

ROBOTIC SYSTEM VERSION 2 - INCORPORATING THE ANALOG I/O MODULE

16/11/1999

Protocols using the Robotone tone encoder/decoder module or the Robotic Desktop Controller on the base station.

The unit employs an RS232 link with the following settings

- A. Electrical standard : RS232C
- B. Baud rate : 2400
- C. Data bits : 8
- D. Start bits : 1
- E. Stop bits : 1
- F. Parity : none
- G. Handshaking : software (RTS and CTS lines are not employed)

As a tone is received over the radio network, it will be sent directly to the PC in decimal format (ie. Tones 0 to 14 corresponding to the tone).

Repeat tones are automatically removed by the unit.

If the tone sequence is interrupted for more than 40mS, the unit will send the NOTONE message FF Hex. This is also used as the end of receive sequence footer. Incompletely received tone sequences should be ignored.

ALARMS

Outstation sends and PC controller receives

Byte 1 :	Controller address digit 1	0B to 0E (Hex)
Byte 2 :	Controller address digit 2	0B to 0E (Hex)
Byte 3 :	Outstation ID digit 1	00 to 09
Byte 4 :	Outstation ID digit 2	00 to 09
Byte 5 :	Outstation ID digit 3	00 to 09
Byte 6 :	Outstation ID digit 4	00 to 09
Byte 7 :	Outstation ID digit 5	00 to 09
Byte 8 :	Alarm code digit 1	00 to 09
Byte 9 :	Alarm code digit 2	00 to 09
Byte 10 :	Value of pins and battery 1	00 to 07
Byte 11 :	Value of pins and battery 2	00 to 07
Byte 12 :	Value of pins and battery 3	00 to 07
Byte 13 :	Parity	00 to 07
Byte 14 :	Footer	FF Hex

Controller address digits

Controller Number	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Controller Digit 1	B	B	B	B	C	C	C	C	D	D	D	D	E	E	E	E
Controller Digit 2	B	C	D	E	B	C	D	E	B	C	D	E	B	C	D	E

Alarm codes - bytes 8 and 9 (byte 8 is most significant)

Alarm code = 10*Alarm Code digit 1 + Alarm code Digit 2

Decimal numbers corresponding to

Byte 8 Alarm Digit 1	Byte 9 Alarm Digit 2	Meaning of code
00	01	Pin 1 has gone low
01	01	Pin 1 has gone high
00	2	Pin 2 has gone low
01	2	Pin 2 has gone high
00	3	Pin 3 has gone low
00	3	Pin 3 has gone high
01	4	Pin 4 has gone low
00	4	Pin 4 has gone high
01	5	Pin 5 has gone low
00	5	Pin 5 has gone high
00	6	Pin 6 has gone low
01	6	Pin 6 has gone high
00	7	Pin 7 has gone low
01	7	Pin 7 has gone high
00	8	Pin 8 has gone low
01	8	Pin 8 has gone high
02	00	The battery is low
03	00	The power has been restored
04	00	Zvei 1 5 tone call received
05	00	Reserved - remote panic
06	00	Analog value low (analog input module)
06	01	Analog value high (analog input module)
06	02	Reserved (analog input module)
06	03	Reserved (analog input module)
06	04	Analog value change (analog input module)
06	05	Analog time report (analog input module)

For the digital units (Robotic Outstations and Digital I/O modules, the **value of the pins and battery** must be extracted:

Byte	12			11			10		
Bit	2	1	0	2	1	0	2	1	0
Used for	battery	pin 8	pin 7	pin 6	pin 5	Pin 4	pin 3	pin 2	pin 1

Battery : 0 - low, 1 - OK
Pins 0 - low (0V), 1 - High

For the analog (Robolin) unit, the data is as follows :

Byte	12			11			10		
Bit	2	1	0	2	1	0	2	1	0
Used for	battery	analog value (0 to 255 dec)							

Battery : 0 - low, 1 - OK

For the decoding of ZVEI messages, all the bits are set to zero.
Parity is an error detection. The incoming parity byte should be the same as the following calculation :

$$\text{PARITY} = (\text{Byte1 XOR Byte2 XOR Byte3 XOR Byte11 XOR Byte12}) \text{ AND } 7$$

Where XOR is the exclusive OR logical operator.

For ZVEI alarms, the parity is set to zero.

EXAMPLE OF AN ALARM - Pin 1 on unit number 15102 has been triggered high. The unit has been programmed to communicate to controller number 15.

At the time of sending the alarm the statuses of the other pins are as follows :

- Pin 1 - High
- Pin 2 - Low
- Pin 3 - High
- Pin 4 - High
- Pin 5 - High
- Pin 6 - Low
- Pin 7 - High
- Pin 8 - Low
- Battery is OK

(corresponding binary number is 101011101 which translates to 5 3 5 in octal)

Sequence received from controller or Robotone is (Hex) : 0E 0E 01 05 01 00 02 05 03 05 04 FF

ALARM ACKNOWLEDGE : If a Robotone is being used, the PC Controller replies by sending the following bytes (the desktop controller will acknowledge the alarm if it is used, no action from the PC is required)

Byte 1 : Header 7C Hex
 Byte 2 : Reserved Set to 0
 Byte 3 : Reserved Set to 0
 Byte 4 : Transmitter preamble Increments of 100mS. 1 = 100mS to 14 Hex = 2000 mS
 Byte 5 : 0F Hex
 Byte 5 : Outstation ID digit 1 0 to 9
 Byte 6 : Outstation ID digit 2 0 to 9
 Byte 7 : Outstation ID digit 3 0 to 9
 Byte 8 : Outstation ID digit 4 0 to 9
 Byte 9 : Outstation ID digit 5 0 to 9
 Byte 10: Footer 75 Hex

Note : The controller does not reply to ZVEI 1 or other standard 5-tone messages

COMMANDS

PC controller sends

Byte 1 : Header 7C Hex
 Byte 2 : Reserved Set to 0
 Byte 3 : Reserved Desktop cont Set to : 2 Robotic, 4 Zvei - Robotone set to 0
 Byte 4 : Transmitter preamble Increments of 100mS. 1 = 100mS to 14 Hex = 2000 mS
 Byte 5 : 0E Hex
 Byte 6 : Outstation ID digit 1 0 to 9
 Byte 7 : Outstation ID digit 2 0 to 9
 Byte 8 : Outstation ID digit 3 0 to 9
 Byte 9 : Outstation ID digit 4 0 to 9
 Byte 10: Outstation ID digit 5 0 to 9
 Byte 11 : 0B Hex
 Byte 12: Command byte 1 6 or 9
 Byte 13: Command byte 2 7 or 8
 Byte 14: Command byte 3 6 or 9
 Byte 15: Command byte 4 7 or 8
 Byte 16: Command byte 5 6 or 9
 Byte 17: Command byte 6 7 or 8
 Byte 18: Command byte 7 6 or 9
 Byte 19: Command byte 8 7 or 8
 Byte 20: Footer 75 Hex

Note : The desktop controller ignores byte 4 (transmitter preamble time) and uses its own pre-programmed value.

The command is constructed from the command bytes, command byte 8 is most significant and command byte 1 is least significant:

Bit in command	7	6	5	4	3	2	1	0
Command Byte number	8	7	6	5	4	3	2	1
value for bit =1	8	9	8	9	8	9	8	9
value for bit = 0	7	6	7	6	7	6	7	6

The command has the following Hex values before it is coded

Command	Hex Code	Command Byte 1 to 8 (Hex values)
output 1 low	10	06 07 06 07 09 07 06 07
output 1 high	11	09 07 06 07 09 07 06 07
output 2 low	20	06 07 06 07 06 08 06 07
output 2 high	21	09 07 06 07 06 08 06 07
output 3 low	30	06 07 06 07 09 08 06 07
output 3 high	31	09 07 06 07 09 08 06 07
output 4 low	40	06 07 06 07 06 07 09 07
output 4 high	41	09 07 06 07 06 07 09 07
output 5 low	50	06 07 06 07 09 07 09 07
output 5 high	51	09 07 06 07 09 07 09 07
output 6 low	60	06 07 06 07 06 08 09 07
output 6 high	61	09 07 06 07 06 08 09 07
output 7 low	70	06 07 06 07 09 08 09 07
output 7 high	71	09 07 06 07 09 08 09 07
output 8 low	80	06 07 06 07 06 07 06 08
output 8 high	81	09 07 06 07 06 07 06 08
remote panic - reserved	00	06 07 06 07 06 07 06 07
ZVEI message	N/A	00 00 00 00 00 00 00 00

eg. The full coding for the command PIN 7 HIGH for outstation ID 15102 through the controller is

BYTE (DEC)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
VAL (HEX)	7C	00	02	03	0E	01	05	01	00	02	0B	09	07	06	07	09	08	09	07	75

eg. The full coding to send the ZVEI 5 - tone message 12234 through the controller is

BYTE (DEC)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
VAL (HEX)	7C	00	04	03	0E	01	02	02	03	04	0B	00	00	00	00	00	00	00	00	75

Note : Byte 3 is set to 02 for the controller to generate a Robotic command and 04 if a ZVEI message is to be sent.

The controller ignores byte 4

For the analog output module, the command contains the value to be output in numerical form (0 to 255 decimal corresponding to 0 to full-scale)

COMMAND ACKNOWLEDGE

The PC controller will receive the following reply from the outstation :

Byte 1 :	Header	0F
Byte 2 :	Outstation ID digit 1	0 to 9
Byte 3 :	Outstation ID digit 2	0 to 9
Byte 4 :	Outstation ID digit 3	0 to 9
Byte 5 :	Outstation ID digit 4	0 to 9
Byte 6 :	Outstation ID digit 5	0 to 9
Byte 7 :	Footer	FF

STATUS QUERY

The PC Controller sends

Byte 1 : Header 7C Hex
 Byte 2 : Robotone Set to 0
 Byte 3 : Reserved Desktop controller Set to 01, Robotone set to 0
 Byte 4 : Transmitter preamble Increments of 100mS. 1 = 100mS to 14 Hex = 2000 mS
 Byte 5 : 0E Hex
 Byte 5 : Outstation ID digit 1 0 to 9
 Byte 6 : Outstation ID digit 2 0 to 9
 Byte 7 : Outstation ID digit 3 0 to 9
 Byte 8 : Outstation ID digit 4 0 to 9
 Byte 9 : Outstation ID digit 5 0 to 9
 Byte 10: 0B Hex
 Byte 11: 0D Hex
 Byte 12: 0A Hex
 Byte 13: 0A Hex
 Byte 14: Footer 75 Hex

Note : The desktop controller ignores byte 4 (transmitter preamble time) and uses its own pre-programmed value.

COMMAND REPLY

The outstation replies

Byte 1 : Header 0F Hex
 Byte 2 : Outstation ID digit 1 0 to 9
 Byte 3 : Outstation ID digit 2 0 to 9
 Byte 4 : Outstation ID digit 3 0 to 9
 Byte 5 : Outstation ID digit 4 0 to 9
 Byte 6 : Outstation ID digit 5 0 to 9
 Byte 7 : Value of pins and battery 1 0 to 7
 Byte 8 : Value of pins and battery 2 0 to 7
 Byte 9 : Value of pins and battery 3 0 to 7
 Byte 10: Footer FF Hex

Notes : Value of pins and battery must be extracted from these bytes

Byte	9			8			7		
Bit	2	1	0	2	1	0	2	1	0
Used for	battery	pin 8	pin 7	pin 6	pin 5	pin 4	pin 3	pin 2	pin 1

Battery : 0 - low, 1 - OK

In the case of the analog module, bytes 7,8,9 are the analog value (0 to 255) and the battery state

Desktop controller specific commands

Cancel audible alarm : Byte 1 50Hex - Stops the warbling alarm in the controller
 Force speaker mute : Byte 1 52Hex - Stops any audio from the internal speaker
 Unforce speaker mute : Byte 1 53Hex - Allow speaker audio
 Clear alarm Que : Byte 1 54Hex - Clears all alarms from the controller queue
 Clear last alarm: Byte 1 55Hex - Clear the last alarm received from the controller queue