GUIDANT

Electronic Blending Controller

Smith Meter® miniBlend.net™

Communications

Issue/Rev. 0.0 (3/11)

Bulletin MNMB004

miniBlend.net

Caution

The default or operating values used in this manual and in the program of the miniBlend.net are for factory testing only and should not be construed as default or operating values for your metering system. Each metering system is unique and each program parameter must be reviewed and programmed for that specific metering system application.

Disclaimer

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Proprietary Notice

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Overview

Incorporated within the Smith Meter® miniBlend.net product family devices is the ability to directly (i.e. without a modem or multiplexer) communicate with an EIA RS 232C and/or an EIA RS485 compatible remote terminal or mini-computer. Depending on the communication type, certain key information from up to sixteen miniBlend.net devices can be requested (polled).

The protocol used for the serial packet format will be the same as that used in the AccuLoad and microLoad.net series of products, that protocol commonly known as the 'Smith' protocol.

The miniBlend.net will also incorporate a Local Storage mode option which will result in non-volatile retention of report data for a number of transactions which could be retrieved at a later time. The miniBlend.net will provide a full range of communications commands for use in requesting status and retrieving both current and historical batch data.

Terminal Mode: '*'A1A2C1C2<SP>[ARGS]<CR><LF>

Minicomputer Mode: <STX>A1A2C1C2<SP>[ARGS]<ETX><LRC><PAD>

Where A1 and A2 are any of the ASCII digits '0' through '9' which taken together represent the address of the miniBlend.net;

C1 and C2 are uppercase alphabetical characters (A-Z) together which form the 'command code' specifying the action to be taken;

[args] represents any additional required information sent with the command;

<CR> is the ASCII Carriage Return character (value 0x13);

<LF> is the ASCII Line Feed character (value 0x10);

<STX> is the ASCII Start Of Text character (value 0x02);

<ETX> is the ASCII End Of Text character (value 0x03);

<PAD> is the ASCII PAD character (value 0x7F); and

<LRC> is a character representing the result of a longitudinal redundancy check calculation (XOR of all characters) performed over the previous portion of the packet, starting after the STX, up to and including the ETX character.

The following page lists the available two-character mnemonic command codes that will be implemented in the initial release of the miniBlend.net; that is followed by a section containing a detailed description of each command and associated response.

For Serial Port Communications:

System Program Codes 701 - 718			
Port 1	**Port 2**	**Port 3**	
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702	708	714	Baud
703	709	715	Data/Parity
704	710	716	Control
705	711	717	Time-out
706	712	718	Mode (RS232/485)

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Serial Communications

Samuel F.B. Morse's dot-dash telegraph code is the earliest example of a practical, time sequential, data-coding scheme for transmission of information by communication equipment. This code is considered the predecessor of the ones and zeros modern digital communication codes now used for serial data transmission of time sequenced information over a pair of wires.

Similar to Morse Code, digital codes provide a means of representing numbers, letters of the alphabet, or other special characters in a digital information system. A digital code is a pattern of binary digits or bits, zeros and ones arranged in a particular fashion. The most familiar code used for arithmetic computations in digital systems is the Binary Coded Decimal, commonly known as BCD code. The BCD code is a weighted code in that a numerical weight is assigned to each bit position in the code. Using a four-bit BCD code for an example, the left-most bit has a numeric weighted value of 8, the next bit has a numeric weighted value of 4, the next to the last bit a weight value of 2 and the last bit, a value of 1. The total value of the coded number is equal to the sum of the numerical weights of the bits represented by the binary digit 1. Four-bit BCD codes are valid only for numbers between 0 and 9. For example, the number 3 is represented by a BCD code of "0011," and the number 9 is "1001." To represent 39, the respective BCD code is "0011 1001."

There are many different codes used to perform specific tasks in digital systems, but the one code most widely used in digital communications systems is the American Standard Code for Information Interchange, or simply ASCII code. Like other binary codes, the ASCII code is a weighted code.

The ASCII code is a more complex code than BCD since it uses patterns of seven bits to represent 128 characters consisting of either upper or lowercase letters of the alphabet, punctuation characters, and control characters in addition to numbers. For example, the ASCII code representation of the number 39 is "0110011 0111001." A complete ASCII code character table is shown in *Table 1*.

ASCII Code Table

ASCII CHARACTER	DECIMAL	HEX	BINARY
NUL	0	0	000 0000
STX	2	2	000 0010
ETX	3	3	000 0011
LF	10	A	000 1010
CR	13	D	000 1101
SP	32	20	010 0000
!	33	21	010 0001
"	34	22	010 0010
#	35	23	010 0011
$	36	24	010 0100
%	37	25	010 0101
&	38	26	010 0110
'	39	27	010 0111
(	40	28	010 1000
)	41	29	010 1001
*	42	2A	010 1010
+	43	2B	010 1011
,	44	2C	010 1100
-	45	2D	010 1101
.	46	2E	010 1110
/	47	2F	010 1111
0	48	30	011 0000
1	49	31	011 0001
2	50	32	011 0010
3	51	33	011 0011
4	52	34	011 0100
5	53	35	011 0101
6	54	36	011 0110
7	55	37	011 0111
8	56	38	011 1000
9	57	39	011 1001
:	58	3A	011 1010
;	59	3B	011 1011
<	60	3C	011 1100
=	61	3D	011 1101
>	62	3E	011 1110

ASCII CHARACTER	DECIMAL	HEX	BINARY
?	63	3F	011 1111
@	64	40	100 0000
A	65	41	100 0001
B	66	42	100 0010
C	67	43	100 0011
D	68	44	100 0100
E	69	45	100 0101
F	70	46	100 0110
G	71	47	100 0111
H	72	48	100 1000
I	73	49	100 1001
J	74	4A	100 1010
K	75	4B	100 1011
L	76	4C	100 1100
M	77	4D	100 1101
N	78	4E	100 1110
O	79	4F	100 1111
P	80	50	101 0000
Q	81	51	101 0001
R	82	52	101 0010
S	83	53	101 0011
T	84	54	101 0100
U	85	55	101 0101
V	86	56	101 0110
W	87	57	101 0111
X	88	58	101 1000
Y	89	59	101 1001
Z	90	5A	101 1010
[	91	5B	101 1011
\	92	5C	101 1100
^	94	5E	101 1101
_	95	5F	101 1111
`	96	60	110 0000
A	97	61	110 0001
B	98	62	110 0010
C	99	63	110 0011
D	100	64	110 0100
E	101	65	110 0101

ASCII CHARACTER	DECIMAL	HEX	BINARY
F	102	66	110 0110
G	103	67	110 0111
H	104	68	110 1000
I	105	69	110 1001
J	106	6A	110 1010
K	107	6B	110 1011
L	108	6C	110 1100
M	109	6D	110 1101
N	110	6E	110 1110
O	111	6F	110 1111
P	112	70	111 0000
Q	113	71	111 0001
R	114	72	111 0010
S	115	73	111 0011
T	116	74	111 0100
U	117	75	111 0101
V	118	76	111 0110
W	119	77	111 0111
X	120	78	111 1000
Y	121	79	111 1001
Z	122	7A	111 1010
{	123	7B	111 1011
	124	7C	111 1100
}	125	7D	111 1101
•	126	7E	111 1110
DEL	127	7F	111 1111

Table 1

A computer system always requires some digital data transmission between its various parts: CPU to peripherals, CPU to memory, or memory to peripherals. Data transmission to and from these devices must conform to some accepted standard. To date, the only widely used transmission standards deal with serial digital data. There are essentially three organizations that issue standards that define serial digital communication interface circuits, their electrical and timing characteristics, the manner in which they operate, and the mechanical details of the appropriate connectors. These organizations are the Electronics Industries Association (EIA), the International Consultative Committee for Telephony and Telegraphy (CCITT), and the International Standards Organization (ISO).

EIA Standard, EIA 232 (formerly known as RS 232) is the most popular serial interface standard. This standard is extensively used by terminals, data sets, measuring instruments, and controllers for data transmission rates up to 20,000 bits per seconds for transmission cables up to 50 feet in length. EIA 232 is a single-ended voltage mode transmission system standard that defines data communication between equipment using alternating pulses which can be in one of two states – either high (logic 1) or low (logical 0). These states are often called “mark” (logic 1) or “space” (logic 0). According to EIA, the logical 1 level must be within +3.75 to +25 volts DC, while the logical 0 level must be within 3.75 to 25 volts DC. Any other voltage levels are unacceptable according to EIA standards.

EIA 232 is not the only serial interface standard or system. EIA 422, 485 and 20mA current loop are among the newer long-distance current mode digital communication standards. The current mode standards are better suited for longer distance, higher speed communications than its voltage mode predecessors. Although not a revolutionary concept, the current mode system dates back to the oldest form of binary serial transmission: the telegraph. In this system a current, usually 20mA, flows through a single loop to represent a logic level one, and turns off, “open key” to represent logic zero.

Serial data is typically transmitted among or between devices in an asynchronous fashion. In asynchronous data transmission, each transmitted character is formed by using a start bit which signals the beginning of the character before the ASCII code pattern, and one or two stop bits after the code pattern signaling the end of the character. The ASCII character is described fully by seven bits with an optional parity bit in the eighth position for error control. Therefore each transmitted ASCII character requires at least ten bits for complete definition. As the communication equipment receives the asynchronously transmitted characters, the start and stop bits are stripped off, parity is checked, and the character itself is interpreted and treated according to whether it is alphanumeric data or control information.

“Baud rate” and “bit rate” are two distinct terms used to describe the speed of data transmission. These terms are often used synonymously and cause much confusion if not completely understood. The baud is a measurement unit dating back to the days of Morse Code, and it is defined as the shortest signaling element. In modern telecommunications language, the data rate is more often specified in bits per second (bps), because a single change of state in a signal can represent a group of two or more data bits. If each signal event represents only one bit condition, baud rate equals bps. Typical asynchronous serial baud rates are 1200, 2400, 4800, 9600, 19200, and 38400 bps. To have an interactive session between two computing devices, both of the devices must be transmitting and receiving at the same baud rate, or there must be an intermediate memory device, called a buffer, that accommodates the differences in speed. Refer to the miniBlend.net installation manual to determine the appropriate baud rate based on cable length for each unique installation site.

Ethernet and TCP/IP Communications

The proliferation of personal computing beginning in the 1970s gave rise to the need to interconnect groups of computers for the purpose of sharing data, peripheral devices (printers, modems…) and now instruments. The most popular of these groups are known as Local Area Networks (LANs). These networks consist of nodes, where computers, peripherals and instruments are connected to the network, and interconnecting wire or fiber optic cable to interconnect the nodes. A LAN can consist of a few nodes up to several hundred but will be confined to a few buildings within a few thousand meters of one another. Technologies were developed to establish standard interface hardware as well as secure control of the flow of data on the LAN. Ethernet emerged as the primary medium for LANs. The Ethernet technology equipment; interface cards, hubs, switches, and cabling have become commodity items. Software protocols were developed to standardize sharing and transfer of files, mail messages, access to peripherals, and access to the internet. Again a primary standard has emerged in the TCP/IP protocol. The acronym TCP/IP comes from two protocols developed for the internet; Transmission Control Protocol and Internet Protocol.

The miniBlend.net can be connected to a TCP/IP LAN using the Ethernet port; or it can be networked in a point-to-point configuration via one of the serial ports using the SLIP protocol.

Communication Types

The type of communicating device that is being used in the system with a miniBlend.net is programmable and can be defined in the communications directory of the miniBlend.net. Communicating devices can be used with any of the serial communications ports on the miniBlend.net.

Terminal (Term Host) – The miniBlend.net communications ports communicate with a terminal type device using a simplified communications protocol.

Minicomputer (Minicomp Host) – The miniBlend.net communications ports communicate with a minicomputer type device using a sophisticated and secure communications protocol.

Modbus Host – The miniBlend.net communicates with other computer systems using the Modbus protocol. (Available in Rev 0.07 and above).

Printer – The miniBlend.net will automatically print a report at the end of each transaction. Each miniBlend.net may be connected to a printer or shared printing can also be used (several miniBlend.nets utilizing one printer).

Print Server – This port acts as a print server for other miniBlends, effectively allowing them to share a printer. Note that this feature requires the use of two separate communications ports at the miniBlend acting as the print server – one to receive reports from the other miniBlends and another for the printer.

Promass Meter – Permits the miniBlend.net to communicate with the Proline Promass meters.

Shared Printer – This port allows multiple miniBlends to share a printer. The miniBlends with “shared printer” ports are all connected to a common miniBlend’s “shared printer” port. The miniBlends with “shared printer” ports will send their reports to the miniBlend configured as the print server. The print server miniBlend will then send the report to the printer.

SLIP (Serial Line Internet Protocol) – The miniBlend.net communications ports communicate with a minicomputer type device using TCP/IP over a serial communications line. Note that host communications over TCP/IP (either via SLIP or Ethernet) follows the Terminal mode protocol and uses port 7734.

Communications for Terminal Mode of Operation

The miniBlend.net System Program Code Communications Port Function must be set to Terminal Host. This character-oriented protocol uses the ASCII character “*” to define the start of a message and Carriage Return – Line Feed (CR-LF) characters to terminate the message. No error checking other than parity on each character is performed.

The message format is:

*	A1 A2	text	CR	LF

for an instruction to miniBlend.net, or

*	A1 A2	text	CR	LF

for a response from miniBlend.net

Where:

*	=	Asterisk Hex “2A”
Text	=	Character string containing instructional or response information
CR	=	Carriage return Hex “0D”
LF	=	Line feed Hex “0A”
A1 A2	=	miniBlend.net Address (01 to 99)

The universal or global address “00” is an invalid address and must not be assigned to any miniBlend.net. The address, A1 A2, always consists of two ASCII characters.

Data is formatted using ASCII characters and each character frame consists of 1 start bit, 7 or 8 data bits, none, even or odd parity, and 1 or 2 stop bits. A maximum communication rate of 38,400 baud is supported. There is no echo back of received characters by the miniBlend.net in the Terminal Mode of operation.

Note: *Via an established Ethernet or SLIP connection, this protocol is always available via port 7734.*

Communications for Minicomputer Mode of Operation

This character-oriented protocol uses the transmission control character STX to define the start of a message, and ETX to terminate the message. A Longitudinal Redundancy Check (LRC) character follows the ETX character for additional message error detection beyond the traditional parity check done on each transmitted character.

The message format is:

STX	A1 A2	text	ETX	LRC

for an instruction to miniBlend.net, or

NL	STX	A1 A2	text	ETX	LRC	PAD

for a response from miniBlend.net

Where:

NL	=	Null character Hex “00”
STX	=	Start of Text Hex “02”
Text	=	Character string containing instructional or response information
ETX	=	End of Text Hex “03”
LRC	=	Longitudinal Redundancy Check
PAD	=	Pad character Hex “7F”
A1 A2	=	miniBlend.net Address (01 to 99)

The LRC is an ASCII character computed as the exclusive OR (XOR) sum of all characters following the STX and including the ETX transmission control characters.

The universal or global address “00” is an invalid address and must not be assigned to any miniBlend.net. The address, A1 A2, always consists of two ASCII characters.

Data is formatted using ASCII characters and each character frame consists of 1 start bit, 7 or 8 data bits, none, even or odd parity, and 1 or 2 stop bits. There is no echo back of received characters by the miniBlend.net in the Minicomputer Mode of communications.

Text Format

Command and Response text will be shown enclosed in single quotes. Embedded spaces are represented by an underscore character (_). Any other character representation will be described where used.

An “OK” is used in response to any action type command that has been successfully carried out. For request only commands, a good response will report the data requested in the format shown for that command.

A “NOXX” (XX represents a two character code) is used to show that the command has been rejected. The two-character code represents the condition causing the rejection. For an expanded description of these codes, see “Appendix II.”

Time-out, or no response received from the miniBlend.net, occurs when the command string has been entered incorrectly. The communicating program should set an upper limit on the amount of time it will wait for a response from any miniBlend.net, and register a time-out when that time has elapsed, to prevent a bad command from locking up the communications. Commands must be formatted exactly as stated. Invalid addresses, incomplete data, and excess data are all causes for this to occur. A more detailed explanation follows:

Invalid Address – A miniBlend.net will ignore a command whose address does not match its own. The communication address is programmed into the miniBlend.net System program code 721. For serial communications, the last octet of the four octet IP address is used.

Incomplete Data – The code format for each communication command is stated in the Command Reference Guide section. If any portion of the command is left out, a time-out will occur.

Excess Data – Commands must be formatted exactly as stated. No excess data may be inserted or added.

Communication Control Selections

The amount of control that the communicating device has over the miniBlend.net is programmable for various degrees of control.

Poll and Program – Identical to “Polling Only” and adds programming privilege, but excludes authorizing privilege.

Host Control – Permits the EIA-232, EIA-485 or Ethernet communication device to request information and to authorize operation, or to have complete control over all operations.

XON/XOFF – Printer security protocol, designed to keep the printer buffer from overflowing. The printer sends an XOFF(13 hex) when the print buffer is nearly full. The miniBlend.net stops sending data until the printer sends an XON (11 hex) signifying that it is ready for more data.

PTB-FX – Printer security protocol, designed to guarantee the printer received and printed each line it is sent. Primarily used in European markets.

PTB-LQ – Printer security protocol, designed to guarantee the printer received and printed each line it is sent. Primarily used in European markets.

Each command listed in the Command Reference Guide section of this manual indicates the supporting communication modes.

Command Code AR – Alarm Reset

The AR command causes a currently active alarm to be cleared from miniBlend.net. A special alarm code 'AA' will cause all currently active alarms to be cleared. The alarm specified must be active and configured to be reset through communications or the command will be rejected.

Command:

"AR" Reset all alarms in all tables
"AR_XX_SY" Reset a specific alarm for a specified directory
"AR_XX_Mn"

Where XX = Two-character alarm code (see tables below)
n = Meter index (1 or 2)

Responses:

"OK" Good Response to the alarm code.

or...

"NOXX" The alarm was not reset.

Remarks: The two-character alarm code must be one of those alarms that is allowed to be reset through the communications channel. All alarms except "DA" can be cleared through communications.

See also:
EA – Enquire Alarms
RA – Request Alarms

Constraints: The alarm code must be able to be reset through communications. If it is allowed, it must be pending or a "NO" will be returned.

Special Case: A special code "AA", may be used to reset all resetable alarms that are pending in the directory specified.

Comm. Modes: Host Control.

Resettable Alarm Status Codes, System

Code	Condition
CL	Clean Line: Less than the clean line amount was delivered without blend product
CM	Communications Alarm: Communications failure on one of the communications channels
OA	System Overrun: Preset amount was exceeded beyond overrun alarm limit
PA	Power-fail Alarm: The unit either had a power failure or a hardware reset occurred
PP	Printer Failure
SP	Shared Printer Failure
U1	User Alarm #1
U2	User Alarm #2
U3	User Alarm #3
U4	User Alarm #4
U5	User Alarm #5

Resettable Alarm Status Codes, Meter

Code	Condition
BH	Blend High – Product blend percentage was above tolerance
BL	Blend Low – Product blend percentage was below tolerance
DR	Density Transducer: Density transducer failure or out-of-range condition
HD	High Density: Density transducer is out of range of the high alarm setting
HF	High Flow Alarm: Flow rate has exceeded limit set by Excess High Flow program code for more than 4 seconds
HP	High Pressure: Pressure transducer is out of range of the high alarm setting
HT	High Temperature: Temperature probe or transducer is beyond the high alarm setting
LA	Leakage Alarm – Product flow detected when not expected
LD	Low Density: Density transducer is out of range of the low alarm setting
LF	Low Flow Alarm: Flow rate was at or below the minimum flow rate established by Low Flow Limit program code for longer than 8 seconds
LP	Low Pressure: Pressure transducer is out of range of the low alarm setting
LT	Low Temperature: Temperature probe or transducer is out of range of the low alarm setting
MF	Mass Meter Communications Failure: Meter is not responding to commands
PA	Power-fail Alarm: The unit either had a power failure or a hardware reset occurred
PM	Promass Alarm: Meter is indicating an error or alarm condition
PR	Pressure Transducer: Pressure transducer failure or out-of-range condition
TP	Temperature Probe: Short or open condition in the temperature probe circuit

Command Code BR – Boolean/Algebraic Register Read

The BR command requests Boolean/algebraic variable data generated from user-defined equations downloaded to miniBlend.net.

Command:

"BR_X_YYY" Reads the Boolean / Algebraic Variable.

Where: X = F – Algebraic Variable (single precision, floating point)
T – Timer Variable
B – Boolean Variable

YYY = Variable number; 1 – 50 for Float and Boolean types, 1 – 8 for timers and strings.

Responses:

Good Response
"BR_X_YYY_D..D"

Where: X = F – Algebraic Variable (single precision, floating point)
T – Timer Variable
B – Boolean Variable

YYY = Variable number; 1 – 50 for Float and Boolean types, 1 – 8 for timers and strings.

D..D = Data; 0 to 255 for Boolean variables and numeric string for algebraic and timer variables.

or...

"NOXX"

Remarks: None.

See also: BW – Boolean/Algebraic Register Write

Constraints: None.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code BW – Boolean/Algebraic Register Write

The BW command writes data to Boolean/algebraic variables used by user-defined equations downloaded to miniBlend.net.

Command:

"BW_X_YYY_D..D" Writes to the Boolean / Algebraic Registers.

Where: X = F – Algebraic Variable (single precision, floating point)
T – Timer Variable
B – Boolean Variable

Responses:

"BW_X_YYY_D..D" Good Response.

Where: X = F – Algebraic Variable (single precision, floating point)
T – Timer Variable
B – Boolean Variable
YYY = Variable number; 1 – 50 for Float and Boolean types, 1 – 8 for timers.
D..D = The Data; 0 to 255 for Boolean variables and numeric string for algebraic and timer variables.

or...

"NOXX"

Remarks: None.

See also: BR – Boolean/Algebraic Register Read

Constraints: None.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code DY – Dynamic Displays

The DY command requests a dynamic display value from miniBlend.net. Information available includes current and load average batch data.

Command:

"DY_DDXX"

Where: DD = Dynamic Display Type
SY = System
CB = Current Batch
XX = Variable Number to Access
System (00 - 17)
Current Batch (00 - 49)

Responses:

"NOXX" Requested display not returned.

Remarks: No response exceed 31 characters.

Constraints: None.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Dynamic Display Values

System Dynamic Displays

Index	Description	Format		
00	Wild Stream Flow Rate	Wild		XXXXX.X GPM
01	Blend Stream Flow Rate	Blend		XXXXX.X GPM
02	Blend Stream Desired Rate	Drate		XXXXX.X GPM
03	Current Blend Percentage	Blend %		XX.X
04	Blend Deviation	Dev		XXXX.XX
05	Blend Tolerance	Tol		XX
06	Current Batch Preset Amount	Preset		XXXXXXX
07	Current Batch Remaining Amount	Remain		XXXXXXX
08	Current Batch Delivered Amount	Del		XXXXXXX.XX
09	Power Fail Date	Pwr Fail	12/31/09	22:00:00

Product Dynamic Displays

Index	Description	Format	
00	Product IV	IV	XXXXXXX.XX
01	Product GV	GV	XXXXXXX.XX
02	Product GST	GST	XXXXXXX.XX
03	Product GSV	GSV	XXXXXXX.XX
04	Product Mass	Mass	XXXXXXX.XX
05	Meter Factor	MFac	X.XXXXXX
06	Temperature	Temp	XXX.X F
07	Density	Dens	XXXX.X LbF3
08	Pressure	Pres	XXX.X PSI
09	Vapor Pressure	VPre	XX.X PSI
10	Current Blend Ratio	CBR	XX.X%
11	Intended Blend Ratio	IBR	XX.X%
12	Current Flow Rate	CRate	XXXXXX

Command Code EA – Enquire Alarms

The EA command retrieves the alarm status from miniBlend.net. Data is returned in a bit-mapped format.

Command:

"EA_XX" (Request alarm status of directory)

Where: XX = Directory Specification
SS = System Alarms
Mx = Meter Alarms
x = Meter Number (1 or 2)

Responses:

"A1A2A3A4A5" Good Response. Five characters for EA SY
"A1A2A3A4A5" Good Response. Five characters for EA Mx

Where: A_1 .. A_n are bit-mapped characters identifying active alarms in the specified directory.

or ...

"NOXX" Alarm status cannot be reported

Remarks: Allow for additional characters to be added to the end when alarms are added in the future.

See also: AR – Alarm Request
RA – Request Alarms

Constraints: None.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Response to Enquire Alarms – Systems

	Hex Value			
	0x08	**0x04**	**0x02**	**0x01**
A1	DA: RAM Corrupt	DA: Flash Error	DA: RAM Bad	DA: ROM Bad
A2	DA: Passcodes Reset	DA: Prog Error	DA: Watchdog	DA: Flash Backup Bad
A3	U3: User Alarm 3	U2: User Alarm 2	U1: User Alarm 1	PA: Powerfail Alarm
A4	CL: Clean Line	CM: Communications	U5: User Alarm 5	U4: User Alarm 4
A5	Reserved	PP: PTB PRN	SP: Shared PRN	OA: Overrun

Response to Enquire Alarms – Meter

	Hex Value			
	0x08	**0x04**	**0x02**	**0x01**
A1	BL: Blend Low	BH: Blend High	OA: Prd Overrun	ZF: Zero Flow
A2	DR: Density Trans	TP: Temp Probe	BP: Back Pressure	VF: Valve Fault
A3	PR: Pressure Trans	HF: High Flow	HT: High Temp	HD: High Density
A4	HP: High Pressure	LF: Low Flow	LT: Low Temp	LD: Low Density
A5	LP: Low Pressure	PM: Promass	MF: Mass Meter	LA: Leakage

Command Code EQ – Enquire Status

The EQ command retrieves the operational status of miniBlend.net. Data is returned in a bit-mapped format.

Command:

"EQ" Request Status

Responses:

"A1A2A3A4A5A6" **Good Response.** Six characters. For descriptions of each of the characters, see the table below.

Where each "A" is a quasi hex value;

"0 1 2 3 4 5 6 7 8 9 : ; < > ? ".

Remarks: Allow for additional characters to be added on the end for future status indicators..

See also: RS – Request Status
RE – Reset Status Flags

Constraints: None.

Special Case: See table.

Comm. Modes: No Control, Host Control, Poll and Program.

	Quasi Hex Value			
	0x08	**0x04**	**0x02**	**0x01**
A1	Program mode	Released	Flowing	Authorized
A2	Trans in progress	Trans done	Batch reset occurred	Reserved
A3	Printing in progress	Reserved	Reserved	Alarm
A4	Prog value changed	Reserved	Reserved	Power fail occurred
A5	Checking entries	Input #1	Input #2	Input #3
A6	Reserved	Reserved	Reserved	Reserved

Command Code ER – Event Recall

The ER command requests historical data from miniBlend.net using the sequence number of the event.

Command:

"ES_S...S"

Where S...S is the sequence number.

Responses:

Good Responses:
"ER_SSSSSSSSSS_DDDDDDDD_HHNN_X_EEEEE_A...A"

Where:

SSSSSSSSSS	= Sequence Number
DDDDDDDD	= Standard Time "MMDDYYYY" or Military Time "DDMMYYYY"
MM	= Month
DD	= Day
YYYY	= Year
HH	= Hours
NN	= Minutes
X	= A (Standard Time – AM), P (Standard Time – PM), M (Military Time)
EEEEE	= Type Number (Returned, but not currently used)
A...A	= Data Variable length string (may contain "tab" characters)

or...

"NOXX" Data not retrieved.

Remarks: None.

See also: ES – Last Event Sequence Number

Constraints: None.

Special Case: None.

Comm. Modes: Host Control, No Control, Poll and Program.

Command Code ES – Last Event Recall

The ES command requests the sequence number of the most recent event stored by miniBlend.net.

Command:

"ES"

Responses:

"ES_SSSSSSSSSS" Good Response.

Where:
SSSSSSSSSS = Sequence Number of most recent event in event log

or...

"NOXX" Data not available.

Remarks: None.

See also: ER – Event Recall

Constraints: None.

Special Case: None.

Comm. Modes: Host Control, No Control, Poll and Program.

Command Code ET – End Transaction

The ET command flags the transaction in progress as complete and forces the storage of the completed batch data to local storage.

Command:

"ET"

Responses:

"OK" **Good Response.** Transaction is flagged as complete if a transaction is in progress. Authorization is removed.

or...

"NOXX" Transaction was not ended.

Remarks: None.

Constraints: None.

Special Case: None.

Comm. Modes: Host Control, Poll and Program.

Command Code FL – Request Meter Pulse Count

The FL command retrieves raw pulse counts from the miniBlend.net. The count is reset to zero at the start of each batch. Appending an "R" indicates the miniBlend.net should return the equivalent delivered IV (raw) amount.

Command:

"FL_Px"
"FL_Px_R"

Responses:

Good Responses:

"FL_PPPPPPPPPP_Px" (for FL Px)
"FL_VVVVVVV.VV_Px" (for FL Px R)

Where:
PPPPPPPPPP = Meter Pulse Count
VVVVVVV>VV = Equivalent raw Product Amount (pulses / k factor)

or...

"NOXX"

Remarks: No meter pulse count available (volume and rate via comm. only)

Constraints: VVVVVVV.VV is reset to zero at start and end of each transaction.

Special Case: None.

Comm. Modes: Host Control, No Control, Poll and Program.

Command Code GD – Get Date and Time

The GD command requests the current data and time programmed at miniBlend.net.

Command:

"GD"

Responses:

"GD_DDDDDDDD_HHNN_X" Good Response.

Where:

DDDDDDDD	= MMDDYYYY (Standard Time)
	= DDMMYYYY (Military Time)
HH	= Hours
NN	= Minutes
MM	= Month
DD	= Day
YYYY	= Year
X	= A (Standard Time – A.M.)
	= P (Standard Time – P.M.)
	= M (Military Time)

or...

"NOXX" The data and time were not read from the miniBlend.net.

Remarks: None.

See also: SD – Set Date and Time

Constraints: None.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code GP – Get Firmware CRC

The GP command retrieves the computed CRC for the firmware currently installed in miniBlend.net.

Command:

"GP"

Responses:

"GP_SSSSSSSS" Good Response.

Where:
SSSSSSSS = eight-character hexadecimal digit signature

or...

"NOXX" Did not read the CRC signatures.

Remarks: CRC signatures may be used to determine firmware revision number. Contact the factory with inquiries.

Constraints: None.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code LD – Batch Average Density

The LD command requests batch average density from miniBlend.net.

Command:

"LD_R"	Current batch density
"LD_01"	Current batch density
"LD_01_NNN"	Complete batch density

Where:
R = Constant (Current Recipe)
NNN = Number of transactions back into Local Storage to retrieve data

Responses:

Good Responses:

Current Transaction

"LD_01_RR_SVVVV.V"	For commands LD R, LD 01
"LD_01_RR_SVVVV.V_NNN"	For commands LD 01 NNN

Where:
S = Sign (+/-)
RR = Current Recipe #
VVVV.V = Batch Average Density for the requested batch
NNN = Number of Batches Back

or...

"NOXX" The load average density was not read.

Remarks: Response field padded with leading spaces. If value is negative, minus sign will immediately precede most significant digit.

See also: LT – Batch Average Temperature
LP – Batch Average Pressure
RD – Request Analog Input Value

Constraints: Density units are as programmed in the miniBlend.net.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code LO – Log Out of Program Mode

The LO command removes miniBlend.net from the program mode and causes all changes made via PC command to be saved.

Command:

"LO"

Responses:

"OK" Good Response.

or...

"NOXX"

Remarks: Ten seconds after issuing a PC command, the miniBlend.net begins the logout process. The "LO" command starts it immediately. All changes made by the PC command are not available (made active) until the logout process is complete.

See also: PC – Program Code Change

Constraints: Logout may only be forced if the comm port is the one logged in (i.e., Port #1 cannot logout Port # 2)

Special Case: None.

Comm. Modes: Host Control, Poll and Program.

Command Code LP – Batch Average Pressure

The LP command requests batch average pressure from miniBlend.net.

Command:

"LP_R"	Current batch – deprecated
"LP_01"	Current batch – deprecated
"LP_01_NNN"	Complete batch – deprecated

Where:
R = Constant (Current Recipe)
NNN = Number of transactions back into Local Storage to retrieve data

Responses:

Good Responses:

Current Transaction

"LP_01_RR_SVVVV.V"	For commands LP R, LP 01
"LP_01_RR_SVVVV.V_NNN"	For commands LP 01 NNN

Where:
R = Current Batch
S = Sign (+/-)
RR = Recipe #
VVVV.V = Batch Average Pressure for the requested batch
NNN = Number of Batches Back

or...

"NOXX" The load average pressure was not read.

Remarks: None.

See also: LT – Batch Average Temperature
LD – Batch Average Density
RD – Request Analog Input Value

Constraints: Pressure units are as programmed in the miniBlend.net.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code LT – Batch Average Temperature

The LT command requests batch average temperature from miniBlend.net.

Command:

"LT_R"	Current batch – completed
"LT_01"	Current batch – completed
"LT_01_NNN"	Complete batch – completed

Where:
R = Constant (Current Recipe)
NNN = Number of transactions back into Local Storage to retrieve data

Responses:

Good Responses:

"LT_01_RR_SVVVV.V"	For commands LT R, LT 01
"LT_01_RR_SVVVV.V_NNN"	For commands LT 01 NNN

Where:
S = Sign (+/-)
RR = Recipe #
VVVV.V = Batch Average Temperature for the requested batch
NNN = Number of Batches Back

or...

"NOXX" The load average temperature was not read.

Remarks: None.

See also: LD – Batch Average Density
LP – Batch Average Pressure
RD – Request Analog Input Value

Constraints: Temperature units are as programmed in the miniBlend.net. Negative temperature is possible.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code NR – New Recipe

Command:

"NR_RR"

Where: RR = Recipe Number (1-12)

Responses:

"OK" Good Response.

or...

"NOXX"

Remarks: This command allows for on-the-fly recipe changes during delivery. When the NR is received during a batch, the recipe will be changed immediately. The portion of the batch already delivered will not be affected (except any exisiting deviation from the desired ratio will still be taken into account if possible). The remainder of the batch will be delivered using the blend percentages specified by the new recipe.

Constraints: If Recipe Select inputs are defined, the NR command will override the recipe selected via the digital inputs.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code OR – Output Relay

The OR command requests that the state of one or more of the general purpose outputs be changed.

Command:

"OR_XX_Y"

Where:

XX = the output number (01-06)
Y = desired state (1 = on, 0 = off)

Responses:

"OK" Good Response. The command was accepted and the desired state was output to the selected contract.

or...

"NOXX" The command was rejected. The miniBlend.net did not request a state change at the selected output.

Remarks: "NO03" will be returned if XX or Y is out of range. "NO06" will be returned if the output is not assigned as a general purpose output.

Constraints: This command will not be allowed if the corresponding relay is not configured as a general purpose relay.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code PC – Program Code Change

The PC command facilitates modification of program mode parameters by specifying the major directory, program code number, and new value.

Command:

"PC_DD_XXX_V...V"

Where:
DD = Major Directory
= CF - Configuration
= SY - System
= P*n* - Product *n* (*n* = 1 or 2)
= 01-12 – Recipe Number

XXX = Program Parameter Number
V...V = New Value, content depends on parameter

Responses:

"PC_DD_XXX_A...A" Good Response.

Where:
DD = Program mode major directory
XXX = Program Parameter Number
V...V = Requested new value
A...A = Programmed Value

or...

"NOXX" The program value was not changed.

Remarks: The number of digits or alpha characters entered for the new program code must be EXACTLY equal to the number of digits or alpha characters required for that particular program code, except for codes requiring text strings.

Due to the varying lengths or the programmable display messages, the number of digits or alpha characters entered for the new program code can number up to maximum of 30. However, the number of digits or alpha characters stored will depend on the maximum length of that particular message being changed.

See also: LO – Log Out of Program Mode
PV – Program Code Value

Constraints: Refer to the Reference section in the Operations Manual for a complete list of parameters in each directory.

Comm. Modes: Host Control, Poll and Program.

Note: *The "+" argument appended to the PC command string affects the number of significant digits returned for floating point numbers. For the "+" version of the command, additional decimal digits may be included in the response beyond the specified format for the program code if they are non-zero (up to a maximum of six total digits to the right of the decimal point).*

Command Code PF – Request Power Fail Time

The PF command retrieves the date and time of the last power fail sustained by miniBlend.net.

Command:

"PF"

Responses:

"PF_DDDDDDDD_HHNN_X" Good Response.

Where:

DDDDDDDD	= Power Fail Date
	= (MMDDYYYY for Standard Time)
	= (DDMMYYYY for Military Time)
HH	= Hours
NN	= Minutes
X	= A (Standard Time – A.M.)
	= P (Standard Time – P.M.)
	= M (Military Time)

Remarks: None.

Constraints: None.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code PP – Print Report to Printer

The PP command initiates a reprint of the requested batch report at the printer.

Command:

"PP"	for most recently completed batch
"PP_NNN"	for NNN batches back in local storage

Responses:

Good Response:

"OK"

or...

"NOXX"

Remarks: None.

See Also: PT – Print Batch Report to Host.

Constraints: A printer port must be configured.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code PR – Program Change Event Recall

The PR command requests NIST related historical data tracking program mode changes.

Command:

"PR_S...S"

Where S...S is the sequence number.

Responses:

Good Response:

"PF_SSSSSSSSSS_DDDDDDDD_HHNN_X_EEEEE_A...A"

Where:
SSSSSSSSSS = Sequence Number
DDDDDDDD = Standard Time (MMDDYYYY) or Military Time (DDMMYYYY)
MM = Month
DD = Day
HH = Hour
NN = Minutes
X = A (Standard Time – A.M.), P (Standard Time – P.M.), M (Military Time)
EEEEE = Event Type Number
A...A = Event Data

or...

"NOXX"

Remarks: None.

See Also: PS – Last Program Change Sequence Number

Constraints: None.

Special Case: None.

Comm. Modes: Host Control, No Control, Poll and Program.

Command Code PS – Last Program Change Sequence Number

The PS command requests the sequence number of the most recent program mode change stored by miniBlend.net.

Command:

"PS"

Responses:

"PS_SSSSSSSSSS" Good Response.

Where:
SSSSSSSSSS= Sequence Number

or...

"NOXX"

Remarks: None.

See Also: PR – Program Change Event Recall

Constraints: None.

Special Case: None.

Comm. Modes: Host Control, No Control, Poll and Program.

Command Code PT – Print Batch Report to Host

The PT command allows a batch report to be generated directly to the host over the existing communications line. The miniBlend.net first responds with an OK response (framed normally according to the current host protocol) followed by the report text. No additional framing characters appear before, during or after the report text other than those returned with the normal OK response.

Command:

"PT"	for the most recently completed batch
"PT_NNN"	for NNN batches back in local storage

Responses:

Good Response:

"OK" (followed by the report text)

or...

"NOXX"

Remarks: None.

See Also: PP – Print Report to Printer

Constraints: None.

Special Case: None.

Comm. Modes: Host Control, No Control, Poll and Program.

Example response in Minicomputer mode:

<STX> O K <ETX> <LRC> <PAD> [report text .....]

Command Code PV – Program Code Value

The PV command requests the currently configured value for program mode parameters.

Command:

"PV_DD_XXX"

Responses:

"PV_DD_XXX_A...A" Good Response.

Where:
DD = Directory
CF = Configuration
SY = System
P*n* = Product *n* (*n* = 1 or 2)
01-12 = Recipe number
XXX = Parameter Number
A...A = Value of the parameter

or...

"NOXX"

Remarks: None.

See Also: PC – Program Code Change

Constraints: None.

Special Case: None.

Comm. Modes: Host Control, No Control, Poll and Program.

Note: *The "+" argument appended to the PC command string affects the number of significant digits returned for floating point numbers. For the "+" version of the command, additional decimal digits may be included in the response beyond the specified format for the program code if they are non-zero (up to a maximum of six total digits to the right of the decimal point).*

Command Code RA – Request Alarms

The RA command requests currently active alarms from miniBlend.net. Data is returned as two-character mnemonics for each alarm reported. A maximum of five alarms will be reported regardless of the number of alarms actually active on miniBlend.net.

Command:

"RA"

Responses:

"A1 A2 A3 A4 A5" **Good Response**

"OK" No alarms for that directory

or...

"NOXX" Bad Response

Remarks: The good response is a character string consisting from 1 to 5 status codes separated by a single space. Each status code is two characters. See AR for Alarm Mnemonics.

If alarms exist for any injector, the two-character alarm code will be included in the response string. To determine the specific injector experiencing the alarm condition, the EA command must be used.

See Also: AR – Alarm Reset
EA – Enquire Alarms

Constraints: None.

Special Case: If no alarm condition is set, an "OK" response is issued.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code RC – Recipe Composition

This command will return the composition of the completed batch for blending configurations.

Command:

"RC"	Request recipe composition of current/most recent transaction
"RC_NNN"	Request recipe composition of historical transaction

Where:
NNN = Number of transactions back into local storage

Responses:

Good Responses:

"RC_RR_AAA.A_BBB.B"	Composition of batch, current transaction
"RC_RR_AAA.A_BBB.B"	Composition of batch, archived transaction NNN

Where:
RR = Recipe number 01-12
AAA.A = Percentage of product 1
BBB.B = Percentage of product 2

or...

"NOXX" The value was not read.

Remarks: Zero will be returned for products not delivered in the batch.

Constraints: None.

Special Case: None.

Comm. Modes: Host Control, No Control, Poll and Program.

Command Code RD – Request Analog Input Value

The RD command requests the current engineering value of one of the analog inputs configured and installed at miniBlend.net, based on input function.

Command:

"RD_X" Request specific transducer value

Where X: = T Temperature
P Pressure
D Density

Responses:

Good Responses:

"RD_X_VVVV.V"
"RD_X_SVVVV.V"

Where:
X = T Temperature
P Pressure
D Density
S = Sign (+/-)
VVVV.V = Current value of analog input

or...

"NOXX" The value was not read.

Remarks: None.

See Also: LD – Load Average Density
LT – Load Average Temperature
LP – Load Average Pressure

Constraints: None.

Special Case: None.

Comm. Modes: Host Control, No Control, Poll and Program.

Command Code RE – Reset Status Flags

The RE command resets or acknowledges pending status conditions of the miniBlend.net.

Command:

"RE_XX"

Where XX = Status flag to be reset
PF = Power Fail
BD = Batch Reset Occurred
PC = Program code value has changed
TD = Transaction Done

Responses:

"OK" **Good Response.** Status condition has been reset. Status condition will no longer appear in the response to status requests (EQ and RS).

or...

"NOXX" The value was not read.

Remarks: None.

See Also: PC – Program Code Change
PF – Request Power Fail Time

Constraints: None.

Special Case: "BD" status is also reset on authorize commands.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code RQ – Request Flow Rate

The RQ command retrieves the current flow rate from miniBlend.net.

Command:

"RQ"	Total flow rate
"RQ_P*n*"	Flow rate for the specified product *n*
"RQ_P"	Both product flow rates

Responses:

"RQ_XXXXX"	**Good Response.**
"RQ_XXXXX_P*n*"	**Good Response.**
"RQ_YYYYY_ZZZZZ"	**Good Response.**

Where:
XXXXX = Requested flow rate
YYYYY = P1 flow rate
ZZZZZ = P2 flow rate

Remarks: None.

Constraints: NO31 will be returned if the command format is inconsistent with the currently configured mode of operations.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code RR – Request Current Recipe Number

The RR command retrieves the number of the currently selected recipe from miniBlend.net.

Command:

"RR"

Responses:

"RR_NN" Good Response.

Where: NN = Recipe Number (1-12)

or...

"NOXX" Recipe number not returned.

Remarks: The recipe number returned by the RR will remain in effect until another recipe is selected, either by allocating a single recipe (AB command) or by selection at the miniBlend.net keypad. Neither a batch done nor transaction done clears the recipe number from the "RR" response.

Constraints: NO05 will be returned if no transaction has ever been completed.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code RS – Request Status

The RS command requests the operational status of miniBlend.net. Data is returned as two-character mnemonics for each status reported. A maximum of twenty status codes will be reported.

Command:

"RS"	Request Status

Responses:

"RS_XX_XX...XX"	**Good Response.** A character string consisting of from 1 to 20 status codes separated by a single space. Each status code is two characters. See table on the following page for more information about status codes.

Remarks: The miniBlend.net is considered released whenever the valve is open and has not been commanded to close. Some alarm conditions cannot be reset through the Communication channel. (See Alarm Reset command).

See Also: EQ – Enquire Status
RE – Reset Status Flag

Constraints: None.

Special Case: A trailing space is returned after the final status code.

Comm. Modes: No Control, Host Control, Poll and Program.

Request Status Codes	
Code	**Condition**
AL	Alarm Active
CE	Checking Entries
FL	Flowing
BD	Batch Reset Occurred (clearable by host)
I1	Input 1 on
I2	Input 2 on
I3	Input 3 on
PC	Program Parameter Changed (clearable by host)
PD	Permissive Delay Active
PF	Power Fail Occurred
PP	Printing in Progress
PW	In Program Mode
TD	Transaction Done
TP	Batch in Progress
RL	Reserved

Command Code RT – Request Batch Volume

The RT command requests batch data from miniBlend.net.

Command:

"RT_X"	Total volume of current batch
"RT_X_P*x*"	Volume of a component product in the current batch
"RT_X_NNN"	Total volume of a completed batch
"RT_X_Px_NNN"	Volume of a component product in a completed transaction

Responses:

Good Responses:

"RT_X_VVVVVVVV"	Current batch volume
"RT_X_Px_VVVVVVVV"	Current batch component volume
"RT_X_VVVVVVVV_NNN"	Batch volume, historical
"RT_X_Px_VVVVVVVV_NNN"	Component volume, historical

Where: X = = R for raw total (IV or indicated)
= G for gross volume
= N for gross @ standard temperature volume (GST)
= P for gross @ standard temperature and pressure volume (GSV)
= M for mass total

VVVVVVVV = Total transaction volume

NNN = The number of transactions bank into local storage

or...

"NOXX" No Transaction data was returned.

Remarks: For Total Volume Requests; (RT_Z and RT_Z_NN) "MR" as the recipe number on the response indicates a multiple recipe transaction. Recipes delivered in batches can be determined via batch volume requests RB or by using the RL or RN commands..

Constraints: Transaction Volume Units are assumed to be as programmed into the miniBlend.net. NO03 will be returned for a recipe request if the recipe requested was not delivered in the transaction. NO30 will be returned if the recipe specified is not currently configured to the miniBlend.net to which the command was directed.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code SA – Remote Start

The SA command instructs miniBlend.net to resume delivery if the Stop key had been pressed.

Command:

"SA"

Responses:

"OK" **Good Response.** miniBlend.net is released for flow to begin.

or...

"NOXX" miniBlend.net is not released for remote start.

Remarks: None.

See Also: SP – Stop via Communications

Constraints: None.

Special Case: None.

Comm. Modes: Host Control.

Command Code SB – Start Batch

The Start Batch command terminates any current transaction, initiates a new transaction and resets the batch totals.

Command:

"SB"

"SB_NN"

Where:
NN = Recipe to be delivered (overrides the recipe select input switches)

Responses:

"OK" **Good Response.** Batch volume has been accepted.

or...

"NOXX" The batch volume has not been set.

Remarks: None.

Constraints: Batch volume must not exceed programmed maximum batch size and must not be below the programmed minimum batch size. Unit's value must correspond to what is programmed into miniBlend.net for units of measurement.

Special Case: An authorization command with batch size of 0 allows the driver to select batch size. Driver may clear any preset batch size and enter a new batch volume providing that it is less than the preset batch size. A batch amount of zero while in the Auto Preset Mode will result in the programmed auto preset amount being displayed; a non-zero set batch amount will override the programmed auto preset amount.

Comm. Modes: Host Control.

Command Code SD – Set Date and Time

The SD command sets the date and time at miniBlend.net.

Command:

"SD_DDDDDDDD_HHNN_X"

Where	DDDDDDDD	= MMDDYYYY (Standard Time) = DDMMYYYY (Military Time)
	MM	= Month
	DD	= Day
	YYYY	= Year
	HH	= Hours
	NN	= Minutes
	X	= A (Standard Time – A.M.) = P (Standard Time – P.M.) = M (Military Time)

Responses:

"OK" **Good Response.** Time and date value accepted and seconds reset to zero.

or...

"NOXX" No Transaction data was returned.

Remarks: None.

See Also: GD – Get Date and Time

Constraints: Time value must be within a range programmed into miniBlend.net – 0000 to 2359 for Military Time, 0000 to 1259 for Standard Time; month must be within the range or 1 to 12; day must be in the range valid for the month chosen.

Special Case: Leading spaces may be used in place of leading zeros for month, day, year, hours and minutes. However, this is not recommended.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code SP – Remote Stop Flow

The SP command instructs miniBlend.net to halt delivery as if the STOP key had been pressed.

Command:

"SP"

Responses:

"OK" Good Response.

or...

"NOXX" miniBlend.net was not stopped.

Remarks: None.

See Also: SA – Start via Communications

Constraints: Valve and pump are shut down whether flow is present or not. If a batch is in progress, the "START" key or Remote Start command "SA" must be used to continue the batch.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code TN – Request Batch Number

The TN command requests the batch number and batch stop date and time for the most recent or historical batch run.

Command:

Current Transaction
"TN"

Local Storage Transaction
"TN_NNN"

Where: NNN = The number of transactions back into local storage to retrieve data.

Responses:

Good Responses:

Current Transaction
"TN_IIII_DDDDDDDD_HHNN_X" (Start time of the current batch)

Local Storage Transaction
"TN_IIII_DDDDDDDD_HHNN_X_NNN" (End time of requested completed batch)

Where:	IIII	= Internal Transaction Number
	DDDDDDDD	= Transaction Stop Date
		= (MMDDYYYY for Standard Time)
		= (DDMMYYYY for Military Time)
	HH	= Hours
	NN	= Minutes
	X	= A (Standard Time – A.M.)
		= P (Standard Time – P.M.)
		= M (Military Time)
	NNN	= Number of transactions in local storage.

or...

"NOXX" The transaction stop date and time were not retrieved.

Remarks: None.

Constraints: None.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code TR – Batch Summary Recall

The TR command requests historical batch summary data from miniBlend.net using the batch number.

Command:

"TR_S...S"

Responses:

"TR_SSSSSSSSSS_[batch data]" **Good Response.**

Where: S...S = Batch number

[batch data] is a comma-delimited text record with the following fields:
- Batch number
- Batch Start Date/Time
- Batch End Date/Time
- 5 volume totals (IV, GV, GST, GSV, Mass)
- 5 non-resettable totalizer values (IV, GV, GST, GSV, Mass)
- 4 batch average values (meter factor, temperature, ρ_{line}, pressure)
- Number of alarms occurring during the batch
- Alarm codes for alarms occurring during the batch (Text field)

or...

"NOXX" The transaction stop date and time were not retrieved.

Remarks: The comma delimiter will still be present, even if a field is blank.

See Also: TS – Last Event Sequence Number
TU – Batch Log Archived User Data

Constraints: None.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code TS – Batch Log Latest Batch Number

The TS command requests the batch number of the most recent (current) batch.

Command:

"TS"

Responses:

"TS_SSSSSSSSSS" Good Response.

Where: SSSSSSSSSS = Current batch number

Remarks: None.

See Also: TR – Batch Log Summary Recall
TU – Batch Log Archived User Data

Constraints: None.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code TU – Transaction Log Archived User Data

The TU command requests historical batch archived user data from miniBlend.net using the number of the batch.

Command:

"TU_S...S"

Responses:

"TU_SSSSSSSSSS_[batch user data]" **Good Response.**

Where: SSSSSSSSSS = Batch number
[batch data] is a comma-delimited text record with the following fields:
5 integer values (0-255) representing the values in USERBOOL46-USERBOOL50 at the end of the batch,
5 user floating point values corresponding to the values in USERFLOAT46-USERFLOAT50 at the end of the batch

or...

"NOXX"

Remarks: Some fields may be empty. The comma delimiter will still be present, even if a field is blank.

See Also: TS – Last Event Sequence Number
TR – Batch Log Summary Recall

Constraints: None.

Special Case: None.

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code VT – Non-Resettable Total

The VT command requests a non-resettable total from miniBlend.net. Recipe totals in five volume types are available.

Command:

"VT_X_Y_Pn"	Non-resettable totals (specific component product).
"VT_X_Y_Pn_NNN"	Product n non-resettable total (historic transaction).
"VT_X_RR"	Recipe non-resettable totals.

Where:

X	= Desired volume type
Pn	= P1 or P2 (Product One or Product Two)
RR	= 01 or 02 (Recipe 01-12)

Responses:

"VT_X_Pn_VVVVVVVVV"	**Good Response.**
"VT_X_Pn_VVVVVVVVV_NNN"	**Good Response.**
"VT_X_RR_VVVVVVVVV"	**Good Response.**

Where:

X	= Desired volume type
	= R for raw total (indicated volume or IV)
	= G for gross volume (GV)
	= N for gross volume at standard temperature (GST)
	= P for net volume temperature and pressure (GSV)
	= M for mass totals
Y	= S for transaction starting value
	= E for transaction ending
VVVVVVVVV	= Requested totalizer value
Pn	= P1 or P2 (Product One or Product Two)
RR	= 01 - 12 (Recipe One through Twelve)

or...

"NOXX" Totals were not retrieved.

Remarks: Recipes must be allocated.

Constraints: NO30 will be returned if the recipe requested is not currently configured to the miniBlend.net to which the request was directed.

Special Case: An asterisk (*) following the totalizer value indicates that the value may not be the final value (e.g. a request was made for the ending current totalizer value while a transaction is in progress).

Comm. Modes: No Control, Host Control, Poll and Program.

Command Code XC – Change Parameter Security Level

The XC command instructs miniBlend.net to modify the security level of a program mode parameter.

Command:

"XC_DD_YYY_Z"

Where: DD = Program mode major directory
CF = Configuration
P1 = Product 1
SY = System
01 = Recipe number
YYY = Parameter number
Z = New security level to set (1-3)

Responses:

"XC_DD_YYY_Z_A...A" **Good Response.**

Where: DD = Program mode major directory
CF = Configuration
P1 = Product 1
SY = System
01 = Recipe number
YYY = Parameter number
Z = New security level to set (1-3)
A...A = Programmed value

or...

"NOXX" Value not changed.

Remarks: None.

See Also: XV – Read Parameter Security Level

Constraints: None.

Special Case: None.

Comm. Modes: Host Control, Poll and Program.

Command Code XV – Read Parameter Security Level

The XV command requests the current security level for a program mode parameter.

Command:

"XV_DD_YYY"

Where: DD = Major directory
CF = Configuration
P1 = Product 1
SY = System
01 = Recipe number
YYY = Parameter number

Responses:

"XV_DD_YYY_Z_A...A" **Good Response.**

Where: DD = Major directory
CF = Configuration
P1 = Product 1
SY = System
01 = Recipe number
YYY = Parameter number
Z = New security level to set (1-3)
A...A = Programmed value

or...

"NOXX" Value not read.

Remarks: None.

See Also: XC – Change Parameter Security Level

Constraints: None.

Special Case: All recipes use recipe 01's parameter security level settings. All products use Product 1's parameter security settings.

Comm. Modes: No Control, Host Control, Poll and Program.

Appendix I – Reference for "NOXX" Response Error Codes

XX	Description
NO00	Invalid Command
NO01	In Program Mode
NO02	Reserved
NO03	Value out of Range
NO04	Flow Active
NO05	No Batch Ever Done
NO06	Operation Not Allowed
NO07	Wrong Control Mode
NO08	Reserved
NO09	Alarm Condition
NO10	Reserved
NO11	Operation Out of Sequence
NO12	Power Failed During Batch
NO13	Reserved
NO14	Program Code Not Used
NO15	Keypad/Display in Use
NO16	Reserved
NO17	No Keypad Data Pending
NO18	No Batch In Progress
NO19	Option Not Installed
NO20	Reserved
NO21	Permissive Delay Active
NO22	Print Request Pending
NO23	Reserved
NO24	Must be in Program Mode
NO25	Reserved
NO26	Volume Type Not Selected
NO27	Reserved
NO28	Reserved
NO29	Checking Entries
NO30	Invalid Product Offset
NO31	Reserved
NO32	No Key Ever Pressed
NO90	Minicomputer Protocol Required
NO91	Buffer Allocation Failure
NO92	Keypad Locked
NO93	Data Recall Failure
NO94	Not in Program Mode
NO95	Security Access Not Available
NO99	miniBlend.net Internal Error

NO00 – Invalid Command

The first two characters following the address were not recognized as a valid miniBlend.net command

NO01 – In Program Mode

The requested operation cannot be performed while the miniBlend.net is in program mode. (Note: this may occur if a program change was made via communications within the last 10-12 seconds. Program mode is automatically entered when a PC command is sent, and exited after a timeout)

NO02 – Reserved

This error code is reserved for future expansion. It will not be returned by the current revision of software.

NO03 – Value out of Range

Typically returned when a PC command contains a value that is not within the range of the particular program code. Some program codes also limit individual entries based on another program code that may conflict.

NO04 – Flow Active

When flow is in progress, the requested operation cannot be performed.

NO05 – No Batch Ever Done

This error occurs when batch data is requested on a newly initialized unit that has never actually run a batch.

NO06 – Operation Not Allowed

This error occurs typically because of invalid security. It may be that a required security input is not asserted, or that the communications access security level is lower than the access level for this function. Another cause of this error is an attempt to change the state of an output that is not configured as a general-purpose output.

NO07 – Wrong Control Mode

This indicates the command being issued is incompatible with the current batch control setting in the System Communications directory. Most likely it requires Host Control mode.

NO08 – Reserved

This error code is reserved for future expansion. It will not be returned by the current revision of software.

NO09 – Alarm Condition

The requested operation cannot be performed when an alarm condition exists.

NO10 – Reserved

This error code is reserved for future expansion. It will not be returned by the current revision of software.

NO11 – Operation Out of Sequence

The requested operation cannot be performed until some other action is completed.

NO12 – Power Failed During Batch

A Power failure during the current batch prevents the requested function.

NO13 – Reserved

This error code is reserved for future expansion. It will not be returned by the current revision of software.

NO14 – Program Code Not Used

The program code number used in a PV/PC command is not valid.

NO15 – Keypad/Display in Use

The display is not currently under communications control, or prompt data is outstanding and needs to be read and cleared before the next prompt.

NO16 – Reserved

This error code is reserved for future expansion. It will not be returned by the current revision of software.

NO17 – No Keypad Data Pending

There was no response entered to a prompt, or no prompt was sent.

NO18 – No Batch In Progress

Command requires a transaction be currently active. (DY, LP, LD etc).

NO19 – Option Not Installed

The requested operation requires an installable option that is not present.

NO20 – Reserved

This error code is reserved for future expansion. It will not be returned by the current revision of software.

NO21 – Permissive Delay Active

This operation cannot be performed until the permissive delay timer expires.

NO22 – Print Request Pending

This operation cannot be performed until the print operation completes.

NO23 – Reserved

This error code is reserved for future expansion. It will not be returned by the current revision of software.

NO24 – Must be in Program Mode

This operation cannot be performed unless Program Mode is active via the keypad.

NO25 – Reserved

This error code is reserved for future expansion. It will not be returned by the current revision of software.

NO26 – Volume Type Not Selected

A volume type requested is not currently included in the set of types stored.

NO27 – Reserved

NO28 – Reserved

NO29 – Checking Entries

This operation cannot be performed until the miniBlend.net has completed verifying program code changes.

NO30 – Product Not Assigned

The requested product is not configured.

NO31 – Reserved

This error code is reserved for future expansion. It will not be returned by the current revision of software.

NO32 – No Key Ever Pressed

No key has ever been pressed at the keypad.

NO90 – Minicomputer protocol required

Function requires secure binary data transfer. Minicomputer control and a parity/data selection using 8 data bits are required.

NO91 – Buffer Allocation Failure

All available buffers are in use; cannot perform requested operation at this time.

NO92 – Keypad Locked

Keypad not available and is required for this function.

NO93 – Data Recall Failure

The miniBlend.net was unable to find/retrieve requested information from nonvolatile storage.

NO94 – Not in Program Mode

Program mode access via communications required to perform this function.

NO95 – Security Access Not Available

Communications security access is insufficient for the requested operation.

NO99 – miniBlend.net Internal Error

This error should not occur. Contact your distributor or Smith Meter Field Service if you receive this response.

Appendix II – Alphanumeric Character Set Used By the miniBlend.net

The following characters are translated by the miniBlend.net to display special characters not found on a typical keyboard: the tilde (~) will display as a degree sign at the miniBlend.net; degree signs sent by the miniBlend.net in a response will appear as a tilde (~) on your computer. The vertical bar (|) translates to a script lowercase “l”, used to denote liters of volume.

Lowercase letters may not be used to issue any of the two-digit command codes (SB, GD, EA, etc.); a NO00, Command Non-existent, will be returned as the response.

Some special characters (for example, [,], &, +, -, and .) are used in prompting or other data entry; all other special characters and lowercase letters are typically used in prompts and textual descriptions entered at the miniBlend.net, such as the product name, etc. The comma (,) may not be used within any prompt (WA-WG, WX, WQ, WP.)

ASCII	DECIMAL	HEX
NUL	0	0
STX	2	2
ETX	3	3
LF	10	A
CR	13	D
SP	32	20
!	33	21
"	34	22
#	35	23
$	36	24
%	37	25
&	38	26
`	39	27
(	40	28
)	41	29
*	42	2A
+	43	2B
'	44	2C
-	45	2D
.	46	2E
/	47	2F
0	48	30
1	49	31
2	50	32
3	51	33
4	52	34
5	53	35
6	54	36
7	55	37
8	56	38
9	57	39
:	58	3A
;	59	3B
<	60	3C
=	61	3D
>	62	3E
?	63	3F

ASCII	DECIMAL	HEX
@	64	40
A	65	41
B	66	42
C	67	43
D	68	44
E	69	45
F	70	46
G	71	47
H	72	48
I	73	49
J	74	4A
K	75	4B
L	76	4C
M	77	4D
N	78	4E
O	79	4F
P	80	50
Q	81	51
R	82	52
S	83	53
T	84	54
U	85	55
V	86	56
W	87	57
X	88	58
Y	89	59
Z	90	5A
[	91	5B
\	92	5C
]	93	5D
^	94	5E
-	95	5F
`	96	60
a	97	61
b	98	62
c	99	63
d	100	64
e	101	65
f	102	66
g	103	67
h	104	68
i	105	69
j	106	6A
k	107	6B
l	108	6C
m	109	6D
n	110	6E
o	111	6F

ASCII	DECIMAL	HEX
p	112	70
q	113	71
r	114	72
s	115	73
t	116	74
u	117	75
v	118	76
w	119	77
x	120	78
y	121	79
z	122	7A
{	123	7B
|	124	7C
}	125	7D
~	126	7E
DEL	127	7F

ASCII Codes

Appendix III – Unauthorized Flow

Unauthorized flow occurs when the miniBlend.net picks up and accumulates stray pulses from the meter between transactions. This may be leakage, or it may be product moving back and forth in the meter. These raw pulse counts are accumulated in the flow counter and can be viewed in the response to the “FL” command. These raw pulses can be converted to units of volume (gallons, liters, etc.) by dividing the accumulated pulse count by the input resolution for the meter. For example, if input resolution is set to 50, an accumulated pulse count of 104 reflects unauthorized flow of a little more than 2 units of volume (gallons, liters, etc).

When the miniBlend.net is authorized for a transaction, the flow counter is zeroed. This updates the non-resettable total for the product by the amount accumulated in the flow counter.

The presence of unauthorized flow is indicated by a status of Flowing without a corresponding Released Status in the response to the “EQ” or “RS” commands.

Appendix IV – Using the Bit-Map Tables

Many command codes in this manual use bit-mapping to encode information concisely and in as short a form as is possible. Up to four discrete bits of information may be represented by a single ASCII character, both as commands to and responses from the miniBlend.net. Most command codes that use bit-mapping consist of two or more such ASCII characters. This appendix describes how to encode or decode a single ASCII character; the process can be repeated for each additional character.

Each option listed across the top of the table carries a binary weighted value associated with it. From right to left, the values are 1, 2, 4, and 8. This is why the table headers may appear to be listed backwards. Special characters are used to represent hexadecimal values A through F, which equate to decimal values 10 through 15, when the bit values for selected options are added together. The “char” column, not the “hex” column, is used to encode and decode ASCII characters.

Encoding a Bit-Mapped Character

An X in the table indicates a selected option. First, determine which of the four column header options will be encoded. Find the row that contains Xs for the options selected. The character listed along the left axis is equal to the value of the options selected.

For example, consider the “AB” command. Suppose we want to enable recipes 1, 3, 6, 7, and 8. Recipes 1 and 3 can be represented in the first ASCII character. The row containing Xs for 1 and 3 only corresponds to the ASCII character “5.” Therefore, the first character of the AB command will be 5. Recipes 6, 7, and 8 can be represented in the second ASCII character. The character corresponding to these values is a “>,” so the second character of the AB command will be >. Because no recipes have been selected that can be encoded in the third, fourth, fifth, or sixth characters of the AB command, these characters will be 0’s.

The complete AB command to enable recipes 1, 3, 6, 7 and 8 is “AB 5>0000.”

Decoding a Bit-Mapped Character

An X in the table indicates an asserted value. Decoding a character is just the opposite of encoding a character. Find the returned ASCII character in the column along the left. For each X in that row, refer to the column header to determine what option or condition is asserted.

For example, consider the following response to the “EQ” command: “580027”

“5” represents miniBlend.net Authorized and miniBlend.net Released

“8” represents Transaction in Progress

“0” represents no conditions met in character 3

“0” represents no conditions met in character 4

“2” represents Input #2 contact

“7” represents Input #5, Input #6, and Input #7

“0” represents no conditions met in character 7

“0” represents no conditions met in character 8.

Appendix V – Interfacing with the miniBlend.net via Ethernet (TCP/IP)

Parameters Affecting TCP/IP Communications

Address: Note that the address is in the form of a TCP/IP address – 4 numbers, each from 0-255. Since each of the 4 numbers can be stored in 8 bits of data, they are often referred to by the term “octet”. The last octet in the IP address is the value used for the communications address for the RS232/RS485 ports.

Netmask: This program code allows the entry of the network mask. Internet standards specify that each IP address has two parts – one part is the network address, and the other part is the host machine’s address on the network. Due to the dynamic nature of the Internet, these “parts” are not always divided up in the same place. There are different “classes” of networks, and hence different “masks” defining which bits in the IP address are the network portion of the address. The remaining bits are the host address.

A very common network, the class “C” network, has a netmask of 255.255.255.0. This means that the first 3 octets (24 bits) define the network, and the last octet (8 bits) defines the specific machine on the network. Taking into account the reserved addresses of 0 and 255, this allows for 254 hosts on a class “C” network.

Gateway: This address specifies where the host should send IP packets when the IP address has a different network than the host. This address specifies the address of a switch or router that will pass packets to networks other than the local network out to the Internet. Note that application layer protocols such as FTP or HTTP connecting to the miniBlend.net from outside do not require any value to be programmed here; this entry is only used for initiating a connection from the miniBlend.net to a point outside the local network.

Using the Smith Protocol Over TCP/IP

The miniBlend.net has a reserved port that supports Smith Meter Terminal communications. This protocol is currently fixed at port 7734. The miniBlend.net expects a single complete command to be contained in each packet received. The miniBlend.net will currently ignore fragmented commands or any additional commands after the first in a packet. Due to the relatively small size of the Smith Meter command frame, this usually poses no problem for the communicating client. However, most Telnet-type programs will attempt to send data as soon as it is entered, so the resulting packets received by the miniBlend.net do not have complete commands and are ignored. The BlendMate has a built in tool – the Terminal Emulator – that sends an entire command in one packet. Custom software written to communicate with the miniBlend.net can duplicate this functionality easily by submitting a completely formed communication command along with any required arguments to the TCP transport layer all at once.

Using a Web Browser to View miniBlend.net Information

By pointing your Web browser at the IP address of the miniBlend.net, you can retrieve various Web pages from the device showing the current state of operation, etc. For example, assuming a miniBlend.net programmed with address 192.168.1.13 is on your network. Enter **http://192.168.1.13** in your web browser to display the home page.

Appendix VI – Windows Setup of SLIP Ports

Windows 2000

- From *Control Panel*, select: *Network and Dial-up Connections*
- Select: *Make New Connection* to start the *New Connection* wizard
- Select: *Connect to Another Computer* on the first page of the wizard
- Select: *Guest* on second page of the wizard
- Select the desired comm. port on the third page of the wizard
- Select: *For all Users*
- Name the connection appropriately (i.e. “miniBlend.net SLIP connection”)
- If prompted to login, click *Properties* or return to *Network Connections* folder, find new connection, right click and select: *Properties*
- Under *General* tab verify the device port desired, click on *Configure*, set baud rate appropriately
- Under *Options* tab disable prompt for name and password, etc.
- Under *Networking* tab
  - Select *SLIP: UNIX Connection* in the *Type of Dial-up Server I am Calling* combo box
  - Clear all check boxes except for *Internet Protocol (TCP/IP)*
  - Click *Properties* for the Internet Protocol component
    - In the Properties dialog for the TCP/IP connection, select *Use the following IP Address*, and specify an address that is different but on the same subnet as the miniBlend.net (i.e. if your miniBlend.net is 192.168.0.1, make the address for the SLIP client 192.168.0.9 or similar.

Windows XP

- From *Control Panel*, select: *Network and Internet Connections*
- Select: *Create a New Connection* to start the *New Connection* wizard
- From the *Network Connection Type* page select: *Set up an advanced connection*
- From the Advanced Connection Options page select: Connect directly to another computer
- From the *Host or Guest?* page select *Guest*
- On the *Connection Name* page, name the connection appropriately (i.e. “miniBlend.net SLIP connection”)
- From the *Select a Device* page select Communications Cable between two Computers (COM _) from the list

- From the *Connection Availability* page select *Anyone's use*
- On the *Connect* page leave *Save this user name and password for the following users* unchecked
- From Connect page select: *Properties*
- Under *General* tab select *Communications cable between two computers* then, click on *Configure*, set baud rate appropriately
- Under *Options* tab uncheck *Dialing options*
- Under *Networking* tab
  - Select *SLIP: UNIX Connection* in the *Type of Dial-up Server I am Calling* combo box
  - Clear all checkboxes except for *Internet Protocol (TCP/IP)* and *QoS Packet Scheduler*
  - Click *Properties* for the Internet Protocol component
    - In the Properties dialog for the TCP/IP connection, select *Use the following IP Address*, and specify an address that is different but on the same subnet as the miniBlend.net (i.e. if your miniBlend.net is 192.168.0.1, make the address for the SLIP client 192.168.0.9 or similar.

Acoustic Coupler: A device that converts electrical signals into audio signals, enabling data to be transmitted over the public telephone network via a conventional telephone handset.

Address: A coded representation of the origin or destination of data.

Algorithm: A procedure for solution of a problem in a finite number of steps.

Applications Software: The applications tasks within a system that make the unit conform to the unique circumstances which it must control. Each task within the applications software performs a function corresponding to an external event such as xxx etc.

ASCII (American Standard Code for Information Interchange): This term is pronounced "asky." It is a seven-bit-plus-parity code established by ANSI to achieve compatibility between data services.

Assembly Language: A machine-oriented language designed to be used to write or express statements of an assembly program. The instruction code written in an assembly language is often a mnemonic code for assembling machine language computer instructions.

Asynchronous Transmission: Transmission in which time intervals between transmitted characters may be of unequal length. Transmission is controlled by start and stop bits at the beginning and end of each character.

Attenuation: The decrease in magnitude of a signal.

Bandwidth: The range of frequencies available for signaling; the difference expressed in Hertz between the highest and lowest frequencies of a band.

Baud: Unit of signaling speed. The speed in baud is the number of discrete conditions or signal events per second. If each signal event represents only one bit condition, baud rate equals bps. When each signal event represents other than one bit, e.g., digit, baud rate does not equal bps.

BCC (Block Check Character): The result of a transmission verification algorithm accumulated over a transmission block. It is normally appended at the end; (e.g., CRC, LRC).

Binary Coded Decimal Representation (BCD): A system of representing decimal numbers, in which each decimal digit is represented by a combination of four digits (bits). For example, the decimal value 6 is represented by 0110 in BCD, the decimal value 15 is represented by 0001 0101.

Binary Digit (bit): A numeral in the binary scale of notation. This digit may be zero or one, which is equivalent to an off or an on position value.

Bisynchronous Transmission (BSC): An IBM communications protocol which uses a defined set of control characters for synchronized transmission of binary coded data between stations in a data communications system.

Bit (Binary Digit): Contraction of "binary digit," the smallest unit of information in a binary system. A bit represents the choice between a one or zero condition. Block one or more records considered or transferred as a unit, particularly with reference to input and output.

Block Parity Check: In data transmission, it is an error detection technique, which is used in addition to parity checks. That is, in addition to bits, one or more check characters are added to each message transmitted. When received, if these characters match the one transmitted, the message is assumed correct, otherwise an error is noted.

BPS (Bits Per Second): Unit of data transmission rate.

Buffer: A storage device used to compensate for a difference in rate of data flow or event timing when transmitting data from one device to another.

Buss: One or more conductors used for transmitting signals, data or power. Often a buss acts as a common connection between several locations.

Byte: A binary element string operated upon as a unit and usually shorter than a computer "word." Eight-bit bytes are most common. A byte is also called a "character."

Carriage Return: In a character-by-character printing mechanism, the operation that causes the next character to be printed at the left margin.

Cathode Ray Tube (CRT): A television-like picture tube used in visual display terminals.

CCITT: International Telegraph and Telephone consultative Committee (from the French, Comite Consultatif International Telegraphique et Telephonique). An international consultative committee that sets international communications standards.

Character: The actual or coded representation of a digit, letter or special symbol.

Clock: Shorthand term for the source(s) of timing signals used in synchronous transmission. More generally: the source(s) of timing signals sequencing electronic events.

Code: A system of symbols and rules for use in representing information.

Compiler: A computer program that prepares a machine-language program from instructions or sub-routines written in a high-level language. A compiler usually generates more than one machine instruction for each symbolic instruction.

Computer: A device capable of solving problems by accepting data, performing prescribed operations on the data under direction of a stored program, and supplying the results of these operations.

Conditioning: The addition of equipment to a leased voice grade channel to provide minimum values of line characteristics required for transmission.

Console: The part of a computer that is used for communications between operators or service personnel and the system. The console contains lights, keys, switches, and related circuits for man-machine communication. The console may be used to control the machine manually, correct errors, determine the status of machine circuits, registers, and counters, determine the contents of storage, and manually revise the contents of storage.

Contention: The facility provided by the dial network or a port selector that allows multiple terminals to compete on a first-come-first-served basis for a smaller number of computer ports.

Conversational Mode: A procedure for communication between a terminal and the computer in which each entry from the terminal elicits a response from the computer and vice versa.

CPU (Central Processing Unit): Portion of a computer which directs the sequence of operations and initiates the proper commands to the computer for execution.

CR (Carriage Return): A formatting tool that moves the active position to the first character position of the same line.

CRC (Cyclic Redundancy Check): An error detection scheme in which the check character is generated by taking the remainder after dividing all the serialized bits in a block by a predetermined binary number.

CTS (Clear To Send): Physical modern interface control signal from data communications equipment (DCE) that indicates to the data terminal equipment (DTE) that it may begin data transmission.

Current Loop: Method of interconnecting terminals and transmitting signals, whereby a mark (binary 1) is represented by current on the line and a space (binary 0) is represented by the absence of current.

Data Integrity: A performance measure based on the rate of undetected errors.

Data Set: A device that converts the signals of a business machine to signals suitable for transmission over communication lines and vice versa. It may also perform other related functions.

DC (Device Control): A category of control characters primarily intended for turning on or off a subordinate device. Samples of DC characters are as follows: DC1, DC2, etc. (See X-ON and X-OFF).

DCE (Data Communications Equipment): The equipment that provides the functions required to establish, maintain and terminate a data transmission connection; e.g., a modem.

Debugging: The process of identifying and correcting mistakes in a computer program.

DIP (Dual In-Line Package): An electronic component package characterized by two rows of external connecting pins which are inserted into the holes of the printed circuit board.

Diskette: A small magnetic disk (resembles a 45-rpm record), which is sealed in a square plastic jacket and weighs less than 2 ounces.

DTE (Data Terminal Equipment): The equipment acting as data source, data sink or both.

EIA (Electronic Industries Association): A standards organization in the U.S.A. specializing in the electrical and functional characteristics of interface equipment.

EIA-232C: Interface between data terminal equipment and data communication equipment employing unbalanced voltage digital interface circuits.

EIA-422: Electrical characteristics of balanced-voltage digital interface circuits.

Emulate: To imitate a computer system by a combination of hardware and software that allows programs written for one computer to run on another.

Ethernet: Networking technology popularly used for Local Area Networks (LANs)

ETX (End of Text): A transmission control character which terminates a text.

File Maintenance: The activity of keeping a file up-to-date by adding, changing or deleting data.

Firmware: A computer program or software stored permanently in PROM or ROM or semi-permanently in EPROM.

FTP: File Transfer Protocol, an application layer protocol used on TCP/IP networks especially for moving large files between hosts on the internet.

Full-duplex: Simultaneous, two-way, independent transmission in both directions.

Half-duplex: Transmission in either direction, but not both directions simultaneously.

Handshaking: Exchange of predetermined signals between two devices for purposes of control.

Hardcopy: A printed copy of machine output in readable form, for example, reports, listings, documents, summaries.

HDLC (High Level Data Link Control): The international standard communication protocol defined by ISO.

Header: The control information prefixed in a message text, e.g., source or destination address, sequence number or message length or type.

Hertz (Hz): A measure of frequency or bandwidth. The same as cycles per second.

Hexadecimal Number System: The number system with the base of sixteen. In hexadecimal, the first ten digits are 0 9 and the last six digits are represented by the letters A-F.

HTTP: Hypertext Transfer Protocol; an application-level protocol used widely on the World Wide Web

Impact Printer: A printer forms characters by the use of print hammers that press the paper and ribbon against selected type characters as they pass in front of the paper. Type characters are commonly mounted on a moving chain or are engraved on the face of a rotating drum. Typical speeds range from 500 to 2,000 lines per minute.

ISO: International Standards Organization.

KSR: Keyboard Send/Receive. A combination teleprinter transmitter and receiver with transmission capability from keyboard only.

LAN: Local Area Network; A data communications system handling a few nodes up to several hundred, confined to a few buildings within a few thousand meters of one another.

Line Driver: A signal converter which conditions a digital signal to ensure reliable transmission over an extended distance.

Line Turnaround: The reversing of transmission direction from sender to receiver or vice versa when using a half-duplex circuit.

Local Line, Local Loop: A channel connecting the subscriber's equipment to the line terminating equipment in the central office. Usually a metallic circuit (either 2-wire or 4-wire).

LRC (Longitudinal Redundancy Check): An error detection scheme in which the check character is a 7 bit ASCII character calculated as the exclusive (OR) sum of all characters excluding itself in the packet of transmitted information.

Magnetic Disk: A storage device of magnetically coated disks, on the surface of which information is stored in the form of magnetic spots arranged in a manner to represent binary data. These data are arranged in circular tracks around the disks, are accessible to reading and writing heads on an arm that can be moved mechanically to the desired disk, and then to the desired track on that disk. Data from a given track is read or written sequentially as the disk rotates.

Magnetic Tape: An external storage medium in the form of a ferrous oxide coating on a reel of metallic or plastic tape on which bits may be recorded magnetically as a means of retaining data.

Mark: Presence of signal. In telegraph communication, a mark represents the closed condition or current flowing. A mark impulse is equivalent to a binary 1.

Message Format: Rules for the placement of such portions of a message as message heading, address text, and end of message.

Minicomputer: A computer usually weighing less than 50 pounds, that contains a relatively small internal memory and that can accept peripherals such as disk storage, magnetic tape units and line printers.

Mnemonic Code: Instructions for the computer written in a form that is easy for the programmer to remember. A program written in mnemonics must be converted to machine code prior to execution.

Modem (Modulator-Demodulator): A device used to convert serial digital data from a transmitting terminal to a signal suitable for transmission over a telephone channel or to reconvert the transmitted signal to serial digital data for acceptance by a receiving terminal.

Multiplexer: A device used for division of a transmission facility into two or more sub-channels either by splitting the frequency band into narrower bands (frequency division), or by allotting a common channel to several different transmitting devices, one at a time (time division).

Noise: In communication theory, an undesired disturbance in a communication system. Noise can generate errors or spurious messages. Contrast with signal.

Null Modem: A device that connects two DTE devices directly by emulating the physical connections of a DCE device.

Off-line: Pertaining to equipment or devices not under direct control of the central processing unit.

On-line: Pertaining to equipment or devices in direct communication with the central processing unit.

Operating System: The operating system supplies all services and utilities to the applications task necessary to run the system efficiently. The operating system provides priorities and schedules of the different applications tasks.

Packet: A group of binary digits, including data and call control signals, which is switched as a whole. The packet information is arranged in a specific format.

Parallel Transmission: Byte-wide data transmission that allocates a data line for each bit in a word. Transmission is usually unidirectional.

Parity Check: Addition of non-information bits to data, making the number of ones in a byte (bit group) either always odd or always even. This permits detection of errors in blocks that have a single error.

Perforator: A keyboard device for punching paper tape.

Polling: A centrally controlled method of calling a number of devices, by sequential inquiry, to permit them to transmit information.

Port: An interface on a computer configured as data terminal equipment and capable of attaching a modem for communication with a remote data terminal.

Priority or Precedence: Controlled transmission of messages in order of their designated importance; e.g., urgent or routine.

Program: An explicit set of steps or instructions that directs the computer and coordinates the operation of the various hardware components.

PROM (Programmable Read Only Memory): Non-volatile memory chip that allows a program to reside permanently in a piece of hardware.

Protocol: A formal set of conventions governing the formatting and relative timing of message exchange between two communicating systems.

Punched Paper Tape: A strip of paper on which characters are represented by combinations of punched holes.

Real Time: Pertaining to the actual time during which a physical process takes place. Pertaining to the performance of a computation during a period, short in comparison, with the actual time that the related physical process takes place in order that results of the computations can be used in guiding the physical process.

Queue: A waiting line or area.

RAM: Random Access Memory. Semiconductor read-write volatile memory. Data stored is lost if power is turned off.

Redundancy Check: A technique of error detection involving the transmission of additional data related to the basic data in such a way that the receiving terminal, by comparing the two sets of data, can determine to a certain degree of probability whether an error has occurred in transmission.

Re-perforator: A device that automatically punches a paper tape from received signals.

Response Time: The elapsed time between the generation of the last character of a message at a terminal and the receipt of the first character of the reply. It includes terminal delay and network delay.

ROM: Read-Only Memory. Non-volatile semiconductor memory manufactured with predefined data content, permanently stored.

RTS (Request to Send): Physical modem interface control signal from DTE, requesting clearance to transmit.

SDLC (Synchronous Data Link Control): IBM standard communication protocol superseding BSC.

SLIP (Serial Line Internet Protocol): The microLoad.net communications ports communicate with a minicomputer type device using TCP/IP over a serial communications line.

Secondary Storage: A storage that principally supplements primary storage. Secondary storage devices include magnetic disk units, magnetic drums, and magnetic tape. Secondary storage is characterized by slower speed of operation and correspondingly lower cost than those related to primary storage.

Sector: A portion of a track (from a magnetic disk) whose shape is similar to a slice of pie. Each track is equally divided into sectors, in which each sector may have its own distinct address.

Selective Calling: The ability of a transmitting station to specify which of several stations on the same line is to receive a message.

Serial Transmission: A method of data transmission in which each bit of information is sent sequentially on a single data channel. Serial transmission is the normal transmission mode for data communications.

Short Haul Modem: A signal converter which conditions a digital signal to ensure reliable transmission over DC continuous private line metallic circuits without interfering with adjacent pairs in the same telephone cable.

Signal: In communication theory, an intentional disturbance in a communication system. Contrast with noise.

Simplex Transmission: Data Transmission in one direction only.

Single-Address Message: A message to be delivered to only one destination.

Start Bit: In a synchronous transmission, the last bit or element in each character, normally a mark, to which is assigned a minimum duration during which the receiving equipment is returned to its rest condition in preparation for the reception of the next character.

Start Bit: In asynchronous transmission, the first bit or element in each character, normally a space, which prepares the receiving equipment for the reception and registration of the character.

Stop Bit: In start-stop transmission, the last bit or element in each character, normally a mark, to which is assigned a minimum duration, during which the receiving equipment is returned to its rest condition in preparation for the reception of the next character.

Storage: A general term for any device capable of retaining information.

STX (Start of Text): A transmission control character which precedes a text and which is used to terminate a heading.

Synchronous Transmission: Transmission where the data characters and bits are transmitted at a fixed rate with the transmitter and receiver synchronized. Synchronous transmission eliminates the need for start and stop bits.

Table: An organized collection of data, usually arranged in an array where each item in the array is uniquely identifiable by some label or by its relative position. Items in a table are easier to locate or identify, and thus provide a ready reference.

TC (Transmission Control): Category of control characters intended to control transmission of information over telecommunication networks. Samples of TC characters are as follows: ACK, DLE, ENQ, EOT, ETB, ETX, NAK, SOH, STX and SYN.

TCP/IP: Transfer Control Protocol/Internet Protocol; protocol used to reliably send messages across a network or the internet.

Voice Grade Channel: A channel suitable for transmission of speech, digital or analog data, or facsimile, generally with a frequency range of about 300 to 3000 Hertz.

Word: A set of characters that occupies one storage location and is treated by the computer circuits as a unit and is transported as such. Word lengths are fixed or variable, depending on the particular computer and program.

X-OFF (Transmitter Off, DC3): The communication control character used to instruct a terminal to suspend transmission.

X-ON (Transmitter On, DC1): The communication control character used to instruct a terminal to start or resume transmission.

Section VII – Related Publications

Specification	Bulletin SSMB001
Installation	Bulletin MNMB001
Operator Reference	Bulletin MNMB002
Operations	Bulletin MNMB003
Communications	Bulletin MNMB004
Modbus Communications	Bulletin MNMB005
BlendMate Installation/Operations	Bulletin MNMB006

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