CONITEL 2020 PROTOCOL EMULATION

1.1 GENERAL DESCRIPTION

This section briefly describes the L&N CONITEL communication protocol for reference purposes only. The appropriate L&N documentation should be consulted for complete details of the CONITEL protocol.

The CONITEL protocol is an asynchronous communications protocol used in many Supervisory Control and Data Acquisition (SCADA) systems. CONITEL Message blocks are composed of 31 bits plus a message synchronization "start bit" at the front of the first message block and an End of Message (EOM) bit at the end of each block. The protocol may be used either in a point-to-point or in a multi-drop configuration. The protocol can be used in either half or full-duplex operation. Communications security is provided by a 5-bit Bose-Chaudhuri cyclic code which is included with each message block.

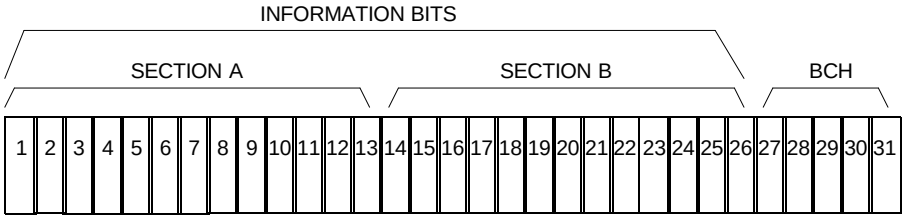
All communications exchanges in CONITEL protocol are initiated by the host. The remote cannot initiate any exchange with the host nor can the remote directly address or communicate with another remote. The remote will return a response to the host for all valid messages sent by the host and addressed to the remote. The only exception to this is in broadcast (all station) messages which produce no response from any remote. Also, all messages received by the remote are validated by checking the BCH code. If the BCH code is not valid, the remote will ignore the message; no action or response will be initiated.

1.2 MESSAGE FORMAT

1.2.1 Message Block

As shown in Figure H-1 the CONITEL message block is divided into three parts. There are two 13-bit sections (called A and B sections) and a 5-bit check digit. One bit in section A and a second bit in section B are reserved for housekeeping purposes. These bits are referred to as the "A" and "B" bits respectively. The remaining bits in each section are used for address, point identification and data

There are two basic types of message blocks; those that contain addresses and those that do not. Address assignments are contained in the first section (section A) of the message block. Section B of a message block can be used for additional control information or data depending on the function.



CONITEL 2020

Figure H-1 Basic Message Block Format

1.2.2 Address Section

The first message block transmitted in either a Master-to-Remote or a Remote-to-Master transmission always contains address information in message Section A. Subsequent blocks (if any) have data inserted in section A in place of the address information. Figure H-2 details the address and modifier sections of a CONITEL message. The address section is divided into three four-bit parts. They are called the Function Code, the Station Address and the Group Address. A unique Station Address will be assigned to each remote station on a communication line. There are four bits

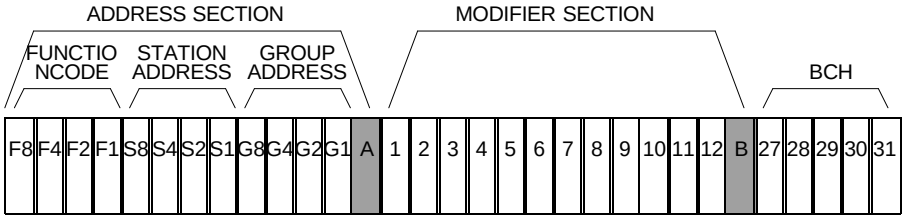


Figure H-2 Master/Remote Message Format

available for encoding the station address, thus up to 15 stations can be connected on each single line. Station Address 0 is reserved for broadcast functions. The next four bits are used for encoding the function code. Figure H-3 details the function code assignments as implemented by the Comm-Troller. The remaining bits in the address section are used to define a "Group". The group number specifies a specific set of points which are to be accessed by the command. All 16 possible group addresses can be used with any function code. The assignment of points to a specific group is user definable when the Comm-Troller configuration table is entered in the PLC. See Section 1.5.2 of this appendix for additional details. The final bit in the address section is the "A" bit. The A bit will always be 0 if section A contains address information. The "A" bit will be set to 1 if section A contains data information.

Function Code	Description	Implemented
0000	Scan	Y
0001	Execute	Y
0010	Trip (check-Before-Operate)	Y
0011	Set point A	Y
0100	Close (check-Before-Operate	Y
0101	Set Point B	Y
0110	Unassigned	N
0111	Unassigned	N
1000	Reset	Y
1001	Master Station request	N
1010	New SOE Events	N
1011	Repeat SOE Events	N
1100	Unassigned	N
1101	Unit Raise/Lower	Y
1110	Freeze and Scan Accumulators	Y
1111	Freeze and Scan Accumulators with reset	Y

Figure H-3 CONITEL Function Codes

1.2.3 Modifier Section

The B section of a Master-to-Remote transmission may be used to send additional information to the remote. When used in this way, the B section is called a "Modifier Section". The modifier is used to select a particular relay output (1 of 12) for Trip an Close functions, the binary value for 1 set point for Setpoint functions or Raise/Lower Control for 3 units.

In Remote-to-Master transmissions the B section is used to transmit data. The "B" bit is always 0 in all transmissions from Master-to-Remote and Remote-to-Master.

1.2.4 BCH Error Check

The remaining 5 bits in all message blocks are used as an error check to insure that the preceding 26 bits have been received error free. The check code is generated with the polynomial $X^5+X^2+X^0$. The MSB of the check code is transmitted as bit 27 of each block.

1.3 MESSAGE TRANSACTIONS

Messages consist of one or more blocks transmitted serially one after the other. Master-to-Remote message are always a single block. Remote-to-Master messages consist of one or more blocks. Section A of the first block of each message contains address information as detailed above. Section B of the first block can contain either a modifier field or the first section of data. Additional blocks will contain the remainder of the data.

1.3.1 Message Synchronization

All communications are initiated by the master station. The remote is quiescent until a message is received from the master. Since no clock information is included with the data transmission a method for synchronizing the receiver must be used. Prior to transmission of the first block in either direction, a "pre-transmission" "**mark**" is transmitted. The pre-transmission time is adjustable by the user by setting a value for it in the Comm-Troller configuration table. The pre-transmission initializes the modems and enables the receiver to look for the start of data. Following the pre-transmission mark a "**space**" is transmitted for a single bit time. The transition from mark to space is used to synchronize the receiver so that the remaining bits can be clocked in. This method is similar to the byte synchronization method used with standard asynchronous serial data. The CONITEL protocol however sends the remaining bits of the message with no further synchronization bits.

1.3.2 End of Message (EOM) Bit

The last bit in each block is the End of Message (EOM) bit. The EOM bit will be a 1 if it is the last bit in the last block. The EOM bit will be a 0 if it is the last bit in a block and more data will be sent.

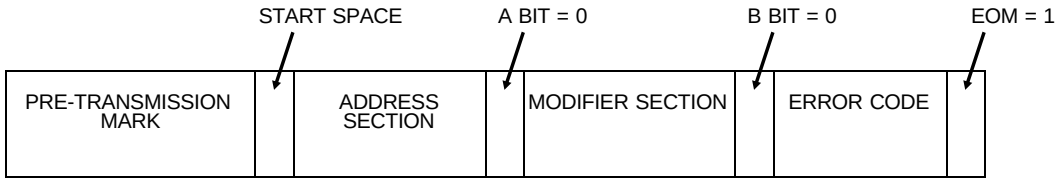


Figure H-4 Typical Master-to-Remote Message

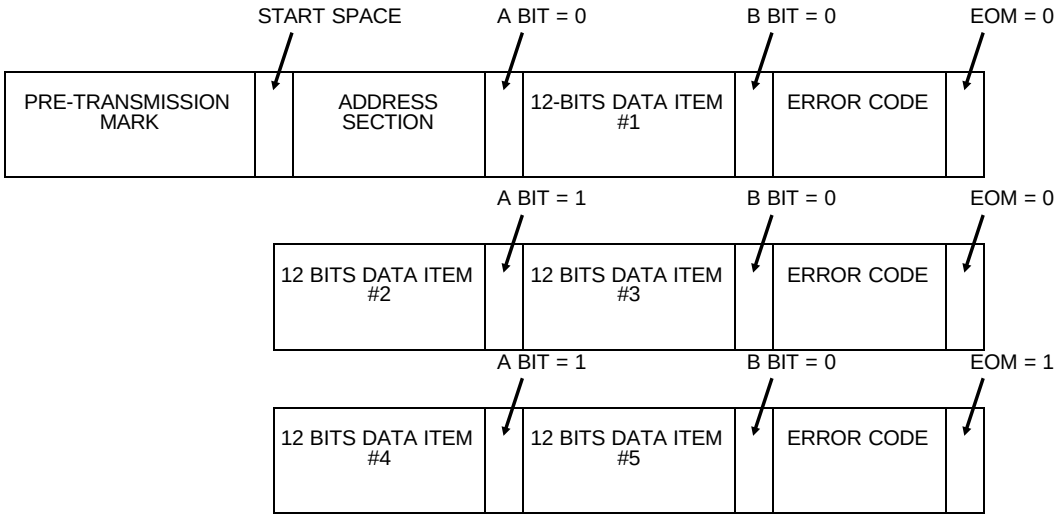


Figure H-5 Typical Remote-to-Master Message (3 blocks)

1.4 Message Types

CONITEL protocol communications exchanges can be divided into two types: data requests and control requests. In data requests, (SCANs in CONITEL parlance) the host transmits a message requesting data values from the remote. The remote responds by transmitting the requested data values. The data values returned may be of any type such as discrete (status), analog, accumulator, calculated variables, remote parameters, RTU status, analog outputs or discrete outputs. The number of data items returned and the type of data that each item represents depends on the GROUP number included in the data request. Points are assigned to a specific group using the Comm-Troller configuration table. The format of the data types are as required by the host. Some variations may exist from site to site provided the host and remote are consistent in the data format (e.g. if the host expects BCD accumulator values, the remote must transmit BCD accumulator values). Note that the Comm-Troller does not do any processing on the data collected from the PLC. The PLC ladder logic must perform any data formatting that is required prior to placing the information in the data area which is read by the Comm-Troller.

Control requests are defined as any message from the host requesting the remote to change the state of a field device or to change or modify an internal condition of the remote. Control requests may be either direct such as in the Unit Raise/Lower command or Check-before-operate for Setpoint, Trip and Close functions.

1.5 CONITEL CONFIGURATION TABLE

All setup and operation information that the Comm-Troller requires for operation is obtained from the "Configuration Table". The configuration table is an area of memory in the PLC that is initialized by the PLC programmer using standard programming tools. The Comm-Troller automatically reads this table whenever power is first applied. Once the table has been read into the Comm-Troller memory normal operation begins. The Comm-Troller continuously reads data from the PLC(s) that may be required by the CONITEL host. The data read is placed in a dual ported memory bank that is accessible by the CONITEL emulation microprocessor. When a request for information is received it is answered using data already present in the dual-ported memory. Control commands received from the host are first validated and if correct a message is sent to the PLC to perform the desired control action. The configuration table consists of a header and from one to eight data sections as defined below. The header contains general type information such as the Station Address, communications baud rate, control de-select time out, pre-transmission mark time and other data as defined is section 1.5.1 on the following page. A data section is defined for each block of data to be read from a PLC. Each data section contains the data highway address of the PLC where the data is as well as the number of items and starting address for each group. Group data can be collected from several PLC's.

1.5.1 CONITEL Configuration Header

The Comm-Troller interprets the configuration header as a string of bytes. Each byte is used to specify a certain option as defined in the table below. The Allen-Bradley PLC uses words (2 bytes) as storage. The Comm-Troller numbers bytes starting with the first word hi-order (left hand) 8 bits as byte #0. Byte #1 is the low-order (right hand) 8 bits of the word. Byte 2 is the hi byte of the next word, byte 3 is the low byte and so on up to the end. When entering data into the configuration table it is usually most convenient to display and enter the number using hexadecimal notation. When using hexadecimal notation each word is represented by 4 hex characters. The left 2 define the hi byte and the right 2 the low byte. The figure below defines both the PLC word and the Comm-Troller byte number for the configuration header.

WORD 0 HI Byte #0 in the configuration header is used to define the Station Address to which the Comm-Troller will respond when communicating with the host. This entry is a two digit hex number in the range of 01 to $0F_H$.

WORD 0 LOW Byte #1 is used to define the number of configuration data sections that are to be read. This entry is a 2 digit hex number in the range of 01 to 08.

Word	Byte #	Function
0	0,1	RTU Number; Number of Data Tables to read
1	2,3	Reserved-set to 0000_H
2	4,5	Baud rate; Reserved
3	6,7	Reserved; Control de-select time HI
4	8,9	Control de-select time LOW; Reserved
5	10,11	Reserved-set to 0000_H
6	12,13	Reserved-set to 0000_H
7	14,15	Reserved; PLC Swap Enable
8	16,17	RTS/CTS Delay
9	18,19	Reserved; Dual Modem Enable (01_H=enable)
10	20,21	Pre-transmission MARK duration
11-24	22-49	Spare-set to 0000_H

Figure C-6 Configuration Header

WORD 1 HI, LOW Bytes #2 and 3 are reserved for use as a Radio Delay Timer. The current implementation of the CONITEL protocol in the Comm-Troller ignores these bytes.

WORD 2 HI Byte #4 is used to define the baud rate which will be used while communicating with the host. This entry is a hex coded number. Valid selections are: 300 baud =04_H, 600 baud =05_H, 1200 baud =06_H, 2400 baud =08_H, 4800 baud =09_H and 9600 baud =$0B_H$.

WORD 2 LOW Byte #5 is reserved for future use. Set to 00_H.

WORD 3 HI Byte #6 is reserved for future use. Set to 00_H.

Word 3 LOW and WORD 4 HI Bytes #7 and 8 are used to define a "control de-select time". The control de-select time is used to further validate a check-before-execute type command. A timer is started whenever a check-before-operate control command is received. If an Execute command is not received within the time-out period, the pending control will be aborted.

WORD 4 LOW Byte #9 is reserved for future use. set to 00_H.

WORDS 5 and 6 Bytes 10 thru 13 are reserved for future use. Set to zero.

WORD 7 HI BYTE #14 is reserved for future use. Set to 00H

WORD 7 LOW Byte #15 is the PLC "SWAP" enable flag. If this byte is non-zero any failure detected by the Comm-Troller while communicating with the PLC will result in an automatic switch-over to a backup PLC. The backup PLC must have exactly the same configuration information as the primary PLC. The backup PLC address must be the address of the main PLC plus 1. If the backup PLC subsequently fails the Comm-Troller will attempt to switch back to the primary unit. If this byte is zero then a switch will not be attempted.

WORD 8 HI, LOW Bytes #16 and 17 are used to define the RTS/CTS delay time used by the Comm-Troller. The delay is started when a message is ready to be transmitted. At this time the RTS line is activated. If a modem is connected it will enable its transmitter and place a constant MARK tone on the line. At the end of the RTS/CTS delay time the Comm-Troller will send the start space followed by data blocks as required. Since the receiving device uses the pre-transmission MARK followed by a start space for message

synchronization it is important to set the RTS/CTS delay correctly. The RTS/CTS delay should be set slightly longer than the pre-transmission MARK time to insure that a valid pre-transmission mark will be seen by the receiver. The delay time will be equal to the count in word 8 (use decimal display of the data if desired) times 6.313 microseconds. For instance, if a pre-transmission MARK of 40 msec. is required set the RTS/CTS time to $18C0_H$ (6336 Decimal).

8.5msec (modem on time)+
40msec (pre-transmission MARK)+
5msec (extra time to allow detection at receiver)
= 53.5msec = 53,500 usec = $211A_H$

WORD 9 HI Byte #18 is reserved for future use. Set to 00H.

WORD 9 LOW Byte #19 is used to enable the MARC Dual/Redundant Modem. Set to 00_H for normal modem operation; set to 01_H for redundant operation.

WORD 10 HI, LOW Bytes #20 and 21 are used to define the pre-transmission MARK time that will be used by the Comm-Troller to validate a start of message. The pre-transmission MARK time used will be equal to the count contained in word 10 times 6.313 microseconds. The count is started when Carrier Detect input from the modem goes true. If the received data line remains in a constant MARK condition for the duration of the delay time specified in word 10 the start bit detection circuitry will be enabled to look for the start space. If the received data ever goes to a SPACE condition before the timer expires the delay timer will be restarted

WORDS 11 thru 25 HI, LOW Bytes #22 thru 49 are not used in this implementation of the Comm-Troller. Set all words to 0000_H.

1.5.2 PLC Data Configuration for CONITEL Protocol

The PLC Data Configuration section(s) are each 81 bytes long. There is one section for each block of data to be read from the PLC or PLCs connected to the Comm-Troller. Each data section can specify a unique PLC address. Multiple reads from a single PLC can be accomplished by using the hi two bits in the PLC address as detailed below. The number of PLCs and thus the number of configuration sections to read is defined by byte #1 in the header section of the configuration table. Up to eight (8) data configuration sections can be defined.

The Comm-Troller interprets the configuration data sections as a string of bytes just like the header section. Each byte is used to specify a certain option as defined in the table below. The Allen-Bradley PLC uses words (2 bytes) as storage. The Comm-Troller numbers bytes starting with the first word hi-order (left hand) 8 bits as byte #0. BYte #1 is the low-order (right hand) 8 bits of the word. Byte 2 is the hi byte of the next word, byte 3 is the low byte and so on up to the end. When entering data into the configuration table it is usually most convenient to display and enter the number using hexadecimal notation. When using hexadecimal notation each word is represented by 4 hex characters. The left 2 define the hi byte and the right 2 the low byte. The figure below defines both the PLC word and the Comm-Troller byte number for a typical data section. The data section must start at the next address following the end of the header.

Data sections are read in pairs. Up to 4 pairs (8 data sections) can be defined. The amount of data that can be defined in a single table cannot exceed 244 bytes because this is the maximum length of an Allen-Bradley read command. Also the comm-Troller limits the total number of items that can be assigned to any Group to a maximum of 32 items.

WORD 0 HI Byte #0 is used to define the address of the PLC on the Data Highway that contains the data to be accessed. Valid addresses are 01_H thru $7F_H$. Allen-Bradley uses OCTAL notation to define PLC addresses. Therefore it is necessary to convert the octal highway address to a hexadecimal equivalent before entering it in the table. For instance if the highway address is 12_8 then set byte 0 to $0A_{H.}$ (12 octal = 10 decimal = A hex.)

WORD 0 LOW, WORD 1 HI, LOW and WORD 2 HI Bytes #1 thru 4 are used to define a size, item count and starting address for data that will be reported with Group 0 in the CONITEL data request. The size field (Byte #1) is always 2 (2 bytes) for the CONITEL protocol emulation. Only the lower 12 bits will be transmitted to the host computer. The upper 4 bits are not used. Byte #2 is used to specify the number of items to add to the **GROUP 0** list. Data that will be reported from **GROUP 0** can originate in several different locations (PLCs). The number of data items reported for **GROUP 0** will be the total number of items specified in all the table entries. Bytes #3 and 4 are used to specify the **HEXADECIMAL BYTE ADDRESS** of the first data item. The hex byte address must be computed depending on the type of PLC that is being accessed. For instance if a **PLC-2** is accessed the

memory is addressed in **OCTAL WORDS**. If a **PLC-5** is used the data is addressed in **DECIMAL WORDS** within the file. I**n either case the address must be converted to a HEX BYTE ADDRESS for entry in the table.**

WORD 2 LOW, WORD 3 HI, LOW and WORD 4 HI Bytes #5 thru 8 are used to define a size, item count and starting address for data that will be reported with **GROUP 1** requests. The size, count and starting address are defined as explained above for group 0 data with **one very important exception**. In order to speed the access time, the Comm-Troller must read all the data from a PLC using a single read command. The Group 1 data must therefore immediately follow the last word of data defined for group 0 (the data area is a contiguous block of memory).

WORD 4 LOW, WORD 5 HI, LOW and WORD 6 HI Bytes #9 thru 12 are used to define a size, item count and starting address for data that will be reported with **GROUP 2** requests. It must be contiguous with Group 1 data.

WORD 6 LOW, WORD 7 HI, LOW and WORD 8 HI Bytes #13 thru 16 are used to define a size, item count and starting address for data that will be reported with **GROUP 3** requests. It must be contiguous with Group 2 data

WORD 8 LOW, WORD 9 HI, LOW and WORD 10 HI Bytes #17 thru 20 are used to define a size, item count and starting address for data that will be reported with **GROUP 4** requests. It must be contiguous with Group 3 data.

WORD 10 LOW, WORD 11 HI, LOW and WORD 12 HI Bytes #21 thru 24 are used to define a size, item count and starting address for data that will be reported with **GROUP 5** requests. It must be contiguous with Group 4 data.

WORD 12 LOW, WORD 13 HI, LOW and WORD 14 HI Bytes #25 thru 28 are used to define a size, item count and starting address for data that will be reported with **GROUP 6** requests. It must be contiguous with Group 5 data.

WORD 14 LOW, WORD 15 HI, LOW and WORD 16 HI Bytes #29 thru 32 are used to define a size, item count and starting address for data that will be reported with **GROUP 7** requests. It must be contiguous with Group 6 data.

WORD 16 LOW, WORD 17 HI, LOW and WORD 18 HI Bytes #33 thru 36 are used to define a size, item count and starting address for data that will be reported with **GROUP 8** requests. It must be contiguous with Group 7 data.

WORD 18 LOW, WORD 19 HI, LOW and WORD 20 HI Bytes #37 thru 40 are used to define a size, item count and starting address for data that will be reported with **GROUP 9** requests. It must be contiguous with Group 8 data.

WORD 20 LOW, WORD 21 HI, LOW and WORD 22 HI Bytes #41 thru 44 are used to define a size, item count and starting address for data that will be reported with **GROUP A** requests. It must be contiguous with Group 9 data.

WORD 22 LOW, WORD 23 HI, LOW and WORD 24 HI Bytes #45 thru 48 are used to define a size, item count and starting address for data that will be reported with **GROUP B** requests. It must be contiguous with Group A data.

WORD 24 LOW, WORD 25 HI, LOW and WORD 26 HI Bytes #49 thru 52 are used to define a size, item count and starting address for data that will be reported with **GROUP C** requests. It must be contiguous with Group B data.

WORD 26 LOW, WORD 27 HI, LOW and WORD 28 HI Bytes #53 thru 56 are used to define a size, item count and starting address for data that will be reported with **GROUP D** requests. It must be contiguous with Group C data.

WORD 28 LOW, WORD 29 HI, LOW and WORD 30 HI Bytes #57 thru 60 are used to define a size, item count and starting address for data that will be reported with **GROUP E** requests. It must be contiguous with Group D data.

WORD 30 LOW, WORD 31 HI, LOW and WORD 32 HI Bytes #61 thru 64 are used to define a size, item count and starting address for data that will be reported with **GROUP F** requests. It must be contiguous with Group E data.

WORD 32 LOW, WORD 33 HI, LOW and WORD 34 HI Bytes #65 thru 68 are used to define a size, item count and starting address for a data area that will be used for control outputs (TRIP and CLOSE functions). The size field must be set to 2 and the item count to 32 (20_H). The first

16 words are used for the "trip" commands, the next 16 for the "close" commands. When a TRIP or a CLOSE function is received from the host the appropriate bit will be activated for a short time. The data area specified must be contiguous with Group F data. Figure H-7 defines the bit assignments for the TRIP and CLOSE functions.

Word	Function
0-15	TRIP Bits
16-31	CLOSE Bits

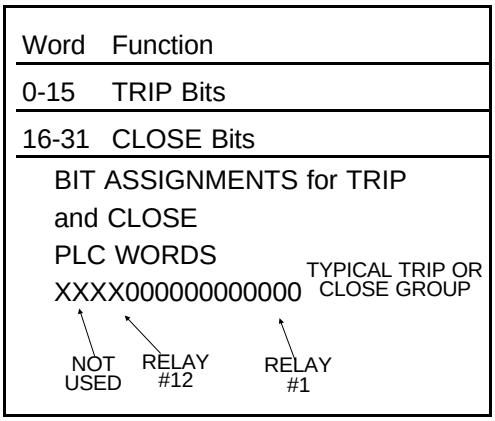


Figure H-7 TRIP and CLOSE Bit Numbering

WORD 34 LOW, WORD 35 HI, LOW and WORD 36 HI Bytes #69 thru 72 are used to define a size, item count and starting address for a data area that will be used for setpoint outputs (SETPOINT A and SETPOINT B functions). The size field must be set to 2. The first 16 words are assigned to SETPOINT A addresses. The next 16 are assigned to SETPOINT B addresses. When a SETPOINT A or B command is received the appropriate PLC word will be set to the value defined in the modifier field of the command. This data area must be contiguous with the TRIP/CLOSE data area.

WORD 36 LOW, WORD 37 HI, LOW AND WORD 38 HI Bytes #73 thru 76 are used to define a size, item count and starting address for a data area that will be used for the Unit Raise/Lower function. The size field must be set to 2. The PLC word defined by the Group number in the address section of the command will be loaded with the modifier data when a Unit Raise/Lower command is received. PLC ladder logic must be used to interpret the bits in the modifier field and take appropriate action.

WORD 38 LOW, WORD 39 HI, LOW AND WORD 40 HI Bytes #77 thru 80 are used to define a size, item count and starting address for a data area that will be used for the FREEZE and FREEZE with RESET function codes. The size field must be set to 2 and the item count field set to 1 for this data type. The single word defined will be used to control the accumulator freeze and reset commands. The Comm-Troller will set bit 0 of the word if an accumulator freeze command is received.

Bit 1 will also be set if a freeze with reset command is received. The PLC ladder logic must use bit 0 to move the current contents of the accumulator words to the appropriate words used for reporting them. In addition if bit 1 is set the counter words should be reset.

Word	BYTE	DESCRIPTION
0	0,1	PLC Addx.; Size=02
1	02,03	#Items Gp 0; Addx HI Gp 0
2	04,05	Addx LOW Gp 0; Size =02
3	06,07	#Items Gp 1; Addx HI Gp 1
4	08,09	Addx LOW Gp 1; Size = 02
5	10,11	#Items Gp 2; Addx HI Gp 2
6	12,13	Addx LOW Gp 2; Size =02
7	14,15	#Items Gp 3; Addx HI GP. 3
8	16,17	Addx LOW Gp 3; Size =02
9	18,19	#Items Gp 4; Addx HI GP. 4
10	20,21	Addx LOW Gp 4; Size = 02
11	22,23	#Items Gp 5; Addx HI GP. 5
12	24,25	Addx LOW Gp 5; Size = 02
13	26,27	#Items Gp 6; Addx HI GP. 6
14	28,29	Addx LOW Gp 6; Size = 02
15	30,31	#Items Gp 7; Addx HI GP. 7
16	32,33	Addx LOW Gp 7; Size = 02
17	34,35	#Items Gp 8; Addx HI GP. 8
18	36,37	Addx LOW Gp 8; Size = 02
19	38,39	#Items Gp 9; Addx HI GP. 9
20	40,41	Addx LOW Gp 9; Size = 02

Word	BYTE	DESCRIPTION
21	42,43	#Items Gp A; Addx HI Gp A
22	44,45	Addx LOW Gp A; Size =02
23	46,47	#Items Gp B; Addx HI Gp B
24	48,49	Addx LOW Gp B; Size = 02
25	50,51	#Items Gp C; Addx HI Gp C
26	52,53	Addx LOW Gp C; Size =02
27	54,55	#Items Gp D; Addx HI Gp D
28	56,57	Addx LOW Gp D; Size =02
29	58,59	#Items Gp E; Addx HI Gp E
30	60,61	Addx LOW Gp E; Size = 02
31	62,63	#Items Gp F; Addx HI Gp F
32	64,65	Addx LOW Gp F; Size = 02
33	66,67	#Items TRIP/CLS; Addx HI T/C
34	68,69	Addx LOW T/C; Size = 02
35	70,71	#Items SETPOINT; Addx HI SP
36	72,73	Addx LOW SP; Size = 02
37	74,75	#Items RAISE/LWR; Addx HI R/L
38	76,77	Addx LOW R/L; Size = 02
39	78,79	#Items=01; Addx HI ACCUM. CTL.
40	80,81	Addx LOW ACCUM; Next Table Star

Figure C-8 PLC Data Section Config. Figure C-9 PLC Data Section Config.

1.8 EXAMPLE CONFIGURATION FILE

The following figures detail a sample configuration file for a typical CONITEL protocol application. The configuration information is based on the following information:

Protocol	CONITEL 2020, Station Address=C
PLC Type	PLC-5/15
Comm. Data	Leased Line, 1200 baud
Num. of PLCs	One
Group 0	5 Words
Group 1	2 Words
Group 2 thru 14	Not Used
Group 15	16 Words
Desired location of configuration table at word 0000_{10}	
Desired starting location of data at word 200_{10}	
Desired location for Config. Table address pointer 128_{10}	
Interface module address is 11_8	
PLC Highway Address is 01_8	

Figure C-10 Example System Info.

1.8.1 Comm-Troller Switch Settings

The data highway address and the start address of the configuration table is selected by three (3) switches on the Comm-Troller. The left most switch is used to specify the highway address of the PLC that has the configuration table. The location of the word which points to the start of the configuration table must then be specified by setting the remaining two (2) address selection switches. For this example the switch selections are:

Pointer Address= 128_{10} (decimal word address)
= 256_{10} (decimal byte address)
= 0100_H (hex byte address)

Set Comm-Troller switches to 110 (First switch is PLC address, next two specify address of pointer word with least significant digit =0 implied)

1.8.2 Example Table Entries

Word	HEX Value
N9:128	0000 (config. table pointer)
N9:0000	0C01
N9:0001	0000
N9:0002	0600
N9:0003	0007
N9:0004	D000
N9:0005	0000
N9:0006	0000
N9:0007	0000
N9:0008	0C60
N9:0009	0000
N9:0010	0C60
N9:0011-0024	0000 (NOT USED SET TO 0000)
N9:0025	0A02
N9:0026	0501
N9:0027	9002
N9:0028	0201
N9:0029	9A00
N9:0030-54	0000 (NOT USED)
N9:0055	0002
N9:0056	1001
N9:0057	9E02
N9:0058	2001
N9:0059	BE02
N9:0060	2001
N9:0061	FE02
N9:0062	1002
N9:0063	3E02
N9:0064	0102
N9:0065	5E00

CONITEL 2020 PROTOCOL EMULATION

J2	1-2	J10	NOT USED
J3	NOT USED	J11	1-2
J4	NOT USED	J12	1-2
J5	NOT USED	J13	NOT USED
J6	1-2	J14	NOT USED
J7	1-2	J15	1-2
J8	NOT USED	J16	NOT USED
J9	NOT USED	J17	NOT USED

CONITEL Protocol

U13 = #180-001-0

U16 = #180-002-0

CONITEL PROTOCOL PORT IS P3 (bottom port)
PLC COMMUNICATIONS PORT is P2 (middle port)
PORT P1 is not used

Figure C-11 Jumper Option Selections