

RCS Serial Communications Protocol
for HVAC Network Devices
RS-232/RS-485

Document No: 150-00225-43

Revision 4.3

4/14/06

NOTE: This is a generic protocol document of all communications commands.

NOT ALL PRODUCTS SUPPORT ALL COMMANDS!

Be sure to refer to the specific product manual for applicable commands or limits.

RCS Serial Communications Protocol Document

DCN: RCS Document Control Number for this document: 150-00225-rev

Application: For HVAC Network Devices, including Thermostats, Sensors and Zone Controls using RS232 and RS485 Communications.

Master Document: This is a master protocol document for all commands across all products that can co-exist on the RCS CommStar RS232 or RS485 serial communications networks.

For the specific protocol application for a product, see the Product Matrix section of this document.

Document Revision History

Revision	Date	Revision Description
4.3	4/16/06	Revised Zone addressing for ZCV2, ZCV4, ZCV6 zone control units.
4.2	3/23/04	Add Heat and Cool stage up timer variables 83,84,85
4.1	01/26/04	Update support matrix(TR16/RS21), SB command update/added modes, RS21 commands CNA and SCAL
4.0	10/1/03	Add Setback commands. Updated OT, VSP, SSS, R=4, R=9
3.9	8/08/03	Update Section 7, System Variables , MOT/MRT ranges
3.8	8/01/03	Add Smart Vent, Security and Timer commands. Add range table appendix. Add R=10
3.7b	7/11/03	Minor edits, update default listing in variable list, reorg product matrix
3.7	5/01/03	Add Section 8. Protocol support matrix by product
3.6	11/04/02	Add Variable "74" Autosend, add system type "2" radiant
3.5	9/23/02	Revised format; Updated command specs for HFR controllers
3.4	12/01/01	Add RCS Link II cmds, DOW, Variable cmd, H3A reporting, revised SCH cmd,
3.3	9/01/00	Add EMC cmds, Time, Date, Sch cmds
3.2	2/04/00	Corrected the SP cmd for SP+ and SP-
3.1	9/28/99	Added Text message cmd
3.0	3/01/98	Added 5mS transmission delay on responding to serial commands
2.9	2/007/97	Added C2A reporting
2.0	8/15/95	Revised and reformatted original protocol document to new baseline rev
1.0	2/22/93	Original release

1.1 General. RCS Thermostats and Sensors with RS-232 or RS-485 network interfaces use an ASCII based freeform message format to communicate with remote hosts or master systems. In general, RCS HVAC Controllers can be either no zone “nodes”, like the TR15 thermostat, for controlling single mechanical systems without zones; or multi-zone controllers, like the ZCV series with multiple Wall Display Units, that provide zoning of a single mechanical system by dampers or valves. In systems with more than one mechanical system, each mechanical system requires its own controller and “System address”.

1.2 Special Note on Revision 3.4. The Serial Communications protocol revision 3.4 is a major revision to the protocol and corresponds to the introduction of RCSLinkII into RCS products. Link II adds significant improvements and additions to the serial communications capabilities of these products. These changes include dual heat/cool setpoint capability and real time scheduling. Also new is the introduction of system data variables that are accessible and changeable via the communications network. Product firmware revision information may now also be interrogated via the network. **Compatibility with older products has been maintained in most cases, but new features will require host support software to be modified to work with revision 3.4 and later products.**

1.3 Special Note on Revision 4.3 Major revision in the zone addressing method for HVAC zone control units (ZCV2/4/6). Former HVAC zone control units reported individual zone information using the Z=x format in the return data strings. The ZCVx series products, which have replaced all former zone products, do not use this method. With the introduction of the ZCVx series, each individual zone is now assigned a unique network address and the use of the Z= data is discontinued. This simplifies and makes individual thermostat zones and zones on a zone control unit now appear the same as separate zone addresses to network controllers. The ZCVx products assign a base address for Zone 1 and all other zones are addressed as offsets from this base address. See the network addressing description section.

1.4 SERIAL COMMUNICATIONS

1.4.1 RS-232 communications requires a separate serial com port on the remote host for each control unit. Any number can be configured in a system according to the capability of the remote host communicating to the controllers. Although RS-232 communications is dedicated point to point, ***an address code for command messages is still required for compatibility with the 485 software and is default set to “01”***. The RCS protocol assigns the master address “00”. Network status request messages that do not specify an originator code will be returned to address “00”. Controllers with address dip switches or soft addressing, can be set to any valid address code. Address 255 is reserved for global commands, all Controllers will act upon commands sent to this address.

1.4.2 RS-485 communications is a master/slave network. These multi-drop or “daisy chain” type networks support one master and up to 254 slave control units. The RS-485 network is a 2 wire, half duplex network and can be up to 4000 ft in length.

1.4.3 Master/Host hardware control of their COM port is required for masters communicating to RCS units, i.e., transmitters must be disabled to allow slave units to respond. RS232/485 serial adapters with Send Data Control such as RCS 8 Channel RS485 Star Hub do not need host hardware flow control and are required for PC hosts.

1.4.4 Transmission Delay: RCS products will delay responses to commands for 5ms to allow host transmitters to release the line. (3.0)

<i>IMPORTANT NOTE: The Data Response Transmission Delay Is Critical To Proper Network Operation.</i>

1.4.5 COMMUNICATIONS PORT CONFIGURATION

The RS-232 and RS-485 communications ports on RCS products are configured for 9600 baud, no parity, 8 data bits and 1 stop bit (9600,N,8,1). No flow control (when used with above adapters/hubs).

1.5 MESSAGE TYPES

1.5.1 Two types of messages are used, COMMAND messages and STATUS REQUEST messages. Each message consists of address, zone and originator codes, followed by one or more command or status codes. Each message is terminated by a carriage return character (referred to hereafter as "CR"). Line Feeds are optional. The only restrictions on command order are that the addressing related codes must come before the command or status related codes. Ideally, the first code should be the receiver address.

- Message codes and data are separated by "white space", which can be a comma and/or spaces.
- All numbers are ASCII decimal.
- Messages are **CASE** sensitive and transmitted MSB first.
- Messages are terminated by a carriage return.
- Originator code is optional and defaults to "00".

In the following message definitions, "x" denotes a numeric character, "a" denotes an alphanumeric character.

A typical message sequence looks as follows:

From Host System address 00 : *A=1 O=00 R=1 CR (originator O=00 is optional, A=1 R=1 CR is also valid)*
Which means message is being sent to device addressed 1, from Host address 00, requesting R1 status.

The response to the above message from a network HVAC device with address = 1 would be:
A=00 O=1 Z=1 T=76 SP=78 M=H FM=0

Which means Reply to Host address 00, message originated from System address 1, Zone 1, Temp=76, Setpoint=78, Mode = Heat, Manual Fan = Off. For single zone devices

1.5.2 For ZC6R HVAC zone control units, additional zone data for zones Z=2 through Z=6 would follow.

1.5.3 For ZCVx series HVAC zone control units, each individual zone has a separate network address. (4.3)

Command messages are used to set parameters in the HVAC controllers. Command messages can set zone setpoints, system mode, manual fan state or to send remote temperature information.

MESSAGE FORMAT

Command messages use the following format:

Address code, Originator code, Zone code (obsolete), Command, Command, Command,...CR (commas optional)

2.1 ADDRESS CODE. Format: A =xxx, where xxx = 1 to 254

- Address “0” is reserved for the host or master network device.
- Address “255” is reserved for global commands.

The first code in the message string is the address of the control unit or sensor being addressed. The address code is NOT optional for controllers connected by an RS-232/422 interface and defaults to “01”.

2.2 ORIGINATOR CODE. Format: O =xx, or O=abcdefg... where xx = any numbers or characters up to 16.

The originator code is the number or alpha identifier of the originator of the message and is only required if a response is expected. The alpha string can be up to 16 characters, terminated by white space. This string will be used as the address code of the status message sent in response to a request for status message. If an originator address is required but NOT specified in the command message, the originator address code defaults to “00” and will be used for the return address of the status message.

Examples are O=00, O=MASTER1 and O=M1

2.3 ZONE CODE. Format: Z =xx, where xx is the zone number. (Obsolete: not used on ZCVx products) (4.3)

The next code in the message string is the zone number code. It is optional for single or no zone nodes and will be ignored if present in single zone systems. In multi-zone systems its absence indicates that following commands will apply to all zones on that controller.

NOTE: ZCVx products do not use the Z= data for zone information. Each individual zone is assigned it's own network address. (4.3)

The following commands may appear in any order in the command string.

2.4 SETPOINT COMMAND. Format: SP =xx or SP+ or SP-, where “xx” is the new zone setpoint in degrees “SP+” increments the zone setpoint by 1 degree.

“SP-” decrements the zone setpoint by one degree. (3.2 Correction)

This command is used in older single setpoint RCS products and is included for compatibility. In dual setpoint controllers, the SP command will set the setpoint of the current mode, i.e., if in heat mode, SP will set SPH.

2.5 SET HEAT SETPOINT COMMAND. Format: SPH=xx, or SPH+ or SPH-, where “xx” is the new heating setpoint in degrees. Sets new heating setpoint. SPH+ or SPH- increments or decrements the setpoint by 1 deg. (3.4) Range: 40 – 109 (Fahrenheit), 5 – 33 (Celsius)

2.6 SET COOL SETPOINT COMMAND. Format: SPC= xx, or SPC+ or SPC-, where “xx” is the new cooling setpoint in degrees. Sets new cooling setpoint. SPC+ or SPC- increments or decrements the setpoint by 1 deg (3.4) Range: 44 – 113 (Fahrenheit), 9 – 37 (Celsius)

2.7 SET MODE COMMAND. Format: M=a, where “a” = O or 0 (Off); H or 1 (Heat); C or 2 (Cool); A or 3 (Auto); EH or 4 (Emergency Heat). Sets the zone mode to the state specified. This command affects the zone specified only and does not affect all zones unless no zone was specified. Use the Set System Mode Command to set a forced or override mode for all zones in multi-zone systems.

2.8 SET FAN MODE COMMAND. Format: F=x, where “x” = 0 (Off or Auto) or 1(On).

Zone fan mode command for manual fan. Sets the zone manual fan mode to the state specified. The Off mode returns the zone fan mode to automatic operation. For zone systems, this fan mode is for the zone only and does not

affect all zones unless no zone was specified. In zone systems, use the Set System Fan command to set system fan mode to override zone modes.

2.9 SET SYSTEM MODE COMMAND. Format: SM=a, where “a” = 0 (Off); 1 (Heat); 2 (Cool); 3 (Auto). Sets the HVAC System Off/Heat/Cool/Auto. This command overrides any zone mode in multi-zone systems and forces all zones to be in the specified mode only. **This command is not valid in single zone systems. Defaults to Auto Mode.**

2.10 SET SYSTEM FAN COMMAND. Format: SF =x, where “x” = 0 (Off) or 1 (On). The System Fan command controls constant fan operation. When set to “1”, the mechanical system FAN output is on constantly for ventilation, filtration or humidity control applications. When set to “0”, constant fan is off, however, the individual zone’s manual fan control is still active and can request fan operation for their zone. **This command is not valid in single zone systems. Default value is Off.**

2.11 SET TEMPERATURE FORMAT COMMAND. Format: CFM=a, where “a” = 0 (or C) or 1 (or F). Sets the system to use either Celsius or Fahrenheit for all displays, calculations and reports. (3.4)

2.12 SEND TEXT MESSAGE COMMAND. Format: TM=”abcde...” where “a...” = character string, 80 characters max or #. Text must be enclosed in double quotes. String may include spaces and carriage returns, but may not contain double quotes. Sends a text message to the control unit, which is forwarded to a messaging Wall Display Unit (TS36). TM=”#”, erases all messages in the message buffer. (3.2)

2.13 SET VENT DAMPER COMMAND. Format: V =x, where “x” = 0 (Off) or 1 (On). When On, the VENT DAMPER output relay will be on, opening an outside air source damper for fresh air venting.

2.14 SEND OUTSIDE TEMPERATURE COMMAND. Format: OT=xxx, where “xxx” = temperature in degrees. Sends the outside temperature data from the network to the control unit. Used when outside temperature information is to be used and displayed on the WDU. Note that if the control unit has built-in outside sensor capability and the sensor installed, this command will have no effect.
Range: -64 to 190 degrees

2.15 SET REMOTE TEMPERATURE COMMAND. Format: RT=xxx, where “xxx” = temperature in degrees. Sends remote temperature data to the control unit. Used when remote temperature data is to be used and displayed instead of local temperature data. (Receiving device must be set to this mode of operation)

2.16 SET SETBACK INDICATOR COMMAND. Format: BF=x, where “x” = 1 to set setback display flash on or 0 to turn off display flash. Does not change any setpoint settings (3.2) (3.4)

2.17 SET TIME COMMAND Format: TIME=hh:mm:ss, where hh is hours (00-23), mm is minutes (00-59), ss is seconds (00-59). Each field must be 2 digits. (3.3)

2.18 SET DATE COMMAND Format: DATE=mm/dd/yy, where mm is month (01-12), dd is day of month (1-31), yy is year (00-99). (3.3)

2.19 SET DAY OF WEEK COMMAND. Format: DOW=n, where n = 1-7, Sun=1, Sat=7.(3.4)

2.20 SCHEDULE ENTRY COMMAND. Format: SEd/x=hhmmHHCC or ?. This command is for controllers that use a combined heat and cool schedule. “d” is day of week (Sun=1 to Sat=7). “x” is the entry number (1 to 4). There are 4 entries per day. The times in the entries must be in ascending order. Each variable must be 2 digits. hh is hours (00-23). mm is minutes (00 to 59). HH is heat setpoint (00, 40 to 95F or 05 to 33C). CC is cool setpoint (00, 44 to 99F or 09 to 37C). A setpoint of 00 is not executed. All 4 entries for all 7 days should be entered before enabling the schedule. (3.4)

SEd/x=?, returns the schedule entries for day=d and period=x.

2.21 SCHEDULE CONTROL COMMAND. Format: SC=n, where “n” is 0 (Hold); 1 (Run); or ?. Run starts execution of setpoint schedule, Hold stops schedule execution and holds current setpoint. (3.4)

SC=?, returns status of SC variable.

2.22 DISPLAY LOCK COMMAND. Format: DL=x, where “x” = 0 for unlocked or 1 for locked. Locks the wall display unit buttons (no action) to prevent unauthorized usage. (3.4)

Range: 0 (Unlocked), 1 (Locked)

2.23 SET VARIABLE COMMAND. Format: SVx=d, where “x” = variable number (1-256), “d” = variable data or ?. See Section 7 for list of system variables. (3.4, 3.9, 4.2)

SVx=?, returns variable data for variable x. Control unit responds with a SVx=“variable data...”.

Energy Management Controller (EMC) Commands

The following section of commands (noted by *) are specific to Energy Management Controller (EMC) products, such as the EMC15.

2.24 *SET UNIT MODE COMMAND. Format: UM=x, where x can range from 0-7. (3.3) See EMC spec for details.

2.25 *NAME COMMAND. Format: NAME=sss...sss, where sss...sss is a text string up to 16 characters in length. The name cannot contain any spaces or control characters. (3.3)

2.26 *SET WATER HEATER DELAY COMMAND. Format: WHD=xxx, where x is 0-255 minutes. Sets the delay from the activation of Security Input 2 to the disabling of the Water Heater Relay. A value of 0 sets no delay, a value of 255 disables the feature. (3.3)

2.27 *SET WATER HEATER MODE COMMAND. Format: WHC=x, where x is 0 for OFF, 1 for ON. (3.3)

2.28 *HEAT SCHEDULE COMMAND Format: SHDx=hmmssshmmssshmmssshmmss, where x is the day, 1 for Sunday, 2 for Monday, 7 for Saturday. There are four time-based setpoint changes per day, hh is hours (00-23), mm is minutes (00-59), ss is Setpoint (0,40-99). A Setpoint value of 0 will disable that time-based change.(3.3)

2.29 *COOL SCHEDULE COMMAND Format: SCDx=hmmssshmmssshmmssshmmss, where x is the day, 1 for Sunday, 2 for Monday, 7 for Saturday. There are four time-based setpoint changes per day, hh is hours (00-23), mm is minutes (00-59), ss is Setpoint (0,40-99). A Setpoint value of 0 will disable that time-based change.(3.3)

2.30 *UNIT MODE 1 DATA COMMAND. Format: UM1D=HHCCM, where HH is heat setpoint (40-99), CC is cool setpoint (40-99), M is mode. The EMC15 will be placed in the Unit 1 Mode after a timeout of Unit Modes 2 or 3 using the values stored with this command. (3.3)

2.31 *UNIT MODE 2 DATA COMMAND. Format: UM2D=SSMx, where SS is the setpoint (40-99), M is mode, and x is duration in minutes (1-65000). The EMC15 will be placed in the Unit 2 Mode after receiving this command, and will transition to Unit Mode 1 after the timeout specified in the duration. (3.3)

2.32 *UNIT MODE 3 DATA COMMAND. Format: UM3D=SSMmddhhmm, where SS is the setpoint (40-99), M is mode, mm is month (01-12), dd is day of month (01-31), hh is hours (00-23) and mm is minutes (00-59). The EMC15 will be placed in the Unit 3 Mode after receiving this command, and will transition to Unit Mode 1 after the date/time specified in the command matches the date/time of the EMC15. (3.3)

2.33 *UNIT MODE 6 DATA COMMAND. Format: UM6D=HHCC, where HH is the Heat setpoint (40-99), CC is the Cool setpoint (40-99). These values are used to setback the EMC when the Security Input 2 (Armed Away) is activated. The EMC will revert to the prior setpoint when the Security Input 2 is de-active. (3.3)

2.34 *UNIT MODE 7 DATA COMMAND. Format: UM7D=HHCCMmddhhmm, where HH is Heat setpoint (40-99), CC is the Cool setpoint (40-99), M is the Mode, mm is the month, dd is the day, hh is the hour, mm is the minutes. These values are used to setback the EMC until the month/day/hour/min matches the current date/time, where the EMC will revert to the Armed Away mode. (3.3)

2.35 *RESTORE DEFAULTS COMMAND. Format: RESD=1. Command to restore the EMC to the default settings.
Heating Schedules = Disabled
Cooling Schedules = Disabled
Water Heater Delay = 0
Zone Occupancy = Occupied
Unit Mode =0 (3.3)

2.36 * MAGIC COOKIE COMMAND Format: MC=x, where x is a number from 0 to 65535. The magic cookie number is stored in non-volatile memory and is accessible through the R=8 request command. The magic cookie is a number that can indicate a stored configuration (schedules, etc) that the host can compare to determine if an EMC has been replaced, and download the new settings. (3.3)

The following section of commands is specific to Smart Vent Controller (ZCVx) products.

2.37 SMART VENT MODE COMMAND

Sets the Smart Vent mode to the state specified. (3.8)

Format: VM=a, where "a" = O or 0 (Off); A or 1 (Auto); M or 2 (Manual).

Range: 0 – 2, or, O, A, M

Respond to ?: No

2.38 SMART VENT SETPOINT COMMAND.

Sets the Smart Vent Setpoint. (3.8)

Format: VSP =xx, where "xx" is the new Smart Vent setpoint in degrees:

Range: 0-99

Respond to ?: No

2.39 SMART VENT SCHEDULE ENTRY COMMAND.

This command is for Smart Vent controllers which use schedule. "x" is the entry number (1 to 4). There are 4 entries per day. The times in the entries must be in ascending order. . A time duration of 000 is not executed. All 4 entries should be entered before enabling the schedule. (3.8)

Format: VSEx=hhmmTTT or ?. hh is hours (00-23 must be 2 digits). mm is minutes (00 to 59 must be 2 digits).

TTT is time duration (000 to 120 must be 3 digits)

Respond to ?: Yes

Example: **VSEx=?, returns the schedule entries for period=x**

2.40 SMART VENT SCHEDULE CONTROL COMMAND.

Run starts execution of Smart Vent schedule, Hold stops schedule execution and holds current setpoint. (3.8)

Format: VSC=n, where "n" is 0 (Hold); 1 (Run); or ?.

Range: 0 - 1

Respond to ?: Yes

Example: **VSC=1, enables the Smart Vent Schedule.**

2.41 SMART VENT RUN TIME COMMAND.

The Smart Vent will operate for this number of minutes and then shutoff. (3.8)

Format: VRT=xxx (up to 3 digits), where "xxx" is 0 to 120 minutes. A value of 0 will turn off the Smart Vent.

Range: 0 – 120 (minutes)

Respond to ?: Yes

Example: **VRT=?, returns status of VRT variable.**

2.42 SMART VENT RUN INSIDE TEMPERATURE.

Inside temperature that the Smart Vent is using. (3.8)

Format: VIT=xxx (read only, up to 3 digits), where "xxx" is the inside temperature that the Smart Vent is using. .

Range: Read only

Respond to ?: Yes

Example: **VIT=?, returns status of VIT variable.**

2.43 SMART VENT ACTIVE.

Indicator that the Smart Vent is active. (3.8)

Format: VA=x, where "x" is 0 (Off) or 1 (ON)

Range: Available in R=10 response only.

Respond to ?: No

The following commands are specific to ZCVx products with the Security feature enabled.

2.44 SECURITY SYSTEM ARM COMMAND

This command is added to the response of the R=1 command. Note that the command is sent out only one time for each arming button press on the wall display unit. (3.8)

Format: SSA=a, where “a” = H (home), or A (Away).

2.45 SECURITY SYSTEM DISARM COMMAND

This command is added to the response of the R=1 command. If the disarming code entered is 1 2 3 4, the disarm command will be SSD=1234. Note that the command is sent out only one time for each disarm attempt. (3.8)

Format: SSD=abcd, where “abcd” is the four digit disarming code entered on the wall display unit.

2.46 SECURITY SYSTEM STATUT COMMAND.

This command is sent by the host controller to update the security status shown by the wall display unit. (3.8)

Format: SSS =xxyy, where “xxyy” is the security status bytes.

The following commands are specific to Smart Vent Controller (ZCVx) products with maintenance timers. The ZCVx controllers accumulate run times of Heat, Cool and Fan operations (in hours).

2.47 MAINTENANCE RUN TIME COMMAND

Accumulated run time in hours for Heat, Cool and Fan operations. (3.8)

Format: RTx=a, where “x” = H (Heat), C (Cool), or F (Fan) and “a’ is the load value

Range: 0 – 10000 (hours)

Example: **RTF=?**, returns accumulated value of Fan Run Time in hours

2.48 MAINTENANCE MAXIMUM TIME COMMAND

Maximum time values are stored in the ZCVx and are used by the wall display units to indicate when the run times have met or exceeded the maximum times (such as a filter change interval). (3.8)

Format: MTx=a, where “x” = H (Heat), C (Cool), or F (Fan) and “a’ is the load value.

Range: 0 – 10000 (hours)

Respond to ?: Yes

Example: **MTH=3000** (sets Max Time for Heat to 3000 hours)

2.49 SETBACK MODE COMMAND (4.1)

When issued, this command will cause the HVAC control unit to load out of memory and change to, Heat and Cool setpoints that have been stored using the SBHx and SBCx commands or SVx direct variable command. (4.0, 4.1)

Format: SB=x, where "x" =

- 0 No Setback
- 1 Home Setback
- 2 Away Setback
- 3 Vacation Setback
- 4 Setback Special
- 5 Setback System (for zone systems, sets all zones to Away Temp)
- 6 Setback Zone (for zone systems, only zone addressed setback to Away Temp)
- 7 Setback Flag only (sets the setback flag on, does not cause setback temp change)

Range: 0 – 7

Respond to ?: Yes

Example: **SB=2, loads the "away" setback setpoints**

2.50 SET HEAT SETBACK SETPOINT COMMAND (4.1)

This command is used to store the Heat setback setpoint for the given mode. (4.0)

Format: SBHx=HH, where "x" =

- 1 (Home Setback)
- 2 (Away Setback)
- 3 (Vacation Setback)

and HH is the Heat setback setpoint to store.

Respond to ?: Yes

Example: **SBH3=62, loads the "vacation" Heat setback setpoint with 62 degrees**

2.51 SET COOL SETBACK SETPOINT COMMAND (4.1)

This command is used to store the Cool setback setpoint for the given mode. (4.0)

Format: SBCx=CC, where "x" =

- 1 (Home Setback)
- 2 (Away Setback)
- 3 (Vacation Setback)

and CC is the Cool setback setpoint to store.

Respond to ?: Yes

Example: **SBC3=95, loads the "vacation" Cool setback setpoint with 95 degrees**

The RS21 is a remote temperature sensor that communicates via the RS485 network. It can be read and programmed via the network.

2.52 CHANGE NETWORK ADDRESS (RS21)

This command is used to change a sensor address. Send the desired **new** network address to the **old** sensor address.

Format: CNA=x, where "x" = 1 to 254, the new sensor address. (0 and 255 are reserved).

If the current sensor address is unknown, you can send the command to address 255 which is the broadcast network address.

CAUTION! the sensor must be the only one installed on the network when sending the CNA command to address 255. Any sensor on the network will change their address if they receive a command addressed to 255.

2.53 SET SENSOR CALIBRATION OFFSET (RS21)

This command is used to set or change the sensor calibration offset from the raw temperature read.

Format: SCAL=x, where "x" = new calibration offset

Range: -10 to +10 degrees

Responds to SCAL =?: Yes, returns current sensor calibration offset.

Section 3

Status Requests Messages

Status Request messages will cause the network device to send a Return Status Message that includes the current values of various groups of data. The groups of data are identified by Types.

STATUS REQUEST MESSAGE FORMAT:

A=Address, O= Originator (optional), R=Status Group Type

Format: R =xx, where “xx” = 1 - 10. Only a single type can be requested at a time.

3.1 Type 1 Status Request message.

Returns temperature, setpoint, and mode data.

For multi-zone control units, every **active** zone will return its zone status in the return string. (zones not active or detected by the zone control unit will not show up in the return message string).

NOTE: The multi-zone format is OBSOLETE. Zones now report as separate network addresses. (4.3)

If an outside air temperature sensor is connected to the zone control unit it will also report as zone “OA”, at the beginning of the message.

3.2 Type 2 Status Request message.

Returns the state of the control unit's HVAC output status

This is NOT relay outputs but “calls” i.e., stage 1 heat, stage 2 cool.

For multi-zone systems, returns zone damper/valve status and system level modes.

3.3 Type 3 Status Request message.

Returns temperature information only. .

3.4 Type 4 Status Request message.

Returns setpoint information only.

3.5 Type 5 Status Request message.

Returns system mode information only.

3.6 Type 6 Status Request message.

Returns Firmware Version information. (3.3, 3.4, 3.5)

3.7 Type 7 Status Request message.

Returns Time and Date/DOW information. (3.3, 3.4)

3.8 Type 8 Status Request message.

Returns EMC15 status information (3.3).

3.9 Type 9 Status Request message.

Returns HVAC system setup information. (3.3)

3.10 Type 10 Status Request message.

Returns Smart Vent information (3.8)

Return Status Messages are returned to the originator of the request status messages and are formatted similar to the command messages and consist of a message address code, originator code, and status data.

4.0 RETURN STATUS MESSAGE FORMAT:

Address Code, Originator Code, Data, Data, Data...Data CR

4.0.1 ADDRESS CODE. Format: A =xx or abcdefg...

The address code is the address of status requester to which the status message is being returned. The address code of the RETURN STATUS MESSAGE is derived from the originator code in the REQUEST STATUS MESSAGE. **If no originator code is included in the REQUEST STATUS MESSAGE, the default address "00" will be used.**

4.0.2 ORIGINATOR CODE. Format O =xxx, where xxx = 1 to 254.

The originator code is the address of the controller responding to the REQUEST STATUS MESSAGE.

4.0.3 DATA. Format varies with each status request type.

4.1 TYPE 1 STATUS MESSAGE

The TYPE 1 Return Status Message includes the current temperature, setpoint, Heat setpoint, Cool setpoint, mode, and fan status data.

For multiple zone controllers, all active zones are included (OBSOLETE 4.3)

Format: A=00 O=1 OA=88 Z=1 T=77 SP= 70 SPH=70 SPC=78 M=H FM=0

4.1.1 OUTSIDE AIR. Format: OA=xxx, where xxx = temperature in degrees. OPTIONAL

If an Outside Air temperature sensor is connected to the control unit, it will report as OA at the beginning of the message string. This is optional and will not be present if there is not an outside sensor attached. (3.5 revised)

4.1.2 ZONE CODE. Format: Z =xx where "x" =zone number.

The Zone Code is the zone number for the data that follows. Multi-zone systems will have a zone code followed by data for that zone, followed by the next zone code and its data and so on. **(Obsolete)** (4.3)

Note: ZCVx series HVAC zone controllers do not use the Z=x format. Each zone is assigned it's own network address. (4.3)

4.1.3 CURRENT TEMPERATURE. Format: T =xxx, where xxx = -64 to 191 degrees.

The current temperature of the zone.

4.1.4 CURRENT SETPOINT. Format: SP=xx, where xx is 40 to 113 degrees.

The current mode setpoint for the zone (for single setpoint systems).

NOTE: This is included in the data string for compatibility with older devices with single setpoints. With dual setpoint controllers, SP will be the same as the current mode setpoint, i.e., if in heat mode, SP will be the same as SPH. (3.4 revised)

4.1.5 CURRENT HEATING SETPOINT. Format: SPH=xx, where xx = 40 to 109 degrees F. (3.4)

The current setpoint temperature for the zone.

4.1.6 CURRENT COOLING SETPOINT. Format: SPC=xx, where xx = 44 to 113 degrees F. (3.4)

The current setpoint temperature for the zone.

4.1.7 CURRENT MODE. Format: M =a, where "a" = O (Off), H(Heat), C(Cool), A(Auto), EH(Emergency Heat) or I (Invalid).

The current Off/Heat/Cool/Auto mode for the ZONE (not System Mode).

A mode of "I" for "Invalid Zone" is returned if there is a communications failure (CF) between the RCS controller and the zone wall display unit. Invalid zones return a temperature of 00 and a Mode set to "I" (invalid) to distinguish between an invalid zone 00 temperature and a real zone temperature of 00 deg.

4.1.8 CURRENT FAN MODE. Format: FM =x, where "x" = 0 (Off or Auto) or 1 (On).
Current MANUAL fan mode for the zone.

Off or Auto = the fan is under automatic control of the HVAC system.

On = Fan is on under manual control and will remain on until manual mode is turned off.

4.2 TYPE 2 STATUS MESSAGE

Type 2 status messages return the state of the operating mode of the HVAC system and the zone dampers or valves in multi-zone systems. If the mode is active or on, the TYPE 2 status will return a data value of 1, if the mode is not active or off, the return data values will be 0. TYPE 2 status messages also contain the *System level status* for System Mode and System Fan mode information for multiple zone controllers.

Format: A=00 O=1 H1A=0 H2A=0 H3A=0 C1A=0 C2A=0 FA=0 VA=0 SM=A SF=0

Note: Heating/Cooling "Calls" vs. relay outputs. The operating mode is the "call" for heating or cooling output, such as, H1A =1 for a Stage 1 Heat Call being active. Which actual control unit output relays are on will depend on the HVAC system type, Std or HP, selected. For standard gas systems, a H1A=1, means that the heat or "W1" relay output is on, but for Heat Pump systems this same H1A=1 means that stage 1 compressor relay output, "Y1", is on.

4.2.1 HEATING STAGE 1 Status. Format: H1A=x, where x = 0 for Off or 1 for Heating Stage 1 On

4.2.2 HEATING STAGE 2 Status. Format: H2A=x, where x = 0 for Off or 1 for Heating Stage 2 On.

4.2.3 HEATING STAGE 3 Status. Format: H3A=x, where x = 0 for Off or 1 for Heating Stage 3 On. (3.4)

4.2.4 COOLING STAGE 1 Status. Format: C1A=x, where x = 0 for Off or 1 for Cooling Stage 1 On.

4.2.5 COOLING STAGE 2 Status. Format: C2A=x, where x = 0 for Off or 1 for Cooling Stage 2 On. (2.9)

4.2.6 FAN Status. Format: FA =x, where x = 0 for Off (same as Auto) or 1 for Manual Fan On.

4.2.7 VENT DAMPER Status. Format: VA =x, where x=0 for Off (closed) or 1 for Vent Damper On (open).

4.2.8 ZONE DAMPER Status*. Format: Dn=x, where n= zone number and x=0 for Off or 1 for On.

Damper Note: RCS zone systems use **Normally Open Dampers**, so when the damper is "Off", the damper is "Open", and when it is "On", the damper is closed. That is why when zone 1 calls for heating/cooling, all the other zones come ON and are closed preventing air from being directed to the unwanted zones.

4.2.9 MOT/MRT Status. Format: SCP=xy, staging delays, where
"x" = Stage 1 Call, 0 for Off or 1 for MOT On or 2 for MRT On.
"y" = Stage 2 Call, 0 for Off or 1 for MOT On or 2 for MRT On.

MOT is Minimum Off Time between stage calls. Subsequent calls are inhibited until the timer expires.

MRT is Minimum Run Time for a stage call. Once a call has been initiated, it will remain on for the minimum time until timer expires, but may continue if call not satisfied yet. (3.4)

4.2.10 SYSTEM MODE Status*. Format: SM =a, where "a" = O (Off), H (Heat), C (Cool).

The System Mode data is the current status of the HVAC system-operating mode (not the same as ZONE mode, which can be different from the system mode, because some zones maybe calling for heat while others may be calling for cooling). If a system mode is set, it overrides all other zone modes. Valid only for Zone systems.

4.2.11 SYSTEM FAN Status*. Format: SF =x, where “x” is 0 (Off) or 1 (On).

Status of the system fan mode. If set to ON, it overrides any zone manual fan control. For continuous fan circulation for venting, filtering or humidity control. Valid only for Zone systems.

* = These status message data are only included in RETURN STATUS message strings for multi-zone control units.

4.3 TYPE 3 STATUS MESSAGE

Type 3 Status Messages returns temperature data only.

Format: A=00 O=1 Z=1 T=75 for non zoning systems (for zone systems: each zone reports)

4.4 TYPE 4 STATUS MESSAGE

Type 4 Status Messages returns setpoint data only.

Format: A=00 O=1 Z=1 SP=68 SPH=68 SPC=78, for non zoning systems (for zone systems: each zone reports)

4.5 TYPE 5 STATUS MESSAGE

Type 5 Status Messages returns mode data only.

Format: A=00 O=1 Z=1 M=H FM=0 for non zoning systems (for zoning systems: each zone reports)

4.6 TYPE 6 STATUS MESSAGE

Type 6 Status Messages returns the device model and firmware version information.

Format: A=00 O=1 CU model=Vyy.yy.yy/WDU model=Vyy.yy.yy

Where “CU model” (such as HFR) and “WDU model” (such as TS16) are the Control Unit and Wall Display Unit models, and y is the firmware version number. (revised 3.4, 3.5)

4.7 TYPE 7 STATUS MESSAGE

Type 7 Status Messages returns the Time, Date and DOW. (3.4)

Format: A=00, O=1, Time=xx:yy:zz, Date=mm/dd/yy, DOW=d

Where “xx”= hours,

“yy”= minutes,

“zz” = seconds,

“mm”=month (01 – 12)

“dd”=date (01 – 31)

“yy”=year (00 – 99)

“d”= day of week 1-7 (1=Sun, 2=Mon, 7=Sat).

4.8 TYPE 8 STATUS MESSAGE (EMC Only)

Type 8 Status Messages returns the status of the EMC15 control unit. (3.4)

Format: A=00 O=1 MC=xxxxxxx, UM=yyy, WHD=zzz WHC=a SIN1=b SIN2=c

Where MC = “xxxxxx” is the master cookie code,

UM = “yyy” is the Unit Mode,

WHD = “zzz” is the water heater delay,

WHC = “a” is the water heater control output status, a=0 (Off) or 1(ON),

SIN1 = “b” is security input 1 state, b=0 (Off), or 1(ON).

SIN2 = “c” is security input 2 state, c=0 (Off), or 1 (ON).

4.9 TYPE 9 STATUS MESSAGE

Type 9 Status Message returns the HVAC system setup DIP Switch settings.

Includes settings for selection of Standard or Heat Pump HVAC system type; Fan with Heating calls; Changeover Valve with heat or cool calls.

Format: A=00 O=1, S1=a, S2=b

Where S1 = "a", STD (standard system) or HP (heat pump system)

(if S1 = STD)

S2 = "b", GAS (no fan w/heat) or ELEC (fan w/heat)

or (if S1=HP)

S2 = "b", CO-COOL(changeover with cool) or CO-HEAT (changeover with heat)

Examples:

A=00 O=1 S1=STD S2=GAS

A=00 O=1 S1=HP S2=CO-HEAT

4.10 TYPE 10 STATUS MESSAGE

Type 10 Status Messages returns the status of the Smart Vent.

Format: A=00 O=1 OA=xxx VIT=xxx VM=c VSP=ddd VRT=eee VA=f

Where:

OA = Outside Air Temp

VIT = Vent Inside Temperature

VM = Vent Mode

VSP = Vent Setpoint

VRT = Vent Run Time

VA = Vent Damper Status

4.10.1 OUTSIDE AIR. Format: OA=xxx, where xxx = temperature in degrees. OPTIONAL

If an Outside Air temperature sensor is connected to the control unit, it will report as OA at the beginning of the message string. This is optional and will not be present if there is not an outside sensor attached.

4.10.2 CURRENT SMART VENT INSIDE TEMP. Format: VIT =xxx where xxx = -64 to 190 degrees.

In a multi-zone system, this is the inside temperature that the Smart Vent system is using when in AUTO mode.

4.10.3 CURRENT SMART VENT SETPOINT. Format: VSP=xx, where xx is 40 to 99 degrees.

4.10.4 CURRENT SMART VENT MODE. Format: VM =a, where "a" = O (Off), A (AUTO), M (MANUAL),

4.10.5 CURRENT SMART VENT SCHEDULE CONTROL. Format: VSC=x, where x is 0 for OFF, 1 for RUN

4.10.6 CURRENT SMART VENT RUN TIME. Format: VRT=xxx, where xxx is 0 to 120 minutes.

4.10.7 CURRENT SMART VENT DAMPER. Format: VA=x, where x is 0 for the Smart Vent damper OFF and 1 for when the Smart Vent damper is ON.

Section 5

Command and Message Summary

Type	Description	Revision
A	Address of target device	2.0
BF	Setback Indicator	3.4
C1A	Cooling Stage One Active Status	2.0
C2A	Cooling Stage Two Active Status	2.9
CFM	C or F mode set	3.4
CNA	Change Network Address (RS21)	4.1
Dn	Damper Status for Zone n	2.0
DATE	Date	3.3
DL	Display Lock	3.4
DOW	Day of Week Command	3.4
F	Fan Command	2.0
FA	Fan Active Status	2.0
FM	Fan Mode Status	2.0
H1A	Heating Stage One Active Status	2.0
H2A	Heating Stage Two Active Status	2.0
H3A	Heating Stage Three Active Status	3.4
M	Mode Command	2.0
MTx	Maintenance Timer Maximum Times	3.8
NAME	Name	2.0
O	Originator address	2.0
OA	Outside Air Temperature Data Returned	2.0, 3.5 revised
OT	Outside Air Temperature Data Sent	2.0, 4.0 revised
R	Request Status Command	3.3
RESD	Restore Defaults	3.3
RT	Remote Temperature	3.3
RTx	Maintenance Timer Run Times	3.8
SB	Setback Command	4.0
SBHx	Setback Heat Setpoint	4.0
SBCx	Setback Cool Setpoint	4.0
SC	Schedule Control Enable/Disable	3.4
SCAL	Sensor Calibration Offset	4.1
SCDx	Schedule Cool Data for Day x	3.3
SCP	Short Cycle Protection Delay(MOT)/MRT Status	3.4
Sed/x	Schedule entry for day and entry	3.4
SF	System Fan Command	2.0
SHDx	Schedule Heat Data for Day x	3.3
SM	System Mode Command	2.0
SP	Setpoint Command	2.0, 3.4 revised
SPC	Set Cool Setpoint	3.4, 4.0 revised
SPH	Set Heat Setpoint	3.4, 4.0 revised
SSA	Security System Arm	3.8
SSD	Security System DisArm	3.8
SSS	Security System Status	3.8, 4.0 revised
SVx	Set Variable number x	3.4
T	Current Temperature	2.0
TIME	Time	3.3
TM	Text Message	3.1
UM	Unit Mode	3.3
UmxD	Unit Mode x Data	3.3
V	Vent Damper Command	2.0
VA	Vent Damper Active Status	2.0, 3.8 revised
VIT	Vent Inside Temperature	3.8
VM	Vent Mode	3.8
VRT	Vent Run Time	3.8
VSC	Vent Schedule Control Enable/Disable	3.8
VSEx	Vent Schedule Entry	3.8
VSP	Vent Setpoint	3.8, 4.0 revised

WHD	Water Heater Delay	3.3
WHC	Water Heater Command	3.3
Z	Zone Code of zone being addressed	2.0
1	Request Status Message 1 Thermostat data	2.0
2	Request Status Message 2 HVAC Data	2.0
3	Request Status Message 3 Temperature only	2.0
4	Request Status Message 4 Setpoint only	2.0, 4.0 revised
5	Request Status Message 5 Mode only	2.0
6	Request Status Message 6 Model/Version number	3.3, 3.5 revised
7	Request Status Message 7 Time and DOW	3.4
8	Request Status Message 8 EMC status	3.3
9	Request Status Message 9 HVAC setup data	3.3, 4.0 revised
10	Request Status Message 10 Smart Vent data	3.8

Reserved Commands and Messages

The following codes are reserved for future use.

Type	Description
ACV	Auto Changeover Variance, Format: ACV=x, "x"=0-9
AS	Alarm Status, Format: AS=x, "x"=0 (Home), 1(Away)
ASF	Alarm Status Fire, Format: ASF=x, "x"=0(ok), 1(Alarm)
C1V	Cool Call Stage 1 Variance from setpoint, Format: C1V=x, "x"=0-9
C2V	Cool Call Stage 2 Variance from setpoint, Format: C2V=x, "x"=0-9
COA	Change Over Status
CV	Cool Call Variable Output, Format: CV=xx, "xx"= 0-99
DVn	Zone Damper Variable Output, Format: DVn=xx, "n"=zone number, "xx"=0-99
F1	Fan Call Stage 1, Format: F1=x, "x"=0, 1
F2	Fan Call Stage 2, Format: F2=x, "x"=0, 1
F3	Fan Call Stage 3, Format: F3=x, "x"=0, 1
FRT	Fan Run Time, Format: FRT=xx, "xx"=0-99
FV	Fan Call Variable, Format: FV=xx, "xx"=0-99
H	Humidity, Format: H=xx, "xx"=0-99
H1V	Heat Call Stage 1 Variance from setpoint, Format: H1V=x, "x"=0-9
H2V	Heat Call Stage 2 Variance from setpoint, Format: H2V=x, "x"=0-9
HV	Heat Call Variable Output, Format: HV=xx, "xx"= 0-99
LAT	Leaving Air Temperature, Format: LAT=xxx, "xxx"=0-999
MP	Mode Priority, Format: MP=x, "x"=0-9 (0=first call, 1=vote)
OH	Outside Humidity, Format: OH=xx, "xx"= 0-99
P	Static Pressure, Format: P=xx, "xx"=0-99
UI	Utility Interface, Format: UI=x, "x"=0-9
VV	Vent Call Variable Output, Format: VV=xx, "xx"=0-99
ZO	Zone Occupancy status, Format: O=x, "x"=0(Unoccupied), 1(Occupied)
ZM	Zone Mode, Format: ZM=x, "x"=0-9 (0= use zone modes, 1=use system mode for all zone modes, 2=use zone 1 mode for all zone modes)

Section 6

System Variable List

Variable	Name	Variable Data	Default value	Notes
1	System Type	0,1, 2	0	0= Gas/Electric, 1 = Heat Pump, 2= Radiant
2	Fan Type	0,1	0	0= Gas (No fan w/Heat), 1= Electric (Fan w/Heat)
3	Change Over Type	0,1	0	0= CO w/cool, 1= CO w/heat
4	C/F Type	0,1	1	0= Centigrade, 1= Fahrenheit
5	Network Address	1-254	1	0= host, 255= global Reserved addresses
6	Fan stages	0,1,2,3,100	1	Reserved, not used this revision
7	Heat stages	0,1,2,3	1	Reserved, not used this revision
8	Cool stages	0,1,2,3	1	Reserved, not used this revision
9	Display lock	0,1	0	0= unlocked, 1=locked
10	MOT	5-9 min	6 min	Service mode = 20 sec. 5 Minute minimum for SCP
11	MRT	1-9 min	6 min	Service mode = 20 sec
12	H Delta Stage 1 On	1-8 deg	1 deg	
13	H Delta Stage 1 Off	0-8 deg	0 deg	Fixed, not adjustable this revision
14	H Delta Stage 2 On	1-8 deg	3 deg	
15	H Delta Stage 2 Off	0-8 deg	0 deg	Fixed, not adjustable this revision
16	H Delta Stage 3 On	1-8 deg	5 deg	
17	H Delta Stage 3 Off	0-8 deg	3 deg	Fixed, not adjustable this revision
18	C Delta Stage 1 On	1-8 deg	1 deg	
19	C Delta Stage 1 Off	0-8 deg	0 deg	Fixed, not adjustable this revision
20	C Delta Stage 2 On	1-8 deg	3 deg	
21	C Delta Stage 2 Off	0-8 deg	0 deg	Fixed, not adjustable this revision
22	C Delta Stage 3 On	1-8 deg	6 deg	Reserved, not used this revision
23	C Delta Stage 3 Off	0-8 deg	0 deg	Reserved, not used this revision
24	Setpoint H/C Delta	3-15 deg	4 deg	Min Delta T between H/C Setpoints
25	SB Mode	0,1	0	0=Fixed, 1= Delta
26	SB Night HSP	0-99 deg	70 deg	
27	SB Night CSP	0-99 deg	76 deg	
28	SB Night Delta	1-10 deg	8 deg	
29	SB Away HSP	0-99 deg	68 deg	
30	SB Away CSP	0-99 deg	78 deg	
31	SB Away Delta	1-10 deg	10 deg	
32	SB Vac HSP	0-99 deg	64 deg	
33	SB Vac CSP	0-99 deg	80 deg	
34	SB Vac Delta	1-10 deg	16 deg	
35	SB Spec HSP	0-99 deg	70 deg	
36	SB Spec CSP	0-99 deg	68 deg	
37	SB Spec Delta	1-10 deg	8 deg	
38	SB T1 HSP	0-99 deg	70 deg	Reserved, not used this revision
39	SB T1 CSP	0-99 deg	74 deg	Reserved, not used this revision
40	SB T2 HSP	0-99 deg	68 deg	Reserved, not used this revision
41	SB T2 CSP	0-99 deg	76 deg	Reserved, not used this revision
42	SB T3 HSP	0-99 deg	66 deg	Reserved, not used this revision
43	SB T3 CSP	0-99 deg	78 deg	Reserved, not used this revision
44	SB T4 HSP	0-99 deg	64 deg	Reserved, not used this revision
45	SB T4 CSP	0-99 deg	80 deg	Reserved, not used this revision
46	Tier 1 price	0-255 mil	0	Reserved, not used this revision
47	Tier 2 price	0-255 mil	0	Reserved, not used this revision
48	Tier 3 price	0-255 mil	0	Reserved, not used this revision
49	Tier 4 price	0-255 mil	0	Reserved, not used this revision
50	Reserved			
51	Reserved			
52	Reserved			
53	Reserved			
54	Reserved			
55	Equalizer Cycle Duration	5-15 min	8 min	Equalizer Run Time (ERT) 0=disabled
56	Equalizer Heat Duration	0-20 min	15 min	Heat Run Time (HRT) before Eq cycle
57	Equalizer Zone Source	1-8	0x01	Reserved, not used this revision
58	Equalizer Zone Sink	1-8	0x01	bit position represents sink
59	Smart Vent Inside Temp zone	1-8	0x01	bit position includes zone in Temp calc
60	Smart Vent Delta	1-9 deg	5 deg	
61	Smart Vent Time	0-99 min	30 min	
62	Smart Vent MRT	1-9 min	4 min	
63	Smart Vent Run Time	0-9999 min		BCD least sig 2 digits
64	Smart Vent Run Time continued			BCD Most sig 2 digits
65	Smart Vent Run Time cont.			
66	Smart Vent Run Time cont.			
67	Smart Vent Run Time cont.			
68	Smart Vent Run Time cont.			
69	Service Mode (Test)	0,1	0	0= Off, 1 = Test Mode, MRT/MOT = 15 sec
70	Smart Vent MOT	5-30 min	10 min	SV Minimum Off Time
71	Outside Temp Offset	-10 to +10 deg	0	Only for sensor attached to CU

72	Fan Purge MRT	0-120 sec	90 sec	Fan Purge in seconds
73	Equalizer Heat MRT	0-5 min	2 min	MRT to allow EQ cycle
74	Autosend mode	0,1	0	0=off, 1=on, send temp/mode on change
83	Heat Stage 1>2 Time		0 min	ZCVxv130 support
84	Heat Stage 2>3 Time		0 min	ZCVxv130 support
85	Cool Stage 1>2 Time		0 min	ZCVxv130 support

Grayed out variables are reserved, but not supported this revision.

Section 7

Protocol Support Matrix By Product

REF	COMMAND	TR15	TR36	ZC6R	EMC15	TR16	TR40	ZCVx	RS21
	Controller Firmware Version	Hcr19b	Hcrd141	2.10	Emc15v04	3.05.4	3.05.1	1.4.8	2.00.1
2.1	Address code	99	127	254	127	99	254	254	254
2.2	Originator code	x	x	x	x	x	x	x	x
2.3	Zone code			x					
2.4	SP=	x	x	x	x	x	x	x	
2.5	SPH=					x	x	x	
2.6	SPC=					x	x	x	
2.7	M=	x	x	x	x	x	x	x	
2.8	F=	x	x	x	x	x	x	x	
2.9	SM=							x	
2.10	SF=							x	
2.11	CFM=					x	x	x	
2.12	TM=		x		x	x	x	x	
2.13	V=			x					
2.14	OT=			x		x	x	x	
2.15	RT=								
2.16	BF=	x				x			
2.17	Time=					x	x	x	
2.18	Date=						x	x	
2.19	DOW=						x	x	
2.20	Sed/x=						x	x	
2.21	SC=						x	x	
2.22	DL=					x	x	x	
2.23	SVx=					x	x	x	
2.24	UM=				x				
2.25	NAME=				x				
2.26	WHD=				x				
2.27	WHC=				x				
2.28	SHDx=				x				
2.29	SCDx=				x				
2.30	UM1D=				x				
2.31	UM2D=				x				
2.32	UM3D=				x				
2.33	UM6D=				x				
2.34	UM7D=				x				
2.35	RESD=				x				
2.36	MC=				x				
2.37	VM=							x	
2.38	VSP=							x	
2.39	VSEx=							x	
2.40	VSC=							x	
2.41	VRT=							x	
2.42	VIT=							x	
2.43	VA=								
2.44	SSA=							x	
2.45	SSD=							x	
2.46	SSS=							x	
2.47	RTx=							x	
2.48	MTx=							x	
2.49	SB=					x		x	
2.50	SBHx=							x	

2.51	SBCx=							x	
2.52	CAN=								x
2.53	SCAL=								x
3.1	R=1	x	x	x	x	x	x	x	x
3.2	R=2	x	x	x	x	x	x	x	
3.3	R=3	x	x	x	x	x	x	x	x
3.4	R=4	x	x	x	x	x	x	x	
3.5	R=5	x	x	x	x	x	x	x	
3.6	R=6			x	x	x	x	x	x
3.7	R=7				x		x	x	
3.8	R=8				x				
3.9	R=9			x	x	x	x	x	
3.10	R=10							x	
4.1	STATUS MSG1	x	x	x	x	x	x	x	
4.2	STATUS MSG2	x	x	x	x	x	x	x	
4.3	STATUS MSG3	x	x	x	x	x	x	x	
4.4	STATUS MSG4	x	x	x	x	x	x	x	
4.5	STATUS MSG5	x	x	x	x	x	x	x	
4.6	STATUS MSG6			x	x	x	x	x	
4.7	STATUS MSG7				x	x	x	x	
4.8	STATUS MSG8				x				
4.9	STATUS MSG9			x	x	x	x	x	
4.10	STATUS MSG10							x	