3710 ACM

Advanced Digital Power Instrumentation Package

3710 ACM / Allen-Bradley

Serial Communications Protocol (Integer Ranging Version)

Version 1.3

CONTENTS

POWER MEASUREMENT

Danger

During normal operation of this device, hazardous voltages are present which can cause severe injury or death. These voltages are present on the terminal strips of the device and throughout the connected potential transformer (PT), current transformer (CT), status input, relay, and control power circuits. Installation and servicing should be performed only by qualified, properly trained personnel. See the *3710 ACM Installation and Operation Manual* for further details.

Warning

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the *3710 ACM Installation and Operation Manual*, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference in which case the operator will be required to take whatever measures may be required to correct the interference.

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1.0 - INTRODUCTION

This document details the serial communications protocol used to pass commands, information and data between the model 3710 ACM Power Meter and the Allen-Bradley line of programmable logic controllers (PLC) and communication interface products.

This document provides the information necessary for a 3rd party OEM to develop in-house software to communicate with the model 3710 ACM Power Meter.

Additional information concerning 3710 ACM Power Meter operations is found in the 3710 ACM Installation and Operation Manual. Information concerning Allen-Bradley communication protocol is found in the Allen-Bradley Data Highway/Data Highway Plus Protocol and Command Set Reference Manual.

The information contained in this document is confidential and is released to the reader on the understanding that it will not be copied or distributed in any way, to any other party.

1.1 - PURPOSE OF THE COMMUNICATIONS PROTOCOL

The purpose of the communications protocol is to allow information and data to be efficiently transferred between an Allen-Bradley PLC and a 3710 ACM Power Meter. This includes:

1) Allowing configuration and interrogation of all 3710 ACM Power Meter set-up parameters from the Allen-Bradley PLC.

2) Allowing interrogation of all data measured by a 3710 ACM Power Meter.

3) Allowing the configuration and interrogation of all 3710 ACM setpoint parameters.

4) Allowing the control of the 3710 ACM relays.

5) Allowing interrogation of the 3710 ACM event and min/max logs.

1.2 - COMMUNICATIONS PROTOCOL REVISIONS

This section details the changes made to each new version of the Serial Communications Protocol Document.

Ver. 1.0 - Initial draft of the Serial Communications Protocol Document (Released 89/12/19).

Ver. 2.0 - Corrected delta mode line-to-line average voltage from incorrect line-to-neutral average voltage readings in Short Real-Time Data Packet.

Ver. 3.0 - Major Revision: Upgraded protocol to support RS-485 serial communications.
- Parameters that are represented as 32-bit long values have now been broken into two integers which range from 0 to 999. In other words, the two integers represent the 32-bit values in the following manner: the low order word containing the range (0 - 999) and the high order word (1000 - 999000).

2.0 - DETAILED DESCRIPTION OF THE COMMUNICATIONS PROTOCOL

2.1 - PROTOCOL GROUND RULES

The following rules define the protocol for information transfer between the Allen-Bradley PLC / Communication Interface Products and the 3710 ACM Power Meter on the RS-485 serial communications loop.

The 3710 ACM uses the Allen-Bradley PLC-2 protocol in order that it may communicate with Allen-Bradley line of PLCs and Communication Interface Products.

1) All communications on the RS-485 loop conforms to a MASTER/SLAVE scheme. In this scheme, information and data is transferred between a single MASTER Allen-Bradley PLC and up to 32 SLAVE 3710 ACM Power Meters.

2) The Allen-Bradley PLC will initiate and control all information transfer on the RS-485 communications loop.

3) Under no circumstances will a SLAVE 3710 ACM Power Meter initiate a communications sequence.

4) All communication activity on the RS-485 loop occurs in the form of "PACKETS", a packet being simply a serial string of data bytes. The maximum number of bytes contained within one packet is 255. The bytes that comprise a packet consist of standard asynchronous serial data transmitted with 8-bits per data byte, no parity and one stop bit.

5) This protocol uses a command / reply message packet format in which the Allen-Bradley PLC transmits a command type packet to the 3710 ACM Power Meter and the 3710 ACM answers the PLC with a reply type packet. This protocol uses two of the Allen-Bradley Message Packet Formats from the PLC-2 or Basic Command Set: Unprotected Read and Unprotected Write.

6) The 3710 ACM Power Meters on the RS-485 communications loop assume the role of the "loop foreman" when data is requested by the PLC. The "loop foreman" is responsible for all acknowledgements back to the PLC for itself and 3710 ACMs that are non-existent or do not respond. This eliminates the 30 second timeout from the Allen-Bradley Communications Module which inhibits communications.

7) In the case where the 3710 ACM Power Meters receive a packet that contains an unknown message type address, the "loop foreman" will respond with its last packet except the STS (Status) byte of the packet will contain a 10 Hex. The 10 Hex in the Allen-Bradley protocol indicates an "illegal command" error.

8) In the case where the 3710 ACM Power Meters receive a packet that contains an unknown unit id address, the "loop foreman" will respond with its last packet except the STS (Status) byte of the packet will

contain a 30 Hex. The 30 Hex in the Allen-Bradley protocol indicate a "remote host missing" error.

2.2 - HARDWARE CONFIGURATION

The following section describes the hardware configuration required to connect a single 3710 ACM Power Meter or up to 32 3710 ACM Power Meters to a single Allen-Bradley PLC through several different Allen-Bradley Communications Interface Modules.

In order for 3710 ACMs to communicate with an Allen-Bradley PLC through the Allen-Bradley Data Highway, it must do so with the aid of the Allen-Bradley Communication Interface Modules. The two modules that the 3710 ACM will communicate with are the 1770-KF2 Series B Communication Interface Module and the 1785-KE Data Highway Plus RS-232C Communications Interface Module.

The Allen-Bradley Communication Interfaces must be configured using the following settings: full duplex, BCC error checking, no parity, no embedded responses, yes to detect and ignore duplicate messages and no to using handshaking signals.

In order for multiple 3710 ACMs (using the RS-485 serial communications standard) to communicate with a Allen-Bradley Communications Interface Module (using the RS-232C serial communications standard), a device called a COM32 convertor must be used in the system. The COM32 is an RS-232C to RS-485 serial communications convertor which allows the translation of the serial data stream from one standard to another.

A single 3710 ACM may be directly connected to an Allen-Bradley Communications Interface Module using the RS-232C standard.

The Allen-Bradley PLC-5/15 may be connected directly to the Data Highway without the use of the communication interfaces.

2.3 - DESCRIPTION OF THE PACKET STRUCTURE

The following section describes the structure of the packet used to transfer data and information between the Allen-Bradley PLC and the 3710 ACM Power Meter. The packet structure will be broken down into appropriate fields and the equipment relevant to each field will be mentioned.

Every packet is composed of six fields:

1) The Message Frame Establishment Field
2) The Interface Address Information Field
3) The Control Information Field
4) The Data Field
5) The Message Frame Termination Field
6) The Error Detection Field

2.3.1 - MESSAGE FRAME ESTABLISHMENT FIELD

The Message Frame Establishment field is used to determine the start of a packet (start of frame delimiter). This field is fixed in length and contains two sub-fields, the Data Link Escape (DLE) SUB-FIELD and the Start of Text (STX) SUB-FIELD. These two bytes are used by the Data Link Layer of the Allen-Bradley Communication Interface and the 3710 ACM Power Meter only.

THE DATA LINK ESCAPE (DLE) SUB-FIELD (1 Byte)

This sub-field contains a single byte control character used to indicate the start of a message packet.

THE START OF TEXT (STX) SUB-FIELD (1 Byte)

This sub-field contains a single byte symbol character used to indicate the start of a message packet.

2.3.2 - INTERFACE ADDRESS INFORMATION FIELD

The Interface Address Information field is fixed in length and contains two sub-fields, the DESTINATION ADDRESS (DST) SUB-FIELD and the SOURCE ADDRESS (SRC) SUB-FIELD. These two bytes are used by the Network Layer of Allen-Bradley Communication Interface and the 3710 ACM Power Meter only.

THE DESTINATION ADDRESS (DST) SUB-FIELD (1 Byte)

This byte contains the address of the device (PLC or Communication Interface connected to the 3710 ACM) that the packet is being sent to.

THE SOURCE ADDRESS (SRC) SUB-FIELD (1 Byte)

This byte contains the address of the device (PLC or Communication Interface connected to the 3710 ACM) from which the packet originated.

2.3.3 - CONTROL INFORMATION FIELD

The Control Information field is fixed in length and contains three sub-fields, the COMMAND TYPE SUB-FIELD (CMD), the STATUS SUB-FIELD (STS) and the TRANSACTION IDENTIFIER SUB-FIELD (TNS). These four bytes are used by the Allen-Bradley PLC, Allen-Bradley Communication Interface and the 3710 ACM Power Meter.

THE COMMAND TYPE SUB-FIELD (1 Byte)

This byte is used to define the activity to be performed by the command at the destination station. The following lists describes the Allen-Bradley command type values that are used in this protocol:

CMD	DESCRIPTION OF CMD
01	Unprotected Read Command
41	Unprotected Read Reply
08	Unprotected Write Command
48	Unprotected Write Reply

An Unprotected Read obtains data from the 3710 ACM while an Unprotected Write delivers data to the 3710 ACM. The commands are only sent from the PLC and the replies are only sent from the 3710 ACM.

THE STATUS SUB-FIELD (1 Byte)

This byte indicates the status of the message transmission. A status byte value of 00 indicates a successful transmission. Errors such as 10 Hex (illegal command) or 30 Hex (remote host missing) will be indicated in this location.

THE TRANSACTION IDENTIFIER SUB-FIELD (2 Bytes)

These two bytes contain a unique 16-bit transaction identifier. The purpose of this field is to associate the replying packet with the one that initiated the command. In other words, a commanding station can identify its' reply packet.

2.3.4 - DATA FIELD (0 up to 244 Bytes)

The Data field will vary in length according to the type of command (CMD) contained within the packet. The following will describe the structure of the data and the order that they are sent in the packet. Secondly, the data structure fields for each command used will be described. These bytes are used by the Application Layer of the Allen-Bradley PLC and the 3710 ACM Power Meter.

Packet Data Structure

In general, most data values sent to and from a model 3710 ACM consist of a 4 byte value. Each 4 byte value can be treated as two WORDS, a LOW ORDER WORD and a HIGH ORDER WORD. In a similar manner, each word is composed of a two byte value, one being a LOW ORDER BYTE and the other being a HIGH ORDER BYTE.

The order of the 4 bytes that represent any single parameter is important. The rules that specify this order are as follows:

ALL PARAMETERS THAT REQUIRE TWO WORDS ARE SENT TO THE ACM IN THE ORDER LOW WORD FIRST, HIGH WORD SECOND.
ALL WORDS ARE COMPOSED OF TWO BYTES AND ARE SENT TO THE ACM IN THE ORDER LOW BYTE FIRST, HIGH BYTE SECOND.

EXAMPLE: A 3710 ACM parameter has the value 12345678 Hex.

This 4 byte value can be split into two WORDS,
LOW ORDER WORD = 5678 Hex.
HIGH ORDER WORD = 1234 Hex.

The LOW ORDER WORD can be split into two bytes,
LOW ORDER BYTE = 78 Hex.
HIGH ORDER BYTE = 56 Hex.

The HIGH ORDER WORD can be split into two bytes,
LOW ORDER BYTE = 34 Hex.
HIGH ORDER BYTE = 12 Hex.

This 4 byte parameter would be transmitted LOW ORDER WORD FIRST, LOW ORDER BYTE FIRST, hence the 4 bytes that comprise this value would be transmitted in the order 78 56 34 12.

Read command response packets issued by the 3710 ACM have the following common elements at the start of the a field.

Device Type: integer representation of 3710 (or 0E7E Hex).
Software Revision: 16 bit value, with each 4 bit nibble representing a digit in the version number X.X.X.X (ie. revision 2.1.0.0 would be represented by 2100 Hex).
Unit ID: 8 bit even value representing the transmitting 3710 ACM unit address or ID.
Input Mode: 0 = 4 Wire WYE.
1 = 3 Wire DELTA.
2 = 3 Wire, Single Phase
3 = Demonstration

COMMAND DATA FIELD FORMATS

The data field format for command and reply message packets of Allen-Bradley Unprotected Read and Write commands are as follows. These two message formats can be found in the basic command set of the Allen-Bradley Data Highway/Data Highway Plus Protocol and Command Set Reference Manual.

Unprotected Read Command Format

This data field contains an ADDRESS SUB-FIELD (ADDR) and a SIZE SUB-FIELD (SIZE). The ADDR is a two byte field which is broken down into two separate bytes. The high order byte contains the location or type of data in the 3710 ACM. The low order byte contain the even valued 3710 ACM unit address or unit id in which the PLC can uniquely identify the meter. These two bytes form the Message Type Address found later in this document. The PLC cannot request data at any address except those defined as Message Type Addresses. The following section entitled Destination Table Address Conversion describes how one converts the hexadecimal Message Type Address into the octal Destination Table Address which is required by the Allen-Bradley PLC-5 ladder logic program communication instruction called the Message Block. The SIZE is a one byte field which specifies the number of bytes to be transferred by the packet. The SIZE value is "fixed".

Unprotected Read Reply Format

This data field contains the data reply to the read command in the form of a DATA SUB-FIELD (DATA). In this field, up to 244 bytes of data are transferred from the 3710 ACM.

Unprotected Write Command Format

This data field contains an ADDRESS SUB-FIELD (ADDR) and a DATA SUB-FIELD (DATA). The ADDR is a two byte field which contains the protocol defined message type address as in the preceding Unprotected Read Command Format section. The DATA field may transfer up to 242 bytes of data to the 3710 ACM.

Unprotected Write Reply Format

This reply packet contains no data field.

DESTINATION TABLE ADDRESS CONVERSION

In order to communicate with a 3710 ACM from a PLC-5, the Message Type Address (which contains the type of data and the unit id of the 3710 ACM) must be converted to a value which can be directly entered into the PLC-5 Message communication instruction Destination Table Address. The following will describe this:

First, take the higher order Message Type Address (ADDR) hexadecimal byte value and append it with the lower order Message Type Address hexadecimal byte value. Divide this hexadecimal word value by two and then convert this hexadecimal value to a octal (base 8) value. The

result is the desired Destination Table Address. The following example will clarify the procedure:

The request is for the Long Real-Time Data Packet (High Order Message Type Address: 04 hexadecimal) from 3710 unit id number 156 (Low Order Message Type Address: 156 decimal = 9C hexadecimal).

First, append the low order byte to the high order byte in hexadecimal:

Message Type Address = 049C Hex.

Second, divide the above word by two in hexadecimal:

Message Type Address = 024E Hex.

Third, convert the previous result from hexadecimal base to octal base to yield the PLC-5 Message Instruction Destination Table Address:

Destination Table Address = 1116 Octal.

2.3.5 - MESSAGE FRAME TERMINATION FIELD

The Message Frame Termination field is used to detect the end of a packet (end of frame delimiter). This field is fixed in length and contains two sub-fields, the Data Link Escape (DLE) SUB-FIELD and the End of Text (ETX) SUB-FIELD. These two bytes are used by the Data Link Layer of Allen-Bradley Communication Interface and the 3710 ACM Power Meter only.

THE DATA LINK ESCAPE (DLE) SUB-FIELD (1 Byte)

This sub-field contains a single byte control character used to indicate the end of a message packet.

THE END OF TEXT (ETX) SUB-FIELD (1 Byte)

This sub-field contains a single byte symbol character used to indicate the end of a message packet.

2.3.6 - ERROR DETECTION FIELD (1 Byte)

The Error Detection Field contains only 1 byte. This byte is an eight bit error code used to detect packets that have been corrupted during transmission. This eight bit code is the last byte transmitted in the packet. This byte is used by the Data Link Layer of Allen-Bradley Communication Interface and the 3710 ACM Power Meter only.

The error code is an eight bit Longitudinal Redundancy Check (LRC) which is complemented prior to transmission.

The LRC is calculated by a simple arithmetic sum over all preceding message bytes contained within the packet with the exception of the start of packet frame delimiter bytes (DLE and STX) and the end of packet frame delimiter bytes (DLE and ETX). The complemented LRC byte

is equivalent to the Block Check Character (BCC) used by Allen-Bradley Communication Products.

2.4 - BROADCAST PACKETS

Provisions have been made for the use of broadcast commands within the RS-485 data transfer protocol. The purpose of this is to allow all Slave devices to receive the same command from the Master station. This feature is very useful in situations such as time synchronization of slave clocks.

When broadcast packets are transmitted by the PLC, all Slave devices will receive and perform the packet command but the device that has been set as the "loop foreman" will send a response packet. This is to avoid the possibility of having more than one Slave Device response at one time. Communications from the Master PLC to the Slave devices must not begin with a broadcast packet because no device has had the chance to setup itself as a "loop foreman". Therefore, communicate with a single meter on the RS-485 loop before transmitting any broadcast packets.

2.5 - NETWORK TIMING CONSIDERATIONS

Network timing considerations for the transfer of packets between units on the RS-485 loop must conform to the following rules.

1) The time between the end of a PLC message request packet and the beginning of a SLAVE STATION message response packet must not be less than 5 milliseconds.

   T response min = 5 milliseconds

   This is to provide the PLC with enough time to prepare for the reception of the message response packet from the SLAVE STATION.

2) The time between the end of a PLC message request packet and the beginning of a SLAVE STATION message response packet must not exceed 500 milliseconds.

   T response max = 500 milliseconds

3) The minimum time between the end of any PLC message packet and the beginning of the next PLC packet is device dependent.

   T PLC min = [device dependent]

4) The minimum time between the end of a SLAVE STATION response packet and the beginning of the next PLC message packet is device dependent.

   T slave min = [device dependent]

5) The maximum time between any two data bytes within a packet must not exceed 50 milliseconds.

   T byte max = 50 milliseconds

2.6 - 3710 ACM TIMING CONSIDERATIONS

1) The 3710 ACM requires a 100 millisecond dead space between the end of any response packet on the RS-485 loop and the start of a new command packet sent by the Master PLC.

2) Sequential transmissions from the Master PLC to the 3710 ACM meters must be 100 milliseconds apart (ie: 100 millisecond dead space).

3) Any 3710 ACM that receives a valid command packet from the Master PLC will begin sending its response packet within 100 milliseconds (10 milliseconds typically).

3.0 - PACKET COMMUNICATIONS WITH THE MODEL 3710 ACM

This section details all packet communications into and out of the model 3710 ACM Power Meter. Command packets sent to the 3710 ACM from the Allen-Bradley PLC and reply packets sent from the PLC to the 3710 ACM are divided into three categories according to their function:

1) The packets listed in the first category are used to configure and set-up the 3710 ACM Power Meter prior to operation.

2) The packets listed in the second category are used to extract the data measured by the model 3710 ACM.

3) The packets listed in the third category are used to perform 3710 ACM control functions.

3.1 - PACKETS USED TO INITIALIZE 3710 ACM SET-UP PARAMETERS

The following is a list of packets that are required to set-up the model 3710 ACM unit for operation.

Upon receipt of any set-up packets, the ACM stores the configuration information into its EEPROM where it is retained even during periods when the ACM is powered-off.

3.1.1 - FORMAT OF THE 3710 ACM GENERAL SET-UP PACKETS.

These packets are used to set-up and change most of the user-programmable parameters used by the model 3710 ACM Power Meter.

(Refer to the 3710 ACM Installation and Operation Manual for a description on the set-up parameters).

i) Read 3710 ACM Set-Up Data **(Message Type Address 01XXH)**.

This packet is issued to a model 3710 ACM Power Meter to request a packet containing the present set-up parameters.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 01H - "Unprotected Read" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 01H - high order message type address byte (ADDR), used to request 3710 data.

Byte 11 = 38H = size byte (SIZE) indicating the number of fixed bytes to be read.

Byte 12 = 10H = Data Link Escape (DLE) control byte.
Byte 13 = 03H = End of Text (ETX) delimiter byte.

Byte 14 = BCC ERROR CHECK.

ii) 3710 ACM Response to Read Set-Up Data.

```
Byte  1 = 10H = Data Link Escape (DLE) control byte.
Byte  2 = 02H = Start of Text (STX) delimiter byte.

Byte  3 = (DST) - destination address byte of message packet.
Byte  4 = (SRC) - source address byte of message packet.
Byte  5 =  41H  - reply to "Unprotected Read" command byte (CMD).
Byte  6 = (STS) - byte to indicate message transmission status.
Byte  7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte  8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte  9,10 = device type identification.  ( 3710 )
Byte 11,12 = current firmware version.

Byte 13,14 = transmitting 3710 ACM address (unit id).
Byte 15,16 = device input voltage mode   =  0 for wye.
                                         =  1 for delta.
                                         =  2 for single phase.
                                         =  3 for demo.

Byte 17,18 = low order word, volt scale.         (0 - 999)
Byte 19,20 = high order word, volt scale X 1000. (0 - 999)

Byte 21,22 = low order word, amp scale.          (0 - 999)
Byte 23,24 = high order word, amp scale X 1000.    (0 - 9)

Byte 25,26 = present 3710 password. ( 0000 <= PW <= 9999 )

Byte 27,28 = baudrate = 1 for   110 BAUD.
                      = 2 for   300 BAUD.
                      = 3 for   600 BAUD.
                      = 4 for  1200 BAUD.
                      = 5 for  2400 BAUD.
                      = 6 for  4800 BAUD.
                      = 7 for  9600 BAUD.
                      = 8 for 19200 BAUD.

Byte 29,30 = mode     = 0 for wye.
                      = 1 for delta.
                      = 2 for single phase.
                      = 3 for demo.

Byte 31,32 = communications mode.   ( 0 -> RS-232C, 1 -> RS485 )
Byte 33,34 = phase sequence.        ( 0 -> ABC, 1 -> ACB )

Byte 35,36 = (reserved for future expansion).

Byte 37,38 = demand period length ( minutes ).
Byte 39,40 = number of demand periods.
```

ii) 3710 ACM Response to Read Set-Up Data (continued).

Byte 41,42 = I Out range (0 -> 0-20 mA , 1 -> 4-20 mA).
Byte 43,44 = I Out key.

Byte 45,46 = low order word, I Out scale. (0 - 999)
Byte 47,48 = high order word, I Out scale X 1000. (0 - 999)

Byte 49,50 = standard frequency.

Byte 51,52 = log status input activity to the event log.

Bits 0 - 3 are used as flags for status input #1.
Bits 4 - 7 are used as flags for status input #2.
Bits 8 - 11 are used as flags for status input #3.
Bits 12 - 15 are used as flags for status input #4.

The four bits are used as follows:
Flag = 0000 disables logging of the status input activity.
Flag = 0001 enables logging of the status input activity.
Flag = 0010 (reserved for future use).
. .
Flag = 1111 (reserved for future use).

Byte 53,54 = number of KW Hours per pulse.
Byte 55,56 = number of KVAR Hours per pulse.

Byte 57,58 = low order word, V aux. scale. (0 - 999)
Byte 59,60 = high order word, V aux. scale X 1000. (0 - 999)

Byte 61,62 = low order word, I4 scale. (0 - 999)
Byte 63,64 = high order word, I4 scale X 1000. (0 - 9)

Byte 65 = 10H = Data Link Escape (DLE) control byte.
Byte 66= 03H = End of Text (ETX) delimiter byte.

Byte 67 = BCC ERROR CHECK.

iii) Writing 3710 ACM Set-Up Data **(Message Type Address 01XXH)**.

This packet is issued to a model 3710 ACM Power Meter to change the present set-up parameters used by the meter.

```
Byte  1 = 10H = Data Link Escape (DLE) control byte.
Byte  2 = 02H = Start of Text (STX) delimiter byte.

Byte  3 = (DST) - destination address byte of message packet.
Byte  4 = (SRC) - source address byte of message packet.

Byte  5 =  08H  - "Unprotected Write" command byte (CMD) issued by
                  the Allen-Bradley PLC.
Byte  6 = (STS) - byte to indicate message transmission status.
Byte  7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte  8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte  9 = XXH - low order message type address byte (ADDR), used to
                address destination 3710 ACM (unit id).
Byte 10 = 01H - high order message type address byte (ADDR), used
                to request 3710 data.

Byte 11,12 = (reserved for future use).

Byte 13,14 = low order word, volt scale.              (0 - 999)
Byte 15,16 = high order word, volt scale X 1000.      (0 - 999)

Byte 17,18 = low order word, amp scale.               (0 - 999)
Byte 19,20 = high order word, amp scale X 1000.       (0 - 9)

Byte 21,22 = previous 3710 password. ( 0000 <= PW <= 9999 )

Byte 23,24 = baudrate = 1 for   110 BAUD.
                      = 2 for   300 BAUD.
                      = 3 for   600 BAUD.
                      = 4 for  1200 BAUD.
                      = 5 for  2400 BAUD.
                      = 6 for  4800 BAUD.
                      = 7 for  9600 BAUD.
                      = 8 for 19200 BAUD.

Byte 25,26 = mode     = 0 for wye.
                      = 1 for delta.
                      = 2 for single phase.
                      = 3 for demo.

Byte 27,28 = new 3710 password.      ( 0000 <= PW <= 9999 )
Byte 29,30 = phase sequence.         ( 0 -> ABC, 1 -> ACB )

Byte 31,32 = new 3710 ACM unit id ( 2 - 254 [even address] ).
```

Byte 33,34 = demand period length (minutes).
Byte 35,36 = number of demand periods.

iii) Writing 3710 ACM Set-Up Data **(Message Type Address 01XXH)** (continued).

Byte 37,38 = I Out range (0 -> 0-20 mA , 1 -> 4-20 mA).
Byte 39,40 = I Out key.

Byte 41,42 = low order word, I Out scale. (0 - 999)
Byte 43,44 = high order word, I Out scale X 1000. (0 - 999)

Byte 45,46 = standard frequency.

Byte 47,48 = log status input activity to the event log.

Bits 0 - 3 are used as flags for status input #1.
Bits 4 - 7 are used as flags for status input #2.
Bits 8 - 11 are used as flags for status input #3.
Bits 12 - 15 are used as flags for status input #4.

The four bits are used as follows:
Flag = 0000 disables logging of the status input activity.
Flag = 0001 enables logging of the status input activity.
Flag = 0010 (reserved for future use).
. .
Flag = 1111 (reserved for future use).

Byte 49,50 = number of KW Hours per pulse.
Byte 51,52 = number of KVAR Hours per pulse.

Byte 53,54 = low order word, V aux. scale. (0 - 999)
Byte 55,56 = high order word, V aux. scale X 1000. (0 - 999)

Byte 57,58 = low order word, I4 scale. (0 - 9999)
Byte 59,60 = high order word, I4 scale X 1000. (0 - 9)

Byte 61 = 10H = Data Link Escape (DLE) control byte.
Byte 62 = 03H = End of Text (ETX) delimiter byte.

Byte 63 = BCC ERROR CHECK.

iv) 3710 ACM Response to Writing Set-Up Data.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 48H - reply to "Unprotected Write" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte 9 = 10H = Data Link Escape (DLE) control byte.
Byte 10 = 03H = End of Text (ETX) delimiter byte.

Byte 11 = BCC ERROR CHECK.

3.1.2 - TO READ OR SET THE 3710 ACM DATE AND TIME PARAMETERS.

These packets are used to read or set-up the date & time used by the 3710 ACM Power Meter.

i) Read 3710 ACM Time **(Message Type Address 02XXH)**.

This packet is issued to a model 3710 ACM Power Meter to retrieve the present time used by the 3710.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 01H - "Unprotected Read" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 02H - high order message type address byte (ADDR), used to request 3710 data.

Byte 11 = 0EH = size byte (SIZE) indicating the number of fixed bytes to be read.

Byte 12 = 10H = Data Link Escape (DLE) control byte.
Byte 13 = 03H = End of Text (ETX) delimiter byte.

Byte 14 = BCC ERROR CHECK.

ii) 3710 ACM Response to Read Time.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 41H - reply to "Unprotected Read" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte 9,10 = device type identification. (3710)
Byte 11,12 = current firmware version.

Byte 13,14 = transmitting 3710 ACM address (unit id).
Byte 15,16 = device input voltage mode   = 0 for wye.
                                         = 1 for delta.
                                         = 2 for single phase.
                                         = 3 for demo.

Byte 17 = year.
Byte 18 = month.

Byte 19 = day.
Byte 20 = hour.

Byte 21 = minutes.
Byte 22 = seconds.

Byte 23 = 10H = Data Link Escape (DLE) control byte.
Byte 24 = 03H = End of Text (ETX) delimiter byte.

Byte 25 = BCC ERROR CHECK.

iii) Set 3710 ACM Time **(Message Type Address 02XXH)**.

This packet is issued to a model 3710 ACM Power Meter to set the present time used by the 3710.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 08H - "Unprotected Write" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = 00H - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 02H - high order message type address byte (ADDR), used to request 3710 data.

Byte 11 = year.
Byte 12 = month.

Byte 13 = day.
Byte 14 = hour.

Byte 15 = minutes.
Byte 16 = seconds.

Byte 17 = 10H = Data Link Escape (DLE) control byte.
Byte 18 = 03H = End of Text (ETX) delimiter byte.

Byte 19 = BCC ERROR CHECK.

iv) 3710 ACM Response to Set Time.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 48H - reply to "Unprotected Write" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte 9 = 10H = Data Link Escape (DLE) control byte.
Byte 10 = 03H = End of Text (ETX) delimiter byte.

Byte 11 = BCC ERROR CHECK.

3.1.3 - TO SET THE 3710 ACM SETPOINT PARAMETERS.

These packets are used to set-up the setpoint parameters used by the model 3710 ACM. To access all 17 setpoint parameters, two packets must be requested.

(Refer to the 3710 ACM Installation and Operation Manual for a description of the setpoint operation).

i) Read 3710 ACM Setpoints **(Message Type Address 08XXH)**.
(Setpoints 1 to 8).

This packet is issued to a model 3710 ACM Power Meter to retrieve the first 8 setpoint parameters used to control the relays associated with the meter. This packet reads Setpoints #1 through #8.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 01H - "Unprotected Read" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 08H - high order message type address byte (ADDR), used to request 3710 data.

Byte 11 = 88H = size byte (SIZE) indicating the number of fixed bytes to be read.

Byte 12 = 10H = Data Link Escape (DLE) control byte.
Byte 13 = 03H = End of Text (ETX) delimiter byte.

Byte 14 = BCC ERROR CHECK.

ii) 3710 ACM Response to Read Setpoints (Setpoints 1 to 8).

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 41H - reply to "Unprotected Read" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte 9,10 = device type identification. (3710)
Byte 11,12 = current firmware version.

Byte 13,14 = transmitting 3710 ACM address (unit id).
Byte 15,16 = device input voltage mode   = 0 for wye.
                                         = 1 for delta.
                                         = 2 for single phase.
                                         = 3 for demo.

The bytes for each of the setpoints are arranged in the following order starting with Setpoint #1 and concluding with Setpoint #8:

(2 Bytes) low order word, setpoint low limit.	(0 - 999)
(2 Bytes) high order word, setpoint low limit X 1000.	(0 - 999)
(2 Bytes) low order word, setpoint high limit.	(0 - 999)
(2 Bytes) high order word, setpoint high limit X 1000.	(0 - 999)
(2 Bytes) setpoint release time delay.	(0 - 32000)
(2 Bytes) setpoint operate time delay.	(0 - 32000)

(2 Bytes) setpoint relay number.
(2 Bytes) setpoint key.

16 Bytes for each setpoint.

Byte 145 = 10H = Data Link Escape (DLE) control byte.
Byte 146 = 03H = End of Text (ETX) delimiter byte.

Byte 147 = BCC ERROR CHECK.

iii) Read 3710 ACM Setpoints **(Message Type Address 09XXH)**.
(Setpoints 9 to 17).

This packet is issued to a model 3710 ACM Power Meter to retrieve the last 9 setpoint parameters used to control the relays associated with the meter. This packet reads Setpoints #9 through #17.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 01H - "Unprotected Read" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 09H - high order message type address byte (ADDR), used to request 3710 data.

Byte 11 = 98H = size byte (SIZE) indicating the number of fixed bytes to be read.

Byte 12 = 10H = Data Link Escape (DLE) control byte.
Byte 13 = 03H = End of Text (ETX) delimiter byte.

Byte 14 = BCC ERROR CHECK.

iv) 3710 ACM Response to Read Setpoints (Setpoints 9 to 17).

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 41H - reply to "Unprotected Read" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte 9,10 = device type identification. (3710)
Byte 11,12 = current firmware version.

Byte 13,14 = transmitting 3710 ACM address (unit id).
Byte 15,16 = device input voltage mode   = 0 for wye.
                                         = 1 for delta.
                                         = 2 for single phase.
                                         = 3 for demo.

The bytes for each of the setpoints are arranged in the following order starting with Setpoint #9 and concluding with Setpoint #17:

(2 Bytes) low order word, setpoint low limit.	(0 - 999)
(2 Bytes) high order word, setpoint low limit X 1000.	(0 - 999)
(2 Bytes) low order word, setpoint high limit.	(0 - 999)
(2 Bytes) high order word, setpoint high limit X 1000.	(0 - 999)
(2 Bytes) setpoint release time delay.	(0 - 32000)
(2 Bytes) setpoint operate time delay.	(0 - 32000)

(2 Bytes) setpoint relay number.
(2 Bytes) setpoint key.

16 Bytes for each setpoint.

Byte 161 = 10H = Data Link Escape (DLE) control byte.
Byte 162 = 03H = End of Text (ETX) delimiter byte.

Byte 163 = BCC ERROR CHECK.

v) Set 3710 ACM Setpoints **(Message Type Address 08XXH)**.
(Setpoints 1 to 8).

This packet is issued to a model 3710 ACM Power Meter to set the first 8 setpoint parameters in the meter. This packet sets Setpoint #1 through Setpoint #8.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 08H - "Unprotected Write" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 08H - high order message type address byte (ADDR), used to request 3710 data.

Byte 11,12 = (reserved for future expansion).

The bytes for each of the setpoints are arranged in the following order starting with Setpoint #1 and concluding with Setpoint #8:

(2 Bytes) low order word, setpoint low limit.	(0 - 999)
(2 Bytes) high order word, setpoint low limit X 1000.	(0 - 999)
(2 Bytes) low order word, setpoint high limit.	(0 - 999)
(2 Bytes) high order word, setpoint high limit X 1000.	(0 - 999)
(2 Bytes) setpoint release time delay.	(0 - 32000)
(2 Bytes) setpoint operate time delay.	(0 - 32000)

(2 Bytes) setpoint relay number.
(2 Bytes) setpoint key.

16 Bytes for each setpoint.

Byte 141 = 10H = Data Link Escape (DLE) control byte.
Byte 142 = 03H = End of Text (ETX) delimiter byte.

Byte 143 = BCC ERROR CHECK.

vi) 3710 ACM Response to Set Setpoints (Setpoints 1 to 8).

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 48H - reply to "Unprotected Write" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte 9 = 10H = Data Link Escape (DLE) control byte.
Byte 10 = 03H = End of Text (ETX) delimiter byte.

Byte 11 = BCC ERROR CHECK.

vii) Set 3710 ACM Setpoints **(Message Type Address 09XXH)**.
(Setpoints 9 to 17).

This packet is issued to a model 3710 ACM Power Meter to set the last 9 setpoint parameters in the meter. This packet sets Setpoint #9 through Setpoint #17.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 08H - "Unprotected Write" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 09H - high order message type address byte (ADDR), used to request 3710 data.

Byte 11,12 = (reserved for future expansion).

The bytes for each of the setpoints are arranged in the following order starting with Setpoint #9 and concluding with Setpoint #17:

(2 Bytes) low order word, setpoint low limit.	(0 - 999)
(2 Bytes) high order word, setpoint low limit X 1000.	(0 - 999)
(2 Bytes) low order word, setpoint high limit.	(0 - 999)
(2 Bytes) high order word, setpoint high limit X 1000.	(0 - 999)
(2 Bytes) setpoint release time delay.	(0 - 32000)
(2 Bytes) setpoint operate time delay.	(0 - 32000)

(2 Bytes) setpoint relay number.
(2 Bytes) setpoint key.

16 Bytes for each setpoint.

Byte 157 = 10H = Data Link Escape (DLE) control byte.
Byte 158 = 03H = End of Text (ETX) delimiter byte.

Byte 159 = BCC ERROR CHECK.

viii) 3710 ACM Response to Set Setpoints (Setpoints 9 to 17).

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 48H - reply to "Unprotected Write" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte 9 = 10H = Data Link Escape (DLE) control byte.
Byte 10 = 03H = End of Text (ETX) delimiter byte.

Byte 11 = BCC ERROR CHECK.

Setpoint Key (Setpoint Type).

Setpoint Key	Setpoint Type
0	NOT USED
1	OVER VOLTAGE
2	UNDER VOLTAGE
3	VOLTAGE UNBALANCE
4	OVER CURRENT
5	CURRENT UNBALANCE
6	OVER KVA
7	OVER KW
8	OVER KW REVERSE
9	OVER KVAR
10	OVER KW DEMAND
11	OVER AMP DEMAND
12	OVER FREQUENCY
13	UNDER FREQUENCY
14	OVER VAUX
15	UNDER VAUX
16	PHASE REVERSAL
17	UNDER PF LAGGING
18	UNDER PF LEADING
19	OVER I4

3.2 - PACKETS USED FOR 3710 ACM DATA EXTRACTION

The following is a list of packets that are required to retrieve data presently measured by the model 3710 ACM meter.

3.2.1 - FORMAT OF THE 3710 ACM REAL-TIME DATA PACKETS.

These packets are used to extract the real time data measured by the model 3710 ACM Power Meter.

i) Read 3710 ACM Short Real-Time Data **(Message Type 03XXH)**.

This packet is issued to a model 3710 ACM Power Meter to retrieve a condensed version of the real-time data measured by the 3710 ACM.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 01H - "Unprotected Read" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 03H - high order message type address byte (ADDR), used to request 3710 data.

Byte 11 = 3CH = size byte (SIZE) indicating the number of fixed bytes to be read.

Byte 12 = 10H = Data Link Escape (DLE) control byte.
Byte 13 = 03H = End of Text (ETX) delimiter byte.

Byte 14 = BCC ERROR CHECK.

ii) 3710 ACM Response to Read Short Real-Time Data.

```
Byte  1 = 10H = Data Link Escape (DLE) control byte.
Byte  2 = 02H = Start of Text (STX) delimiter byte.

Byte  3 = (DST) - destination address byte of message packet.
Byte  4 = (SRC) - source address byte of message packet.
Byte  5 =  41H  - reply to "Unprotected Read" command byte (CMD).
Byte  6 = (STS) - byte to indicate message transmission status.
Byte  7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte  8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte  9,10 = device type identification.  ( 3710 )
Byte 11,12 = current firmware version.

Byte 13,14 = transmitting 3710 ACM address (unit id).
Byte 15,16 = device input voltage mode   =  0 for wye.
                                         =  1 for delta.
                                         =  2 for single phase.
                                         =  3 for demo.

Byte 17,18 = (reserved for future expansion).

Byte 19 = year.
Byte 20 = month.

Byte 21 = day.
Byte 22 = hour.

Byte 23 = minutes.
Byte 24 = seconds.

Byte 25,26 = low order word, average voltage.            (0 - 999)
             (L-L for Delta mode else L-N reading).
Byte 27,28 = high order word, average voltage X 1000.    (0 - 999)
             (L-L for Delta mode else L-N reading).

Byte 29,30 = low order word, average amperage.           (0 - 9999)
Byte 31,32 = high order word, average amperage X 1000    (0 - 9)

Byte 33,34 = low order word, total kva reading           (0 - 999)
Byte 35,36 = high order word, total kva reading X 1000   (0 - 999)

Byte 37,38 = low order word, total kw reading.           (0 - 999)
Byte 39,40 = high order word, total kw reading X 1000.   (0 - 999)

Byte 41,42 = low order word, total kvar reading.         (0 - 999)
Byte 43,44 = high order word, total kvar reading X 1000. (0 - 999)

Byte 45,46 = low order word, present kw demand.          (0 - 999)
```

Byte 47,48 = high order word, present kw demand X 1000. (0 - 999)

Byte 49,50 = (reserved for future expansion).
Byte 51,52 = power factor reading.

ii) 3710 ACM Response to Read Short Real-Time Data
(Continued).

Byte 53,54 = low order word, present alarm status.
Byte 55,56 = high order word, present alarm status.

Byte 57,58 = low order word, present vaux reading. (0 - 999)
Byte 59,60 = high order word, present vaux reading X 1000. (0 - 999)

Byte 61,62 = low order word, present amp demand. (0 - 999)
Byte 63,64 = high order word, present amp demand X 1000. (0 - 999)

Byte 65,66 = low order word, I4 current reading. (0 - 9999)
Byte 67,68 = high order word, I4 current reading X 1000. (0 - 9999)

Byte 69 = 10H = Data Link Escape (DLE) control byte.
Byte 70 = 03H = End of Text (ETX) delimiter byte.

Byte 71 = BCC ERROR CHECK.

Alarm Status Bytes

Bit Position
0 -> Setpoint #1 status
1 -> Setpoint #2 status
2 -> Setpoint #3 status
3 -> Setpoint #4 status
4 -> Setpoint #5 status
5 -> Setpoint #6 status
6 -> Setpoint #7 status
7 -> Setpoint #8 status
8 -> Setpoint #9 status
9 -> Setpoint #10 status
10 -> Setpoint #11 status
11 -> Setpoint #12 status
12 -> Setpoint #13 status
13 -> Setpoint #14 status
14 -> Setpoint #15 status
15 -> Setpoint #16 status
16 -> Setpoint #17 status
17 -> Reserved for future use
18 -> Relay #1 status
19 -> Relay #2 status
20 -> Relay #3 status
21 -> Status Input #1 status
22 -> Status Input #2 status
23 -> Status Input #3 status
24 -> Status Input #4 status
25 -> Alarm Status Change flag

26 -> New Event flag
27 -> New Min/Max flag
28 -> Diagnostics Failure flag
29 -> Reserved for future use
30 -> Reserved for future use
31 -> Reserved for future use

iii) Read 3710 ACM Long Real-Time Data **(Message Type 04XXH)**.

This packet is issued to a model 3710 ACM Power Meter to retrieve a detailed account of the real-time data measured by the 3710 ACM meter.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 01H - "Unprotected Read" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 04H - high order message type address byte (ADDR), used to request 3710 data.

Byte 11 = B4H = size byte (SIZE) indicating the number of fixed bytes to be read.

Byte 12 = 10H = Data Link Escape (DLE) control byte.
Byte 13 = 03H = End of Text (ETX) delimiter byte.

Byte 14 = BCC ERROR CHECK.

iv) 3710 ACM Response to Read Long Real-Time Data.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 41H - reply to "Unprotected Read" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte 9,10 = device type identification. (3710)
Byte 11,12 = current firmware version.

Byte 13,14 = transmitting 3710 ACM address (unit id).
Byte 15,16 = device input voltage mode   = 0 for wye.
                                         = 1 for delta.
                                         = 2 for single phase.
                                         = 3 for demo.

Byte 17 = year.
Byte 18 = month.

Byte 19 = day.
Byte 20 = hour.

Byte 21 = minutes.
Byte 22 = seconds.

Byte 23,24 = (reserved for future expansion).

The next section the packet is dependant on which voltage mode the 3710 ACM Power Meter is operating in.

If the 3710 ACM is operating in **3-WIRE DELTA** mode (Mode 1):

Byte 25-36 = Unused Data Location

Byte 37,38 = low order word, present average L-L voltage. (0 - 999)
Byte 39,40 = high order word, present average L-L voltage X 1000. (0 - 999)

Byte 41,42 = low order word, present L-L voltage, phase AB. (0 - 999)
Byte 43,44 = high order word, present L-L voltage, phase AB X 1000. (0 - 999)

Byte 45,46 = low order word, present L-L voltage, phase BC. (0 - 999)
Byte 47,48 = high order word, present L-L voltage, phase BC X 1000. (0 - 999)

iv) 3710 ACM Response to Read Long Real-Time Data (Continued).

Byte 49,50 = low order word, present L-L voltage, phase CA. (0 - 999)
Byte 51,52 = high order word, present L-L voltage, phase CA X 1000. (0 - 999)

If operating in **4-WIRE WYE** or **DEMO** mode (Modes 0 or 3):

Byte 25,26 =	low order word, present L-N voltage, phase A.	(0 - 999)
Byte 27,28 =	high order word, present L-N voltage, phase A X 1000.	(0 - 999)
Byte 29,30 =	low order word, present L-N voltage, phase B.	(0 - 999)
Byte 31,32 =	high order word, present L-N voltage, phase B X 1000.	(0 - 999)
Byte 33,34 =	low order word, present L-N voltage, phase C.	(0 - 999)
Byte 35,36 =	high order word, present L-N voltage, phase C X 1000.	(0 - 999)
Byte 37,38 =	low order word, present average L-N voltage.	(0 - 999)
Byte 39,40 =	high order word, present average L-N voltage X 1000.	(0 - 999)
Byte 41,42 =	low order word, present L-L voltage, phase AB.	(0 - 999)
Byte 43,44 =	high order word, present L-L voltage, phase AB X 1000.	(0 - 999)
Byte 45,46 =	low order word, present L-L voltage, phase BC.	(0 - 999)
Byte 47,48 =	high order word, present L-L voltage, phase BC X 1000.	(0 - 999)
Byte 49,50 =	low order word, present L-L voltage, phase CA.	(0 - 999)
Byte 51,52 =	high order word, present L-L voltage, phase CA X 1000.	(0 - 999)

Otherwise if operating in **3-WIRE SINGLE PHASE** mode (Mode 2):

Byte 25,26 =	low order word, present L-N voltage, phase A.	(0 - 999)
Byte 27,28 =	high order word, present L-N voltage, phase A X 1000.	(0 - 999)

iv) 3710 ACM Response to Read Long Real-Time Data (Continued).

Byte 29,30 =	low order word, present L-N voltage, phase B.	(0 - 999)
Byte 31,32 =	high order word, present L-N voltage, phase B X 1000.	(0 - 999)
Byte 33-36 =	Unused Data Location.	
Byte 37,38 =	low order word, present average L-N voltage.	(0 - 999)
Byte 39,40 =	high order word, present average L-N voltage X 1000.	(0 - 999)
Byte 41,42 =	low order word, present L-L voltage, phase AB.	(0 - 999)
Byte 43,44 =	high order word, present L-L voltage, phase AB X 1000.	(0 - 999)
Byte 45-52 =	Unused Data Location.	

If operating in **4-WIRE WYE**, **3-WIRE DELTA** or **DEMO** mode (Modes 0, 1 or 3):

Byte 53,54 =	low order word, present amperage, phase A.	(0 - 999)
Byte 55,56 =	high order word, present amperage, phase A X 1000.	(0 - 9)
Byte 57,58 =	low order word, present amperage, phase B.	(0 - 999)
Byte 59,60 =	high order word, present amperage, phase B X 1000.	(0 - 9)
Byte 61,62 =	low order word, present amperage, phase C.	(0 - 999)
Byte 63,64 =	high order word, present amperage, phase C X 1000.	(0 - 9)
Byte 65,66 =	low order word, present average amperage.	(0 - 999)
Byte 67,68 =	high order word, present average amperage X 1000.	(0 - 9)
Byte 69,70 =	low order word, total kva reading.	(0 - 999)
Byte 71,72 =	high order word, total kva reading X 1000.	(0 - 999)
Byte 73,74 =	low order word, present kw reading, phase A.	(0 - 999)
Byte 75,76 =	high order word, present kw reading, phase A X 1000.	(0 - 999)

iv) 3710 ACM Response to Read Long Real-Time Data (Continued).

Byte 77,78 = low order word, present kw reading, phase B. (0 - 999)
Byte 79,80 = high order word, present kw reading, phase B X 1000. (0 - 999)

Byte 81,82 = low order word, present kw reading, phase C. (0 - 999)
Byte 83,84 = high order word, present kw reading, phase C X 1000. (0 - 999)

Otherwise if operating in **3-WIRE SINGLE PHASE** mode (Mode 2):

Byte 53,54 = low order word, present amperage, phase A. (0 - 999)
Byte 55,56 = high order word, present amperage, phase A X 1000. (0 - 9)

Byte 57,58 = low order word, present amperage, phase B. (0 - 999)
Byte 59,60 = high order word, present amperage, phase B X 1000. (0 - 9)

Byte 61-64 = Unused Data Location.

Byte 65,66 = low order word, present average amperage. (0 - 999)
Byte 67,68 = high order word, present average amperage X 1000. (0 - 9)

Byte 69,70 = low order word, total kva reading. (0 - 999)
Byte 71,72 = high order word, total kva reading X 1000. (0 - 999)

Byte 73,74 = low order word, present kw reading, phase A. (0 - 999)
Byte 75,76 = high order word, present kw reading, phase A X 1000. (0 - 999)

Byte 77,78 = low order word, present kw reading, phase B. (0 - 999)
Byte 79,80 = high order word, present kw reading, phase B X 1000. (0 - 999)

Byte 81-84 = Unused Data Location.

The following bytes are common to all modes:

Byte 85,86 = low order word, total kw reading. (0 - 999)
Byte 87,88 = high order word, total kw

reading X 1000. (0 - 999)

iv) 3710 ACM Response to Read Long Real-Time Data (Continued).

Byte 89,90 = low order word, kw reverse reading. (0 - 999)
Byte 91,92 = high order word, kw reverse reading X 1000. (0 - 999)

Byte 93,94 = low order word, total kvar reading. (0 - 999)
Byte 95,96 = high order word, total kvar reading X 1000. (0 - 999)

Byte 97, 98 = low order word, present kilowatt demand. (0 - 999)
Byte 99,100 = high order word, present kilowatt demand X 1000. (0 - 999)

Byte 101,102 = power factor.
Byte 103,104 = present frequency.

Byte 105,106 = low order word, present kilowatt hour reading. (0 - 999)
Byte 107,108 = middle order word, present kilowatt hour reading. (0 - 999)
Byte 109,110 = high order word, present kilowatt hour reading. (0 - 999)

Byte 111,112 = low order word, present kilowatt hour reverse. (0 - 999)
Byte 113,114 = middle order word, present kilowatt hour reverse X 1000. (0 - 999)
Byte 115,116 = high order word, present kilowatt hour reverse X 1000000. (0 - 999)

Byte 117,118 = low order word, present kvar hour reading. (0 - 999)
Byte 119,120 = middle order word, present kvar hour reading X 1000. (0 - 999)
Byte 121,122 = high order word, present kvar hour reading X 1000000. (0 - 999)

Byte 123,124 = (reserved for future expansion).

Byte 125,126 = low order word, present alarm status.
Byte 127,128 = high order word, present alarm status.

Byte 129,130 = low order word, present vaux reading. (0 - 999)
Byte 131,132 = high order word, present vaux reading X 1000. (0 - 999)

Byte 133,134 = low order word, present amp demand. (0 - 999)

Byte 135,136 = high order word, present amp
demand X 1000. (0 - 9)

iv) 3710 ACM Response to Read Long Real-Time Data (Continued).

If operating in **3-WIRE DELTA** mode (Mode 1):

Byte 137-160 = Unused Data Location.

If the 3710 ACM is operating in **4-WIRE WYE** or **DEMO** mode (Modes 0 or 3):

Byte 137,138 = low order word, present kva reading,
phase A. (0 - 999)
Byte 139,140 = high order word, present kva reading,
phase A X 1000. (0 - 999)

Byte 141,142 = low order word, present kva reading,
phase B. (0 - 999)
Byte 143,144 = high order word, present kva reading,
phase B X 1000. (0 - 999)

Byte 145,146 = low order word, present kva reading,
phase C. (0 - 999)
Byte 147,148 = high order word, present kva reading,
phase C X 1000. (0 - 999)

Byte 149,150 = low order word, present kvar reading,
phase A. (0 - 999)
Byte 151,152 = high order word, present kvar reading,
phase A X 1000. (0 - 999)

Byte 153,154 = low order word, present kvar reading,
phase B. (0 - 999)
Byte 155,156 = high order word, present kvar reading,
phase B X 1000. (0 - 999)

Byte 157,158 = low order word, present kvar reading,
phase C. (0 - 999)
Byte 159,160 = high order word, present kvar reading,
phase C X 1000. (0 - 999)

Otherwise if the 3710 ACM is operating in **3-WIRE SINGLE PHASE** (Mode 2):

Byte 137,138 = low order word, present kva reading,
phase A. (0 - 999)
Byte 139,140 = high order word, present kva reading,
phase A X 1000. (0 - 999)

Byte 141,142 = low order word, present kva reading,
phase B. (0 - 999)
Byte 143,144 = high order word, present kva reading,

phase B X 1000. (0 - 999)

Byte 145-148 = Unused Data Location.

iv) 3710 ACM Response to Read Long Real-Time Data (Continued).

Byte 149,150 = low order word, present kvar reading, phase A. (0 - 999)
Byte 151,152 = high order word, present kvar reading, phase A X 1000. (0 - 999)

Byte 153,154 = low order word, present kvar reading, phase B. (0 - 999)
Byte 155,156 = high order word, present kvar reading, phase B X 1000. (0 - 999)

Byte 157-160 = Unused Data Location.

The remaining section the packet is common to all voltage modes of the 3710 ACM Power Meter.

Byte 161,162 = low order word, I4 current reading. (0 - 999)
Byte 163,164 = high order word, I4 current reading X 1000 (0 - 9)

Byte 165 = Relay #1 status byte.
Byte 166 = Relay #2 status byte.
Byte 167 = Relay #3 status byte.

Byte 168 = Status Input status byte.

Byte 169 = Setpoint #01 status byte.
Byte 170 = Setpoint #02 status byte.
Byte 171 = Setpoint #03 status byte.
Byte 172 = Setpoint #04 status byte.
Byte 173 = Setpoint #05 status byte.
Byte 174 = Setpoint #06 status byte.
Byte 175 = Setpoint #07 status byte.
Byte 176 = Setpoint #08 status byte.
Byte 177 = Setpoint #09 status byte.
Byte 178 = Setpoint #10 status byte.
Byte 179 = Setpoint #11 status byte.
Byte 180 = Setpoint #12 status byte.
Byte 181 = Setpoint #13 status byte.
Byte 182 = Setpoint #14 status byte.
Byte 183 = Setpoint #15 status byte.
Byte 184 = Setpoint #16 status byte.
Byte 185 = Setpoint #17 status byte.

Byte 186 = Unused Data Location.

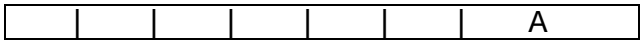
Byte 187,188 = Status Input #1 Counter.

Byte 189 = 10H = Data Link Escape (DLE) control byte.
Byte 190 = 03H = End of Text (ETX) delimiter byte.

Byte 191 = BCC ERROR CHECK.

Relay Status Bytes

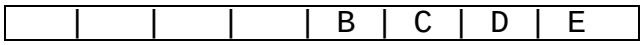
Bit Position 7 6 5 4 3 2 1 0



A) 00 -> Released
01 -> Operated
10 -> Forced Released
11 -> Forced Operated

Status Input Status Byte

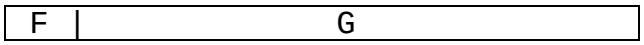
Bit Position 7 6 5 4 3 2 1 0



B) Status Input #4
C) Status Input #3
D) Status Input #2
E) Status Input #1 = 0 -> Normal, 1 -> Active

Setpoint Status Bytes

Bit Position 7 6 5 4 3 2 1 0



F) Setpoint Status = 0 -> Normal, 1 -> Active

G) Setpoint Parameter -> Setpoint index (0 - 127)

00 - Setpoint Not Used
01 - Setpoint Over Voltage
02 - Setpoint Under Voltage
03 - Setpoint Voltage Unbalance
04 - Setpoint Over Amperage
05 - Setpoint Amperage Unbalance
06 - Setpoint Over KVA
07 - Setpoint Over KW
08 - Setpoint Over KW Reverse
09 - Setpoint Over KVAR
10 - Setpoint Over KW Demand
11 - Setpoint Over Amp Demand
12 - Setpoint Over Frequency
13 - Setpoint Under Frequency
14 - Setpoint Over Vaux
15 - Setpoint Under Vaux
16 - Setpoint Phase Reversal
17 - Setpoint Under PF Lagging
18 - Setpoint Under PF Leading
19 -
. - Not Used
127 -

3.2.2 - FORMAT OF THE 3710 ACM STATUS PACKETS.

These packets are used to determine the status of the relays, the status inputs, and all setpoints used by the model 3710 ACM Power Meter. Refer to the 3710 ACM Installation and Operation Manual for additional information on the relays, status inputs and setpoints.

i) Read 3710 ACM Status **(Message Type Address 0AXXH)**.

This packet is issued to a model 3710 ACM Power Meter to retrieve the status information on the relays, status inputs & setpoints on the model 3710 ACM Power Meter.

```
Byte  1 = 10H = Data Link Escape (DLE) control byte.
Byte  2 = 02H = Start of Text (STX) delimiter byte.

Byte  3 = (DST) - destination address byte of message packet.
Byte  4 = (SRC) - source address byte of message packet.

Byte  5 =  01H  - "Unprotected Read" command byte (CMD) issued by
                  the Allen-Bradley PLC.
Byte  6 = (STS) - byte to indicate message transmission status.
Byte  7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte  8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte  9 = XXH - low order message type address byte (ADDR), used to
                address destination 3710 ACM (unit id).
Byte 10 = 0AH - high order message type address byte (ADDR), used
                to request 3710 data.

Byte 11 = 20H = size byte (SIZE) indicating the number of fixed
                bytes to be read.

Byte 12 = 10H = Data Link Escape (DLE) control byte.
Byte 13 = 03H = End of Text (ETX) delimiter byte.

Byte 14 = BCC ERROR CHECK.
```

ii) 3710 ACM Response to Status request.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 41H - reply to "Unprotected Read" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte 9,10 = device type identification. (3710)
Byte 11,12 = current firmware version.

Byte 13,14 = transmitting 3710 ACM address (unit id).
Byte 15,16 = device input voltage mode   = 0 for wye.
                                         = 1 for delta.
                                         = 2 for single phase.
                                         = 3 for demo.

Byte 17 = Relay #1 status byte.
Byte 18 = Relay #2 status byte.
Byte 19 = Relay #3 status byte.

Byte 20 = Status Input status byte.

Byte 21 = Setpoint #01 status byte.
Byte 22 = Setpoint #02 status byte.
Byte 23 = Setpoint #03 status byte.
Byte 24 = Setpoint #04 status byte.
Byte 25 = Setpoint #05 status byte.
Byte 26 = Setpoint #06 status byte.
Byte 27 = Setpoint #07 status byte.
Byte 28 = Setpoint #08 status byte.
Byte 29 = Setpoint #09 status byte.
Byte 30 = Setpoint #10 status byte.
Byte 31 = Setpoint #11 status byte.
Byte 32 = Setpoint #12 status byte.
Byte 33 = Setpoint #13 status byte.
Byte 34 = Setpoint #14 status byte.
Byte 35 = Setpoint #15 status byte.
Byte 36 = Setpoint #16 status byte.
Byte 37 = Setpoint #17 status byte.

Byte 38 = Unused Data Location.

Byte 39,40 = Status Input #1 Counter.

Byte 41 = 10H = Data Link Escape (DLE) control byte.
Byte 42 = 03H = End of Text (ETX) delimiter byte.

Byte 43 = BCC ERROR CHECK.

3.3 - PACKETS USED FOR 3710 ACM LOG EXTRACTION

The following is a list of packets that are required to retrieve data logs stored by the model 3710 ACM Power Meter. Refer to the 3710 ACM Installation and Operation Manual for further information on the event logs.

The 3710 ACM can store up to 50 events in its event log which is located in NON VOLATILE RAM.

The logs contain too much information to fit into one packet so the master terminal must specify which information it wants. Eighteen events will fit into one packet.

The events are stored as follows: first event being the most recent event and last event being the oldest event in the event log. To obtain all the events, three packets must be transmitted. The first packet contains the 18 recent events (Events 1 to 18); the second packet contains the next 18 most recent events (Events 19 to 36) and the third packet contains the last 14 events (Events 37 to 50).

In the case where the event log is empty or the log is not full, the 3710 ACM will fill these positions in the packet will zeros.

3.3.1 - FORMAT OF THE 3710 ACM EVENT LOG PACKETS.

These packets are used to extract the event log data logged by the model 3710 ACM Power Meter.

i) Read 3710 ACM Event Log **(Message Type Address 05XXH)**.
(Events 1 to 18).

This packet is issued to a model 3710 ACM Power Meter to retrieve the eighteen most recent event logs (Events 1 to 18) stored by the meter.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 01H - "Unprotected Read" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 05H - high order message type address byte (ADDR), used to request 3710 data.

Byte 11 = E0H = size byte (SIZE) indicating the number of bytes to be read.

Byte 12 = 10H = Data Link Escape (DLE) control byte.
Byte 13 = 03H = End of Text (ETX) delimiter byte.

Byte 14 = BCC ERROR CHECK.

ii) 3710 ACM Response to Read Event Log.
(Events 1 to 18).

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 41H - reply to "Unprotected Read" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9,10 = device type identification. (3710)
Byte 11,12 = current firmware version.

Byte 13,14 = transmitting 3710 ACM address (unit id).
Byte 15,16 = device input voltage mode = 0 for wye.
= 1 for delta.
= 2 for single phase.
= 3 for demo.

The bytes for each of the event logs are arranged in the following order:

(4 Bytes) time of event. (compressed format)
(1 Byte) year of event. (current year = 1900 + year)
(1 Byte) event flag value.
(2 Bytes) event code value.
(2 Bytes) low order word, event log value. (0 - 999)
(2 Bytes) high order word, event log value X 1000. (0 - 999)

12 Bytes for each event log.

Byte 233 = 10H = Data Link Escape (DLE) control byte.
Byte 234 = 03H = End of Text (ETX) delimiter byte.

Byte 235 = BCC ERROR CHECK.

iii) Read 3710 ACM Event Log **(Message Type Address 06XXH)**.
(Events 19 to 36).

This packet is issued to a model 3710 ACM Power Meter to retrieve the next eighteen most recent event logs (Events 19 to 36) stored by the meter.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 01H - "Unprotected Read" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 06H - high order message type address byte (ADDR), used to request 3710 data.

Byte 11 = E0H = size byte (SIZE) indicating the number of bytes to be read.

Byte 12 = 10H = Data Link Escape (DLE) control byte.
Byte 13 = 03H = End of Text (ETX) delimiter byte.

Byte 14 = BCC ERROR CHECK.

iv) 3710 ACM Response to Read Event Log. (Events 19 to 36).

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 41H - reply to "Unprotected Read" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte 9,10 = device type identification. (3710)
Byte 11,12 = current firmware version.

Byte 13,14 = transmitting 3710 ACM address (unit id).
Byte 15,16 = device input voltage mode   = 0 for wye.
                                         = 1 for delta.
                                         = 2 for single phase.
                                         = 3 for demo.

The bytes for each of the event logs are arranged in the following order:

(4 Bytes) time of event.   (compressed format)
(1 Byte) year of event.   (current year = 1900 + year)
(1 Byte) event flag value.
(2 Bytes) event code value.
(2 Bytes) low order word, event log value.   (0 - 999)
(2 Bytes) high order word, event log value X 1000.   (0 - 999)

12 Bytes for each event log.

Byte 233 = 10H = Data Link Escape (DLE) control byte.
Byte 234 = 03H = End of Text (ETX) delimiter byte.

Byte 235 = BCC ERROR CHECK.

v) Read 3710 ACM Event Log **(Message Type Address 07XXH)**.
(Events 37 to 50).

This packet is issued to a model 3710 ACM Power Meter to retrieve the last fourteen event logs (Events 37 to 50) stored by the meter.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 01H - "Unprotected Read" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 07H - high order message type address byte (ADDR), used to request 3710 data.

Byte 11 = B0H = size byte (SIZE) indicating the number of bytes to be read.

Byte 12 = 10H = Data Link Escape (DLE) control byte.
Byte 13 = 03H = End of Text (ETX) delimiter byte.

Byte 14 = BCC ERROR CHECK.

vi) 3710 ACM Response to Read Event Log. (Events 37 to 50).

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 41H - reply to "Unprotected Read" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte 9,10 = device type identification. (3710)
Byte 11,12 = current firmware version.

Byte 13,14 = transmitting 3710 ACM address (unit id).
Byte 15,16 = device input voltage mode   = 0 for wye.
                                         = 1 for delta.
                                         = 2 for single phase.
                                         = 3 for demo.

The bytes for each of the event logs are arranged in the following order:

(4 Bytes) time of event.   (compressed format)
(1 Byte) year of event.   (current year = 1900 + year)
(1 Byte) event flag value.
(2 Bytes) event code value.
(2 Bytes) low order word, event log value.   (0 - 999)
(2 Bytes) high order word, event log value X 1000.   (0 - 999)

12 Bytes for each event log.

Byte 185 = 10H = Data Link Escape (DLE) control byte.
Byte 186 = 03H = End of Text (ETX) delimiter byte.

Byte 187 = BCC ERROR CHECK.

Compressed Time Format

Bit Position 31-28 27-22 21-16 15-11 10-06 05-02 01-00

A	B	C	D	E	F	G

A) 4 bits -> Unused
B) 6 bits -> Seconds
C) 6 bits -> Minutes
D) 5 bits -> Hour
E) 5 bits -> Day

F) 4 bits -> Month
G) 2 bits -> Unused

Event Flag Value

Bit Position

7	6	5	4	3	2	1	0
A	B	C	D		E	F	

A) Relay Status #3
B) Relay Status #2
C) Relay Status #1 = 0 -> Released
1 -> Operated
D) Relay Number = 00 -> Relay #0
01 -> Relay #1
10 -> Relay #2
11 -> Relay #3
E) Setpoint Status = 0 -> Normal
1 -> Active
F) General Info = 00 -> No Data
01 -> Front Panel Event
10 -> Comm Packet Event
11 -> Forced Relay Operation

Event Code Value

00 -> Reserved
01 -> Setpoint Over Voltage
02 -> Setpoint Under Voltage
03 -> Setpoint Voltage Unbalance
04 -> Setpoint Over Amperage
05 -> Setpoint Amperage Unbalance
06 -> Setpoint Over KVA
07 -> Setpoint Over KW
08 -> Setpoint Over KW Reverse
09 -> Setpoint Over KVAR
10 -> Setpoint Over KW Demand
11 -> Setpoint Over Amp Demand
12 -> Setpoint Over Frequency
13 -> Setpoint Under Frequency
14 -> Setpoint Over Vaux
15 -> Setpoint Under Vaux
16 -> Setpoint Phase Reversal
17 -> Setpoint Under PF Lagging
18 -> Setpoint Under PF Leading
19 -> Setpoint Over I4
. ->
. ->
. -> Reserved for future Setpoint Expansion
. ->
31 ->
32 -> Setpoint Over Voltage Phase A
33 -> Setpoint Over Voltage Phase B
34 -> Setpoint Over Voltage Phase C

35 -> Unused
36 -> Setpoint Under Voltage Phase A
37 -> Setpoint Under Voltage Phase B
38 -> Setpoint Under Voltage Phase C
39 -> Unused

Event Code Value (continued)

40 -> Setpoint Voltage Unbalance Phase A
41 -> Setpoint Voltage Unbalance Phase B
42 -> Setpoint Voltage Unbalance Phase C
43 -> Unused
44 -> Setpoint Over Amperage Phase A
45 -> Setpoint Over Amperage Phase B
46 -> Setpoint Over Amperage Phase C
47 -> Unused
48 -> Setpoint Amperage Unbalance Phase A
49 -> Setpoint Amperage Unbalance Phase B
50 -> Setpoint Amperage Unbalance Phase C
51 ->
. ->
. -> Reserved for future Setpoint Expansion
. ->
256 ->
257 -> Time Set
258 -> Setup Changed
259 -> Alarms Changed
260 -> Power Up/Reset
261 -> Relay Control
262 -> Cleared Max/Min
263 -> Cleared Hours
264 ->
. ->
. -> Reserved for future expansion
. ->
267 ->
268 -> Factory Clear
269 -> Firmware Revision
270 -> EEPROM Failure
271 -> Frequency Failure
272 -> Power Failure
273 -> Setpoint Failure
274 -> Front Panel Failure
275 -> Propack Failure
276 -> ISR Failure
277 -> Init Failure
278 -> Calc Failure
279 -> Timer Failure
280 -> Status Input Failure
281 -> Status Input #1 - Normal
282 -> Status Input #2 - Normal
283 -> Status Input #3 - Normal
284 -> Status Input #4 - Normal
285 -> Status Input #1 - Active
286 -> Status Input #2 - Active

```
  287 -> Status Input #3 - Active
  288 -> Status Input #4 - Active
  289 ->
   .  -> Unused
32767 ->
```

3.3.1 - FORMAT OF THE 3710 ACM MAX/MIN LOG PACKETS.

These packets are used to extract the max/min log data logged by the model 3710 ACM Power Meter.

i) Read 3710 ACM Max/Min Log without Reset
(Message Type Address 0CXXH). (First 14 Elements).

This packet is issued to a model 3710 ACM Power Meter to retrieve the first 14 elements of the max/min data stored by the meter without resetting the max/min log data.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 01H - "Unprotected Read" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 0CH - high order message type address byte (ADDR), used to request 3710 data.

Byte 11 = E8H = size byte (SIZE) indicating the number of fixed bytes to be read.

Byte 12 = 10H = Data Link Escape (DLE) control byte.
Byte 13 = 03H = End of Text (ETX) delimiter byte.

Byte 14 = BCC ERROR CHECK.

ii) 3710 ACM Response to Read Max/Min Log without Reset.
(First 14 Elements).

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 41H - reply to "Unprotected Read" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9,10 = device type identification. (3710)
Byte 11,12 = current firmware version.

Byte 13,14 = transmitting 3710 ACM address (unit id).
Byte 15,16 = device input voltage mode = 0 for wye.
= 1 for delta.
= 2 for single phase.
= 3 for demo.

The bytes for each of the max/min logs are arranged in the following order:

(4 Bytes) time of maximum. (compressed time format)
(2 Bytes) low order word, maximum value. (0 - 999)
(2 Bytes) high order word, maximum value. X 1000 (0 - 999)
(4 Bytes) time of minimum. (compressed time format)
(2 Bytes) low order word, minimum value. (0 - 999)
(2 Bytes) high order word, minimum value. X 1000 (0 - 999)

16 Bytes for each max/min log.

Byte 241 = 10H = Data Link Escape (DLE) control byte.
Byte 242 = 03H = End of Text (ETX) delimiter byte.

Byte 243 = BCC ERROR CHECK.

iii) Read 3710 ACM Max/Min Log without Reset
(Message Type Address 0DXXH). (Last 7 Elements).

This packet is issued to a model 3710 ACM Power Meter to retrieve the last 7 elements of the max/min data stored by the meter without resetting the max/min log data.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 01H - "Unprotected Read" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 0DH - high order message type address byte (ADDR), used to request 3710 data.

Byte 11 = 78H = size byte (SIZE) indicating the number of fixed bytes to be read.

Byte 12 = 10H = Data Link Escape (DLE) control byte.
Byte 13 = 03H = End of Text (ETX) delimiter byte.

Byte 14 = BCC ERROR CHECK.

iv) 3710 ACM Response to Read Max/Min Log without Reset.
(Last 7 Elements).

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 41H - reply to "Unprotected Read" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9,10 = device type identification. (3710)
Byte 11,12 = current firmware version.

Byte 13,14 = transmitting 3710 ACM address (unit id).
Byte 15,16 = device input voltage mode = 0 for wye.
= 1 for delta.
= 2 for single phase.
= 3 for demo.

The bytes for each of the max/min logs are arranged in the following order:

(4 Bytes) time of maximum. (compressed time format)
(2 Bytes) low order word, maximum value. (0 - 999)
(2 Bytes) high order word, maximum value. X 1000 (0 - 999)
(4 Bytes) time of minimum. (compressed time format)
(2 Bytes) low order word, minimum value. (0 - 999)
(2 Bytes) high order word, minimum value. X 1000 (0 - 999)

16 Bytes for each max/min log.

Byte 129 = 10H = Data Link Escape (DLE) control byte.
Byte 130 = 03H = End of Text (ETX) delimiter byte.

Byte 131 = BCC ERROR CHECK.

Compressed Date Format

Bit Position 15 - 10 09 - 05 04 - 00

A	B	C

A) 6 bits -> Year
B) 5 bits -> Month
C) 5 bits -> Day

Compressed Time Format

Bit Position 31-28 27-22 21-16 15-11 10-06 05-02 01-00

A	B	C	D	E	F	G

A) 4 bits -> Unused
B) 6 bits -> Seconds
C) 6 bits -> Minutes
D) 5 bits -> Hour
E) 5 bits -> Day
F) 4 bits -> Month
G) 2 bits -> Unused

Max/Min Packet Structure

The location of data is dependant on which voltage mode the 3710 ACM Power Meter is operating in.

If the 3710 ACM is operating in **3-WIRE DELTA** mode (Mode 1):

Element #	1st Packet	2nd Packet
01	Volts (L-L) Phase AB	Power Factor
02	Volts (L-L) Phase BC	Amp Demand
03	Volts (L-L) Phase CA	KW Demand
04	Unused	Amperage I4
05	Unused	(Reserved)
06	Unused	Frequency
07	Unused	Vaux
08	Amperage Phase A	
09	Amperage Phase B	
10	Amperage Phase C	
11	Amperage Average	
12	KW Total	
13	KVA Total	
14	KVAR Total	

If operating in **4-WIRE WYE** or **DEMO** mode (Mode 0 or 3):

Element #	1st Packet	2nd Packet
01	Volts (L-N) Phase A	Power Factor
02	Volts (L-N) Phase B	Amp Demand
03	Volts (L-N) Phase C	KW Demand
04	Volts (L-N) Average	Amperage I4
05	Volts (L-L) Phase AB	(Reserved)
06	Volts (L-L) Phase BC	Frequency
07	Volts (L-L) Phase CA	Vaux
08	Amperage Phase A	
09	Amperage Phase B	
10	Amperage Phase C	
11	Amperage Average	
12	KW Total	
13	KVA Total	
14	KVAR Total	

Otherwise if operating in **3-WIRE SINGLE PHASE** mode (Mode 2):

Element #	1st Packet	2nd Packet
01	Volts (L-N) Phase A	Power Factor
02	Volts (L-N) Phase B	Amp Demand
03	Unused	KW Demand
04	Volts (L-N) Average	Amperage I4
05	Volts (L-L) Phase AB	(Reserved)
06	Volts (L-L) Phase BC	Frequency
07	Unused	Vaux
08	Amperage Phase A	
09	Amperage Phase B	
10	Unused	
11	Amperage Average	
12	KW Total	
13	KVA Total	
14	KVAR Total	

v) Read 3710 ACM Max/Min Log with Reset
(Message Type Address 0EXXH). (First 14 Elements).

This packet is issued to a model 3710 ACM Power Meter to retrieve the first 14 elements of the max/min data stored by the meter & then reset the max/min log data.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 01H - "Unprotected Read" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 0EH - high order message type address byte (ADDR), used to request 3710 data.

Byte 11 = E8H = size byte (SIZE) indicating the number of fixed bytes to be read.

Byte 12 = 10H = Data Link Escape (DLE) control byte.
Byte 13 = 03H = End of Text (ETX) delimiter byte.

Byte 14 = BCC ERROR CHECK.

vi) 3710 ACM Response to Read Max/Min Log with Reset (First 14 Elements).

This packet is identical to that of the First Packet 3710 ACM Response to Read Max/Min Log without Reset (Message Type Address 0CXXH).

vii) Read 3710 ACM Max/Min Log with Reset
(Message Type Address 0FXXH). (Last 7 Elements)

This packet is issued to a model 3710 ACM Power Meter to retrieve the last 7 elements of the max/min data stored by the meter & then reset the max/min log data.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 01H - "Unprotected Read" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 0FH - high order message type address byte (ADDR), used to request 3710 data.

Byte 11 = 78H = size byte (SIZE) indicating the number of fixed bytes to be read.

Byte 12 = 10H = Data Link Escape (DLE) control byte.
Byte 13 = 03H = End of Text (ETX) delimiter byte.

Byte 14 = BCC ERROR CHECK.

viii) 3710 ACM Response to Read Max/Min Log with Reset (Last 7 Elements).

This packet is identical to that of the Second Packet 3710 ACM Response to Read Max/Min Log without Reset (Message Type Address 0DXXH).

3.4 - PACKETS USED FOR 3710 ACM CONTROL FUNCTIONS

The following is a list of packets that are required to control functions used by the model 3710 ACM meter. Refer to the 3710 ACM Installation and Operation Manual for additional information on control functions.

3.4.1 - FORMAT OF THE 3710 ACM CLEAR KW HOURS PACKET.

This packet is used to clear the KW HOURS parameter stored by the model 3710 ACM Power Meter.

i) Clear 3710 ACM KW Hour **(Message Type Address 10XXH)**.

This packet is issued to a model 3710 ACM Power Meter to clear the KW Hour reading stored by the meter.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 08H - "Unprotected Write" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 10H - high order message type address byte (ADDR), used to request 3710 data.

Byte 11 = 10H = Data Link Escape (DLE) control byte.
Byte 12 = 03H = End of Text (ETX) delimiter byte.

Byte 13 = BCC ERROR CHECK.

ii) 3710 ACM Response to Clear KW Hour

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 48H - reply to "Unprotected Write" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte 9 = 10H = Data Link Escape (DLE) control byte.
Byte 10 = 03H = End of Text (ETX) delimiter byte.

Byte 11 = BCC ERROR CHECK.

3.4.2 - FORMAT OF THE 3710 ACM CLEAR KVAR HOURS PACKET.

This packet is used to clear the KVAR HOURS parameter stored by the model 3710 ACM Power Meter.

i) Clear 3710 ACM KVAR Hour **(Message Type 11XXH)**.

This packet is issued to a model 3710 ACM Power Meter to clear the KVAR Hour reading stored by the meter.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 08H - "Unprotected Write" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 11H - high order message type address byte (ADDR), used to request 3710 data.

Byte 11 = 10H = Data Link Escape (DLE) control byte.
Byte 12 = 03H = End of Text (ETX) delimiter byte.

Byte 13 = BCC ERROR CHECK.

ii) 3710 ACM Response to Clear KVAR Hour

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 48H - reply to "Unprotected Write" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte 9 = 10H = Data Link Escape (DLE) control byte.
Byte 10 = 03H = End of Text (ETX) delimiter byte.

Byte 11 = BCC ERROR CHECK.

3.4.3 - FORMAT OF THE 3710 ACM CONTROL RELAY PACKET.

This packet is used to control the operations of the 3 relays used by the model 3710 ACM Power Meter.

i) Control 3710 ACM Relays **(Message Type Address 12XXH)**.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 08H - "Unprotected Write" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 12H - high order message type address byte (ADDR), used to request 3710 data.

Byte 11,12 = Relay Number. (1 <= NUM <= 3)
Byte 13,14 = Relay Command.

Byte 15 = 10H = Data Link Escape (DLE) control byte.
Byte 16 = 03H = End of Text (ETX) delimiter byte.

Byte 17 = BCC ERROR CHECK.

Relay Commands

Relay Command = 0 -> Relay returns control back to setpoint control
1 -> Relay is forced operated by the operator
2 -> Relay is forced released by the operator

ii) 3710 ACM Response to Controlling Relays.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 48H - reply to "Unprotected Write" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte 9 = 10H = Data Link Escape (DLE) control byte.
Byte 10 = 03H = End of Text (ETX) delimiter byte.

Byte 11 = BCC ERROR CHECK.

3.4.4 - FORMAT OF THE 3710 ACM CLEAR STATUS #1 COUNTER.

This packet is used to clear the Status #1 (S1) counter stored by the model 3710 ACM Power Meter.

i) Clear 3710 ACM Status #1 Counter **(Message Type 13XXH)**.

This packet is issued to a model 3710 ACM Power Meter to clear the Status #1 counter reading stored by the meter.

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.

Byte 5 = 08H - "Unprotected Write" command byte (CMD) issued by the Allen-Bradley PLC.
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by the Allen-Bradley communication interface.

Byte 9 = XXH - low order message type address byte (ADDR), used to address destination 3710 ACM (unit id).
Byte 10 = 13H - high order message type address byte (ADDR), used to request 3710 data.

Byte 11 = 10H = Data Link Escape (DLE) control byte.
Byte 12 = 03H = End of Text (ETX) delimiter byte.

Byte 13 = BCC ERROR CHECK.

ii) 3710 ACM Response to Clear Status #1 Counter

Byte 1 = 10H = Data Link Escape (DLE) control byte.
Byte 2 = 02H = Start of Text (STX) delimiter byte.

Byte 3 = (DST) - destination address byte of message packet.
Byte 4 = (SRC) - source address byte of message packet.
Byte 5 = 48H - reply to "Unprotected Write" command byte (CMD).
Byte 6 = (STS) - byte to indicate message transmission status.
Byte 7 = (TNS) - low order byte of transaction identifier used by
                  the Allen-Bradley communication interface.
Byte 8 = (TNS) - high order byte of transaction identifier used by
                  the Allen-Bradley communication interface.

Byte 9 = 10H = Data Link Escape (DLE) control byte.
Byte 10 = 03H = End of Text (ETX) delimiter byte.

Byte 11 = BCC ERROR CHECK.

4.0 - LIST OF THE 3710 ACM PACKET COMMAND TYPES

Message Address		Command	Page	Reference
CMD (Hex)	ADDR (Hex)			
01	01XX	Read Setup	17	3.1.1 i
08	01XX	Write Setup	20	3.1.1 iii
01	02XX	Read Time	23	3.1.2 i
08	02XX	Set Time	25	3.1.2 iii
01	03XX	Read Short Real-Time Data	35	3.2.1 i
01	04XX	Read Long Real-Time Data	38	3.2.1 iii
01	05XX	Read Event Log (Events 1 to 18)	49	3.3.1 i
01	06XX	Read Event Log (Events 19 to 36)	52	3.3.1 iii
01	07XX	Read Event Log (Events 37 to 50)	54	3.3.1 v
01	08XX	Read Setpoints (Setpoints 1 to 8)	27	3.1.3 i
01	09XX	Read Setpoints (Setpoints 9 to 17)	29	3.1.3 iii
08	08XX	Write Setpoints (Setpoints 1 to 8)	31	3.1.3 v
08	09XX	Write Setpoints (Setpoints 9 to 17)	33	3.1.3 vii
01	0AXX	Read Status	47	3.2.2 i
01	0BXX	(Reserved for Future Expansion)		
01	0CXX	Read Max/Min Log without Reset (First 14 Elements)	58	3.3.3 i
01	0DXX	Read Max/Min Log without Reset (Last 7 Elements)	60	3.3.3 iii
01	0EXX	Read Max/Min Log with Reset (First 14 Elements)	64	3.3.3 v
01	0FXX	Read Max/Min Log with Reset (Last 7 Elements)	65	3.3.3 vii
08	10XX	Clear KW Hours	66	3.4.1 i
08	11XX	Clear KVAR Hours	68	3.4.2 i
08	12XX	Control Relays	70	3.4.3 i
08	13XX	Clear Status 1 Counter	72	3.4.4 i
XX	14XX	Not Used		
XX	15XX	Not Used		
.	.	.		
.	.	.		
.	.	.		
XX	7FFE	Not Used		

Message Types designated 'Not Used' **may not be used** in modifications of the present communication protocol using the model 3710 ACM Power Meters which communicate with Allen-Bradley PLC / Communication Interface Products.