



**Unico 2400 Drive
Help Diagnostics
Jan. 2017**

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1. Help Display

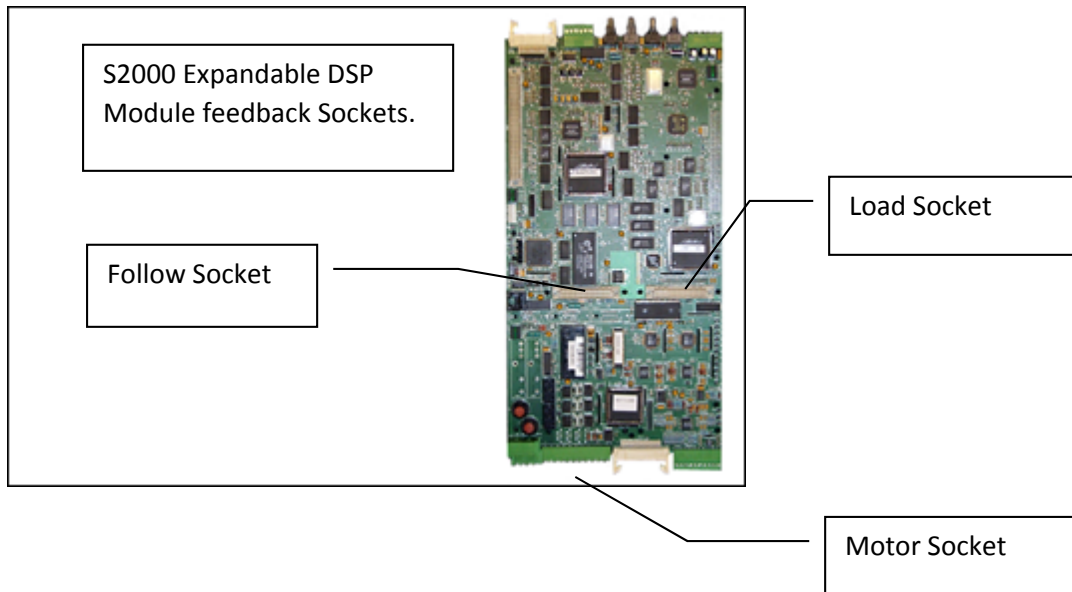
The **Help Display** menu option is selected from the SETUP MENU of the drive. Use help to determine feedback, analog, view PIO, adjust the calendar, view clock settings, view process stack space, view the controller states and other options described below.

The help display contains utilities to help determine fault conditions, or aid in the startup and debugging process. The help display also contains utilities useful to help determine and maintain program optimization.

1.1 FEEDBACK

This utility accesses variables associated with the feedback transducers. Variables associated with each transducer type are summarized below. The type of transducer interface option installed on the drive will determine which set of variables are displayed. Pressing the down arrow key will scroll to the next variable. Holding the down arrow key while pressing the function key will scroll to the previous variable.

There are 3 sockets available of the S2000 Expanded DSP module, and 1 socket on the S2000 standard DSP module. On the standard module, the one socket is referred to as the motor socket. Each socket on the expandable board is identified by a name as defined in the diagram below.



1.1.1 Incremental Encoder (Pulse Generator)

An incremental encoder or pulse generator provides differential inputs for quadrature channel configuration. Encoders should be wired following the hardware wiring manual for the drive. The help screen provides the following information to assist in verifying the feedback device. Pressing the down arrow key will scroll to the next variable. Holding the down arrow key while pressing the function key will scroll to the previous variable. The socket name precedes the display variable.

- **Motor PG Position**
The accumulated incremental position of the encoder is displayed in units of pulses. Holding the function key while pressing the zero key resets the accumulated position to zero.
- **Motor PG Velocity**
Encoder velocity is displayed in units of revolutions per minute.
- **Motor PG Mark Count**
This counter is incremented on each transition of the encoder marker pulse. Once the count reaches 99, it will roll over to 0. Holding the function key while pressing the zero key resets the counter to zero.

- **Motor PG Mark Distance**

The number of encoder pulses accumulated between the two most recent marker pulse transitions is displayed. This value will be positive, negative, or zero depending upon the direction of rotation and changes in the direction of rotation. Non-zero values should be equal to either plus or minus four times the encoder size.

- **Motor PG Mark Fault**
Deviation from the expected marker distance for the two most recent marker pulse transitions is displayed in units of pulses.

- **Motor PG Ref Count**
This counter is incremented on each transition of the reference input on the encoder interface. Once the count reaches 99, it will roll over to 0. Holding the function key while pressing the zero key resets the counter to zero.
- **Motor PG Ref Distance**
This counter is the number of pulses between the reference pulse.

1.1.2 Xless(Transducerless)

Transducerless connections refer to a motor that has no feedback device connected to it.

Transducerless operation uses an internal velocity estimator to regulate the motor speed, so a transducer is not needed. The help screen provides the following information to assist in verifying the xless feedback. Pressing the down arrow key will scroll to the next variable. Holding the down arrow key while pressing the function key will scroll to the previous variable. Transducerless display values are shown preceded by Xless.

- **Xless(Transducerless)Velocity**
Xless velocity is displayed in units of revolutions per minute.

- **Xless(Transducerless) Position**

The accumulated incremental position is displayed in units of pulses. Holding the function key while pressing the zero key resets the accumulated position to zero.

1.1.3 Resolver

The resolver feedback device is an absolute encoder. The feedback from the device will produce an absolute position of 0 to 65535 for each revolution of the encoder. Some resolvers have multiple turns that require the resolver to turn multiple times before the absolute position limit is reached. The help screen provides the following information to assist in verifying the xless feedback. Pressing the down arrow key will scroll to the next variable. Holding the down arrow key while pressing the function key will scroll to the previous variable. The socket name precedes the display variable.

- **Load Res Position**

The accumulated incremental position of the resolver is displayed in units of pulses. Holding the function key while pressing the zero key resets the accumulated position to zero.

- **Load Res Velocity**
Resolver velocity is displayed in units of revolutions per minute.
- **Load Res Raw Pos**
Resolver absolute position is displayed in units of pulses from the zero position. The value will roll over to 0 after each complete revolution.

1.1.4 Serial Absolute Encoder SRAE

The socket name precedes the display variable.

- **Load SRAE Position**

The accumulated incremental position of the SRAE is displayed in units of pulses. Holding the function key while pressing the zero key resets the accumulated position to zero.

- **Load SRAE Velocity**
SRAE velocity is displayed in units of revolutions per minute.
- **Load SRAE Raw Pos**
SRAE absolute position is displayed in units of pulses from the zero position. The value will roll over to 0 after the maximum position value has been reached.

1.1.5 Sine Cosine Encoder

The socket name precedes the display variable.

- **Load SINECOSINE Position**

The accumulated incremental position of the Sin Cosine device is displayed in units of pulses. Holding the function key while pressing the zero key resets the accumulated position to zero.

- Load SINECOSINE Velocity
SRAE velocity is displayed in units of revolutions per minute.
- Load SINECOSINE AbsPos
Sine Cosine device absolute position is displayed in units of pulses. The value will roll over to 0 after each complete revolution if configured as a single turn. If configured as a multi turn, the device will roll over after the multi turn count is reached.
- Load SINECOSINE res
Sine Cosine device resolution is displayed in units of pulses per revolution of the device.
- Load SINECOSINE max
Sine Cosine maximum velocity value that can be reached with the current configuration of the sine cosine device. This display is in revolutions per minute.
- Load SINECOSINE fault codes
Sine Cosine fault codes shows (in hexadecimal) the accumulation of faults since power up. This includes internal faults of the encoder which may not be differentiated in the drive fault history. (inquire Unico Inc for further detail)
- Load SINECOSINE scaler
Sine Cosine scaler is the number of rpm per volt that is set on the velocity test point of the hardware module.

1.2 ANALOG

The ANALOG utility allows monitoring of the real-time value of the various analog input channels (ADC) and output channels (DAC). The submenu is for selecting either input or outputs for displaying. The first line of the display is a center-zero bar graph that displays $\pm 100\%$ of full scale. The second line contains the description and present value of the analog signal. The value is scaled such that a value of ± 10 corresponds to $\pm 100\%$ of full scale. Pressing the down arrow key will scroll to the next analog signal. Holding the function key while pressing the down arrow key will scroll to the previous analog signal.

Available analog input signals are summarized below.

1. U voltage

This is a real-time display of the U phase motor voltage level. The maximum value of 10 is equal to 100% of peak armature voltage.

2. V voltage

This is a real-time display of the V phase voltage level. The maximum value of 10 is equal to 100% of peak armature voltage.

3. U current

This is a real-time display of the U phase motor current level. The maximum value of 10 is equal to 100% of peak armature current.

4. V current

This is a real-time display of the V phase motor current level. The maximum value of 10 is equal to 100% of peak armature current.

5. analog In 3

This is a real-time display of analog channel 3. The maximum value of 10 is equal to 100% of the full-scale input.

6. bus voltage

This is a real-time display of the bus voltage level. The maximum value of 10 is equal to the bus over voltage trip level.

7. analog in 1

This is a real-time display of analog channel 1. The maximum value of 10 is equal to 100% of the full-scale input.

8. analog in 2

This is a real-time display of analog channel 2. The maximum value of 10 is equal to 100% of the full-scale input.

8. analog in 3

This is a real-time display of analog channel 3. The maximum value of 10 is equal to 100% of the full-scale input.

Available analog output (DAC) signals are summarized below.

1. U cmd

This is a real-time display of the U phase motor voltage command. The maximum value of 10 is equal to 100% of peak armature voltage.

2. V cmd

This is a real-time display of the V phase voltage command. The maximum value of 10 is equal to 100% of peak armature voltage.

3. Probe0

This is a real-time display of dac probe 0. The maximum value of 10 is equal to 100% of the full-scale input.

3. Probe1

This is a real-time display of dac probe 1. The maximum value of 10 is equal to 100% of the full-scale input.

1.3 S2000 PIO

The PIO option will display the status of the parallel inputs and outputs. Inputs and outputs should be assigned using the dictionary reference of the input or output data item. Refer to the documentation on these dictionaries to setup the inputs or outputs.

Parallel IO is attached to the bottom of each drive, or with a S2000 Standard drive, 8 bits of I/O can be found on the mother board. With a S2000 expandable drive, 16bit or 32bit io modules may be used. Each embedded application supports the use of parallel IO. Any combination of serial IO (RIO or Modbus Plus) and parallel may be used.

The application software will define the functions available, and assign the functions to default bit locations.

Any bit can be re-assigned to any function dictionaries.

No input and output can be tied to the same

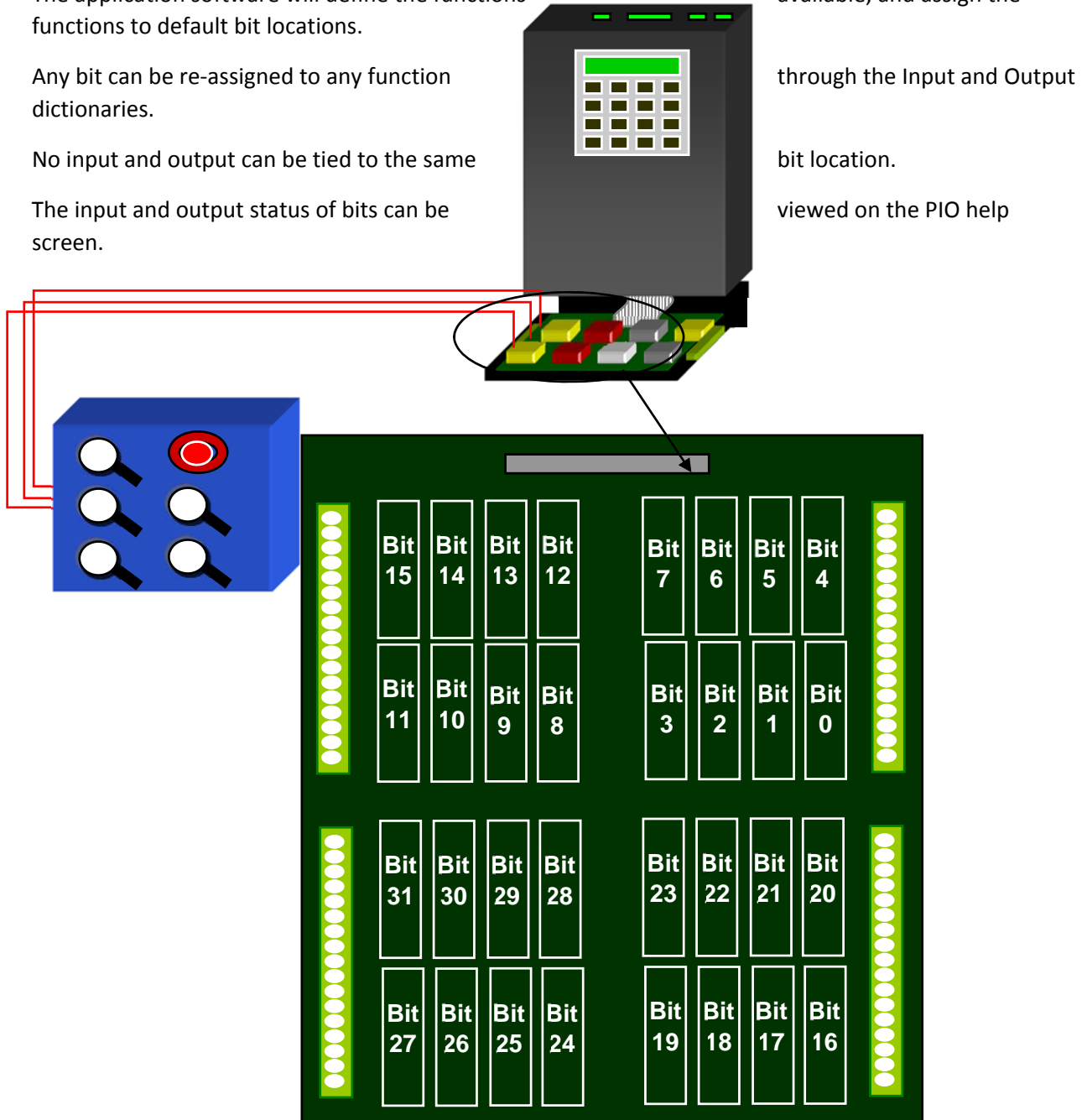
The input and output status of bits can be screen.

available, and assign the

through the Input and Output

bit location.

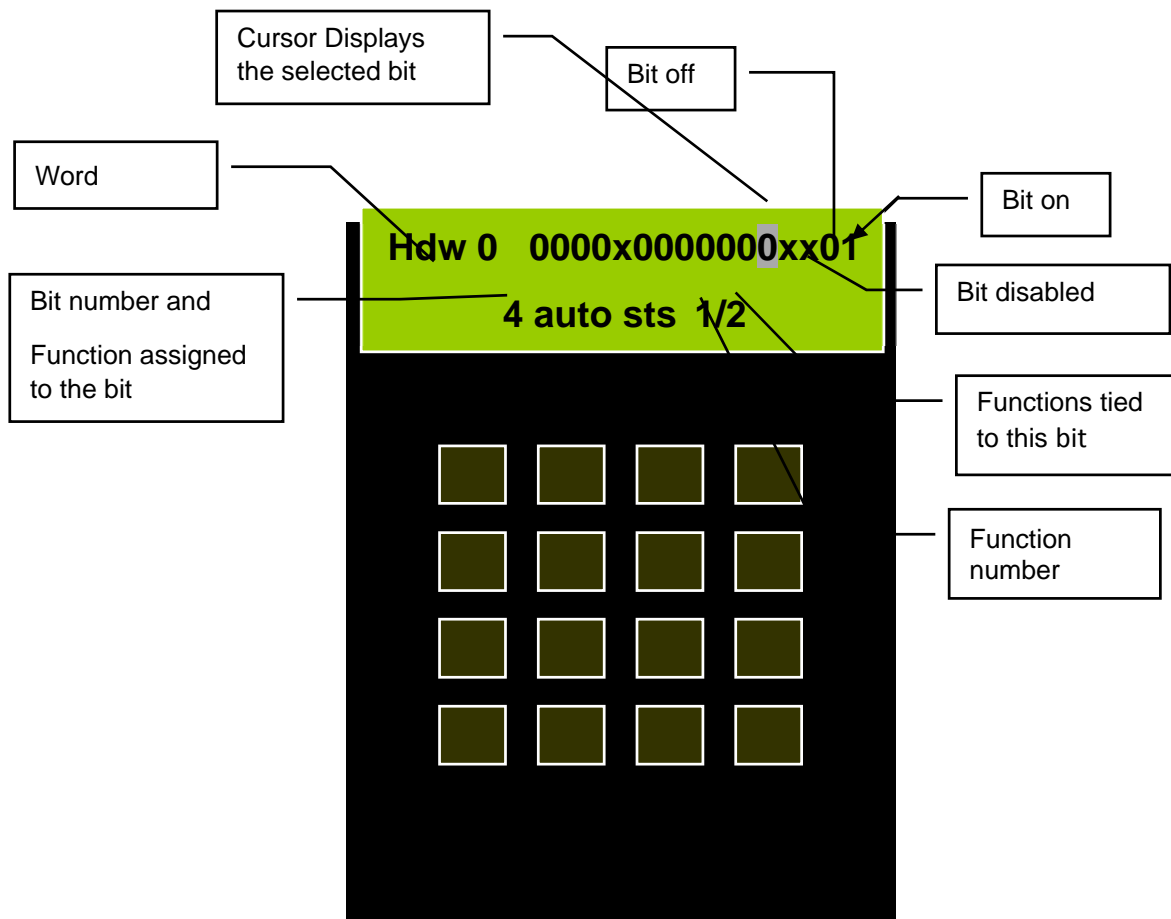
viewed on the PIO help



The io status can be viewed from the HELP / PIO screen. The output status can also be viewed in the output dictionary at the end of the list of bits. Readouts are prefixed with a "!".

Once on the help PIO screen, IO bits can be viewed 16 at a time. The bit can be selected by typing in the bit number, or using the arrow key to scroll through the words. Information shows the state of the bit .

Use FUNCTION 0 to scroll through the function assigned to a specific bit. More than one input function can be assigned to a single bit.



1.3.1 PIO Word Definitions

Each IO word defined in the application can have functions associated with the word. Functions are assigned to a specific bit in the word using the input and output configuration dictionaries. Refer to the INPUT dictionary documentation and the OUTPUT dictionary documentation for information on how to assign input request functions to word bits, and output bits to output status functions. The IO words that are displayed in the PIO help view are defined below:

- HDW – Configurable Bits either inputs or outputs depending on the setting of the word bit selection from the IO data items. Inputs are outputs are configured from the IN SETUP dictionary, or the OUT SETUP dictionary or from the GLOBAL dictionary by selecting the function that will be used by the bit. Outputs that are configured on a certain bit override inputs, so outputs and inputs cannot be configured on the same bit. Inputs have the 'req' suffix applied to the name, and outputs have the 'sts' suffix applied to the name.
- REL – Relay IO. There are 2 relay inputs, and 2 relay outputs available to assign input and output functions. In addition there are 2 keypad inputs available to assign functions when using the remote keypad additional keypad keys.
- SIN – Serial inputs. These are available when a serial protocol that has been configured to use the IO bits is configured such as RIO. The **serial IO source** must be setup to the appropriate protocol before the IO can be assigned.
- SOUT – Serial outputs. These are available when a serial protocol that has been configured to use the IO bits is configured such as RIO. The **serial IO source** must be setup to the appropriate protocol before the IO can be assigned.
- PLCOUT-LOUT-LHOUT-LRELAY-INT – UEdit designated IO mapping words. These bits are used by UEdit applications, and must be viewed by using the UEdit program.

1.4 CLOCK

The CLOCK option will display the status of the internal clocks. Each foreground clock runs at a specified frequency that is a multiple of the clock frequency setup. There are 5 clocks configured, each has a multiple setup associated with it in the dictionary. Refer to change the clock multiple.

1.4.1 Settings

The clock settings view displays the current running frequency of each clock. Clocks are configured in either the global dictionary, or from the setup dictionary by modifying the multiple of the clock.

clock frequency - The frequency of the slowest control loops in the drive. Clock frequencies are determined at power-up, so if this item is changed, control power to the drive must be cycled. This setup is modified from the dictionary.

drive multiple - Drive multiple sets the frequency of all the routines which execute on the drive clock. The drive controller is the main routine which runs on the drive clock. If the **clock frequency** is at 50 Hz and the **drive multiple** is a 5, the drive clock runs at $50 * 5 = 250$ Hz. Clock frequencies are determined at power-up, so if this item is changed, control power to the drive must be reset. This setup is modified from the dictionary.

upid multiple - The position/velocity loop controller runs on the upid clock by this multiple. If the drive clock is at 250 Hz and the upid multiple is a 4, the upid clock runs at $250 * 4 = 1000$ Hz. Clock frequencies are determined at power-up, so if the multiple item is changed, control power to the drive must be reset. This setup is modified from the dictionary.

ac multiple - The ac vector controller runs on the ac clock. This clock runs faster than the upid clock by this multiple. If the upid clock is at 500 Hz and this multiple is a 2, the ac clock runs at $500 * 2 = 1000$ Hz. Clock frequencies are determined at power-up, so if the multiple item is changed, control power to the drive must be reset. This setup is modified from the dictionary.

ac fast multiple - The ac vector rotator runs on the ac fast clock. This clock runs faster than the ac clock by this multiple. If the ac clock is at 1000 Hz and this multiple is a 2, the ac clock runs at $1000 * 2 = 2000$ Hz. Clock frequencies are determined at power-up, so if the multiple item is changed, control power to the drive must be reset. This setup is modified from the dictionary.

1.4.2 Foreground Ticks & Overruns

The overrun view shows the number of ticks for each AC Clock, and also any overruns that may have happened on one or more of the other clocks.

The screen displays the overrun count in each clock, Fast Clock(FOr), Ac Clock(AOr), Upid Clock(UOr), Drive Clock(DOr), and Slow Clock(SOr). Each item has an accumulator for the number of overruns on the clock level. Select F0 to reset the overrun counts.

1.4.3 Clock Synchronization

Select the RTC(real time clock) from the clock menu to display the settings of the RealTimeClock that is used to synchronize control loops. The RTC display screen shows the connection state either INT for internal, or WAIT for waiting to connect to a master, or SYNC when synchronized to a master RTC clock. The clock source is either Internal or External when it is configured as a slave using the RTC mode setup in the dictionary.

The STC display shows if the clock is synchronized to the gate array switching frequency.

1.4.4 Timing

Select the Timing option from the clock menu to display the percent usage for each foreground clock. The clock is displayed followed by the percent of the clock that is used. Over 100% would produce an overrun. Increasing the usage on a clock will increase the usage on all the clocks slower than that one. Clock usage may change with time depending on what code is executed during the time slice. The usage percent displays the highest value, and can be reset by using Fn 0.

- fast – Percent of clock used
- ac – Percent of clock used
- upid – Percent of clock used
- drv – Percent of clock used
- slo – Percent of clock used

1.4.5 Clock Tasks

Select Task List from the clock menu screen to scroll through the list of tasks posted on the specified clocks.

1.5 PROCESS

The PROCESS display shows the amount of memory consumed by an individual background process. The arrow down key and function arrow keys can be used to scroll up and down through the processes configured within a device.

Once a process has been selected, Use the Fn1 key to display the Scan time in msec of the process, and the Maximum scan time in msec. Scan time is the amount of time from one background scan to the next.

Press Fn1 again to display the Exec time to executable time for the process. The executable time is the amount of time the specific process took during its execution.

Press Fn1 again to display the process state.

Press Fn1 again to display the starting address of the process in memory.

1.6 CALENDAR

The CALENDAR chip maintains the current time and date of the device. This chip stores the calendar set time and date, and updates this continually even when power to the drive has been lost.

To change the calendar date or time, select the calendar display from the help menu options, and then press the enter key to edit the date. Continue to press the ENT key until the cursor is at the item that is desired to be changed, then press the down arrow key until the desired item displays the correct value.

Access level 3 must be granted before the time or date can be altered.

1.7 CONTROLLER

The CONTROLLER help option displays data about the controller. The controller is used to manage the drive on and off states, and charging unit states if they are used. The state of the controller is displayed first, and indicates the current status of the controller. The status of the motor on input is displayed next. This is followed by the software enable status. Other information in the controller help screen displays the status of the bits associated with the controller.

The controller help screen is used by Unico personnel to service drives, and make repairs.

1.7.1 Controller Enable Display

Pressing function 1 from the controller's main screen will access the screen which displays additional information about software enable status. Latch is the name of the software module that disabled the controller. While, value is the name of the software module that is currently disabling the control.

1.8 SSI

The SSI (Synchronous Serial Interface) is a high speed serial protocol written by Unico. This protocol transfers a minimal amount of data at very high speeds and is typically used to couple drives together by electronically synchronizing them. If the SSI is not used, the screen will show "ssi disabled".

If the ssi is configured to only transmit data, the number of data packets transmitting will be displayed, and can be reset by pressing function and zero keys together.

If the ssi is configured to receive data or transmit and receive data, the screen will display the takeovers, faults, communication errors, packets received, and the current state.

- **tkov** - indicates the number of times the hardware has detected a loss of the rtc synchronous signal.
- **flt** - indicates the number of faults. A fault is a bad or no packet of data. The fault count is any receive error, receive overrun error, or general receive errors.
- **cerr** - indicates the number of consecutive errors.
- **pcks** - indicates the number of received packets.

- **state** - indicates the current state of the SSI link. The state can be one of the following states:

INT - Internal

SOUR - SOURCE

WAIT - Wait

MEAS - Measure

SYNC - Synchronized

PLL Phase Lock Loop

To clear faults or reset the data use the function zero keys.

1.9 MEM

The MEM display is used by Unico personnel only. This display helps the Unico development team track down and destroy annoying memory leaks or memory allocation problems.

1.10 Dictionary

The GLOBAL Dictionary displays all defined data items. User defined items are displayed here as well. The dictionary must have level 3 access to edit values. This dictionary cannot be removed or modified by UEdit®. This dictionary should be used as a reference source to the data items created within.

1.11 Network Map

The network map contains a parameter connection to data items. This is useful when upgrading software, and a PLC or other device has to talk to the software, but will not be modified to the new data layout. The network map provides a connection between the old data item indexes, and the new data item indexes.

Each network map must be constructed by the user, and can be done using any text editor, and downloaded using the archive menu. Alternatively, UEdit provides a network map modifier that uses standard drag and drop techniques and a simple download function to create the map.

When creating the network map in an archive file, the end of the file should contain the network map indicated by NETWORK_START, after the data from the archive, indicated by DATA_END. If no data archive is used, the DATA_END can be omitted. The network starting offset or reference made by the network device (PLC or other communicating device) should be set to some value, and each item will be

incremented from the start of the network offset. In the example below, the offset is 1000, and the 4 items would be at 1000, 1001, 1002 and 1003.

```

DATA_END

NETWORK_START
NETWORK_OFFSET    1000    [dd]

vel preset 1      [ac]    $network item 1000

vel preset 2      [$$]

vel preset 3      [$$]

vel preset 4      [$$]

NETWORK_END

$END

```

Figure 1 An example of the archive file text that can be used to create a network map. When the archive is uploaded from the drive, any network map will be displayed in the format shown above at the end of the archive file.

1.12 NVMEM

The NVMEM display is used by Unico personnel only. This display helps the Unico development team track down and destroy annoying memory leaks or memory allocation problems.

1.13 PORTS

The S2000 drives have 3 onboard configurable serial ports.

- The **download** port located on the left center of the motherboard configured as a RJ8(phone) connector.
- The **console** port located on the top of the mother board next to the keypad connector.
- The **fiber** port located on the top of the mother board next to the power connector.

Other ports are available as **port A** and **port B**, by adding an additional communication card.

The PORTS display shows what serial port has been configured for use. The port must have a protocol running before it will show up in the help. Select the port in question, each port displays first:

- RCNT Character receive count incremented each time a character is received.

- QIN Count is incremented to the maximum qin buffer size, and then reset. QIN and QOUT should match.
- QOUT Count is incremented each time a character is removed from the input buffer.
- CHAR the last character read.
- SIZE the input buffer size.

Select the arrow down key to display the Transmit port information.

- TCNT Character transmit count incremented each time a character is sent.
- QIN Count is incremented to the maximum buffer size, and then reset.
- QOUT Count is incremented to the maximum buffer size, and then reset. QIN and QOUT should match as this indicates that the buffer is functioning properly, and not missing characters.
- CHAR is the last character written out.
- SIZE is the output buffer size.

Select the arrow down key again to display protocol specific help screens.

1.14 FLUX GAIN

The FLUX Gain help option displays information for the current scaling of the flux feedback. Gain is the multiplier (*x) or divisor (/*) of the flux feedback. Shift is the number of shifts on the flux voltage. Ffbk pk is the peak flux feedback.

1.15 UEDIT

The UEDIT help option displays information about any UEdit® application that may be installed in the device. If UEdit® is not available to this device, the UEDIT menu option will not display.

1.15.1 Execution Times

The display screen shows the following status about UEdit® applications.

- **En** - Enable indicates that the UEdit® application has been enabled and is running if it is set to a 1. If the value is set to a zero, the UEdit® application is not running and must be started with UEdit®. Refer to UEdit® documentation on how to enable a UEdit® application.
- **Scan** - This value represents the current scan time taken to execute UEdit® tasks posted on the process level clock and any other tasks posted on the process clock level by the application. This value is in milliseconds. This value can be reduced by reducing the foreground overhead by lowering scheduled clock levels.

- **Max** - The maximum process clock time. This value will grow during downloads, but indicates the longest run time ever. Large values are not uncommon because during downloading much data is written to NVRAM which takes a long time. To reset this value select the function and zero keys together.
- **Exe** - The longest execution time for the entire list of UEdit®tasks on the process clock level. This value differs from the Scan time value in that it only accounts for the time used by the UEdit®tasks, and not any other process tasks posted by the application. This value is in milliseconds.

1.15.2 Modification Date/Time

Pressing the down arrow key from the UEdit®help menu option, will display the UEdit®revision time and date. This indicates when the UEdit®application was last modified.

1.15.3 Program Name

Depress the arrow key again from the modification date and time screen, and the UEdit®program name is displayed to indicate the program number or name that has been loaded and is executing in the drive.

1.15.4 NVRAM

The next item in the UEDIT display screen can be reached by selecting the down arrow key. This screen displays the amount of available non-volatile ram in the device, under the NVSz label, and the amount of non-volatile ram available under the NVAv label. Non-volatile ram is used to store UEdit applications until they are written to program flash using the archive store utility. The NVRAM partitions may be modified using UEdit®.

1.15.5 Status

The next item in the UEDIT display screen can be reached by selecting the down arrow key. This screen displays any UEdit errors that may have occurred when the UEdit application powered up.

1.16 ETHERCAT

The ETHERCAT help option displays information for the EtherCAT protocol. See the section on EtherCAT for more information.

1.17 Syncbus

UEdit® is best for monitoring/debugging the Syncbus network. However, the drive also has help screens for monitoring/debugging syncbus problems. Each display may contain any of the following items.

STXCOUNT- the number of **scheduled** packets the display's device has transmitted. In the master device this readout indicates the number of schedule packets the master sent to the slaves. In the slave device this readout is the number of packets sent in response to a master scheduled packet sent to this slave. This item is only visible if the device's address is the same as the display's device number.

SRXCOUNT- the number of **schedule** packets received from the display's device. This readout is the number of packets received from a slave in response to a scheduled packet sent to this slave from the master. This item is only visible if the device's address is the same as the display's device number.

UTXCOUNT- the number of **unscheduled** packets the display's device has transmitted. These packets are currently not used. This item is only visible if the device's address is not the same as the display's device number.

URXCOUNT- the number of **unscheduled** packets received from the display's device. These packets are currently not used. This item is only visible if the device's address is not the same as the display's device number.

OFFCOUNT-The number of times the display's device became faulted and went offline.

STATE-Displays the if the device is online or offline..

FAULTS-The number of times a fault was detected for that device. The counter will continually increment, as long a fault condition exists.

FAULTS DATE-The day when the last fault occurred.

FAULTS TIME-The time of day when the last fault occurred.

NET FAULTS-The number of times a fault was detected by this device. The counter will continually increment, as long a fault condition exists.

NET FAULTED DEV-The device that caused the network fault. If the entire network is faulted the last device may be displayed.

Following the counters is the list of Syncbus commands configured for the display's device. Each command line shows the command name, option and if applicable its raw value.

1.18 System Errors

The system errors log is list of logs used to record information about firmware fault since power on. The log shows the cause of the fault and the time the system error occurred. The up/down arrows are used to scroll through the log. Pressing ENTER will display a view that has the additional debugging information. On two line displays the arrows keys are used to scroll through all the debug information. The log is retained during power cycles unless a non-volatile memory fault occurs. The debug information is as follows.

System Error Name- The name of the system error is used for determining where the software the error occurred.

TimeStamp-When the error occurred.

Tick Count-The value of the foreground tick counter when the error occurred.

Latch Count-The system error count since the last power cycle.

In Background/In Foreground-Indicates if the system error happened in the foreground interrupt or in a background process.

Process name-The name of the process that is executing when the system error occurred. The name is valid even if the error occurred in the foreground.

Call Stack-This is the most important information. The call stack is a list of addresses with in the software. The addresses give a trace of how the software got to the location where the system error was detected.

1.19 Other Help Options

Help menu options are dependent on the configuration of the device and the optional communication and hardware cards installed on the device. Refer to the protocols documentation for additional information on help screens.

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