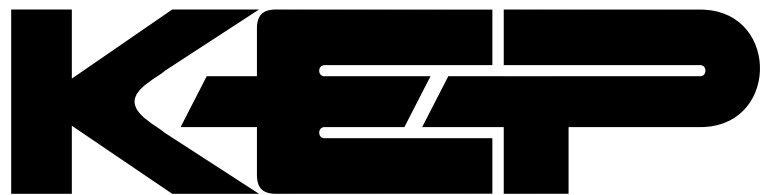


***Universal
Communications
Protocol***



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Introduction

This document contains the specifications for the software protocol for the serial link of all new and future KEP products. This protocol is used with RS232.

This protocol is to apply to all new and future KEP units. This simple protocol is assumed to not require data checking which would be present for modem usage which is a future option.

Alternate protocols for OEM's are exempt from this requirement if an alternative protocol has been specified.

Protocol Summary

The protocol may be summarized as a Full Duplex, Master-Slave Protocol. Many KEP products contain transmitter control hardware to support multidrop connections on RS232.

Commands have the following format:

Dnncxx,yy<CR>	read cell addressed by xx,yy
Dnncxx,yypppp<CR>	Write the value pppp to cell addressed by xx,yy
Dnncxx,yyaaaa<CR>	Write text string aaaa to string cell addressed by xx,yy

Field Descriptions

D	first character must be upper or lower case "d"
nn	device number, ascii 00-99
c	command letter
xx,yy	variable serial address 00,00 thru 99,99. Comma is optional.
pppp	ascii numeric entry to be written
aaaa	ascii text string to be written
<CR>	carriage return character, hex value 0x0D

Syntax Summary

nn	00-99
c	"V" or "v" value command "H" or "h" header command "U" or "u" units command "M" or "m" message string command
xx	00-99 command group
yy	00-99 specific command within group
pppp	ascii numeric string may also contain a negative sign and decimal point
aaaa	ascii text string, if a null string is desired send two double quotes, "".

Command Line Editing Capabilities

Some products accept the backspace character before a <CR> for line editing. Supertrol 1 does not support this function. Command lines in progress are cancelled by sending an escape, <ESC> (0x1B), followed by a <CR> (0x0D).

Description and operation

An instrument is programmed by writing numeric values or ascii strings into a series of cells that have been defined for the instrument. Each cell conceptually has a value field, header field and units field. Message cells have text fields only. The fields may have attributes of “read only”, “read/write”, “write only” or not accessible. Refer to the protocol definitions for your particular product.

To promote uniformity, a list of common cell usages and selections will be maintained by the engineering department for incorporation into new designs so as to permit standardization.

Parsing and Interpretation by the instrument

The command is parsed by the unit following reception of a <CR>. Any appended <LF> characters will be ignored.

The Master must wait for the Slave to respond with data or an error code, followed by a <CR><LF>, before sending the next command. The reset communications sequence of <ESC><CR> may be sent at any time however.

Responses to a command could be:

- a) ascii numeric value of cell
- b) ascii text header of a cell
- c) ascii text units of a cell
- d) error/verification code response

Communications Considerations for Driver Implementation

Architecture and Configuration

The communications architecture is a simple Master to Slave, polled response type whereby a single Master polls one or more Slave devices over an RS232 multidrop link.

The PLC or PC is considered the Master and the Flow Computer is considered the Slave.

Note: The Slave device has the facility to print at specified intervals or time of day. It may also print when certain pushbutton or batch events occur. These capabilities should be turned off manually or serially to avoid packet collisions while using the KEP Universal Protocol.

The serial port parameters must match between the slave devices and the master. I.e. baud rate, parity etc.

Each slave on a multidrop line must have a unique ID or serial contention will result.

Master must know all the slave IDs to make efficient use of the connection.

Timing issues must be addressed.

Timing Issues

The KEP Protocol was designed to be simple ascii character based. Please consider the following important points when writing a Master Device Driver for the KEP Universal Protocol:

- 1) When the Master sends a command to the slave the execution character, <CR>, should be withheld until the command has been repeated back by the slave with no errors. This may take at least several character times plus 20ms to resolve Slave transmitter control on the multidrop RS232. When the "dnn" portion of the command is received by the slaves the addressed device turns on its transmitter and all other devices turn them off. The addressed Slave then initiates a repeat of all characters received, including the initial "dnn". The final <CR> character is sent if the command repeats back correctly. Waiting for the command repeat gives some security to the protocol. The <CR> can be sent along with the actual command string if the read back before execution is not important though.
- 2) When the final execution character, <CR>, of the command is sent by the Master it may take between 50ms and 400ms to receive a response depending on the type of unit and its setup. This is because the slave response follows parsing and execution of the command which takes a low priority in relation to the internal workings of the unit. Therefore the Master should not send any other commands until a response is received terminated with a <CR><LF>. If the maximum response time has been exceeded then the Master should clear the line by sending an <ESC><CR> and waiting 200ms.

Error Codes

The error codes in the protocol are ascii text messages. This complex response was developed to assist users with dumb terminals interpret responses. The responses are:

- | | |
|----------------------|--|
| 1) OK | - Command was valid and executed |
| 2) COMMAND NOT FOUND | - The specified cell address is not defined |
| 3) INVALID COMMAND | - The command code was invalid for this cell address |
| 4) READ ONLY ITEM | - Write command failed because it is read only |
| 5) BAD VALUE | - The value specified is out of range or not defined |
| 6) INACTIVE ITEM | - Item chosen not valid in current setup |

It is up to the Master devices application layer as to what action should be taken after encountering the above responses.

Universal Matrix Access Table

Key

R = Read Only
 W = Write Only
 R/W = Read and Write

Process Parameters Group Selection (Group 00)

Title	Address	Value	Header	Unit	Selections	Value	Comments
Heat Flow	00,00	R	R/W	R	n/a	n/a	St2/DXF
Mass Flow	00,01	R	R/W	R	n/a	n/a	St1/All
Corrected Volume Flow	00,02	R	R/W	R	n/a	n/a	St1/All
Volume Flow	00,03	R	R/W	R	n/a	n/a	St1/All
Temperature	00,04	R	R/W	R	n/a	n/a	St1/All
Temperature2	00,05	R	R/W	R	n/a	n/a	All
Delta Temperature	00,06	R	R/W	R	n/a	n/a	All
Pressure	00,07	R	R/W	R	n/a	n/a	All
Diff Pressure	00,08	R	R/W	R	n/a	n/a	All
Density	00,09	R	R/W	R	n/a	n/a	St1/All
Spec Enthalpy	00,10	R	R/W	R	n/a	n/a	All
Date	00,11	R	R	R	n/a	n/a	St1/All
Time	00,12	R	R	R	n/a	n/a	St1/All
Level	00,15	R	R	R	n/a	n/a	LT2
Peak Demand	00,16	R	R	R	n/a	n/a	St2
Demand Last Hour	00,17	R	R	R	n/a	n/a	St2
Peak Demand Time	00,18	R	R	R	n/a	n/a	St2
Peak Demand Date	00,19	R	R	R	n/a	n/a	St2
Viscosity	00,20	R	R	R	n/a	n/a	DXF
Reynolds Number	00,21	R	R	R	n/a	n/a	DXF

Totalizer Group Selection (Group 01)

Title	Address	Value	Header	Unit	Selections	Value	Comments
Heat Total	01,00	R	R/W	R	n/a	n/a	All
Grand Heat Total	01,01	R	R/W	R	n/a	n/a	All
Mass Total	01,02	R	R/W	R	n/a	n/a	St1/All
Grand Mass	01,03	R	R/W	R	n/a	n/a	St1/All
Corrected Volume Total	01,04	R	R/W	R	n/a	n/a	St1/All
Grand Corrected Volume	01,05	R	R/W	R	n/a	n/a	St1/All
Volume Total	01,06	R	R/W	R	n/a	n/a	St1/All
Grand Volume	01,07	R	R/W	R	n/a	n/a	St1/All

Units Group Selection (Group 02)

<u>Title</u>	<u>Address</u>	<u>Value</u>	<u>Header</u>	<u>Unit</u>	<u>Selections</u>	<u>Value</u>	<u>Comments</u>
Time Base	02,00	R/W	R	n/a	Sec	0.0	St1/St2
					Min	1	St1/St2
					Hour	2	St1/St2
					Day	3	St1/St2
Heat Flow Units	02,01	R/W	R	n/a	kBtu/<Time>	0.0	St2
					kW	1	St2
					MJ/<Time>	2	St2
					kCal/<Time>	3	St2
					MW	4	St2
					tons	5	St2
					GJ/<Time>	6	DXF
					Mcal/<Time>	7	DXF
Gcal/<Time>	8	DXF					
Mass Flow Units	02,02	R/W	R	n/a	lbs/<time>	0.0	St2
					kg/<time>	1	St2
					g/<time>	2	St2
					t/(met)<time>	3	St2
					ton(us)<time>	4	St2
ton(long)<time>	5	St2					
Std Vol Flow Units	02,03	R/W	R	n/a	bb/<time>	0.0	St2
					gal/<time>	1	St2
					l/<time>	2	St2
					hl/<time>	3	St2
					dm3/<time>	4	St2
					ft3/<time>	5	St2
					m3/<time>	6	St2
					scf/<time>	7	St2
					Nm3/<time>	8	St2
					NI/<time>	9	St2
igal/<time>	10	St2					
Vol Flow Units	02,04	R/W	R	n/a	bb/<time>	0.0	St2
					gal/<time>	1	St2
					l/<time>	2	St2
					hl/<time>	3	St2
					dm3/<time>	4	St2
					ft3/<time>	5	St2
					m3/<time>	6	St2
					acf/time	7	St2
igal/<time>	8	St2					
Temperature Units	02,05	R/W	R	n/a	Deg C	0.0	St1/St2/LT2
					Deg F	1	St1/St2/LT2
					Deg K	2	St2/LT2
					Deg R	3	St2/LT2
Pressure Units	02,06	R/W	R	n/a	bara	0.0	St2
					kpa	1	St2
					kc2a	2	St2
					psia	3	St2
					barg	4	St2
					psig	5	St2
					kpag	6	St2
kc2g	7	St2					
Diff Pres Units	02,07	R	R	n/a	-	-	St2

Units Group Selection (Group 02) (continued)

Title	Address	Value	Header	Unit	Selections	Value	Comments
Density Units	02,08	R/W	R	n/a	kg/m3	0.0	St2
					kg/dm3	1	St2
					#/gal	2	St2
					#/ft3	3	St2
Specific Enthalpy Units	02,09	R/W	R	n/a	btu/#	0.0	St2
					kW-Hr	1	St2
					MJ/kg	2	St2
					kCal/kg	3	St2
Viscosity Units	02,10	n/a	n/a	n/a	n/a	-	Future
Heat Total Units	02,11	R/W	R	n/a	kBtu	0.0	St2
					kW-Hr	1	St2
					MJ	2	St2
					kCal	3	St2
					MWH	4	St2
					ton-hr	5	St2
					GJ	6	DXF
					Mcal	7	DXF
					Gcal	8	DXF
Mass Total Units	02,12	n/a	R	R/W	n/a	n/a	St1/LT2
Mass Total Units	02,12	R/W	R	n/a	lbs	0.0	St2
					kg	1	St2
					g	2	St2
					t(metric)	3	St2
					ton(us)	4	St2
					ton(long)	5	St2
Std Vol Total Units	02,13	R/W	R	n/a	bbl	0.0	St2
					gal	1	St2
					l	2	St2
					hl	3	St2
					dm3	4	St2
					ft3	5	St2
					m3	6	St2
					scf	7	St2
					Nm3	8	St2
					NI	9	St2
					igal	10	St2
Volume Total Units	02,14	n/a	R	R/W	n/a	n/a	St1/LT2
Volume Total Units	02,14	R/W	R	n/a	bbl	0.0	St2
					gal	1	St2
					l	2	St2
					hl	3	St2
					dm3	4	St2
					ft3	5	St2
					m3	6	St2
					acf	7	St2
					igal	10	St2

Units Group Selection (Group 02) (continued)

<u>Title</u>	<u>Address</u>	<u>Value</u>	<u>Header</u>	<u>Unit</u>	<u>Selections</u>	<u>Value</u>	<u>Comments</u>
Define bbl Units	02,15	R/W	R	n/a	US:31.0 ga/bbl	0.0	St2
					US:31.5 ga/bbl	1	St2
					US:42.0gal/bbl	2	St2
					US:55.0gal/bbl	3	St2
					IMP:36.0gal/bbl	4	St2
				IMP:42.0gal/bbl	5	St2	
Level Units	02,16	n/a	R	R/W	n/a	n/a	LT2
Length Units	02,17	R/W	R	n/a	mm	0.0	St2/DXF
					in	1	St2/DXF

System Parameters Group Selection (Group 03)

<u>Title</u>	<u>Address</u>	<u>Value</u>	<u>Header</u>	<u>Unit</u>	<u>Selections</u>	<u>Value</u>	<u>Comments</u>
Instrument Function	03,00	R/W	R	n/a	Rate/Tot	0.0	St1
					Batch	1	St1
					Level/Tot	2	LT2
Flow Equation	03,01	R/W	R	n/a	Steam Mass	0.0	st2
					Steam Heat	1	st2
					Steam Net Heat	2	st2
					Steam Del Heat	3	st2
					Corr Gas Vol	4	st2
					Gas Mass	5	st2
					Gas Comb. Heat	6	st2
					Liq Cor/Vol	7	St1/All
					Liq Mass	8	St1/All
					Liq Comb. Heat	9	st2
					Sens. Liq Heat	10	st2
					Liq Delta Heat	11	st2
					Spread Sheet	12	Future
Volume	13	St1					
Operator Password	03,02	R/W	R	n/a	n/a	n/a	St1/All
Supervisor Password	03,03	R/W	R	n/a	n/a	n/a	St1/St2
Count Mode	03,04	R/W	R	n/a	Up	0.0	St1
					Down	1	St1
Batch Status	03,05	R	n/a	n/a	Filling	0.0	St1
					Stopped	1	St1
					Idle	2	St1
Batch Control	03,06	write	n/a	n/a	Start	0.0	St1
					Stop	1	St1
					Clear	2	St1
Batch Overrun	03,07	R/W	R	n/a	NO	0.0	St1
					YES	1	St1
Totalizer Reset	03,08	write	n/a	n/a	n/a	n/a	St1/All
Alarm Reset	03,09	write	n/a	n/a	n/a	n/a	St1/All
Access Code	03,10	write	R	n/a	n/a	n/a	St2/DXF
Operating Mode	03,11	write	n/a	n/a	n/a	n/a	St2/DXF
Quick Setup	03,12	n/a	n/a	n/a	n/a	n/a	n/a
Batch Direction	03,13	R/W	R	n/a	Out	0.0	LT2
					In	1	LT2

System Parameters Group Selection (Group 03) (continued)

<u>Title</u>	<u>Address</u>	<u>Value</u>	<u>Header</u>	<u>Unit</u>	<u>Selections</u>	<u>Value</u>	<u>Comments</u>
Auto Batch Restart	03,14	R/W	n/a	n/a	off	0.0	St1
					on	1	St1
Batch Restart Delay Time	03,15	R/W	n/a	n/a	seconds	0-99	St1

Function Key Group Selection (Group 04)

<u>Title</u>	<u>Address</u>	<u>Value</u>	<u>Header</u>	<u>Unit</u>	<u>Selections</u>	<u>Value</u>	<u>Comments</u>
Key Select	04,00	R/W	n/a	n/a	n/a	n/a	DXF
Key Usage	04,01	R/W	R	n/a	language	0.0	DXF
					Measuring Sys	0.0	DXF
					Quick Setup	0.0	DXF
					Rate and Total	1	DXF
					Total and Grand	2	DXF
					Clear Total	3	DXF
					Print Trans	4	DXF
					Ack+Clr Alarm	5	DXF
					Change Setpt1	6	DXF
					Change Setpt2	7	DXF
					Temp+Density	8	DXF
					Temp+Press	9	DXF
					Temp+Temp2	10	DXF
					Del Temp+VFlow	11	DXF
					Diff Press+VFlow	12	DXF
					Enthalpy+Density	13	DXF
					Viscosity + Reynolds	14	DXF

Flow Input Group Selection (Group 05)

<u>Title</u>	<u>Address</u>	<u>Value</u>	<u>Header</u>	<u>Unit</u>	<u>Selections</u>	<u>Value</u>	<u>Comments</u>
Meter Type	05,01	R/W	R	n/a	Prowhirl	0.0	DXF
					Promag	1	DXF
					Delta Bar	2	DXF
					Linear	3	All
					Sqr law w/o sqrt	4	ST1/ST2
					Orifice	4	DXF
					Sqr law w/ sqrt	5	St2
					Orifice Linearized	5	DXF
					Linear 16 pt.	6	All
					Sqr law 16PT w/o sqrt	7	St2
					Orifice 16 PT	7	DXF
					Sqr law 16PT w/ sqrt	8	St2
					Orifice Lin. 16 PT	8	DXF
					UVC	9	St2
					Nozzle	9	DXF
					Nozzle linearized	10	DXF
					Nozzle 16pt	11	DXF
					Nozzle lin. 16pt	12	DXF
					Pitot	13	DXF
					Pitot Linearized	14	DXF
					Pitot 16pt	15	DXF
					Pitot Lin. 16pt	16	DXF
					Basic sqr law	17	DXF
					Basic sqr law lin.	18	DXF
					UVC	19	DXF

Flow Input Group Selection (Group 05) (continued)

Title	Address	Value	Header	Unit	Selections	Value	Comments
Square law Flow Meter	05,02	R/W	R	n/a	Orifice	0.0	St2
					V-cone	1	St2
					Annubar	2	St2
					Pitot	3	St2
					Venturi	4	St2
					Flow Nossle	5	St2
					TARGET	6	St2
Input Signal Type	05,03	R/W	R	n/a	Wedge	7	St2
					PFM	0.0	DXF
					Dig, 10mV	1	St1/All
					Dig, 100mV	2	St1/All
					Dig, 2.5Vdc	3	St1/All
					4-20mA	4	St1/All
					0-20mA	5	St1/All
					0-5Vdc	6	St1/All
					1-5Vdc	7	St1/All
					0-10Vdc	8	St1/All
					Quadrature	9	St1
4-20mA Stacked	10	ST2					
0-20mA Stacked	11	ST2					
Low Scale	05,05	R/W	R	R	n/a	n/a	St1/All
High Scale	05,06	R/W	R	R	n/a	n/a	St1/All
Low Cutoff	05,07	R/W	R	R	n/a	n/a	St1/All
Low Alarm	05,08	R/W	R	R	n/a	n/a	St1/All
High Alarm	05,09	R/W	R	R	n/a	n/a	St1/All
DP Factor	05,10	R/W	R	R	n/a	n/a	ST2/DXF
KA-Factor	05,11	R/W	R	R	n/a	n/a	St1/All
Low Pass Filter	05,12	R/W	R	n/a	40Hz	40	St1 v3.xx
					3KHz	3000	St1 v3.xx
					20KHz	20000	St1 v3.xx
					40Hz	0.0	St1 v4.xx
					3KHz	1	St1 v4.xx
					20KHz	2	St1 v4.xx
Trigger Level	05,13	R/W	R	n/a	10mV	0.0	St1/All
					100mV	1	St1/All
					2.5V	2	St1/All
Input Termination	05,14	R/W	R	n/a	Pullup	0.0	St1/All
					Pulldown	1	St1/All
					None	2	St1/All
Housing Expansion	05,15	R/W	R	R	n/a	n/a	ST2/DXF
Excitation Voltage	05,16	R/W	R	n/a	5V	0.0	St1
					12V	1	St1
					24V	2	St1
Sample Window Time	05,17	R/W	R	n/a	n/a	n/a	St1
Current Input Value	05,18	R	n/a	n/a	n/a	n/a	St2
Inlet Pipe Bore	05,19	R/W	R	R	n/a	n/a	St2
Local Gravity	05,20	R/W	R	R	n/a	n/a	St2
Low Scale High Range	05,21	R/W	R	R	n/a	n/a	Stacked DP
High Scale High Range	05,22	R/W	R	R	n/a	n/a	Stacked DP
Switch Up DP	05,23	R/W	R	R	n/a	n/a	Stacked DP
Switch Down DP	05,24	R/W	R	R	n/a	n/a	Stacked DP
Calibration Density	05,25	R/W	R	R	n/a	n/a	St2
KB-Factor	05,26	R/W	R	R	n/a	n/a	St1
Pulse Input Type	05,27	R/W	R	n/a	single	0.0	St1
					pulse security PS(A=B)	1	St1
					Quad x 1	2	St1
					Quad x 2	3	St1

Flow Input Group Selection (Group 05) (continued)

<u>Title</u>	<u>Address</u>	<u>Value</u>	<u>Header</u>	<u>Unit</u>	<u>Selections</u>	<u>Value</u>	<u>Comments</u>
View Input Signal	05,28	R	R	n/a	n/a	St2	
View Input Signal High Flow		05,29	R	R	n/a	n/a	St2
Flowmeter Location	05,30	R/W	R	n/a	Cold HOT	0.0 1	ST2/DXF ST2/DXF
DP Beta	05,31	R/W	R	R	n/a	n/a	ST2/DXF

Linearization Table Group (Group 06)

<u>Title</u>	<u>Address</u>	<u>Value</u>	<u>Header</u>	<u>Unit</u>	<u>Selections</u>	<u>Value</u>	<u>Comments</u>
Point No.	06,01	R/W	n/a	n/a	n/a	n/a	St1/All
X-Value Table A	06,02	R/W	n/a	n/a	n/a	n/a	St1/All
Y-Value Table A	06,03	R/W	n/a	n/a	n/a	n/a	St1/All
reserved for extra point #	06,04	n/a	n/a	n/a	n/a	n/a	n/a
X-Value Table B	06,05	R/W	n/a	n/a	n/a	n/a	St1
Y-Value Table B	06,06	R/W	n/a	n/a	n/a	n/a	St1

Display Group (Group 07)

<u>Title</u>	<u>Address</u>	<u>Value</u>	<u>Header</u>	<u>Unit</u>	<u>Selections</u>	<u>Value</u>	<u>Comments</u>
Setup Rate Averaging filter	07,00	R/W	R	n/a	n/a	n/a	St1
Line Select	07,01	R/W	n/a	n/a	n/a	n/a	St2
Display List	07,02	R/W	n/a	n/a	n/a	n/a	St2
Display Damping	07,03	R/W	R	n/a	n/a	n/a	St2
Display Contrast	07,04	R/W	R	n/a	n/a	n/a	DXF
Maxium Decmial Point	07,05	R/W	R	n/a	n/a	n/a	St1/St2
Language	07,06	R/W	R	n/a	n/a	n/a	St2
Quick Update	07,07	R/W	R	n/a	n/a	n/a	St1
Total Decimal Point	07,10	R/W	R	n/a	n/a	n/a	St1
Rate Decimal Point	07,11	R/W	R	n/a	n/a	n/a	St1
Temperature Decimal Point	07,12	R/W	R	n/a	n/a	n/a	St1
Density Decimal Point	07,13	R/W	R	n/a	n/a	n/a	St1
Level Decimal Point	07,14	R/W	R	n/a	n/a	n/a	LT2

Compensation Input (Group 08)

<u>Title</u>	<u>Address</u>	<u>Value</u>	<u>Header</u>	<u>Unit</u>	<u>Selections</u>	<u>Value</u>	<u>Comments</u>
Channel	08,00	R/W	R	n/a	n/a	n/a	St2
Usage	08,01	R/W	R	n/a	Input1 not used	0.0	St1/All
					RTD Temp1	1	St1/All
					4-20mA Temp1	2	St1/All
					0-20mA Temp1	3	St1/All
					Manual Temp1	4	St2
					Input2 Not Used	5	St2
					4-20mA Press	6	St2
					0-20mA Press	7	St2
					Manual Press	8	St2
					4-20mA(abs Press)	9	St2
					0-20mA(abs Press)	10	St2
					RTD Temp2	11	St2
					4-20mA Temp2	12	St2
					0-20mA Temp2	13	St2
					Manual Temp2	14	St2
					4-20mA Dens	15	St1/All
					0-20mA Dens	16	St1/All
					Manual Dens	17	St2
					0-10V Dens	18	St1
					0-5V Dens	19	St1
					1-5V Dens	20	St1
					0-10V Temp	21	St1
					0-5V Temp	22	St1
					1-5V Temp	23	St1
Input Signal	08,02	read	n/a	n/a	n/a	n/a	n/a
Low Scale	08,03	R/W	R	R	n/a	n/a	St1/All
High Scale	08,04	R/W	R	R	n/a	n/a	St1/All
Default	08,05	R/W	R	R	n/a	n/a	St1/All
Low Alarm	08,06	R/W	R	R	n/a	n/a	St1/All
High Alarm	08,07	R/W	R	R	n/a	n/a	St1/All
Barometric	08,08	R/W	R	R	n/a	n/a	St2
Stp. Ref	08,09	R/W	R	R	n/a	n/a	St2
Density Extraction Method	08,10	R/W	R	n/a	Therm Expan Coef	0.0	St1
					API 2540	1	St1
Veiw Compensation In1	08,11	R	R	R	n/a	n/a	ST2
Veiw Compensation In2	08,12	R	R	R	n/a	n/a	ST2
Low Delta T Cutoff	08,13	R/W	R	R	n/a	n/a	DXf
Calibration Temperature	08,14	R/W	R	R	n/a	n/a	ST2/DXF

Control Input (Group 09)

<u>Title</u>	<u>Address</u>	<u>Value</u>	<u>Header</u>	<u>Unit</u>	<u>Selections</u>	<u>Value</u>	<u>Comments</u>
Channel	09,00	R/W	R	n/a	Input 1	0.0	St1 v3.xx
					Input 2	1	St1 v3.xx
					Input 3	2	St1 v3.xx
Usage	09,01	R/W	R	n/a	Not Used	0.0	St1 v3.xx
					Inhibit Totalizer	1	St1 v3.xx
					Reset Total	2	St1 v3.xx
					Print	3	St1 v3.xx
					Ack Alarms	4	St1 v3.xx
					Start	5	St1 v3.xx
					Reset/Start	6	St1 v3.xx
					Stop	7	St1 v3.xx
					Stop/Reset	8	St1 v3.xx
					Reset Batch	9	St1 v3.xx
Key Lock	10	St1 v3.xx					
Current Status	09,02	R	n/a	n/a	Off	0.0	St1 v3.xx
					On	1	St1 v3.xx
Control Input 1 Usage	09,03	R	R	n/a	Not Assigned	0.0	St1 v4.xx
					Inhibit Totalizer (R/T)	1	St1 v4.xx
					Start (batch)	5	St1 v4.xx
					Reset/Start (batch)	6	St1 v4.xx
Control Input 2 Usage	09,04	R	R	n/a	Not Assigned	0.0	St1 v4.xx
					Reset Total (R/T)	2	St1 v4.xx
					Stop (batch)	7	St1 v4.xx
					Stop/Reset (batch)	8	St1 v4.xx
Control Input 3 Usage	09,05	R	R	n/a	Not Assigned	0.0	St1 v4.xx
					Reset Batch	9	St1 v4.xx
					Print	3	St1 v4.xx
					Ack Alarms	4	St1 v4.xx
					Key Lock	10	St1 v4.xx
Control Input 1 Status	09,06	R	n/a	n/a	Off	0.0	St1 v4.xx
					On	1	St1 v4.xx
Control Input 2 Status	09,07	R	n/a	n/a	Off	0.0	St1 v4.xx
					On	1	St1 v4.xx
Control Input 3 Status	09,08	R	n/a	n/a	Off	0.0	St1 v4.xx
					On	1	St1 v4.xx

Fluid Properties (Group 10)

Title	Address	Value	Header	Unit	Selections	Value	Comments
Channel	10,00	R/W	R	n/a	n/a	n/a	n/a
Fluid Type	10,01	R/W	R	n/a	Generic	0.0	St2
					Water	1	St2
					Sat Steam	2	St2
					Sup Steam	3	St2
					Air	4	St2
					Natural Gas	5	St2
					Ammonia	6	DXf
					Carbon Dioxide	7	DXf
					Propane	8	DXf
					Oxygen	9	DXf
					Argon	10	DXf
					Methane	11	DXf
					Nitrogen	12	DXf
					Gasoline	13	DXf
					NO. 2 Fuel Oil	14	DXf
					Kerosene	15	DXf
					NX19	16	DXf
Reference Density	10,02	R/W	R	R	n/a	n/a	St1/All
Therm Expansion Coef	10,03	R/W	R	R	n/a	n/a	St1/All
Combustion Heat	10,04	R/W	R	R	n/a	n/a	St2
Specific Heat	10,05	R/W	R	R	n/a	n/a	St2
Flow Z Factor	10,06	R/W	R	R	n/a	n/a	St2
Ref Z Factor	10,07	R/W	R	R	n/a	n/a	St2
Isentropic Exponent	10,08	R/W	R	R	n/a	n/a	St2
Viscosity A	10,09	R/W	R	R	n/a	n/a	St1/St2
Viscosity B	10,10	R/W	R	R	n/a	n/a	St1/St2
Reference Temperature	10,11	R/W	R	R	n/a	n/a	St1
Calibration Density	10,12	R/W	R	R	n/a	n/a	St1
Base Density H2O @ 4C	10,13	R/W	R	R	n/a	n/a	St1
Per Mole N2	10,14	R/W	R	R	n/a	n/a	ST2/DXF
Per Mole CO2	10,15	R/W	R	R	n/a	n/a	ST2/DXF

Pulse Output Group (Group 11)

Title	Address	Value	Header	Unit	Selections	Value	Comments
Channel	11,00	R/W	R	n/a	n/a	n/a	St2
Usage	11,01	R/W	R	n/a	Heat Total	0.0	St2
					Mass	1	All
					Cvol	2	All
					Vol	3	All
					Off	4	St1
Pulse Type	11,02	R/W	R	R	Passive Negative	0.0	St2
					Passive Positive	1	St2
					Active Negative	2	St2
					Active Positive	3	St2
Pulse Output Scaling	11,03	R/W	R	R	n/a	n/a	All
Pulse Width	11,04	R/W	R	n/a	10mS	0.0	St1
					100mS	1	St1
Pulse Width	11,04	R/W	R	n/a	10mS	0.01	St2
					100mS	0.1	St2
Simulation Test	11,06	R/W	n/a	n/a	0Hz	1	St2
					0.1Hz	2	St2
					1Hz	3	St2
					10Hz	4	St2
					50Hz	5	St2

Current Output Group (Group 12)

Title	Address	Value	Header	Unit	Selections	Value	Comments
Channel	12,00	R/W	R	n/a	n/a	n/a	St2
Usage	12,01	R/W	R	n/a	Heat Flow	0.0	ST2
					Mass Rate	1	St1
					Cvol Rate	2	St1
					Vol Rate	3	St1
					Temp	4	St1
					Temperature 2	5	ST2
					Delta Temperature	6	ST2/DXf
					Pressure	7	ST2/DXf
					Density	8	ST2/DXf
					Vol Total	9	St1
					Cvol Total	10	St1
					Mass Total	11	St1
					Viscosity	12	ST2/DXf
					Reynolds	13	ST2/DXf
					Demand Last	14	ST2
					Peak Demand	15	ST2
Output Range	12,02	R/W	R	R	None	0.0	ST2/DXf
					0-20mA	1	ST2/DXf
					4-20mA	2	ST2/DXf
Low Scale	12,03	R/W	R	R	n/a	n/a	St1
High Scale	12,04	R/W	R	R	n/a	n/a	St1
Time constant	12,05	R/W	R	n/a	n/a	n/a	St1
Current out value	12,06	read	R	R	n/a	n/a	ST2
Simulation Test	12,07	R/W	R	n/a	Off	0.0	ST2/DXf
					0mA	1	ST2/DXf
					2mA	2	ST2/DXF
					4mA	3	ST2/DXF
					12mA	4	ST2/DXF
					20mA	5	ST2/DXF
					25mA	6	ST2/DXF
Current Output Range	12,08	R/W	R	n/a	4-20ma	0.0	St1
					0-20ma	1	St1

Relay Output Group (Group 13)

<u>Title</u>	<u>Address</u>	<u>Value</u>	<u>Header</u>	<u>Unit</u>	<u>Selections</u>	<u>Value</u>	<u>Comments</u>
Relay Number	13,00	R/W	R	n/a	Rly1	0.0	St1 v3.xx/ All
					Rly2	1	St1 v3.xx/ All
					Rly3(if 3 relay unit)	2	St1 v3.xx All
					Rly4(if 4 relay unit)	3	St1
Usage	13,01	R/W	R	n/a	Heat Flow	0.0	St2
					Mass Total	1	St1 v3.xx/ All
					Cvol Total	2	St1 v3.xx/ All
					Vol Total	3	St1 v3.xx/ All
					Heat Flow	4	St2
					Mass Rate	5	St1 v3.xx/ All
					Cvol Rate	6	St1 v3.xx/ All
					Vol Rate	7	St1 v3.xx/ All
					Temp1	8	St1 v3.xx/ All
					Temp2	9	St2
					Delta Temp	10	St2
					Pressure	11	St2
					Density	12	St1 v3.xx/ All
					Wet Steam	13	St2
					Malfunction	14	St2
					Demand Last Hour	15	ST2
					Preset	16	St1 v3.xx
					Prewarn	17	St1 v3.xx
					Ovrun	18	St1 v3.xx
					Alarm	19	St1 v3.xx
					Off	20	St1 v3.xx
					Viscosity	21	DXF
					Reynolds Number	22	DXF
					Aux Input 1	23	
Peak Demand	24	ST2					
Mode	13,02	R/W	R	n/a	Hi_Alarm Follow	0.0	St1 v3.xx/ All
					Lo_Alarm Follow	1	St1 v3.xx/ All
					Hi_Alarm latch	2	ST2/DXF
					Lo_Alarm latch	3	ST2/DXF
					Relay Pulse out	4	ST2/DXF
Setpoint	13,03	R/W	R	R	n/a	n/a	St1 v3.xx/ All
Duration	13,04	R/W	R	R	n/a	n/a	St1 v3.xx/ All
Hysterisis	13,05	R/W	R	R	n/a	n/a	St1 v3.xx/ All
Relay Status	13,06	R	n/a	n/a	n/a	n/a	St1 v3.xx All
Relay #1 Usage	13,07	R/W	R	n/a	Mass Total	1	St1 v4.xx
					Cvol Total	2	St1 v4.xx
					Vol Total	3	St1 v4.xx
					Mass Rate	5	St1 v4.xx
					Cvol Rate	6	St1 v4.xx
					Vol Rate	7	St1 v4.xx
					Preset	16	St1 v4.xx
					Off	20	St1 v4.xx
Relay #1 Mode	13,08	R/W	R	n/a	Hi_Alarm Follow	0.0	St1 v4.xx
					Lo_Alarm Follow	1	St1 v4.xx
Relay #1 Setpoint	13,09	R/W	R	R	n/a	n/a	St1 v4.xx
Relay #1 Duration	13,10	R/W	R	R	n/a	n/a	St1 v4.xx
Relay #1 Hysterisis	13,11	R/W	R	R	n/a	n/a	St1 v4.xx
Relay #1 Status	13,12	R	n/a	n/a	n/a	n/a	St1 v4.xx

Relay Output Group (Group 13) (continued)

Title	Address	Value	Header	Unit	Selections	Value	Comments					
Relay #2 Usage	13,13	R/W	R	n/a	Mass Total	1	St1 v4.xx					
					Cvol Total	2	St1 v4.xx					
					Vol Total	3	St1 v4.xx					
					Mass Rate	5	St1 v4.xx					
					Cvol Rate	6	St1 v4.xx					
					Vol Rate	7	St1 v4.xx					
					Prewarn	17	St1 v4.xx					
					Off	20	St1 v4.xx					
					R elay #2 Mode	13,14	R/W	R	n/a	Hi_Alarm Follow	0.0	St1 v4.xx
										Lo_Alarm Follow	1	St1 v4.xx
Relay #2 Setpoint	13,15	R/W	R	R	n/a	n/a	St1 v4.xx					
Relay #2 Duration	13,16	R/W	R	R	n/a	n/a	St1 v4.xx					
Relay #2 Hysterisis	13,17	R/W	R	R	n/a	n/a	St1 v4.xx					
Relay #2 Status	13,18	R	n/a	n/a	n/a	n/a	St1 v4.xx					
Relay #3 Usage	13,19	R/W	R	n/a	Mass Total	1	St1 v4.xx					
					Cvol Total	2	St1 v4.xx					
					Vol Total	3	St1 v4.xx					
					Mass Rate	5	St1 v4.xx					
					Cvol Rate	6	St1 v4.xx					
					Vol Rate	7	St1 v4.xx					
					Ovrun	18	St1 v4.xx					
					Off	20	St1 v4.xx					
					Aux Input 1	23	St1 v4.xx					
					Relay #3 Mode	13,20	R/W	R	n/a	Hi_Alarm Follow	0.0	St1 v4.xx
Lo_Alarm Follow	1	St1 v4.xx										
Relay #3 Setpoint	13,21	R/W	R	R	n/a	n/a	St1 v4.xx					
Relay #3 Duration	13,22	R/W	R	R	n/a	n/a	St1 v4.xx					
Relay #3 Hysterisis	13,23	R/W	R	R	n/a	n/a	St1 v4.xx					
Relay #3 Status	13,24	R	n/a	n/a	n/a	n/a	St1 v4.xx					
Relay #4 Usage	13,25	R/W	R	n/a	Mass Total	1	St1 v4.xx					
					Cvol Total	2	St1 v4.xx					
					Vol Total	3	St1 v4.xx					
					Mass Rate	5	St1 v4.xx					
					Cvol Rate	6	St1 v4.xx					
					Vol Rate	7	St1 v4.xx					
					Alarm	19	St1 v4.xx					
					Off	20	St1 v4.xx					
					Aux Input 1	23	St1 v4.xx					
					Relay #4 Mode	13,26	R/W	R	n/a	Hi_Alarm Follow	0.0	St1 v4.xx
Lo_Alarm Follow	1	St1 v4.xx										
Relay #4 Setpoint	13,27	R/W	R	R	n/a	n/a	St1 v4.xx					
Relay #4 Duration	13,28	R/W	R	R	n/a	n/a	St1 v4.xx					
Relay #4 Hysterisis	13,29	R/W	R	R	n/a	n/a	St1 v4.xx					
Relay #4 Status	13,30	R	n/a	n/a	n/a	n/a	St1 v4.xx					

Communication Group (Group 14)

<u>Title</u>	<u>Address</u>	<u>Value</u>	<u>Header</u>	<u>Unit</u>	<u>Selections</u>	<u>Value</u>	<u>Comments</u>
Usage	14,01	R/W	R	n/a	Print Modem Terminal Database	0.0 1 2 3	St1/All St2 St1/All St1
Device ID	14,03	R/W	R	n/a	n/a	n/a	St1/All
Baud	14,04	R/W	R	n/a	300 600 1200 2400 4800 9600 19200	3 6 2 1 5 0.0 4	St1/All St1 St1/All St1/All St1 St1/All St1
Parity	14,05	R/W	R	n/a	None Odd Even	0.0 1 2	St1/All St1/All St1/All
Handshake	14,06	R/W	R	n/a	None Software Hardware	0.0 1 2	St1/All St1/All St1/All
Current Status	14,07	?	?	?	?	?	Need to clarify

Network Card Setup (Group 15)

<u>Title</u>	<u>Address</u>	<u>Value</u>	<u>Header</u>	<u>Unit</u>	<u>Selections</u>	<u>Value</u>	<u>Comments</u>
Network Protocol	15,01	R/W	R	n/a	Modbus RTU	0.0	
Network Device ID	15,03	R/W	R	n/a	n/a	n/a	
Network Baudrate	15,04	R/W	R	n/a	300 600 1200 2400 4800 9600 19200	0.0 1 2 3 4 5 6	
Network Parity	15,05	R/W	R	n/a	n/a	n/a	

Printing and Data Output Group (Group 16)

Title	Address	Value	Header	Unit	Selections	Value	Comments
Print List Setup	16,00	R/W	R	n/a	n/a	n/a	St1/St2
Print Initiate	16,01	R/W	R	n/a	None	0.0	ST2/DXF
					Time of Day	1	ST2/DXF
					Interval	2	ST2/DXF
Print Interval	16,02	R/W	R	n/a	n/a	n/a	St1/All
Print Time	16,03	R/W	R	n/a	n/a	n/a	St1/All
Enable Print Key	16,04	R/W	R	n/a	No	0.0	St1
					Yes	1	St1
Enable Print Batch	16,05	R/W	R	n/a	No	0.0	St1
					Yes	1	St1
Page Length	16,06	R/W	n/a	n/a	# of lines	0-66	St1
Top Margin	16,07	R/W	n/a	n/a	# of lines	0-60	St1
Transaction Number	16,08	R/W	n/a	n/a	n/a	n/a	St1
Output Full Data Set	16,10	read	n/a	n/a	n/a	n/a	St1 v4.xx
External I/O Status	16,11	read	n/a	n/a	n/a	n/a	St1 v4.xx

Modem Communication Group (Group 17)

Title	Address	Value	Header	Unit	Selections	Value	Comments
?	?	?	?	?	?	?	Modem

menu is inhibited now

Data Logger Group(Group 18)

Title	Address	Value	Header	Unit	Selections	Value	Comments
Dump Data Log	18,00	W	n/a	n/a	stop dump	0.0	St1
					start dump	1	St1

Documentation Group (Group 19)

Title	Address	Value	Header	Unit	Selections	Value	Comments
Tag Number	19,00	R/W	R	n/a	n/a	n/a	St2
Software Version	19,01	R	R	n/a	n/a	n/a	St1
Hardware Version	19,02	R/W	R	n/a	n/a	n/a	St2
Order Code	19,03	R/W	R	n/a	n/a	n/a	St1/St2
Serial Number	19,04	R/W	R	n/a	n/a	n/a	St1/St2
Sensor Serial #	19,05	R/W	R	n/a	n/a	n/a	St1St2

Maintenance Group (Group 20)

Title	Address	Value	Header	Unit	Selections	Value	Comments
Audit Trail configuration	20,00	R	R	n/a	n/a	n/a	St2
Audit Trail caillbration	20,01	R	R	n/a	n/a	n/a	St2
Process Alarms	20,02	R	R	n/a	n/a	n/a	St2
System Errors	20,03	R	R	n/a	n/a	n/a	St2
Self Test	20,04	R/W	R	n/a	n/a	n/a	St2
Service Test	20,05	R/W	R	n/a	n/a	n/a	St2
Current Error Status	20,06	R/W	R	n/a	n/a	n/a	St2
Error log	20,07	R/W	R	n/a	n/a	n/a	St2
Next Calibration	20,08	R/W	R	n/a	n/a	n/a	St2
Print Maintenance	20,09	R/W	R	n/a	n/a	n/a	St2
Print System Setup	20,10	read	n/a	n/a	n/a	n/a	St1/St2
Calibration	20,11	read	n/a	n/a	n/a	n/a	St2

Level Input Group (Group 22)

Title	Address	Value	Header	Unit	Selections	Value	Comments
Level Sensor Type	22,01	R/W	R	n/a	Diff. Pressure Ultrasonic	0.0 1	Leveltrol II Leveltrol II
Signal Response	22,02	R/W	R	n/a	Level Distance	0.0 1	Leveltrol II Leveltrol II
Input Signal Type	22,03	R/W	R	n/a	4-20mA 0-20mA 0-5Vdc 1-5Vdc 0-10Vdc	4 5 6 7 8	Leveltrol II Leveltrol II Leveltrol II Leveltrol II Leveltrol II
Low Scale	22,05	R/W	R	R	n/a	Float	Leveltrol II
High Scale	22,06	R/W	R	R	n/a	Float	Leveltrol II
Averging Constant	22,19	R/W	R	n/a	n/a	0-9	Leveltrol II

Tank Style Group (Group 23)

Title	Address	Value	Header	Unit	Selections	Value	Comments
Tank Shape	23,00	R/W	R	n/a	32 point table Verticle Horizontal Spherical	0.0 1 2 3	Leveltrol II Leveltrol II Leveltrol II Leveltrol II
Tank Diameter	23,01	R/W	R	R	n/a	Float	Leveltrol II
Tank Length	23,02	R/W	R	R	n/a	Float	Leveltrol II
Tank Sensor Location	23,03	R/W	R	R	n/a	Float	Leveltrol II
Tank Discharge Location	23,04	R/W	R	R	n/a	Float	Leveltrol II