130 Command Reference

Format Specifications

Rev 3.3.0 Document Revision H

2011.03.11

This REF TEK manual provides comprehensive, detailed descriptions of the formats of command that control the 130 family of products. This manual includes an overview of command structure, classifications of commands, functional descriptions, parameters, and Immediate Action commands.

Refraction Technology
1600 Tenth Street
Suite A
Plano, Texas 75074
Tel: 214-440-1265
Fax: 972-578-0045
www.reftek.com

Revision History:

Revision	Date	Reason for change	Pages
	2010.09.29	**Modified for 3.2.8**	**All**
	2010.06.24	**3.2.6 Update Format**	**All**
	2010.03.08	**3.2.0 Update to LP and WP**	**Sect 3.11** **Sect 3.36**
	2010.01.18	**Added Index**	**Section 4**
H	**2009.10.08**	**Clarify SS command parameters**	**Section 3.33**
	2009.06.04	**Added disk operation cutoff (3.0.0)**	**iii**
G	**2008.07.24**	**Converted to WORD**	**All**
	2008.01.14	**Added changes to LP and WP**	
F	**2007.06.01**	**Added LP and WP Commands** **Added Channel Comment for PC**	
E	**2006.09.08**	**Added MT (Memory Test)**	**Section 2.2**
D	**2006.01.19**	**Added GC command**	**Sect 1.8**
C	**2005.12.03**	**Added Vote Trigger**	**Sect 2.13.8**
B	**2003.05.03**	**Sensor Commands (PK)(PQ)(SK)**	**Sect 2**
A	**2003.01.03**	**11/27/02 Command Update**	**All**
0.1	**2002.03.04**	**Initial release**	**All**

About this manual:

This Technical Reference manual provides a detailed overview of the commands used with the 130. It covers the following broad operational topics:

- Overview of commands and responses
- Command format
- Command type
- Command function
- Technical definition of each command and its response

CF Card Replacement:

Due to the large variability of CF cards available on the world market and the resulting problems with compatibility due to memory layout, signal structuring and power requirements, Refraction Technology cannot guarantee a CF card will work in a REFTEK data recorder unless it is sold through REFTEK itself. REFTEK ensures compatibility through communications with CF manufacturers and rigorous in-house testing. Some CF manufacturers refuse to provide adequate information or factory controls to ensure that the product being sold today is the same as the product sold earlier under the same part number. CF cards not purchased from REFTEK may work at one temperature but not at another, or may fail all together.

ATTENTION: For optimal performance in a REF TEK 130 recorder, Compact Flash disks should ALWAYS be formatted BY THE RECORDER.

Software Version:

Current software and documentation is available on our web site. Some early units may require hardware modifications to use the latest software. Contact REF TEK if you have any queries on the compatibility of your unit(s) and the current software release.

Firmware Update:

To update firmware from the FTP site

1. Login to our FTP site at: ftp.reftek.com/pub as:

   User name: Anonymous

   Password: Your E-mail address
2. Find the 130 firmware at ftp.reftek.com/pub/130/cpu/prom.
3. Download the zip file of the most recently released firmware version.

Update firmware:

Updating firmware in a 130 DAS requires the presence of a firmware file on an installed Compact Flash device.

1. On power-up, the 130 checks the Compact Flash for the presence of 'main.s3' in the root directory.
2. If the 'main.s3' file is present on the Compact Flash, the 130:
   - Reads the file.
   - DELETES the file.
   - Re-programs the internal flash memory.

Note: DO NOT DISTURB THE UNIT DURING THIS PROCESS.

Note: User parameters stored in SPROM using the WP command will be erased when a firmware update is performed.

Note: DAS power must be above 11.5V for a firmware update.

Follow these steps to update the firmware of a 130 DAS:

1. Unzip the 'main.s3' file from the downloaded zip file of the most recently released firmware.
2. Copy the desired firmware image to the root of the Compact Flash as 'main.s3' using a PC with a Compact Flash reader or ftp into the 130 DAS, with a Compact Flash installed, in binary mode.
3. With the Compact Flash with the main.s3 image installed in the 130 DAS, issue a reset command.

(a) If you are at the 130 DAS:

1. Issue a Reset command from a PDA running PFC_130 or Physically disconnect and reconnect power to the unit.
2. Observe the LCD for the following messages:

```
READING DISK DO NOT DISTURB
WRITING FLASH DO NOT DISTURB
```

3. The 130 DAS resets and returns to normal messaging.

(b) If you are remotely connected to a 130 DAS via telemetry mode:

- If you are connecting remotely by a TCP connection:
  1. First connect
  2. Discover the unit
  3. Acquire status
  4. Issue a reset command from the Status screen.
  5. Delete the unit from the Station List screen.
  6. Wait at least 5 minutes.
  7. At the Connections screen (reconnect id using a TCP connection) issue a Station Discovery again to discover the 130 DAS station.

Note: DO NOT DISTURB THE UNIT until the start-up LCD message reappears.

Notation Conventions

The following notation conventions are used throughout REF TEK documentation:

Notation	Description
ASCII	Indicates the entry conforms to the American Standard Code for Information Interchange definition of character (text) information.
Binary	Indicates the entry is a raw, numeric value.
Hex	Indicates hexadecimal notation. This is used with both ASCII characters (0 – 9, A – F) and numeric values.
BCD	Indicates the entry is a numeric value where each four bits represents a decimal digit.
FPn	Indicates the entry is the ASCII representation of a floating-point number with n places following the decimal point.
<n>	Indicates a single 8-bit byte. When the contents are numeric, it indicates a hexadecimal numeric value; i.e. <84> represents hexadecimal 84 (132 decimal). When the contents are capital letters, it represents a named ASCII control character; i.e. <SP> represents a space character, <CR> represents a carriage return character and <LF> represents a line feed character.
MSB	Most Significant Byte of a multi-byte value.
MSbit	Most Significant Bit of a binary number.
LSB	Least Significant Byte of a multi-byte value.
LSbit	Least Significant Bit (bit 0) of a binary number.
YYYY	Year as a 4-digit number
DDD	Day of year
HH	Hour of day in 24-hour format
MM	Minutes of hour
SS	Seconds of minute
TTT	Thousandths of a second (milliseconds)
IIII	Unit ID number

n, nS	nano, nanoSecond; 10-9 = 0.000000001
u, uS	micro, microSecond; 10-6 = 0.000001
m, mS	milli, milliSecond; 10-3 = 0.001
K, KHz	Kilo, KiloHertz; 103 = 1,000
M, MHz	Mega, MegaHertz; 106 = 1,000,000
G, GHz	Giga, GigaHertz; 109 = 1,000,000,000
Kb, KB	Kilobit, KiloByte; 210 = 1,024
Mb, MB	Megabit, MegaByte; 220 = 1,048,576
Gb, GB	Gigabit, GigaByte; 230 = 1,073,741,824

Related Manuals:

130-01/3 System Documents	Number	PDF file
130-01 System Startup	Doc-130-Ops	130_startup_01.pdf
PFC_130 Users Guide	Doc-130-PFC	Pfc_130.pdf
Data Utilities Users Guide	Doc-DataUtils	130_utilities.pdf
Archive Utilities	Doc-ArcUtils	arcutil.pdf
130 Theory of Operations	Doc-130-Theory	130_theory.pdf
130 PFC Release Notes	Doc-130-PFCRel	130_PFCRN.pdf
130 CPU Release Notes	Doc-130-CPURel	130_CPURN.pdf
130 Command Reference	Doc- 130-Cmd	130_command.pdf
130 Recording Format	Doc-130-Record	130_record.pdf
130-GPS Manual	Doc-GPS-Ops	Gps. pdf
Optional Manuals	**Number**	**PDF file**
RTPD Installation and Users Guide	Doc-RTPD	RTPD.pdf
RTP Protocols	Doc-RTP	RTP.pdf
RT_View (Part of Data Utilities)[1]	Doc-RTView	RTView.pdf
RTCC Command and Control Users	Doc-RTCC	RTCC.pdf
130 RTCC Release Notes*	Doc-RTCCRel	130_RTCCRN.pdf
RT_Display Users Guide*	Doc-RTDis	RTDisplay.pdf
RTPMonitor Installation and Users Guide	Doc-RTPMon	RTPM.pdf
131A-02/3 3G Triaxial Accelerometer	Doc-131A-02/3	131A023.pdf
131A-02/2 3G Biaxial Accelerometer	Doc-131A-02/2	131A022.pdf
131B-01/3 4G Triaxial Accelerometer	Doc-131B-01/3	131B013.pdf
131B-01/1 4G Unixial Accelerometer	Doc-131B-01/1	131B011.pdf

[1] * = Programs are included in the optional REF TEK Command and Control Interface (RTI)

REF TEK Support and update notifications

As a valued user of REF TEK equipment we would like to provide the best support possible by keeping you up to date with our product updates.

If you would like to be notified of any REF TEK product updates please spend a couple of minutes to register with the REF TEK customer support team.

To register enter your company information through the Register link on our website fill at http://support.reftek.com .

Our support team will send you a unique Username and Password allowing secured access to all product documentation and software sold to your company.

Once we register your contact we will only send necessary notifications via email. The same notifications will be shown on our website http://support.reftek.com page

Thanks,

Your REF TEK support team

Contents

1 Commands

1.1 Command Overview

All commands and command responses have the following general format:

<ATTN><0>IIIILLLLCCpayloadCCXXXX<CR><LF>

Field	Description
<ATTN>	8-bit Attention value
<0>	8-bit Reserved value of zero (NULL)
IIII	4-digit ASCII hex representation of the Unit ID of the unit to receive the command. An ID of zero (0000) addresses any/all units.
LLLL	4-digit Length of the rest of the command
CC	2-character ASCII Command Code
Payload	command-specific set of ASCII values
XXXX	CRC in ASCII hex characters
<CR>	ASCII carriage return character
<LF>	ASCII line feed character

The entire sequence is composed of ASCII characters except for the **Attention** and **Reserved** bytes. All commands use an attention value of 84h. All responses use an attention value of 85h. Every command generates a response. Responses can be viewed as commands by the DAS to the user interface.

The **Unit ID** for all REF TEK 130 series DAS units is in the range of 9001h - FFFFh. A Unit ID of 0 addresses any and all units that can receive the command. The Unit ID field is NEVER 0 in a response, but always indicates which DAS unit issued the response.

The **Length** field specifies the number of bytes that follow, including the command codes, payload, CRC and delimiters. The length of a command may change if additional payload is added to the command.

The **Payload** is specific to each command or response. The payload is broken into command-specific fields that have their contents left-justified and are padded on the right with spaces when their entry does not fill the specified field length. If new fields are added to the payload, they are added to the end of the existing fields.

The **CRC** field is the CRC-16 (X16 + X15 + X2 + 1) value calculated beginning with the first byte of the Unit ID field and ending with the last byte of the second command code field. The CRC is initialized to FFFFh.

1.2 Command Types

There are two types of commands for REF TEK 130 DAS units:

- Delayed Action Commands
- Immediate Action Commands

Delayed Action commands transfer and store DAS operating parameters that are not acted upon until a later time. **Immediate Action** commands include some parameter commands and cause the DAS to perform various actions when the command is received. A specific **Immediate** Action command, the Parameter Implement (**PI**) command, causes the DAS to begin operating according to the parameters received in the **Delayed Action** commands. This behavior is necessary because the **Delayed Action** commands directly affect the data acquisition process and the information stored with the data.

The **PI** command automatically forces acquisition to stop if it has not already been disabled. However, this causes a delay in the performance of the **PI** command. It is therefore recommended that the Acquisition Stop be issued first instead of relying on the **PI** command to force the stop.

The commands classified as Delayed Action commands are:

Channel definition (PC)

Data Stream definition (PD)

Station definition (PS)

Several Immediate Action commands are used in conjunction with the Delayed Action commands. These include Parameter Erase (**PE**), Parameter Backup (**PB**), Parameter Request (**PR**) and Parameter Implement (**PI**). Details for these commands are provided in the section on Immediate Action commands.

The Delayed Action commands should be issued in the following sequence:

These can be in any order.

- Acquisition Stop (AQ)
- Parameter Erase (PE)
- Station parameters (PS)
- Channel 1 parameters (PC)

  …
- Channel n parameters (PC)
- Data Stream 1 parameters (PD)

  …
- Data Stream n parameters (PD)
- Auxiliary Data Parameters (PA)
- Calibration Parameters (PK)
- Parameter Implement (PI)
- Acquisition Start (AQ)

A **Delayed Action** command does not have to be sent for every channel or every data stream if the **Parameter Erase** command is issued prior to sending any **Delayed Action** parameters. In this case, only the active channels and data streams must be sent to the DAS.

This Page Left Intentionally Blank

2 Command List

The commands currently defined for REFTEK 130 series Data Acquisition Systems, with an explanation of their basic functions, are listed below. Shaded commands affect the operating parameters of the DAS.

Cmd Code	Command Name	Command Type	Function
AQ	Acquisition Control	Immediate Action	Controls data acquisition; start includes a delay time of up to 99 minutes and 59 seconds.
CT	Command Trigger	Immediate Action	Activates a trigger for a data stream that has not yet been triggered.
DM	Data Monitor	Immediate Action	Returns data for a specified channel of a data stream for display.
DO	Data Offset	Immediate Action	Returns averages for channels of a data stream.
DS	Data Statistics	Immediate Action	Returns statistics for channels of a data stream.
FD	Forced Dump	Immediate Action	Forces the unit to flush data from RAM to disk.
FW	Firmware Update	Immediate Action	Reprograms the CPU flash memory with firmware stored in a file on the disk drive
GC	GPS Duty Cycle	Immediate Action	Programs GPS to be on continously, duty cycled, or off
ID	Identify Unit	Immediate Action	Requests firmware version numbers.
IG	Immediate Gain Set	Immediate Action	Changes the DAS unit's gain to specified settings.
LP	Load Parameter	Immediate Action	Searches for a parameter set on SPROM to load.
MF	Media Format	Immediate Action	Erase information from RAM or disk.
MT	Memory Test	Immediate Action	Test DAS RAM.
PA	Auxiliary Data Info.	Delayed Action	Defines information for recording the auxiliary data channels.
PB	Parameter Backup	Immediate Action	Restores the backup copy of the DAS control parameters to the user-accessible copy.
PC	Channel Info.	Delayed Action	Defines information for a specified channel, including a channel name and the type, location, and orientation of the sensor used to input data on that channel.
PD	Data Stream Info.	Delayed Action	Defines the unit's data stream and recording parameters.

Cmd Code	Command Name	Command Type	Function
PE	Parameter Erase	Immediate Action	Erases the user-accessible copy of all the parameters in the DAS unit's internal RAM.
PI	Parameter Implement	Immediate Action	Duplicates the user-accessible copy of the control and data recording parameters to create a checksum copy; it verifies the checksum and converts the parameters to the format used internally by the DAS.
PK	Sensor Calibration Signal Info.	Delayed Action	Defines sensor calibration signal information.
PL	Sensor Calibration Sequence Parameters	Delayed Action	Define the time sequence used for periodic calibrations.
PM	Modem Info.	Immediate Action	Defines the command strings sent to a modem.
PN	Network Info.	Immediate Action	Defines the network parameters of the DAS.
PQ	Sensor Auto Re-center Info.	Delayed Action	Defines sensor automatic re-centering information.
PR	Parameter Request	Immediate Action	Copies the parameters in the DAS unit to the control interface.
PS	Station Info.	Delayed Action	Defines experiment and station information for a specified data recording station in a network.
PT	Transmitter and Calibration	Delayed Action	Configures transmitter and calibration parameters for the DAS.
PZ	Disk Info.	Immediate Action	Defines disk recording control parameters.
RS	Reset System	Immediate Action	Causes the DAS to perform a soft reset; it interrupts data acquisition and optionally resets the parameters to their defaults and erases data in RAM.
SK	Sensor Calibration	Immediate Action	Initiates a calibration cycle or mass center cycle.
SH	State-of-Health	Immediate Action	Places a user-specified ASCII message directly into the unit's state-of-health (SOH) log.
SO	Set Offset	Immediate Action	Sets the DC offset correction for each channel.
SS	Status	Immediate Action	Requests various status information from the DAS, specified by a subcommand code.
ST	Sensor Test	Immediate Action	Outputs a test signal to the sensor.
TS	Time Set	Immediate Action	Enters a new time for the DAS. Optionally waits for a pulse to activate the new time.
WP	Write Parameter	Immediate Action	Write the current user-accessible parameter set to SPROM.

3 Command Reference

This section provides technical definitions for all commands used with REF TEK 130 Data Acquisition Systems.

3.1 Acquisition Control (AQ)

The **Acquisition** command requests activation and deactivation of data collection. The unit does not begin detecting trigger until acquisition has been activated. No data is recorded unless a trigger is detected.

Activation and deactivation of acquisition is a two-step process. The **AQ** command indicates the desired acquisition state. The unit must perform some internal operations to achieve the desired state. The acquisition status information (**SS:AQ**) indicates both the requested and actual state of acquisition.

When the requested state is Start, the unit delays actual activation based on the Start Time Delay. This is intended to allow the operator to leave the area without causing a false trigger when an Event Trigger or Level Trigger is used for data collection.

When the requested state is Halt, the unit completes any non-continuous events in progress before actually deactivating acquisition. When disk recording is enabled, this also forces data from RAM onto disk.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	Binary (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: AQ
12	Requested State	1	ASCII characters: S (start), H (halt) or space (report state)
13	Reserved	1	ASCII space
14	Start Time Delay	4	ASCII digits: MMSS
18	Command code	2	ASCII characters: AQ
20	CRC	4	ASCII hexadecimal
24	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: AQ
12	Requested State	1	ASCII characters: S (start) or H (halt)
13	State	1	ASCII characters: A (active) or I (inactive)
14	Command code	2	ASCII characters: AQ
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

3.2 Command Trigger (CT)

The **Command Trigger** causes an un-triggered data stream to trigger when acquisition is active. The data stream then records data for the record length specified in its data stream parameters.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: CT
12	Stream number	1	ASCII digits: 1-8
13	Reserved	1	ASCII <SP>
14	Trigger Time	16	ASCII digits: YYYYDDDHHMMSSTTT
30	Command code	2	ASCII characters: CT
32	CRC	4	ASCII hexadecimal
36	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: CT
12	Stream number	1	ASCII digits: 1-8
13	Reserved	1	ASCII <SP>
14	Result	2	ASCII hexadecimal: 00 done (no error), 01 invalid request (inactive stream), 02 rejected (already triggered)
16	Command code	2	ASCII characters: CT
18	CRC	4	ASCII hexadecimal
22	Delimiter	2	ASCII characters: <CR><LF>

3.3 Data Monitor (DM)

The **Data Monitor** command controls the output of simple monitor data. This data is intended for simple display purposes, not for precise data analysis. The sample rate is not directly controllable by the user, but is based on the current rate of the requested channel of the requested data stream. Channel data collected at rates above 25 samples per second is filtered using a 6 Hz low pass filter and decimated to 20 or 25 samples per second. Channel data collected at rates of 25 samples per second or lower are not filtered or decimated. A data stream must be configured before the Data Monitor will return data.

A total of 160 data values are returned. The data is broken up into a sequence of response packets rather than a single response packet. The number of data points in a packet is variable.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: DM
12	Reserved	1	ASCII <SP>
13	Data Stream	1	ASCII digit: The data stream to be monitored.
14	Channel	2	ASCII digit: The data channel: 1 - 12
16	Command code	2	ASCII characters: DM
18	CRC	4	ASCII hexadecimal
22	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: DM
12	Data Size (s)	1	ASCII digit: hex digits per sample: 4, 6 or 8
13	Data Stream	1	ASCII digit: The data stream to be monitored.
14	Channel	2	ASCII digits: The data channel to be monitored.
16	Number of Responses	1	ASCII integer: 1 – 8
17	Response Sequence Number	1	ASCII integer: 1 – 8
18	Sample Rate	2	ASCII integer
20	Sample Count (n)	2	ASCII hexadecimal
22	Data	s * n	ASCII hexadecimal
22 + (s * n)	Command code	2	ASCII characters: DM
24 + (s * n)	CRC	4	ASCII hexadecimal
28 + (s * n)	Delimiter	2	ASCII characters: <CR><LF>

3.4 Data Offset (DO)

The **Data Offset** command calculates and returns the mean of each channel of a selected data stream. A data stream must be configured before the Data Offset will return data.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: DO
12	Data Stream	1	ASCII digit: The data stream to be monitored.
13	Offset Type	1	ASCII character: A = absolute S = stored, else = relative to currently stored offset correction
14	Length	2	ASCII integer: 0 – 99 (seconds)
16	Command code	2	ASCII characters: DO
18	CRC	4	ASCII hexadecimal
22	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: DO
12	Data Stream	1	ASCII digit: The data stream to be monitored.
13	Offset Type	1	ASCII character: A = absolute S = stored R = relative to currently stored offset correction
14	Channel count (c)	2	ASCII integer
16	Channel information	c * 10	ASCII: see below
16 + (c * 10)	Command code	2	ASCII characters: DO
18 + (c * 10)	CRC	4	ASCII hexadecimal
22 + (c * 10)	Delimiter	2	ASCII characters: <CR><LF>

For each channel, the following information is returned:

Offset	Description	No. of Bytes	Type and Range
0	Channel Number	2	ASCII digits: 1 – MAX_CHN
2	Offset	8	ASCII hexadecimal

3.5 Data Statistics (DS)

The **Data Statistics** command controls the output of statistical information about the data.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: DS
12	Reserved	1	ASCII <SP>
13	Data Stream	1	ASCII digit: The data stream to be monitored.
14	Length	2	ASCII integer: number of seconds to gather statistics
16	Command code	2	ASCII characters: DS
18	CRC	4	ASCII hexadecimal
22	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: DS
12	Reserved	1	ASCII <SP>
13	Data Stream	1	ASCII digit: The data stream to be examined.
14	Length	2	ASCII integer: number of seconds to gather statistics
16	Channel count (c)	2	ASCII integer: 1 – MAX_CHN
18	Statistics	c * 22	See below
18 + (c * 22)	Command code	2	ASCII characters: DS
20 + (c * 22)	CRC	4	ASCII hexadecimal
24 + (c * 22)	Delimiter	2	ASCII characters: <CR><LF>

For each channel, the following information is returned:

Offset	Description	No. of Bytes	Type and Range
0	Channel Number	2	ASCII integer: 1 – MAX_CHN
2	Maximum	8	ASCII hexadecimal
10	Minimum	8	ASCII hexadecimal
18	Overscale	4	ASCII hexadecimal

3.6 Forced Dump (FD)

The **Forced Dump** command causes the unit to flush data from RAM to the disk drive. Only data that was configured to record to disk is affected.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: FD
12	Reserved	2	ASCII spaces
14	Command code	2	ASCII characters: FD
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: FD
12	Reserved	2	ASCII spaces
14	Command code	2	ASCII characters: FD
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

3.7 Firmware Update (FW)

The **Firmware Update** command reprograms the CPU flash memory with firmware stored on the disk drive.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: FW
12			
	Command code	2	ASCII characters: FW
	CRC	4	ASCII hexadecimal
	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: FW
12	Result	2	ASCII hexadecimal: 00 OK (no error), 01 invalid request, 02 rejected
14	Command code	2	ASCII characters: FW
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

3.8 GPS Control (GC)

The **GPS Control** command changes the duty cycle of the GPS.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: GC
12	Mode	1	ACSII character: C – continuous D – normal duty cycle O – GPS off
13	Reserved	7	
20	Command code	2	ASCII characters: GC
22	CRC	4	ASCII hexadecimal
26	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: GC
12	GPS mode	1	ASCII character: C – continuous D – normal duty cycle O – GPS off
13	Reserved	7	
20	Command code	2	ASCII characters: GC
22	CRC	4	ASCII hexadecimal
26	Delimiter	2	ASCII characters: <CR><LF>

3.9 Identify Unit and Software (ID)

The **Identify** command returns information about the firmware installed in the unit.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: ID
12	Command code	2	ASCII characters: ID
14	CRC	4	ASCII hexadecimal
18	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: ID
12	CPU version	8	ASCII characters
20	Command code	2	ASCII characters: ID
22	CRC	4	ASCII hexadecimal
26	Delimiter	2	ASCII characters: <CR><LF>

3.10 Immediate Gain (IG)

The **Immediate Gain** command changes the gain without sending the entire **Channel Parameter** (**PC**) **Delayed Action** command, which would also require stopping and restarting acquisition.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: IG
12	Channel number	2	ASCII digits: 1 – MAX_CHN
14	Gain1	4	ASCII characters: 1 or 100
18	Command code	2	ASCII characters: IG
20	CRC	4	ASCII hexadecimal
24	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: IG
12	Channel number	2	ASCII digits: 1 – MAX_CHN
14	Gain	4	ASCII characters: 1 or 100
18	Result	2	ASCII hexadecimal: 00 done (no error), 01 invalid request (invalid channel or gain)
20	Command code	2	ASCII characters: IG
22	CRC	4	ASCII hexadecimal
26	Delimiter	2	ASCII characters: <CR><LF>

3.11 Load Parameters from SPROM (LP)

The **Load Parameter** command causes the DAS to load recording parameters stored in the DAS SPROM.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: LP
12	Command code	2	ASCII characters: LP
14	CRC	4	ASCII hexadecimal
18	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: LP
12	Result	2	ASCII hexadecimal 00 = Success 01 = Fail
14	Command code	2	ASCII characters: LP
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

Firmware	Parameter Set Location
After CPU Firmware Version 2.8.8	Disk
After 3.2.0	SPROM

3.12 Media Format (MF)

The **Media Format** command clears all data from a disk or RAM. The device code specifies which device will be affected; RM for RAM, D1 for disk 1 and D2 for disk 2. The RQ device code requests the status from the most recent MF command.

A response indicating "In Progress" is sent on receipt of the command. An additional response is returned when the operation is complete. The status of the most recent **MF** command can be requested at any time.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: MF
12	Device code	2	ASCII characters: RQ, RM, D1, D2
14	Command code	2	ASCII characters: MF
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: MF
12	Device code	2	ASCII characters: RM, D1, D2
14	Result code	2	ASCII hexadecimal: 00 = done (no error) 01 = invalid request 02 = rejected (busy) FF = in progress, others to be defined
16	Command code	2	ASCII characters: MF
20	CRC	4	ASCII hexadecimal
22	Delimiter	2	ASCII characters: <CR><LF>

3.13 Memory Test (MT)

The **Memory Test** command causes the DAS to perform a check on the memory. Acquisition will be stopped prior to starting the test and the DAS will attempt to flush any remaining data. A Pass or Fail (including 1st failing address) response will be sent. Upon completion of the test the DAS will be reset.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: MT
12	Device code	2	ASCII characters: RM
14	Command code	2	ASCII characters: MT
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: MT
12	Device code	2	ASCII characters: RM
14	Result code	2	ASCII hexadecimal: 00 = Pass (no error) 01 = invalid request 03 = Fail
16	Failing Address	8	ASCII hexadecimal
24	Command code	2	ASCII characters: MT
26	CRC	4	ASCII hexadecimal
30	Delimiter	2	ASCII characters: <CR><LF>

3.14 Auxiliary Data Parameters (PA)

The **Auxiliary Data Parameters** set the conditions for collection of very slow sample rate (long period) data, such as temperature, wind speed, barometric pressure, etc. All enabled channels are recorded at the same rate. Auxiliary Data is recorded as Data Stream 9. The Data format is always 16-bit. The Stream Name is always "Auxiliary Data". Auxiliary data recording is disabled if no recording destination is selected or no channels are enabled.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PA
12	Marker	2	ASCII digits: 99
14	Channels	16	ASCII characters: Each byte by position corresponds to a channel. A <SP> disables a channel while a character enables a channel.
30	Sample Period	8	ASCII integer: seconds between samples
38	Data Format	2	ASCII digits: 16
40	Record length	8	ASCII integer : seconds
48	Recording Destination	4	ASCII characters: Each byte represents a recording destination; RAM, Disk, Ethernet and Serial. A <SP> disables a destination while a character enables it.
52	Reserved	4	ASCII character: <SP>
56	Differential Control	4	ASCII characters: Each byte represents a pair of channels; A <SP> indicates single-ended and a non-<SP> indicates differential input for chn 7/11, 8/12, 9/13 & 10/14.
60	Reserved	4	ASCII character: <SP>
64	Command code	2	ASCII characters: PA
66	CRC	4	ASCII hexadecimal
70	Delimiter	2	ASCII characters: <CR><LF>

Auxiliary channels 1 – 6 require installation of an RT527 Sensor Control board. These channels are typically used to measure mass position from a broadband sensor.

Auxiliary channels 7 – 12 require installation of a second RT527 Sensor Control board OR an RT576 Auxiliary Channel board. When sourced by a second RT527 board, the channels are typically used to measure mass position from a broadband sensor.

Auxiliary channels 13 and 14 contain either the Charger Voltage and RAM voltage information as measured on the CPU board OR two channels from the RT576 Auxiliary Channel board, if installed.

Auxiliary channels 15 and 16 contain Input Voltage and Temperature information as measured on the CPU board.

When an RT576 Auxiliary Channel board is installed, pairs of channels can be configured as either 2 single-ended inputs or 1 differential input. Channel 7 is paired with channel 11, channel 8 with channel 12, channel 9 with 13 and channel 10 with 14. When a pair is configured for differential input, the second channel of the pair is never recorded.

Ch #	Source		
1	RT527 #1 – 1		
2	RT527 #1 – 2		
3	RT527 #1 – 3		
4	RT527 #1 – 4		
5	RT527 #1 – 5		
6	RT527 #1 – 6		
7	RT527 #2 – 1	OR	RT576 – 1
8	RT527 #2 – 2	OR	RT576 – 2
9	RT527 #2 – 3	OR	RT576 – 3
10	RT527 #2 – 4	OR	RT576 – 4
11	RT527 #2 – 5	OR	RT576 – 5
12	RT527 #2 – 6	OR	RT576 – 6
13	CPU Charger Voltage	OR	RT576 – 7
14	CPU RAM Voltage	OR	RT576 – 8
15	CPU Input Voltage		
16	CPU Temp		

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PA
12	Command code	2	ASCII characters: PA
14	CRC	4	ASCII hexadecimal
18	Delimiter	2	ASCII characters: <CR><LF>

3.15 Parameter Backup (PB)

The **Parameter Backup** command causes the DAS to restore the user-accessible ASCII parameters from its backup copy. The backup copy is made when the **Parameter Implement** (**PI**) command is issued.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: PB
12	Command code	2	ASCII characters: PB
14	CRC	4	ASCII hexadecimal
18	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: PB
12	Command code	2	ASCII characters: PB
14	CRC	4	ASCII hexadecimal
18	Delimiter	2	ASCII characters: <CR><LF>

3.16 Channel Parameters (PC)

The **Channel Parameters** set record-keeping information about the input channels and control the gain of the channel. Several of these settings are recorded in the EH and ET packets. The parameters in this command do not take effect until the **Parameter Implement** (**PI**) command is received. Only the gain can be changed during data acquisition (using the **Immediate Gain** (**IG**) command).

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PC
12	Channel number	2	ASCII digits: 1 – MAX_CHN
14	Channel name	10	ASCII characters
24	Azimuth	10	ASCII characters
34	Incline	10	ASCII characters
44	Location - X	10	ASCII characters
54	Location - Y	10	ASCII characters
64	Location - Z	10	ASCII characters
74	Units - X & Y	4	ASCII characters
78	Units - Z	4	ASCII characters
82	Gain	4	ASCII characters: 1 or 100
86	Sensor model	12	ASCII characters
98	Sensor serial number	12	ASCII characters
110	Channel Comment	40	ASCII characters
150	Command Code	2	ASCII characters: PC
152	CRC	4	ASCII hexadecimal
156	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII hexadecimal (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PC
12	Channel number	2	ASCII digits: 1 – MAX_CHN
14	Command code	2	ASCII characters: PC
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

3.17 DataStream Parameters (PD)

The **DataStream Parameters** set the conditions for actual data collection. These settings include trigger information as well as data format and record length information. Several of these settings are recorded in the EH and ET packets. The data format is recorded in the header of these packets and also in the header of the data packets (**DT**). The parameters in this command do not take effect until the Parameter Implement (**PI**) command is received. They cannot be changed during data collection.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PD
12	Stream number	2	ASCII digits: 1 to 8
14	Stream name	16	ASCII characters
30	Recording Destination	4	ASCII characters: Each byte represents a recording destination; RAM, Disk, Ethernet and Serial. A <SP> disables a destination while a character enables it.
34	Reserved	4	ASCII character: <SP>
38	Channels	16	ASCII characters: Each byte by position corresponds to a channel. A <SP> disables a channel while a character enables a channel.
54	Sample rate	4	ASCII digits (FP 1): 1000, 500, 250, 200, 125, 100, 50, 40, 25, 20, 10, 8, 5, 4, 2, 1, 0.1
58	Data format	2	ASCII characters: 16, 32, CO (compressed) or C2 (highly compressed
60	Trigger type	4	ASCII characters: CON, CRS, EVT, EXT, LEV, TIM, TML
64	Trigger	162	ASCII characters
226	Command code	2	ASCII characters: PD
228	CRC	4	ASCII hexadecimal
232	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PD
12	Stream number	2	ASCII digits: 1 to 8
14	Command code	2	ASCII characters: PD
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

The trigger information is broken into fields based on the trigger type. Only one trigger may be set for a data stream. The following trigger types have been defined:

- Continuous trigger (CON)
- Cross trigger (CRS)
- Event trigger (EVT)
- External trigger (EXT)
- Level trigger (LEV)
- Time trigger (TIM)
- Time List trigger (TML)

3.17.1 Continuous Trigger Description (Trigger type = CON)

The continuous trigger collects data beginning at the specified trigger time until acquisition is disabled. The data is broken into events based on the specified record length.

Offset	Description	No. of Bytes	Type and Range
64	Record Length	8	ASCII digits: FP 3 (seconds)
72	First Trigger Time	14	ASCII: YYYYDDDHHMMSS
86	Reserved	140	ASCII character: <SP>

3.17.2 Cross Trigger Description (Trigger type = CRS)

The Cross trigger specifies that data will be collected on this data stream at the same time as another data stream. The event length is independent of the triggering data stream.

Offset	Description	No. of Bytes	Type and Range
64	Trigger stream	2	ASCII digits
66	Pre-trigger length	8	ASCII digits: FP 3 (seconds)
74	Record length	8	ASCII digits: FP 3 (seconds)
82	Reserved	144	ASCII character: <SP>

3.17.3 Event Trigger Description (Trigger type = EVT)

The Event trigger specifies that data will be recorded when the ratio between the Short Term Average (STA) and the Long Term Average (LTA) exceeds a specified ratio for a minimum number of trigger channels. Only channels that are included in the data stream may be used as trigger channels, but all included channels are recorded, even if they are not trigger channels. The length of the recording is always at least the length specified by the record length, but may be longer when a de-trigger ratio is specified. The post-trigger length is only used in conjunction with a de-trigger ratio.

Offset	Description	No. of Bytes	Type and Range
64	Trigger channels	16	ASCII characters: Each byte by position corresponds to a channel. A <SP> disables a channel while character enables it.
80	Minimum channels	2	ASCII integer: 1 - 99
82	Trigger window	8	ASCII digits: FP 3 (seconds)
90	Pre-trigger length	8	ASCII digits: FP 3 (seconds)
98	Post-trigger length	8	ASCII digits: FP 3 (seconds)
106	Record length	8	ASCII digits: FP 3 (seconds)
114	Reserved	8	
122	STA length	8	ASCII digits: FP 3 (seconds)
130	LTA length	8	ASCII digits: FP 3 (seconds)
138	Reserved	8	ASCII spaces
146	Trigger ratio	8	ASCII digits: FP 2
154	De-trigger ratio	8	ASCII digits: FP 2
162	LTA Hold	4	ASCII characters: ON, OFF
166	Low Pass Corner Freq.	4	ASCII digits: FP 1 (Hz): OFF, 0, 12
170	High Pass Corner Freq.	4	ASCII digits: FP 1 (Hz): OFF, 0, 0.1, 2
174	Reserved	52	ASCII character: <SP>

3.17.4 External Trigger Description (Trigger type = EXT)

The External trigger specifies that data will be recorded when an external pulse is detected by the DAS on the external trigger line.

Offset	Description	No. of Bytes	Type and Range
64	Pre-trigger length	8	ASCII digits: FP 3 (seconds)
72	Record length	8	ASCII digits: FP 3 (seconds)
80	Filler	146	ASCII character:<SP>

3.17.5 Level Trigger Description (Trigger type = LEV)

The Level trigger specifies that data will be recorded when the amplitude of the data exceeds a specified threshold for any channel in the data stream.

The trigger level can be specified in several different ways. If the first character of the field is 'G' then the field is interpreted as containing a level in G's with up to 4 places of precision behind the decimal point ways. If the first character of the field is 'M' then the field is interpreted as containing a level in milliG's with up to 2 places of precision behind the decimal point. If the first character of the field is '%' then the field is interpreted as containing a level as an integer percent of full scale. Otherwise, the field is interpreted as an integer number of digital counts.

Regardless of how the level is specified, it is converted to digital counts and compared against the absolute value of the data after filtering, if filtering is enabled. If sensor sensitivity information is not available from the sensor itself, the unit assumes the presence of a 4G sensor for converting from a level in G's to digital counts.

Offset	Description	No. of Bytes	Type and Range
64	Level	8	ASCII: (see paragraph above) Gnn.nnnn FP4 (Gs) Mnnn.nn FP2 (mGs) %nn Integer (1-99) Else Integer (counts)
72	Pre-trigger length	8	ASCII digits: FP 3 (seconds)
80	Record length	8	ASCII digits: FP 3 (seconds)
88	Low Pass Corner Freq.	4	ASCII digits: FP 1 (Hz): OFF, 0, 12
92	High Pass Corner Freq.	4	ASCII digits: FP 1 (Hz): OFF, 0, 0.1, 2
96	Filler	130	ASCII character: <SP>

3.17.6 Time Interval Trigger Desc. (Trigger type = TIM)

The Time trigger specifies that data will be recorded at specified intervals beginning when a specific time is reached.

Offset	Description	No. of Bytes	Type and Range
64	Start time	14	ASCII digits: YYYYDDDHHMMSS
78	Repeat interval	8	ASCII digits: DDHHMMSS
86	Number of intervals	4	ASCII integer
90	Reserved	8	ASCII <SP>
98	Record length	8	ASCII digits: FP 3 (seconds)
106	Filler	120	ASCII character: <SP>

3.17.7 Time List Trigger Description (Trigger type = TML)

The Time List trigger specifies that data will be recorded at each specified time.

Offset	Description	No. of Bytes	Type and Range
64	Start time	14	ASCII digits: YYYYDDDHHMMSS
78	Start time	14	ASCII digits: YYYYDDDHHMMSS
92	Start time	14	ASCII digits: YYYYDDDHHMMSS
106	Start time	14	ASCII digits: YYYYDDDHHMMSS
120	Start time	14	ASCII digits: YYYYDDDHHMMSS
134	Start time	14	ASCII digits: YYYYDDDHHMMSS
148	Start time	14	ASCII digits: YYYYDDDHHMMSS
162	Start time	14	ASCII digits: YYYYDDDHHMMSS
176	Start time	14	ASCII digits: YYYYDDDHHMMSS
190	Start time	14	ASCII digits: YYYYDDDHHMMSS
204	Start time	14	ASCII digits: YYYYDDDHHMMSS
218	Record Length	8	ASCII digits: FP 3 (seconds)

3.17.8 Vote Trigger Description (Trigger type = VOT)

The Vote trigger specifies that data will be recorded when the votes for triggered channels reaches the Trigger Minimum Votes. Data collection continues until the votes for de-triggered channels reaches the De-trigger Minimum Votes.

A channel is triggered when it exceeds its individual trigger level. It is de-triggered when it drops below its individual de-trigger level, or below its trigger level when its de-trigger level is not specified. Different levels can be used for triggering and de-triggering a particular channel.

Levels can be specified as Gs (with up to 4 places of precision behind the decimal point), mGs (with 2 places of precision), percent of full scale or counts. All levels must use the same units. Regardless of how the level is specified, it is converted to digital counts and compared against the absolute value of the data after filtering, if filtering is enabled. If sensor sensitivity information is not available from the sensor itself, the unit assumes the presence of a 4G sensor for converting from a level in G's to digital counts.

Trigger votes are only calculated before a trigger is declared. De-trigger votes are only calculated after a trigger is declared. A channel is used to detect a trigger when its Trigger Channel Votes is non-zero. A channel is used for de-triggering when its De-trigger Channel Votes is non-zero.

The length of the recording is always at least the length specified by the Record Length, but may be longer when a Post-trigger Length is specified. The recording will have a fixed length equal to the Record Length when the Post-trigger Length is zero and the De-trigger Minimum Votes is zero.

Offset	Description	No. of Bytes	Type and Range
64	Pre-trigger length	8	ASCII digits: FP 3 (seconds)
72	Post-trigger length	8	ASCII digits: FP 3 (seconds)
80	Record length	8	ASCII digits: FP 3 (seconds)
88	Level Units	1	ASCII characters: G Gs M mGs % percent of full-scale Else counts
89	Reserved	3	ASCII spaces
92	Trigger Channels	6	ASCII digit: Each byte indicates a channel (1 – G represents 1 - 16), allowing up to 6 channels to be specified.
98	Trigger channel votes	6	ASCII digit: Each byte indicates the number of votes, 1 – 9, for the corresponding channel specified by the channels field.
104	Trigger channel level	6 * 8	ASCII digits: Trigger level for each corresponding channel: Gs FP 4 mGs FP2 % Integer 1 – 99 Counts Integer
152	Trigger minimum votes	2	ASCII integer: 1 - 99
154	Trigger window	8	ASCII digits: FP 3 (seconds)
162	De-trigger channel votes	6	ASCII digit: Each byte indicates the number of votes, 1 – 9, for the corresponding channel specified by the channels field.
168	De-trigger channel level	6 * 8	ASCII digits: De-trigger level for each corresponding channel: Gs FP 4 mGs FP2 % Integer 1 – 99 Counts Integer
216	De-trigger minimum votes	2	ASCII integer: 1 - 99
218	Low Pass Corner Freq.	4	ASCII digits: FP 1 (Hz): OFF, 0, 12
222	High Pass Corner Freq.	4	ASCII digits: FP 1 (Hz): OFF, 0, 0.1, 2

3.18 Parameter Erase (PE)

The **Parameter Erase** command causes the DAS to erase the current user-accessible copy of the parameters from the Delayed Action commands. It does NOT affect parameters from other Immediate Action commands. The parameters can be restored from the backup copy using the **Parameter Backup** (**PB**) command.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: PE
12	Command code	2	ASCII characters: PE
14	CRC	4	ASCII hexadecimal
18	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: PE
12	Command code	2	ASCII characters: PE
14	CRC	4	ASCII hexadecimal
18	Delimiter	2	ASCII characters: <CR><LF>

3.19 Parameter Implement (PI)

The **Parameter Implement** command causes the DAS to store a backup copy of the user-accessible ASCII parameters and convert them into the actual binary operating parameters.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: PI
12	Command code	2	ASCII characters: PI
14	CRC	4	ASCII hexadecimal
18	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: PI
12	Command code	2	ASCII characters: PI
14	CRC	4	ASCII hexadecimal
18	Delimiter	2	ASCII characters: <CR><LF>

3.20 Sensor Calibration Signal Parameters (PK)

The **Sensor Calibration Signal** parameters define the test signal for each sensor.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PK
12	Sensor	1	ASCII digit: 1 - 4
13	Enable	1	ASCII character: <SP> = disable, else = enable
14	Reserved	2	ASCII <SP>
16	Duration	4	ASCII digits: 1 – 500 seconds
20	Amplitude	4	ASCII digits: FP 2: 0.01 – 3.75 volts
24	Signal	4	ASCII characters: STEP, SINE, NOIS, RNSP, RNLP, RNBB, SWSP, SWLP, SWBB
28	Step interval	4	ASCII digits: 1 – 250 seconds
32	Step width	4	ASCII digits: 1 – 250 seconds
36	Sine Frequency	4	ASCII digits: 1, 2, 4, 5, 8, 10, 20, 25, 40, 50 or 100 Hz
40	Command code	2	ASCII characters: PK
42	CRC	4	ASCII hexadecimal
46	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PK
12	Sensor	1	ASCII digit: 1 - 4
13	Enable	1	ASCII character: <SP> = disabled, else = enabled
14	Command code	2	ASCII characters: PK
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

3.21 Sensor Calibration Sequence Parameters (PL)

The **Sensor Calibration Sequence** parameters define the time sequence used for periodic calibrations.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PL
12	Sequence #	1	ASCII digit: 1
13	Enable	1	ASCII character: non-<SP>
14	Reserved	2	ASCII <SP>
16	Start Time	14	ASCII digits: YYYYDDDHHMMSS
30	Interval	8	ASCII digits: DDHHMMSS
38	Count	2	ASCII integer
40	Record Length	8	ASCII integer seconds
48	Reserved	22	ASCII <SP>
70	Command code	2	ASCII characters: PL
72	CRC	4	ASCII hexadecimal
76	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PL
12	Sequence	1	ASCII digit: 1
13	Enable	1	ASCII character: <SP> = disabled, else = enabled
14	Command code	2	ASCII characters: PL
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

3.22 Modem Parameters (PM)

The **Modem Parameters** define the command strings sent to a modem connected to a telemetry port.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (0 addresses all units.)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PM
12	Port Number	2	ASCII character: 2
14	Modem Init	48	ASCII characters
62	Modem Hangup	24	ASCII characters
86	Modem Dial #1	48	ASCII characters
134	Modem Dial #2	48	ASCII characters
182	Command code	2	ASCII characters: PM
184	CRC	4	ASCII hexadecimal
188	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PM
12	Port Number	2	ASCII character: 2
14	Command code	2	ASCII characters: PM
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

3.23 Network Parameters (PN)

The **Network Parameters** define the IP addresses and other settings used in networking.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (0 addresses all units.)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PN
12	Port Number	2	ASCII digits: 1 (Ethernet) or 2 (Serial PPP)
14	Port IP Address	15	ASCII digits: nnn.nnn.nnn.nnn
29	Port Device Power	1	ASCII characters: P = continuous power, else = toggle
30	Port IP Mask	16	ASCII digits: nnn.nnn.nnn.nnn
46	Port Host	16	ASCII digits: nnn.nnn.nnn.nnn
62	Port Gateway	16	ASCII digits: nnn.nnn.nnn.nnn
78	Line Down	1	ASCII character: K, <SP> (keep) or T (toss after timeout)
79	Line Mode (applies to serial port only)	1	ASCII character: D, <SP> (direct) or A (AT/modem) or F (fragment for Freewave multicast)
80	Port Speed (applies to serial port only)	6	ASCII digits: 9600, 19200, 57600, 115200
86	Toss Delay	2	ASCII digits: 2 – 99 (minutes)
88	Reserved	2	ASCII character: <SP>
90	Command code	2	ASCII characters: PN
92	CRC	4	ASCII hexadecimal
96	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PN
12	Port Number	2	ASCII digits: 1 or 2
14	Result	2	ASCII hexadecimal: 00 = done (no error), 01 = invalid request (invalid port), 02 = rejected (cannot change port where received command)
16	Command code	2	ASCII characters: PN
18	CRC	4	ASCII hexadecimal
22	Delimiter	2	ASCII characters: <CR><LF>

3.24 Sensor Auto Re-center Parameters (PQ)

The **Sensor Auto Re-center** parameters define the conditions for automatic re-centering of the mass of a sensor.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (0 addresses all units.)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PQ
12	Sensor	1	ASCII integer: 1 – 4
13	Enable	1	ASCII character: <SP> = disable, else = enable
14	Reading Interval	4	ASCII integer: 10 or 100 (seconds)
18	Cycle Interval	2	ASCII integer: hours between cycles, 0 = disable
20	Level	4	ASCII digits: 0.1 – 9.9 volts
24	Attempts	2	ASCII integer: max attempts per cycle
26	Attempt Interval	2	ASCII integer: minutes between attempts
28	Command code	2	ASCII characters: PQ
30	CRC	4	ASCII hexadecimal
34	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PQ
12	Sensor	1	ASCII integer: 1 – 4
13	Reserved	1	ASCII <SP>
16	Command code	2	ASCII characters: PQ
18	CRC	4	ASCII hexadecimal
22	Delimiter	2	ASCII characters: <CR><LF>

3.25 Parameter Request (PR)

The **Parameter Request** command causes the DAS to return the current user-accessible ASCII parameters corresponding to the request.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: PR
12	Parameter Code	2	ASCII characters: PA, PC, PD, PK, PN, PQ, PS, PZ
14	Record Number	2	ASCII digits, <SP> if a record number is not required or to request all records, '*' to request all active records
16	Command code	2	ASCII characters: PR
18	CRC	4	ASCII hexadecimal
22	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: PR
12	Parameter Code	2	ASCII characters: PA, PC, PD, PK, PN, PQ, PS, PZ
14	Record Number	2	ASCII digits or <SP> if a record number is not required
16	Parameters	n	ASCII requested parameters
n+16	Command code	2	ASCII characters: PR
n+18	CRC	4	ASCII hexadecimal
n+22	Delimiter	2	ASCII characters: <CR><LF>

3.26 Station Parameters (PS)

The **Station Parameters** identify the station and experiment. The station name, station number, experiment name and experiment number are stored in the Event Header (EH) and Event Trailer (ET) recording packets.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (0 addresses all units.)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PS
12	Experiment number	2	ASCII integer
14	Experiment name	24	ASCII characters
38	Experiment comment	40	ASCII characters
78	Station number	4	ASCII integer
82	Station name	24	ASCII characters
106	Station comment	40	ASCII characters
146	Command code	2	ASCII characters: PS
148	CRC	4	ASCII hexadecimal
152	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PS
12	Command code	2	ASCII characters: PS
14	CRC	4	ASCII hexadecimal
18	Delimiter	2	ASCII characters: <CR><LF>

3.27 Transmitter and Calibration Parameters (PT)

The **Transmitter and Calibration** command configures the DAS for operation. The Transmitter parameters are activated when **Acquisition** (**AQ**) is started. The Calibration parameters are used with the **Sensor Calibration** (**SK**) or **Sensor Calibration Sequence** (**PL**) commands.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: PT
12	Transmitter Stream Number	2	ASCII characters: 00 = never or Stream #
14	Transmitter Frequency	8	ASCII characters: expressed as decimal or x/y
22	Duty Cycle	4	ASCII characters: 50 or 100
26	Reserved	4	ASCII characters: <sp>
30	Calibration Stream Number	2	ASCII characters: 00 = never or Stream #
32	Calibration Frequency	8	ASCII characters: expressed as decimal or x/y
40	Number of Calibrations	4	ASCII hexadecimal: Calibration cycles
44	Reserved	4	ASCII characters: <sp>
48	Stage 1 Duration	4	ASCII hexadecimal: clock ticks
52	Stage 1 Amplitude	4	ASCII hexadecimal: DAC value
56	Stage 2 Duration	4	ASCII hexadecimal: clock ticks
60	Stage 2 Amplitude	4	ASCII hexadecimal: DAC value
64	Stage 3 Duration	4	ASCII hexadecimal: clock ticks
68	Stage 3 Amplitude	4	ASCII hexadecimal: DAC value
72	Stage 4 Duration	4	ASCII hexadecimal: clock ticks
76	Stage 4 Amplitude	4	ASCII hexadecimal: DAC value
80	Reserved	8	ASCII characters: <sp>
88	Command code	2	ASCII characters: PT
90	CRC	4	ASCII hexadecimal
94	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: PT
12	Transmitter Stream Number	2	ASCII characters: 00 = never or Stream #
14	Calibration Stream Number	2	ASCII characters: 00 = never or Stream #
24	Command code	2	ASCII characters: PT
26	CRC	4	ASCII hexadecimal
30	Delimiter	2	ASCII characters: <CR><LF>

3.28 Disk Parameters (PZ)

The **Disk Parameters** affect the behavior of the disk. These parameters can be changed at any time, even during data collection. If a disk operation is already in progress, they will not take effect until the current disk operation is complete.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (0 addresses all units.)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PZ
12	Reserved	4	ASCII spaces
16	Dump on ET	1	ASCII character: Y (yes/enable) or N (no/disable)
17	Reserved	1	ASCII spaces
18	Disk dump Threshold	2	ASCII integer: percent of RAM
20	Reserved	4	ASCII spaces
24	Disk Wrap	1	ASCII character: Y (yes/enable) or N (no/disable)
25	Reserved	3	ASCII spaces
28	Disk Retry	1	ASCII digit: days
29	Reserved	11	ASCII spaces
40	Command code	2	ASCII characters: PZ
42	CRC	4	ASCII hexadecimal
46	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PZ
12	Command code	2	ASCII characters: PZ
14	CRC	4	ASCII hexadecimal
18	Delimiter	2	ASCII characters: <CR><LF>

3.29 Reset System (RS)

The **Reset System** command causes the DAS to restart. The command response is sent BEFORE the DAS resets.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: RS
12	Initialize	1	ASCII character: space (normal) or I (initialize)
13	Reserved	1	ASCII space
14	Command code	2	ASCII characters: RS
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: RS
12	Initialize	1	ASCII character: space (normal) or I (initialize)
13	Reserved	1	ASCII space
14	Command code	2	ASCII characters: RS
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

3.30 State-of-Health (SH)

The **State of Health** command stores a message into the State of Health log.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	Binary (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: SH
12	Text	n<= 60	ASCII
n+ 12	Command code	2	ASCII characters: SH
n+ 14	CRC	4	ASCII hexadecimal
n+ 18	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: SH
12	Message Length	2	ASCII digits: length of stored message
12	Command code	2	ASCII characters: SH
14	CRC	4	ASCII hexadecimal
18	Delimiter	2	ASCII characters: <CR><LF>

3.31 Sensor Calibration (SK)

The **Sensor Calibration** command initiates a calibration cycle or manual re-centering of the mass for a sensor.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (0 addresses all units.)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: SK
12	Sensor Number	1	ASCII digit: 1 – 4
13	Calibration Type	1	ASCII character: S = calibration signal, M = Mass re-center
14	Command code	2	ASCII characters: SK
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: SK
12	Sensor Number	1	ASCII digit: 1 – 4
13	Calibration Type	1	ASCII character: <SP> = ignored S = calibration signal M = Mass re-center
14	Command code	2	ASCII characters: SK
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

3.32 Set Offset (SO)

The **Set Offset** command sets the DC offset correction value for each channel.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: SO
12	Reserved	1	ASCII <SP>
13	Offset Type	1	ASCII character: A = absolute S = stored else = relative to currently stored offset correction
14	Channel count (c)	2	ASCII integer
16	Channel information	c * 10	ASCII: see below
16 + (c * 10)	Command code	2	ASCII characters: SO
18 + (c * 10)	CRC	4	ASCII hexadecimal
22 + (c * 10)	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: SO
12	Reserved	1	ASCII <SP>
13	Offset Type	1	ASCII character: S = Stored
14	Channel count (c)	2	ASCII integer
16	Channel information	c * 10	ASCII: see below
16 + (c * 10)	Command code	2	ASCII characters: SO
18 + (c * 10)	CRC	4	ASCII hexadecimal
22 + (c * 10)	Delimiter	2	ASCII characters: <CR><LF>

Channel information:

Offset	Description	No. of Bytes	Type and Range
0	Channel Number	2	ASCII digits: 1 – MAX_CHN
2	Offset	8	ASCII hexadecimal

3.33 Status Information (SS)

The **Status** command causes the DAS to report various kinds of status **information.**

Offset	Description	No. of Bytes	Type and Range
0	**Attention**	**1**	**<84>**
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: SS
12	Status Type	2	ASCII characters: see table
14	Status Parameters	14	ASCII <SP> unless otherwise noted
28	Command code	2	ASCII characters: SS
30	CRC	4	ASCII hexadecimal
34	Delimiter	2	ASCII characters: <CR><LF>

Function	Description	Return Information
AD	Auxiliary Data	Auxiliary Input channel current readings
AQ	Acquisition	Acquisition state, event count,
DK	Disk	Disk space total, used, available
ET	Event Trigger	STA, LTA, Mean Removal, Ratio, Trigger flag
NT	Network	Network statistics and settings
PR	Parameter	Parameter maximums and active records
RT	RTP	RTP status
SI	Sensor Information	Sensor ID Information
US	Unit	Time, Temperature, Power
VS	Version	Code, FPGA versions
XC	External Clock	Phase, position, time since last lock

General Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer: n+40
10	Command code	2	ASCII characters: SS
12	Status Type	2	ASCII characters: see table
14	Time	18	ASCII digits: YYYY:DDD:HH:MM:SS
32	Status Response	n	ASCII characters
n+32	Command code	2	ASCII characters: SS
n+34	CRC	4	ASCII hexadecimal
n+38	Delimiter	2	ASCII characters: <CR><LF>

3.33.1 Auxiliary Data Response (Status type = AD)

The **Auxiliary Data Response** returns the current stored value of all auxiliary data channels installed in the unit, whether or not they are connected to anything. If no auxiliary channels are installed, the Sensor Count will be zero and no auxiliary data will be returned.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: SS
12	Status Type	2	ASCII characters: AD
14	Time	18	ASCII digits: YYYY:DDD:HH:MM:SS
32	Sensor Count (s)	1	ASCII digit: 0 - 4
33	Reserved	1	ASCII <SP>
34	Auxiliary Data	s * 30	ASCII: see below
34 + (s * 30)	Command code	2	ASCII characters: SS
36 + (s * 30)	CRC	4	ASCII hexadecimal
40 + (s * 30)	Delimiter	2	ASCII characters: <CR><LF>

For each sensor, the following information is returned:

Offset	Description	No. of Bytes	Type and Range
0	Sensor Number	1	ASCII digit: 1 - 4
1	Reserved	1	ASCII <SP>
2	Count	6	ASCII integer
8	Count Limit	6	ASCII integer
14	Level	4	ASCII: n.n (volts; 0.0 – 9.9)
18	Aux1 Data	4	ASCII: +/-n.n (volts; 0.0 – 9.9)
22	Aux2 Data	4	ASCII: +/-n.n (volts; 0.0 – 9.9)
26	Aux3 Data	4	ASCII: +/-n.n (volts; 0.0 – 9.9)

3.33.2 Acquisition Status Response (Status type = AQ)

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: SS
12	Status Type	2	ASCII characters: AQ
14	Time	18	ASCII digits: YYYY:DDD:HH:MM:SS
32	Acquisition Requested	1	ASCII character: Y or N
33	Acquisition Active	1	ASCII character: Y or N
34	Event Count	6	ASCII digits
40	Event in Progress	2	ASCII character: Y or N
42	RAM Total	6	ASCII digits (in 1K blocks)
48	RAM Used	6	ASCII digits (in 1K blocks)
54	RAM Available	6	ASCII digits (in 1K blocks)
60	Command code	2	ASCII characters: SS
62	CRC	4	ASCII hexadecimal
66	Delimiter	2	ASCII characters: <CR><LF>

3.33.3 Disk Status Response (Status type = DK)

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: SS
12	Status Type	2	ASCII characters: DK
14	Time	18	ASCII digits: YYYY:DDD:HH:MM:SS
32	Disk 1 Total	6	ASCII digits (in 1M blocks)*
38	Disk 1 Used	6	ASCII digits (in 1M blocks)*
44	Disk 1 Available	6	ASCII digits (in 1M blocks)*
50	Disk 2 Total	6	ASCII digits (in 1M blocks)*
56	Disk 2 Used	6	ASCII digits (in 1M blocks)*
62	Disk 2 Available	6	ASCII digits (in 1M blocks)*
68	Current Disk	1	ASCII digit: 1 or 2
69	Wrap Enabled	1	ASCII character: Y or N
70	Wrap Count	2	ASCII hexadecimal
72	Command code	2	ASCII characters: SS
74	CRC	4	ASCII hexadecimal
78	Delimiter	2	ASCII characters: <CR><LF>

Note: * Reported as an integer until smaller than 1MB; then reported as FP3.

3.33.4 Event Trigger Status Response (Status type = ET)

The stream and channel number must be passed as parameters in the status request:

Offset	Description	No. of Bytes	Type and Range
14	Stream #	2	ASCII digits: 1 – 8
16	Channel #	2	ASCII digits: 1 – MAX_CHN
18	Reserved	10	ASCII <SP>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: SS
12	Status Type	2	ASCII characters: ET
14	Time	18	ASCII digits: YYYY:DDD:HH:MM:SS
32	Stream #	2	ASCII digits: 1 – 8
34	Channel #	2	ASCII digits: 1 – MAX_CHN
36	STA	6	ASCII digits
42	LTA	6	ASCII digits
48	Reserved	6	ASCII spaces
54	Ratio	6	ASCII digits: nnn.nn
60	Triggered	2	ASCI character: Y or N
62	Command code	2	ASCII characters: SS
66	CRC	4	ASCII hexadecimal
70	Delimiter	2	ASCII characters: <CR><LF>

3.33.5 Network Status Response (Status type = NT)

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: SS
12	Status Type	2	ASCII characters: NT
14	Time	18	ASCII digits: YYYY:DDD:HH:MM:SS
32	Ethernet Rx packets	8	ASCII hex digits
40	Ethernet Rx CRC	8	ASCII hex digits
48	Ethernet Rx frame	8	ASCII hex digits
56	Ethernet Rx overrun	8	ASCII hex digits
64	Ethernet Rx overflow	8	ASCII hex digits
72	Ethernet Tx packets	8	ASCII hex digits
80	Ethernet Tx collisions	8	ASCII hex digits
88	Ethernet Tx retransmits	8	ASCII hex digits
96	Ethernet Spurious Interrupts	8	ASCII hex digits
104	Serial Rx packets	8	ASCII hex digits
112	Serial Rx CRC	8	ASCII hex digits
120	Serial Rx frame	8	ASCII hex digits
128	Serial Rx overrun	8	ASCII hex digits
136	Serial Rx overflow	8	ASCII hex digits
144	Serial Tx packets	8	ASCII hex digits
152	Serial Tx collisions	8	ASCII hex digits
160	Serial Tx retransmits	8	ASCII hex digits
168	Serial Spurious Interrupts	8	ASCII hex digits
176	Command code	2	ASCII characters: SS
178	CRC	4	ASCII hexadecimal
182	Delimiter	2	ASCII characters: <CR><LF>

3.33.6 Parameter Status Response (Status type = PR)

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: SS
12	Status Type	2	ASCII characters: PR
14	Time	18	ASCII digits: YYYY:DDD:HH:MM:SS
32	Max Channels (c)	2	ASCII digits: 6, 12
34	Max Datastreams (d)	1	ASCII digit: 8
35	Max Network Ports	1	ASCII digit: 2
36	Reserved	4	ASCII character: <SP>
40	Active Channels	c	ASCII character: <SP> = inactive, else = active
40 + c	Active Datastreams	d	ASCII character: <SP> = inactive, else = active
40 + c + d	Command code	2	ASCII characters: SS
42 + c + d	CRC	4	ASCII hexadecimal
46 + c + d	Delimiter	2	ASCII characters: <CR><LF>

3.33.7 RTP Status Response (Status type = RT)

The Network Interface number must be passed as a parameter in the status request:

Offset	Description	No. of Bytes	Type and Range
14	Network Interface	1	ASCII digit: 1 (Ethernet) or 2 (Serial PPP)
15	Reserved	13	ASCII <SP>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: SS
12	Status Type	2	ASCII characters: RT
14	Time	18	ASCII digits: YYYY:DDD:HH:MM:SS
32	Network Interface	1	ASCII digit: 1 (Ethernet) or 2 (Serial PPP)
33	RTP State	1	ASCII digit: 0 - 5
34	Line Mode	1	ASCII character: K (keep) or T (toss)
35	Tx Queue State	1	ASCII character: O (open) or C (closed)
36	Tx Queue Oldest Sequence	2	ASCII hexadecimal: 00 - FF
38	Tx Queue Newest Sequence	2	ASCII hexadecimal: 00 - FF
40	Tx Queue Count	2	ASCII digits: 0 - 18
42	Rx Queue Oldest Sequence	2	ASCII hexadecimal: 00 - FF
44	Rx Queue Newest Sequence	2	ASCII hexadecimal: 00 - FF
46	Rx Queue Count	2	ASCII digits: 0 - 18
48	Delay Count	4	ASCII hexadecimal: 0 - FFFF
52	Delay Threshold	4	ASCII hexadecimal: 0 - FFFF
56	Server IP	16	ASCII digits: nnn.nnn.nnn.nnn
72	Reserved	24	ASCII spaces
96	Command code	2	ASCII characters: SS
98	CRC	4	ASCII hexadecimal
102	Delimiter	2	ASCII characters: <CR><LF>

3.33.8 Sensor Info Status Response (Status type = SI)

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: SS
12	Status Type	2	ASCII characters: SI
14	Time	18	ASCII digits: YYYY:DDD:HH:MM:SS
32	Sensor Number	1	ASCII digit: 1 - 4
33	Reserved	1	ASCII <SP>
34	Manufacturer	30	ASCII characters
64	Model	14	ASCII characters
78	Serial Number	14	ASCII characters
92	Number of Components (n)	2	ASCII digits
94	Component Description	n * 30	ASCII: see below
94 + (n * 30)	Command code	2	ASCII characters: SS
96 + (n * 30)	CRC	4	ASCII hexadecimal
100 + (n * 30)	Delimiter	2	ASCII characters: <CR><LF>

For each sensor component, the following information is returned:

Offset	Description	No. of Bytes	Type and Range
0	Component Number	2	ASCII integer
2	Orientation	4	ASCII characters: (SEED descriptor)
6	Measurement Units	10	ASCII characters: M, M**2, etc.
16	Volts per Unit	14	ASCII digits: (FP)

3.33.9 Unit Status Response (Status type = US)

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: SS
12	Status Type	2	ASCII characters: US
14	Time	18	ASCII digits: YYYY:DDD:HH:MM:SS
32	Input Power	4	ASCII digits: nn.n (volts)
36	Backup Power	4	ASCII digits: nn.n (volts)
40	Temperature	6	ASCII digits: +/-nnn.n (degrees C)
46	Charger Power	4	ASCII digits: nn.n (volts)
50	Command code	2	ASCII characters: SS
52	CRC	4	ASCII hexadecimal
56	Delimiter	2	ASCII characters: <CR><LF>

3.33.10 Version Status Response (Status type = VS)

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: SS
12	Status Type	2	ASCII characters: VS
14	Time	18	ASCII digits: YYYY:DDD:HH:MM:SS
32	CPU Version	16	ASCII characters
48	Board count (b)	2	ASCII digits
50	Board info	b * 20	ASCII characters
50 + (b * 20)	Command code	2	ASCII characters: SS
52 + (b * 20)	CRC	4	ASCII hexadecimal
54 + (b * 20)	Delimiter	2	ASCII characters: <CR><LF>

For each board, the following information is returned:

Offset	Description	No. of Bytes	Type and Range
0	Board Number	4	ASCII digits
4	Board Revision	1	ASCII character
5	Board Acronym	3	ASCII characters
8	Board Serial Number	4	ASCII digits
12	FPGA Board Number	4	ASCII digits
16	FPGA Minimum brd rev	1	ASCII character
17	FPGA Version	3	ASCII characters

3.33.11 External Clock Status Response (Status type = XC)

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: SS
12	Status Type	2	ASCII characters: XC
14	Time	18	ASCII digits: YYYY:DDD:HH:MM:SS
32	Last Lock	8	ASCII digits: DD:HH:MM since last lock
40	Last Lock Phase	11	ASCII digits: +/-SS,MMM,UUU (secs, mSecs, uSecs) phase error at last lock
51	Lock status	1	ASCII character: L (locked) or U (unlocked)
52	SV	2	ASCII digits: # satellites being tracked
54	Latitude	12	ASCII: c dd mm.mmmm
66	Longitude	12	ASCII: cddd mm.mmmm
78	Altitude	6	ASCII: +/-nnnnn
84	GPS On	1	ASCII character: GPS currently awake Y or N
85	GPS Mode	1	ASCII character: C (continuous awake) or D (duty-cycle) O (off)
86	Command code	2	ASCII characters: SS
88	CRC	4	ASCII hexadecimal
92	Delimiter	2	ASCII characters: <CR><LF>

3.34 Sensor Test (ST)

The **Sensor Test** command activates the sensor test signal for the ANSS internal accelerometer. The signal is activated on the internal 1 Hz and stays active for 1 second.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: ST
12	Signal	4	ASCII characters: STEP
16	Sensor #1	6	ASCII characters: ANSS
22	Sensor #2	6	ASCII characters
28	Sensor #3	6	ASCII characters
34	Sensor #4	6	ASCII characters
40	Command code	2	ASCII characters: ST
42	CRC	4	ASCII hexadecimal
46	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: ST
12	Command code	2	ASCII characters: ST
14	CRC	4	ASCII hexadecimal
18	Delimiter	2	ASCII characters: <CR><LF>

3.35 Time Set (TS)

The **Time Set** command causes the DAS to set its internal time to the specified time as soon as the command is received.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: TS
12	Time	17	ASCII : YYYY:DDD:HH:MM:SS
29	Type	1	ASCII character: M (manual) P (pulse) C (cancel) space (request)
30	Timeout	2	ASCII integer: 0 – 99 (seconds)
32	Command code	2	ASCII characters: TS
34	CRC	4	ASCII hexadecimal
38	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Command code	2	ASCII characters: TS
8	Length	4	ASCII integer: 0
12	Time	17	ASCII : YYYY:DDD:HH:MM:SS
29	Type	1	ASCII character: M (manual) P (pulse) C (Cancel) space (request)
30	Result	2	ASCII hexadecimal: 00 = done (no error) 01 = invalid request 02 = rejected 03 = timeout waiting for pulse 04 cancelled FF = waiting for pulse
32	Command code	2	ASCII characters: TS
34	CRC	4	ASCII hexadecimal
38	Delimiter	2	ASCII characters: <CR><LF>

3.36 Write Parameters to SPROM (WP)

The **Write Parameter** command causes the DAS to save the current user-accessible parameters to SPROM installed in the DAS. Care must be taken to ensure that all parameters are in the desired state when the **WP** command is issued. The parameter set is always saved with **Acquisition ON**. These parameters become the default parameters should the parameters in RAM become corrupted.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: WP
12	Command code	2	ASCII characters: WP
14	CRC	4	ASCII hexadecimal
18	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command code	2	ASCII characters: WP
12	D1 Result Code	2	ASCII hexadecimal 00 = Pass 01 = Fail
14	D2 Result Code	2	ASCII hexadecimal 00 = Pass 01 = Fail
16	Command code	2	ASCII characters: WP
18	CRC	4	ASCII hexadecimal
22	Delimiter	2	ASCII characters: <CR><LF>

Firmware	Parameter Set Location
After CPU Firmware Version 2.8.8	Disk
After 3.2.0	SPROM

This page intentionally left blank.

3.37 Future Commands

The following commands may be added at a future time. They may change from the definition provided here.

3.37.1 Future Delayed Action Commands

3.37.2 A/D Calibration Signal Parameters (PF)

The **A/D Calibration Signal** parameters define the test signal for the A/D.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PF
12	Channel Group	1	ASCII digit: 1 - 4
13	Enable	1	ASCII character: <SP> = disable, else = enable
14	Reserved	2	ASCII <SP>
16	Duration	4	ASCII digits: 1 – 500 seconds
20	Amplitude	4	ASCII digits: FP 2: 0.01 – 5.00 volts
24	Signal	4	ASCII characters: STEP, SINE, NOIS, GRND
28	Step interval	4	ASCII digits: 1 – 250 seconds
32	Step width	4	ASCII digits: 1 – 250 seconds
36	Sine Frequency	4	ASCII digits: 1 – 100 Hz
40	Command code	2	ASCII characters: PF
42	CRC	4	ASCII hexadecimal
46	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: PF
12	Sensor	1	ASCII digit: 1 - 4
13	Enable	1	ASCII character: <SP> = disable, else = enable
14	Command code	2	ASCII characters: PF
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

3.37.3 Additional Immediate Action Commands

3.37.4 Auxiliary Control (AC)

The **Auxiliary Control** command controls various relays and soft switches.

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<84>
1	Reserved	1	<0>
2	Unit ID	4	ASCII (0 addresses all units.)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: AC
14	Command code	2	ASCII characters: AC
16	CRC	4	ASCII hexadecimal
20	Delimiter	2	ASCII characters: <CR><LF>

Response:

Offset	Description	No. of Bytes	Type and Range
0	Attention	1	<85>
1	Reserved	1	<0>
2	Unit ID	4	ASCII integer (non-zero)
6	Length	4	ASCII integer
10	Command Code	2	ASCII characters: AC
12	Command code	2	ASCII characters: AC
14	CRC	4	ASCII hexadecimal
18	Delimiter	2	ASCII characters: <CR><LF>

This page intentionally left blank.

3.38 REF TEK 72A Commands

The following commands adhere to the format used with the REF TEK 130, but are specific to the REF TEK 72A series Data Acquisition System. They will be implemented when the 130 command set is ported to the 72A DAS firmware.

3.38.1 Additional Delayed Action Commands

Operating Mode Parameters (PO)

Wake Sequence Parameters (PW)

External Clock Parameters (PX)

3.38.2 Additional Immediate Action Commands

4 Index:

U

V

W

This Page Left Intentionally Blank

Refraction Technology
1600 Tenth Street
Suite A
Plano, Texas 75074

Tel: 214-440-1265
Fax: 972-578-0045
www.reftek.com