Disaster Management & Flood Alert

Alert 2

ELPRO Technologies

July 2024

ELPRO ALERT2 Product Line Overview

Extensive local customer input and 35+ years of flood warning equipment supply experience used in specification development

- Simplifies ALERT2™ system migration strategy
- Innovative:
  - Transmitter, repeater or receiver configurable, reduces spares
  - Wireless Bluetooth BLE config/diagnostic interface access without removing equipment from tree – no ladders
  - Secure and robust, includes features to protect against cyber attack
  - IOPlus control for programmable logic support to drive outputs
  - Innovative power management system allows support for internal lithium or external lead acid and integrated solar regulator or external power supply
- Ease of use:
  - Same MilSpec connector/pinouts compatible with existing ERRTS™ installations
  - ALERT1 mode configurable for field station to simplify migration
  - ERRTS™ upgrade kit available to allow retrofit of existing ALERT1 gauging sites
  - Installation options of tree, cabinets or simple outdoor situations
- Flexible:
  - Two Analog inputs, 4 Discrete/pulsed inputs, SDI-12 Interface for Smart Sensors and discrete outputs to drive alarms, sirens or lights
  - Standard 150/400MHz licenced radio, optional cellular or satellite options
  - Logging support, internal Flash memory for recorded data retrieval

Features at a glance

Wireless

Licenced Cell/Sat

- 150/450MHz License or license free
- Cellular LTE/4G
- Satellite

Flexible

Field Stn Rptr/Rx'r

- Configurable as field, repeater or receiver station
- Wiring via MIL Spec or cable entry

Inputs

Pulse/Analog

- 4 Discrete on/off or pulsed
- 2 Analog 4-20mA/0-5V

Sensors

SDI-12

- Environmental Smart Sensors
- Max 46 sensor variables
- 12Vdc switched supply

Logging

Inputs/Config

- Internal or external IO
- USB accessable

Robust

Enclosure

- IP66 weatherproof enclosure
- Extended operating Temperature Range

Power IN

Pb, LiFe, Li-P

- Dual chemistry
- Internal LFP or LiP
- External battery

Charging

DC IN Solar

- External DC input 15-30Vdc
- Solar charge up to 30W panel
- Max charge 2A

VHF/UHF Radio Detail

Field Station
Standard

- Single communications medium through either standard VHF, Cellular, Satellite, or RS232 interfaces
- Lowest power configuration with Rain (pulsed or digital) gives typ 2 year battery life
- A1 over radio support legacy applications
- RS232 support A2 ASCII or Binary modes
- External pulse, digital, analog and SDI-12 IO
- Internal IO diagnostics:
  - Supply monitoring (battery/supply in)
  - RSSI, temperature, internal faults

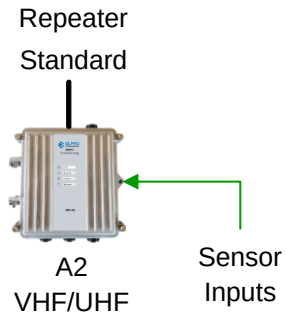
Repeater
Standard

- Single communications medium through either standard VHF, Cellular, Satellite, or RS232/RS485 serial interfaces
- Serial support A2 ASCII or Binary input or output modes
- A1 migration data to A2 network though serial input (future update)
- Serial output allows for communications redundancy mode.
- External pulse, digital, analog and SDI-12 IO
- Internal IO diagnostics:
  - Supply monitoring (battery/supply in)
  - RSSI, temperature, internal faults

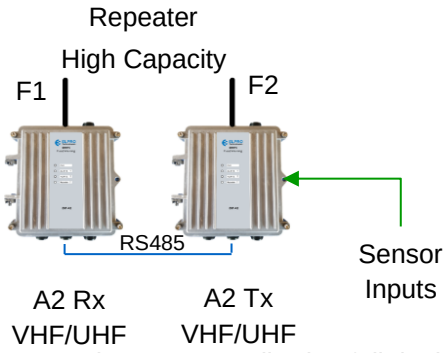
Base Receiver
Standard

- 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 A2 Binary modes
- Decoder-Gateway connects RS-485/232 A2 data to Ethernet, HFEM, HyData, A1 or converts into industrial protocols such as Modbus or DNP3 for Environmental or Industrial applications
- Internal IO diagnostics:
  - Supply monitoring (battery/supply in)
  - RSSI, temperature, internal faults

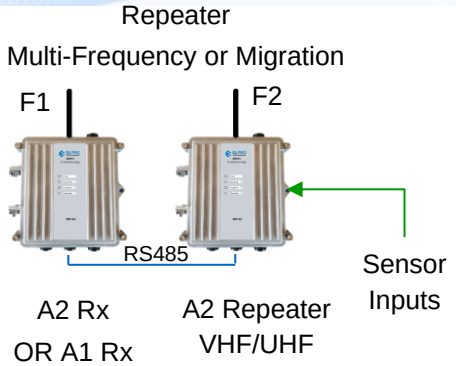
VHF/UHF Radio Detail



- Simple fully integrated low-cost repeater
- Single communications medium through either standard VHF, Cellular, Satellite, or RS232/RS485 serial interfaces
- Supports simplex frequency or half duplex frequencies (different Rx and Tx frequency)
- Aggregate's data frames in periods or high-density traffic
- Serial support A2 ASCII or Binary input or output modes
- A1 migration data to A2 network though serial input (future update)
- Serial output allows for communications redundancy mode.
- External pulse, digital, analog and SDI-12 IO
- Internal IO diagnostics:
  - Supply monitoring (battery/supply in)
  - RSSI, temperature, internal faults

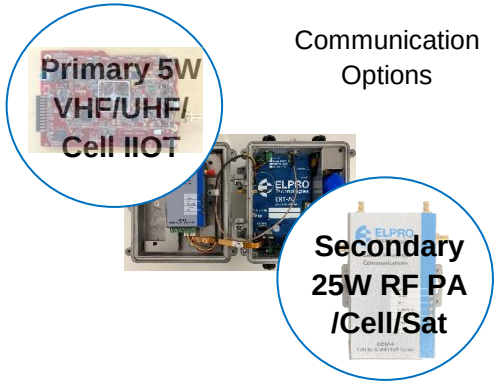


- High data capacity Repeater allowing full duplex frequencies with Rx-Tx linked with RS-232 data connection
- Simple configuration option to deploy using same electronics package as field station, repeater and receiver
- Single communications medium through either standard VHF/UHF, Cellular, Satellite, or RS232/RS485 serial interfaces
- Dual antennas or single antenna using duplexer
- Aggregate's data frames in periods or high-density traffic
- Serial support A2 Binary input or output modes
- Rx'er supports A1 allowing A1 migration data to A2 network though serial input to Tx or Repeater
- External pulse, digital, analog and SDI-12 IO
- Internal IO diagnostics:
  - Supply monitoring (battery/supply in)
  - RSSI, temperature, internal faults

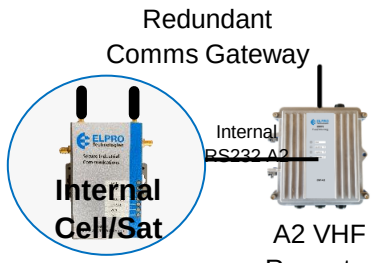


- Linked Repeater to second receive frequency network data
- Allows merging of two frequencies into one stream in complex networks
- Can also be used with High Capacity Repeater configuration
- Aggregate's data frames in periods or high-density traffic
- Receiver can be configured as A2 or A1 to allow legacy site data to be transported on A2 network
- A1 mode receiver can be on same frequency as repeater
- Allows sensor inputs at repeater unit
- Dual antennas or single antenna using duplexer or splitter configuration

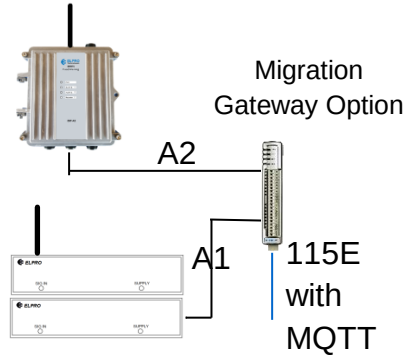
VHF/UHF Radio Configurations



- ERT-A2 unit is designed to be utilized with multiple communications channels
- A standard unit can be configured with two communications channels designated as Primary and Secondary
- Primary channels are used for the transport of A2 data through the network is support as an internal module integrated with the ERT-A2 host electronics assembly. Options:
  - Condor VHF/UHF DSP radio
  - Cellular IIOT
- Secondary channels are used to feed data to alternate stakeholders or redundancy. Secondary communication module mounted on the enclosure door plate provides options:
  - 25W VHF RF Power Amplifier
  - Cellular IIOT
  - Satellite Short Burst Data



- Redundant repeater communication can be provided with use of internal Cell/Sat modem (external for 25W VHF). Repeater could have local IO or SDI-12 sensors
- Redundant path could support A2 ASCII or Binary modes
- This model can also provide gateway for VHF network directly to WAN or Cloud computing in base situation.
- Can be configured to provide Ethernet connectivity for camera – would require larger battery/solar to suit higher power requirement
- Standard repeater type provides configuration of second port for A2 comms output.
- External IO, including SDI-12 sensors such as AWS..
- Internal IO diagnostics:
  - Supply monitoring (battery/supply in)
  - RSSI, temperature
  - Radio received packets good/bad



- Simple migration of receiver base sites
- Minimal disruption to existing receiver wiring
- Immediately allows system to be A2 capable for new equipment transmitting directly into base receiver
- ERT-A2 receiver located near antenna and connects to Gateway-Decoder via RS485 allowing very long cable runs reliably
- 115E-2 Gateway-Decoder can receiver A1 in through RS232 and A2 in RS485 to send out on ethernet as A1, A2 or HFEM (future)

Front panel LED Functions

Short Green Flash (10sec cycle): Normal
ON Green: Active
Short Red Flash: low battery voltage

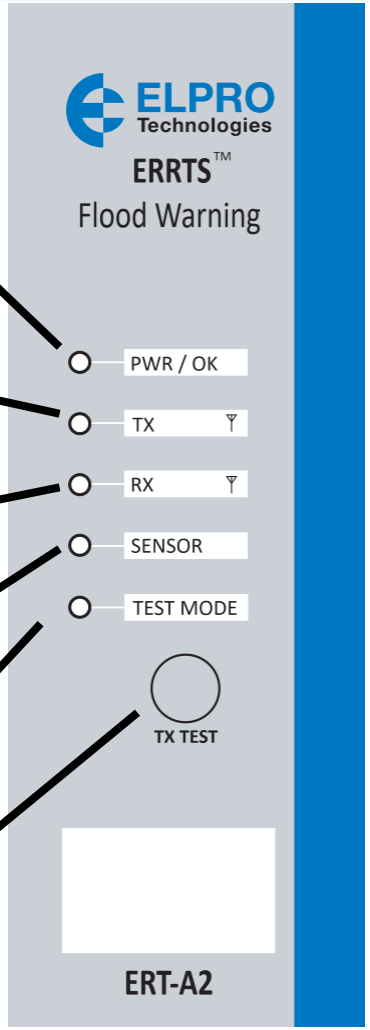
Green: Transmitting data
Red: Transmit fault/failure

Green: Receiving – Good signal
Red: Receiving –weak signal

Analog Loop or SDI-12 supply active

Green: Test transmission
Red: Maintenance mode enabled

Short Press (<5 sec): Send test transmit
Long Press (>5 sec): Enable Maint Mode



- Data transmit and receive LEDs indicate primary or secondary comms status as optioned
- Sensor LED also flashes on sending of SDI-12, RS232 and RS485 serial data
- Front panel push button allows sending of a test transmission or external enabling of maintenance mode
- Maintenance mode each data transmitted frame is flagged when enabled to allow host to accept or reject data
- Maintenance mode will timeout after 15mins

Connectivity View Inside

RS232 Mil Spec

Primary Radio N-type – Screw on Surge option

Solar Mil Spec

Secondary Radio Cellular, Satellite or 25W PA

Battery:
LFP rechargeable
LiP non-rechargeable
or external options

Bluetooth Ant (Cell/Sat Primary)
Secondary Radio Ant Cell/Sat

River Analog Mil Spec

Rain Mil Spec

River Digital Mil Spec

Note: Mil Spec connectors can be easily replaced with cable gland, eg river analog sensors

Power Supply Wiring/Connectivity Overview

Wiring entry: IP66 Cable entry Gland (5-13mm)

Terminals: PushIN connection Max 0.2 – 1.5mm2 Wire

RS-232: Alternate config/comms

GND

DIO1: ON/OFF, pulsed, encoder

DIO2: ON/OFF, encoder

DIO3: ON/OFF, pulsed

DIO4: ON/OFF only

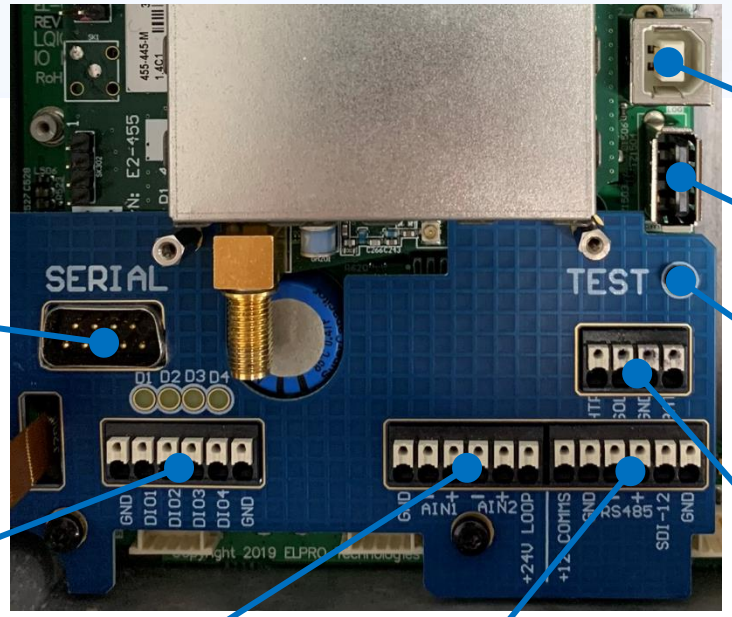
GND

GND

AIN1 -/+: 4-20mA Current Loop

AIN2 -/+: 4-20mA Current Loop

+24V LOOP: 4-20mA loop supply switched



+12 COMMS: SDI-12 Pwr Supply

GND

RS485 -/+: RS485 ALERT2 Data output for Receiver Base

SDI-12: SDI-12 Data IN/OUT

GND

RESET: Reboot unit

USB B: Config/Diagnostics

USB A: Download Logged data/Firmware upgrade

TEST: Short press to send input data message. Long press (5s) to send logged data to USB

HTR: Control for internal heater

SOL: Solar panel 30W 2A max

or Ext Supply 17-30Vdc

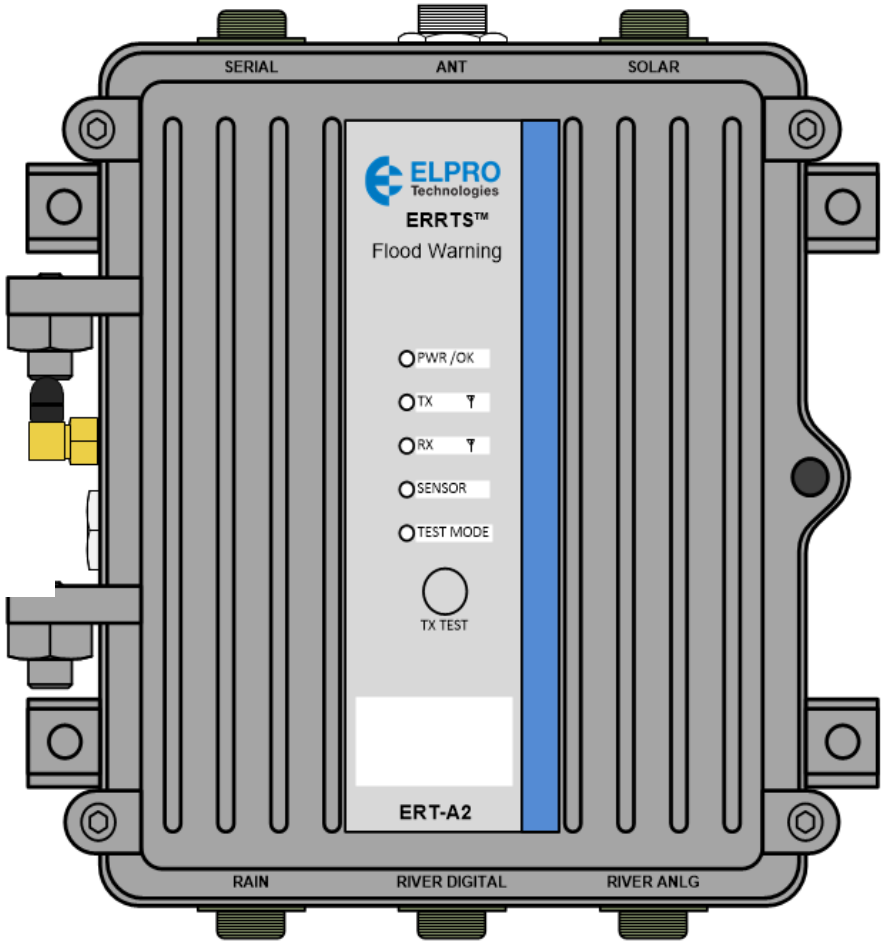
GND: External Power –ve Supply

BAT: External Power 11 – 15Vdc

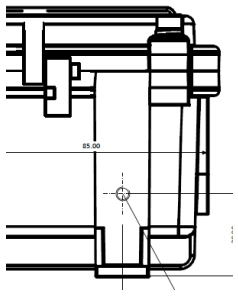
Unit Installation

SMA Cell or Bluetooth

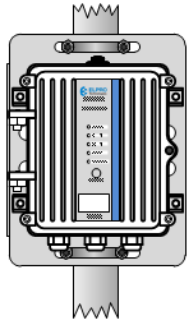
Gore-tex Vent



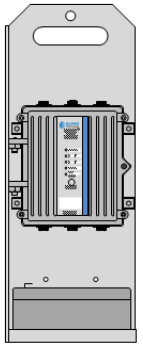
- Wiring access through either MIL spec connectors that have standard pinout or cable glands located on top and bottom of unit
- Suits installation in tree, cabinet or standalone outdoor situations
- Unit can be mounted by the four 6mm mounting holes at each corner (A)
- M5 threaded Earth connect provide on lower left side
- Accessory mounting brackets available to allow for tree (standpipe) or pole situations

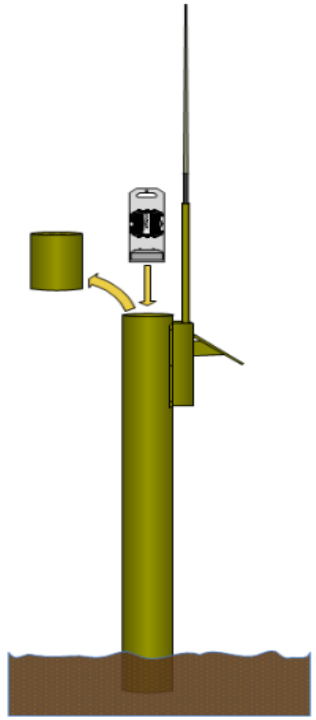


EARTH



POLE

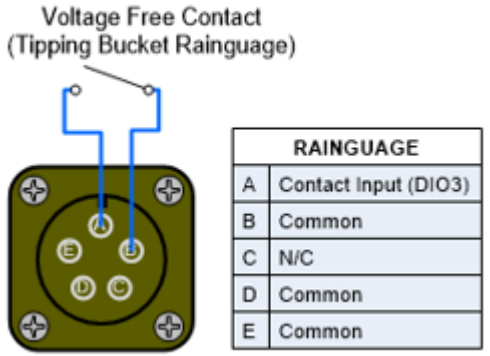




TREE/STANDPIPE

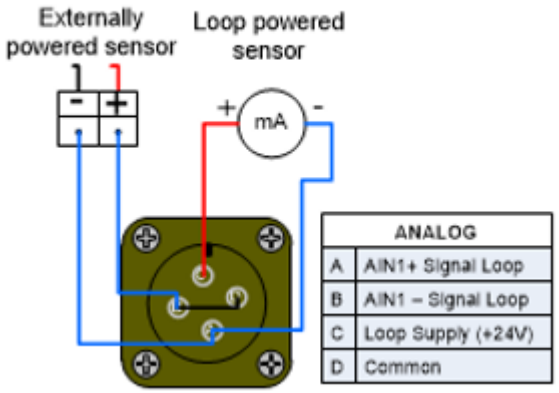
External Connector Wiring

Rain (Digital)



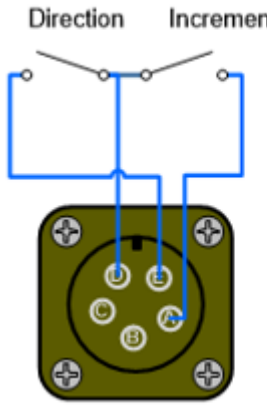
RAINGUAGE	
A	Contact Input (DIO3)
B	Common
C	N/C
D	Common
E	Common

River (Analog)



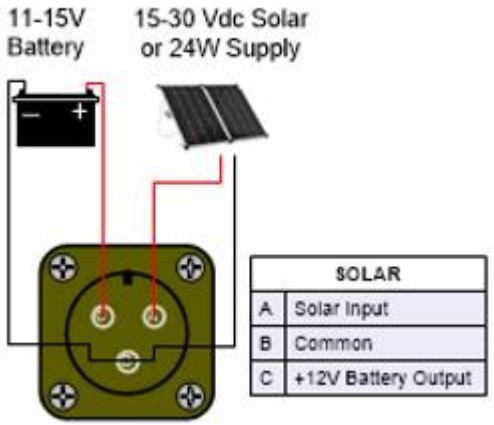
ANALOG	
A	AIN1+ Signal Loop
B	AIN1 – Signal Loop
C	Loop Supply (+24V)
D	Common

River Digital (Digital/Pulse)



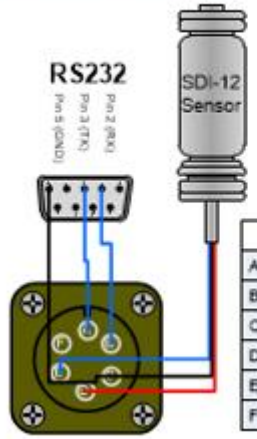
SHAFT ENCODER (Inc)	
A	Digital (DIO1)
B	N/C
C	Digital (DIO1)
D	Common
E	Direction (DIO2)

Solar (Ext Supply)



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

Serial (Serial / SDI-12)



SERIAL	
A	RX Data (DTE IN), Pin 3 DB9
B	TX Data (DTE OUT), Pin 2 DB9
C	Common
D	SDI-12 +12 V supply
E	SDI-12 Data
F	Common

Configuration

- Primary access to unit configuration is through USB cable – type B (printer/scanner type)
- Simple text based menu

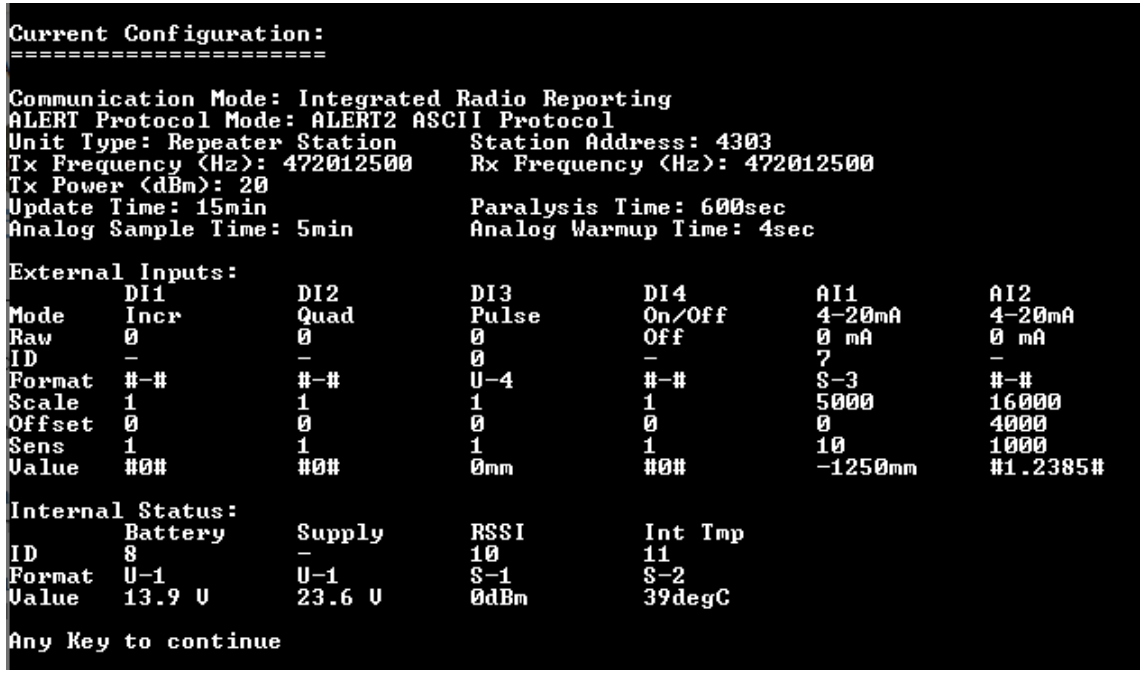
```
        22-Jun-2020 05:12:01 UTC; Station Address: 4303
        Firmware: v1.3  Hardware: Rev2A.B

Main Menu:

        a)      Unit Config
        b)      I/O Setup
        c)      Set Accumulators
        d)      Unit Diagnostic
        e)      Change Password
        f)      Set Date & Time
        g)      Show/Save Configuration
        h)      Exit

                Selection: g
```

- ALERT quick start to setup basic flood warning application base: Rain/River/Battery

```
Unit Config Menu:

        a)      Communication
        b)      Station Address
        c)      Update Time
        d)      Paralysis Time
        e)      ALERT Quick Setup
        f)      Restore Default Configuration

                Select:
```

Configuration - Essentials

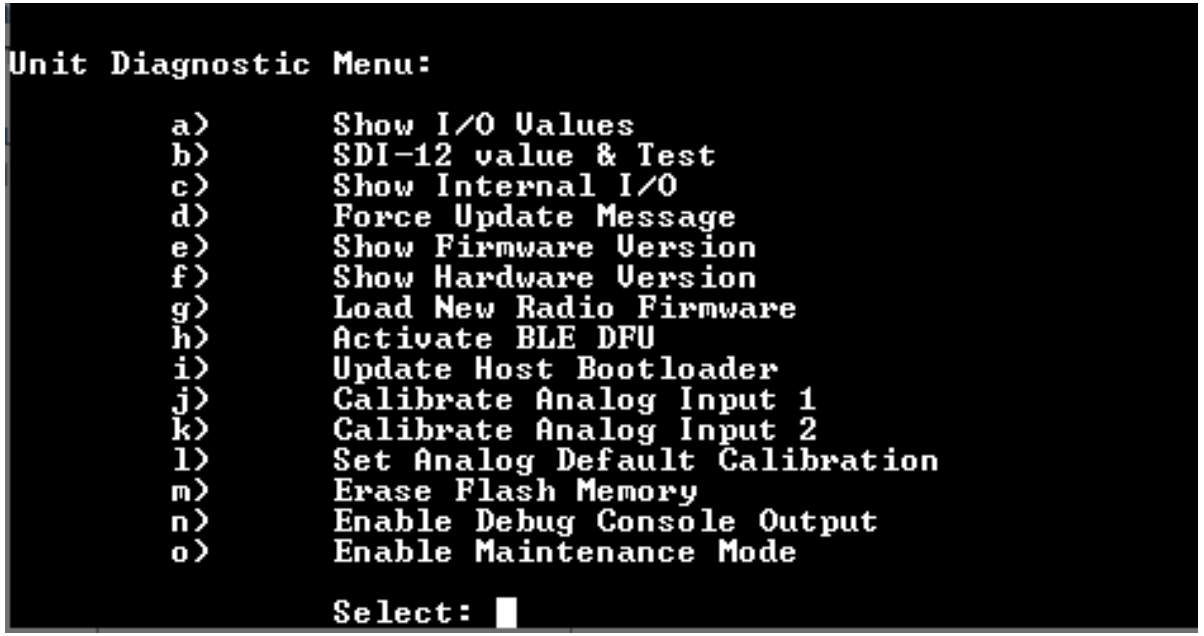
- Primary/Secondary Communications options
- Comms detail, VHF/Cellular/etc
- Station details, update time, paralysis, etc
- External discrete, analog, SDI12 and Internal input sensors setup
- Input types, offsets, engineering units, display units



```
Current Configuration:
======================

Communication Mode: Integrated Radio Reporting
ALERT Protocol Mode: ALERT2 ASCII Protocol
Unit Type: Repeater Station      Station Address: 4303
Tx Frequency (Hz): 472012500     Rx Frequency (Hz): 472012500
Tx Power (dBm): 20
Update Time: 15min               Paralysis Time: 600sec
Analog Sample Time: 5min         Analog Warmup Time: 4sec

External Inputs:
        DI1         DI2         DI3         DI4         AI1         AI2
Mode    Incr        Quad        Pulse       On/Off      4-20mA      4-20mA
Raw     0           0           0           Off         0 mA        0 mA
ID      -           -           0           -           7           -
Format  #-#         #-#         U-4         #-#         S-3         #-#
Scale   1           1           1           1           5000        16000
Offset  0           0           0           0           0           4000
Sens    1           1           1           1           10          1000
Value   #0#         #0#         0mm         #0#         -1250mm     #1.2385#

Internal Status:
        Battery     Supply      RSSI        Int Tmp
ID      8           -           10          11
Format  U-1         U-1         S-1         S-2
Value   13.9 V      23.6 V      0dBm        39degC

Any Key to continue
```

Configuration - Diagnostics

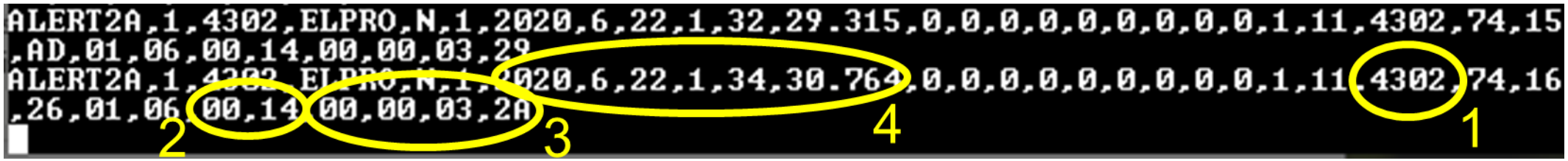
- Display current sensor input values, internal/external
- Force update
- Maintenance mode
- Internal firmware versions/updates
- Analog input calibration
- For repeater/receiver radio signal level indication



Standard Sensor Types

ID	Sensor Type	Bytes	Format	Resolution	Default Units Metric	Default Units US
0	Rain	4	Unsigned Integer			
1	Air Temperature	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 or external)	1	Unsigned integer	0.1	V	V
10	Received Signal Strength (RSSI)	1	Signed integer	1	dBm/Signal Quality	dBm/ Signal Quality
11	Internal Temperature	2	Signed Integer	0.1	deg C	deg F
12	Internal Status Word	2	Unsigned integer	1	Bit	Bit

Decoding – ALERT2 ASCII

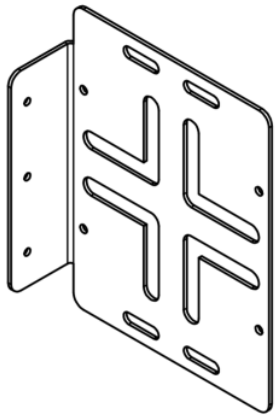


1. Station Address (decimal): 4302 (decimal)
2. Sensor ID, TL (hex):
   - Sensor ID: 0 (rain)
   - TL: type length 14 decodes as unsigned integer, length 4 bytes
3. Sensor Value (hex): 00 00 03 2A > 810 counts
4. Time-Date Stamp (dec): simple format – 2020/6/22 1:34:30.764 UTC time

Note: All transmitted data is automatically logged in ALERT2 ASCII format to allow recovery at later date.

Accessories

- **BR-ERTA2-TREE:** ERT-A2 Tree mounting bracket including hardware
- **BR-ERTA2-POLEMNT:** ERT-A2 Pole mount kit, Horizontal or vertical postions, Aluminium plate and hardware
- **ANTGPS-3-KIT:** Weather Resistant IP67 GPS Antenna, 3m RG174 cable, SMA-Male with 16mm cable gland
- **CBLUSB-ATOB:** USB 2.0 CABLE - TYPE A to TYPE B , 1M LONG configuration cable
- **CBLSER-RJ45:** Serial Cable RS-232: 0.9m (3ft) long, RJ45(male) to DB9(female) - Straight-through.



Configuration / Ordering Guide

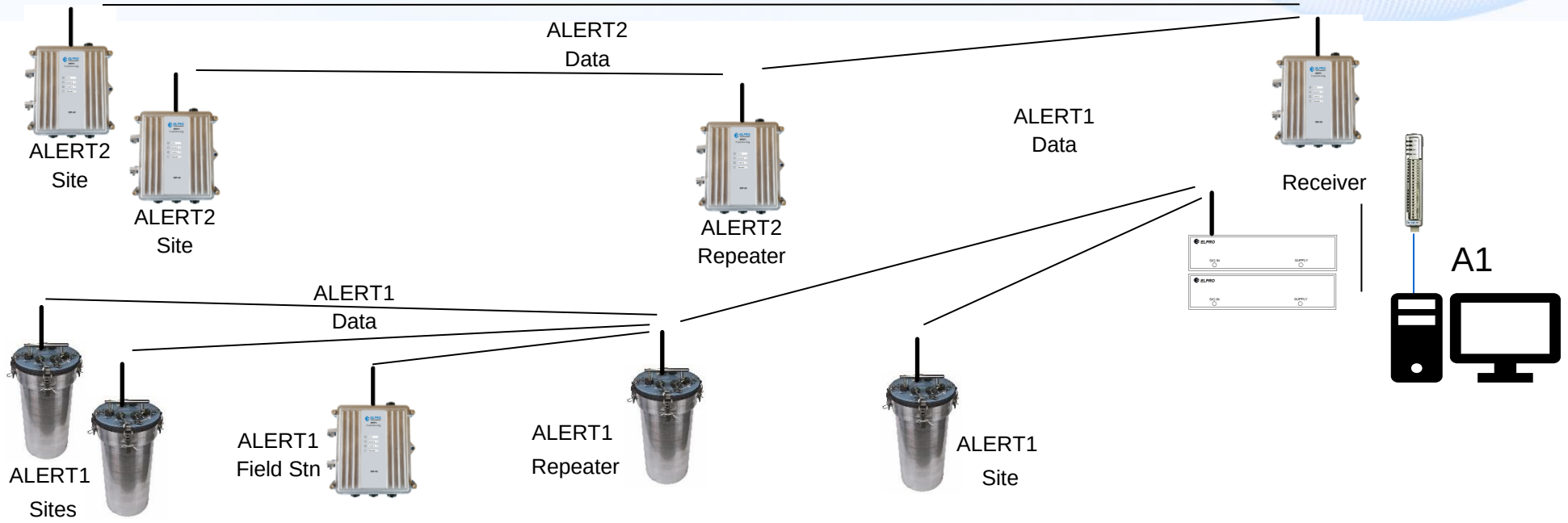
- Typical 150MHz field station:
  - EL-ERT-A2-MGR-1X
- 150MHz 25W repeater:
  - EL-ERT-A2-MGR-HX
- Base 150MHz receiver:
  - EL-ERT-A2-CXE-1X
- Gateway-Decoder:
  - EL-115E-2-A2

	Part Number	**EL-ERT-A2**	-C	G	R	-X	A
	(-X if option not fitted)	EL-ERT-A2-CGR-XA					
Base Config	Enclosure	ERRTS Std Mil Spec	-M				
		Cable Gland	-C				
		1/2" NPT	-N				
		ALERT1 Upgrade Kit	-U				
	GPS	Fitted		G			
		Not Fitted		X			
	Battery	Internal rechargeable			R		
		Internal non rechargeable			P		
		External			E		
Primary Comms	Licence Free/Licenced	150MHz 5W				-1	
		300MHz 10W				-3	
		400MHz 10W				-4	
		500MHz 10W				-5	
		150MHz 25W				-H	
	Cellular IOT	APAC				-A	
		Americas				-U	
		Europe				-E	
		Not Fitted				-X	
Secondary Comms	Cellular 4G LTE Gateway	APAC					A
		Americas					U
		Europe					E
	Satellite Gateway	Sat					S
	Not fitted	Blank					X

Migration Strategies

- Migration of system will depend on system architecture, number of repeaters, etc. ELPRO can help with recommendations on process
- Typical recommended steps:
  - ALERT2 receiver and gateway-decoder can be installed at any time as it works in parallel with existing ALERT1 equipment
  - Start purchasing ERT-A2 for new or upgrade field/gauging stations (ERT-A2 in field station mode support ALERT1 and ALERT2)
  - Once system has majority of ERT-A2 field stations, swap repeaters over to ALERT2

ALERT1 to ALERT2 Repeater Migration



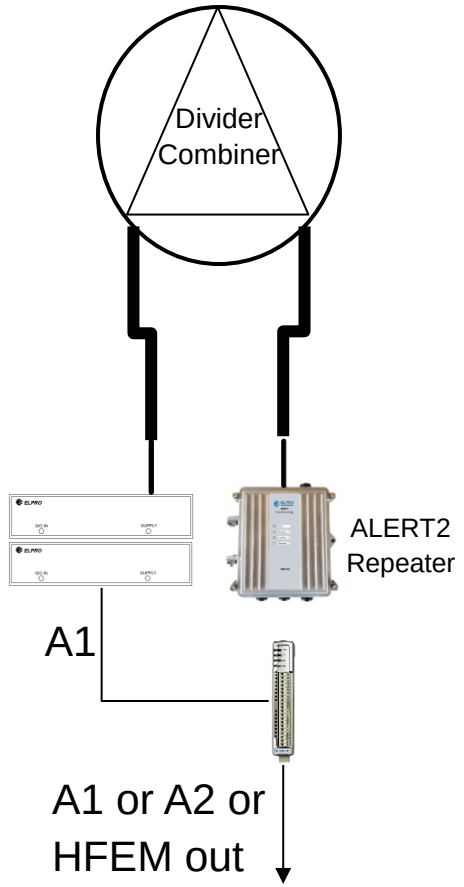
Antenna at base can just be split between A1 and A2 Base receivers

ALERT1 Migration Networking:

1. Install A2 receiver and Gateway-Decoder at base
2. Migrate sites: direct to base sites can work on A2 immediately and sites via repeaters in A1 mode
3. Update repeaters to A2 capable once all sites are A2 capable

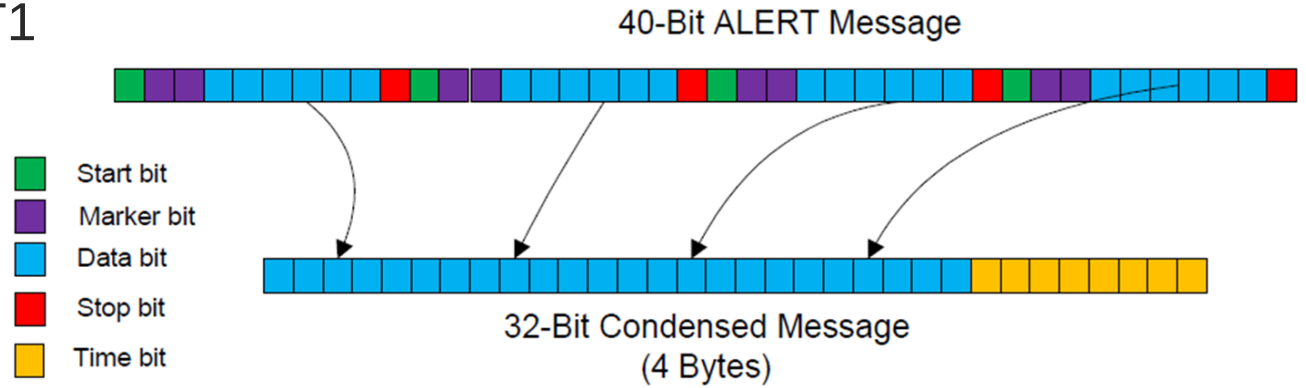
Sharing of Antenna Receiver

- Allows connection of A1 and A2 receiver to single antenna
- Simplifies migration of systems by allowing immediate move to A2 on local sites to receiver
- ELPRO 115E-2-A2 gateway-decoder will take in A1 and A2 protocol and send as A1, A2 or HFEM direct
- Gateway support A1 concentration mode in A2 protocol to allow dual protocol support at base



Application Layer – ALERT1 Concentration

- ALERT2 allows for transport for ALERT1 packages on ALERT2 network through ALERT1 concentration mode



ELPRO A1 ID migration:

- Set unit station address to lowest A1 ID (usually rain) as base
  - Rain Sensor ID set to 0
  - River Sensor ID set to offset of existing base station ID above
  - Battery Sensor ID set to offset of existing base station ID above

Item	A1 ID	A2 Stn	A2 Sensor
Rain	1554	1554	0
River	1555	1554	1
Battery	1556	1554	2

Thank You.

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