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Data_Link 2000

APPLICATION NOTE AN011

Exception Reporting

Summary

Exception reporting is a mechanism by which the user can define critical data that needs to be transmitted without undue delay. If an outstation detects a change on one of its inputs which has been defined as critical it will send an unsolicited message to the base-station, without waiting until it is next polled. Similarly, if the base-station detects a change on one of its inputs which has been defined as critical it will interrupt its normal scan to immediately send a message to the relevant outstation.

When used with outstations with large amounts of I/O, exception reporting significantly reduces the delay before changes are reported.

When used with battery-powered outstations, exception reporting greatly reduces the delay before changes are reported, and dramatically increases battery life.

Outline

Data_Link 2000, like most other telemetry systems, operates on a polling principle, whereby outstations only transmit in response to commands from the base-station. The base-station can be configured to poll continuously or at a defined scan rate.

Continuous polling provides the fastest data update rate, but this can still be significant if there are a number of outstations, or the outstations are large.

Scanning at a slow rate is of particular use when using battery-powered outstations, since they don't need to switch on their radio transmitter as often. Furthermore, since each outstation knows when it will next be called it can put itself to sleep between scans, thus further saving battery power.

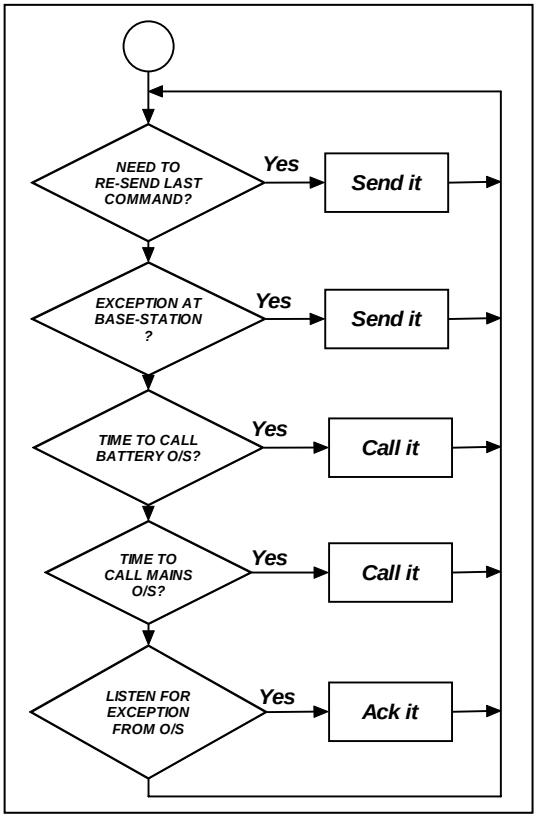
If exception reporting is implemented on all the I/O of a system, the function of the normal polling sequence is just that of a confidence poll to confirm that the system is still functioning.

If exception reporting is applied to analogue inputs on a ***Nano_Link*** outstation, the user must also define the rate at which the analogues are to be sampled. This is because the outstation must wake up and apply power to the transducers before reading them. The user could, for example, configure to outstation to read analogues every 10 minutes and send an exception report if the value has changed by more than 5%. A confidence poll could be sent every 2 hours.

Method of operation

After any reset, the base-station first checks the data routing table for any exception entries. If there are any, it immediately sends the appropriate configuration messages to the relevant outstations. From their responses it deduced if they are mains or battery-powered.

It then enters the programme loop illustrated in the flow diagram.



It should be obvious that the base-station cannot be set to continuous polling, since it would then never have time to listen for exception reports. A typical application might set the scan rate for normal outstations to poll every 10 seconds, and the scan interval for battery-powered outstations to one hour.

Messages to battery-powered outstations take precedence over those to mains-powered outstations, since battery outstations wake at the time when they expect to be next called. If the call is delayed they would waste battery power unnecessarily.

When the base-station detects an exception report from an outstation it sends an acknowledgement to cancel it. If the outstation does not receive an acknowledgement it keeps repeating the message (at random time interval in the range 1…10 seconds) for one minute before giving up.

Configuration

Exception reporting is configured at the base-station, using a DCD terminal (i.e. a PC running Data_Link Configuration and Diagnostic software). To illustrate the means of configuring, we will work on an example using two outstations, one mains powered (allocated address 10) and the other battery powered (allocated address 20).

Data routing is configured as normal on any ***Data_Link 2000*** system, for example:

```
Outstation 10 Count 1                -> Local Digital Output 1
Outstation 20 Count 1                -> Local Digital Output 2
Outstation 10 Digital Input 2-8      -> Local Digital Output 3-9
Outstation 20 Digital Input 2-4      -> Local Digital Output 10-12
Outstation 10 Analogue Input 1-2     -> Local Analogue Output 1-2
Outstation 20 Analogue Input 1-2     -> Local Analogue Output 3-4
Local Digital Input 1-8              -> Outstation 10 Digital Output 1-8
```

This defines the first digital input on each outstation as a count totaliser, and ensures pulses are replicated on the relevant digital output at the base-station. The remaining digital inputs are copied as statuses.

Exception reporting could be implemented by adding the following lines:

```
Exception Count = 10                 -> Outstation 10 Count 1
Exception Count = 10                 -> Outstation 20 Count 1
Exception Digital                    -> Outstation 10 Digital Input 2-8
Exception Digital                    -> Outstation 20 Digital Input 2-4
Exception Analogue = 200             -> Outstation 10 Analogue Input 1-2
Exception Analogue = 200             -> Outstation 20 Analogue Input 1-2
Exception Scan Rate (x10secs) = 60   -> Outstation 20 Analogue Input 1-2
Exception Digital                    -> Outstation 10 Digital Output 1-8
```

This will ensure that any digital input change at either outstation or at the base-station will be reported immediately. If more than 10 count pulses are detected at either outstation the new totalised count will be sent to the base-station immediately. Any analogue change greater than 5% (remembering that analogue inputs are scaled so 0…100% reads 0…4000). Because outstation 10 is mains powered it will read analogues at the default rate of every 10 seconds. Since outstation 20 is battery powered the user has over-written the analogue scan rate (in this case to 600 seconds = 10 minutes) to conserve battery life.

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