ITU Configuration Guide

Document Overview

This document was written to detail the technical aspects of the Irrigation Telemetry Units (ITU). This document was written primarily for Water-Insight internal usage. The information contained here is needed for configuration and testing of the device during production.

Device Overview

Designator	Function	Introduced in Version
ITU1	Flow Measurement	V1.0.0
ITU2	Level Measurement	V1.3.0

The ITU can log time stamped analogue input values to a FIFO in EPROM. The device has 4kB of EEPROM available for logging storage. As at version 1.0 the device can store a maximum of 600 events in memory (some memory is left unallocated). INC version > 2.13 can periodically retrieve those values and store them to a CSV file.

The device also has digital inputs and relays that can be read and/or written via radio commands. These are currently not used, but the outputs can be controlled, and the inputs can be read via the INC command shell. The device also has the ability to send self-initiated messages to a designated address. This is a similar concept to Change of State Messages (COS) in QComms. This feature is also currently not used.

Device Configuration

Various categories of configuration data can be read and written to/from the device EEPROM using an EP2 and terminal application (eg PuTTY). The serial port settings to use for this connection are 115200, n, 8, 1.

The general command format is detailed in the table below.

Command	Meaning
`get all`	Print a list of all configuration values to the terminal.
`get <category>`	Print a specific configuration or constant value to the terminal.
`set <category> <value>`	Write a specific configuration value to EEPROM.
`reload`	Restart and processes that use configuration values. This makes the device begin to use the updated values. Alternatively the device can just be repowered.

The categories that can be read or written are listed in the table below.

Category	Format/Range	Meaning
interval	Number: 2, 65535	Logging interval in seconds.
deadband	Number: 1, 4095	Logging deadband in raw counts.
dest	MAC: xx:xx:xx:xx:xx:xx	Default destination MAC address. Only used for self-initiated comms (COS).
comms	String: "local", "mesh"	Default method for COS comms.
ttl	Number: 2, 16	Maximum TTL value to use for mesh COS comms.
retries	Number: 0, 10	Maximum retires value to use for comms.
channel	Number: 0, 25	Radio channel to use.
power	Number: 0, 7	Radio Transmitter Power.
serial	Number: 0, 65535	Device Serial Number.
scaling	4 x Numbers: a,b,c,d	Measurement scaling parameters with no spaces (raw_min,raw_max,scaled_min,scaled_max).
itu_mode	String: "flow", "level_ultrasonic", "flow_pulse", "level_pressure"	ITU operating mode (must match hardware setup).
vol_pp	Number	Volume per pulse typically 10 litres per pulse or 100 litres per pulse
win_len	Number	Number of pulses over which to calculate the average volume
max_freq	Number (Hz)	Pulses collected at greater than this frequency will be discarded as suspected glitches or noise

After editing the values the settings need to be re-loaded from EEPROM into the running code that uses them. This is achieved by sending the "reload" command. There are several other categories of data that are not actually contained in the EEPROM memory.

Category	Format/Range	Meaning
version	<major>.<minor>.<build>	Device Firmware version.
address	MAC: xx:xx:xx:xx:xx:xx	The MAC address of the Flow-Logger.
time	HH:MM:SS-DD/MM/YYYY	Device RTC time value.

It is important to read the address and keep a record of it, as this value is used by the INC and EP3 to communicate with the particular device.

Below is an example Flow-logger Command Shell session showing how it works (typed input in **bold**).

```
get all
interval = 900 secs
deadband = 65535 (1-4095)
dest = ff:ff:ff:ff:ff:ff
comms = unknown
ttl = 8 (2 - 16)
retries = 5 (0 - 16)
channel = 3 (0 - 9)
```

```
power = 7
serial = 1000

get interval
interval = 30 secs

set power 5
OK

get power
power = 5 (0 - 9)

reload
OK

get address
address = 00:04:a3:62:2d:81
```

Note that in the example the deadband value specified is 4095; this essentially means that deadband logging is disabled and only interval logging is used.

INC and EP3 Configuration

The ITU is configured into the INC pod-list via the pod configuration file, similar to a regular IPC. Naturally the schedule field does not need to be included for this device. The INC knows that the device is an ITU by the presence a "type = x" line. The INC treats ITUs differently from regular IPCs and repeaters, in that there is a separate task that sends logging data requests to ITUs, and the communications messages are different. The device type defaults to "IPC" if it is not explicitly specified in the file. This means that configuration file entries for existing IPCs won't need to be changed.

The type value can be one of "Logger" or "Flow" for an ITU1, or "Level" for an ITU2.

Below is an example pod configuration file entry for an ITU1 (Flow-logger).

```
[pod1]
address  = 00:04:A3:62:2D:81
channel  = 3
name     = F1
serial   = 1234
mode     = local
type     = logger
```

INC Communications Commands for Flow Loggers

The INC has a set of commands to make it communicate with a Flow-Logger. The Flow Logger reuses the already existing "manual" channel (packet type). Most comms with the flow logger can be sent via Local or Mesh comms methods, but for brevity, only the Local (-l) switch option is shown below.

Command	Meaning

`timeset -l <name>`	Set the ITU clock (mesh option not supported).
`timeset -b`	Send a network flooded time-set message. The ITU will receive these messages, but not forward them as an IPC would.
`telem -l <name> data`	Trigger the ITU to begin sending the data logs.
`telem -l <name> status`	Request the ITU internal status. This include the time value, and number of pending data records.
`telem -l <name> control <do> <ao>`	Control the ITU outputs (ITU1 only).
`telem -l <name> poll`	Request device IO values (ITU1 only).
`telem -l <name> level`	Trigger the ITU2 to begin taking a level measurement (ITU2 only).
`telem -l <name> config`	Request device configuration values.
`telem -l <name> config write <category> <value>`	Change device configuration. Values can be read, but aren't used until reloaded.
`telem -l <name> config reload`	Force the ITU to begin using the config values.

Below is an example INC command shell usage.

```
telem -l f1 status
Sending logging command type 2 to F1 (local)
Sending packet
Packet delivered
[status] n = 40, t = 8:52:17 31/08/2015

telem -l f1 data
Sending logging command type 3 to F1 (local)
Sending packet
Packet delivered
[data] len = 17, more
[data] len = 17, more
[data] len = 7, last

telem -l f1 config
Sending logging command type 4 to F1 (local)
Sending packet
Packet delivered
[config] v = 1
   comms: local
    dest: 00:1e:c0:8d:f7:e1
   power: 5 (0-7)
 channel: 0 (0-9)
 retries: 10
     ttl: 16
deadband: 4095 (1-4095)
interval: 30 secs
```

Firmware Upgrade Process

In application firmware version 1.5 the ITU was modified to include a bootloader to allow support for OTA firmware upgrade. As part of the factory run-up process, the bootloader is flashed into the

ITU board via the ISP port. The Application firmware can then be flashed into the board using an EP3 in the same way as for an IPC. The ITU does not have a reed switch, so must be IPC list for this to work as the only way that the ITU can be triggered into bootloader active mode is via an OTA command. Consequentially, if the Application firmware upgrade fails the ITU will remain in bootloader active state (where it will blink an error code explaining why it is not able to boot the application).