SOUTHWEST MICROWAVE

Software Document

Remote Polling Module II SDK – INTREPID™

57A46792-A01

REVISIONS

0	Release to Production	12-16-13

1.0 Scope

The Remote Polling Module II SDK developed by Southwest Microwave Inc is an application layer protocol that provides a method for customer software to query status/send commands to remote devices attached to an INTREPID Remote Polling Module II (RPM II) via TCP/IP socket layer. This standard is specific to TCP/IP IPv4 socket communications.

This document assumes the developer has TCP/IP socket programming expertise. Please refer the IETF TCP/IP RFC documentation and the development socket library for more details about network protocols. This document does not describe networking protocols.

This document also assumes the developer has some knowledge of MD5 message-digest algorithm.

2.0 Requirements

INTREPID Remote Polling Module II SDK is an asynchronous server/client protocol over an Ethernet TCP/IP socket.

The customer software requires the following data to establish a socket connection with a RPM II.

2.1 The RPM IIs IP address (user configurable). The default IP address of 192.168.1.4 is a **static IPv4** address predefined at the factory. The customer software administrator/operator needs to know the IP address of the RPM II before initiating a socket connection request.

2.2 The default socket ports are 50001and 50002, configurable by local USB connection.

2.3 The RPM IIs password for the SDK connection, configurable by local USB connection.

In addition, the following notes apply.

2.4 Up to two remote connections and one UIST II connection are supported simultaneously with a RPM II.

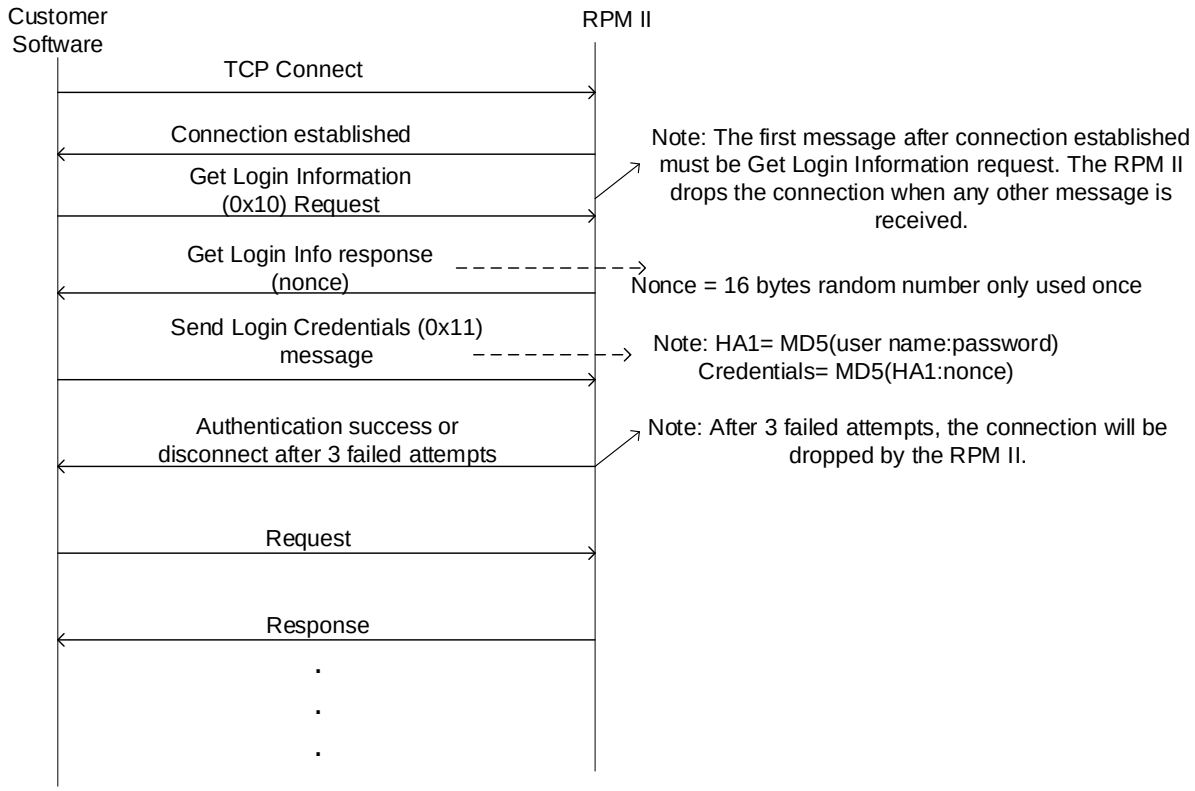
2.5 Secure communication is not supported.

2.6 The maximum polling rate for each port should not exceed 125 milliseconds per request.

2.7 If the RPM II does not receive a message request for 30 seconds, it will close the port.

3.0 Message work flow between the customer software and RPM II

After the TCP/IP socket connection is established between the customer software and RPM II, the first message sent to RPM II must be Get Login Information (0x10). Any other message will cause the connection to be silently dropped. The second message sent to RPM II must be Send Login Credentials (0x11). If authentication success is returned, the sender then can request other information. If authentication failed is returned, the sender will have two more tries. After the third failed attempt, the connection will be dropped.



4.0 Frame Description

4.1 Frame Definition

Protocol Version	msgId	status	dataLen	Sequence number	Data
1 byte	1 byte	1 byte	2 bytes	2 bytes	payload

4.1.1 **Protocol Version**: supported protocol version.
Only version 1 is supported. If the protocol version in the request packet is not 1, the packet will be dropped and the connection will be closed.

4.1.2 **msgId**: This field indicates the type of operation to be performed.

4.1.3 **status** : This field indicates ACK/NAK status of request.
0x00 : request processed successfully
(Status > 0): request process error

4.1.4 **dataLen**: The length field specifies the length of the payload data + 7
(the size of protocol version, msgId, status, dataLen and Sequence number)

4.1.5 **Sequence Number:** Sender's transaction number (min = 0, max = 0xFFFF)
The Sequence Number provided in the Request Message will be copied directly into the Response Message. The Sequence Number has no affect on the RPM IIs performance.

4.1.6 **Payload data**: 0 – 1847 bytes.

4.1.7 **Endianness**: all data in the frame are in big-endian format.

5.0 Message Definitions

The following messages are supported:

Message Id	Description
0x10	Get login information
0x11	Send login credentials
0x12	Get RPM II configuration settings
0x14	Set date and time
0x15	Get RPM II attached devices
0x16	Get alarm record of all devices
0x17	Set/Clear relays of a relay device

6.0 MSGID 0x10 Get Login Information

Request

The *Get Login Information* request is used to get information required for login to the RPM II.

msgId = 0x10
status = 0
dataLen = 7
sequenceId = 0..0xFFFF (sender's transaction sequence number)
Request Payload: None

Response

The *Get Login Information* response frame contains the information used for login.

msgId = 0x10
status = 0 for success or positive number for error
dataLen = 23
sequenceId = (sender's request sequence id)
Response Payload:

Byte Offset	*Description*	*Byte Count*	*Min.*	*Max.*
0	Nonce (16 bytes random number used for this connection)	16	-	-

Notes:

- This must be the first message sent to the RPM II after the TCP connection is established. All other messages will automatically disconnect the port.

- Once you have properly logged into the RPM II, any additional Get Login Information Requests will be ignored. There will be no Response Message.

7.0 MSGID 0x11 Send Login Credentials

Request

The *Send Login Credentials* request is used to send login credentials to the RPM II for authentication.

msgId = 0x11
status = 0
dataLen = 7 + payload length
sequenceId = 0..0xFFFF (sender's transaction sequence number)
Request Payload:

Byte Offset	*Description*	*Byte Count*	*Min.*	*Max.*
0	User name (null terminated UTF-8 string)	Variable (1 to 33)	Null Character	32 UTF-8 characters + Null Character
Variable	credential	16	16 bytes MD5 hash	16 bytes MD5 hash

Credential calculation:
HA1= MD5(username + ":" + password)
Credential = MD5(hex string of HA1 + ":" + hex string of nonce)
Nonce is from the Get Login Information response.

Response

The *Send Login Credentials* response frame returns the status to indicate authentication status.
msgId = 0x11
dataLen = 7
status = 0 for success or positive number for error
sequenceId = (sender's request sequence id)

Return Status set to 0 shall indicate success and non-zero indicates the following:
1 = Authentication failed

Response Payload: None

Notes:

- This must be the second message sent to the RPM II after the TCP connection is established. All other messages will automatically disconnect the port.

- The Username is not currently used. This field must be left blank (only the null character 0 is included). The dataLen for the request will be equal to 24.

- See Appendix 1 for an example of a properly created Credential and login process.

- If you receive a non-zero Status response, you will have a total of three tries to send the correct Credential (using the same nonce previously retrieved), otherwise the port will close.

- Once you have properly logged into the RPM II, any additional Send Login Credential Requests will be ignored. There will be no Response Message.

8.0 MSGID 0x12 Get RPM II Configuration Settings

Request

The *Get RPM II Configuration Settings* request is used to get the configuration data of the RPM II.

msgId = 0x12
status = 0
dataLen = 7
sequenceId = 0..0xFFFF (sender's transaction sequence number)
Request Payload: None

Response

The *Get RPM II Configuration Setting* response frame contains the RPM IIs configuration settings.

msgId = 0x12
status = 0 for success or positive number for error
dataLen = variable (64 to 128)
sequenceId = (sender's request sequence id)
Response Payload:

Byte Offset	*Description*	*Byte Count*	*Min.*	*Max.*
0	Date and time	7	-	-
7	RS422 fault tolerance mode	1	0	1
8	RS422 device polling interval	2	125	600
10	RPM II MAC Address	6	-	-
16	RPM II software version and build date / time (UTF-8 string)	40	-	-
56	RPM II name (null terminated UTF-8 string)	Variable (1 to 65)	Null Character	64 UTF-8 characters + Null Character

Date and time format in BCD format:

Byte Offset	Description	Byte Count	Min.	Max.
0	MM - Month	1	1	12
1	DD - Day of Month	1	1	31
2	YY - Year	1	0	99
3	D - Day of week	1	1	7
4	HH - Hour	1	0	23
5	MM - Minute	1	0	59
6	SS - Second	1	0	59

9.0 MSGID 0x14 Set Date and Time

Request

The *Set Date and Time* request will change the date and time on the RPM II and on all connected devices.

msgId = 0x14
status = 0
dataLen = 14
sequenceId = 0..0xFFFF (sender's transaction sequence number)
Request Payload:

Byte Offset	*Description*	*Byte Count*	*Min.*	*Max.*
0	MM - Month	1	1	12
1	DD - Day of Month	1	1	31
2	YY - Year	1	0	99
3	D - Day of week	1	1	7
4	HH - Hour	1	0	23
5	MM - Minute	1	0	59
6	SS - Second	1	0	59

Note: Year: 00 = 2000, 01 = 2001
Day of Week begins at 1 = Sunday

Response

The *Set Date and Time* response shall contain the new date and time of the RPM II if the request payload is valid, otherwise, the current date and time are returned. After a successful set, the new date and time is broadcasted to all attached devices.

msgId = 0x14
status = 0 for success or positive number for error
2 = Invalid data and time

dataLen = 14
sequenceId = (sender's request sequence id)

Response Payload:

Same as Request Payload.

Notes:

- The Day of Week field is not used when setting the date, but it must be between 1 and 7. You can leave it set to 1.

10.0 MSGID 0x15 Get RPM II Attached Devices

Request

The *Get RPM II Attached Devices* request is to get the attached device list of RPM II.

msgId = 0x15
status = 0
dataLen = 7
sequenceId = 0..0xFFFF (sender's transaction sequence number)
Request Payload: None

Response

The *Get RPM II Attached Devices* response frame contains the discovered device list of RPM II.

msgId = 0x15
status = 0 for success or positive number for error
dataLen = 7 + 1 + (114 * Total Devices)
sequenceId = (sender's request sequence id)

Response Payload:

Byte Offset	*Description*	*Byte Count*	*Min.*	*Max.*
0	Total Devices	1	0	16
1	Device [total devices]	114* total devices	See device structure	See device structure

Where the Device structure is:

Byte offset	*Description*	*Byte Count*	*Min.*	*Max.*
0	Device address	1	0	239
1	Device poll type	2	0x0100	0x0600 Note: 0x0100 – PM II 0x0200 – ROM II-16 0x0300 – ROM II-8 0x0400 – AIM II 0x0500 – MTP II 0x0600 – MODEL330
3	Device mac address	6	-	-
9	Device Software version and build date and time (UTF-8 string)	40	-	-
49	Device tag name (null filled UTF-8 string)	65		0-64 UTF-8 characters + Null Characters to fill remaining field

Notes:

- This command should be executed before the Get Alarm Buffers command. The order of the devices retrieved in this response will determine the meaning of the Compromised Alarms flags and the Communication Failure flags in the RPM II Alarm Buffer.

11.0 MSGID 0x16 Get Alarm Record of All Devices

Request

The *Get Alarm Record of All Devices* request is transmitted to retrieve alarm record of all devices including the RPM II itself. The RPM II shall return the latched alarm record of the devices. Alarm record will be cleared after the response is sent.

msgId = 0x16
status = 0
dataLen = 7
sequenceId = 0..0xFFFF (sender's transaction sequence number)
Request Payload: None

Response

msgId = 0x16
dataLen = 7 + payload length
sequenceId = (sender's request sequence id)
status = 0 for success or positive number for error
Response Payload:

Byte offset	*Description*	*Byte Count*	*Min.*	*Max.*
0	Total Alarm Records (# of Devices plus RPM II)	1	1	17
1	Alarm Record [total Alarm Records]	variable	See alarm record	See alarm record

Where the alarm record is:

Byte offset	*Description*	*Byte Count*	*Min.*	*Max.*
0	Device address	1	0	254
1	Device poll type	2	0x0000	0x0600 Note: 0x0000 – RPM II 0x0100 – PM II 0x0200 – ROM II-16 0x0300 – ROM II-8 0x0400 – AIM II 0x0500 – MTP II 0x0600 – MODEL330
3	Alarm Buffer	Length of the Alarm Buffer	-	-

Notes:

- See appendix 2 for detailed description of all Alarm Buffers.

- The address of the RPM II is fixed at 254.

12.0 MSGID 0x17 Set/Clear Relays

Request

The *Set/Clear Relays* request is transmitted to set/clear relays of a relay device. The RPM II shall return the status of the set/clear command and the relay status of the device if no error is detected. If RPM II loses communication with a device, it shall indicate so in the response.

msgId = 0x17
status = 0
dataLen = 12
sequenceId = 0..0xFFFF (sender's transaction sequence number)
Request Payload:

Byte Offset	Description	Byte Count	Min.	Max.
0	Device address	1	0	239
1	Device poll type	2	0x0200 –ROM II-16	0x0300 – ROM II-8
3	Relays [16..9]	1	0	0xFF
4	Relays [8..1]	1	0	0xFF

Note: For ROM II-8 Set/Clear Relays - relays are specified in byte[4] of payload, byte[3] of payload is not used (set to 00).

Relay bit:
0 – Normal Position, Relay is energized
1 – Alarm Position, Relay is de-energized

Response

msgId = 0x17
dataLen = 10 or 12
sequenceId = (sender's request sequence id)
status = 0 for success or positive number for error
3 = RPM II is busy
4 = Device in comfail
5 = Device address not discovered
6 = Device type not supported
7 = No response received from Device

Response payload :

When status is not success (greater than 0), payload is as following:

Byte Offset	Description	Byte Count	Min.	Max.
0	Device address	1	0	239
1	Device poll type	2	0x0200 –ROM II-16	0x0300 – ROM II-8

When status is success (0), payload is as following:

Byte Offset	Description	Byte Count	Min.	Max.
0	Device address	1	0	239
1	Device poll type	2	0x0200 –ROM II-16	0x0300 – ROM II-8
3	Current relays [16..9]	1	0	0xFF
4	Current relays [8..1]	1	0	0xFF

Notes:

- When a Set / Clear Relays command is sent to the RPM II, the RPM II will compare the requested relay settings with the data it currently has stored for that particular ROM II 8 or 16. If the requested relay states are the same as the current states, the RPM II will simply reply with the status = 0. If the requested relay states are different than the current states stored in the RPM II, then the RPM II will immediately send a message via RS422 bus to the ROM II 8 or 16 and change the relays, then the RPM II will respond with the status field set based on the results of this RS422 command.

13.0 **Appendix 1 : Login Example with Credential Calculation**

The values provided in the example below are valid and can be used to verify your Credential generator routine.

Step 1 is to establish the TCP connection, and then request a Nonce from the RPM II.

To retrieve the Nonce, send the 'Get Login Information' message as shown below:
01 10 00 00 07 00 00

The RPM II will respond with a unique Nonce with each new request:
01 10 00 00 17 00 00 53 E3 10 A8 00 58 62 4A 1E A9 47 E8 78 2D 0E A8

From this, Nonce = 53 E3 10 A8 00 58 62 4A 1E A9 47 E8 78 2D 0E A8

Step 2 is to generate the Credential:

Assume the RPM II is configured with the following:
Password = 0000000000000000 <default 16 zeros>

The username is not used at this time and must be left blank.
User name = <blank>

Note that the Nonce must be in lower case letters with no spaces as shown:
Proper form for Nonce = 53e310a80058624a1ea947e8782d0ea8

HA1 = MD5(username + ":" + password)
HA1 = MD5(:0000000000000000) = 5634e406feaaf4899263567506968cd4

Credential = MD5(hex string of HA1 + ":" + hex string of nonce)
Credential =
MD5(5634e406feaaf4899263567506968cd4:53e310a80058624a1ea947e8782d0ea8)
Credential = 389f7416aeb387e10b83deffb4933f03

Step 3 is to send the Credential to the RPM II using the 'Send Login Credentials' message:
01 11 00 00 18 00 01 00 38 9F 74 16 AE B3 87 E1 0B 83 DE FF B4 93 3F 03

Note that the 8th byte (00) is the null termination for the unused Username, followed by the Credential.

Results: If the returned Status is zero (successful), the RPM II will respond as follows:
01 11 00 00 07 00 01
You now have access to the remaining commands.

If the returned Status is not zero, you will be allowed up to 3 attempts to send the right Credential (using the same Nonce) before the RPM II automatically terminates the TCP connection.

14.0 Appendix 2: Alarm Record Description for each Device Type

The Alarm Records for the various devices listed below have some bytes and/or some bits marked as 'Reserved'. These data bytes / bits values may change from time to time. It is important that these Reserved fields be ignored (masked out) by any third party software to avoid current or future compatibility issues.

14.1 RPM II Alarm Record – 6 bytes (Alarm Poll Type 0x0000)

Byte Offset	Description	Byte Count	Min.	Max.
0	Alarms	1	0	0xFF
1	Compromised Alarms	3	0	0xFF
4	Communication Failure Alarms	2	0	0xFF

Alarms:

Byte 0 - bit 0 = Tamper alarm
Byte 0 - bit 1 = Low input voltage alarm
Byte 0, -bit 2 = Line break alarm
Byte 0 - bit 3-7 = Reserved

Where bit state: 1 = Alarm
0 = Normal

Compromised Alarms:

Byte 1 = Devices 8 - 1
Byte 2 = Devices 16 - 9
Byte 3 - bit 0 = RPM II
Byte 3 - bit 1-7 = Reserved

Where bit state: 1 = Device Compromised
0 = Normal

Communication Failure Alarms:

Byte 4 = Devices 8 - 1
Byte 5 = Devices 16 - 9

Where bit state: 1 = Device in Communication Failure
0 = Normal

Notes:

Device 1 is the first device in the response of *Get RPM II Attached Devices.*
Device 2 is the second device (if present) in the response of *Get RPM II Attached Devices.*
...
Device 16 is the **16th** device (if present) in the response of *Get RPM II Attached Devices.*

14.2 PM II Alarm Record – 59 bytes (Alarm Poll Type 0x0100)

Byte Offset	Description	Byte Count	Min.	Max.
0	Cable A Alarms	27	0	0xFF
27	Cable B Alarms	27	0	0xFF
54	Aux. Inputs	1	0	0xFF
55	Tamper, Faults	1	0	0xFF
56	Service Status	1	0	0xFF
57	Reserved	2	0	0xFFFF

Cable A Alarm Status:

Byte 0	Cells 8 – 1	Byte 10	Cells 88 - 81	Byte 20	Cells 168 - 161
Byte 1	Cells 16 – 9	Byte 11	Cells 96 - 89	Byte 21	Cells 176 - 169
Byte 2	Cells 24 - 17	Byte 12	Cells 104 - 97	Byte 22	Cells 184 - 177
Byte 3	Cells 32 - 25	Byte 13	Cells 112 - 105	Byte 23	Cells 192 - 185
Byte 4	Cells 40 - 33	Byte 14	Cells 120 - 113	Byte 24	Cells 200 - 193
Byte 5	Cells 48 - 41	Byte 15	Cells 128 - 121	Byte 25	Cells 208 - 201
Byte 6	Cells 56 - 49	Byte 16	Cells 136 - 129	Byte 26	Cells 216 - 209
Byte 7	Cells 64 - 57	Byte 17	Cells 144 - 137		
Byte 8	Cells 72 - 65	Byte 18	Cells 152 - 145		
Byte 9	Cells 80 - 73	Byte 19	Cells 160 - 153		

The lowest numbered cell is in the least significant bit of each byte.
Where bit state: 1 = Alarm
0 = Normal

Cable B Alarm Status:

Byte 27	Cells 8 – 1	Byte 37	Cells 88 - 81	Byte 47	Cells 168 - 161
Byte 28	Cells 16 - 9	Byte 38	Cells 96 - 89	Byte 48	Cells 176 - 169
Byte 29	Cells 24 - 17	Byte 39	Cells 104 - 97	Byte 49	Cells 184 - 177
Byte 30	Cells 32 - 25	Byte 40	Cells 112 - 105	Byte 50	Cells 192 - 185
Byte 31	Cells 40 - 33	Byte 41	Cells 120 - 113	Byte 51	Cells 200 - 193
Byte 32	Cells 48 - 41	Byte 42	Cells 128 - 121	Byte 52	Cells 208 - 201
Byte 33	Cells 56 - 49	Byte 43	Cells 136 - 129	Byte 53	Cells 216 - 209
Byte 34	Cells 64 - 57	Byte 44	Cells 144 - 137		
Byte 35	Cells 72 - 65	Byte 45	Cells 152 - 145		
Byte 36	Cells 80 - 73	Byte 46	Cells 160 - 153		

The lowest numbered cell is in the least significant bit of each byte.
Where bit state: 1 = Alarm
0 = Normal

Auxiliary Inputs:

Byte 54 - bit 0 = Auxiliary Input 1
Byte 54 - bit 1 = Auxiliary Input 2

Byte 54 - bit 2 = Auxiliary Input 3
Byte 54 - bit 3 = Auxiliary Input 4
Byte 54 - bit 4-7 = Reserved

Where bit state: 1 = Alarm
0 = Normal

Tamper and Fault Alarms:

Byte 55 - bit 0 = Alarm status for Cable A Fault
Byte 55 - bit 1 = Alarm status for Cable B Fault
Byte 55 - bit 2 = Alarm status for Enclosure Tamper
Byte 55 - bit 3-7 = Reserved

Where bit state: 1 = Alarm
0 = Normal

Service Status:

Byte 56 – bit 0 = Universal Installation Service Tool II active (UIST II)
Byte 56 – bit 1-7: Reserved

Where bit state: 1 = UIST II Active
0 = Normal

Reserved: Factory Reserved Bytes (2 Bytes)

14.3 ROM II-16 Alarm Record – 5 bytes (Alarm Poll Type 0x0200)

Byte Offset	Description	Byte Count	Min.	Max.
0	Relay Status[16..9]	1	0	0xFF
1	Relay Status [8..1]	1	0	0xFF
2	Tamper Status	1	0	0xFF
3	Reserved	2	0	0xFFFF

Relay Status

0 – Normal Position, Relay is energized
1 – Alarm Position, Relay is de-energized

Tamper Status:

Byte 2 – bit 0 = Tamper Switch
Byte 2 – bit 1-7: Reserved

Where bit state: 1 = Tamper Active
0 = Normal

Reserved: Factory Reserved Bytes (2 Bytes)

14.4 ROM II-8 Alarm Record – 4 bytes (Alarm Poll Type 0x0300)

Byte Offset	Description	Byte Count	Min.	Max.
0	Relay Status[8..1]	1	0	0xFF
1	Tamper Status	1	0	0xFF
2	Reserved	2	0	0xFFFF

Relay Status

0 – Normal Position, Relay is energized
1 – Alarm Position, Relay is de-energized

Tamper Status:

Byte 1 – bit 0 = Tamper Switch
Byte 1 – bit 1-7: Reserved

Where bit state: 1 = Tamper Active
0 = Normal

Reserved: Factory Reserved Bytes (2 Bytes)

14.5 AIM II Alarm Record – 5 bytes (Alarm Poll Type 0x0400)

Byte Offset	Description	Byte Count	Min.	Max.
0	Alarm Input	1	0	0xFF
1	Line Status	1	0	0xFF
2	Tamper Switch	1	0	0xFF
3	Reserved	2	0	0xFFFF

Alarm Input Byte:

Byte 0 - bit 7 = Alarm Input 8
Byte 0 - bit 6 = Alarm Input 7
Byte 0 - bit 5 = Alarm Input 6
Byte 0 - bit 4 = Alarm Input 5
Byte 0 - bit 3 = Alarm Input 4
Byte 0 - bit 2 = Alarm Input 3
Byte 0 - bit 1 = Alarm Input 2
Byte 0 - bit 0 = Alarm Input 1

Where bit state: 1 = Alarm
0 = Normal

Line Status Byte:

Byte 1 - bit 7 = Supervised Alarm on Input 8
Byte 1 - bit 6 = Supervised Alarm on Input 7
Byte 1 - bit 5 = Supervised Alarm on Input 6
Byte 1 - bit 4 = Supervised Alarm on Input 5
Byte 1 - bit 3 = Supervised Alarm on Input 4
Byte 1 - bit 2 = Supervised Alarm on Input 3
Byte 1 - bit 1 = Supervised Alarm on Input 2
Byte 1 - bit 0 = Supervised Alarm on Input 1

Where bit state: 1 = Alarm
0 = Normal

Tamper Status:

Byte 2 – bit 0 = Tamper Switch
Byte 2 – bit 1-7: Reserved

Where bit state: 1 = Tamper Active
0 = Normal

Reserved: Factory Reserved Bytes (2 Bytes)

14.6 MTP II Alarm Record – 40 bytes (Alarm Poll Type 0x0500)

Byte Offset	Description	Byte Count	Min.	Max.
0	Cable A Alarms	18	0	0xFF
18	Cable B Alarms	18	0	0xFF
36	Tamper, Faults	1	0	0xFF
37	Service Status	1	0	0xFF
38	Reserved	2	0	0xFFFF

Cable A Alarms:

Byte 0	Cells 8 - 1	Byte 9	Cells 80 - 73
Byte 1	Cells 16 - 9	Byte 10	Cells 88 - 81
Byte 2	Cells 24 - 17	Byte 11	Cells 96 - 89
Byte 3	Cells 32 - 25	Byte 12	Cells 104 - 97
Byte 4	Cells 40 - 33	Byte 13	Cells 112 - 105
Byte 5	Cells 48 - 41	Byte 14	Cells 120 - 113
Byte 6	Cells 56 - 49	Byte 15	Cells 128 - 121
Byte 7	Cells 64 - 57	Byte 16	Cells 136 - 129
Byte 8	Cells 72 - 65	Byte 17	Cells 144 - 137

The lowest numbered cell is in the least significant bit of each byte.
Where bit state: 1 = Alarm
0 = Normal

Cable B Alarms:

Byte 18	Cells 8 - 1	Byte 27	Cells 80 - 73
Byte 19	Cells 16 - 9	Byte 28	Cells 88 - 81
Byte 20	Cells 24 - 17	Byte 29	Cells 96 - 89
Byte 21	Cells 32 - 25	Byte 30	Cells 104 - 97
Byte 22	Cells 40 - 33	Byte 31	Cells 112 - 105
Byte 23	Cells 48 - 41	Byte 32	Cells 120 - 113
Byte 24	Cells 56 - 49	Byte 33	Cells 128 - 121
Byte 25	Cells 64 - 57	Byte 34	Cells 136 - 129
Byte 26	Cells 72 - 65	Byte 35	Cells 144 - 137

The lowest numbered cell is in the least significant bit of each byte.
Where bit state: 1 = Alarm
0 = Normal

Tamper, Faults:

Byte 36 - bit 0 = Alarm status for Cable A Fault
Byte 36 - bit 1 = Alarm status for Cable B Fault
Byte 36 - bit 2 = Alarm status for Enclosure Tamper
Byte 36 - bit 3-7 = Reserved

Where bit state: 1 = Alarm

0 = Normal

Service Status:

Byte 37 – bit 0 = Universal Installation Service Tool II active (UIST II)
Byte 37 – bit 1-7 = Reserved

Where bit state: 1 = UIST II connected
0 = Normal

Reserved: Factory Reserved Bytes (2 Bytes)

14.7 Microwave Model 330 Alarm Record – 3 bytes (Alarm Poll Type 0x0600)

Byte Offset	Description	Byte Count	Min.	Max.
0	Alarms	1	0	0xFF
1	Reserved	2	0	0xFFFF

Alarms:

Byte 0 - bit 0 = Microwave alarm
Byte 0 - bit 1 = Tamper alarm
Byte 0 - bit 2 = Align/Path alarm
Byte 0 - bit 3 = Auxiliary (ext. input/tamper) alarm
Byte 0 - bit 4 = Service alarm
Byte 0 - bit 5 = Low Voltage alarm
Byte 0 - bit 6-7 = Reserved

Where bit state: 1 = Alarm
0 = Normal

Reserved: Factory Reserved Bytes (2 Bytes)