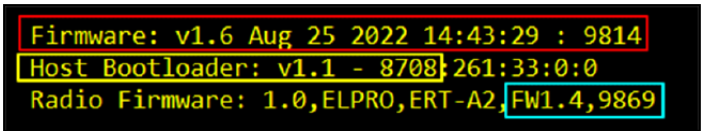
Other Useful Diagnostic Information and procedures

Firmware check and Update

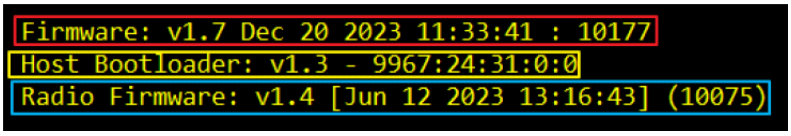
Checking the firmware versions for the various processors on the radio can be done by connecting using some terminal software and a USB A to USB B cable and navigate to the “Unit Diagnostic” menu then “Show Firmware Version”.

The display could display different depending on the Firmware versions.

E.g. Host V1.4-V1.6 version display



E.g. Host V1.7 version display



Host firmware is highlighted with a Red rectangle, Bootloader is Yellow and Radio is Cyan.

To upgrade any of the firmware version you will need the appropriate files from Elpro Technology, which you can download from the following web link.
Https://elprotech.com/product/errts-alert2-flood-warning-system/

Download the device firmware from the “FIRMWARE” link, then unzip the supplied firmware file to a folder on your PC then copy all the files to a cleanly formatted (Fat32) USB stick . **Do not rename or change the files in any way.**

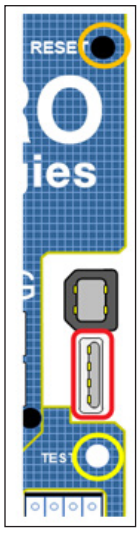
ERT-A2_v1.7_10048_B20000.bin	10/03/2023 11:31 AM	BIN File	229 KB
ERT-A2-B_v1-3_rc4_9967.bin	1/12/2022 9:34 AM	BIN File	129 KB
ERT-A2-R_app_155_v1-4_rc10252.wrap	3/07/2024 1:56 PM	WRAP File	170 KB
ERT-A2-R_fi6_0_1_5_v1-4_rc10250.wrap	1/07/2024 12:21 PM	WRAP File	49 KB

They should look similar to below, however the versions and build numbers may be different.

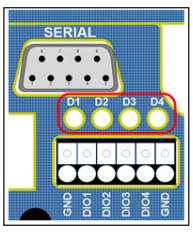
Please Note: if the Radio Firmware version on the ERT-A2 shows V1.2 or less the radio cannot be updated using this procedure. You will need to contact ELPRO Technologies for possible options.

Upgrade Procedure

NOTE: DO NOT REMOVE USB stick or interrupt the power, during this upgrade process, especially during the Bootloader. Doing so could render the unit inoperable.



1. **Host Firmware -** Plug in the USB stick that contains all the files (from Step 1) into the USB “A” socket on the ERT-A2 marked with the red rectangle (shown in the picture on the right).
2. Momentarily press the “Reset” button (Orange circle in the shown picture, you will need something long like a screwdriver to press the button through the hole) and then within 1 second press and hold “Test button”(Yellow circle) until you see the first DI1 LED turns on.
3. The I/O LED’s D1, D2, D3 & D4 should illuminate in sequence to indicate the firmware update progress, when all four D1-4 LEDs are on, pull the USB stick out and the unit will reboot with the new Host version, if you have trouble getting all the LEDs to come on, try removing the USB, plug it back in and try again.
4. **Bootloader Firmware -** From the menu select “Unit Diagnostics” / “Update Device Firmware”, then from the next menu select “Update Bootloader”. Press “Y” to “Continue” and you should see the I/O LED’s D1, D2, D3 & D4 illuminate in sequence to indicate the update progress.
5. **Radio firmware -** after Plugging the flash drive back into the USB, select from the menu “Unit Diagnostics” - “Update Device Firmware”, then select the option “Load firmware to Radio (ERTA2-R_app)”.
6. Again, you should see that the USB LED will flash (if using the Elpro USB) and the Input LED’s D1, D2, D3 & D4 illuminate in sequence to indicate the update progress, when all D1-4 LEDs are illuminated, press <Enter> a few times to step through the menu to complete the process.



7. **Note: This Radio firmware update process should not take any longer than 1 minute. If it is very slow or non responsive, press the Reset button, unplug and re-insert the Flash drive and try again. If you continue to have problems, try formatting the USB and/or contact Elpro Technologies**
8. **Radio Function Image "If required"-** Unplug the flash drive and plug back in, then select from the menu "Unit Diagnostics" / "Update Device Firmware", then "Load V23 Image to radio (ERTA2-R_fi6)". Again, the USB LED will flash and the Input LED's D1, D2, D3 & D4 will illuminate in sequence to indicate the update progress, when all four D1-4 LEDs are illuminated, press <Enter> a few times to step through the options and complete the process.
9. When finished you can check the firmware versions summary via the "Unit Diagnostic" / "Show Firmware Version". You should now see that all versions should be up to date as per the versions numbers shown. You might notice a new version string at the end of the radio firmware as highlighted at the beginning of this section, This is the Function Image version, which was not shown in earlier versions.

Restore Defaults and Factory Defaults

This can be done, one of three ways and each will clear out the current configuration and most of the timings, as well as some other functions.

1. From the Unit Config menu select "Restore Default Configuration" and Acknowledge "yes"
2. From the Diagnostic menu select "Factory Default Erase All" and Acknowledge "yes"
3. Using the button press process described below.
   * Briefly press Reset button (Small hole in top label plate near "Elpro" may require a small screwdriver)
   * Within 2 seconds, press and hold the "Test" button for 5 Seconds.

Factory Reset Completed!

With all these options it will default all I/O Setup configuration and any timings, i.e. Update times, paralysis, etc.

It will not default any of the Radio Parameter, i.e. Frequency, TX Power, Unit type, etc and this is because the communication needs to go to a known value and there can be many variations depending on the model and how it is setup., Because of this the communication settings will stay the same.

The "Factory Default Erase All" option will default all I/O Setup configuration and any timings, i.e. Update times, paralysis, etc. It will also **Erase all logged event data.**

The "Button Process" will default all I/O Setup configuration and any timings, i.e. Update times, paralysis, etc. It will also reset the Engineer & Technician passwords to the default.

USB Datalog Download procedure.

All configured sensor event or updates are logged to internal flash memory.
It will be stored in the format selected by the "Data Log Format" option under the Config Menu.

The available selections are below. If unchanged the default will be ALERT2 ASCII even if you are operating in ALERT mode.

DATA LOG FORMAT

Menu Option	Description
ALERT2 ASCII	Logs all Local I/O changes to a single CSV file formatted for ALERT2
CSV on change	Logs All Local I/O to a single CSV file. Data is logged every time any sensor value changes by the configured sensitivity.
CSV on Sample	Logs All Local I/O to a single CSV file. Data is logged every time a sample is made on the Analog or SDI-12, regardless of whether the data values have changed.

This data can be downloaded to use to backfill after communication outage or for analysing sensor values.
Use the follow procedure to recover a log file form the unit:

1. Plug in USB stick formatted as standard FAT32 file system.
2. Press and hold test button for more than 5 second and then release.
3. It will indicate the process has started by short flash of all four input LEDs and then flash DI1-4 while writing. **DO NOT REMOVE USB stick during writing process.**
4. Completion is indicated by all four input LEDs briefly turning on and then going out. Depending on how long

the unit has been running and how much data is logged this could take tens of minutes.

You are also able to download the file manually, by plugging a USB drive into the unit then select “Upload log to USB” from the Unit Diagnostic menu.

The Log file will log either ALERT or ALERT2 data depending on what format is selected in the “Unit Config Menu”.
Data will be appended to the file so its possible the file may show both format types if the file was not reset after changing the format type. This can be done from the Diagnostic Menu.

Data format will look like below.

ALERT, CSV Format data

```
Typical ALERT1 Datalog format
Time_and_Date,ID_5000,ID_5001,ID_5002
2013-12-16 04:47:03,0,0,133
2013-12-16 04:48:03,0,0,133
2013-12-16 04:49:03,0,0,133
2013-12-16 04:50:03,0,0,133
2013-12-16 04:51:03,0,0,133
2013-12-16 04:52:03,0,0,133
2013-12-16 04:53:03,0,0,133
2013-12-16 04:54:03,0,0,133
2013-12-16 04:55:03,0,0,133
2013-12-16 04:56:03,0,0,133
```

ALERT2 ASCII format - ALERT Concentration messages

Typical ALERT 2 or concentrated frame datalog format

```
ALERT2A,1,1000,ELPRO,N,1,2014,5,2,16,18,24.734,0,0,0,0,0,0,0,0,0,1,9,1000,74,3C,90,01,04,03,12,00,82
ALERT2A,1,1000,ELPRO,N,1,2014,5,2,19,18,24.786,0,0,0,0,0,0,0,0,0,1,9,1000,74,66,C0,01,04,01,12,01,05
ALERT2A,1,1000,ELPRO,N,1,2014,5,2,19,18,24.830,0,0,0,0,0,0,0,0,0,1,10,1000,74,66,C0,01,05,02,23,FF,FD,9E
ALERT2A,1,1000,ELPRO,N,1,2014,5,2,19,18,24.874,0,0,0,0,0,0,0,0,0,1,9,1000,74,66,C0,01,04,03,12,00,82
ALERT2A,1,1000,ELPRO,N,1,2014,5,2,22,18,25.106,0,0,0,0,0,0,0,0,0,1,9,1000,74,90,F1,01,04,01,12,01,05
ALERT2A,1,1000,ELPRO,N,1,2014,5,2,22,18,25.150,0,0,0,0,0,0,0,0,0,1,10,1000,74,90,F1,01,05,02,23,FF,FD,9E
ALERT2A,1,1000,ELPRO,N,1,2014,5,2,22,18,25.194,0,0,0,0,0,0,0,0,0,1,9,1000,74,90,F1,01,04,03,12,00,82
ALERT2A,1,1000,ELPRO,N,1,2014,5,3,1,18,25.246,0,0,0,0,0,0,0,0,0,1,9,1000,74,12,61,01,04,01,12,01,05
ALERT2A,1,1000,ELPRO,N,1,2014,5,3,1,18,25.290,0,0,0,0,0,0,0,0,0,1,10,1000,74,12,61,01,05,02,23,FF,FD,9E
ALERT2A,1,1000,ELPRO,N,1,2014,5,3,1,18,25.334,0,0,0,0,0,0,0,0,0,1,9,1000,74,12,61,01,04,03,12,00,82
```

LED Functionality.

Discrete input status is shown on LED only when menu is active, i.e. when sampling analogs, etc as part of its normal operation or when plugged into the Serial port. This is to conserve battery energy.

OK/PWR LED also indicates internal status or failures:

Green - For normal operation

Orange (Green and Red) - Indication battery low voltage @ 12.0Vdc

Red - Internal Alarm condition, i.e. Radio Faults: PA over-temp, PLL fail, high VSWR, power supply fail or Rx power reduced <5W

Red - Cell/Sat Modem: Failure to connect to network and TCP connection failed to connect

Receive LED RSSI threshold:

RSSI Low Threshold Level for ALERT1 = - 115dBm

RSSI Low Threshold Level for ALERT2 = - 112dBm

Internal Status Indication

The status register is an internal register available the in the ERT-A2 that shows any internal alarm indications that may have occurred and will also be indicated by a red OK LED.
If the OK Led is indicating RED, then connect to the menu and go to “Diagnostics menu”, then select the “Show Internal I/O Values” menu.

The status register value will be displayed with a detailed description and as a string of single characters to indicate any alarms (See table below).

Alarm Bit	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Alarm Description	Battery Low Voltage	Main Communications	Main Network Issues	Radio or Main Modem Comms issues	Secondary Comms issues	Secondary Network Issue	Secondary Modem Fault	SDI-12 Sensor Issue	-	Radio PA Over temp	Radio TX PLL Lock	Antenna VSWR	Radio RX PLL Lock	Radio supply Low	Radio supply too High	Radio Initialisation

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