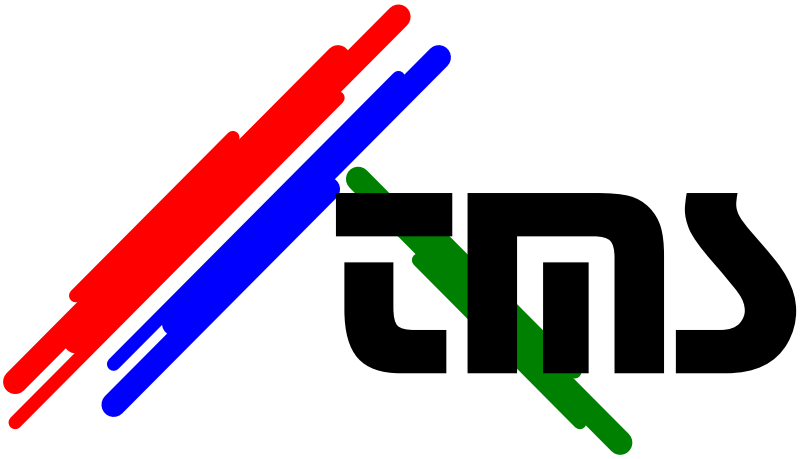


# Basyx / TriComm

## Graphical Interface Software

## System Operation Manual

TRI-OM Revision 1.9

06/12/2009

# Operators manual Contents.

# Connect using the TMS to PC connection and Software kit

This kit is designed to connect a PC or Lap top Computer to a TMS control card. Do not use this kit for any other purpose.

**Supplied Components.**
One RJ45 connection lead Note if you need a longer lead you can purchase a longer cable as a telephone extension cable. One RJ45 to 9 pin RS232 plug. One Program CD with instruction manual and soft ware on.

**Connection Instructions.**
Connect RS232 plug into 9 pin RS232 (serial) socket on your PC.
Connect one end of the connection lead onto the RS232 plug and the other end into the socket with the word "DIRECT" next to it on the TMS control board. **Do not connect to socket on the corner of the TMS board.**

**Note** if your PC or Lap Top does not have an RS232 output port you can Purchase a USB to RS232 converter at leading electronic stores such as Jaycar, Altronics and some computer sales outlets.

**Software installation instructions.**
Ensure the TMS unit is working i.e. A light will be flashing on the TMS board.
Insert the TMS CD in to your PC and locate the file called "Set up. Exe".
Follow on screen instructions.
After soft ware is loaded locate the working file on the CD. For commercial systems this will be the name of the site, drag and drop this file to the following location on your PC.
C:/Program files/triangle micro systems/BASYX/
Locate the BASXY icon on your desktop screen and double click it. A screen will open up click on the name of the site file you loaded, then click on "exit" then shut down the BASXY software. This causes the site file to be registered on your PC and does not need to be performed again unless you are installing the software on to another PC

Click on the "BASXY" icon again to start the software, then click on the name of the site file that you placed in the BASXY directory. You should now see a list of several files on the upper left of the screen.

Where you see the direct window enter the port number of your RS232 output plug this will probably be 1 or 2 but with USB to RS232 converters it could be a number as high as 20. In the Baud rate window enter 19200 from the pull down list.

**Note** to locate the correct port number go to "control panel, system, Device manager. Ports (COM & LPT), next to the wording communication port you should see the words "COM1" if com 1 is used. If you are using a USB to RS232 converter look for a reference to the converter double click on it and look for the Com port used by it.

After entering the correct data click on direct connect after a few seconds you should see the words connected and the date and time, click on the word exit, you are now ready to use your BASXY software.

**For commercial systems.**
This instruction Manual and site details are included on this CD. You should also have received site specific instructions from your installation company.\

## Un-installing the Software

Do not delete the BASYX folder from the windows explorer. The install shield uninstall information is located in this folder.
To remove the TMS100 Installation and Setup Program:
1. Start Windows® 95/98/NT/XP Operating System
2. Close all open program windows.
3. Select the Settings folder from the Start Menu
4. Select the Control panel Icon
5 Select the ADD/REMOVE programs Icon.
6. Select BASYX from the scroll bar.
7. Click on Add/Remove Programs button
8. The program will automatically remove the files and settings created during setup.

## Overview:

The BASYX© TMS100 stand-alone controller is an inexpensive alternative to a full direct digital control system. The unit provides direct digital control and environmental monitoring along with complete electrical system monitoring and reporting. The BASYX© system contains all on-board firmware, clock and memory for complete stand-alone operation.

## Pre-programmed Control Strategies:

The BASYX© is simple to control and operate and has the following algorithms ready for your use:

Basic Time Schedule Control
Lighting Control
Air handler control
Heat pump control
Setpoint Control
Unoccupied Setup/Set Back Control Setpoints
Heating/Cooling Outdoor Air Reset Control
Holiday Schedule Programming
Electrical Load Shedding
Power monitoring and Sub-Metering
Power Billing
System Alarm
Push button Timed overrides
Interlock control
0-10vdc Damper and Valve Control
Lead Lag Pump Control
History (Temperature and Power) Data Recording
Outdoor air reset control

## Hardware Configuration:

The TMS100 controller contains eight (8) triac outputs for on/off control, eight (8) universal inputs for temperature and contact monitoring and four (4) electric or pulse meter inputs. The TMS100 may be connected to additional BASYX© TMS100 controllers through a twisted pair cable, with a total system configuration of 256 controllers. This network will allow single point access through 1 modem or direct connection.

## BASYX© Options: (Communication)

An optional 2400 baud plug-in modem module allow remote interrogation and data retrieval for all controllers connected to the communications loop.
An optional infrared interface which provides programming and monitoring capabilities through a palm-top or other infrared compatible device.

3. A keypad interface with digital display to allow system access, limited monitoring and control interface.

## Software Interface:

The BASYX PSC controller is accessed through a Windows interface program, and will allow text and graphics interface, along with a complete polling package for off-site retrieval of monitoring and point data.

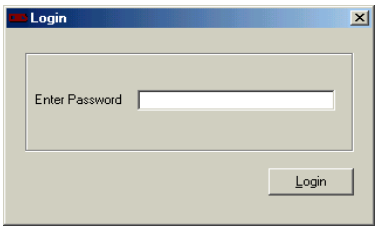
## System Requirements:

Before you set up the BASYX© BASYX PSC Installation and Setup Program ™ software, take a few minutes to make sure your computer meets the minimum requirements needed to run

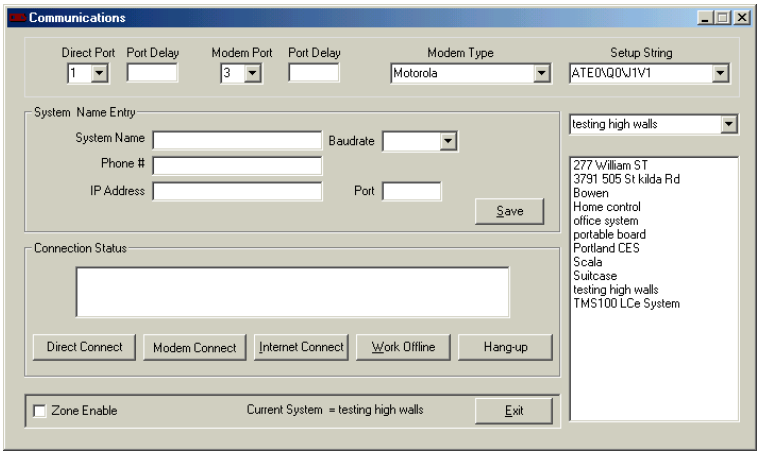
and connect to the BASYX PSC controller.
To use the Installation and Setup Program for the BASYX© BASYX PSC controller, you need the following:
1. IBM-Compatible personal computer with an 80486 or Higher processor.
(Pentium 130 or higher recommended)
2. Hard disk with 4 megabytes of free space
3. Microsoft mouse® or other compatible pointing device.
4. VGA or compatible display capable of 800x600 resolution
(Super VGA or higher recommended)
5. Eight megabytes of random access memory.
6. Microsoft Windows® 98/NT/XP.
7. CD ROM Drive
8. Unused Serial Port or Modem connected to an outside telephone line.
9. Cable/Phone Connection to BASYX© BASYX PSC controller.

# Connecting your Computer to the Basyx System.

When you start the soft ware you may be prompted to enter a pass word, enter the pass word here then press the logon button. If you enter an invalid pass word the screen will not change.




You will then see the following screen.




On the right hand side you will see a list of all preprogrammed systems currently on your computer please click on the one you need to connect to. Next make sure the connection details are entered on the screen.

**For direct connect use.**
Ensure that the baud rate is set to 19600 and the direct port of your computer you are using for connection is shown in the top left hand window. *Your computer must be connected to the TMS system via a direct connection to the RS-232 RJ-11 Jack and the Serial Port of your computer.*

**For Modem connect use**.
Ensure that the coms port that your modem is using is shown in the modem port window, the phone number is shown in the correct window and the correct type of modem you are using is shown in the modem type window.

**For internet connection**.
Ensure that the IP address and port number is shown in the correct window.

You can also choose to work off line (no connection to a system) be clicking on the work off line button.
Push the button for the type of connection you are using and look at the window shown on the lower part of the screen to see when communication has been established. When it has you will see the current data and the words CONNECTED TO TMS100. you can now click on the EXIT icon to leave the current screen and start working with the TMS automation system.

## Operating the system.

The pass work you entered will dictate what parts of the system you will be able to enter and manipulate. There are 3 operating levels of passwords and 3 programming level passwords as follows.
Operator levels.
Level zero allows you to look at the graphic screen.
Level one allows you to look at the Graphic screen and change set points
Level two allows you to look at the status screens and change time/date
Programming levels.
Level three allows you to program the unit.
Level four allows you to change passwords and enter logic program mode.
Level five allows you to reset meters.

## Operator level passwords.

**Level Zero.**

At level zero you may click on the graphic icon at the top of the screen and enter the graphics screens.
On the right of the screen you will see a vertical row of buttons those with names on are connected to a graphic window which will allow you to see what is happening with the system. Clicking on any of these buttons will bring up the appropriate window. You will now see the graphic image with control windows on top. When you open a window the computer will examine the TMS control system and then display the information on the screen. This may take some time if many boards are connected to the system. You will now be able to view any inputs and outputs placed during programming mode.

**Level one. Changing data.**

At level one password you will be able to change set points and time schedule data shown within the graphic screens.
To change set points or time schedule data. Click on the green **edit** button at the lower right of the screen you can now change data. When finished click on **send to controller** located where the edit button was.
*Note when entering time data please use the format 00:00*

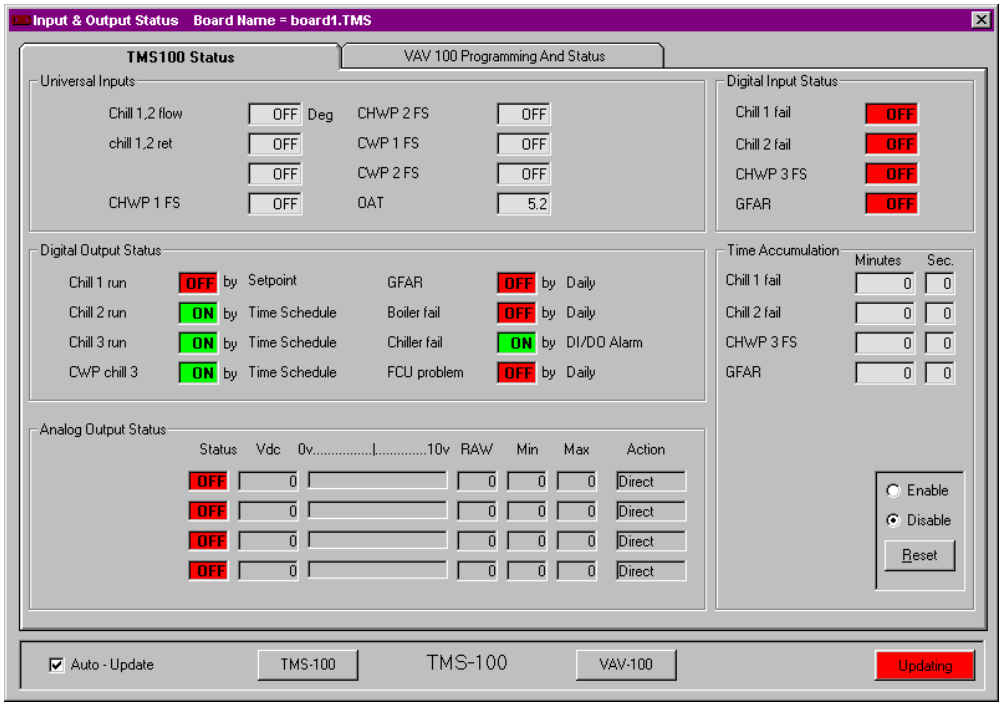
**Level two**

At level two you will be able to view all of the status screens. First highlight the name of the board you want to see on the left of the screen, then at the top of the screen click on status then click on the item you need.

# Status Menu

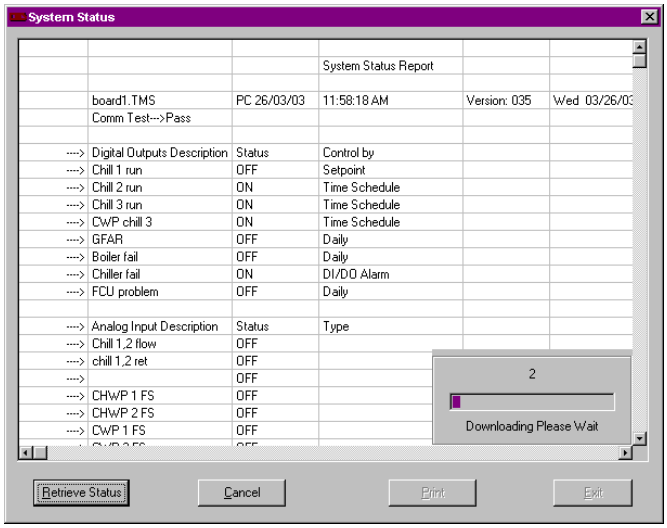
## Viewing Board Status

**Digital Input Status** - Shows current On/Off status of all four inputs.
**Time Accumulation** - Shows the total amount of time, all four digital inputs have been ON. The Enable button must be highlighted for this operation to work. To enable or disable Click **Auto Update** then Click Enable or Disable then press the Reset button.
**Universal inputs** - Shows Current Temperatures and on/off if input is shorted or open.
**Digital Outputs Status** - Shows Current Output ON/OFF Status and what it is controlled by.
**Analogue Output Status** - Shows Current Analogue output position 0% - 100% (0vdc - 10vdc)




## View System Status

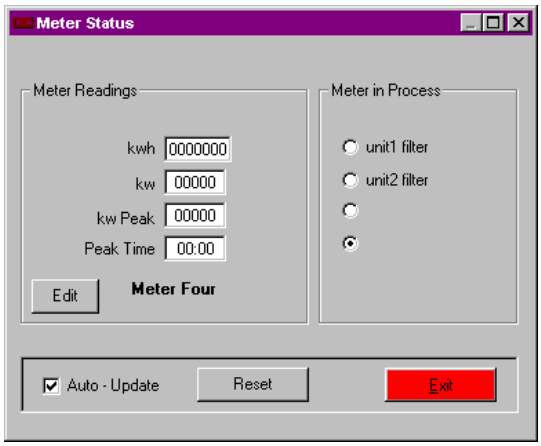
System Status gives the current status of all boards connected on the communications bus. Use this function to get a quick overview of the entire system.



## View Meter Status

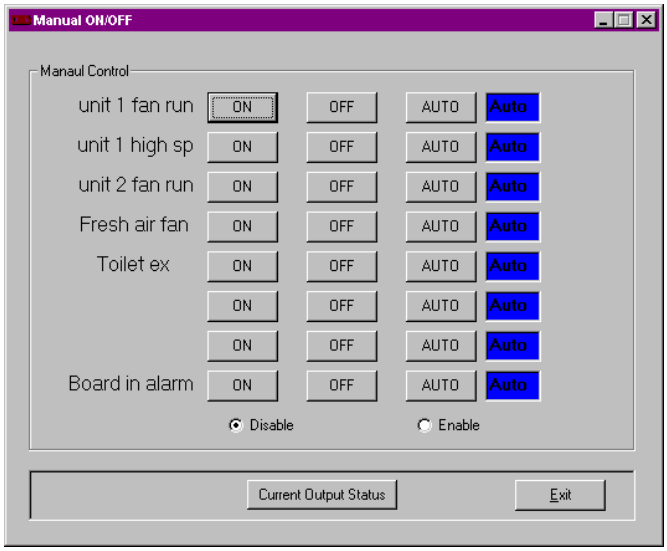
Meter Status shows the current reading for Kw, KWh, KW peak, and time of occurrence.

**The Edit Button Allows you to customise the Unit Type you are monitoring with the ability to change to names.**




## Manual On / Off

The Manual On/ Off Menu Can Override any output On or Off at anytime, By pressing the ON or OFF buttons. The Auto Button Releases the Output from manual control. Remember the status boxes show the status of the button pushed and not the board status. If you want to see the current board status use the board status menu. If you have turned an output on via manual control the output will show on/off according to your control.




*Note: if you have used the logic program to control outputs you may be unable to operate the point via the Manual screen and the coloured bad at the right of the screen may show white.*

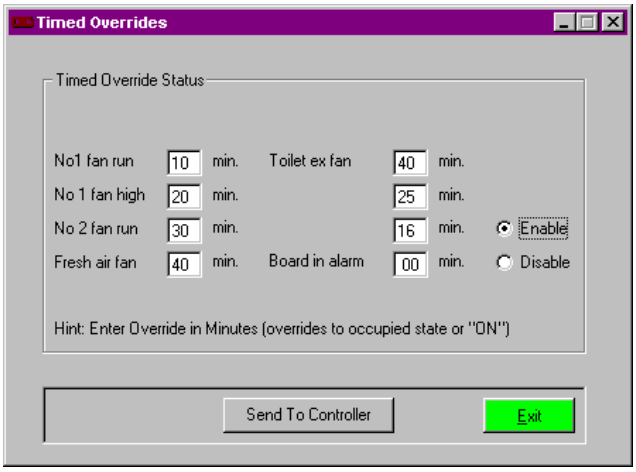
# Timed Override

The occupied status may be overridden during unoccupied periods by utilising the BASYX© timed override algorithm. This feature works in conjunction with the push button override algorithm and may be used to override the system in advance of unoccupied hours or remotely. This feature is designed to be used once for each override event and will be cleared when the override time has elapsed.

Note: If a push button override has been assigned to the desired point, the push button will override any time value that has been entered into the timed overrides input box with the programmed value of the push button override program.

Go to the STATUS menu and select TIMED OVERRIDE

To enable Timed Override function of the BASYX© controller, you may access the timed override screen from the STATUS menu and selecting the TIMED OVERRIDES option. Press the Edit button then Select the input box next to the point you wish to change or override. Enter 0 to clear a override or any other number of minutes to change the remaining time each point will be in the occupied status. Press the Send to Controller button to download the information to the system board.




## Time And Date

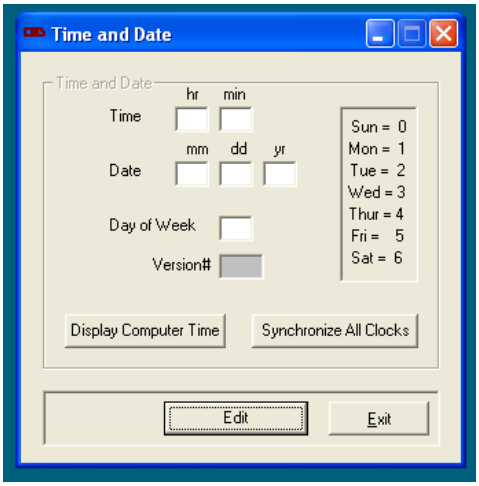
Go to Program, time/date.

To Program Time and Date You Must First Press the **Edit** Button

Next, Manually Enter the Time, Date, and Day or Week or Press the **Display Computer Time** Button.

To Save **Press the Send To Controller** Button (see fig 2).

If you want to save the Time ,Date and Day of Week to all the boards Connected Press the **Synchronise All Clocks** Button.



## History menu

Note, in order to retrieve history data you first have to program what data you wish to retrieve in the history set up window, see programming guide.

## Retrieving the History Data

The history data makes the BASYX system a very powerful stand alone controller. The history may be retrieved in 10 ways. Each mode will change which data the system will retain in the comma separated file (csv) .

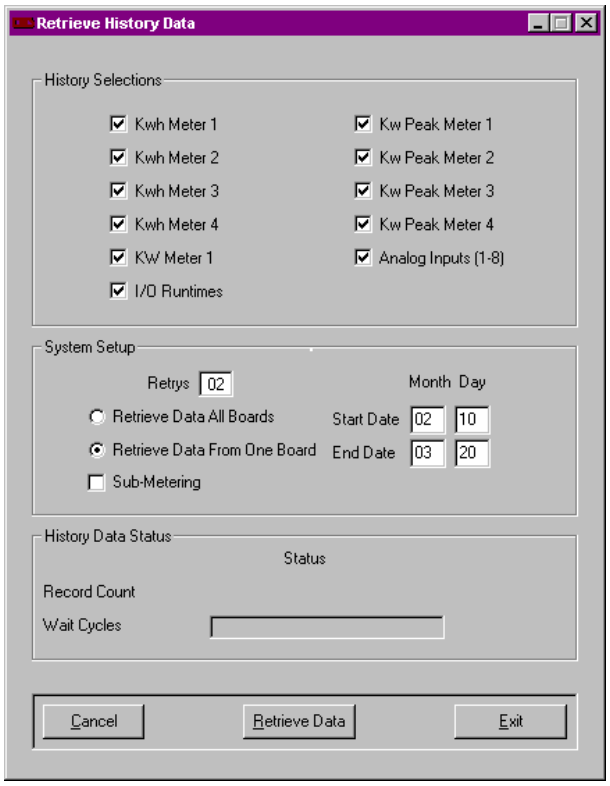
Click the data you wish to receive then enter the Start Date and End Date.

Choose to retrieve data from one board or all boards.

Next, Press the Retrieve Data Button

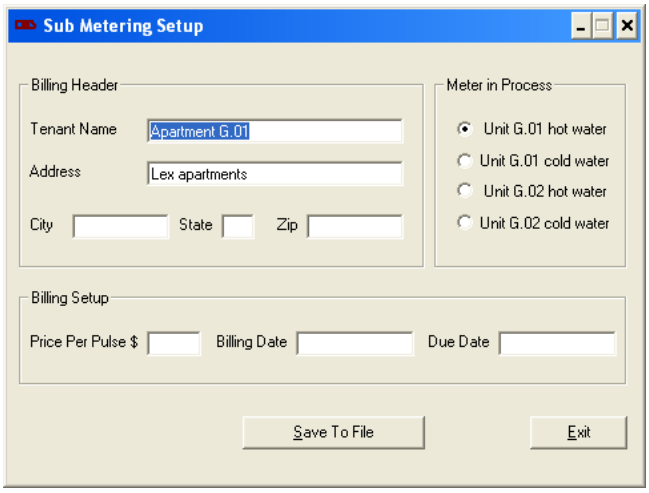
A dialog box will open select the Folder you would like to keep the File data in then enter a file name.

Remember Basyx Program will automatically add the .csv extension just enter in the file name example: test . After the file name is entered Press the open button.



# Sub Metering Setup

Sub metering allows you to bill each tenant using Ct's or separate power or water meters. The BASYX sub metering program will then allow you to generate a separate bill for each meter in your system.




## Programming steps.

To program sub metering hold the ALT key down and press the <M> key. You will then see the screen shown above.
Ensure that the meter you wish to program is high lighted on the right side of the window.
Enter the tenants name and address details on the billing header part of the window.
Enter the price you wish to charge for each Kw of power of litre of water.
Enter the billing date, this is the date you are down loading the billing data.
Enter the due date, this is the date you wish the bill to be paid by.
Then press <Save to file> and continue programming the next metre by high lighting the meter on the right side of the screen.

*Note if you have other meters on other boards press <exit> high light the next board file and again press <ALT> <M> to program those meters. Continue this way until all of your meters are programmed.*

## Down loading sub metering data.

Under the history pull down menu click on <retrieve history data to file>. Follow the instructions on page 10 but place a tick in the Sub-metering window. Make sure you tell the system if you want to retrieve from one or all boards. Press <retrieve data> and follow the prompts, make sure you give the CSV down load a file name.

The computer will tell you when the history down load is complete.

Look at the place on your computer that you down loaded the file to, you will notice a separate CSV file for each meter.
Use Microsoft Excel © to view each file you will now be able to add any more details you need on the bill and print it out.

# Section two programmers manual



# Section three Advanced programming structure.

# Section two Programming levels

## Software Main Menu's

***File -****The File menu allows you to create, save, or close the project information located on your PC, which will interact to the BASYX system.*

***Program -*** *The Programming menu allows you to program the desired setpoints or control functions for the BASYX System.*

***Status -*** *The Status menu is an online function which will give you the status information for the BASYX panel to which the system is connected and communicating.*

***History -*** *The History mode menu is used for data logging of information with the BASYX system.*

***Communications -*** *The Communications menu is used to connect to a specific TMS100 controller and is also used to download program information from the PC file to the controller.*

***Help -*** *Help Basyx Operations Manual*

## File Sub Menu's:

***New Job*** *- Create a new Job Folder*

***Open Job*** *- Open an existing TMS BASYX file.*

***Edit Job*** *- Edit existing TMS Basyx File*

***Print Job*** *- Print Basyx Board File Data*

***Close*** *- Close the current TMS BASYX panel file.*

***Save*** *- Save the current information in the PC Database to a BASYX File*

***Pass words*** *– Set pass word protection off/on and enter new pass words.*

***Exit*** *- Exits the system without a save.*

## Program Sub Menu's:

***Point Assignment*** *- Used to give meaningful names to Hard wired points.*

***Time/Date*** *- Sets the current time and date for the System*

***Daily Schedule*** *- Sets occupied periods for the points connected.*

***Setpoint Occupied*** *- Sets occupied and Unoccupied target temperatures.*

***Special Schedule*** *- Sets up to four occupied periods for each point connected Such as outside lighting.*

***Reset Control*** *- Used for boiler or Chilled water control to reset the temperature based on another temperature input such as outside air.*

***Holiday Schedule*** *- Disables occupied setpoints for any points which fall on the scheduled holiday.*

***KWH/Interval*** *- Used for power meter demand pulse setup.*

***KWH Shedpoint*** *- Used for Demand load shedding to shed loads when the current estimated usage is projected to set a new peak demand.*

***Alarms*** *- Used to the alarm point and activation levels for critical points.*

***Push Button Override*** *- Sets the number of minutes the sensor pushbutton will activate the system points.*

***Output Interlocks*** *- Used to tie system points together for proper operation.*

***Analog Output Setup****- Used in conjunction with the Tms AO board for valve 0-10vdc valve control and 0-10v motor control.*

***Lead / Lag Control****- Used to control boiler or chilled water pumps.*

***Sensor Setup****- Used to set Sensors as Thermistor,0-10vdc or 4-20ma with scaling*

***History Mode*** *- Used to set the desired data logging format for the internal history log.*

## Status Sub Menu's:

***Board Status*** *- Shows status of the current system points.*

***System Status****-Shows status and created a report of all Points current status.*

***Meter Status*** *- Shows the current status of the demand load shed.*

***Manual ON/OFF*** *- Manual locks in the on or off position.*

***Timed Override*** *- Software initiated override of unoccupied areas.*

## History Sub Menu's:

***Retrieve History Data*** *- Retrieve comma delimited file of the system history.*

***Sub- Metering*** *- Used to setup Tenant information for power billing.*

## Communications Sub Menu's:

***Connect****-Used to connect and download system information.*

***Restore System Data*** *-Used to Send PC File Data To Controller*

***Hang up*** *- Disconnect current communications session.*

## Control Hierarchy

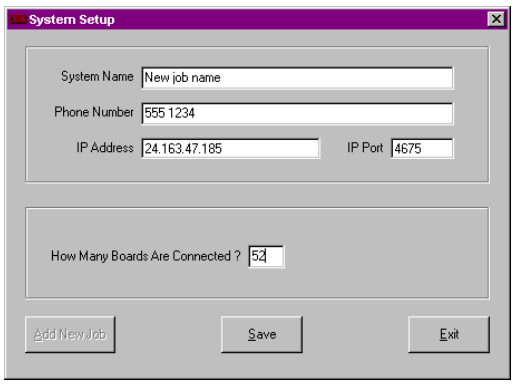
The BASYX© controller has a predefined control hierarchy. There are only two schedules that can put an output into occupied mode. Special schedule and Daily schedule, the rest of the control algorithms are designed to turn the output OFF. When trouble shooting the system operation be sure to review all control hierarchy below: (The higher algorithms will dictate turning the status of the point off.)
The hierarchy of the BASYX© TMS100 is as follows:

- Manual On/Off
- Output Locking Control
- TimeWatch Control
- Pushbutton timed override
- Keypad Access Override (not in use at this time)
- Timed override
- Temperature Alarm Schedules
- Temperature Unoccupied Schedules
- Demand Load Shedding
- Holiday Schedules
- Lead Lag Schedules
- Special Schedules
- Set point Occupied
- Daily Schedules.
- Each section above has been included to aid you in setting up your BASYX© controller.

# File Menu

## Open New Job File

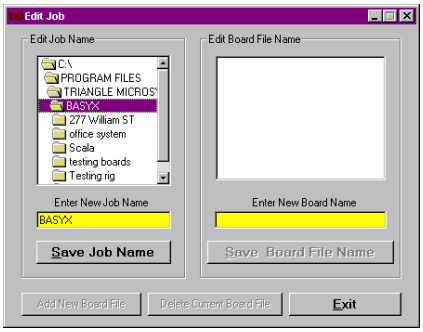
To Add a New Job or System select **NEW** from the file menu .
Enter the name of the Job (**System name**) you wish to use to identify the system files.
Enter the System **Phone Number**. (only for phone line communication).
Enter the **number of boards** which are physically connected to the 485 communication bus.
Then Press Save.
Now Press Exit.



## Working with Existing Files.

**Selecting a file**:

To modify or change information in an existing file select FILE and **Open** from the Menu bar. Select the sub folder which will match the 10 Character name you entered for the project when you first entered the job data. Select the board number you wish to work with and press the APPLY button.




Once the Apply Button has been pressed the Software will automatically open the Communications Window you must connect to the Basyx controller to **program.**

Press **Exit** To Cancel.

## Edit Existing Job Name and Job File

To edit existing Job or System name select **Edit Job** from the file menu .
To edit the Job Name Double Click on the job you wish to edit (see fig1).
The job name should be displayed in the Enter **New Job Name** Box.
Edit Job Name then Press **Save Job Name** Button

## Edit Board File Name

To edit existing Board File Name Double Click on the job name which holds the
Board Files you wish to edit .
The Single Click the Board File Name You wish to edit.
The Board File name should be displayed in the **Enter New Board Name** Box.
Edit Board File then Press **Save Board File Name** Button.
*Note your new board file name should be followed by an under score and the board number, for example a new name for board 2 would be* **newname_2.tms**

## Adding Board File Names

To Add a new Board File Name Double Click on the job name which holds the
Board Files you wish to add .
The Single Click any Board File Name this will enable the **Add New Board File** Button .
Then Press **Add New Board File** Button.

## Deleting Board File Names

To Delete a Existing Board File Name Double Click on the job name which holds the
Board Files you wish to delete.
The Single Click any Board File Name you wish to delete this will enable the **Delete Current Board File** Button .
Then Press **Delete Current Board File** Button.

## Print Board File Data

To print Board File Data select **Print Job** from the file menu .
To select the data you want to print Single Click the selection box a check mark should be displayed (see fig1).
Then press the **Print** Button.

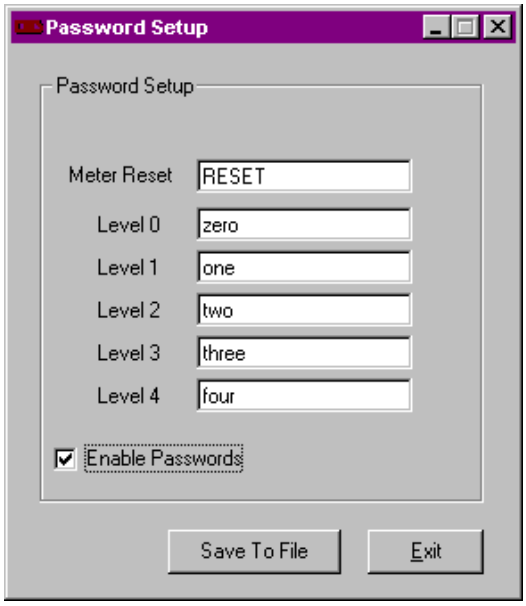
Note the Basyx program uses Windows default printer settings if any error occurs check
Your windows printer settings .

## Pass words

To use this section you must have the preset pass word for level 4. Contact your distributor to obtain this pass word.
Enter pass words for levels 1 to 4 and meter pass word then tick the enable pass word box.

Level zero allows you to look at the graphic screen.

Level one allows you to look at the Graphic screen and change setpoints
Level two allows you to look at the status screens and change time/date
Level three allows you to program to unit.
Level four allows you to change passwords and enter logic program.
Note meters can only be reset to zero by turning passwords off.



# Program Menu.

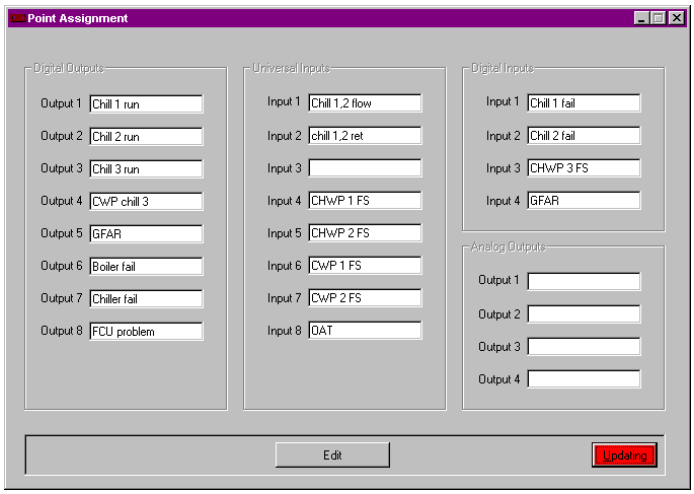
## Point Assignments

Point assignments are 15 character labels of text, numbers or spaces which are designed to help you identify the hardware connections to the BASYX controller. The DO's AI's ,AO's and DI's are assigned labels with this function. See the screen shown below for a sample of point labels.

**To save your work to a file:**

Press the **Save Data To File** Button.

Note: This Data is saved in the PC File Only



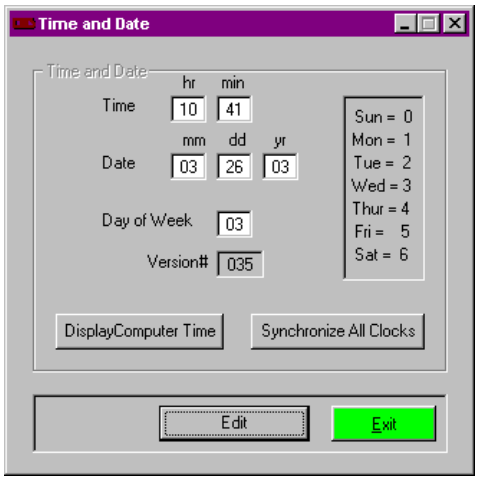

## Time And Date

To Program Time and Date You Must First Press the **Edit** Button

Next, Manually Enter the Time, Date, and Day or Week or Press the **Display Computer Time** Button.

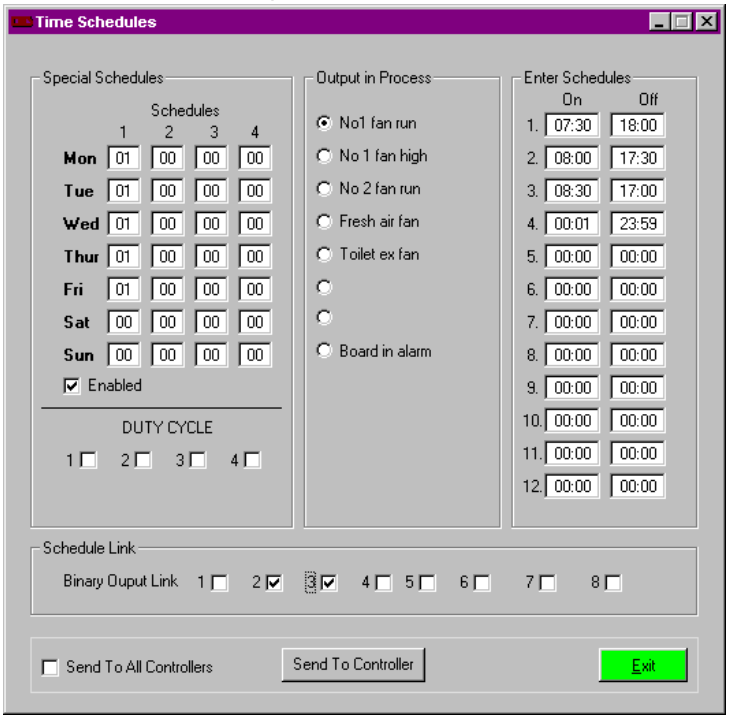
To Save **Press the Send To Controller** Button (see fig 2).

If you want to save the Time ,Date and Day of Week to all the boards Connected Press the **Synchronise All Clocks** Button.



## Time schedules (Special Schedules)

The special schedule is used to set up four separate occupied periods for a point. The special schedule will enable the **Set point occupied** temperature control program to maintain the desired occupied setting.
Press the **Edit** button to start programming
Enter your ON and OFF times in the **Enter Schedules** Section
Press the Output you wish to program
The OUTPUT IN PROCESS selection circle will be filled in for the output
Enter the Schedule Numbers or zero For Monday
Repeat previous step for each day.
Placing ticks in the Binary output link boxes will save you from repeating the steps for any other outputs on the board that are to operate with the same time schedule.




To Save Press the **Send To Controller** Button.

## Duty cycle

Also within the Time schedule window is the duty cycle it works as follows.

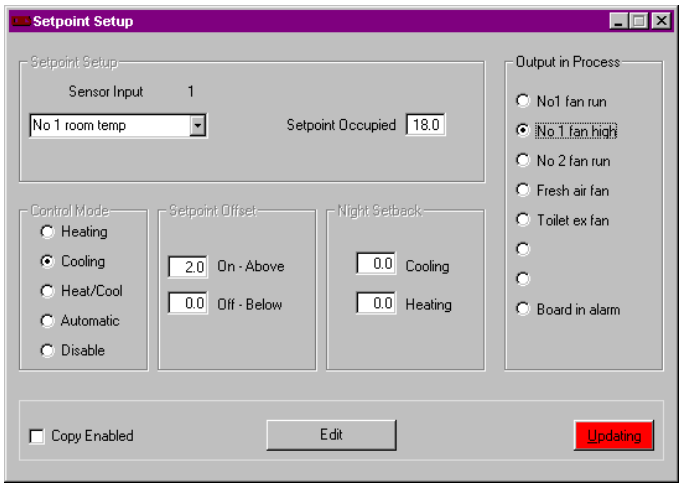
An hour is divided up into to four 15 Min intervals.
check box 1 = 0-15min
check box 2 = 16-30min
check box 3 = 31-45min
check box 4 = 45-60min
any one of the check boxes enabled will cause the output to be off for that 15 minute interval every hour.

# Setpoint Occupied

The BASYX© controller is designed to maintain comfort levels during occupied periods. The comfort level is a temperature setpoint which the system will operate to maintain during the times the points are Scheduled as occupied. A control point is scheduled to the occupied mode when the time schedule for the current day has a start time less than the present system time and less than the scheduled stop time. When a system is in the Occupied mode. The occupied setpoint will be used as the target temperature for the system.

The BASYX© controller also increases the energy efficiency of the system by allowing for reduced setpoints in the heating season or raised setpoints in the cooling season for unoccupied periods of the building. These setpoints are utilised for any point where the current time falls outside the scheduled occupied time periods.

**To enable the Temperature Control Function.**
Select PROGRAM from the menu selection and choose Setpoint Occupied.
Press the Output you wish to program.
The OUTPUT IN PROCESS selection circle will be filled in for the output.
Choose the control mode by clicking on the selection circle so that it is filled in with a black dot.
The control modes operate as follows and must be set up for proper operation:




**Heating** - The heating control mode will only be allowed to activate (Energise) when the system is indexed to the heating mode.(Outside air below entered switch-over set point).
**Cooling** - The cooling control mode will only be allowed to activate (Energise) when the system is indexed to the cooling mode.(Outside air is above entered switch-over set point).

**Heat/Cool** - This control mode will active (energise) the point when the temperature is above the entered setpoint plus the offset above and when the temperature is below the entered setpoint minus the offset below.
***Note:-*** *The heating/cooling Changeover is set from the* ***Output locking*** *selection from the Program Menu.*

*Analog input number eight must be the outdoor air temperature sensor. The system will be in the cooling mode when the outside air temperature is one (1) degree above the setpoint entered and will index to the heating mode when the outside air temperature is one (1) degree below the setpoint entered.*

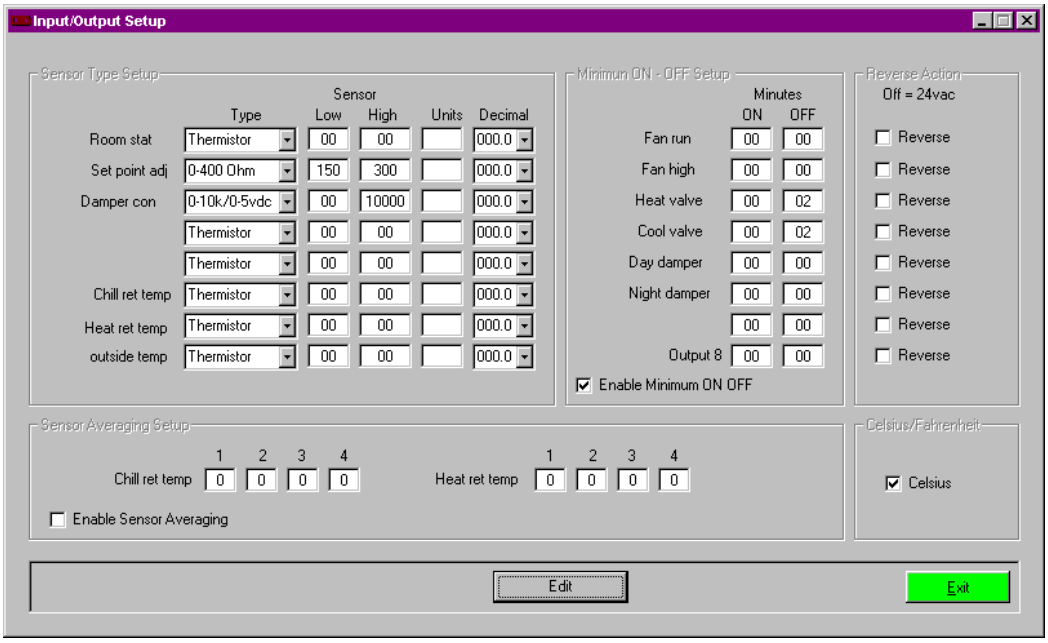
- Choose the input sensor that will be evaluated against the desired setpoint.
- Enter the setpoint or target occupied temperature for this point.
- Enter the offset temperatures which act as a deadband to prevent unit cycling. (1 degree is recommended for each).
- Unoccupied Temperature control - Enter the Night Setback temperature for cooling or heating. Note You Cannot Enter A Cooling And Heating Setback Temperature at the same time Enter Either a Cooling Setback Or a Heating Setback (zero disables).
- This function will work similar to the occupied temperature control, but uses a raised setpoint in cooling seasons and a reduced setpoint in heating seasons.
- Repeat for additional temperature control points for this controller.

To Save Press **The Send To Controller** Button.

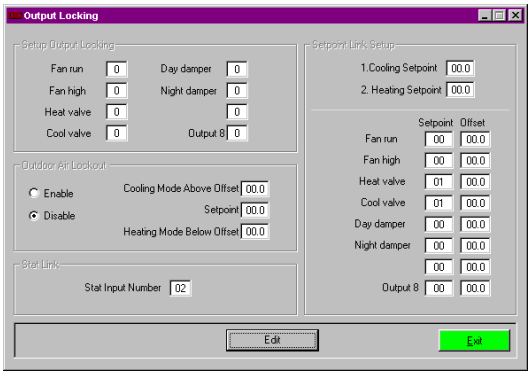
## Slide Control function

To use the slider on the wall sensors to reset the set point for an output the following setup instructions must be observed.

First go to **sensor input/output setup,** locate the input you are using for the adjustment and set the sensor type 0-400ohm. Then set the sensor low/high to the minimum and maximum of the range that you wish to use (example 150 Min to 300 max = a temperature range of 15 to 30 degree's




Next go to **setpoint linking** in the **stat link** box place the number of the input where the slider is connected. On the right of the screen place a number one in the **setpoint box** of any output you wish to control. If you now look at the **set point occupied box** located on the **set point occupied** screen and move the slider you will see the set point change according to your set up information. You can now set any off sets you need to provide you with a dead band between heating and cooling set points. This can be done by placing the number of degrees you need to off set by in the **off set** part of this screen or by placing the data in the **set point occupied** screen. Notes, by using the number 1 in the set point box as shown here you are using the cooling set point box shown on the top




right hand part of the screen. If you put say 2 in that box your set point will have 2 added to it or –2 will have 2 removed from it this means that you can also use this box to add offsets ie put –1 in the cooling box and 1 in the heating box. So that all output set point boxes that you place 1 in will have 1 deg removed from the slider set point and all output set point boxes that you place 2 in will have 1 deg added to it.

## Reset Control function

Many systems require the ability to change the setpoint automatically when the outside air temperature changes. Systems that might utilise such a strategy are chilled water systems or heating systems. The BASYX controller allows for very simple and effective means to use reset control for your points.

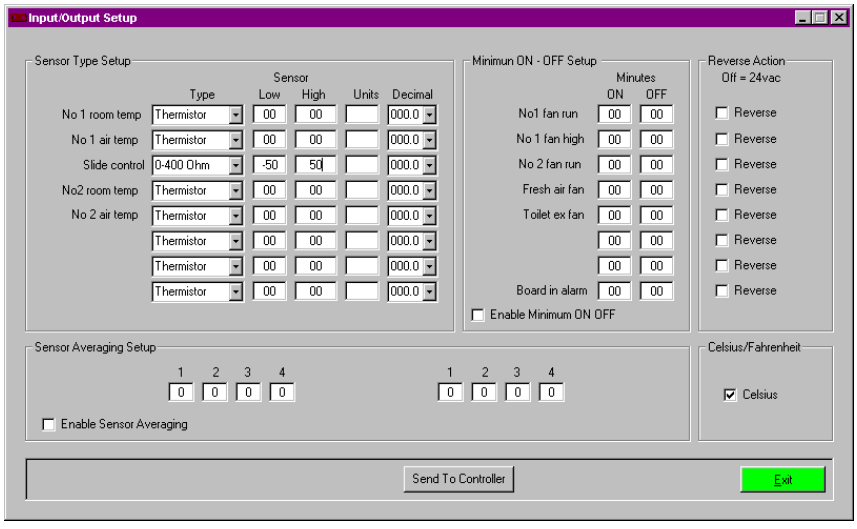
Reset control automatically changes the setpoint for the occupied temperature control schedule. The set point will be calculated based on a simple proportional relationship. Enter the minimum and maximum outside air temperature. Enter the minimum and maximum setpoint levels. Select direct for a reset calculation that will raise the setpoint as the temperature measured increases or reverse which will lower the temperature setpoint as the temperature measured increases.

## Programming Reset schedules for Analog outputs

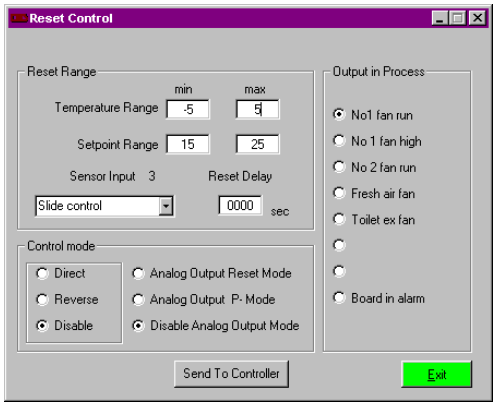
Many systems require the ability to change the Analog Outputs setpoint automatically when the outside air temperature changes. System that might utilise such a strategy are chilled water Valves. The BASYX controller allows for very simple and effective means to use reset control for your Analog Outputs.
Reset control automatically changes the Analog Output Setpoint for the occupied control schedule. The Analog Output setpoint will be calculated based on a simple proportional relationship. Enter the minimum and maximum outside air temperature. Enter the minimum and maximum setpoint levels. Select direct for a reset calculation that will raise the setpoint as the temperature measured increases or reverse which will lower the temperature setpoint as the temperature measured increases. Then Select Analog Output Reset Mode so the controller knows that you wish to reset the Analog Output Setpoint. Use Analog Output P - Mode when you need absolute proportional control of the analog Output it does not change the setpoint instead is directly resets the position of the analog output. The Setpoint Range is the analog output Position (0-255 / 0vdc - 10vdc).

### Example

To use an input to reset the set point for an output the following setup instructions must be observed.
First go to **sensor input/output setup,** locate the input you are using for the adjustment and set the sensor type to the type in use. Then set the sensor low/high to the minimum and maximum of the range that you wish to use (example –50 min to 50 max = 5 deg below set point to 5 deg above set point). This will set the max range of the output.

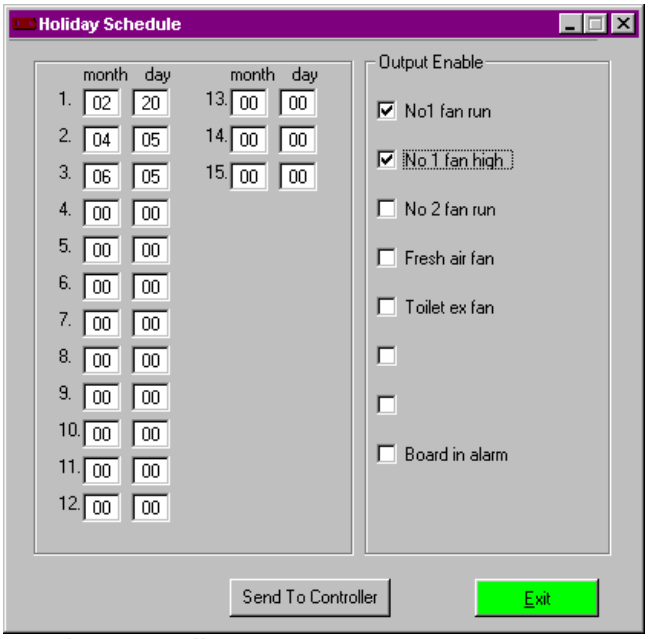



Next go to **Reset control** click on the output you wish to be controlled by the input. Select the input you are to use. Under **setpoint range** set the minimum and maximum temperatures wish to control over and then under **temperature range** set the maximum and minimum distance that the slide will travel (must be within your settings on the sensor input/output table). For instance if you set the range on the sensor input/output table from **–5 to 5** and you set the temperature range from **–2.5 to 2.5** then your setpoint range would swing from minimum to maximum in half of the sliders travel. You can also set a delay in seconds in order to restrict the speed of the action.




## Holiday Schedule function

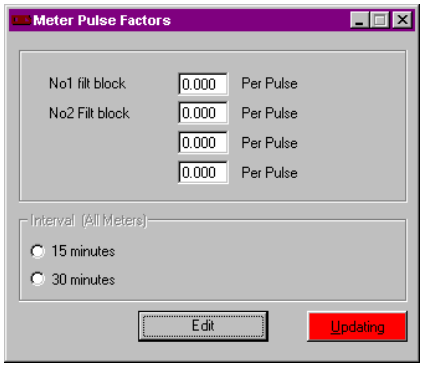
The holiday schedule is used to override the daily schedule for a point. The holiday schedule is only used for scheduling unoccupied periods. Up to 15 holiday dates may be entered for the holiday schedules. Select the points which will follow (be indexed off) for the holiday periods. Enter the Month (1-12) in the first entry box and enter the month day (1-31) in the second entry box. Repeat this for all desired holiday schedules.




Press the **Send to Controller** Button to save.

## Kwh Interval and pulse per unit

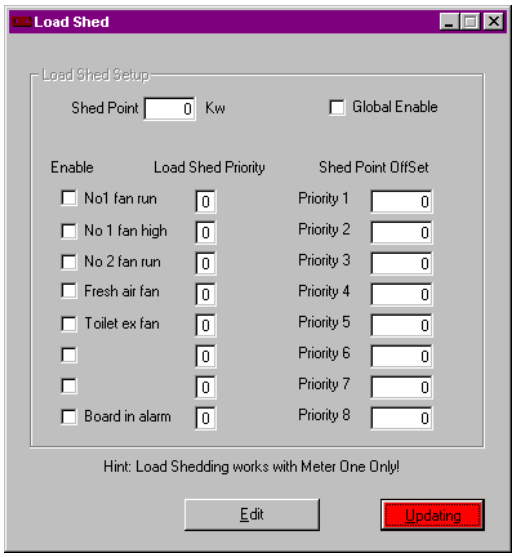
Select PROGRAM from the menu selection and choose Kw interval.
You must enter the KWH/Pulse which your utility company uses for demand calculations.
If you do not know this number, contact your local utility company for this information.
Fill in the selection circle for 15 or 30 minutes to match your demand period. If you are on a 30 minute demand period you may still use the 15 minute selection for quicker system shedding response.
Press the **Send to Controller** Button to save.




## Demand Load Shedding Func**tion**

The BASYX load shed control function is a program designed to save you energy expense. The load-shed function will monitor the current electrical usage and will turn points off when the projected usage is forecasted to exceed the demand setpoint.

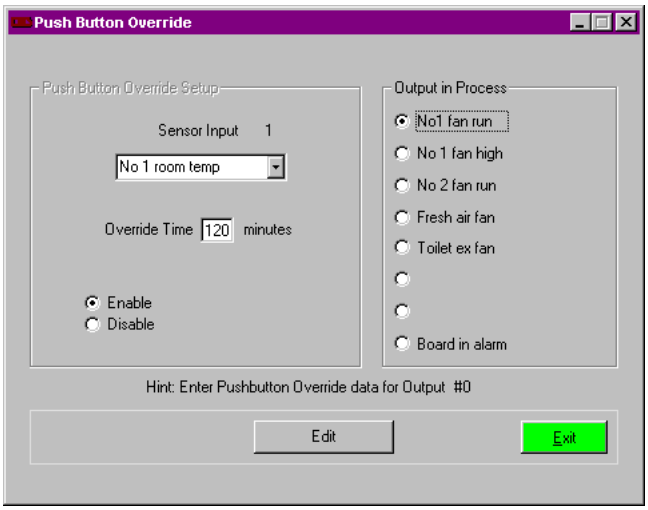
Select PROGRAM from the menu selection and choose KW Shed point to enter the load shed information.
First Enter KW Shedpoint . (This is the target KW demand you do not wish to exceed)
Select the points which will be shed when your current estimated usage is forecasted to exceed your entered shed point KW. Select the point by clicking on the check box next to each point. This will enable the load shed routine for these points.
Select the point priority (1-8) for each load. The priority tells the BASYX system in which order to shed the system points. Priority 1 is shed first, followed by two and so on.
Next Enter the estimated load of each priority entered. For example if you assign point three (AHU Fan) as a priority one load shed, enter the estimated KW usage for the AHU Fan under the first priority load demand. If two or more points are assigned as a priority one, add the KW estimates for each and enter under the priority one load demand.



**Understanding Tms100 load shedding**

The load shedding Schedule uses Meter one (Digital Input 1) to estimate the current KW usage. Meter one is the only meter that can be used for load shedding. The KW readings are estimated readings based on the current KW pulse feedback from the utility meter. This number is used to project the KW usage over the next hour. The Estimated KW Value is used by the load shedding Schedule to assist in protecting you from setting a new KW peak demand. Only the points which are enabled by the system load shedding program will be shed and therefore care should be taken to add all high electrical usage equipment to the BASYX control system.
Note: A five minute delay is built in between shedding stages. This feature is to protect you from duty cycling your equipment.

## Push Button Timed Override: Analog Input




The occupied status may be overridden during unoccupied periods by utilising the BASYX© push button timed override algorithm. This feature is set up through the setup software and will index all the assigned points to the OCCUPIED status. See the application notes on using timed overrides for systems.

**Note: Pushbutton Override will not work unless Timed Overrides are enabled!!!!!**
To enable the Analog Input (Push Button) Timed Override function of the BASYX© controller:
Go to the PROGRAM MENU and select PUSHBUTTON OVERRIDE
Press the output you wish to program
The OUTPUT IN PROCESS selection circle will be filled in for the output.
Click on the ENABLE selection circle so that it is filled in with a black dot.
Click on the OVERRIDE TIME input box and enter the number of minutes you wish the system to override.
Click on the SENSOR SELECTION choice box and enter the space sensor or input number which the system will monitor for a momentary push button or short circuit.
Press **Send To Controller** To Save

**Displaying or Clearing a pushbutton override from the system:**

To display or clear a timed override from the system, you may access the timed override screen from the STATUS menu and selecting the TIMED OVERRIDES option. Select the UPDATE button to view the time remaining for all the push button or timed overrides. To clear a timed override, select the input box next to the point you wish to change. Enter 0 to clear the override or any other number of minutes to change the remaining time in minutes for all points you wish to change. Press the SET button to download the information to the system board.
Note: The push button will override any time value that has been entered into the timed overrides input box with the programmed value which was set in the step previous.

***Note**:- from firmware version 0.3.6 if you push the push button override button a second time after at least 1 Min from the first push the override will be cancelled after a further 1 Min delay.*

## Digital Input Overrides

***Note:- lead/lad is on the same screen.***

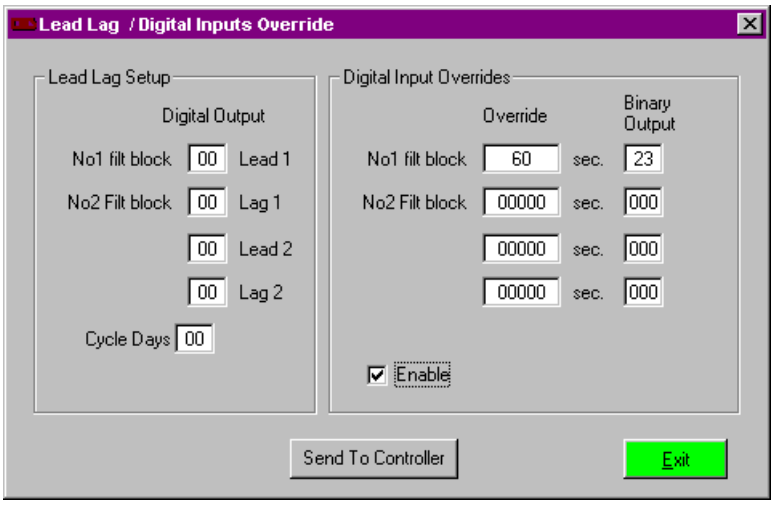
Select PROGRAM from the menu selection and choose Lead Lag Control.
Enter your override time in seconds (64k max input).
Enter in your Binary Output Code this code represents the outputs you want in Occupied Mode when a contact closure is across the specified digital input (see Chart Below).
Press the Send to Controller Button to save.

**Look up Table for Binary number entry** Alternate method to find code value for override

| POINT | DO8 | DO7 | DO6 | D05 | DO4 | DO3 | DO2 | DO1 | Binary code |
|---|---|---|---|---|---|---|---|---|---|
| # TO ADD FOR OVERRIDE | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | |
| VALUE | | | | 1 | 0 | 1 | 1 | 1 | 10111 |
| EXAMPLE | | | | 16 | 0 | 4 | 2 | 1 | 23 |

**Entering 23 will override points 1,2,3 and 5 into the occupied mode**

A zero indicates point is under normal control -1 indicates point is in override (occupied mode)
Order is DO(8,7,6,5,4,3,2,1)

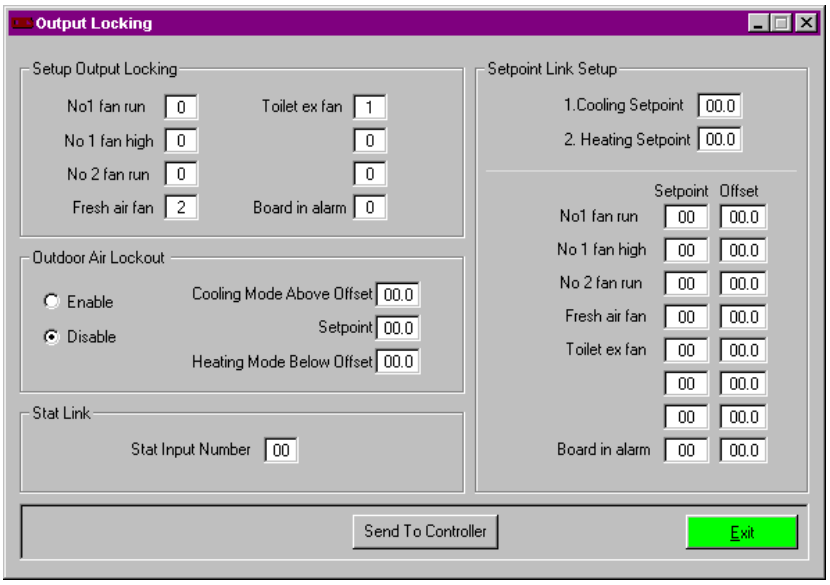



## Output lock **Interlocking points for operational control.**

Often points on a control panel are part of a larger system such as an air handler or rooftop unit. These points must operate as a system for proper mechanical operation. Good mechanical practice dictates that the units be interlocked through the relays such that the cooling circuit will not be enabled if the fan is not operational. The BASYX controller allows for you to indicate which points must operate together. An example would be a fan and heating or cooling point on an air handling unit.

To set up the interlock control, select the PROGRAM menu tab and choose the OUTPUT LOCK Selection.

Each point is listed with an entry box following. To interlock a point, enter the associated output which would need to be energised along with the current point. For example, if the fan is point number one, (DO 1) and you wish to interlock it with the heating on point two (DO2) enter a one (1) in the second box. This will force point one to the energised (on) state when ever point number 2 is called to be energised.




## OAT change over

**Heating/Cooling Mode**

The heating/cooling mode of operation uses analog input number eight (AI-8) for the outside air sensor. To utilise this function, the outside air sensor must be connected to this physical point. Enter the Switch over setpoint which will toggle the system to heating mode if one degree below the given value and to cooling mode when one degree above the given value. The screen above shows the system is set to be in heating mode below 49 degrees Fahrenheit and in cooling mode at 51 degrees Fahrenheit.

The digital outputs may be assigned with the following modes of operation:
**heating**- The heating control mode will only be allowed to activate (Energise) when the system is indexed to the heating mode.(Outside air below entered switch-over setpoint)

**Cooling**- The cooling control mode will only be allowed to activate (Energise) when the system is indexed to the cooling mode.(Outside air is above entered switch-over setpoint)

**Heat/cool**- This control mode will active (energise) the point when the temperature is above the entered setpoint plus the offset above and when the temperature is below the entered setpoint minus the offset below.

**Automatic**-This control mode will automatically switch the point control mode to heating if the system is in heating and to cooling when the system is in the cooling mode.

**Disable**-Ignores temperature control function. Recommended for points not utilising temperature control.

## Daily Schedule Function

As an alternative to the time schedule function you may choose to use the Daily Schedule function
The daily schedule is used to set up occupied periods for a point. The daily schedule will enable the occupied temperature control program to maintain the desired occupied setting.
Press the Output you wish to program
The OUTPUT IN PROCESS selection circle will be filled in for the output
Enter the ON and OFF hour and minute for Monday
Repeat previous step for each day.

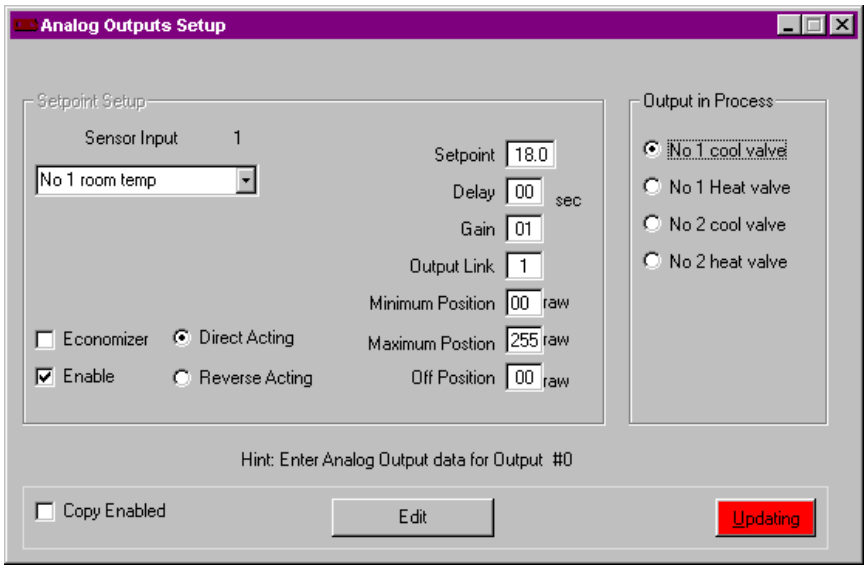
Press The **Send To Controller Button** To Save Data

# Analog Output Schedules

The BASYX© controller is designed to maintain comfort levels during occupied periods. The comfort level is a temperature setpoint which the system will operate to maintain during the times the points are Scheduled as occupied. A control point is scheduled to the occupied mode when the time schedule for the current day has a start time less than the present system time and less than the scheduled stop time. When a system is in the occupied mode, the occupied setpoint will be used as the target temperature for the system.
The BASYX© controller also increases the energy efficiency of the system by allowing for reduced setpoints in the heating season or raised setpoints in the cooling season for unoccupied periods of the building. These setpoints are utilised for any point where the current time falls outside the scheduled occupied time periods.

**To enable the Analog Output Control Function.**
Select PROGRAM from the menu selection and choose Analog Output Setup.
Press the Output you wish to program
The OUTPUT IN PROCESS selection circle will be filled in for the output.
The control modes operate as follows and must be set up for proper operation:
Select the Input (**Sensor Input**) You Would Like to Control Press the Down Arrow For your choices.
The **Normal Check Box** Should Be left unchecked
Check the **Enabled/ Disabled** Check Box if the check box shows Disabled The analog output schedules will not operate.
The **Reverse/Direct** Acting Check Box works as followed. Select direct for a reset calculation that will raise the Analog RAW value percentage as the temperature measured increases or reverse which will lower Analog RAW value percentage as the temperature measured increases.

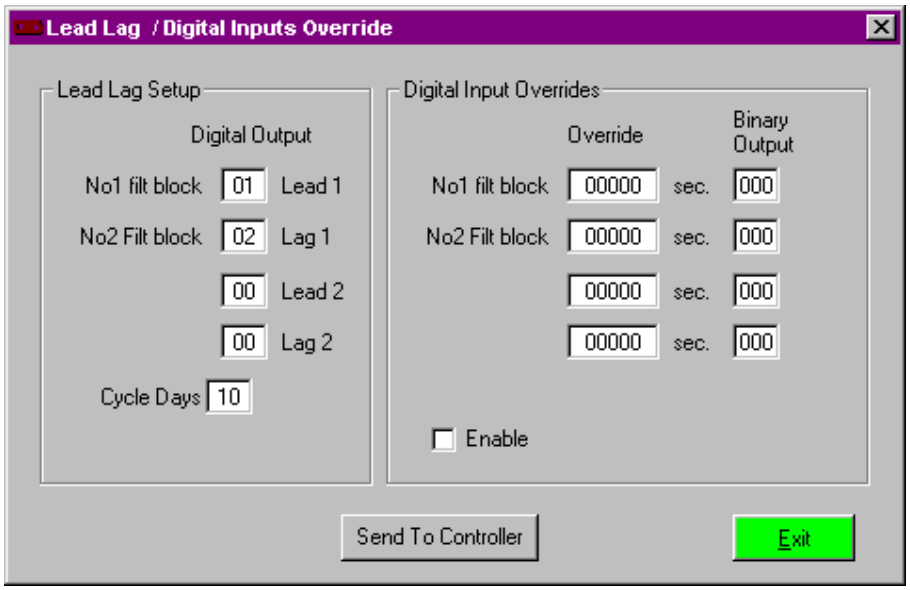
**Off Position 0%- Off Position 100%** - This Check Box is used when you have linked the Analog Output to a Digital output. When Digital Output is ON (Occupied) then the Analog output schedule is ON . When the Digital Output is OFF the Analog output Raw Value defaults to Either 0% (0vdc) or 100% (10vdc) which ever you choose.
Enter the **setpoint** or target occupied temperature for this point.
Enter the **Delay** in seconds. This is the delay between each calculation use this to either slow control or speed up control.
Enter **Gain** . The analog output position = (error X gain) + the original analog output position. A High gain can cause erratic control. A gain of one is recommended.
**Output Link** Allows you to turn the analog output schedule ON(Occupied) and Off via a Digital Output with a Daily Schedule.
Set the **Min/ma**x positions you want the output to control to (max position = 255)



## Programming Lead Lag Schedules:

The Lead Lag schedule is most commonly used in Dual Pump configurations Digital Inputs one through four are used, allowing you to control two pump pairs. The Lead Lag Algorithm will not operate unless the Digital Outputs are in Occupied Mode. On Initial Start up of the lead pump #1, If Digital Input #1 is not ON within 30 seconds the Lag Pump #1 will be powered ON , If Digital Input #2 is not On within 30 seconds Lead pump 1 is turned ON again. The Pumps will cycle until one of the digital inputs are switched ON. By connecting the pump flow switches and thermal over loads to the digital inputs you can maintain both a lead/lag and pump back up configuration. The same for Lead Lag Pump 2.

**Cycle Days automatically changes from Lead to Lag or from Lag to lead. For example if you were to enter 2 in the Cycle days text box the Pumps would cycle from lead to lag and lag to lead every 2 days.**



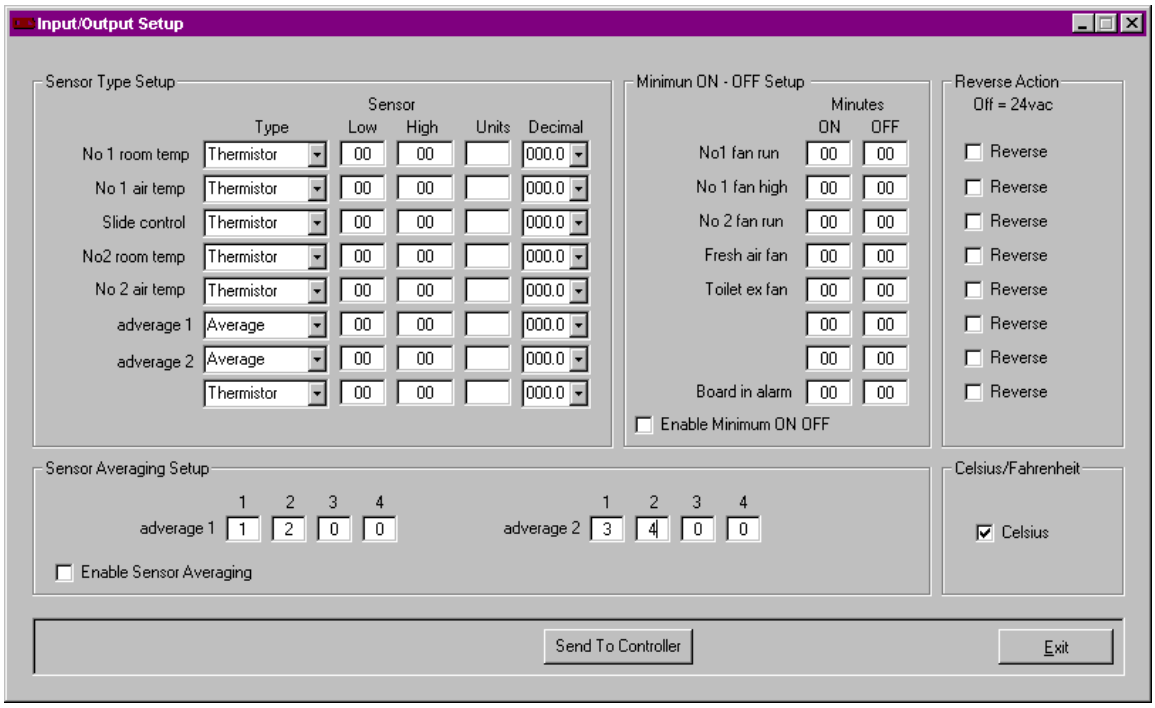
# Temperature Averaging Setup.

Sensor Averaging allows you to Average up to 4 temperatures sensor values....The averaged value is displayed in sensor input Position 6 or 7 if do not want to use a sensor position the averaged values can read using Basyx Logic Positions:

```
AVG_AI6          EQU    1865          ;AVG ANALOG INPUT POSITION 6
AVG_AI7          EQU    1867          ;AVG ANALOG INPUT POSITION 7
```

Sensor Inputs 6 or 7 must be set to Average if you want the value to be displayed on the status screen or to be used as a control input.

1. Set Input 6 or 7 to Average.
2. Under **Sensor Averaging Setup** Select the inputs you want to average.
3. Send To Controller
4. You are Finished




Above Sensor Position 6 Will show the Averaged Value of Sensor Input 1 and 2.
Above Sensor Position 7 Will show the Averaged Value of Sensor Input 3 and 4.

# Programming Sensor Setup:

The Sensor Setup allows you to read voltage and current sensors or for example pressure sensors.

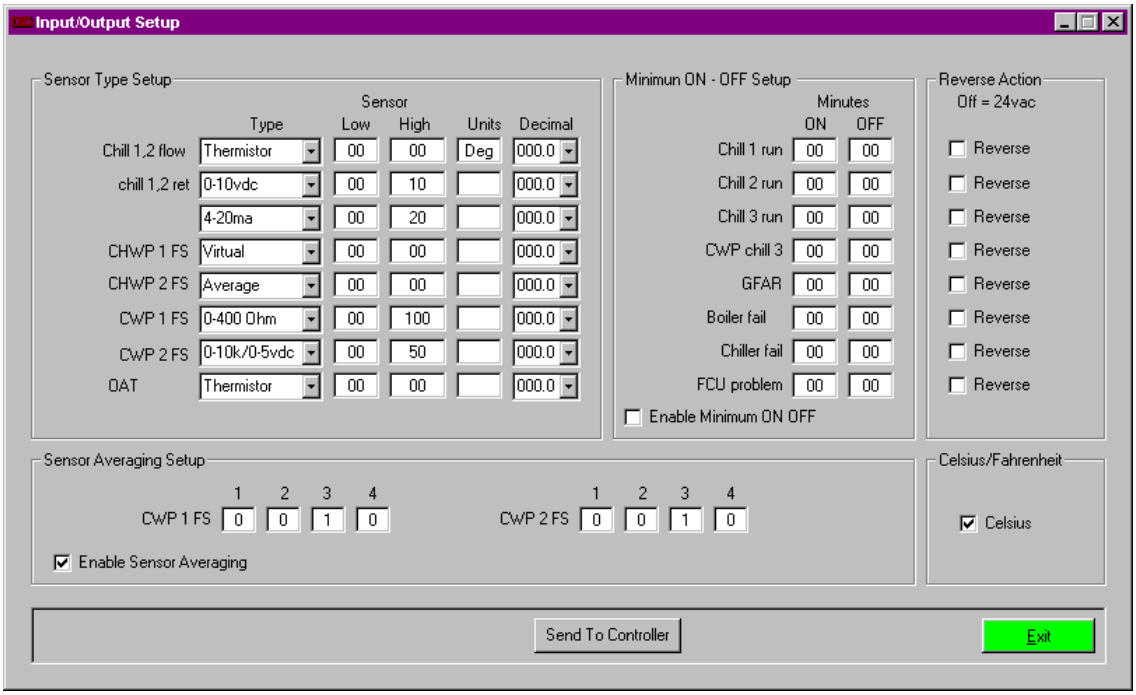
**Thermistor** is the standard 10k@77deg F or 10K@25 deg C temperature sensor a Low and High value should not be entered the sensor table is preloaded in the Basyx system. Just Enter the Units DEG or C and your done.
**0-10VDC** is for 0 to 10vdc sensors enter in the Low and High Sensor Value then enter in the Unit type such as PSI and your Done. Please note to use this function you must change the dip switch setting for the input you are using. The dip switch are located at the edge of the BASYX PSC control board next to the Analogue inputs. When operated the dip switch turns off the 10VDC the BASYX PSC applies to each input, if you leave it on you will not read the correct value on the system.
**4-20ma** is for 4 to 20ma sensors you will need to acquire a 499 ohm resistor to go across the sensor input use for proper readings. Then Enter in the Low and High Sensor Value next enter in the units and your done. Please note to use this function you will need to operate the dip switch as shown above and also operate the dip switches in the next block to them. These dip switches apply a resistor across the input in question to enable them to be read as 4-20ma instead of 0-10VDC.
**Virtual** is to enable you to read from the corresponding input on board 1.
**Average** Please see averaging instruction shown on previous page**.**
**0-400ohms** to read from the slide control on the sensor, set min and max readings ie. –100 to 100 = remove 10DEG from setpoint or add 10 DEG to set point.
**0-10K/0-5VDC** To enable the reading of straight resistance.

## Min on/off

Under the sensor set up screen you will be able to set up minimum on/off times for each digital output. This is especially useful with compressors where you may not want them to be turned of to quickly or wish them to stay off for a minimum time to prevent short cycling.
Note:- if you set both a min on and min off time the output will act as a re cycle timer.

## Reverse action

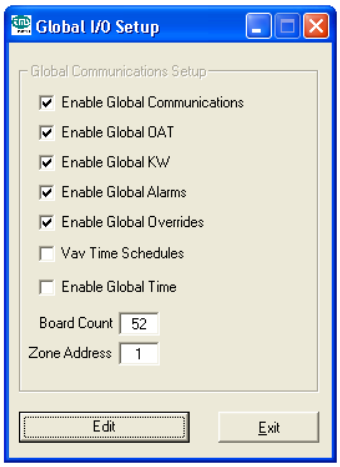
To the reverse the action of a digital output go to Sensor set up screen and tick the box of the output you wish to reverse.
To reverse the out put of an analog output go to the Analog output setup screen and tick the box of the output you wish to reverse.



## Global Sensors

To enable global communications and point sharing set the corresponding points to on.
To read an input from board one at any other board on the system. Set the input on the board you want to read at to virtual, the input will now display the data from the corresponding input at board 1.

## Global Communication.




**Enable Global Communications**: This turns on the global communications program, which allows global information to be passed along the data bus (always used).

**Enable Global OAT:** This enables the program which allows sensors on board 1 to be read on additional boards through the virtual sensor setup (almost always used).

**Enable Global KW**: This program passes information obtained through the meter input on board 1 to be used for demand control on additional boards (used only for global load shedding).

**Enable Global Alarms**: This activates the program that looks at all boards for an alarm status, and allows board 1 to dial out through the pager program .

**Enable Global Overrides:** Enables Global over dire timer see Global commands in logic Variable 1054 to 1961.

**VAV Time Schedules**: This allows any schedule on board 1 to be sent to VAV controllers, which have a box in the setup program labeled Time Schedules (1-12).

**Enable Global Time:** This box activates the program which performs clock synchronization between 4-5:00am every day (same as manual command).

**Board Count:** Lets board 1 know how many boards to look for communication with.

**Zone Address:** This is for addressable repeaters for projects larger than 256 controllers.

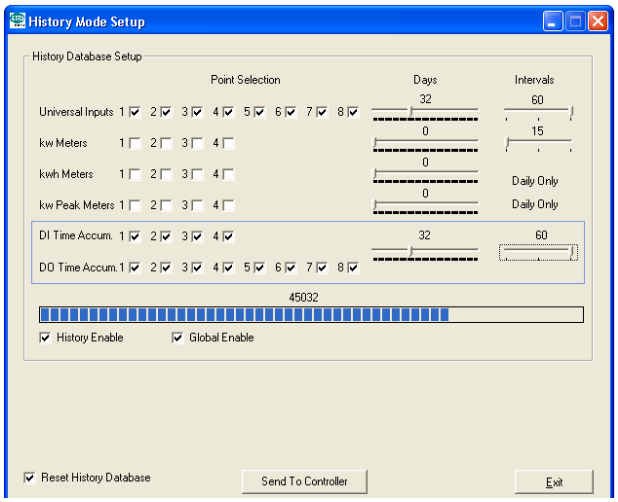
## History Mode

The history mode makes the BASYX system a very powerful stand alone controller. The history may be logged in one of three intervals. Each mode will change the number of days the system will retain and the interval in which the temperature readings are set
To set up history recording, select PROGRAM from the menu tab and choose HISTORY MODE selection.
Press the Edit Button then Click on the check boxes you wish to record. Then move the days slider to the number of days you wish to record for. Finally move the interval tab to your desired setting. The bar graph shows the amount of memory you are going to use, if it says our of range ether reduce the number of days you are going to record over or increase the interval. Then Press the **Send to Controller** Button to save.
You must check the global box if you are using global. This moves the history up to a higher address to allow space for the global file. If you do not check this, your global and histories write to the same memory address, causing problems primarily with the history files.
At the bottom left of this screen there is a tick box. When you place a tick in it and press send to controller you will reset all history data. This should be done at any time you change the information displayed on the screen. If you fail to do this the history's may not work correctly.

**Notes**:-

1) time accumulation is only possible if you first go to the board status screen and enable time accumulation. To do this first stop auto update then click on enable (bottom right) then click on reset, after which allow auto update to continue.

The recorder works on last in first out that is when you go to down load the history data and the memory has over flowed you will see only the most resent data.



## Graphic menu

Once within the graphic screen you can enter programming mode or Status mode. Status allows you to click on any one of the screen buttons located on the left of the screen and view the graphic within that screen.

## Status Mode

Open the graphic screen by clicking on graphics. Click on one of the buttons located on the right of the screen. You will now see the graphic image with control windows on top. From here you can view any inputs and outputs placed during programming mode.

**Changing data.**

To change set points or time schedule data. Click on the green **edit** button at the lower right of the screen you can now change data. When finished click on **send to controller** located where the edit button was.

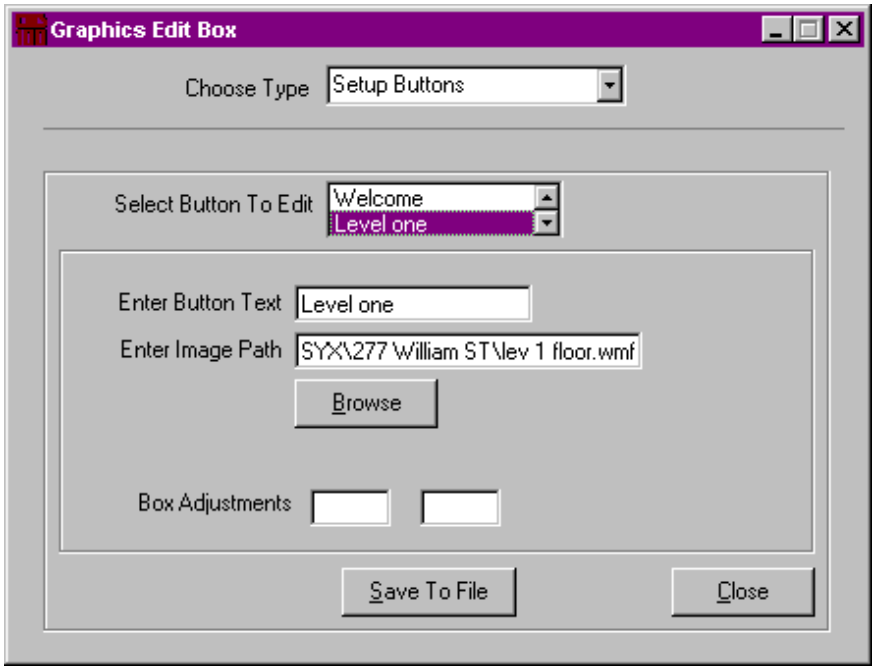
## Programming mode

Open the graphic mode screen and click on the Program mode button click on the edit graphic button then click on edit graphic. A screen will open up, click on choose type Set up Button.

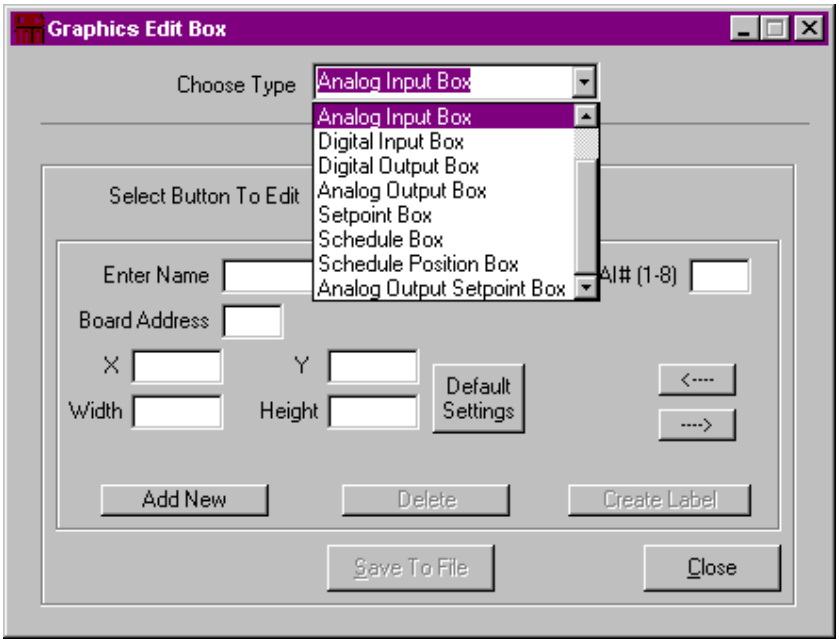
**Set up Button**

This is used to set up a new graphic screen. Once you have clicked on this box choose one of the graphic side bars by number, enter the name you wish to call it and enter the path to the graphic image you wish to use. *Note:- Windows Meta files work best.*

Once you have set up a side bar graphic you can place the following information windows on to it by clicking on the wording and clicking on add new. Enter the name you wish to call the button, the board number and the point it is going to get information from. Click on create label. A button will appear on the upper middle left of the screen. Place you pointer just below the button and hold down the left mouse button. You will now be able to move the button to where ever you wish on the screen.



**Programming control boxes.**
Choose the type of control box you wish to program. *See following picture.*




Click in add new.
Enter the name you wish to call it, the input, output number or logic address and the board number. Then click on create label.
The control box will appear in the top left part of the screen.
Use you mouse to move the box to where you want it.
Click on save to file.
**Continue with the above until all your control boxes are on the screen.**

**Modifying or fixing a graphic file.**
Do not do it unless you have to then keep a copy of the original just in case.
Use the extra program "BASXY graphic file converter" to convert the file to a readable/changeable note pad file. After converting you will find a file called "graphics_converted.txt" under the same sub directory as the original graphics file. Open it with note pad, keep the total number of lines the same and do not delete any blank lines. The following rules apply

The first screen file name must be on LINE 34 of the text file....

The first of the 2 zeros must be on LINE 67 of the text file....

The number of lines in the file must be on LINE 101 of the text file.

The lines which put data on the screen must begin with increment 101, then the lines must be in numerical order. The number of lines shown on line 101 must always be one more than the increment in the last line of the file.

If you delete any lines you must re increment the line number the location of the line number is shown in the example below line 118 shown.

1,LOGICVAR,z3 SP,2,63793,3437.5,5242.5,655,255,**118**,0,000.0

This line will put a box on the second screen "1" it will be a "LOGICVAR" called "z3 SP" from board number '2" using logic variable "63793" at location "3437.5,5242.5" the size will be "655 by255" and the decimal point will be displayed as "000.0".

**Analog Input box.** Used to display the data from one of the Analog inputs.

**Digital input box.** Used to display the data from one of the Digital inputs.

**Digital output box.** Used to display the data from one of the Digital outputs.

**Analog output box.** Used to display the data from one of the Analog outputs.

**Analog output set point box.** Used to display and change the set point for the four analog outputs.

**Set point Box.** Used to display the set point of one of the Digital outputs. This point can be changed from display mode.

**Logic Variable**. Used to display the contents of any memory location within the TSM150. You can also set a decimal position or make the window show ON or OFF instead of a value. Note of logic variable is Zero OFF will be displayed if Logic Variable is grater than Zero then ON will be displayed.

**Schedule box.** Used to display time schedules. This point can be changed from display mode. Schedule one on time = Schedule 0, Schedule one off time = schedule 1. Schedule two on time = Schedule 2, Schedule two off time = schedule 3 etc.

**Schedule position box.** Used to display the number located in one of the schedule number boxes in the time programming window as follows.

**Meter Boxes.** Used to display the metering values.

| output one | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Monday | 0 | 1 | 2 | 3 |
| Tuesday | 4 | 5 | 6 | 7 |
| Wednesday | 8 | 9 | 10 | 11 |
| Thursday | 12 | 13 | 14 | 15 |
| Friday | 16 | 17 | 18 | 19 |
| Saturday | 20 | 21 | 22 | 23 |
| Sunday | 24 | 25 | 26 | 27 |

| output two | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Monday | 28 | 29 | 30 | 31 |
| Tuesday | 32 | 33 | 34 | 35 |
| Wednesday | 36 | 37 | 38 | 39 |
| Thursday | 40 | 41 | 42 | 43 |
| Friday | 44 | 45 | 46 | 47 |
| Saturday | 48 | 49 | 50 | 51 |
| Sunday | 52 | 53 | 54 | 55 |

| output three | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Monday | 56 | 57 | 58 | 59 |
| Tuesday | 60 | 61 | 62 | 63 |
| Wednesday | 64 | 65 | 66 | 67 |
| Thursday | 68 | 69 | 70 | 71 |
| Friday | 72 | 73 | 74 | 75 |
| Saturday | 76 | 77 | 78 | 79 |
| Sunday | 80 | 81 | 82 | 83 |

| output four | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Monday | 84 | 85 | 86 | 87 |
| Tuesday | 88 | 89 | 90 | 91 |
| Wednesday | 92 | 93 | 94 | 95 |
| Thursday | 96 | 97 | 98 | 99 |
| Friday | 100 | 101 | 102 | 103 |
| Saturday | 104 | 105 | 106 | 107 |
| Sunday | 108 | 109 | 110 | 111 |

| output five | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Monday | 112 | 113 | 114 | 115 |
| Tuesday | 116 | 117 | 118 | 119 |
| Wednesday | 120 | 121 | 122 | 123 |
| Thursday | 124 | 125 | 126 | 127 |
| Friday | 128 | 129 | 130 | 131 |
| Saturday | 132 | 133 | 134 | 135 |
| Sunday | 136 | 137 | 138 | 139 |

| output six | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Monday | 140 | 141 | 142 | 143 |
| Tuesday | 144 | 145 | 146 | 147 |
| Wednesday | 148 | 149 | 150 | 151 |
| Thursday | 152 | 153 | 154 | 155 |
| Friday | 156 | 157 | 158 | 159 |
| Saturday | 160 | 161 | 162 | 163 |
| Sunday | 164 | 165 | 166 | 167 |

| output seven | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Monday | 168 | 169 | 170 | 171 |
| Tuesday | 172 | 173 | 174 | 175 |
| Wednesday | 176 | 177 | 178 | 179 |
| Thursday | 180 | 181 | 182 | 183 |
| Friday | 184 | 185 | 186 | 187 |
| Saturday | 188 | 189 | 190 | 191 |
| Sunday | 192 | 193 | 194 | 195 |

| output eight | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Monday | 196 | 197 | 198 | 199 |
| Tuesday | 200 | 201 | 202 | 203 |
| Wednesday | 204 | 205 | 206 | 207 |
| Thursday | 208 | 209 | 210 | 211 |
| Friday | 212 | 213 | 214 | 215 |
| Saturday | 216 | 217 | 218 | 219 |
| Sunday | 220 | 221 | 222 | 223 |

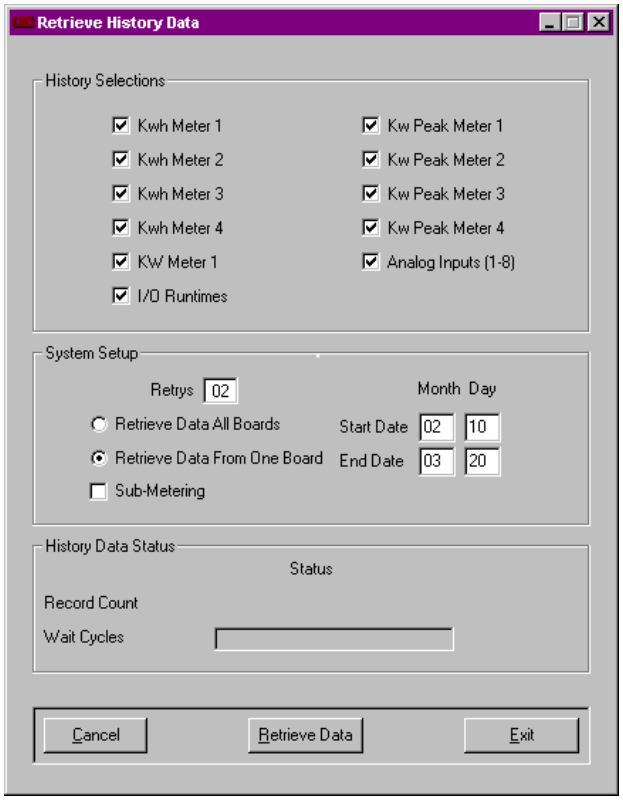
**Meter boxes**

| | DI1 | DI2 | DI3 | DI4 |
|---|---|---|---|---|
| **Kwh** | 1 | 2 | 3 | 4 |
| **Kw** | 5 | 6 | 7 | 8 |
| **Kw peak** | 9 | 10 | 11 | 12 |
| **Kw peak time** | 13 | 14 | 15 | 16 |

# History menu

## Retrieving the History Data

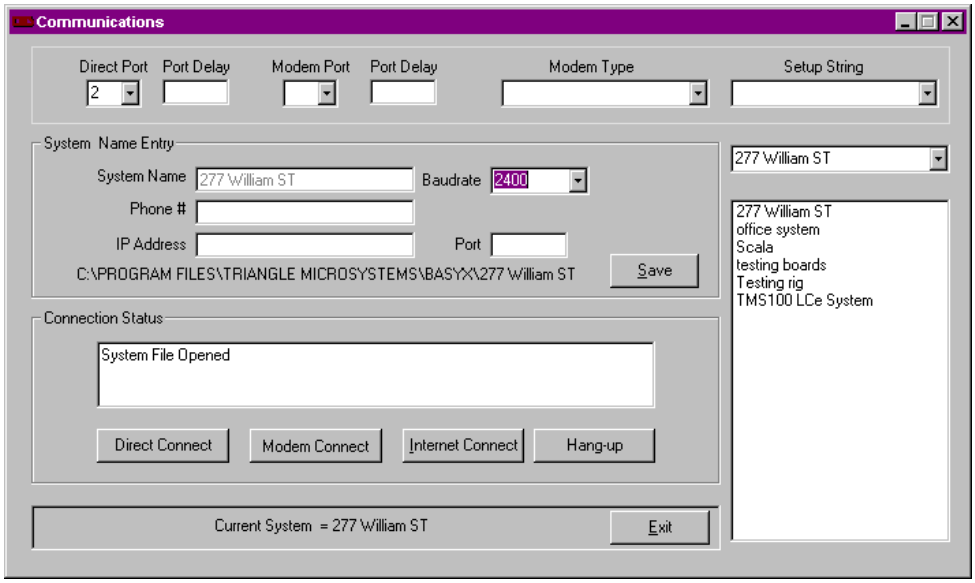
The history data makes the BASYX system a very powerful stand alone controller. The history may be retrieved in 10 ways. Each mode will change which data the system will retain in the comma separated file (csv) .
Click the data you wish to receive then enter the Start Date and End Date.
Choose to retrieve data from one board or all boards.
Next, Press the Retrieve Data Button
A dialog box will open select the Folder you would like to keep the File data in then enter a file name.
Remember Basyx Program will automatically add the .csv extension just enter in the file name example: test . After the file name is entered Press the open button.



# Communications menu

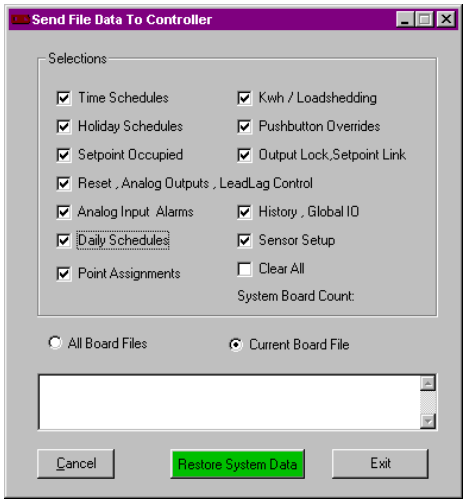
## Connecting to Basyx

When Communicating via Modem a setup string must be entered or use the Default string. Next Enter the communication port your modem is setup on. Then Press the Modem Connect Button. Remember the Basyx Program will not let you connect unless the current system name and system file name match. If you have trouble communication just try a different Modem type.
When communicating via Direct Connect enter the communications port the Basyx system is connected to then press the Direct connect button.
Once communication is established you can exit the communications menu and view the system.
**Note**: when connecting the program looks for the first board in the list and will fail to start if it cannot be found. If you need to connect to a system where board one is not on line go to <file> <edit job> double clock on your job, click on an active board file and add 00 to the start of the name. Exit the program and restart. The program will now look for that board file instead of board one.




## Restore System Data

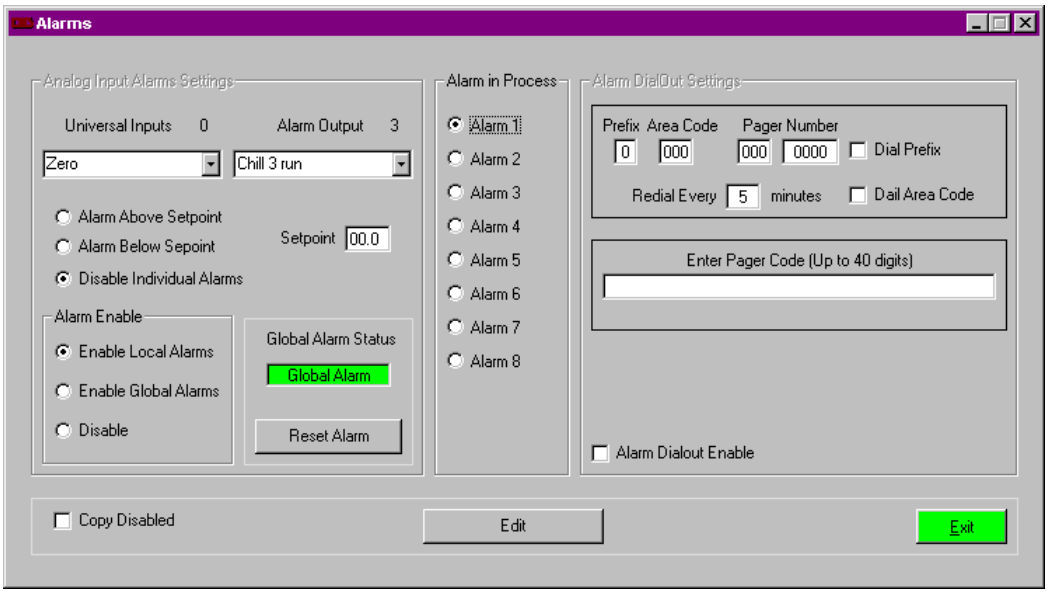
Use the restore system data window when the Basyx system database becomes corrupt choose the data that needs to be restored and press the Restore system Data Button.
Note with a few minutes of communicating with a system the TMS100 boards will send data to the PC. If you wish to up load data to the TMS100 system do so as soon as you establish communication.



# Alarm menu

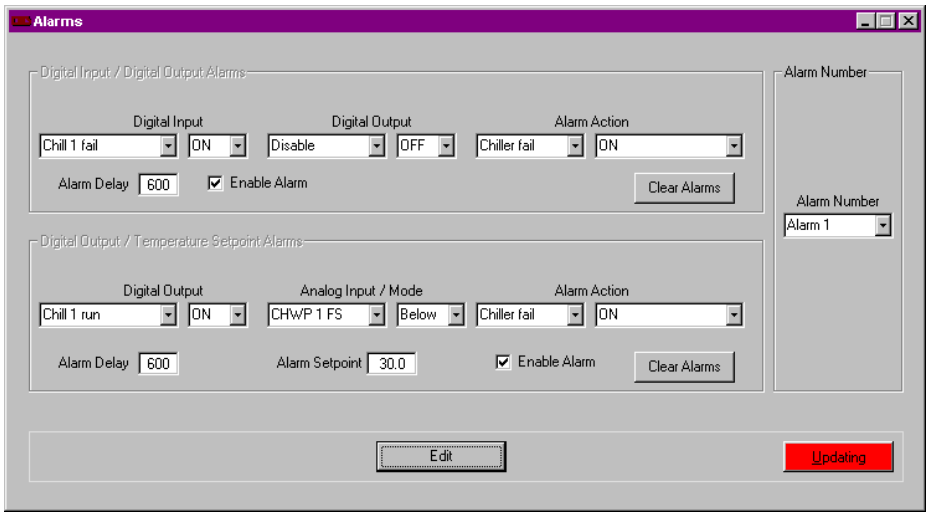
The BASYX© controller allows for eight different alarm levels to be monitored and alarmed. Occurrence of any alarm will cause the designated alarm output to be turned ON during the period the alarm is active. The designated output may be connected to an automatic dialer for notification of alarms during unoccupied hours or to a point enabling the building lights for security purposes.

**To enable the Temperature Alarm function**
select ALARM from the menu selection and choose ALARM DIAL OUT from the options.



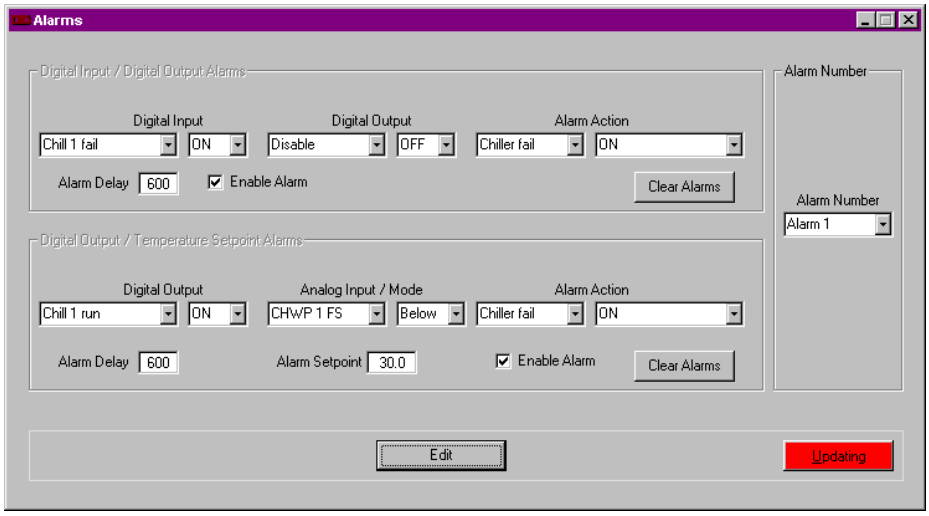

Press the edit button.
Select one of the alarm in progress buttons.
Press the Output you would like to program.
Select the input you wish to examine.
Select alarm above or below set point and enter the set point.
Select ether enable local or global alarms.
Press the send to controller button.

**To enable digital input/digital output alarms**.
select ALARM from the menu selection and choose DIGITAL INPUT/OUTPUT ALARMS from the options.



Press the edit button.
Select one of the alarm numbers on the right of the screen.
Enter the Digital input and whether on or off you wish to monitor.
Select the input you wish to examine.
Select output you wish to examine against and whether on/off.
Select the alarm out put and action.
Enter and alarm delay you need in seconds.
Tick the enable alarm button.
Press the send to controller button.
Repeat for any other alarms you need.

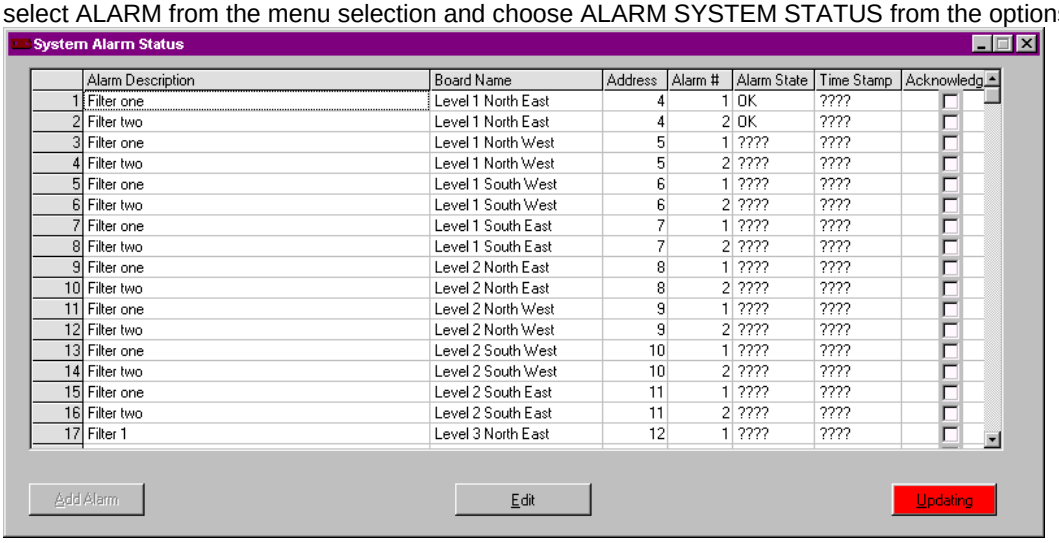
**To enable digital input/analog input alarms.**
select ALARM from the menu selection and choose DIGITAL INPUT/OUTPUT ALARMS from the options.




Press the edit button.
Select one of the alarm numbers on the right of the screen.
*Note if you have already programmed DI/DO alarms you can use the same alarm number to add DO/AI alarms.*
Enter the Digital output and whether on or off you wish to monitor.
Select analog input you wish to examine against and whether above or below.
Enter the alarm set point.
Select the alarm out put and action.
Enter and alarm delay you need in seconds.
Tick the enable alarm button.
Press the send to controller button.
Repeat for any other alarms you need.

*Note 1: Both the DI/DO and the DO/AI alarms operate like an IF/AND/THEN statement "**if** digital input one is on **and** digital out put one is on **then** turn digital output two on".*
*Note 2: If you enter only one value in the left hand side of the DI/DO alarm set such entering "digital input one on" and then set an alarm out put, the alarm output will come on whenever the digital input is on.*

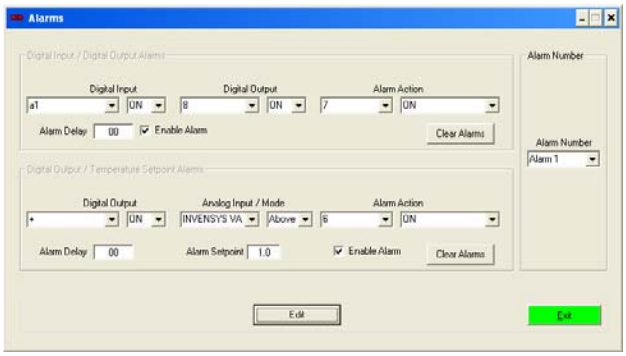
**Alarm system status**
select ALARM from the menu selection and choose ALARM SYSTEM STATUS from the options.



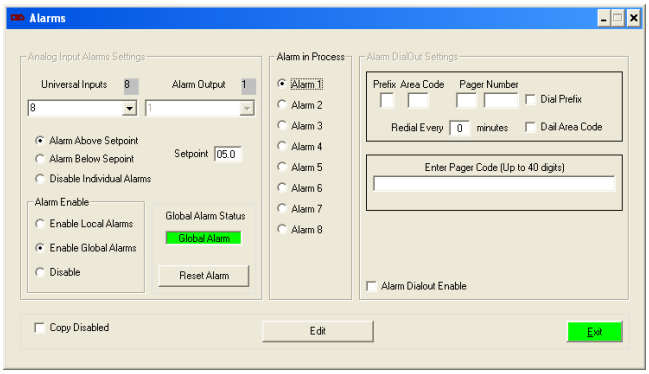

Press edit.
Press add alarm, a new row will be added.
Enter a descriptive name for your alarm.
Enter a name of your choosing for the board.
Enter the board number the alarm is generated from.
Enter the alarm number you programmed in the previous section (1 TO 8).

When the alarm is raised the alarm state column will show the word “alarm” and the time stamp will be applied by the system. after the alarm is cleared you must click on the acknowledge button to cancel it.

When an alarm is raised any ware in your system you will see the red word “alarm” in the bottom right corner of the main screen.




**Note:-** When placing a number in the “alarm#” box the alarms shown in the top boxes on the above screen are 1 to 8 the alarms in the bottom boxes are alarms 9 to 16.




The alarms on this screen are numbered 17 to 24

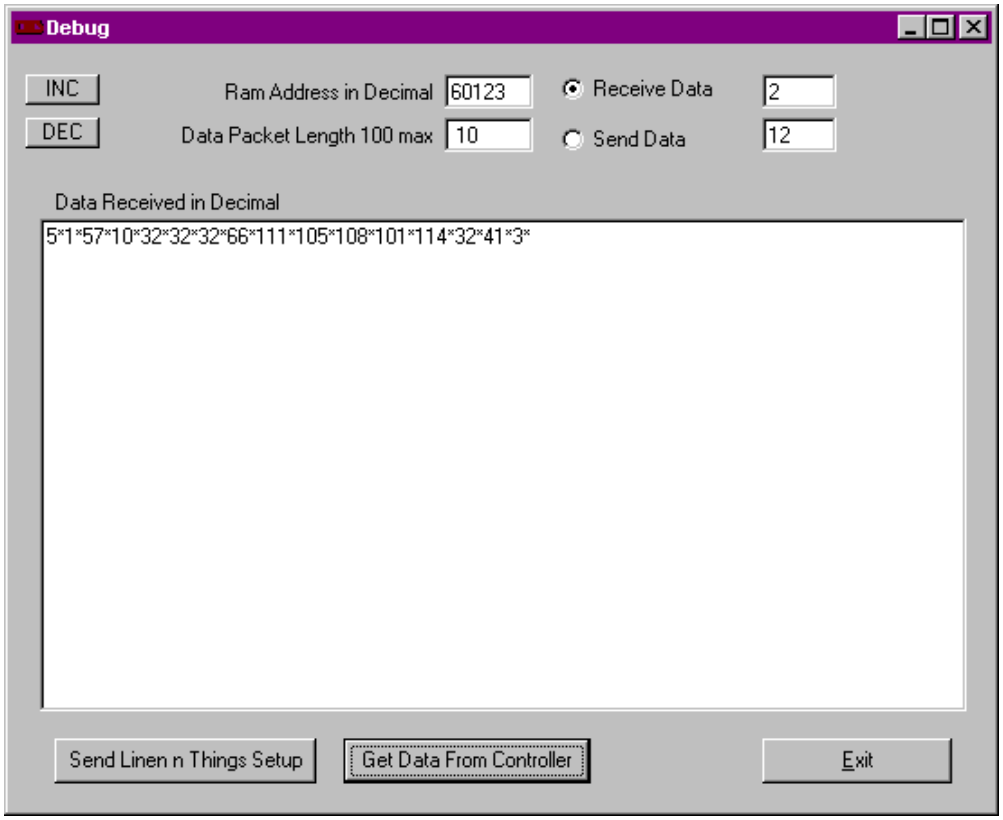
# **Advanced programming structure**.

## Debug program

### **Changing or viewing one point**

By pressing Alt D you can enter the debug mode. From here you are able to change or view the points separately. For example, view contents of AO3.
Enter 1715 in to memory location and enter 1 in data packet. Example of data received will be.
**5*2*57*1*116*184*3***
command structure:
5 = start of packet, 2 = board address, 57 = packet command, 1 = packet length
**116 = is data**, 184 = checksum, 3 = end of packet.

You can also place data in to the memory locations by entering the memory location in the memory location box and entering the data in to the data packet window then click on the send data box.



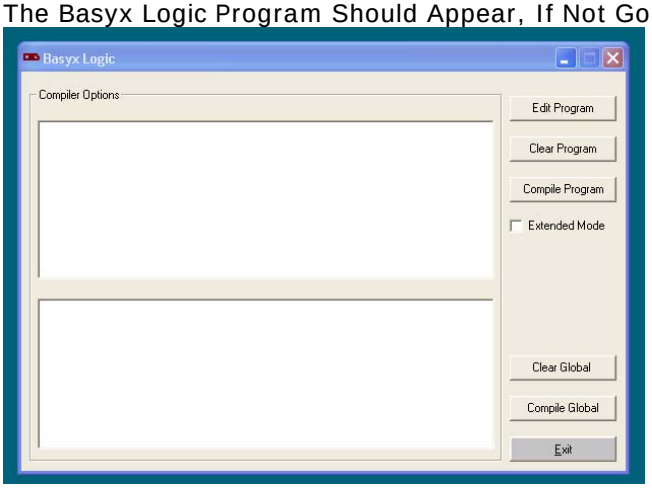
# Logic programming

**Note**
The logic variable chart is supplied at the end of this Manual.

## Program compiling

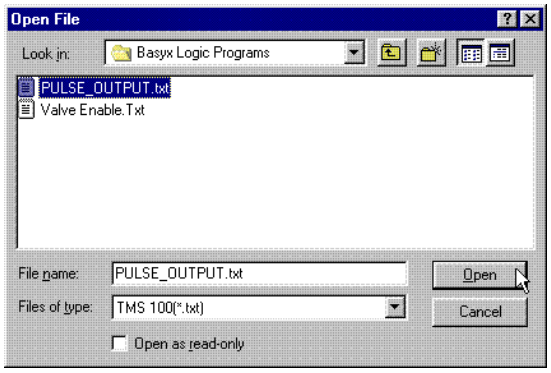
First Open Basyx Software
Click Centre of Screen.
Now Press the **ALT** and **L** key at the same time.

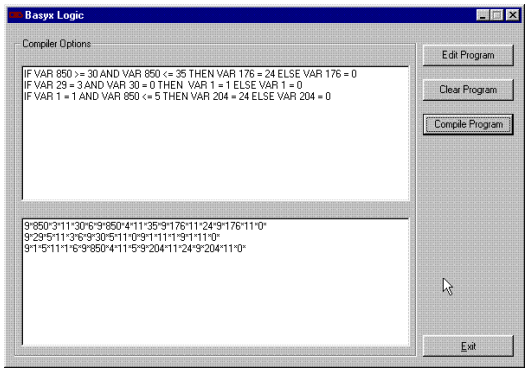
The Basyx Logic Program Should Appear, If Not Go to Step 1




To Load a Logic Program first press the CLEAR button to remove any previous file next Press the **Compile Program** Button.

Now Select Your Logic Program (must be a .txt file) then Press the **Open** Button.




Your Program Will Compile and Then Down Load To the Tms100 Board.

# Assembling a Logic file.

**Important.** To be able to understand Logic programming you will need have experience in computer programming languages. If you do not have these skills please contact you TMS supplier to manufacture the file for you. When using Logic programming be aware you will be directly affecting the TMS CPU contents if done incorrectly this can disrupt the existing pre-programmed routines. Do not under any circumstances try to affect other logic point than the one's shown in the logic table.

You write your logic file in Windows note pad.
The following commands are recognised by the system.
IF, THEN, ELSE, AND, OR, VAR.
And symbols < > =
Each line must consist of an argument (real or dummy) and an end of line command which is the symbol **;** After the end of line symbol you may choose to add comments these will be ignored by the system. SO a line may take the following format.

```
IF VAR 786 > 220 THEN VAR 768 = 1;      Place comments here.
```

The line above states if Analogue input 1 is higher than 22 Deg then Place digital output 1 into Manual on. Note you ignore decimal points when programming in logic.

In order to make your logic program easier to read you can place the program in CAPS and the comments in lower case you may also choose to add Tabs to your comments line.

The word "VAR" must proceed any logic location and each word or number must have one space between. All statements must start with the word "IF" and contain the word "THEN".

If you wish to maintain a logic location at a given value you may choose to use a dummy argument.

```
IF VAR 31 > 0 THEN VAR 64781 = 1;       Southern day light savings
```

In the above statement VAR 31 is the day of the month so will always be a number greater than zero VAR 64781 makes the BASYX PSC use the southern hemisphere day light savings routine instead of the northern hemisphere routine.

## Basic Australian logic for all boards.

Following is a basic logic file used in Australia.

```
IF VAR 850 > 0 THEN VAR 1934 = 1;              turn on daylight savings change over
IF VAR 850 > 0 THEN VAR 64781 = 1;             enable day light savings
IF VAR 850 > 0 THEN VAR 776 = 1;               enable time over ride
IF VAR 850 > 0 THEN VAR 767 = 1;               enable man control
IF VAR 61056 = 1 THEN VAR 61054 = 0;           disable set point offsets
IF VAR 61056 = 1 THEN VAR 61025 = 1;           disable set point linking
IF VAR 850 > 0 THEN VAR 721 = 1;               set to Centigrade
```

## Maths.

In order to perform a math routine you need to do the following.

**Adding numbers together**.
A number in VAR 64039 will be added to a number in VAR 64041 the result will be in VAR 64043

```
IF VAR 130 = 1 THEN VAR 64039 = VAR 1711;   move AI 1 to maths
IF VAR 130 = 1 THEN VAR 64039 = 10;         add 1 deg to AI1
IF VAR 130 = 1 THEN VAR 63767 = VAR 64043;  move answer to user variable
IF VAR 130 = 0 THEN VAR 63767 = 0;          reset user variable
```

In the above example if digital input 1 is on then the math routine will add 1 deg to the Analogue input 1 value and place the answer in to user variable 63767 when digital input 1 is off the user variable will reset to zero.

**Minus numbers.**
A number in VAR 64045 will have the number in VAR 64047 removed from it the result will be in VAR 64049

```
IF VAR 131 = 1 THEN VAR 64045 = VAR 1711;    move AI 1 to maths
IF VAR 131 = 1 THEN VAR 64047 = 10;          minus 1 deg from AI1
IF VAR 131 = 1 THEN VAR 63769 = VAR 64049;   move answer to user variable
IF VAR 131 = 0 THEN VAR 63769 = 0;           reset user variable
```

In the above example if digital input 2 is on the math routine will remove 1 deg from analogue input 1 value and place the answer in user variable 63769. When digital input 2 is off the user variable will reset.

The math VAR locations for multiply and divide can be found in the logic variable chart.

**User Variables.**
User Variables are memory locations that you can use as you wish to store and manipulate data. These are VAR 63767 through to VAR 63863 they are 2 byte values only place data in the odd numbers. If you require more user variables you can choose to turn history recording off and also use VAR 10074 to 14074 use even numbers only. Normally a Logic file can only be 100 lines long but with histories disabled you may produce a much longer program you must however tick the "extended logic" box when you down load the program to the BASYX PSC.

**High signal select**. First enable global alarms.
This enables you to keep a count of how many boards require heating or cooling so you can decide when you require the boiler or chiller to operate.
The VAR used are.
VAR 64079 high signal counter 1 at board 1
VAR 64081 high signal counter 2 at board 1
VAR 64076 high signal 1 at slave board
VAR 64077 high signal 2 at slave board

Assuming Digital output 2 on each board is used for the heat valve and digital output 3 is used for the cool valve. Here is an example of the logic program used in each board numbered 2 upwards.

```
IF VAR 714 = 1 THEN VAR 64076 = 1 ELSE VAR 64076 = 0;    set counter 1
IF VAR 715 = 1 THEN VAR 64077 = 1 ELSE VAR 64077 = 0;    set counter 2
```

At board 1 assume digital output 1 starts the boiler and digital output 2 starts the chiller the program is as follows.

```
IF VAR 64079 > 4 THEN VAR 768 = 2;    set DO1 to auto
IF VAR 64079 < 2 THEN VAR 768 = 0;    reset DO1 to manual off
IF VAR 64081 > 4 THEN VAR 769 = 2;    set DO2 to auto
IF VAR 64081 < 2 THEN VAR 769 = 0;    reset DO2 to manual off
```

This will cause the output in question to go on if more than 4 boards call for boiler/chiller and off again if less than 2 call.

**TMS100 auto reset**
Variable 63865 enables the automatic soft reset function, which is similar to pressing the reset button on the board. Variable 63866 sets the hourly cycle for this to happen from the point at which you enable 63865. For example, if you have a system that seems to lock up for some reason, you could enable Variable 63865 at 1:00am and disable it at 5:00am and if you set 63866 to 1 it would reset the board every hour during that period - It is not based on the clock, but rather every hour from the point that the enable variable is set.

**Timers.** Enable by setting VAR 61056 TO 1
20 count down timers are included in the logic programming instructions they will always try to count to zero unless you keep them at a higher value.

Example.

| | |
|---|---|
| IF VAR 31 > 0 THEN VAR 64056 = 1; | enable timers |
| IF VAR 714 = 1 THEN VAR 63999 = 500: | set timer 1 |
| IF VAR 63999 > 10 THEN VAR 771 = 1; | set DO4 on |
| IF VAR 63999 = 0 THEN VAR 771 = 0; | reset DO4 |

In the above logic file if Digital output 2 is on the timer will be held at 500 (seconds) when digital output 2 is off the timer will count down until it reaches zero, when it does digital output 4 will go off. This behaves as a delay off timer for digital output 4.

**Global logic**.
You can also choose to form a global logic file. This file allows you to send any data to and from board 1 to any other board. Note to send data from say board 4 to board 6 you would have to send it via board 1 as follows.

In the following example we will move data from board 4 to board 6 the VAR we will move is User VAR 63767.

4,18,63767,63767
Please note you can not add comments with this form of logic. The above statement will move data from board 4 VAR 63767 to board 1 VAR 63767

6,2,63767,63767
The above statement will move data from board 1 VAR 63767 to board 6 VAR 63767

When uploading this logic file to board 1 first "**clear global**" then "**compile global**"

**Example of broadcast Variable**.
255,2,1711,1711
The broadcast variable sends contents of variable XXXX to all boards. The boards are constantly looking for this address (255) and will retrieve the value immediately, rather than waiting in order when done board by board. In the example shown above the contents of Variable 1711 at board 1 will be send to Variable 1711 at all other boards. This is very good for functions that require immediate operation by the boards.

Logic notes

1) logic files can be up to 100 lines long when histories are used.
2) If histories are disabled you can assemble logic files up to 1000 lines long. This the same for both standard logic and global logic files. In order for this to work you must disable histories in the board first by clicking on the "global enable" box in the history set up screen. Next when you are loading the file make sure you click on "extended mode" before clicking on "Compile program".
3) when using a GLOBAL file on board 1, you must check the box on the history setup screen which tells the system you are using a global file. This moves the history memory location to allow room for the global file. If you use the extended logic control you can not use history on board 1.

# Appendix A
# Notes

## Special requirements for board one.

Input 8 must be the OAT sensor.
If you back wire an output to an input on board one you can use that input to set a global time schedule, by making all boards look at that input for daily schedules.

## Board name change

To change the board names to the required one's use the format (*name*_2.tms) for board 2.
If you need a system of boards to look for another board on start up instead of board 1 go to the file manager and add a leading letter A or zero to the front of the board file you wish to start up with.

## Logic down loading

When down loading logic files make sure you clear any previous file first otherwise errors can be caused both to the logic file and to other set points.

## Resetting board memory.

To reset board memory do the following..

- Record settings on the board dip switches.
- Turn board off.
- Put all dip switches on .
- Turn board on .
- wait until the red light flashes.
- Turn board off.
- Change the dip switches back to original settings.
- Turn board on. The board is now ready to accept a new program.

# Appendix B

## Start up check list.

**Pre start, Examine the boards for**

1. All wiring connected to the correct points and no stray wire strands shorting out to the adjacent points.
2. Dip switches set correctly (note communication will be erratic or not work at all if 2 or more boards have the same binary number).
3. Fuses installed.
4. Any add on boards correctly connected.
5. Fail safe termination installed.

**Connect power to board.**

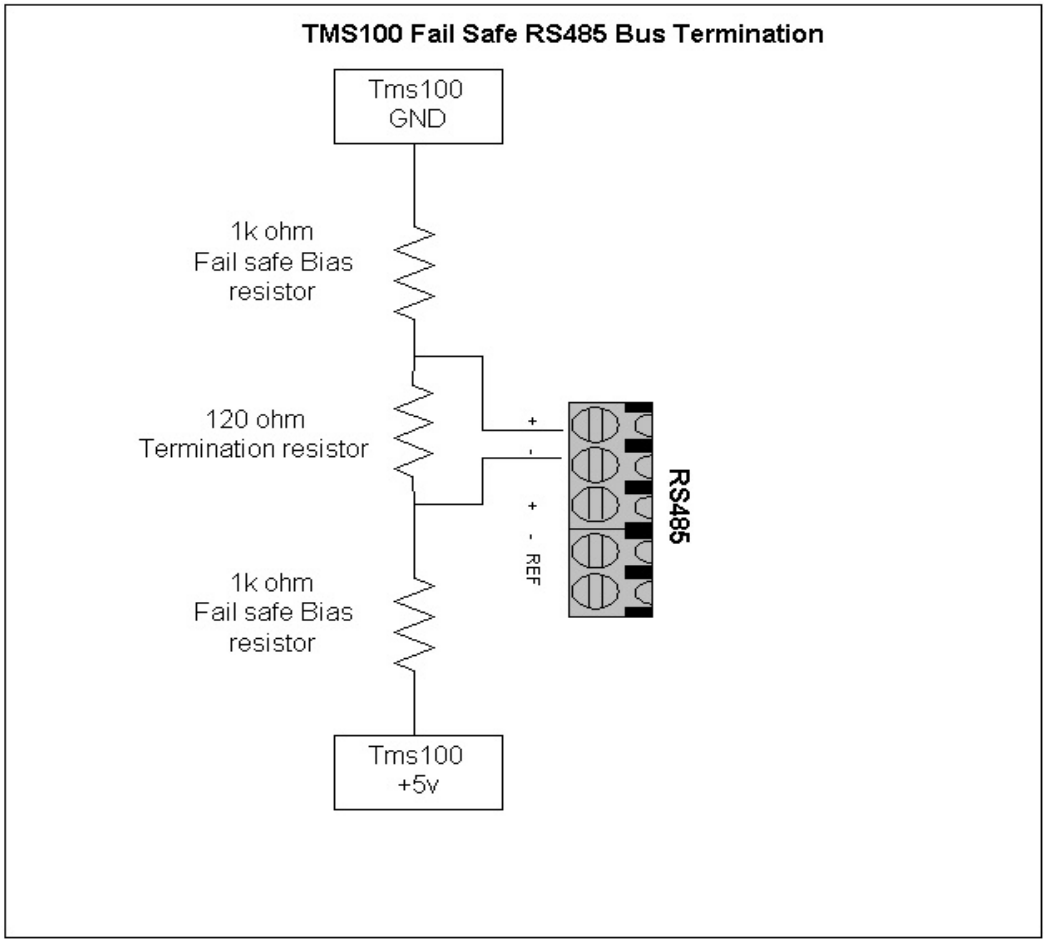
1. Make sure the green light is on steady and the red light is flashing. If not reset the board.
2. Look at the board file on the PC to see if it is getting information from the board.
3. Examine the board file to see if all your wired inputs are showing the correct data.
4. Set the on board time clock to the correct setting.
5. Enter programming instructions.

**Resetting a board**

Set all dip switches to on press the reset button then power up the board for a few seconds, power down and change the dip switches back to there correct settings.

# Appendix C

**TMS100 Fail safe bus termination**.



# Appendix D

## Update register.

### TMS100 Firmware update revisions.

Version 0.3.6
Added high signal select.
Version 0.3.7
Changed communication from board direct to PC from 2400 to 9600 Baud
Version 0.3.8
Added DO status points 64631 64638
Version 0.3.9
***Beta version*** greatly increased global command communication speed.
Min value can now be greater than Max value in set up screen.
Added 0-10V span setup so min value can be greater than max.
Version 0.4.0
Global speed decrease.
Version 0.4.1
Removed alarm dial out
RS484 Baud rate adjustable added
Removed floating point control.

### BASYX PSC firmware update revisions.

Version 1.0.4.
Added 0-10V span setup.
Version 1.0.5
Decrease global speed (causing coms error)
Version1.0.6.
Push button reset added. Upgrade speeds Bus speed to 56600 direct connect to 19200

### Software update revisions.

Version 1.9.36
Added 2000 user variables when histories turned off.
1.9.39
extended logic files when histories turned off.
1.9.40
Fix up for ASC100 meter reading

# Appendix E

## BASYX PSC requirements and notes.

**The DIP switches located on the board are set as follows:**

1. The row closest to the edge of the board controls the 10vdc excitation voltage for the analog inputs. This switch should always be ON except when using a low impedance self-powered voltage sensor i.e.: current sensors, etc. We have only seen a couple of instances where this would be the case.

2. The inner row of switches controls the 499 ohm resistor required for a 4-20ma input. This switch should remain OFF unless using a 4-20ma input.

**Power supply modification.**

The older BASYX PSC boards are full wave rectification power supples while this is a good thing it is not fully compatible with 0-10VDC and 4ma to 20ma input sensors that are half wave types (3 wire). To make the BASYX PSC compatible you need to change it to a half wave board. To do this turn the board upside down locate the 2 power supply diodes they are black and are located just below the GOWANDA unit they are directly connected to the power supply pins L1 and L2. Remove the diodes from the board then solder in a link across the diode that was connected to terminal L2. the BASYX PSC is now a half wave board and is compatible with 3 wire input devices.

**Note a BASYX PSC half wave board will not talk to a full wave board or TMS100's**

**RS484 communications.**

Install 120 Ohms resister across + to _ on last board in line
Connection a PC to board 1 stops global communications, connect instead to another board.
If the PC is a long way from the boards use a USB to RS484 converter at the PC then use a RS484 to RS232 at the board end of the cable. Do not connect directly in to the RS484 loop as this can cause data corruption.

# Appendix F
# Fault finding.

| Problem | Solution |
|---|---|
| **RS484 communication loss** | Install fail safe termination. This is particularly important on long cable runs.<br>Look for open or closed circuit, one faulty board can stop all so connect boards one by one to the loop.<br>**Note a BASYX PSC half wave board will not talk to a full wave board or TMS100's** |
| **Unusual voltages showing up on communication cables.** | This can cause boards to be damaged. Possible cause is when several transformers are used on the same project. Floating voltages can be up to line voltage with respect to ground and the difference can show on RS484 loop. To fix this earth one side of all transformers making sure it is the same side. Also with rev3 boards using the ref terminals will compensate. |
| **AO not working or not seeing the correct voltage.** | Ensure that the device you are controlling and the TMS board are both referenced to the same common. If not 24VAC can be passed from the device back to the TMS board causing damage to the AO card and possible communication and control problems with the other parts of the board. *Hint on many devices* G=*24V active* GO=*24V common* Y=*control voltage (0-10V or 4-20ma)* |
| **Data corruption** | Although many causes can be attributable to this the main 2 to look out for are.<br>1) Soft ware caused, ensure you delete a logic file before installing a new or modified version as it may place it in different memory locations causing confusion with the original.<br>2) Voltage caused, Motor or contactor switching may cause a voltage spike. Install MOV's or .1uf caps over outputs and power supply input to the board. |

# Appendix G

## TMS100/150 logic variable chart

### Time

**Days and times**

| | | |
|---|---|---|
| Day of WK | 28 | Day light savings on set 1934 = 0 |
| Hour | 29 | BASYX PSC USA day light savings set 64781 to 0 |
| Min | 30 | BASYX PSC Australian day light savings set 64781 to 1 |
| Day | 31 | BASYX PSC Europe day light savings set 64781 to 2 |
| Month | 32 | |
| Year | 33 | TMS100 Southern Hemisphere day light savings set 64801 to 1 |
| MSB Ver no | 34 | |
| LSB Ver No | 35 | |
| Seconds | 850 | |

**Hours on and off times** **Time Schedules enable 1397**

| | L1 | L2 | L3 | L4 | L5 | L6 | L7 | L8 |
|---|---|---|---|---|---|---|---|---|
| Mon Hr on | 174 | 202 | 230 | 258 | 286 | 314 | 342 | 370 |
| Mon min on | 175 | 203 | 231 | 259 | 287 | 315 | 343 | 371 |
| Mon hr off | 176 | 204 | 232 | 260 | 288 | 316 | 344 | 372 |
| Mon Min off | 177 | 205 | 233 | 261 | 289 | 317 | 345 | 373 |
| Tue Hr on | 178 | 206 | 234 | 262 | 290 | 318 | 346 | 374 |
| Tue min on | 179 | 207 | 235 | 263 | 291 | 319 | 347 | 375 |
| Tue hr off | 180 | 208 | 236 | 264 | 292 | 320 | 348 | 376 |
| Tue Min off | 181 | 209 | 237 | 265 | 293 | 321 | 349 | 377 |
| Wed Hr on | 182 | 210 | 238 | 266 | 294 | 322 | 350 | 378 |
| Wed min on | 183 | 211 | 239 | 267 | 295 | 323 | 351 | 379 |
| Wed hr off | 184 | 212 | 240 | 268 | 296 | 324 | 352 | 380 |
| Wed Min off | 185 | 213 | 241 | 269 | 297 | 325 | 353 | 381 |
| Thr Hr on | 186 | 214 | 242 | 270 | 298 | 326 | 354 | 382 |
| Thr min on | 187 | 215 | 243 | 271 | 299 | 327 | 355 | 383 |
| Thr hr off | 188 | 216 | 244 | 272 | 300 | 328 | 356 | 384 |
| Thr Min off | 189 | 217 | 245 | 273 | 301 | 329 | 357 | 385 |
| Fri Hr on | 190 | 218 | 246 | 274 | 302 | 330 | 358 | 386 |
| Fri min on | 191 | 219 | 247 | 275 | 303 | 331 | 359 | 387 |
| Fri hr off | 192 | 220 | 248 | 276 | 304 | 332 | 360 | 388 |
| Fri Min off | 193 | 221 | 249 | 277 | 305 | 333 | 361 | 389 |
| Sat Hr on | 194 | 222 | 250 | 278 | 306 | 334 | 362 | 390 |
| Sat min on | 195 | 223 | 251 | 279 | 307 | 335 | 363 | 391 |
| Sat Hr off | 196 | 224 | 252 | 280 | 308 | 336 | 364 | 392 |
| Sat min off | 197 | 225 | 253 | 281 | 309 | 337 | 365 | 393 |
| Sun Hr on | 198 | 226 | 254 | 282 | 310 | 338 | 366 | 394 |
| Sun min on | 199 | 227 | 255 | 283 | 311 | 339 | 367 | 395 |
| Sun Hr off | 200 | 228 | 256 | 284 | 312 | 340 | 368 | 396 |
| Sun min off | 201 | 229 | 257 | 285 | 313 | 341 | 369 | 397 |

**Schedule position boxes** **Enable time schedules Variable 1397**

Code controls 2 position boxes place a number 1 to 15 will put a number in pos box 2
by placing a number in the box 20 will put a 1 in box 1 and a 4 in box 2

| | L1 | L2 | L3 | L4 | L5 | L6 | L7 | L8 |
|---|---|---|---|---|---|---|---|---|
| Mon 1,2 | 1398 | 1412 | 1426 | 1440 | 1454 | 1468 | 1482 | 1496 |
| Mon 3,4 | 1399 | 1413 | 1427 | 1441 | 1455 | 1469 | 1483 | 1497 |
| Tues 1,2 | 1400 | 1414 | 1428 | 1442 | 1456 | 1470 | 1484 | 1498 |
| Tues 3,4 | 1401 | 1415 | 1429 | 1443 | 1457 | 1471 | 1485 | 1499 |
| Wed 1,2 | 1402 | 1416 | 1430 | 1444 | 1458 | 1472 | 1486 | 1500 |
| Wed 3,4 | 1403 | 1417 | 1431 | 1445 | 1459 | 1473 | 1487 | 1501 |
| Thur 1,2 | 1404 | 1418 | 1432 | 1446 | 1460 | 1474 | 1488 | 1502 |
| Thur 3,4 | 1405 | 1419 | 1433 | 1447 | 1461 | 1475 | 1489 | 1503 |
| Fri 1,2 | 1406 | 1420 | 1434 | 1448 | 1462 | 1476 | 1490 | 1504 |
| Fri 3,4 | 1407 | 1421 | 1435 | 1449 | 1463 | 1477 | 1491 | 1505 |
| Sat 1,2 | 1408 | 1422 | 1436 | 1450 | 1464 | 1478 | 1492 | 1506 |
| Sat 3,4 | 1409 | 1423 | 1437 | 1451 | 1465 | 1479 | 1493 | 1507 |
| Sun 1,2 | 1410 | 1424 | 1438 | 1452 | 1466 | 1480 | 1494 | 1508 |
| Sun 3,4 | 1411 | 1425 | 1439 | 1453 | 1467 | 1481 | 1495 | 1509 |

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Hr on | 1510 | 1514 | 1518 | 1522 | 1526 | 1530 | 1534 | 1538 |
| Min on | 1511 | 1515 | 1519 | 1523 | 1527 | 1531 | 1535 | 1539 |
| Hr off | 1512 | 1516 | 1520 | 1524 | 1528 | 1532 | 1536 | 1540 |
| Min off | 1513 | 1517 | 1521 | 1525 | 1529 | 1533 | 1537 | 1541 |

| | 9 | 10 | 11 | 12 |
|---|---|---|---|---|
| Hr on | 1542 | 1546 | 1550 | 1554 |
| Min on | 1543 | 1547 | 1551 | 1555 |
| Hr off | 1544 | 1548 | 1552 | 1556 |
| Min off | 1545 | 1549 | 1553 | 1557 |

**Timers** you can read and write to both high & low bytes

| | **MSB** | **LSB** |
|---|---|---|
| **1** | 63999 | 64000 |
| **2** | 64001 | 64002 |
| **3** | 64003 | 64004 |
| **4** | 64005 | 64006 |
| **5** | 64007 | 64008 |
| **6** | 64009 | 64010 |
| **7** | 64011 | 64012 |
| **8** | 64013 | 64014 |
| **9** | 64015 | 64016 |
| **10** | 64017 | 64018 |

**Enable timers 61056.** 1 sec per digit on low byte

| | **MSB** | **LSB** |
|---|---|---|
| **11** | 64019 | 64020 |
| **12** | 64021 | 64022 |
| **13** | 64023 | 64024 |
| **14** | 64025 | 64026 |
| **15** | 64027 | 64028 |
| **16** | 64029 | 64030 |
| **17** | 64031 | 64032 |
| **18** | 64033 | 64034 |
| **19** | 64035 | 64036 |
| **20** | 64037 | 64038 |

## Digital inputs

**Digital input positions**

| | | on/off | MSB | LSB |
|---|---|---|---|---|
| Never write to DI low byte | **DI1** | 130 | 134 | 135 |
| | **DI2** | 131 | 136 | 137 |
| | **DI3** | 132 | 138 | 139 |
| | **DI4** | 133 | 140 | 141 |

Digital input time over ride

| | **DI1** | **DI2** | **DI3** | **DI4** |
|---|---|---|---|---|
| LOW | 1258 | 1261 | 1264 | 1267 |
| HIGH | 1259 | 1262 | 1265 | 1268 |

Digital input time accumulation

| | Min | | Sec |
|---|---|---|---|
| DI1 | 1663 | 1662 | 1661 |
| DI2 | 1666 | 1665 | 1664 |
| DI3 | 1669 | 1668 | 1667 |
| DI4 | 1672 | 1671 | 1670 |

**Reset KW data Base**

| | | |
|---|---|---|
| KWH | 726 | 727 |
| KW | 736 | 737 |
| KWP | 847 | 848 |
| ALL | 757 | 758 |

**Pulse per meter**

| | MSB | LSB | | MSB | LSB |
|---|---|---|---|---|---|
| **DI1** | 445 | 446 | **DI3** | 1377 | 1378 |
| **DI2** | 1375 | 1376 | **DI4** | 1379 | 1380 |

**Binary code for DI over ride**

Example to switch DO3 & DO6= 4+32 = 36 enter 36 into box

| DO1 | DO2 | DO3 | DO4 | DO5 | DO6 | DO7 | DO8 |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 |

**Analog inputs**

**Average positions**

| AI6,1 | AI6,2 | AI6,3 | AI6,4 | AI7,1 | AI7,2 | AI7,3 | AI7,4 |
|---|---|---|---|---|---|---|---|
| 1701 | 1702 | 1703 | 1704 | 1705 | 1706 | 1707 | 1708 |

Universal input average input 6=1865, input 7 =1867

**AI positions**

| | AI1 | AI2 | AI3 | AI4 | AI5 | AI6 | AI7 | AI8 |
|---|---|---|---|---|---|---|---|---|
| LSB | 1711 | 1713 | 1715 | 1717 | 1719 | 1721 | 1723 | 1725 |
| MSB | 1712 | 1714 | 1716 | 1718 | 1720 | 1722 | 1724 | 1726 |
| AI fast | 1727 | 1729 | 1731 | 1733 | 1735 | 1737 | 1739 | 1784 |
| | If above VAR > 150 then ON if VAR < 100 then OFF | | | | | | | |
| Virtual | 1759 | 1761 | 1763 | 1765 | 1767 | 1769 | 1771 | 1773 |

**You can read Virtual data within logic files without attaching it to an input providing global is enabled. This will allow you to have all 8 AI used locally but still be able to use global outside air temperature etc at the board.**

## Digital outputs

**Digital output positions**. Enable Man on 767
**Timed override enable** 776. DI read/write 0=off 1=on 2=auto

| | DO1 | DO2 | DO3 | DO4 | DO5 | DO6 | DO7 | DO8 |
|---|---|---|---|---|---|---|---|---|
| Read only | 713 | 714 | 715 | 716 | 717 | 718 | 719 | 720 |
| R+W | 768 | 769 | 770 | 771 | 772 | 773 | 774 | 775 |
| time in min | 777 | 778 | 779 | 780 | 781 | 782 | 783 | 784 |

**Push button over ride enable 785**

| | DO1 | DO2 | DO3 | DO4 | DO5 | DO6 | DO7 | DO8 |
|---|---|---|---|---|---|---|---|---|
| Sensor | 786 | 788 | 790 | 792 | 794 | 796 | 798 | 800 |
| time | 787 | 789 | 791 | 793 | 795 | 797 | 799 | 801 |

| **Over ride timers** | DO1 | DO2 | DO3 | DO4 | DO5 | DO6 | DO7 | DO8 |
|---|---|---|---|---|---|---|---|---|
| Hi byte | 858 | 860 | 862 | 864 | 866 | 868 | 870 | 872 |
| Low byte | 859 | 861 | 863 | 865 | 867 | 869 | 871 | 873 |

| **Min on/off** | | DO1 | DO2 | DO3 | DO4 | DO5 | DO6 | DO7 | DO8 |
|---|---|---|---|---|---|---|---|---|---|
| Enable | ON | 1617 | 1619 | 1621 | 1623 | 1625 | 1627 | 1629 | 1631 |
| 1616 | OFF | 1618 | 1620 | 1622 | 1624 | 1626 | 1628 | 1630 | 1632 |

**Set point control** Mode 0=disable, 1= cool, 2=heat, 3=heat. cool, 4=auto

| | DO1 | DO2 | DO3 | DO4 | DO5 | DO6 | DO7 | DO8 |
|---|---|---|---|---|---|---|---|---|
| Mode | 1775 | 1781 | 1787 | 1793 | 1799 | 1805 | 1811 | 1817 |
| Sensor | 1776 | 1782 | 1788 | 1794 | 1800 | 1806 | 1812 | 1818 |
| Set point | 1777 | 1783 | 1789 | 1795 | 1801 | 1807 | 1813 | 1819 |
| DB on | 1779 | 1785 | 1791 | 1797 | 1803 | 1809 | 1815 | 1821 |
| DB off | 1780 | 1786 | 1792 | 1798 | 1804 | 1810 | 1816 | 1822 |
| Set back C | 1823 | 1827 | 1831 | 1835 | 1839 | 1843 | 1847 | 1851 |
| set back H | 1825 | 1829 | 1833 | 1837 | 1841 | 1845 | 1849 | 1853 |

**DO current mode** 0=unoccupied 1=occ time sch, 2=occ override

| DO1 | DO2 | DO3 | DO4 | DO5 | DO6 | DO7 | DO8 |
|---|---|---|---|---|---|---|---|
| 64631 | 64632 | 64633 | 64634 | 64635 | 64636 | 64637 | 64638 |

**Logic control of outputs** 0 = Auto 1 = On, 2 = Off

| DO1 | DO2 | DO3 | DO4 | DO5 | DO6 | DO7 | DO8 |
|---|---|---|---|---|---|---|---|
| 64654 | 64655 | 64656 | 64657 | 64658 | 64659 | 64660 | 64661 |

Retrieve load status. 803 to 812 1=man override, 2=pushbutton override, 3=timed override, 4=temperature alarm, 5=temperature unoccupied, 6=demand load shed, 7=holiday schedule, 8=temperature occupied, 9=daily sch, 10=timer override sec, 12=Auto/man override, 13= lead lag control, 14 time watch over ride, 15= time schedule, 16 min on/off, 17 override global, 18=global man off, 19=duty cycle, 20 Di, DO alarms, 21=Di AI alarms. 24 Logic control

**HOA switch position**
**current position**

to get the current switch positions calculate 85 from the Manual on position

Variable 1574 outputs 1 to 4.

| output | Auto add | Off add |
|---|---|---|
| 1 | 1 | 2 |
| 2 | 4 | 8 |
| 3 | 16 | 32 |
| 4 | 64 | 128 |
| | | |

Variable 1575 outputs 5 to 8

| output | Auto add | Off add |
|---|---|---|
| 5 | 1 | 2 |
| 6 | 4 | 8 |
| 7 | 16 | 32 |
| 8 | 64 | 128 |

**Analog outputs**

| **AO position Raw value of current position** | AO1 | AO2 | AO3 | AO4 |
|---|---|---|---|---|
| | 1294 | 1295 | 1296 | 1297 |

AO action 0=direct, 1=reverse, link =output 1to8
Loop 0=disable, 1= enable, econ 0=disable, 1=enable

| | enable | sen | set | del | act | gain | def | econ | link |
|---|---|---|---|---|---|---|---|---|---|
| AO1 | 1302 | 1303 | 1304 | 1306 | 1307 | 1308 | 1309 | 1310 | 1311 |
| AO2 | 1312 | 1313 | 1314 | 1316 | 1317 | 1318 | 1319 | 1320 | 1321 |
| AO3 | 1322 | 1323 | 1324 | 1326 | 1327 | 1328 | 1329 | 1330 | 1331 |
| AO4 | 1332 | 1333 | 1334 | 1336 | 1337 | 1338 | 1339 | 1340 | 1341 |

^

| **AO positions Min and Max** set positions | | AO1 | AO2 | AO3 | AO4 |
|---|---|---|---|---|---|
| | Min | 1566 | 1568 | 1570 | 1572 |
| | Max | 1567 | 1569 | 1571 | 1573 |

## Alarms

Global alarms, activate global alarms, set 1875 to 1 at slave boards, Board 1 bit 1875 will now be set you will have to reset it in a

**Digital input Digital output alarms. enable 60775**

| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
|---|---|---|---|---|---|---|---|---|
| Input on/off | 60776 | 60782 | 60788 | 60794 | 60800 | 60806 | 60812 | 60818 |
| action | 60777 | 60783 | 60789 | 60795 | 60801 | 60807 | 60813 | 60819 |
| output | 60778 | 60784 | 60790 | 60796 | 60802 | 60808 | 60814 | 60820 |
| status | 60779 | 60785 | 60791 | 60797 | 60803 | 60809 | 60815 | 60821 |
| time del HI | 60780 | 60786 | 60792 | 60798 | 60804 | 60810 | 60816 | 60822 |
| time del low | 60781 | 60787 | 60793 | 60799 | 60805 | 60811 | 60817 | 60823 |

Note. the (Input on/off) low nibble = the Digital input the (input on/off) high nibble = action on/off

**Digital input Analog output alarm. enable 60824**

| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
|---|---|---|---|---|---|---|---|---|
| DO & on/off | 60825 | 60833 | 60841 | 60849 | 60857 | 60865 | 60873 | 60881 |
| AI No &h/L | 60826 | 60834 | 60842 | 60850 | 60858 | 60866 | 60874 | 60882 |
| set point low | 60827 | 60835 | 60843 | 60851 | 60859 | 60867 | 60875 | 60883 |
| set point hi | 60828 | 60836 | 60844 | 60852 | 60860 | 60868 | 60876 | 60884 |
| output | 60829 | 60837 | 60845 | 60853 | 60861 | 60869 | 60877 | 60885 |
| status | 60830 | 60838 | 60846 | 60854 | 60862 | 60870 | 60878 | 60886 |
| reload hi | 60831 | 60839 | 60847 | 60855 | 60863 | 60871 | 60879 | 60887 |
| reload low | 60832 | 60840 | 60848 | 60856 | 60864 | 60872 | 60880 | 60888 |

**Alarm** Var 60833 = 19. 19 bin = 000100111
MSB action data LSB output data therefore turn out 3 on

| Action | data |
|---|---|
| off | 0000 |
| on | 0001 |
| Dial out | 0010 |
| on Dial out | 0011 |
| off dial out | 0100 |

| LSB | Data |
|---|---|
| DO1 | 0001 |
| DO2 | 0010 |
| DO3 | 0011 |
| DO4 | 0100 |

| LSB | Data |
|---|---|
| DO5 | 0101 |
| DO6 | 0110 |
| DO7 | 0111 |
| DO8 | 1000 |

Example **AI No &h/L** Low nibble = AI number high nibble = above or bellow set point

**Links**

| **Output link** | **L1** | **L2** | **L3** | **L4** | **L5** | **L6** | **L7** | **L8** |
|---|---|---|---|---|---|---|---|---|
| | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |

| **Set point links** | **Enable** | **cool low** | **heat low** |
|---|---|---|---|
| | 61025 | 61026 | 61028 |

To disable set point inputs set 61054 = 0 and 61025 = 1.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| set point link | 61030 | 61033 | 61036 | 61039 | 61042 | 61045 | 61048 | 61051 |
| link offset low | 61031 | 61034 | 61037 | 61040 | 61043 | 61046 | 61049 | 61052 |
| link offset high | 61032 | 61035 | 61038 | 61041 | 61044 | 61047 | 61050 | 61053 |

61054 adjust heating cooling set point with input 61055 input link

| **Outdoor air lock out** | | **Enable** | 23 | | |
|---|---|---|---|---|---|
| change over set point | LSB | | 24 | MSB | 25 |
| Dead band | Cooling | | 26 | heating | 27 |

## Logic notes.

Cause board 1 to read all global data set 1614 to 1 every so often.
Power up reset counter 1601 can read and write to.

**Global Plant call signals** *Enable global alarms first*
Var 64079 counter one at board one Var 64081 counter two at board one
Var 64076 signal one enable slave boards. Var 64077 signal two enable slave boards.
Counter at board 1 keeps the total of slave boards that have the Variable > 0. this is used to start chillers/Boilers when there is enough demand.

**Automatic soft reset.**
Var 63865 1 = enable 0 = disable
Var 63866 hour reset is to occur

**History reset.**
Analog inputs 757 & 758 set to 0
DO/DI run times 63869 & 63870 set to 0
History disable Var 60694, set to zero to disable histories

**Math's**

| | | | |
|---|---|---|---|
| Additions number in | **64039** added to | **64041** result in | **64043** |
| Minus number in | **64045** minus | **64047** result in | **64049** |
| Multiply number in | **64051** by | **64053** result in | **64055** |
| Divide number in | **64057** divided by | **64059** result in | **64061** |

**User Variables**.
Var 63767 to 63863 Odd number only (high byte used when numbers over 255
Also Var 10074 to 14074 even numbers only. Disable histories first.

**Global commands**
Global over ride timer. Enable= Var 1937 Var 1963 on board 1 enable global overrides
enable global override on global I/O set up. use these Var on board address 1 only
ex set Var 1954 to 1 will turn on DO1 on all boards.

| Timers. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Variable | 1954 | 1955 | 1956 | 1957 | 1598 | 1959 | 1960 | 1961 |

**Global script**
When Global communication is enabled do not use histories at board 1.

Global Data example.
2,2,63763,63763 move B1 Var 63763 to B2 63763
3,2,63763,63765 move B1 Var 63763 to B3 63765
2,18,1771,1711 this script moves data from Var 1771 of slave board 2 to Var 1711 of board 1
2,17,1771,1711 this moves data from Var 1711 of board 1 to Var 1771 of board 2

Use 255 to broadcast a number to all boards example 255,2,1711,1711 will send contents of 1711 B1 to 1711 in all other boards

## Decimal to Binary

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| **0** to 7 | 0000 | 0001 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 |
| **8** to 15 | 1000 | 1001 | 1010 | 1011 | 1100 | 1101 | 1110 | 1111 |
| **16** to 23 | 10000 | 10001 | 10010 | 10011 | 10100 | 10101 | 10110 | 10111 |
| **24** to 31 | 11000 | 11001 | 11010 | 11011 | 11100 | 11101 | 11110 | 11111 |
| **32** to 39 | 100000 | 100001 | 100010 | 100011 | 100100 | 100101 | 100110 | 100111 |
| **40** to 47 | 101000 | 101001 | 101010 | 101011 | 101100 | 101101 | 101110 | 101111 |
| **48** to 55 | 110000 | 110001 | 110010 | 110011 | 110100 | 110101 | 110110 | 110111 |
| **56** to 63 | 111000 | 111001 | 111010 | 111011 | 111100 | 111101 | 111110 | 111111 |

# Appendix H
## Engineering notes

### Graphic file structure
From a file structure standpoint, the following applies:

The first screen file name must be on LINE 34 of the text file....
The first of the 2 zeros must be on LINE 67 of the text file....
The number of lines in the file must be on LINE 101 of the text file (311 shown below)

The lines which put data on the screen must begin with increment 101, then the lines must be in numerical order.
The number of lines shown on line 101 (311) will always be one more than the increment in the last line of the file.