EAS Encoder/Decoder Functional Description

EasyPlus, Model EASyPLUS-1

Product Detail:
FCC ID: **P4V-EASYPLUS-1**
Equipment type: **EAS Encoder/Decoder**

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Related Documents:

EASyPLUS block diagram (diagram number EASBlock007)

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1 GENERAL DESCRIPTION.

The Trilithic EAS*yPLUS* (PN: 2010909300) EAS (Emergency Alert System) Encoder/Decoder is a two-U rack mounted control center capable of performing manual or automated EAS messaging for Cable Headends and Hub sites, in accordance with CFR 47 part 11 FCC regulations, and the EAS Cable Handbook.

The EAS*yPLUS* receives EAS messages from up to six audio sources (internal or external), decodes the message, and operates Cable System equipment to replay the message for subscribers. In addition, messages can be originated by the user via local or remote control of the EAS*yPLUS*. The EAS Audio sources for the EAS*yPLUS* include internal AM/FM/NOAA radios and external audio inputs that can be connected to any known EAS audio source. EAS Audio is decoded by the internal AFSK circuitry, it is then sorted and interpreted to determine the type of emergency or test, locations for which the emergency applies, and other information supplied in the EAS Header. If a voice message is contained in the EAS message, it is recorded for possible playback to subscribers. EAS messages then pass through a series of tests to determine if the message matches predefined, user configurable parameters. If these tests pass, EAS activation of the Cable system automatically occurs. To play an EAS message to subscribers, the EAS*yPLUS* activates TTLs and Contact Closures, as well as sending commands via RS-485 and High Data Rate AFSK, it also supplies pertinent video and re-encodes/plays the EAS FSK and recorded audio. The TTLs, Contact Closures, and RS-485 commands activate routing equipment throughout the headend to provide the emergency audio and video to all channels of the cable system.

In addition to the EAS messaging capabilities, the EAS*yPLUS* logs all received and transmitted messages to a printer, the LCD display, and it's internal log storage area.

2 INTERFACE

Front Panel Display: The display provides visual feedback to the user during programming, setup, monitoring, and activation of the EASyPLUS.

Front Panel Keypad: The keypad is used for local, real-time control of the EASyPLUS. It provides access to EAS setup and monitoring functions, as well as message encoding functions. The keypad also provides password protection for sensitive functions.

Front Panel Speaker: The speaker is used for monitoring audio inputs, and to provide feedback to the user during non-messaging functions, and allows the user to hear incoming or outgoing messages during EAS activations.

Front Panel Microphone: The Microphone allows the user to record EAS audio messages prior to sending, speak a "live" EAS audio message onto a cable system, or record a "Tune To" audio message used to direct subscribers to a details channel.

Rear Panel:

> **Power Entry:** a single phase AC Line input with ground connection, normally powered by 117 VAC 60 Hz.
>
> **CG Video In:** a connection with which a cable system may supply "normal" video to a channel designated for EAS messaging. This video is replaced by the EASyPLUS during messaging.
>
> **CG Video Out:** provides EAS information video during messaging. This video is distributed to all cable channels during messaging, otherwise it contains the CG Video In signal.
>
> **Audio Switch In:** provides a balanced input with which a cable system may supply "normal" audio to a channel designated for EAS messaging. This audio is replaced by the EASyPLUS during messaging.
>
> **Audio Switch Out:** provides EAS information audio during messaging. This audio is distributed to all cable channels during messaging, otherwise it contains the Audio Switch In signal.
>
> **RS-485 Data:** provides a balanced serial data output to control peripheral devices during EAS messages. The EASyPLUS uses a 1/8th load RS-485 to allow connection of up to 255 external devices. RS-485 data is terminated at the last device in the chain, using a 120 Ohm resistor.
>
> **Audio Expansion, Audio 3, 4, 5, and 6:** The audio expansions provide a means for external audio or radio tuner modules to be inserted, providing up to 6 EAS audio inputs. With a radio module attached, a 75 Ohm "F" connector is provided allowing input of AM, FM, or NOAA band signals.
>
> **COM-1, COM-2:** Provide an RS-232 compliant serial data connection to allow control of the EASyPLUS from an external computer, and to provide streaming EAS information to and from the EASyPLUS as required by CFR 47 part 11 for encoders and decoders.
>
> **Parallel port:** The parallel port provides an external printer to be connected for EAS logging purposes as required by CFR 47 part 11 for encoders and decoders.
>
> **Audio Inputs I1+ I1- I2+ I2- and G:** provide a means for external balanced audio to be supplied to the EASyPLUS for EAS decoding and recording. I1+ , I1- and G (ground) provide one balanced input channel, I2+ , I2- and G provide the other balanced input channel.

Audio Outputs O1+ through O4+, O1- through O4-, and G: provide four balanced EAS audio outputs that may be distributed throughout a headend during EAS messaging.

AFSK Switch (inputs) +RI, -RI, +LI, -LI, and G: provide balanced left and right audio inputs with which a cable system may supply “normal” audio to a channel designated for EAS Hub Control signals. This audio is replaced by the EASyPLUS during messaging, and used to provide High Speed AFSK for control over remote hub locations.

AFSK Switch (outputs) +RO, -RO, +LO, -LO, and G: provide balanced left and right audio outputs to a channel designated for EAS Hub Control signals. During messaging this output is used to provide High Speed AFSK for control over remote hub locations, otherwise it provides the AFSK Switch (inputs) signals.

TTL Outputs 1-10 and G: provide a five volt DC signal (and ground connection) used to activate headend equipment to route EAS messages to individual cable channels. Normally, these outputs are normally low (0 volts), and active high (5 volts).

Contact Closure 1 (C1, NC1, NO1): provide a programmable contact closure used to activate headend equipment to route EAS messages to individual cable channels. Normally there is an electrical path from C1 (common 1) to NC1 (normally closed 1), and no path between C1 and NO1 (normally opened 1). During activation, the electrical path is from C1 to NO1, and there is no path between C1 and NC1.

Contact Closure 2 (C2, NC2, NO2): same as Contact Closure 1.

Contact Closure 3 (C3, NO3): same as Contact Closure 1, except that no normally closed path is provided.

Contact Closure 4 (C4, NO4): same as Contact Closure 1, except that no normally closed path is provided.

3 BLOCK DESCRIPTIONS

Note: Refer to the EASyPLUS block diagram (diagram number EASBlock007) for operational block interconnect. Each functional block referred to in this section is accompanied by block diagram coordinates for easy lookup. Coordinates are enclosed in brackets, IE: **[A1]** is the bottom-left corner of the Block Diagram.

Power Supply **[B1] :** The power supply section provides +12, -12, and +5 Volts to the EASyPLUS circuitry.

Regulators **[B1] :** The +3 and +1.5 Volt Regulators supply power for most of the digital circuitry in the EASyPLUS.

Micro-Controller **[C3] :** The Micro-Controller controls all the devices within the EAS*yPLUS*. It is responsible for all decision making and flow control, and coordinates the other digital devices in the operation of their tasks.

System Flash **[C2] :** This memory device is the main permanent storage unit for the EAS*yPLUS*. It contains all the micro-controller[C3] and DSP[B4] instructions, and the permanent EAS database, as well as most of the user data stored for EAS. It is able to be reprogrammed (upgraded) without disassembling the EAS*yPLUS*.

System RAM **[B2] :** This memory device is used to provide rapid access to program code and data that changes often, or as a temporary buffer for data to be stored in Flash memory. It is made non-volatile by a battery-backed-up RAM controller[B2].

RAM control **[B2] :** Provides the System Ram[B2] with power and refresh control during power outages and extended disconnects.

Real Time Clock **[B2] :** Along with the 32.768 MHz crystal[B2], provides the EAS*yPLUS* with an accurate time reference for message filtering and logging. The Real Time Clock is battery operated during power loss.

Audio Flash **[B2] :** This memory device provides long term storage for a “Tune To” audio message, and bulk storage for EAS audio messages. It is a standard Flash RAM set aside for audio storage.

Character Generator **[C1] :** a separate unit within the EAS*yPLUS* Chassis used as a video source and audio switch during message generation or playback.

COM Port 1 **and** ***COM Port 2*** **[C2] :** Provide standard RS-232C ports to the external devices. Used for setup and control of the EAS*yPLUS*, or to control external devices.

Reset Control **[D3] :** Monitors power for level and stability, providing the system hardware with a known starting point during Power-Up, and preventing data corruption during Power-Down. It is also able to reset digital devices at the command of the Micro-Controller[C3].

I/O Controller and Glue Logic(XG) **[C4] :** Provides the interface between the Micro-Controller[C3], and most of the other digital devices.

Reference Oscillators **[C4] :** Provides stable clock references to the Micro-Controller[C3], IO Controller and Glue Logic[C4], and the DSP[B4].

***DSP* [B4] :** The Digital Signal Processor provides the interface between the Micro-Controller[C3] and the Codecs[B5]. It is a specialized micro-controller used to synthesize the audio tones used in EAS, Detect these tones from an incoming audio stream, and provide other mathematic manipulation of digitized audio.

***AFSK Relay* [B4] :** Provides external routing for High Speed AFSK, used for control of Hub site equipment.

***Full Expansion Port* [B5] :** This port provides interconnect to add-on cards. It provides a full system buss, as well as audio input and output to the codecs[B5].

***Data Driver 1* [A3] :** Provides a means for the Micro-Controller[C3] to output TTLs for control of external devices.

***Data Driver 2* [A3] :** Provides a means for the Micro-Controller[C3] to output TTLs for control of external devices, as well as driving contact closures[A3] [A4] A5] for control of external devices.

***TTL Expansion* [A2] :** Provides an interface for an optional TTL board for control of external devices. Up to 48 TTL outputs can be added.

***20x4 Alpha Numeric Display* [D4] :** Provides visual feedback for EAS*yPLUS* operation, as well as real time status monitoring.

***4x4 Keypad* [D4] :** Provides Alpha-Numeric input from the user, as well as menu controls.

***Parallel Port Buffer* [D4] :** Provides signal output to drive a printer for logging and status hardcopy.

***Audio Expansion 1* [D5] and *2* [C5] :** Provide four inputs (two per port) for EAS audio on expansion cards. The EAS*yPLUS* usually ships with one slot containing a dual AM/FM/NOAA radio, and one slot empty.

***Codec 0, Codec 1, and Codec2* [B5] :** Provide Analog to Digital, and Digital to Analog conversions for all audio inputs and outputs. In addition, the codecs provide cross point switching and audio volume control for all onboard audio.

***Microphone and LP Amp* [C5] :** Provide a means for the user to record an EAS Audio Message, or "Tune to" audio.

***Front Panel Speaker* [C6] *and Amp* [C5] :** Provide audio feedback and monitoring functions for the user.

***8 KHz Anti-Alias filters* [C6] [B6] :** These filters reduce unwanted noise on EAS Audio inputs, and prevent audio artifact generation by the digitization process.

***LP Filter(s)* [B5] :** Reduce high frequency noise in the Codec[B5] outputs and are used for wave shaping on the High Speed AFSK audio.

***(EAS Audio) Amp(s)* [B6] [A6] :** Provide unbalanced-to-balanced audio amplification for EAS audio routed externally and to the internal Character Generator[C1].

***Contact Closure(s)* [A3] [A4] [A5] :** Provide Normally Open, Normally Closed, and Common contacts for control of external equipment.

4 POWER UP SEQUENCE

1) Upon application of power, the EASyPLUS digital circuitry is held in a known starting state by the Reset Control[D3] until the Power Supply[B1] and Regulators[B1] stabilize. Once power is stable, the reset is released, and digital circuitry is free to operate.

2) Once the reset is released, the Micro-Controller[C3] begins executing the instructions contained in the System Flash[C2]. The startup instructions include the following operations…
   a) Test System Ram for functionality[B2]
   b) Initialize the IO Controller[C4].
   c) Initialize the Display[D4].
   d) Initialize and turn off TTLs via Data Drivers 1 and 2[A3], and the TTL Expansion[A2].
   e) Initialize and turn off Contact Closures [A3] [A4] [A5] via Data Driver 2[A3].
   f) Turn the AFSK Relay[B4] off.
   g) Initialize the RS-485 Port.
   h) Blank the Character Generator[C1], command it's Video Relay on, and command it's Audio Relay off.
   i) Initialize the Com Ports[C2].
   j) Load the User Configuration (setup) from the System Flash[C2].
   k) Initialize the Radios on Audio Expansion port 1[D5] and 2[C5] if present. If present, the radios are tuned to the frequencies indicated by the user setup.
   l) Upload the DSP instructions to the DSP[B4].
   m) Command the DSP to begin executing instructions.
   n) Wait for the DSP to complete initialization.
   o) Upload the user setup to the DSP.
   p) Update the status on the display, and begin standby operation.

3) Once the reset is released, the DSP[B4] begins scanning for instructions (program code) from the Micro-Controller[C3]. Upon receipt of these instructions, and the command to execute them, the DSP begins its own initialization sequence. This includes the following operations…
   a) Set up communications to the Codecs[B5].
   b) Set up the (default) mixer controls for the Codecs.
   c) Inform the Micro-Controller[C3] that it is ready for user data.
   d) Download the user setup from the Micro-Controller.
   e) Modify the Codecs[B5] mixer settings according to the user setup.
   f) Instruct the Codecs to begin digitizing incoming audio.
   g) Begin processing of incoming data, and sending results to the Micro-Controller[C3].
   h) Begin listening for commands from the Micro-Controller[C3].

5 STANDBY OPERATION

1) Standby Operation is the normal monitoring condition of the EASyPLUS. During Standby, the following operations are performed continuously…
   a) The DSP[B4] receives A/D data from the Codecs[B5], and searches the data for EAS Mark, Space, and Attention tones, and the S.A.M.E. protocol 1050Hz tone.
   b) The DSP[B4] calculates AGC values, and updates the Codec[B5] mixers if needed.
   c) The Micro-Controller[C3] monitors the DSP[B4] for a change in tone detection status.
   d) The Micro-Controller[C3] monitors the DSP[B4] for presence of audio on each channel.
   e) The Micro-Controller[C3] monitors the Keypad[D4] for user input.
   f) The Micro-Controller[C3] monitors the COM Ports[C2] for commands.
   g) The Micro-Controller[C3] monitors the Real Time Clock[B2] and updates the display[D4] with correct time information.
   h) The Micro-Controller[C3] updates the display[D4] to provide signal loss information.
   i) The Micro-Controller[C3] monitors the Full Expansion Port[B5] for an interrupt.

6 COMMON SEQUENCES

The following sequences are used commonly in the operation of the EASyPLUS. When used, they may or may not have signal flow and location indicated. They will be underlined to inform the reader that the signal flow and location are available in this section. The phrasing used in later text may not be identical to the phrasing used in this section, this is done to increase readability of the Theory of Operation.

1) **Keypad Operations:** The 4x4 Keypad[D4] contains 16 keys, including the numbers 0-9, the √ symbol for "Select" or "Enter", **X** mark for "Exit" or "Cancel", ↑, ↓, ←, and → keys for Navigation, and the letters A-Z above the keys for alpha-character entry.
   a) When a key is pressed on the 4x4 Keypad[D4], the signal is interpreted and routed through the I/O Controller and Glue Logic[C4] to the Micro-Controller[C3].
   b) The value of the key is analyzed by the micro-controller according to the current front panel interface mode.
   c) If the interface mode is awaiting a letter entry and an alpha key has been pressed, feedback is provided to the user to aid in character selection. Each number key has three letters associated with it and printed above it, the character used is toggled each time the key is pressed, until the √ or → key is pressed. For example: The "1" key has the legend "ABC" above it. If the interface is awaiting an alpha character, and the "1" key is pressed twice, followed by the √ key, the letter returned is "B".
   d) The **X** key will usually cancel an operation in progress, and may be used to return to the previous menu or cancel an entry when navigating menus.
   e) The ↑ key is used to scroll up the list of currently selected menu items.
   f) The ↓ key is used to scroll down the list of currently selected menu items.
   g) The → key is used to enter a sub menu or final menu item.
   h) The ← key is used to exit a sub menu, or return to standby mode from the menus.

2) **Display Operations:** The 20x4 Alpha-Numeric Display[D4] is used to provide status information to the user, and to provide feedback during any operations requiring user intervention or control.
   a) When appropriate, the Micro-Controller[C3] sends display information to the I/O Controller and Glue Logic[C4], which then decodes the information and sends it to the 20x4 Alpha-Numeric Display[D4].

3) **Input from the Computer:** A computer may be used to control the EASyPLUS, or to upload setup information, digital audio, or new program code.
   a) The computer may be connected to COM Port 1[C2] or 2[C2] of the EASyPLUS. When the computer sends serial data, the COM Port converts the RS-232 data and handshakes to 0 and 5 Volts. These voltages are presented to appropriate pins on the Micro-Controller[C3] where they are decoded into 8 bit bytes, and processed according to established protocol.
   b) When the Micro-Controller[C3] decodes a command, the command is immediately executed, and feedback provided to the display and/or to the computer.

4) **Output To the Computer:** During sessions with an external computer, the EASyPLUS provides feedback to the user via the computer software. Upon request, the EASyPLUS may also supply setup or audio data to the software on the computer.
   a) To send data to the computer, the Micro-Controller[C3] sends 0 and 5 Volt serial data and handshakes to COM 1[C1] or 2[C1], which convert these signals to RS-232 compliant levels, and provide them to the computer.

5) **Audio Input Selection:** During many audio operations, it is necessary to define access to a specific audio source, and sometimes to change mixer settings on Codec 0, 1, and 2[B5] to route the audio. In the case of an input, a single source is flagged for data transfer to the Micro-Controller[C3], or routed to appropriate outputs.

a) To select and route an audio source, the Micro-Controller[C3] commands the DSP[B4] to change the mixer settings appropriately, or to flag the incoming digitized audio for transfer to the Micro-Controller[C3].
b) If a mixer setting change is needed, the DSP[B4] commands Codec 0, 1, and 2[B5] to perform the operation, and the codecs route the audio appropriately.
c) If a data transfer is required, the DSP[B4] receives the data from Codec 0, 1, or 2[B5] and transfers it to the Micro-Controller[C3].

6) **Audio Output Selection:** During many audio operations, it is necessary to define access to a specific audio channel, and sometimes to change mixer settings on Codec 0, 1, and 2[B5] to route the audio. In the case of an Output, one or several channels may be selected to receive digital data from the Micro-Controller[C3], or routed to a single audio source.
   a) To select and route an audio output, the Micro-Controller[C3] commands the DSP[B4] to change the mixer settings appropriately, or to flag the outgoing digitized audio for transfer to Codecs 0, 1, and 2[B5].
   b) If a mixer setting change is needed, the DSP[B4] commands Codec 0, 1, and 2[B5] to perform the operation, and the codecs route the audio appropriately.

7) **Audio Routing:** Audio Routing consists of an Audio Input Selection function and an Audio Output Selection function performed in such a way that the audio source is routed to the destination(s) without the aid of data transfer, or when the data transfer is performed by the DSP[B4] in a manner transparent to the Micro-Controller[C3].

8) **Audio Recording:** Audio recordings are used to store voice information for "tune to" messages, and "EAS Voice" messages. "Tune to" messages are seldom recorded, but may be played back onto a system to direct users to a channel with greater detail about an emergency. "EAS Voice" messages are up to two minutes long, and are required as part of the EAS Protocol.
   a) To record audio, the Micro-Controller[C3] selects the appropriate audio input, and commands the DSP[B4] to send data. The DSP retrieves the digitized audio data from the appropriate Codec[B5] and sends it in a continuous stream to the Micro-Controller[C3]. The Micro-Controller then stores the data to System RAM[B2]. When a sufficient amount of data is stored in the System RAM, the Micro-Controller[C3] programs the data into the Audio Flash[B2] and continues receiving data.
   b) At the end of an audio recording, the Micro-Controller[C3] commands the DSP[B4] to stop sending audio data. The Micro-Controller[C3] then stores the remaining data in the Audio Flash[B2], and returns from the Audio Recording routine.

9) **Audio Playback:** Audio playback operations are performed during review of Audio Recordings, and during EAS messaging to the Cable Headend. In addition, it is possible to store and use audio prompts to the operator of the EASyPLUS.
   a) To play back audio, the Micro-Controller[C3] selects the appropriate audio output(s), retrieves digitized audio from the Audio Flash[B2], and transfers it to the DSP[B4]. The DSP then sends this data to the appropriate Codec[B5], where it is converted to audio.

10) **Generating a Dual Tone:** The Dual Tone (EBS Attention Signal) is required for EAS messages that contain a voice message.
    a) To generate a Dual Tone, the Micro-Controller[C3] selects an Audio Output, and commands the DSP[B4] to generate the Dual Tone for a specified time period.
    b) The DSP calculates the D/A values necessary to create the tone, and sends them to the appropriate Codec[B5].
    c) After all data is sent to the Codec, the DSP[B4] sends a message to the Micro-Controller[C3] and the Micro-Controller continues with the sequence in progress.

11) **EAS FSK Generation:** The EAS protocol requires that FSK audio be sent at the beginning and end of every EAS message. This audio contains the event and location codes that allow EAS to function as an area specific, automatic messaging system.
    a) Before sending EAS FSK, The Micro-Controller[C3] selects the appropriate audio output device(s).
    b) To generate EAS FSK, the Micro-Controller first encodes message information into the appropriate EAS Protocol text string.
    c) The EAS text string is then disassembled into a bit stream, and sent to the DSP[B4].
    d) The DSP calculates the D/A values necessary to create the EAS FSK Audio, and sends the data to the appropriate Codec[B5].
    e) After all data is sent to the Codec, the DSP[B4] sends a message to the Micro-Controller[C3] and the Micro-Controller continues with the sequence in progress.

12) **TTL Activation/Deactivation:** TTL lines are 0 or 5 Volt signals used to control external routing equipment during EAS activations.
    a) To activate/deactivate one or more TTL lines, the Micro-Controller[C3] sends synchronous serial data to Data Driver 1 and/or 2[A3]. The data drivers decode the serial data to provide parallel logic externally.
    b) The TTL Expansion Card[A2] (if present) operates in the same manner as the Data Drivers[A3], and is used for greater routing flexibility.

13) **Contact Closure Activation/Deactivation:** Contact Closures are used to control external routing equipment during EAS activations.
    a) To activate/deactivate a Contact Closure, the Micro-Controller[C3] send synchronous serial data to Data Driver 2[A3].
    b) Data Driver 2 decodes the serial data, and provides an activation/deactivation signal to Contact Closures 1 and 2[A3], 3[A4], and 4[A5].

14) **Printing/Logging:** The ability to log incoming and outgoing EAS messages is required for FCC compliance.
    a) To send information to the external printer, the Micro-Controller[C3] sends data to the I/O Controller and Glue Logic[C4], where it is encoded.
    b) The I/O Controller and Glue Logic provide the data to the Parallel Port Buffer[D4], which provides the data to the printer port.

15) **FSK Decoding:** The ability to decode incoming EAS messages is required for FCC compliance.

a) When FSK data comes in to the External Audio inputs or the External Audio Expansions [D5] and [C5], it is provided directly to the Anti-Alias filters[C6] and [B6].
b) The filters remove all high frequency (above 8 KHz) components from the audio, and provide the modified audio signal to the Codecs[B5], which converts the audio to data.
c) The DSP[B4] retrieves the digitized audio and algorithmically checks for EAS Mark and Space frequencies. When present, these frequencies are converted into an ASCII bit pattern, and relayed to the Micro-Controller[C3].
d) The Micro-Controller searches the ASCII data for a two-out-of-three match, and if present, checks and decodes the EAS Header. If valid, the EAS Header is processed according to user-defined parameters for retransmission if appropriate. The Header information is also logged.

16) **Tone Detection:** The ability to detect incoming attention tones is required for FCC compliance.

a) When audio comes in to the External Audio inputs or the External Audio Expansions [D5] and [C5], it is provided directly to the Anti-Alias filters[C6] and [B6].
b) The filters remove all high frequency (above 8 KHz) components from the audio, and provide the modified audio signal to the Codecs[B5], which converts the audio to data.
c) The DSP[B4] retrieves the digitized audio and algorithmically checks for EBS dual tones. When present, the DSP sets a status bit and alerts the Micro-Controller[C3] of a change in status.
d) The Micro-Controller checks the status bits for an attention tone, and if present, uses this information to help determine the structure of the incoming EAS message (if after an EAS header).

17) **Keeping Time:** The ability to keep track of time is required for many of the Encoding and Decoding functions of the EASyPLUS. This includes time stamping outgoing messages, determining the validity of incoming messages, logging, and keeping track of message expiration.

a) During “Set Time” operations, the Micro-Controller[C3] sets status registers in the Real Time Clock[B2], providing information on the local time and time zone.
b) During “Read Time” operations, the Micro-Controller[C3] Reads the status registers in the Real Time Clock[B2], retrieving information on the local time and daylight savings status. The Micro-Controller[C3] may interpret this information to provide UTC time if needed.
c) At all times the Real Time Clocks[B2] registers are being updated by the 32.768 KHz crystal[B2]. The registers increment at a rate necessary for accurate timekeeping.