

## ***APPLICATION NOTE AN041***

### ***Mega\_Link 2***

## ***4G + 458MHz Radio Dual Communications***

### **Overview**

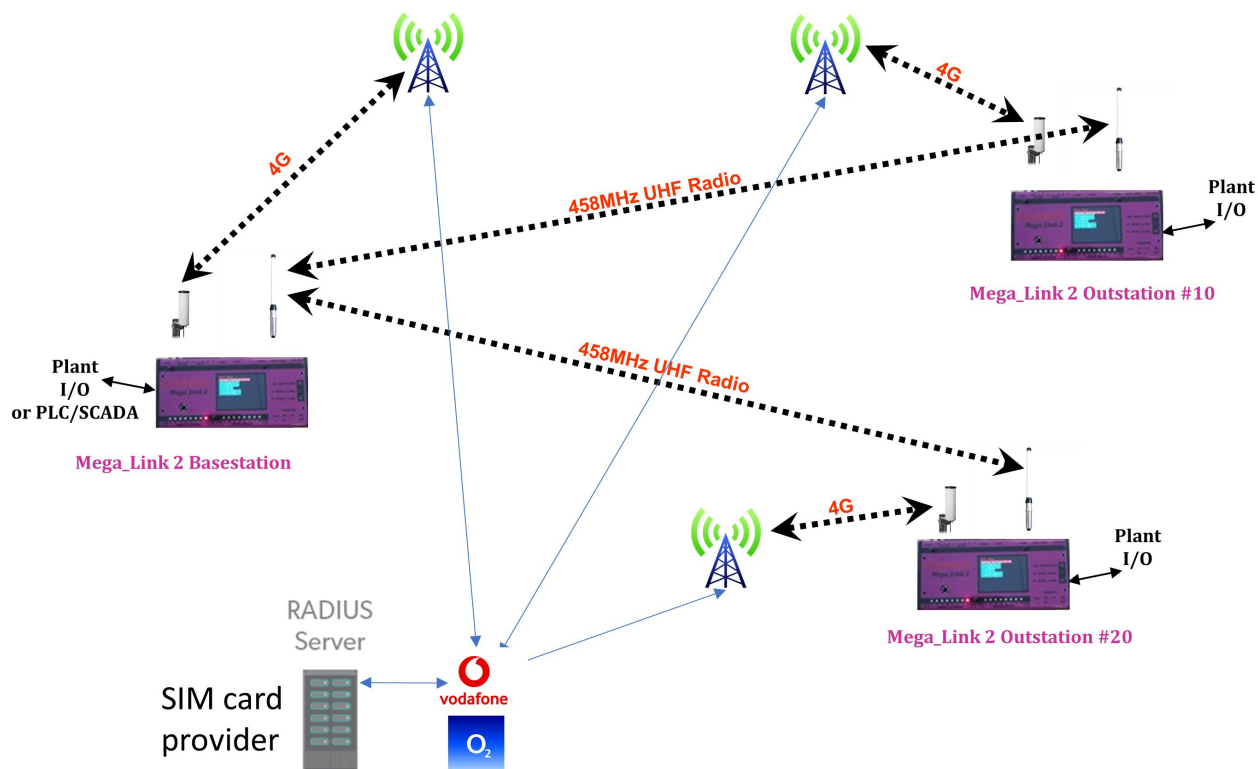
Mega\_Link 2 normally operates using a UHF radio module for deregulated licence-exempt low power radio applications as authorised under Ofcom IR2030/2/6.

It can also communicate using a 4G LTE Cat-1 module with a SIM card over the mobile networks.

An interesting advanced feature of Mega\_Link 2 is the ability to operate with both communication channels in a “Dual Comms” mode to provide redundancy for radio interference or 4G network outages.

Both communications paths (Primary & Secondary) are operating concurrently at a 10 second scan rate.

### **Mega\_Link 2 – 4G + 458MHz Radio in Dual Comms Mode**



Churchill Controls Ltd. Unit 30 Wellington Business Park, Dukes Ride, Crowthorne, RG45 6LS  
Tel: +44 (0)1344 750233 e-mail: [sales@churchill-controls.co.uk](mailto:sales@churchill-controls.co.uk)

## Background

Licence-exempt low power radio communications in the 458MHz UHF radio band continues to be operated very successfully in the UK for telemetry and control applications. Water companies are by far the main users. The nature of un-licenced radio communications is such that it can be expected to experience and easily tolerate a certain amount of interference from time to time. Radio frequency interference can be caused when other users are within range and on the same (or sometimes adjacent) radio frequency channels.

If all equipment providers and users behave responsibly and adhere to the <1% duty cycle transmission guidelines then in the event that two users do transmit on the same frequency channel at the same time, all that is normally required is a few retries for the communications to get through for both parties. Or most often the next 10 second scan will be successful. The nature of slowly varying water measurement signals mean that applications can tolerate missed communication events also known as “Comms Fails”.

## Problem

A telemetry system can be running happily for many years but the problem comes when 3<sup>rd</sup> party equipment using RF transmission is temporarily set up nearby which is not adhering to the fair use policy. The main example of this can often be traced to temporary radio-controlled traffic light signals used for controlling traffic at single file road works which have recently been set up nearby.

If these temporarily traffic light signals are very local and near to an outstation in a big system this can cause unreliable comms with that outstation or if local to the basestation it can even degrade or take out the whole system.

Obviously, changing the radio channel in use can mitigate and often recover the telemetry system but this does involve time, effort and visiting every site.

## Solution

A good solution to solve and avoid the problem of 3<sup>rd</sup> party co-channel radio interference is to specify and install Mega\_Link 2 units fitted with dual communications.

Mega\_Link 2 has the capacity to fit two modules, either two UHF radio modules operating on different frequencies or one radio module plus one 4G module.

## Principle of Dual Comms

Mega\_Link has position for two modules known as COM1 and COM2, normally COM1 is assigned as Primary and COM2 is assigned as Secondary.

In this example a 4G module is installed in COM1 and a 458MHz radio module is in COM2.

During operation data exchanges take place over both Primary and Secondary channels together and as long as the data exchange is successful over at least one of them, then the Comms will not fail.

It should be noted that the Churchill Controls' principle of operation is that both communications channels are always operated together on every scan. This is not a “Failback” type of operation where if the main channel fails the system falls back to use an alternative channel. Rather both channels are always in use and have good confidence that they are both reliably operating up until one of them has an unexpected interference problem or network outage.

Churchill Controls Ltd. Unit 30 Wellington Business Park, Dukes Ride, Crowthorne, RG45 6LS  
Tel: +44 (0)1344 750233 e-mail: [sales@churchill-controls.co.uk](mailto:sales@churchill-controls.co.uk)

Individual “Primary Comms Fail” and “Secondary Comms Fail” outputs can be configured for use as communication indicators and fed to the local alarm system to be monitored for a warning or alarm condition that one of channels has a problem.

## Comms Fail Alarms

Every outstation has an “Outstation XX Comms Fail” signal, this is normally sent to a digital output for interface to the supervisory system as a system health indication. On a dual comms system there is also a basestation “Primary Comms Fail” and “Secondary Comms Fail” signal which can also be made available to give confidence that both communication paths are currently working.

## Example Configuration

The following shows the recommended comms fail configurations for a system with two outstations.

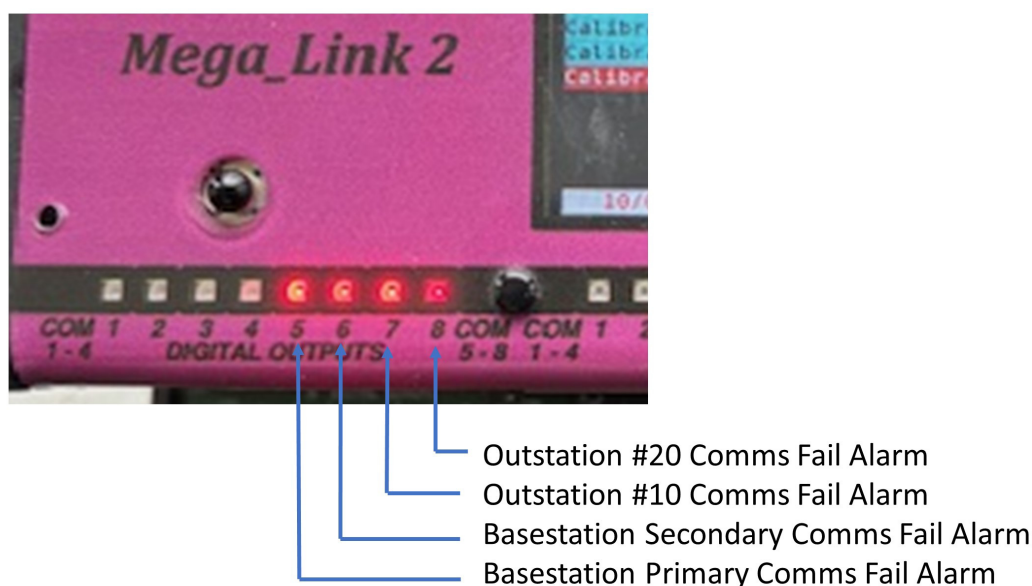
BS 4G+ RC.dcd	
Outstation 10 Comms Fail Alarm	-> Local Digital Output 7
Outstation 10 Comms Fail Alarm	-> Outstation 10 Digital Output 8
Outstation 20 Comms Fail Alarm	-> Local Digital Output 8
Outstation 20 Comms Fail Alarm	-> Outstation 20 Digital Output 8
Local Primary Comms Fail Alarm	-> Local Digital Output 5
Local Secondary Comms Fail Alarm	-> Local Digital Output 6

The outstation #10 comms fail alarm is on basestation output 7 and sent to outstation #10 on output 8.

The outstation #20 comms fail alarm is on basestation output 8 and sent to outstation #20 on output 8.

The basestation Primary comms fail alarm is on basestation output 5.

The basestation Secondary comms fail alarm is on basestation output 6.



Churchill Controls Ltd. Unit 30 Wellington Business Park, Dukes Ride, Crowthorne, RG45 6LS  
Tel: +44 (0)1344 750233 e-mail: [sales@churchill-controls.co.uk](mailto:sales@churchill-controls.co.uk)

## Diagnostics “D”-Command

Normal operation under good conditions shows “Primary comms rcvd pkt” and “Secondary comms rcvd pkt”

### NORMAL MEGA\_LINK2 COMMS (BASE-STATION)

Outstation: 10

-----  
TX: 10/03/25 15:43:51 (UTC)

01 1A 01 00 0A 0C 00 80 00 00 00 00 00 00 00 00 00 00 44 16 43 00 00 00 0F 02 B7 A2 E0 07 49 7B

Primary comms rcvd pkt

Secondary comms rcvd pkt

RX: 10/03/25 15:43:56 (UTC)

01 16 01 0A 00 0D FF 00 00 00 19 00 13 00 14 00 12 00 DE 06 70 17 00 00 02 00 01 00 98 8C

7900ms left. Good reply.

-----  
Outstation: 20

TX: 10/03/25 15:44:06 (UTC)

01 1A 01 00 14 0C 00 80 00 00 00 00 00 00 00 00 00 00 34 21 00 00 00 00 0F 02 C6 A2 E0 07 58 37

Primary comms rcvd pkt

Secondary comms rcvd pkt

RX: 10/03/25 15:44:11 (UTC)

01 16 01 14 00 0D FF 00 00 00 1C 00 18 00 18 00 18 00 DF 06 A4 1F 01 00 00 00 01 00 E9 00

7900ms left. Good reply.

-----  
End of fast scan.

Scanning every 15 secs

Scanned 2 Outstations with 0 failures

## Further Information:

Please contact Churchill Controls for further information and to request example Mega\_Link 2 configuration files.

Churchill Controls Ltd. Unit 30 Wellington Business Park, Dukes Ride, Crowthorne, RG45 6LS

Tel: +44 (0)1344 750233

e-mail: [sales@churchill-controls.co.uk](mailto:sales@churchill-controls.co.uk)