Tempest TEMP Protocol

Developer Guide

Revision 2.1

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TEMPEST

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Document Revisions

Rev	Details	Date
0.01	First draft version for review	30 APR 2015
0.02	Second draft for review and comment	01 MAY 2015
0.03	First revision after initial implementation. Change of Baud rate for 250K to 115.2K	12 MAY 2015
0.04	Inclusion of Error Codes, corrections from internal review.	12 MAY 2015
0.05	Revision of example to match valid mnemonics. Addition of Relay status for initialisation. Addition of status parameters for DEC 4	01 OCT 2016
0.06	Correction of inconsistent mnemonics for Heater and Fan Drive Levels	13 MAY 2017
1.00	Addition of Fan Speed reporting when PWM fans fitted	OCT 2019
2.00	Addition of Cooler management settings when Cooler installed	MAY 2024
2.01	Correction of Cooler Fan rate mnemonic to 'LOW' from 'MIN'	SEP 2025

Introduction

This document describes the protocol and command set for the remote control and status monitoring of enabled Tempest DEC4 controllers.

The protocol is a half duplex ASCII syntax, based on a client-server model.

1.1 Terms and Conventions

All commands are initiated by a TEMP Controller and are responded to by a TEMP Responder. Commands and Responses are collectively referred to as packets.

A single Command and associated Response is referred to as an exchange.

1.1.1 TEMP Controller

A TEMP controller is not to be confused with a DEC or 'DEC Controller'. The TEMP Controller, referred to here on in as a Controller will be the system of software that is a client of the Tempest DECs.

All serial packets sent by the Controller will be referred to as a command.

1.1.2 TEMP Responder

A TEMP Responder, for the purpose of this document, refers to a Tempest DEC and from here on, is referred to as a Responder.

All serial packets sent by a Responder will be referred to as a response.

Connectivity

1.2 Physical Connection

The connection to Tempest Equipment is via an RS485 Buss with Controller Idle State bias, compliant with ANSI E1.20 section 2.4.1. at 115.2K Baud, 8 data bits, two stop bits.

Responder Addressing

The responder address will be the electronic UID of the responder. A responder UID is comprised of a PLASA manufacturer ID and a unique manufacturer serial number. For Tempest equipment, the vendor ID or VID is $544C. The remaining 8 characters are a hexadecimal extrapolation of the responder serial number, so for example, a serial number of 64035 would be represented by a hexadecimal value of $0000FA23. These two strings combined together form the responder address

$544C0000FA23.

The responder serial number can be found on the Tempest electronics or by accessing the user display and scrolling the status information.

A GET command to address $FFFFFFFFFFFF will solicit a response from all responders, which having more than one responder on a single buss will cause a data conflict.

A SET command to address $FFFFFFFFFFFF will be acted on by a responder but not responded to.

Command Structure

Each packet is transmitted as an ASCII string, enclosed in the reserved characters '<' and '>'. Any traffic before the < and after the > characters shall be disregarded.

On receipt of a < character before the final > character, all preceding data shall be disregarded. Each packet is addressed to an associated Responder.

Each packet contains a reserved Command or Response Identifier character, being '?' or '!' respectively.

The responder address shall be sent immediately after the command or response Identifier. There are two classes of exchange, **SET** to configure and **GET** to retrieve status data.

1.3 Get Command Example

<?:$544C0000FA23;GET:STA>

1.4 Get Response Example

<!:$544C0000FA23;STA:ACV=#223,ACC=#5.3,ATM=#32,RHM=#62,RLY=AUT>

1.4.1 Set Command Example

<?:$544C0000FA23;SET:RLY=OFF>

1.4.2 Set Response Example

<!:$544C0000FA23;RLY=OFF>

Packet Parsing

1.5 Order of Precedence

Packets are syntactically arranged for parsing in order of precedence, the precedence being a string literal, semi-colon, colon comma and vertical line.

1.5.1 Type Identifiers

- Decimal values are preceded by a hash character **#**
- Hexadecimal values are preceded by a dollar character **$**
- Text strings are enclosed by the double quote character **"**
- All other data implicitly represents and enumerated constant

1.5.2 Reserved Characters

The following character are reserved for packet delineation and text encapsulation:

< > " \

Reserved characters used in strings will be preceded by the reserved escape character **** .

Character	Use	Description
\	\\	Backslash
<	\<	Start of packet
>	\>	Packet terminator
"	\"	String Literal Quote

Packet Parameters

Each Command packet will contain one parameter, optionally with an argument. Each Response packet will contain one or more parameters each with a parameter argument. Parameters with arguments will be in the format PPP=A, where PPP is the three letter Mnemonic or PID to identify the parameter and A being the argument value or data of the parameter. Parameters without arguments will be in the format PPP, where PPP is the three letter Mnemonic or PID to identify the parameter.

Get command packets may have one parameter argument. Set command packets will have one parameter argument.

Response packet parameters are cardinal with no pre-determination of the order.

Command and Response PIDs

1.6 STA

1.6.1 GET Command

This is used to return the current status of the DEC, no parameter arguments are sent with this request.

1.6.2 GET Response

Responses to the request include the following values:

- ACC AC RMS Lamp current
- ACV AC RMS Line Voltage
- ATE Air Temperature (External) °C
- ATM Air temperature (Main) °C
- DLH Heater Drive Level %
- DLF Fan Drive Level %
- FxxFan Speed (xx) RPM *****
- LHR Lamp hours
- PCT PCB temperature °C
- RHM Relative Humidity (Main) %

- RLY Relay Status (INI |OFF | SBY | RUN | TRP)

***** Note: xx represents the fan index and will only be reported when the appropriate fan(s) are fitted and detected. For example, F01.

1.7 CFG

1.7.1 GET Command

This is used to return the current configuration of the DEC, no parameter arguments are sent with this request.

1.7.2 GET Response

Responses to the request are as detailed in the configurable parameters detailed later on in this guide. Reported parameters will be dependent of corresponding options being installed and detected.

1.8 VER

1.8.1 GET Command

This is used to return version information associated with the DEC system, no parameter arguments are sent with this request.

1.8.2 GET Response

Responses to the request include the following values:

- HWR Hardware Revision Text Description
- FWR Firmware Revision Text Description

1.9 RLY

This PID is used to change the operational mode of the relay in a DEC.

1.9.1 SET Command

Valid arguments for this PID are:

- AUT Automatic On, Relay Closed Unless Over Temperature.
- OFF Manual Off, Relay Held Open

1.9.2 SET Response

Response to this parameter will be one of the following enumerated constants:

- INI Relay Open, System Initialization
- OFF Manual Off state
- SBY Relay Closed, Lamp Load Off
- RUN Relay Closed, Lamp Load On
- TRP Relay Automatically Tripped Open, Over Temperature

1.10 LBL

Labels are 7 bit ASCII strings up to 32 characters long, enclosed in " literal quotes. Reserved characters are escaped as detailed in section Reserved Characters

1.10.1 GET Command

This retrieves the current label string assigned to the DEC. No parameter arguments are sent with this request.

1.10.2 GET Response

- LBLQuote Enclosed DEC Label

1.10.3 SET Command

This writes a new label to the responder, the new label is sent as a parameter argument, formatted as a quote enclosed string.

1.10.4 SET Response

- LBLThe Request String Echoed Back

1.11 TST

This PID facilitates a remote override of the Fans in the enclosure.

1.11.1 GET Command

This retrieves the current state of a Fan Test. No parameter arguments are sent with this request.

1.11.2 GET Response

- TST (RUN|OFF)

1.11.3 SET Command

Valid arguments for this PID are:

- RUN Run or initiate an enclosure Fan Test
- OFF Cancel or Stop an Active Fan Test

1.11.4 SET Response

The Request enumerated option or error code will be Echoed Back.

1.12 LOT

This PID reports and configures the Lower Temperature Setting of the enclosure in °C

1.12.1 GET Command

This retrieves the current setting, together with the permissible setting range. No parameters are accepted with this request.

1.12.2 GET Response

- CFG Currently Configured setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.12.3 SET Command

This configures a permissible setting.

The response will follow the format of the GET response or return an error code.

1.12.4 SET Response

- CFG Updated configuration setting
- MIN Minimum permissible parameter setting

- MAX Maximum permissible parameter setting

1.13 UPT

This PID reports and configures the Upper Temperature Setting of the enclosure in °C

1.13.1 GET Command

This retrieves the current setting, together with the permissible setting range. No parameters are accepted with this request.

1.13.2 GET Response

- CFG Currently Configured setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.13.3 SET Command

This configures a permissible setting.

The response will follow the format of the GET response or return an error code.

1.13.4 SET Response

- CFG Updated configuration setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.14 TRP

This PID reports and configures the Trip-Out Temperature Setting of the enclosure in °C

1.14.1 GET Command

This retrieves the current setting, together with the permissible setting range. No parameters are accepted with this request.

1.14.2 GET Response

- CFG Currently Configured setting
- MIN Minimum permissible parameter setting

- MAX Maximum permissible parameter setting

1.14.3 SET Command

This configures a permissible setting.

The response will follow the format of the GET response or return an error code.

1.14.4 SET Response

- CFG Updated configuration setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.15 RHM

This PID reports and configures the Relative Humidity Limit Setting of the enclosure in %

1.15.1 GET Command

This retrieves the current setting, together with the permissible setting range. No parameters are accepted with this request.

1.15.2 GET Response

- CFG Currently Configured setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.15.3 SET Command

This configures a permissible setting.

The response will follow the format of the GET response or return an error code.

1.15.4 SET Response

- CFG Updated configuration setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.16 RUN

This PID reports and configures the Lamp Current 'On' State Threshold of the enclosure in AC Amps RMS.

1.16.1 GET Command

This retrieves the current setting, together with the permissible setting range. No parameters are accepted with this request.

1.16.2 GET Response

- CFG Currently Configured setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.16.3 SET Command

This configures a permissible setting. Values shall be formatted to one decimal place. The response will follow the format of the GET response or return an error code.

1.16.4 SET Response

- CFG Updated configuration setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.17 RUH

This PID reports and configures the Maximum Lamp Current draw in AC APMS RMS

below which enclosure heaters may operate to maintain the enclosure Relative Humidity within the configured setting.

1.17.1 GET Command

This retrieves the current setting, together with the permissible setting range. No parameters are accepted with this request.

1.17.2 GET Response

- CFG Currently Configured setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.17.3 SET Command

This configures a permissible setting. Values shall be formatted to one decimal place. The response will follow the format of the GET response or return an error code.

1.17.4 SET Response

- CFG Updated configuration setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.18 FRO

This PID reports and configures the time in minutes, for which fans will Run On after the Lamp Current has dropped below the 'On' State Threshold.

1.18.1 GET Command

This retrieves the current setting, together with the permissible setting range. No parameters are accepted with this request.

1.18.2 GET Response

- CFG Currently Configured setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.18.3 SET Command

This configures a permissible setting. Values shall be formatted to one decimal place. The response will follow the format of the GET response or return an error code.

1.18.4 SET Response

- CFG Updated configuration setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.19 FDL

This PID reports and configures when fitted, the Minimum Drive of variable speed fans as %. The configured minimum duty applies to fan operation when the Lamp is ON

1.19.1 GET Command

This retrieves the current setting, together with the permissible setting range. No parameters are accepted with this request.

1.19.2 GET Response

- CFG Currently Configured setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.19.3 SET Command

This configures a permissible setting. Values shall be formatted to one decimal place. The response will follow the format of the GET response or return an error code.

1.19.4 SET Response

- CFG Updated configuration setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.20 FDH

This PID reports and configures when fitted, the Maximum Drive of variable speed fans as %. The configured minimum duty applies to fan operation when the Lamp is ON

1.20.1 GET Command

This retrieves the current setting, together with the permissible setting range. No parameters are accepted with this request.

1.20.2 GET Response

- CFG Currently Configured setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.20.3 SET Command

This configures a permissible setting. Values shall be formatted to one decimal place. The response will follow the format of the GET response or return an error code.

1.20.4 SET Response

- CFG Updated configuration setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.21 SCM

This PID reports and Defaults an Active cooling system, when the option is integrated.

1.21.1 GET Command

This retrieves the current setting. No parameters are accepted with this request.

1.21.2 GET Response

- SCM System Cooler Mode (OFF|CLD|DRY|HTR|AUT)

1.21.3 SET Command

This is used to default the operational mode of a System Cooler, when fitted. valid arguments for this PID are:

- CLD Standard Cooling operation

1.21.4 SET Response

The requested option or an error code will be echoed back.

1.22 SCT

This PID reports and configures Temperature settings related to an Active cooling system in °C, when the option is integrated.

1.22.1 GET Response

- CFG Currently Configured setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.22.2 SET Command

This configures a permissible setting. Values shall be formatted to one decimal place. The response will follow the format of the GET response or return an error code.

1.22.3 SET Response

- CFG Updated configuration setting
- MIN Minimum permissible parameter setting
- MAX Maximum permissible parameter setting

1.23 SCF

This PID is for configuring Fan Speed settings related to an Active cooling system, when the option is integrated.

1.23.1 GET Command

This retrieves the current setting. No parameters are accepted with this request.

1.23.2 GET Response

- SCF System Cooler Fan Rate (OFF|LOW|MED|MAX|AUT) *****

1.23.3 SET Command

This is used to change the operational mode of the fan in a System Cooler, when fitted. valid arguments for this PID are:

- LOW Lowest Active Cooler Fan Speed setting
- MED Intermediate Active Cooled Fan Speed setting
- MAX Highest Active Cooler Fan Speed setting
- AUT Active Cooler Fan Speed managed by Cooling Unit

Note that this command will default the SCM parameter to the CLD setting, if not already configured.

1.23.4 SET Response

The requested option or an error code will be echoed back.

Error Codes

In the case that a responder in not able to parse a Command packet, one of the following parameter and argument will be returned:

1.24 SET Response

- ERR Hex Error Code Number

The table below describes the possible error codes

Code	Description
$01	Packet Format Error
$02	Unknown Command Class
$03	Unknown Command Parameter
$04	Parameter Argument Data Invalid
$05	Parameter Value out of Range
$FF	Un-handled Error