

# **WATCHDOG 'ELITE'**

## **SERIAL COMMUNICATIONS OPTION**

This document should be read by anyone intending to use the Watchdog' *Elite*' on a serial communications network, or to develop equipment which will work on the same network.

The WATCHDOG 'ELITE' is equipped with an RS485 communications interface. Below is a description of the physical requirements and the communications protocol.

### **Physical Requirements.**

Communication is achieved through a 4 (four)-wire communications system. The format used meets the requirements of the RS485 communication standard. The WATCHDOG ' *Elite*' units can be connected together in a free topology network (any order). A twin twisted cable with either individual pair or overall screen should be used. The network should not have a cable length of greater than 1000 meters. The cable should have each pair terminated at each end with a 120-ohm ½ watt resistor. Longer distances can be achieved by the use of a signal repeater. The Network can consist of a maximum of 32 devices. This includes WATCHDOG, *Elite*' units and/or other devices including PLC or computer based controllers which can use the same protocol. All devices must be capable of working in a multi master mode (high impedance transmitters when not in use). It is possible to connect a single WATCHDOG ' *Elite*' to a single PLC or computer using the RS422 standard as an alternative. In essence, the two standards are the same except that RS422 cannot be used with multiple master devices.

### **Protocol Requirements.**

The Watchdog' *Elite*' expects to be polled by a host device. When it receives a correctly formatted poll message containing its own ID in the header, it responds by transmitting a packet of characters back to the host.

The communications format is fixed at 9600 Baud, 8 data bits and 1 stop bit and is used in the following manner.

### **Request Poll.**

The poll message format is a packet of four characters. <STX> <ID1> <ID2> <ETX>  
Control characters are used to initiate and end the sequence.

STX = 02 (HEX) ' Start of transmission. , ETX = 03 (HEX) 'End of transmission.'

The comms ID has a range of 1-80Hex, (1-128Dec), and is formatted as two **ASCII** characters, e.g.

WATCHDOG ID address 18H is made up of ID 1 = 31 Hand ID2 = 38H. (**31H is ASCII for 1 and 38H is ASCII for 8**).

### **Response.**

The response to a request is in the following format.

<STX> <ID1> <ID2> <DATA (x28)><DID1><DID2> <CK1> <CK2> <ETX>

## Comms ID field

The comms ID is two bytes formatted as in the 'Request Poll' described above.

## Data Field.

The data field in the response packet is 28 ASCII characters encoded as follows.

D1, D2	Speed high byte
D3, D4	Speed low byte.
D5, D6	Status code byte.
D7, D8	Status data byte.
D9, D10	Under speed alarm setting percentage.
D 11, D12	Under speed stop setting percentage.
D13, D14	Over speed alarm setting percentage.
D15, D16	Over speed stop setting percentage.
D 17, D 18	Calibrated speed high byte.
D19, D20	Calibrated speed low byte.
D21, D22	Scale factor high byte.
D23, D24	Scale factor low byte.
D25, D26	Flags byte- Reserved.
D27, D28	Reserved.

All data is encoded as an **ASCII character representation of a HEX number**, i.e. two characters are required to represent one HEX byte.

Examples

### *i) Speed*

Speed is a special case as decimal point data is encoded within the high byte, D 1.

There can be either 1 or 2 decimals.

For one decimal, add 4000H

For two decimals, add 8000H

E.g. If speed= 99.99 Pulses per minute (PPM), there are 2 decimal places and this is encoded as  
270F H + 8000 H = A70F H

Therefore

D1 = 41H 'A'

D2 = 37H '7'

D3 = 30H '0'

D4 = 46H 'F'

### *ii) Status code*

If status code = 36 D, (24H) then this is encoded as

D5 = 32H, D6= 34H

## Device ID field

The Device ID is the two characters following D28, and is formatted as in the 'Request Poll' described previously.

The Device ID, <DIDI><DID2> identifies the device type to the host when it replies. The Watchdog Elite's code is 0. Other devices will be given a Device ID as required.

## Checksum field.

The checksum is a byte-sized sum of all characters in the ID and data fields only. This is encoded within the message as two ASCII characters in CK1 and CK2.

## List of Status codes.

The status code is encoded in D5 and D6 as an ASCII representation of a HEX byte.

Examples.

'Elevator running' is 36 Decimal, = 24HEX, so D5 = 32HEX and D6 = 34HEX.

'HBS open cct zone5' is 90 Decimal, or 5A HEX, therefore D5= 35HEX and D6= 41HEX.

<u>Code</u>	<u>Description</u>
2	Test Mode: Showing Calibrated speed.
3	Test Mode: Showing under speed Alarm.
4	Test Mode: Showing under speed Stop.
5	Test Mode: Showing over speed Alarm.
6	Test Mode: Showing over speed Stop.
7	Test Mode: Showing End of Test.
9	Watchdog is calibrating.
15	Elevator stopped Persistent belt slip conditions.
16	Elevator stopped (Persistently over speeding).
17	Misalignment detected at top & bottom sensors.
34	Elevator is stopped and ready to run.
35	Elevator is accelerating.
36	Elevator running.
37	Stop Relay has been de-energised.
39	Misalignment detected- Alarm relay about to de-energised.
42	Over speeding Alarm relay about to de-energise.
45	Misalignment detected at top of Elevator.
47	Over-calibration... Stop relay about to de-energise.
49	Speed display is over range check Scale Factor.
50	Start Elevator to commence calibration procedure.
57	Belt slipping -Alarm relay about to de-energise.
58	Belt slipping Stop relay about to de-energise.
59	Elevator stopped due to lack of acceleration.
60	Persistent Alarm delay count is showing on LCD.
61	Elevator stopped speed exceeded over speed Stop limit.
62	Interlock signal off waiting for zero speed.
63	Elevator stopped persistent alarm conditions.
64	Elevator stopped because of severe under speed or belt slip.
65	Watchdog has no calibrated speed. Please see manual.
66	Misalignment detected at bottom of elevator.
68	Wrong access code entered.
70	Elevator speed less than alarm level (belt slipping?).
71	Elevator speed exceeds alarm level (Over speeding).
74	Suspect fault with one or more MAS e.g. mains pickup.
76	Testing Alarm relay de-energised.
77	Testing both relays de-energised.
78	Plug switch is open.
79	Head Pulley Alignment Switch is open.
80	Hot bearing at Zone 1.
81	Hot bearing at Zone 2.

- 82 Hot bearing at Zone 3.
- 83 Hot bearing at Zone 4.
- 84 Hot bearing at Zone 5.
- 85 Hot bearing at Zone 6.
- 86 HBS is open circuit at Zone 1.
- 87 HBS is open circuit at Zone 2.
- 88 HBS is open circuit at Zone 3.
- 89 HBS is open circuit at Zone 4.
- 90 HBS is open circuit at Zone 5.
- 91 HBS is open circuit at Zone 6.

**Status Data**

Some Status Codes have associated data, which is encoded in D7 and D8. For status codes not on the following list, the Status data is invalid, so should be disregarded.

List of Status Codes, which have associated data:

<u>Status code</u>	<u>Associated Status Data (from above list)</u>
3	Under speed Alarm percentage.
4	Under speed stop percentage.
5	Over speed Alarm percentage.
6	Over speed stop percentage.
9	% of Calibration completed.
35	Start-up Delay seconds remaining.
36	Percentage speed (of calibrated).
39	Seconds remaining before Alarm relay de-energisation.
42	Seconds remaining before Alarm relay de-energisation.
47	Seconds remaining before Stop relay de-energisation.
57	Seconds remaining before Alarm relay de-energisation.
58	Seconds remaining before Stop relay de-energisation.
60	Persistent Alarm Counter value (seconds) decreasing.
62	Percentage speed (of calibrated).
70	Percentage speed (of calibrated).
71	Percentage speed (of calibrated).
80-85	Temperature in Celsius (NTC thermistors only).