SOLUTIONS PLUS

By

Envirotronics, Inc.

Revision 3
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General information

The following explains the different symbols used on the *Solutions Plus*.

A raised button indicates modifiable data or leads to another screen.

Abbreviations used.

The following explains the various abbreviations used in the *Solutions Plus and with-in this manual*.

Ch.	Channel
Set Pt. or SP	Set Point
P.V.	Process Variable
Dev.	Deviation
STOP/RUN	Program run state
HOLD	Program is holding
Timed Start	Waiting to start at start time. (Program Setup)
Timed Stop	Program stopped at selected stop time. (Program Setup)

Alarms.

The following are the alarm abbreviations used in the *Solutions Plus*.

LOPS	Low Stage Oil Pressure Switch
LHTS	Low Stage Thermal Head Switch
LHLP	Low Stage Hi/Lo Pressure Switch
HOPS	High Stage Oil Pressure Switch
HHTS	High Stage Thermal Head Switch
HHLP	High Stage Hi/Lo Pressure Switch
WDOG	Communications Watch Dog
TROP	Enviromiser Oil Pressure Switch
TRHT	Enviromiser Thermal Head Switch
TRHL	Enviromiser Hi/Lo Pressure Switch
COL1	Circulator Motor Overload Station 1
COL2	Circulator Motor Overload Station 2
COL3	Circulator Motor Overload Station 3
POFF	Power Off
TSEN	Temperature Sentry
SP01 - SP08	Spare Alarms - Use varies by application

Starting the Solutions Plus

The Solutions Plus controller has 2 ways to start control. One method of starting control is by using manual controls (see: Manual Output Control page 8). The other method is by utilizing the Program Setup Mode and a program. (See: Programming the Solutions Plus Controller page 10).

Starting the System

Press the **Main Menu** button on the main screen. Then select the **START/STOP Menu** button. A window appears with three possible options. If any of these options are not present, it indicates that option is already in effect.

Start Manual Mode

Start System will start the system. It will now begin to achieve any manual set points that have been entered provided all system safeties are satisfied. (see: Manual Output Control page 8).

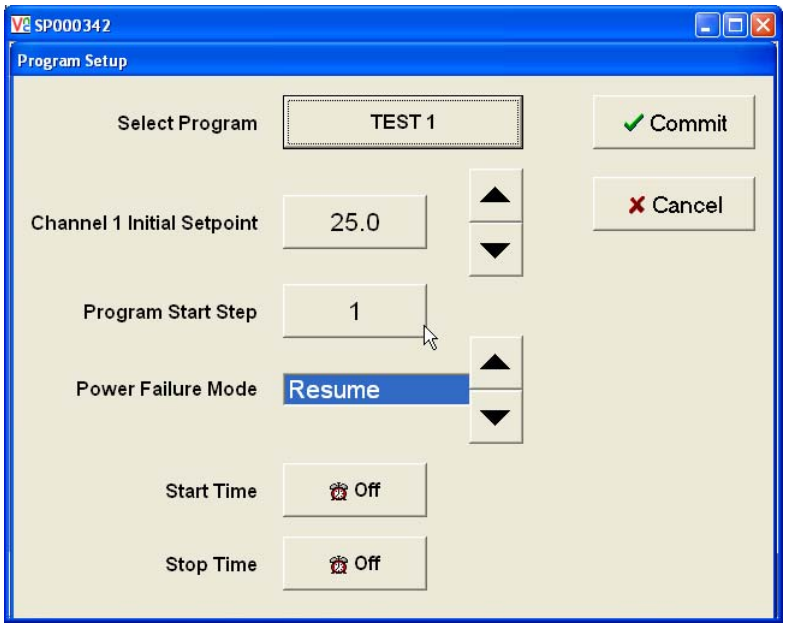
Start, via Program

Start Program allows you start a selected program. After selection is entered, the system will start the selected program provided that all system safeties are satisfied. Note that you must have a program selected to run.

Selecting a Program to Run

To choose a program to run you must be on the PROGRAM SETUP screen.

Press the **MAIN MENU** button on the lower left of the Solutions Plus touch screen and select **START/STOP** Menu button. At this point, you may select the **PROGRAM SETUP** button to enter the Program Setup screen.



This is the PROGRAM SETUP *screen. Its available options are described below.*

Select Program will give you a list of programs in memory. Enter the name of the program you wish to run.

Program Starting Step lets you assign a starting step number, other than step 1, to start at in the program.

Channel 1-10 Initial SetPoint. sets the initial setpoints of channels 1 – 10 respectively.

NOTE: The ABOVE initial setpoints take effect only once when the program has been started. It tells the Solutions Plus where the setpoint should be at the start of the program. These will typically be set at ambient.

Start Time Enabled allows you to enter a date and time at which you would like the program to actually begin controlling, if not immediately. This option will start both the system and the program. You must press the Start Program for the option to work correctly.

Start Time is the actual date and time the program should begin its cycles. This option will not be displayed unless item Start Time is set to ON.

NOTE: If Start Time is set to ON, then a valid time and date must be entered.

Stop Time Enabled allows you to enter a date and time that you would like the program and the system to stop.

Stop Time is the actual date and time you wish a running program to stop at. This option, will not be displayed unless item Stop Time is set to ON.

NOTE: If Stop Time is set to ON, then a valid time and date must be entered.

Power Failure toggles between STOP, HOLD, RESUME, and RESET, and tells the controller what to do when it recovers from a power failure. STOP, to stop the program, HOLD, to hold at the particular point of the program where the power failure occurred, RESUME, to continue the program where it stopped when the power failure occurred, and RESET, to restart the program at the Program Starting Step specified in the Program Setup

Stopping the Solutions Plus

Here is how you can stop the System.

Stop System Button

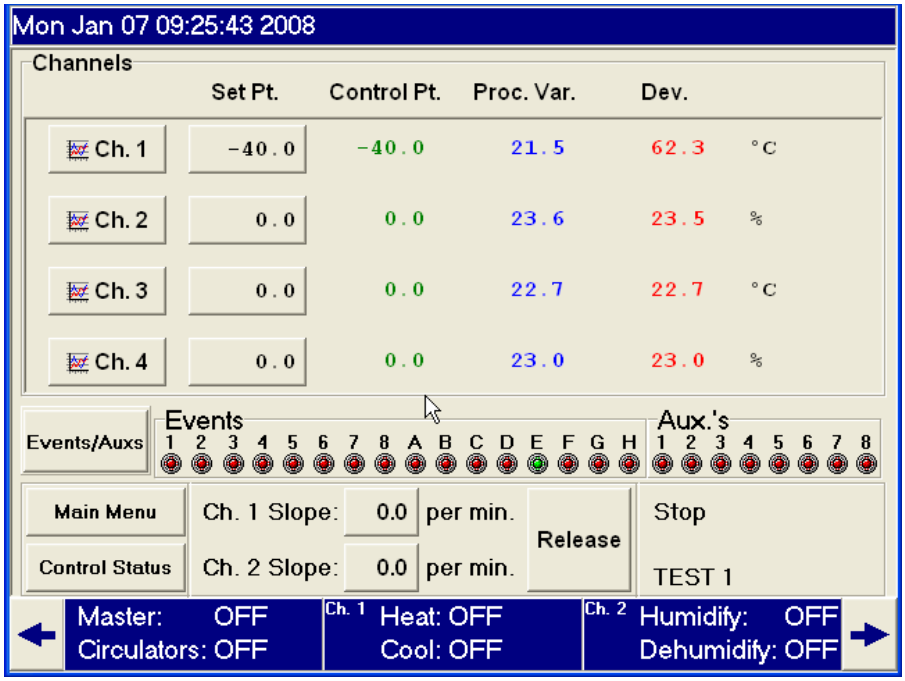
The **STOP SYSTEM** button will automatically stop both the system and a program.

The **STOP PROGRAM** button will stop the program that is currently running, but leave the system running at the programs last setpoints before the selection was made.

Hold Present Values is available when a program is running and will hold the program, and stop the step time clock.

Resume from Hold is available when a program is holding and will restart the program and the step time clock from the point where the program was put into hold.

Manual Output Control



This is the MANUAL CONTROL page

Manual Event Control

An event output is a simple on/off signal that can be used to operate a peripheral device. These are located on the PLC and are triggered from the Solutions Plus. The PLC outputs are rated at 2 amps @ 120 VAC. **NOTE:** Events are typically wired for 120 VAC operation at the factory.

Event 1
Event 2
Event 3
Event 4 Selecting an item by touching it switches its state between ON and OFF.
Event 5 A green light indicates ON and a red light indicates OFF.
Event 6
Event 7
Event 8
Event A
Event B
Event C
Event D
Event E
Event F
Event G
Event H

Aux. 1
Aux. 2 These allow you to turn Auxiliaries 1 through 8 ON or OFF.
Aux. 3
Aux. 4
Aux. 5
Aux. 6
Aux. 7
Aux. 8

NOTE: These options only require that the internal safeties to the individual output be set to their proper positions. Also, these can not be changed while a program is running.

Manual Setpoints

With the system started (see: Starting the System page 6) you may enter values respectively for all active channels. If all safeties are OK, the system will then try to achieve the manual setpoints you entered. **NOTE:** If a program is running, you will be warned that the setpoint can not be changed while a program is running.

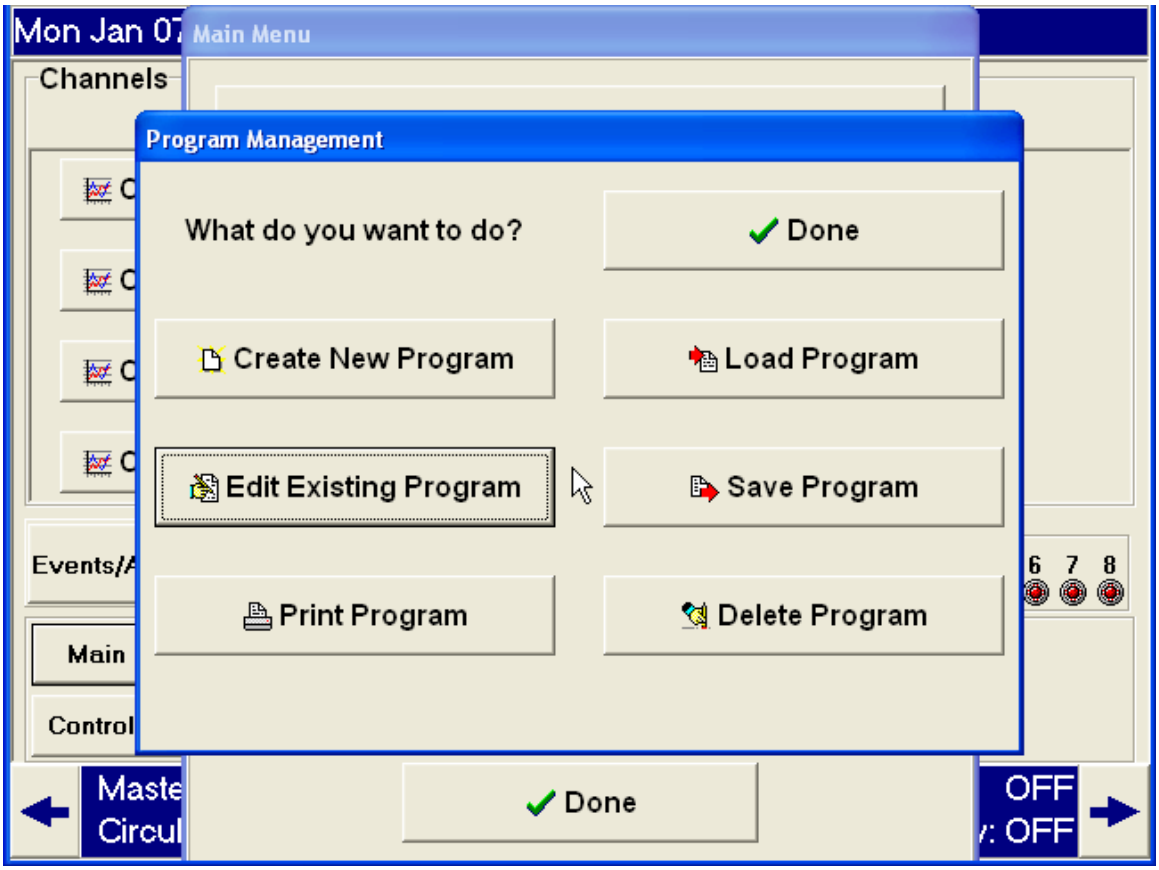
Slope

In manual mode you can set a ramp rate for temperature changes. This can be set in degrees per hour, minute, or second. The Hold/Release button allows you to hold a ramp at any time in manual mode.

NOTE: If the word Release is visible, the ramp is in HOLD mode and if Hold is visible, the ramp will continue normally,

Programming the Solutions Plus Controller

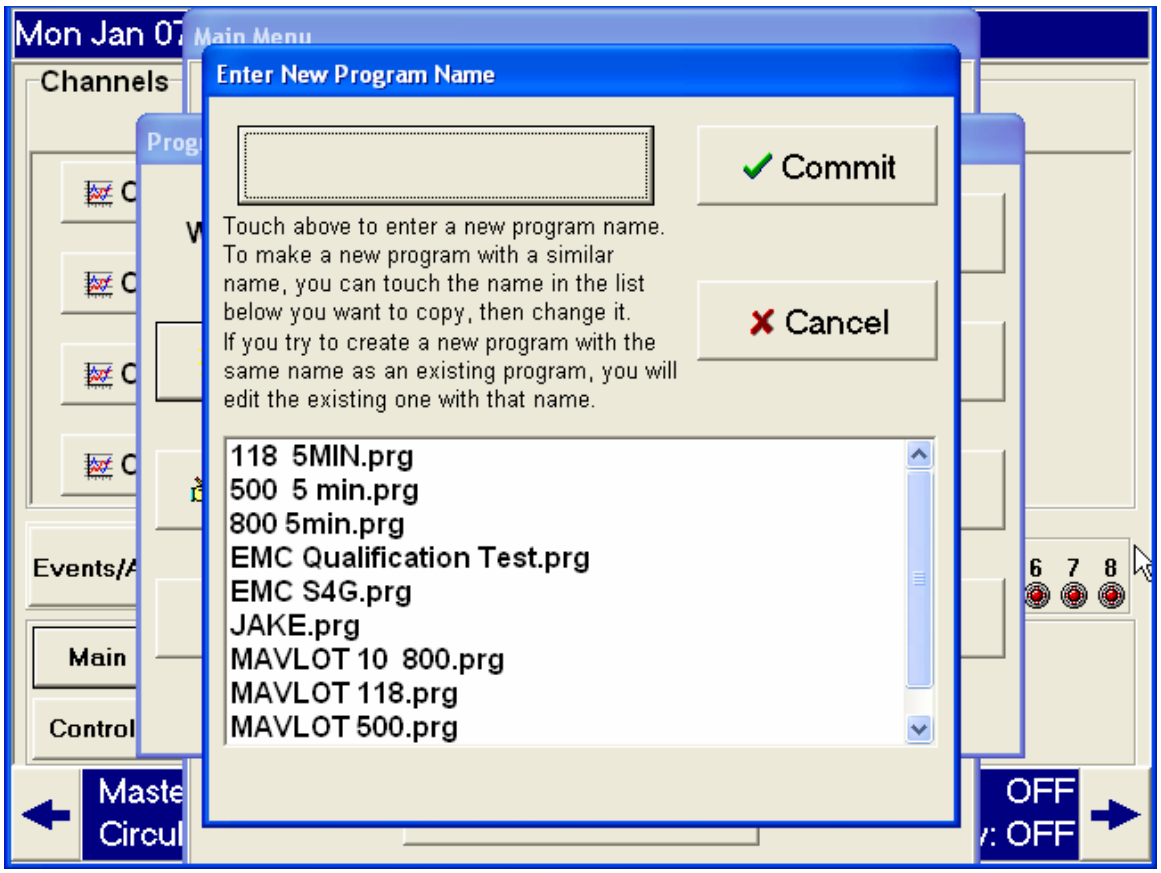
To Load, Save, or Edit a program, you must first be on the PROGRAM MANAGEMENT page.



To reach this screen, select the MAIN MENU button, then select the PROGRAM EDITOR button. Enter your level 2 password (see Passwords page 27).

Creating a New Program

Create New Program. Selecting this item will display a list of programs in memory. You may create a new program with a similar name by selecting one of them and modifying it, or you may create a new name by touching the bar at the top of the sub-screen. Once your name is created, select COMMIT to enter the edit program screen.

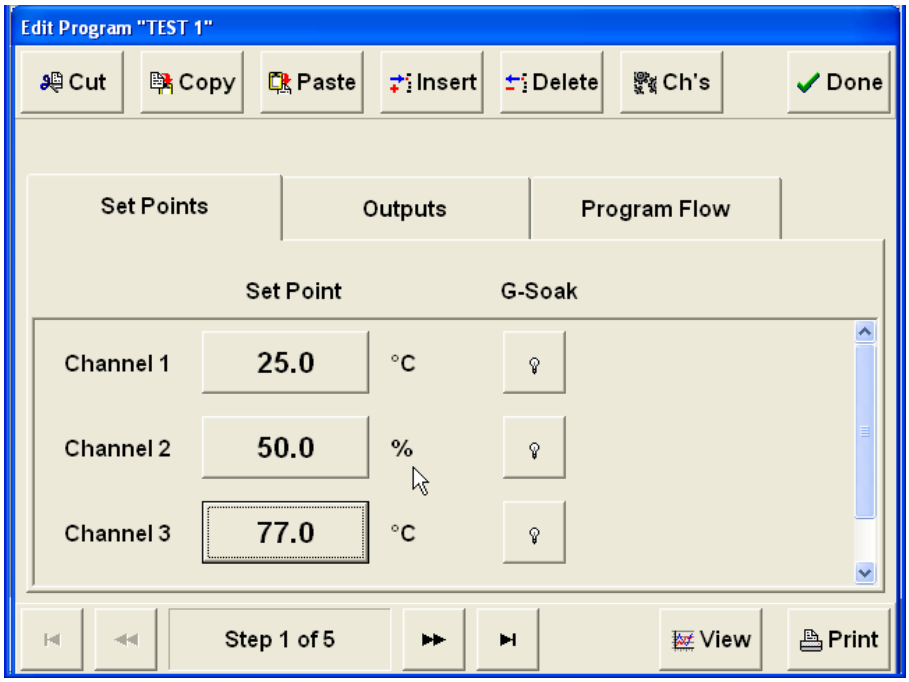


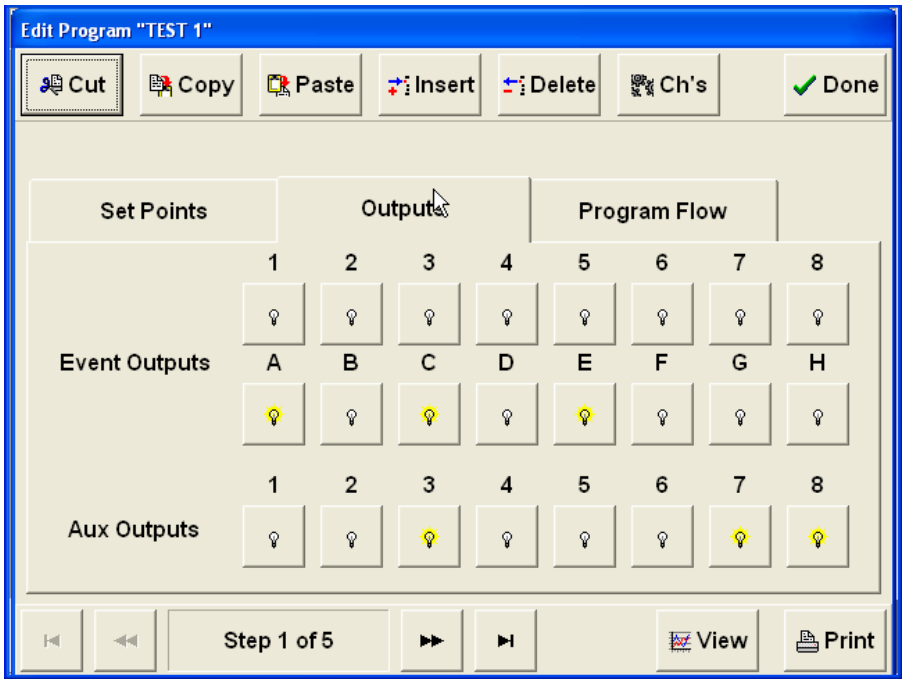
Editing a Program

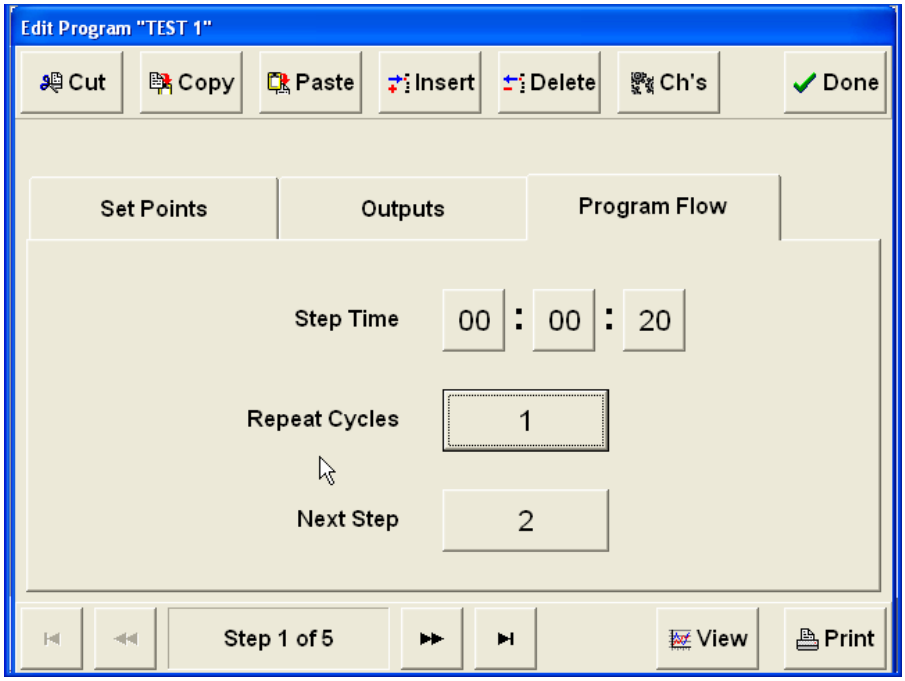
Edit Existing Program. Selecting this item will display a list of programs in memory. You may enter a program name from the list to edit it.

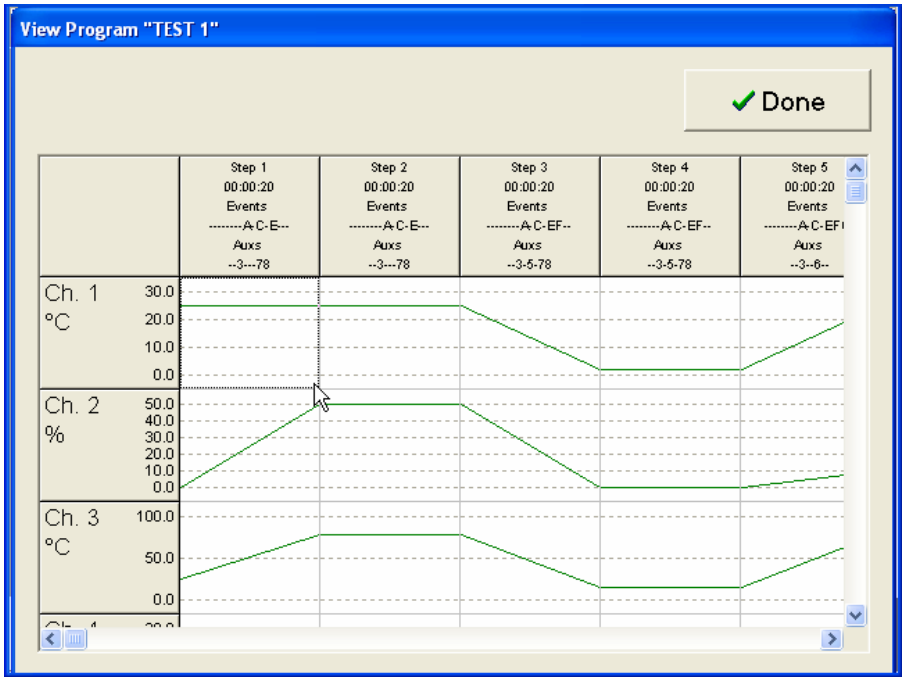
The Editor Screens:

The Editor Screen is made of 3 pages per program step as they are displayed below. You can move in between the 3 pages by touching the tabs (Set Points, Outputs, and Program Flow). If you are on a step and there is a step number greater than the one you are on, you may continue to use the arrow keys to move to those as well.






Edit Program "TEST 1"
Cut
Copy
Paste
Insert
Delete
Ch's
Done
Set Points
Outputs
Program Flow
Step Time
00 : 00 : 20
Repeat Cycles
1
Next Step
2
Step 1 of 5
View
Print


View Program "TEST 1"
Done
Step 1
00:00:20
Events
--------A-C-E---
Aux
--3---78
Step 2
00:00:20
Events
--------A-C-E---
Aux
--3---78
Step 3
00:00:20
Events
--------A-C-EF--
Aux
--3-5-78
Step 4
00:00:20
Events
--------A-C-EF--
Aux
--3-5-78
Step 5
00:00:20
Events
--------A-C-EF
Aux
--3--6--
Ch. 1
°C
30.0
20.0
10.0
0.0
Ch. 2
%
50.0
40.0
30.0
20.0
10.0
0.0
Ch. 3
°C
100.0
50.0
0.0

Edit Menu Commands

Removing an existing program step

There are 2 ways to remove a step from with-in a program. The first would be to delete it. Advance to the step you wish to remove and select **Delete**.

The second way will allow you to place the step into another part of the program. Advance to the step that you would like to move. Select **Cut**. This will place the step information into memory. You can then advance to the part of the program where you would like to place the step, and select **Paste.**

Copying a program step

To copy a program step, advance to the desired step and select **Copy**. The information from this step will be copied into memory. Advance to the step where the information is to be placed and select **Paste**. (See **Paste Step** later in this section).

Paste a program step

Paste will place a step from memory into the desired section of the program. If you have selected Cut or Copy (see above) then that step is loaded into memory. Advance to the area of the program that you would like to place the step. Select **Paste**. The step will then be copied to that position. This can be done as many times as desired. Once a step is loaded into memory, it will remain until either you exit the program or copy a different step into memory. NOTE: Only one step can be copied into memory at a time.

Insert a program step

Insert will allow you to insert a step between any two steps in the program. To use, advance to the point in the program where you would like to insert the step, select **Insert**.

Delete a program step

To delete a step, advance to the step that is to be deleted and select **Delete**. The step will then be deleted from the program. NOTE: Once a step is deleted, It can not be replaced with the Paste function.

Loading a Program

Load Program. Selecting this item when a data disk is in the floppy drive will display a list of programs stored on that disk. Enter the number of the program you wish to load. If you select a program name that has the same name as a program in memory you will be warned and asked if you wish to over write the program in memory or not.

Saving a Program

Save Program. Selecting this item with a data disk in the floppy drive will display a list of programs in the controller's memory. Select the name of the program you wish to save. If you enter a name and that program already exists on the disk, you will be warned and asked if you wish to over write the file on the disk or not.

Delete a Program

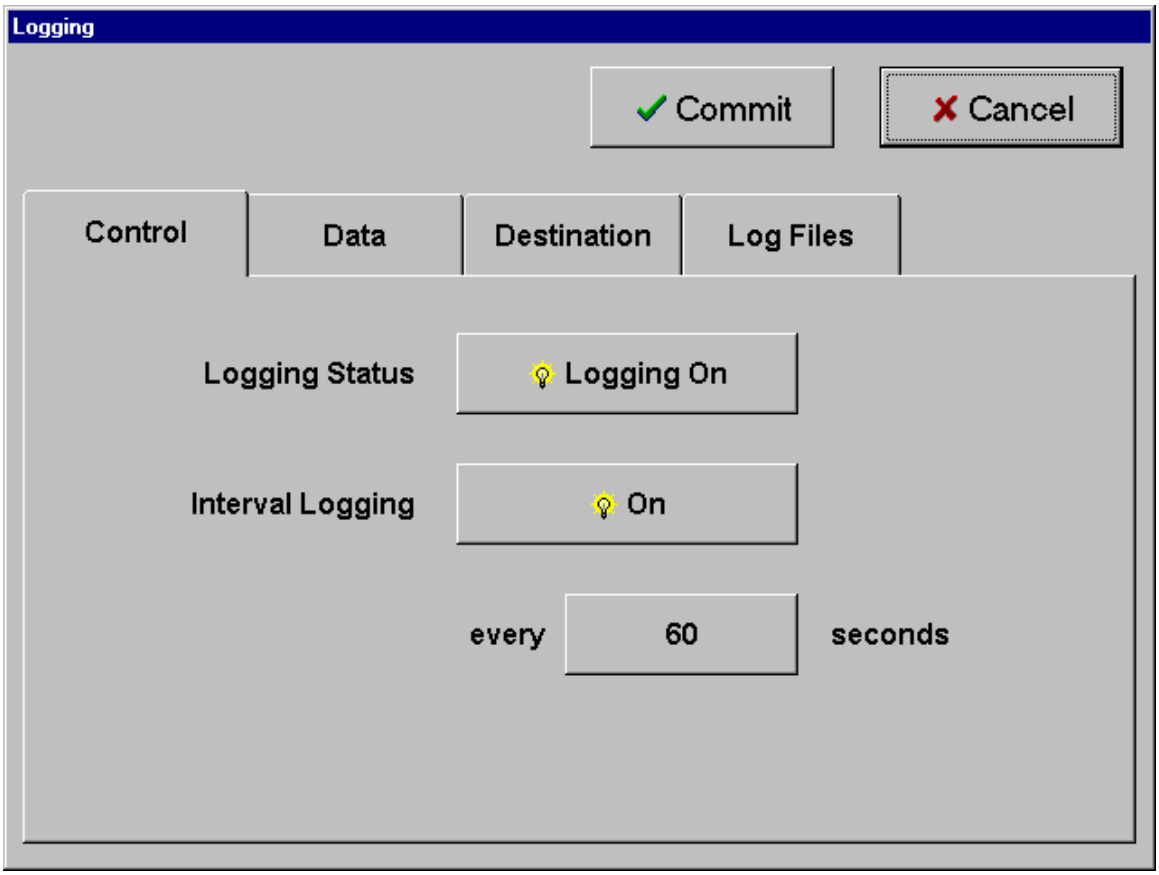
Delete Program. Selecting this item will display a list of programs in the controller's memory. Select the name of the program you wish to delete. Once you select COMMIT, you will be prompted “Are You Sure”. Selecting Yes will permanently delete the program.

View a Program

View. Selecting this item will display a graphical representation of your program. Select the view button on the lower right of the screen, and your program will be displayed in a graph format. This is a good way to determine if the program was written as expected.

System Logging

From the Main Menu, select Logging. Enter the level 1 password (see: Passwords page 27) when requested and the LOGGING screen will appear.



What You Can Log

Logging Data

Logging On tells the controller that you wish to log data.

When to Log Data

Interval Logging indicates that you wish to have the data logged only at set intervals of time. A NO here indicates that you wish to log data whenever that data, such as steps or events, change.

Set Logging Rate is the interval time between data samplings for logging. Requires that Interval logging on this menu be set to YES. The minimum setting is 60 seconds.
Log Event Outputs indicates that you wish to log the event outputs.

Log Aux. Outputs indicates that you wish to log the auxiliary outputs.

Log Steps indicates that you wish to log the step numbers of the program you are running.

Log Channel 1 - 10 PV & SP These indicate that you want the Process Variable and the Set-Point, of the respective channels, logged.

Logging Alarms

Trigger indicates that you wish to log alarms that get triggered.

Acknowledge indicates that you wish to log the acknowledgment of any alarms.

Return to Normal indicates that you wish to log the resetting of alarms.

Destination of Logged Data

Log To Memory. Will cause logging data to be written in the controller's memory.

Log to Printer will cause logging data to be written to a printer connected to the Solutions Plus.

Log Clearing, Printing, and Storage

Save Log will list the log files stored in memory and let you select one of log files to be saved to a diskette, CDRW, or USB Memory Stick.

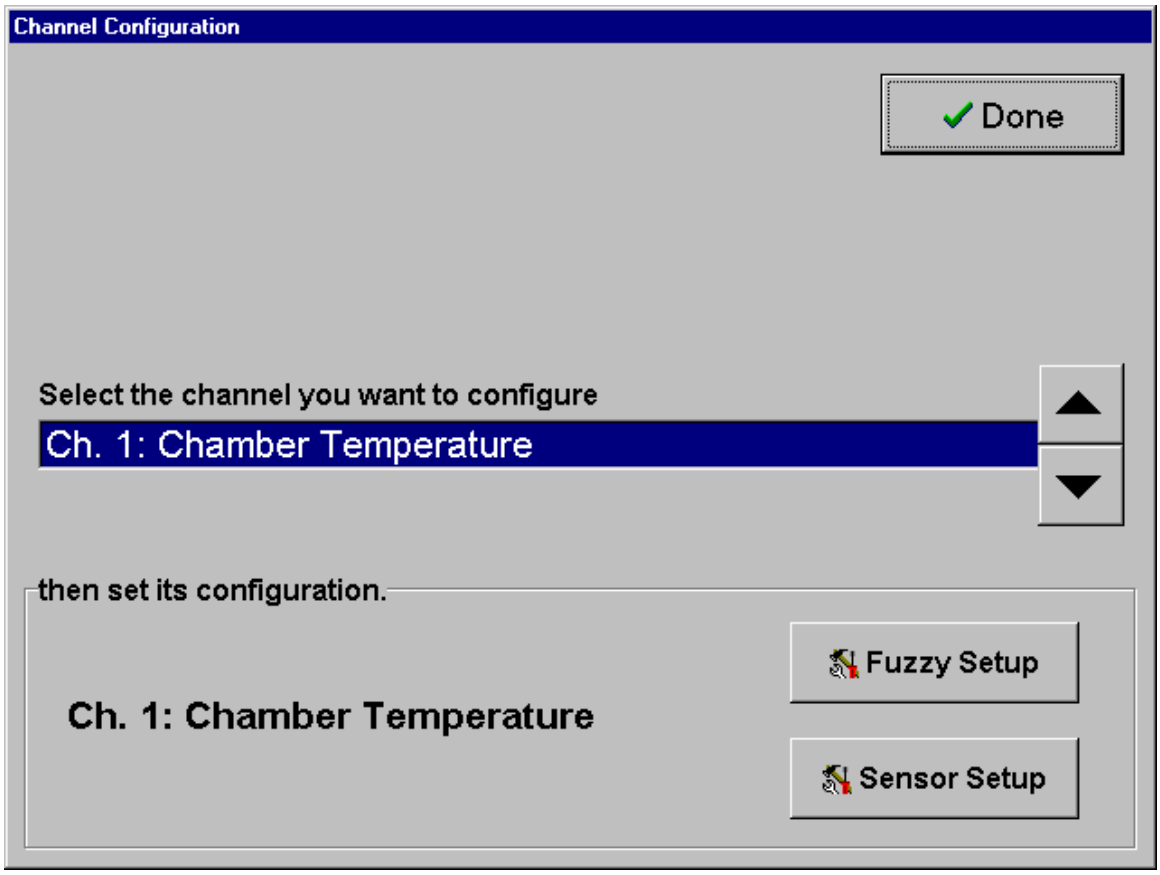
Print Log will list the log files stored in memory and let you select one of those files for printing to the printer port. The information will be printed in a standard text format.

Delete Log will erase a log file from memory. Selecting this item will display a list of the log files in memory. Enter the number of the log you wish to clear and press Delete Log.

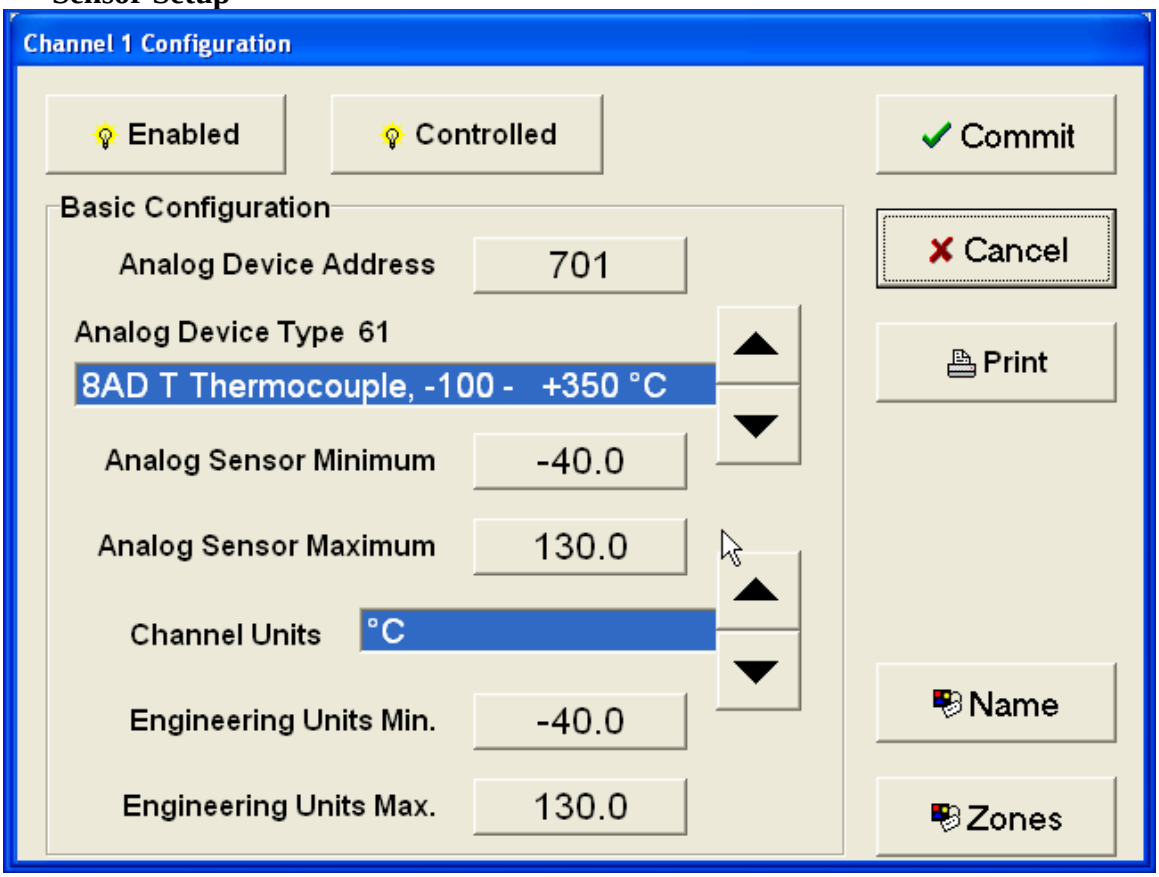
Configuring Analog Channels

Entering Channel Configuration

To get to the channel configuration menu, first enter the MAIN MENU. Now select Configuration. You will be prompted for the level 2 password, (see: Passwords page 27) enter it and you will be brought up to the CONFIGURATION MENU. Once here, select Channel Setup. You will be prompted for your level 3 password, (see: Passwords page 27) enter it and you will be brought to the Channel Configuration page. Using the scroll bar, enter the channel number that you wish to edit. These items are typically pre-set at the factory to match your installation.



Sensor Setup



Addressing Channels

Analog Device Address tells the Solutions Plus at which address the particular module for this channel resides. This needs to be the same address as that which the module itself was configured to.

Analog Device Type This will give you a list of possible configurations for the different analog modules. This tells the controller what type of module it is talking too and what range of data it can expect.

NOTE: The analog device type selected must match the installed analog module for proper operation. This is typically preset at the factory.

Range Setting & Data Scaling

Range Setting

Analog Sensor Minimum. Lets you set the lowest value that you should be receiving from the sensor type you have selected.

Analog Sensor Maximum. Lets you set the Highest value that you should receive from the sensor that you have selected.

NOTE: The values entered for items 1 and 2 must be between the allowable range of the sensor type.

Example: The Module type is a 6B11 configured to range 06, +/- 20 mA. You may enter 0 to 20, 4 to 20, or -20 to +20 as your analog range.

Displaying Units

Channel Units: This lets you choose from a list of 21 selections. This lets you label the data on the display.

Note: Changing the units selection does not automatically configure the engineering units.

Scaling

Engineering Units Minimum. This is for scaling received data. The number entered here will be the number displayed when the data received equals the Analog Sensor Min. value.

Engineering Units Maximum. This is for scaling received data. The number entered here will be the number displayed when the data received equals the Analog Sensor Max. value.

Example: You need Degrees F, The Module type is T thermocouple in degrees C, analog Min. and Max. set to 0 and 100, respectively. The module will send the 0 to 100 in degrees Celsius to the System Plus. To get degrees F, simply enter 32 and 212 for options 4 and 5 (32 F = 0 C, 212 F = 100 C) and your data is scaled before it is displayed. (See the conversion chart starting on page 48 of this manual.)

NOTE: The range set by options 4 and 5 determine the Min. and Max. input range for that channels setpoint.

NOTE: The values in 1 and 2 must correlate with the values in 4 and 5. A typical configuration for a two channel instrument will be as follows:

	Channel 1	Channel 2
Analog Device Address	[001]	[002]
Analog Device Type	16	05
	6B11 T Thermocouple, -100 - 400 °C	6B11 +/- 5V
Analog Sensor Min.	[-80.0]	[0.0]
Analog Sensor Max.	[180.0]	[5.0]
Channel Units:	01, °C	22, %RH(V)
Engineering Units Min	[-80.0]	[0.0]
Engineering Units Max	[180.0]	[100.0]

To display °F, channel 1 engineering units min. will change to -112.0 and engineering units max. will change to 356.0. The channel units would then be set to 02, °F. See the charts starting on page 48 for temperature conversions.

Channel Setup Notes

Module	Hex Code	Plus Addr.	Description
6B11	0	0	+/-15mV
6B11	1	1	+/-50mV
6B11	2	2	+/-100mV
6B11	3	3	+/-500mV
6B11	4	4	+/-1V
6B11	5	5	+/-5V
6B11	6	6	+/-20mA
6B11	0E	14	J Thermocouple 0 to 760 C
6B11	0F	15	K Thermocouple 0 to 1000 C
6B11	10	16	T Thermocouple -100 to 400 C
6B11	11	17	E Thermocouple 0 to 1000 C
6B11	12	18	R Thermocouple 500 to 1750 C
6B11	13	19	S Thermocouple 500 to 1750 C
6B11	14	20	B Thermocouple 500 to 1800 C
6B12	7	7	+/-50V
6B12	8	8	+/-10V
6B12	9	9	+/-5V
6B12	0A	10	+/-1V
6B12	0B	11	+/-500mV
6B12	0C	12	+/-150mV
6B12	0D	13	+/-20mA
8AD		*	T Thermocouple -148 to 662 F
8AD		*	J Thermocouple -148 to 1112 F
8AD		*	K Thermocouple -148 to 2192 F
8AD		*	T Thermocouple -100 to 350 C
8AD		*	J Thermocouple -100 to 600 C
8AD		*	K Thermocouple -100 to 1200 C
8AD		*	+/- 20,000 uA (250 uA)
8AD		*	+/- 20 mA (5.0 uA)
8AD		*	+/- 20 mA (2.50 uA)
8AD		*	4,000 uA to 20,000 uA (2.0 uA)
8AD		*	4 to 20 mA (4.0 uA)
8AD		*	4 to 20 mA (2.0 uA)
8AD		*	+/- 10,000 mV (1 mV)
8AD		*	+/- 10V (2.5 mV)
8AD		*	+/- 10V (0.63 mV)
6B13	20	32	Pt,-100 to 100 C, .00385
6B13	21	33	Pt, 0 to 100 C, .00385
6B13	22	34	Pt, 0 to 200 C, .00385
6B13	23	35	Pt, 0 to 600 C, .00385
6B13	24	36	Pt, -100 to 100 C, .003916
6B13	25	37	Pt, 0 to 100 C, .003916
6B13	26	38	Pt, 0 to 200 C, .003916
6B13	27	39	Pt, 0 to 600 C, .003916
6B13	28	40	Ni, -80 to 100 C
6B13	29	41	Ni, 0 to 100 C
6B13	2A	42	Cu, 0 to 120 C, (10 Ohm @ 25 C)

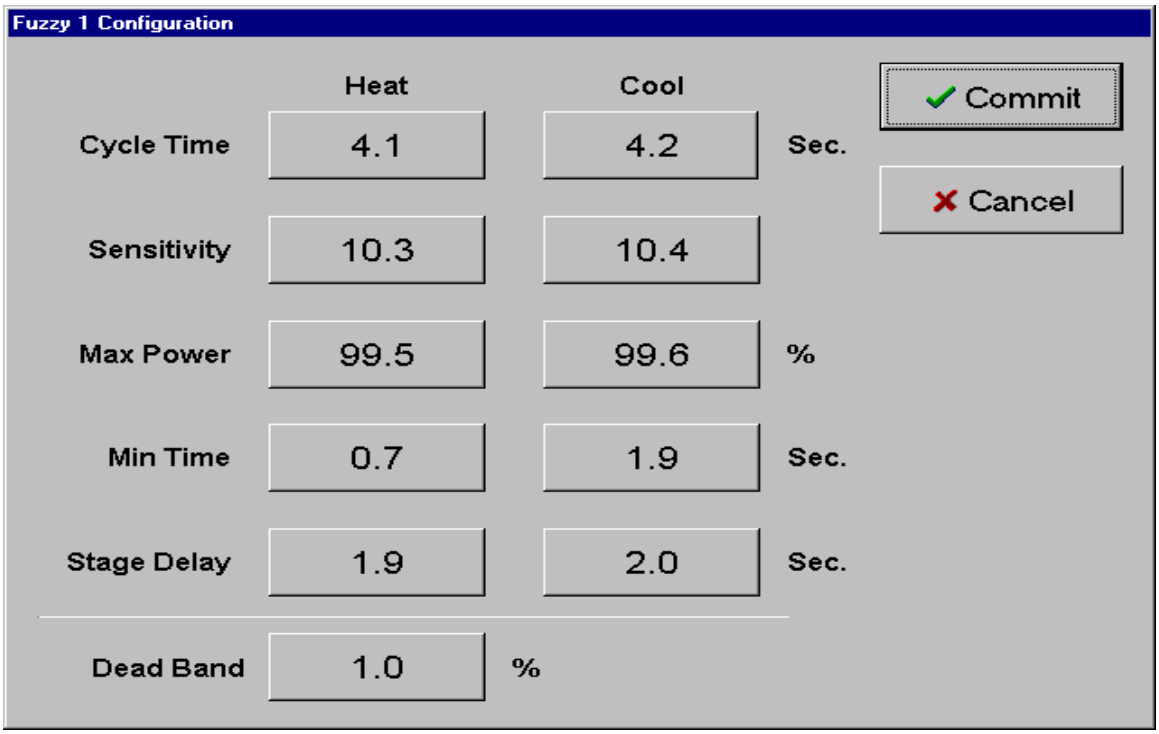
The chart on the preceding page shows the different analog input types used by the Solutions Plus.

The Analog Devices modules used have a hex code for there initial setup that does not coincide with the codes used in the Solutions Plus. For example, if you use a type "T" thermocouple, the hex code on the Analog Devices module 6B11 would be 10. You would select number 16 in the Solutions Plus analog device type selection page.

If the instrument is equipped with the 8AD module connected to the PLC rather than the Analog Devices, then the addresses are by channel. Channel 1 address will be 701 and each following channel will increment this address by one. For example, channel 3 will have an address of 703.

Fuzzy Logic Control

Fuzzy Logic is what the Solutions Plus uses in place of traditional PID control. To set the parameters for the Fuzzy Logic analysis routines, go to the MAIN MENU. Select CONFIGURATION and enter your level 2 password. (see Passwords page 27). Select CHANNEL SETUP, and enter your level 3 password. (see Passwords page 27). At this point, you can select which channel you would like to edit, then select FUZZY SETUP to reach the screen pictured below.



This is the Fuzzy Setup screen used to adjust how the Fuzzy routines are to analyze and respond to received data.

NOTE: The numbers used in the above referenced screen are pictorial only. Consult factory for the actual settings for your equipment.

Fuzzy Configuration

(1) Heat Cycle Time defines the maximum ON to OFF to ON time window in which heating can be called for.

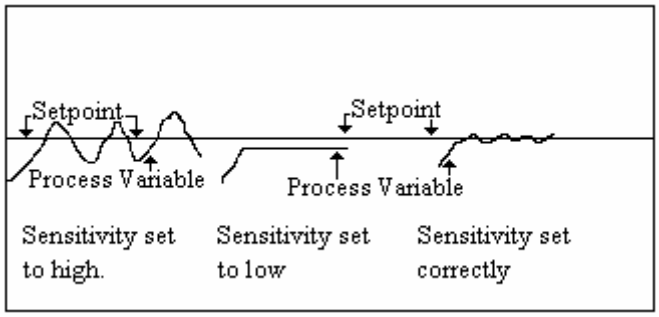
(2) Cool Cycle Time defines the maximum ON to OFF to ON time window in which cooling can be called for.

NOTE: For most processes, a fast cycle time (less than 5 seconds) will produce a better control of loads with a fast response time. A typical setting is 3 to 4 seconds. The allowable settings are 1 to 20 seconds.

(3) Heat Sensitivity determines the responsiveness the controller uses to reach a channel setpoint when heating is required. A typical setting is a value of 10 to 15.

(4) Cool Sensitivity determines the responsiveness the controller uses to reach a channel setpoint when cooling is required. A typical setting is a value of 10 to 15.

The sensitivity setting determines how often the Solutions Plus compares the setpoint and the process variable and acts on the difference. By entering a value in either of the sensitivity settings, the Solutions Plus will compare the values and, based on the settings, will make adjustments as required. The larger the value, the more often comparisons are made for adjustments. The allowable settings are 0 to 100.



NOTE: These values are typically factory set and usually do not need adjustment. If the product load changes, and a change in performance is seen, an adjustment may be made. Caution should be taken to ensure that overshoot is kept to a minimum. A value to large in item 3 or 4 may cause oscillation of temperature and a longer period of time to obtain the setpoint. A value too low may cause the controller to not be able to reach its setpoint.

NOTE: The following items may not apply to all installations.

(5) Heat Max. Power is used to adjust the maximum amount of on time in terms of a percentage of the Heat Cycle Time. The allowable settings are 0 to 100 percent.

(6) Cool Max. Power is used to adjust the maximum amount of on time in terms of a percentage of the Cool Cycle Time. The allowable settings are 0 to 100 percent.

NOTE: The maximum power setting uses the cycle time to determine the maximum allowable on time per cycle. With the cycle time set at 4 seconds, and the max. power set at 50%, the output will be on for 2 seconds and off for 2 seconds. The output will continue to pulse at this rate until the set point is reached or until the system has reached an equilibrium of heat loss/gain. The output is limited to this setting only when the demand requirement is longer than the limit. If the demand is 1 second, then the output will be on for 1 second. If the demand is 3 seconds, then the output will be on for 2 seconds, off for 2 seconds, then on for 1 second.

(7) Heat Min. Time is the minimum amount of time that the heaters will be activated when they receive an input signal. The allowable settings are 0 to 20 seconds. When this setting is enabled, the set point may be ignored. The output will remain on for the duration of the time specified regardless of the set point. Once the time has expired, the set point will again be checked and the appropriate output will be enabled.

(8) Cool Min. Time is the minimum amount of time that the cooling solenoids will be activated when they receive an input signal. The allowable settings are 0 to 20 seconds. When this setting is enabled, the set point may be ignored. The output will remain on for the duration of the time specified regardless of the set point. Once the time has expired, the set point will again be checked and the appropriate output will be enabled.

(9) Heat Stage Delay is the amount of time the controller waits between the activation of the first stage of heaters and the second stage of heaters. The allowable settings are 0 to 20 seconds.

(10) Cool Stage Delay is the amount of time the controller waits between the activation of the first stage of cooling and the second stage of cooling. The allowable settings are 0 to 20 seconds.

(11) Dead Band represents the percent of the temperature range above and below the set point in which heating or cooling is not called for. The temperature must go out of this range in order for heating or cooling to be called for. The allowable settings are 0 to 100 percent.

Maintenance

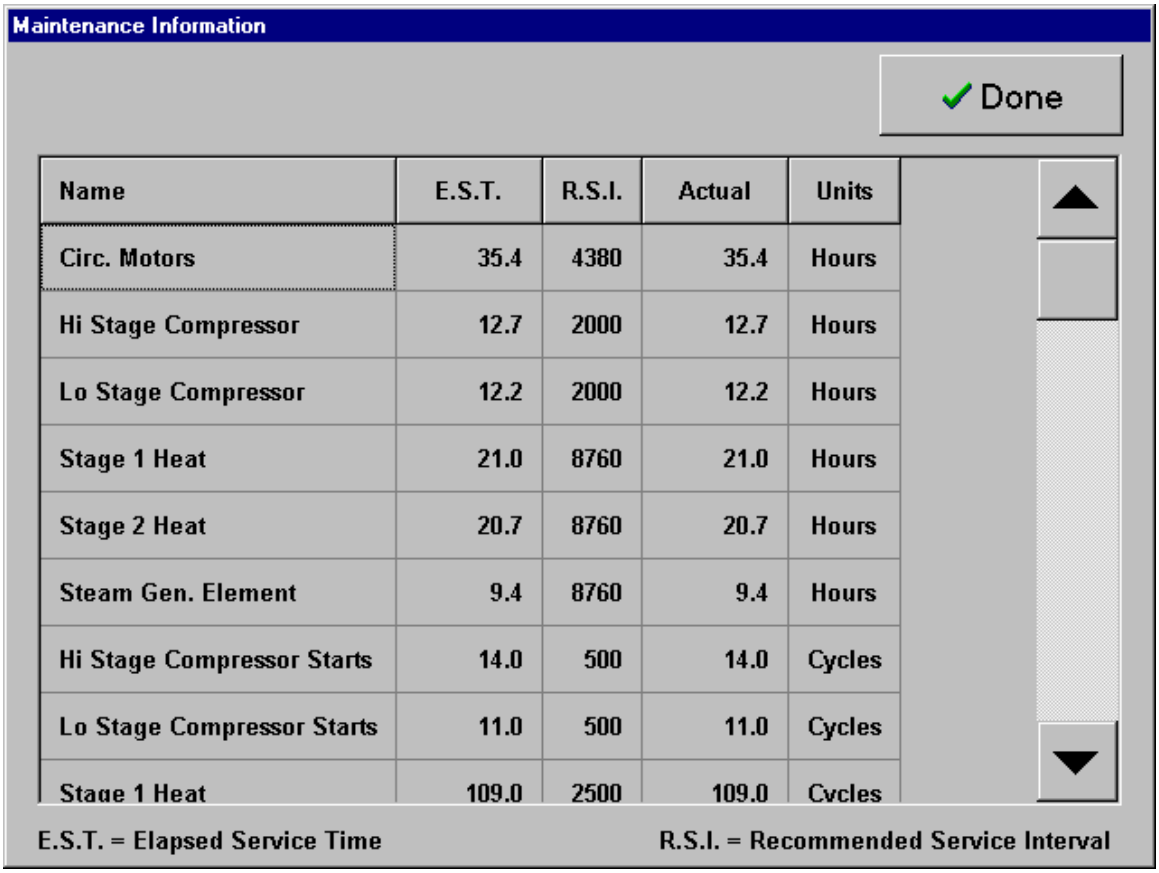
The maintenance system of the Solutions Plus Controller allows you to keep track of the amount of time or the number of cycles a component has endured in the operation of the equipment.

Maintenance List Setup

To select items for maintenance tracking, enter the MAIN MENU. Then select configuration and enter your level 2 password (see: Passwords page 27) to enter the CONFIGURATION menu. Now select MAINTENANCE SETUP to enter the MAINTENANCE SETUP screen.

Maintenance Information

Enter the MAIN MENU. Select Maintenance to enter the MAINTENANCE INFORMATION screen. This displays the actual use hours for the equipment selected in the Maintenance List Setup.



System Alarms

Alarm Configuration

Enter the MAIN MENU. Select CONFIGURATION then enter the level 2 password (see: Passwords page 27). Select ALARM SETUP on the CONFIGURATION menu to enter the SYSTEM ALARMS CONFIGURATION.

Selection of Alarms

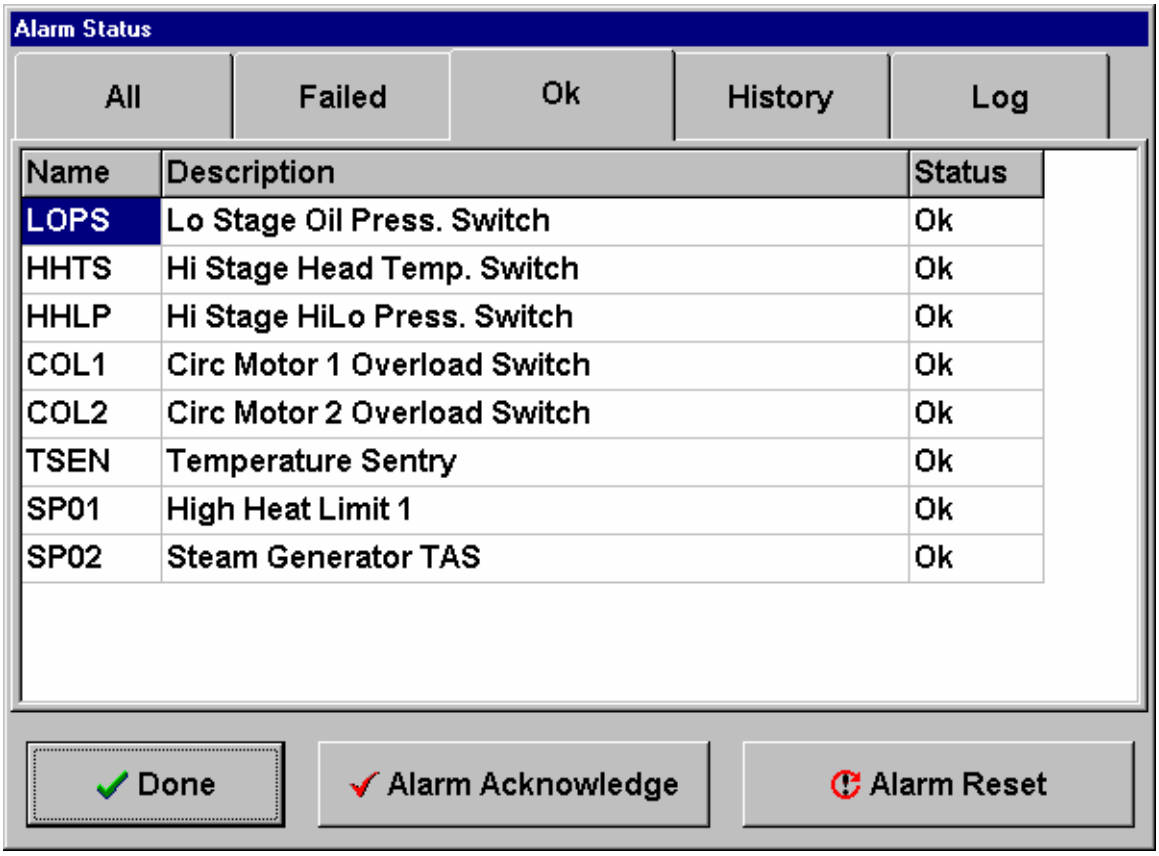
System Alarm Selection will display a scroll bar of all available alarms and let you choose which one will be looked for. An ON setting will cause the controller to acknowledge that particular alarm, while an OFF will cause the controller to ignore it.

NOTE: If an alarm is disabled in the Solutions Plus, it will not necessarily allow the system to operate. Additional safeties have been built in to protect the equipment.

In the Event of an Alarm

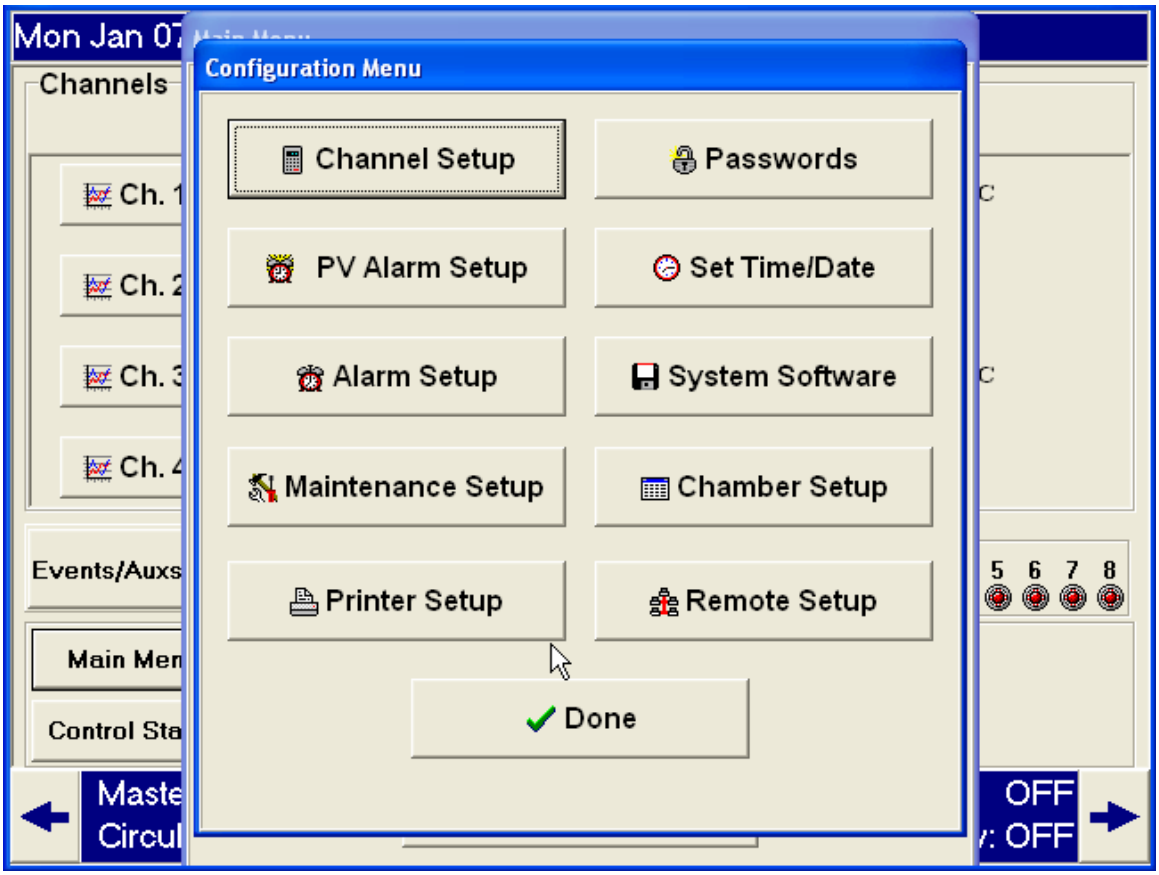
Alarm Occurs

If an alarm is triggered, the word ALARM will be displayed in the upper right corner of the screen. Touching this will bring you to the **ALARM STATUS** page. Here you can view all of the active alarms. The alarm that has failed will be displayed in red. **ALARM ACKNOWLEDGE** will acknowledge the alarm and quiet any audible alarm that may be active, but will not reset the alarm. Once the alarm has been satisfied (returned to normal) the **ALARM RESET** key will reset the internal alarms and allow the system to function normally again. Pressing the **DONE** button again will bring you back to the diagnostic menu at which you entered the alarm display mode.



General Configurations

This section will deal with other aspects of the Solutions Plus CONFIGURATION MENU that is not covered in previous sections. The CONFIGURATION MENU is shown below.



Passwords

This will bring you to a screen in which you can enter the level 1 through level 4 passwords. The factory default passwords are 48 through 51 respectively. NOTE: If the level 4 password has been lost, you may enter this screen by using a standard 101 or 104 key keyboard. Power off the Solutions Plus and connect the keyboard to the connector on the bottom of the instrument (This is a PS2 type connector). Apply power to the Solutions Plus and once the system has "booted-up", use the touch screen to reach the password page. Once here, using the keyboard, enter the password ENVIRO. This will allow you access to the password screen to view or change the current password. Once complete, again power off the Solutions Plus, and unplug the keyboard. You may now apply power to the Solutions Plus and access all areas via the passwords that were set.

Set Time and Date

This item will let you do the following

(1) Set Time to set the system clock time.
(2) Set Date to set the system date.
(3) Time zone to set the time zone.

System Software

Here is where you can update the controller software. Be sure to have the appropriate disk in the floppy drive before you enter any selections. Note that the current version of the Controller Software is shown at the lower middle of the screen.

System Software Upgrade

The following step by step instructions will assist your in upgrading your Solutions Plus controller software.

1. From the program menu, you must press the **Main Menu** to enter the main menu area.

2. From the main menu, you must then enter the **CONFIGURATION MENU**. You must then enter your level 2 password. (see Passwords page 27).

3. Once in the configuration menu, you must then select **System Software** and enter the level 3 password to enter the system software section.

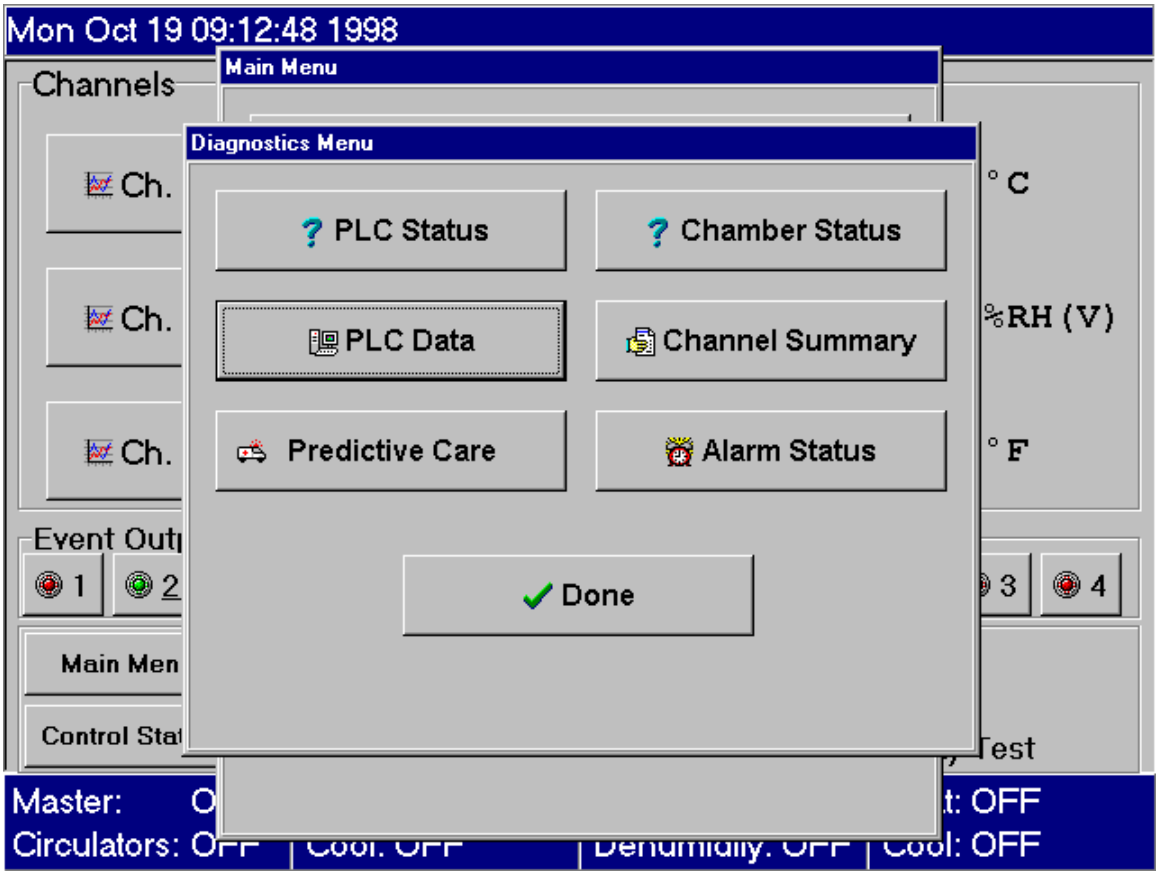
4. Insert the supplied diskette into the disk drive and select **UPDATE CONTROLLER SOFTWARE** (Located at the bottom of the screen). This will start the transfer from the disk to the controller.

5. When the transfer is complete, the Solutions Plus will restart itself.

6. Remove the diskette from the disk drive and store it in a safe place.

Diagnostics

This section deals the diagnostics and functional validation, of the Solutions Plus Controller, that does not fall into the previous areas. To access these functions, you must go to the MAIN MENU to enter the DIAGNOSTICS MENU shown.



PLC Status

This item, when selected, will display an informational page containing status information on the PLC. It will display Battery condition and the point at which it will fail, the number of power failures, the scan time average as well as the maximum and minimum scan times. Status of the real time clock of the PLC as well as the amount of memory and the memory type. It will also show the list of the PLC's 10 Error Status Registers.

PLC Data

This will let you examine the contents of the PLC registers. You can choose the type of register by selecting one of the following followed by the number of the particular register you wish to view. This will create a list on the display as you select more and more registers.

(1) M	Memory Registers
(2) T	Timer Registers
(3) C	Counter Registers
(4) D	Data Registers
(5) X	PLC Input Status
(6) Y	PLC Output Status
(7) S	PLC State Registers

Predictive Care

This item will display an informational page on the chamber. You may select High Stage Compressor, Low Stage Compressor, or Enviromiser (depending on system configuration). Each selection will allow you to view current values for each compressor as well as historical data for discharge temperatures, oil pressures, suction pressures, and discharge pressures.

Chamber Status

This item will display a screen depicting the refrigeration system for your chamber. It will display all current values of the refrigeration system.

Channel Summary

This item will give a list of what the channels are configured as. It will display the channel numbers, address of the analog module for each channel, the analog device type and its units, the sensor range settings, and the engineering units range.

Alarm Status

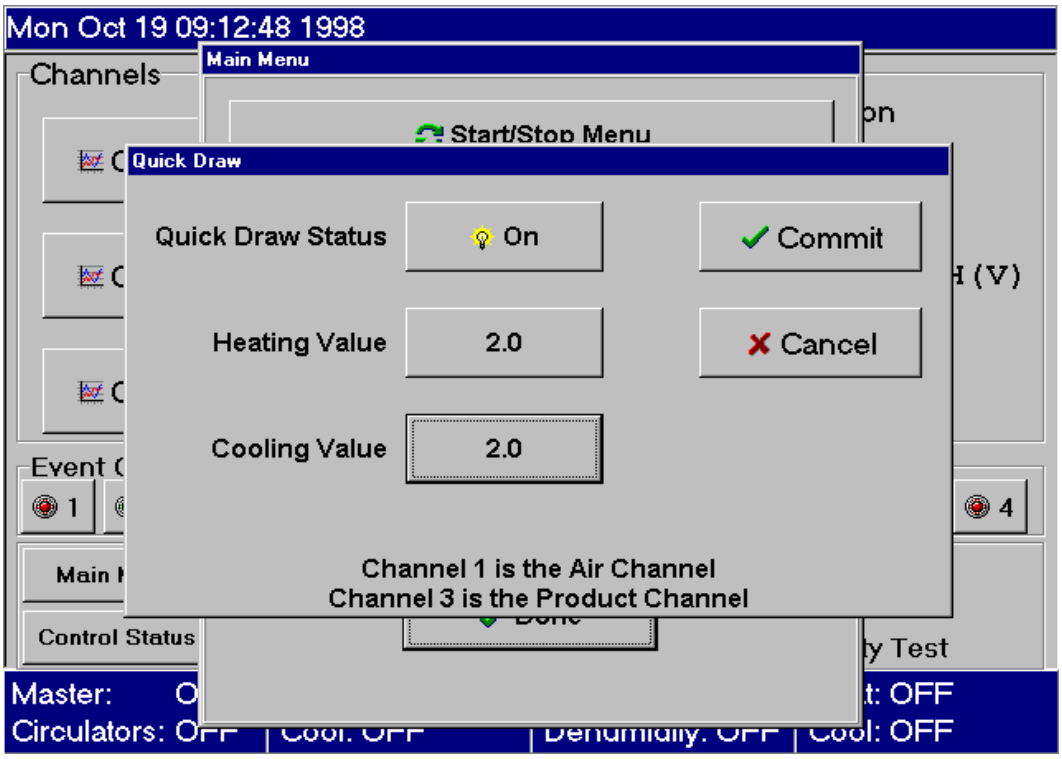
This item will give you a screen to view the status of all the enabled system alarms. You can select All, Failed, OK, History, and Log.

Quick Draw (Optional)

This section will deal with the Quick Draw option of the Solutions Plus. Quick Draw is designed to control product temperature. It also aids in allowing faster temperature change rates of the product

Quick Draw

This will bring you to a screen in which you can use items 1, 2, and 3 to enter the Quick Draw Status and Values.



Quick Draw Status Toggles Quick Draw on/off.
Heating Value Sets the heating value.
Cooling Value Sets the cooling value.

When Quick Draw is enabled, the maximum allowable air temperature is set in channel 1 and the desired product temperature in channel 3. This allows the chamber air to go to a specified maximum value in order for the product to reach the desired setpoint as fast as possible.

Example: Desired product temperature = 65° C - Maximum air temperature = 85° C. Enter 85°C for the channel 1 setpoint and 65 for the channel 3 setpoint. Turn Quick Draw ON. The chamber air will ramp to 85° C and maintain this temperature until the product reaches 65°C. At this time, the chamber air will reduce in temperature while maintaining the product temperature. The Heating Value and the Cooling Value will typically be set at 2° C.

Quick Draw uses the heating and cooling values to determine the ratio of heating and cooling required to achieve and maintain the product temperature. When the product is with-in the setting of the heating or cooling value, the Quick Draw Air setpoint will begin to move towards the product setpoint. This will allow the air temperature to close in towards the product desired setpoint.

To disable Quick Draw in a program step, set both channel 1 and channel 3 setpoints to the same value.

Definitions:

SP_{air} = Original air channel setpoint
PV_{air} = Air channel process variable
SP_{prod} = Product channel setpoint
PV_{prod} = Product channel process variable
QD_{air} = Quick Draw air setpoint

Heating Rule:

The Heating Rule is used when $SP_{air} > SP_{prod}$.

Delta = SP_{air} - SP_{prod}
Threshold = SP_{prod} - Heating Value
Ratio = Delta / Heating Value

If PV_{prod} is below Threshold, QD_{air} is the same as SP_{air}.

When PV_{prod} goes above Threshold, SP_{air} is decreased by Ratio degrees for each degree that PV_{prod} is above Threshold.

Example: SPair = 85.0, SPprod = 65.0 and Heating Value = 2. Delta: 85.0 - 65.0 = 20, Threshold: 65.0 - 2 = 63, Ratio: 20/2 = 10. When the PVprod is greater than 63.0, the SPair is reduced by a ratio of 10. When PVair reaches 63.0 then SPair is reduced to 75.0. When PVair reaches 64.0 then SPair is reduced to 65.0.

Cooling Rule:

The Cooling Rule is used when $SP_{air} < SP_{prod}$.

Delta = SP_{prod} - SP_{air}
Threshold = SP_{prod} + Cooling Value
Ratio = Delta / Cooling Value

If PV_{prod} is above Threshold, QD_{air} is the same as SP_{air}.

When PV_{prod} goes below Threshold, SP_{air} is increased by Ratio degrees for each degree that PV_{prod} is below Threshold.

Example: SPair = -85.0, SPprod = -65.0 and Cooling Value = 2. Delta: -65.0 - -85.0 = 20, Threshold: -65.0 + 2 = -63, Ratio: 20/2 = 10. When the PVprod is less than 63.0, the SPair is reduced by a ratio of 10. When PVair reaches -63.0 then SPair is reduced to -75.0. When PVair reaches -64.0 then SPair is reduced to -65.0.

Remote Communications

What is it?

The Envirotronics Solutions Plus controller utilizes a COMMAND mode in which a remote source may send commands to the Solutions Plus and it will respond with requested data, status, or an error if one has occurred.

Communications Setup

To set the default mode of remote communications, first locate the MAIN MENU on the Solutions Plus. Then select the configuration button. You will be asked for the level 2 password. (see: Passwords page 27). Enter the password and you will be given the CONFIGURATION MENU. Then select REMOTE SETUP followed by the level 3 password (see: Passwords page 27) and you will enter the COMMUNICATIONS SETUP.

Serial Port Setting

(1) Serial Port Tells the Solutions Plus which serial port it should use. (Note: This is pre-wired at the factory for COM 2)

(2) Baud Rate lets you set the speed at which the Serial Port talks. You may select between 110, 300, 600, 1200, 2400, 4800, 9600, 19200, 28800, 38400, 56000, 57600, 115200, 128000, and 256000 Baud rates.

(3) Parity tells the controller how to send and receive the actual data bits, whether there should always be an EVEN number of bits, ODD number of bits, or a don't care (NONE) of the parity of the bits.

(4) Data Length sets the number of bits that the serial port will use for actual data. This is a toggle between 7 and 8 bits.

(**5) Stop Bits** sets the number of bits that the serial port will use to signal the end of a data byte. This is a toggle between 1 and 2 bits

Handshaking

(5) Flow Control lets you determine the type of handshaking that the controller will use with the remote host computer. This option toggles between Xon/Xoff software handshaking, RTS/CTS hard wired handshaking, or NONE.

Remote Command Set

Here we will show you the commands available to you via the remote COMMAND mode. This section is divided into 7 sections listed below.

Program & System Control
Manual Control
Program Menu Commands
Program Setup
Alarm Control
Miscellaneous
Editing

In this section, the following conventions are observed:

monospace bold words are sent to the controller exactly as shown

italicized represent a variable value to be sent

Boolean can be any of the following:

true
yes
on
false
no
off

true, yes, and on are interchangeable, as are false, no and off

channel	represents a valid channel number
month, day, year	represents a 1 or 2 digit number corresponding to the desired value. Note that this is different from the front panel interface, where all 4 digits must be entered for years
hour, minute, second	represents a 1 or 2 digit number corresponding to the desired value.
alarm	represents a 4-character abbreviations as used on the various alarm pages.

All commands are case-insensitive. You may use any mix of upper and lower case characters in your commands.

Program & System Control

These commands control the starting and stopping of the program and system. They correspond to the options available when the START and STOP keys on the front panel are pushed.

emergency stop	has the same effect as pressing the STOP SYSTEM button.
hold program	puts the running program on hold. This is the same as pressing HOLD PRESENT VALUES.
resume program	restarts a holding program.
start program	starts the selected program.
start system	starts the system.
stop program	stops the running program.
stop system	stops the system.

Manual Control

set setpoint *channel* **=** *value*	sets the setpoint for a specified channel. Example: set setpoint 2 = 23.5
read setpoint *channel*	returns the specified channel's setpoint.
read pv *channel*	returns the specified channel's P.V.
read deviation *channel*	returns the specified channel's deviation.
set event *event_num* **=** *Boolean*	sets the specified event to the specified state. Example: set event 7 = false
read event *event_num*	returns the current state of the specified event as either "ON" or "OFF".
read events	returns a string containing the state of all events as displayed on the PROGRAM MENU page with "-" for off and the corresponding event number for on.
set aux. *aux_num* **=** *Boolean*	sets the specified aux. to the specified state. Example: set aux. 1 = on
read aux. *aux_num*	returns the current state of the specified aux. as either "ON" or "OFF"
read auxs	returns a string containing the state of all auxs as displayed on the PROGRAM MENU page with a "-" for off and the corresponding number for on.

set slope *channel* **=** *value* sets the slope units for a specified channel. Example: set slope 1 = 2.1

set slope units = *value* sets the slope units for a specified channel. Example: set slope units 1 = upm Valid entries are ups, upm, and uph. These represent units per second, units per minute and units per hour respectively.

set slope hold =*Boolean* sets the slope hold. Example: set slope hold = off

set slope release =*Boolean* sets the slope hold. Example: set slope release = on

read slope *channel* reads the slope value and units for a specified channel. Example: read slope 1 may return 2.1 upm

Program Menu Commands

Program menu commands correspond to the controls and data normally available on the PROGRAM MENU page.

read setpoint *channel*	returns the specified channel's setpoint.
read pv *channel*	returns the specified channel's P.V.
read deviation *channel*	returns the specified channel's deviation.
read program status	returns one of the following strings: Timed Start, Alarm Hold, Hold, Run, Timed Stop, or Stop
read remaining step time	returns the remaining step time.
read remaining step cycles	returns the number of remaining step cycles.
read selected program	returns the currently selected program.
read step number	returns the current step number.
read step time	returns the steps' total time.

Program setup

Program Setup commands correspond to those items on the PROGRAM SETUP page. Since they correspond directly to these items, little description is given. "**read**" commands return the current value as described by the last item in the command string while the "**set**' commands modify the specified item.

select program *program_num*

set start step = *step_num*
read start step

set initial setpoint *channel* **=** *value*
read initial setpoint *channel*

set start time enabled = *Boolean*
read start time enabled

set start time = *month/day hour:minute*
read start time

set stop time enabled = *Boolean*
read stop time enabled

set stop time = *month/day hour:minute*
read stop time

Alarm Control

These commands control and get data about the system alarms

alarm reset	resets alarms. This is the same as pressing the ALARM RESET key.
alarm acknowledge	acknowledges alarms. This is the same as pressing the ALARM ACK key.
read alarm status *alarm*	returns the current state of the specified alarm as it would be shown on the ALARM STATUS page. Either "OK" or "FAIL" is returned.
read alarm all	returns the current state of the all alarms as it would be shown on the ALARM STATUS page. Either "OK" or "FAIL" is returned for all active alarms.
read alarm failed	returns the current list of the all alarms that have failed as it would be shown on the ALARM STATUS page.
read alarm ok	returns the current list of the all alarms that are ok as it would be shown on the ALARM STATUS page.
read alarm history	returns the current state of the all alarms as it would be shown on the ALARM HISTORY page. Either "OK" or "FAIL" is returned for all active alarms, along with a time/date stamp of the failure, acknowledgement, and return to normal.
read alarm log	returns the contents of the ALARM TRIP HISTORY page.

Miscellaneous Commands

These commands don't fit neatly into any of the other categories.

set date = *month / day / year*	sets the Solutions Plus system date.
set time = *hour:minute:second*	sets the Solutions Plus system time.
read software version	returns the Solutions Plus controller version, as displayed on the System Software configuration page. It will display the software version for the GUI (touch screen) and the PCM (PLC/Analog controller)

Editing Commands

In the command language, the concept of "editing" is extended to include more than just editing programs. There is an "editor", which can be in any of the following modes

Edit Program
Edit Fuzzy Configuration
Not Editing

To return to the "Not Editing" mode (which is the default), the command **end edit** is used. You cannot be certain that the entered data has been saved until the edit mode is changed.

Edit Program

This mode edits the specified program. It is possible to be editing one program via the command language, a second via the front panel, and running a third.

edit program *program_name*	enters the Edit Program mode, editing the specified program.
edit read program	returns the program number currently being edited.
edit step *step_num*	specifies the program step to edit.
edit read step	returns the program step currently being edited.
edit remove step	removes the current program step.
edit insert step	inserts a new step before the current program step and changes current step to that new step.
edit add step	adds a new step after the current step. This works only if current step is the last step in the program.
edit clear program	deletes the currently edited program from the system. Editor mode is returned to "Not Editing."
edit read number steps	returns the number of steps in the program.

The remainder of these set or return the corresponding values for the current program step.

edit read setpoint *channel*
edit read gsoak enabled *channel*
edit read gsoak *channel*
edit read duration
edit read events
edit read aux.
edit read cycles
edit read next
edit set setpoint *channel = value*
edit set gsoak enabled *channel = Boolean*
edit set gsoak *channel = value*
edit set duration = *hour:minute:second*
edit set events = *event_list*
edit set auxs = *aux_list*
edit set cycles = *num_cycles*
edit set next = *next_step_num*

Edit Fuzzy Configuration

This corresponds to the Fuzzy Configuration page. For *fuzzy* in the following commands, substitute on of the following phrases:

heat cycle time
cool cycle time
heat sensitivity
cool sensitivity
heat max. power
cool max. power
heat min. time
cool min. time
heat stage delay
cool stage delay
dead band

edit fuzzy *channel*	enters this editing mode on the specified channel.
edit read fuzzy *fuzzy*	returns the current value of the specified fuzzy value for the channel being edited.
edit set fuzzy *fuzzy* = *value*	sets the specified fuzzy control parameter to the specified value.

Calibration and Preventative Maintenance

Preventative Maintenance should be done as described below.

1. Regularly dust the outside surfaces and keep the Solutions Plus' interior free of dust and debris, especially any pieces of wire or metal that may cause shorts.

2. Periodical inspection of the battery located in the PLC. It should be replaced every 3 to 5 years depending on use. The battery is only in use while the control power to the PLC is disconnected.

Calibration.

The Solutions Plus is calibrated at the factory and generally does not need re-calibration. If re-calibration is required, the following steps must be used.

Equipment required. (Review your application for the specific equipment required.)

1. Thermocouple calibration standard (calibrator) such as a Biddle model #720350 or Barber Colman model #PA39 or equivalent and appropriate thermocouple extension wire.
2. Precision resistance box, accuracy 0.1%, or RTD calibrator and appropriate wires.
3. A calibrated millivolt or milliamp source for linear input calibration and appropriate wires.
4. Fluke 77 Multimeter (calibrated) or equivalent.
5. Temperature sensor to measure ambient temperature.
6. IBM compatible computer to run calibration software (Analog Devices 6B11 modules only).
7. 6B series configuration disk p/n 63-1310603, rev. 2.10 or newer software diskette (Analog Devices 6B11 modules only).

Verification Procedure for the Analog Devices 6B11 Modules.

1. Using a calibrated Multimeter (Fluke #77 or equivalent) measure the output of the 5 vdc power supply at terminal TB21 on the analog board. The output should be 5 vdc +/- 0.0. If not, adjust the output of the power supply by using the V.ADJ. trim pot located on the power supply.
2. From the manual supplied with your equipment, find the drawing depicting the analog input configuration. This is either on the main electrical print or on drawing number 601215-00A0 depending on the model of your system. This will show the terminal connections as well as type and positioning of the sensors on the analog board.
3. Disconnect the sensor wires from the terminals of the 6B module being calibrated and attach the calibrator (Biddle #720350, Barber Colman PA39, or equivalent). Allow to warm up for a minimum of 30 minutes.
4. After the 30 minute warm up (ref. step 3), select the input data (zero and span) using the calibrator, and set for the appropriate ranges.
   Example: Type "T" thermocouple -80°C to +180°C (millivolts)
   100Ω RTD -80°C to +180°C (ohms)
   4 - 20 mA 4 mA=0 and 20mA=100 (milliamps)
   0 - 5 VDC 0 VDC=0 and 5 VDC=100 (volts)
5. Record your readings and repeat for each 6B module on the analog board.

   NOTE: On units supplied with humidity sensors, you must verify the type of sensor being used before attempting verification of the readings. Some sensors are not temperature compensated at the sensor. The temperature compensation correction is accomplished in the Solutions Plus. If the “units” is listed as either %RH(R) or %RH(V), then the units must be changed to selection (3) % before the verification procedure can be started. (Reference page 17 to change this setting) This will allow for

a linear signal from the calibrator to accurately display the desired output. Once the verification process is complete, the units must be restored to the original setting before returning the unit to operation.

NOTE: On units with channel 2 configured for wet bulb/dry bulb humidity readings, you must either verify the readings as a temperature setting or a constant temperature must be inputted to channel 1 while verifying channel 2. In the first case, channel 2 setup should match channel 1 (change channel units to °C. NOTE: Reference page 17 to change this setting) Once verification is complete, you must change the channel units back to %RH(1). The second will require a second calibrator of the proper type to input a constant temperature to channel 1.

6. The verification is now complete. If for some reason your verification indicates and out of tolerance condition, use calibration steps starting at step 7 to calibrate the 6B module that is out of tolerance.

NOTE: If the temperature reading is out of range on both the zero and span by the same amount, a linear zero shift can be accomplished by changing the engineering units Min and Max settings by the same amount. EXAMPLE: Input of -80 = -82 and input of 180 = 178, then the engineering units can be changed to -78 and 182 respectively. This will "shift" the readings to correspond with the input from the calibration device.

Calibration procedure for the Analog Devices 6B11 Modules..

7. Disconnect the analog cable from the Solutions Plus and connect it to an IBM compatible P.C. with software diskette p/n 63-1310603 in drive A. **Note:** A 30 minute warm up time for the 6B module is required if step 3 is not already complete.
8. After 30 minutes (ref. step 3) turn on the computer. At the A;> prompt, type SIXBCCD and press enter. At this point, the software identification information should be on the screen. Strike escape to continue.
9. You now should see the main menu at the top of the screen. Select "Calibrate" using the arrow keys. Press ENTER to continue.
10. You should now be asked for the upper limit of scanned addresses. The default is 255. This refers to the number of 6B modules installed on your analog board. Backspace to clear and type the number of modules located on your analog board and press ENTER.
11. Select the module to be calibrated.
12. At this point, the software will prompt you to apply the appropriate input signal. (Biddle #720350 or Barber Colman PA39 or equiv.) Adjust calibrator for proper setting as software indicates and press ENTER.
13. The software will automatically indicate if the calibration attempt was successful. If successful, move the input wires to the next 6B module to be calibrated and repeat steps 10 and 11. If for some reason the module does not calibrate correctly, consult the factory for service.
14. Exit the calibration program and reconnect any cables that were removed for the calibration procedure.
15. After the calibration procedure is complete, repeat verification steps 2 through 6 and record your adjusted readings. If out of tolerance condition continues, consult factory for service.

Verification and Calibration Procedures for the Mitsubishi FX2N-8AD.

For the following procedures (verifying or calibrating the 8AD), the following must be done first.

1. Go to Main Menu and select Configuration.
2. Select Chamber Setup (Level 5 password).
3. Select PLC Update.

4. For channel 1 change data register D900 to 25, for channel 2 change D901 to 25, and the same for each additional controlled channel.

Verification

1. From the manual supplied with your equipment, find the drawing depicting the analog input configuration. This is on the main electrical print. This will show the terminal connections as well as type and positioning of the sensors on the 8AD Module.
2. Disconnect the sensor wires from the terminals of the 8AD module being calibrated and attach the calibrator (Biddle #720350, Barber Colman PA39, or equivalent). Allow to warm up for a minimum of 30 minutes.
3. After the 30 minute warm up (ref. step 2), select the input data (zero and span) using the calibrator, and set for the appropriate ranges.
   Example: Type "T" thermocouple -80°C to +180°C (millivolts)
   4 - 20 mA 4 mA=0 and 20mA=100 (milliamps)
   0 - 5 VDC 0 VDC=0 and 5 VDC=100 (volts)
4. Record your readings and repeat for each input on the 8AD.

NOTE: On units supplied with humidity sensors, you must verify the type of sensor being used before attempting verification of the readings. Some sensors are not temperature compensated at the sensor. The temperature compensation correction is accomplished in the Solutions Plus. If the "units" is listed as either %RH(R) or %RH(V), then the units must be changed to selection (3) % before the verification procedure can be started. (Reference page 17 to change this setting) This will allow for a linear signal from the calibrator to accurately display the desired output. Once the verification process is complete, the units must be restored to the original setting before returning the unit to operation.

NOTE: On units with channel 2 configured for wet bulb/dry bulb humidity readings, you must either verify the readings as a temperature setting or a constant temperature must be inputted to channel 1 while verifying channel 2. In the first case, channel 2 setup should match channel 1 (change channel units to °C. NOTE: Reference page 17 to change this setting) Once verification is complete, you must change the channel units back to %RH(1). The second will require a second calibrator of the proper type to input a constant temperature to channel 1.

5. The verification is now complete. If for some reason your verification indicates and out of tolerance condition, use calibration steps below to calibrate the 8AD module channel that is out of tolerance.

Calibration

1) Exit back to Configuration Menu. Select the channel to be calibrated.
2) In the channel configuration page, select Zones. Divide the channel configuration range by 4 to set the zone values (ex. -80°C to 180°C would be 65° per zone, so the zones would be set at -15, 50, and 115). After setting these values, hit the Commit button on the configuration screen.
3) Wire in your calibration meter to the channel you are calibrating according to the electrical schematic.
4) Set the desired calibration point, and then adjust the offset for the corresponding zone until the instrument reads within specification.
5) After adjusting all zones, go back to the PLC update and set all the D900 registers back to zero. Restart the controller.

Technical Specifications

Sensor Descriptions

Range Accuracy (typical @ 25°C and 5.00 VDC)

Module	Hex Code	Description	Typical Accuracy
6B11	0	+/-15mV	+/- 0.03 mV
6B11	1	+/-50mV	+/- 0.015 mV
6B11	2	+/-100mV	+/- 0.0055 mV
6B11	3	+/-500mV	+/- 0.005 mV
6B11	4	+/-1V	+/- 0.005 V
6B11	5	+/-5V	+/- 0.005 V
6B11	6	+/-20mA	+/- 0.008 mA
6B11	0E	J Thermocouple 0 to 760 C	+/- .4 C
6B11	0F	K Thermocouple 0 to 1000 C	+/- .5 C
6B11	10	T Thermocouple -100 to 400 C	+/- .5 C
6B11	11	E Thermocouple 0 to 1000 C	+/- .5 C
6B11	12	R Thermocouple 500 to 1750 C	+/- .63 C
6B11	13	S Thermocouple 500 to 1750 C	+/- .62 C
6B11	14	B Thermocouple 500 to 1800 C	+/- 1.2 C
6B12	7	+/-50V	+/- 0.015 V
6B12	8	+/-10V	+/- 0.006 V
6B12	9	+/-5V	+/- 0.005 V
6B12	0A	+/-1V	+/- 0.005 V
6B12	0B	+/-500mV	+/- 0.005 mV
6B12	0C	+/-150mV	+/- 0.005 mV
6B12	0D	+/-20mA	+/- 0.008 mA
6B13	20	Pt,-100 to 100 C, .00385	+/- 0.02 C
6B13	21	Pt, 0 to 100 C, .00385	+/- 0.02 C
6B13	22	Pt, 0 to 200 C, .00385	+/- 0.02 C
6B13	23	Pt, 0 to 600 C, .00385	+/- 0.02 C
6B13	24	Pt, -100 to 100 C, .003916	+/- 0.02 C
6B13	25	Pt, 0 to 100 C, .003916	+/- 0.02 C
6B13	26	Pt, 0 to 200 C, .003916	+/- 0.02 C
6B13	27	Pt, 0 to 600 C, .003916	+/- 0.02 C
6B13	28	Ni, -80 to 100 C	+/- 0.05 C
6B13	29	Ni, 0 to 100 C	+/- 0.05 C
6B13	2A	Cu, 0 to 120 C, (10 Ohm @ 25 C)	+/- 0.13 C
6B13	2B	Cu, 0 to 120 C, (10 Ohm @ 0 C)	+/- 0.11 C
8AD		+/- 10 VDC	+/- 60 mV
8AD		+/- 20 mA	+/- 120µA
8AD		T Thermocouple -100 to 350 C	+/- 1.0 C
8AD		K Thermocouple -100 to 1200 C	+/- 1.3 C
8AD		J Thermocouple -100 to 600 C	+/- 1.3 C

NOTE: When using thermocouple, an additional error of ± .5° C may occur due to the cold junction compensator on the Analog Devices Backplane. For thermocouple type inputs, the typical accuracy can be calculated using the following formula: $\sqrt{X^2 + Y^2}$. This calculates to .5° squared (Cold junction compensator) = .25 and .5° squared (Type "T" thermocouple) = .25. .25 + .25 = .5. The square root of .5 = .7. The typical accuracy is now ± .7° C for a Type "T" thermocouple. It should also be noted that many other variables, such as thermocouple extension wire, can cause further error in accuracy's.

Operating Conditions

General Specifications:

Operating Ambient Temperature	0 to 55°C
Operating Ambient Humidity	35 to 85% RH (Non-condensing)
Operating Ambiance	To be free from corrosive gases.
Operating Voltage	120 VAC +/- 10% 50/60 Hz

Output Specifications:

Resistive Load	2 A/pt - 8 A/4 pts
Load Voltage	250 VAC or 31 VDC (surge diode required)
Other Loads	80 VA (inductive) 100 W (lamp)
Isolation	Mechanical

Digital Performance

Functional Specifications:

Instruction Word	15 basic instructions, 26 applied instructions
I/O	256 input/output combinations
Internal Relay	240 points (all points can be maintained)
Special Integral Relay	16 points
Shift Register	128 points (all points can be maintained)
Timer	80 points (0 to 999.9 seconds)
Counter	45 points (0 to 9999) (all points can be maintained)
Reversible Counter	2 points (all points can be maintained)
Power Failure Protection	Internal relay, Shift register, Counter, Reversible counter
Self Diagnostic Function	CPU error (WDT, transmission error, operation code error)

Temperature Conversions

°C to °F

C	F	C	F	C	F	C	F
-80	-112.00	-35	-31.00	10	50.00	55	131.00
-79	-110.20	-34	-29.20	11	51.80	56	132.80
-78	-108.40	-33	-27.40	12	53.60	57	134.60
-77	-106.60	-32	-25.60	13	55.40	58	136.40
-76	-104.80	-31	-23.80	14	57.20	59	138.20
-75	-103.00	-30	-22.00	15	59.00	60	140.00
-74	-101.20	-29	-20.20	16	60.80	61	141.80
-73	-99.40	-28	-18.40	17	62.60	62	143.60
-72	-97.60	-27	-16.60	18	64.40	63	145.40
-71	-95.80	-26	-14.80	19	66.20	64	147.20
-70	-94.00	-25	-13.00	20	68.00	65	149.00
-69	-92.20	-24	-11.20	21	69.80	66	150.80
-68	-90.40	-23	-9.40	22	71.60	67	152.60
-67	-88.60	-22	-7.60	23	73.40	68	154.40
-66	-86.80	-21	-5.80	24	75.20	69	156.20
-65	-85.00	-20	-4.00	25	77.00	70	158.00
-64	-83.20	-19	-2.20	26	78.80	71	159.80
-63	-81.40	-18	-0.40	27	80.60	72	161.60
-62	-79.60	-17	1.40	28	82.40	73	163.40
-61	-77.80	-16	3.20	29	84.20	74	165.20
-60	-76.00	-15	5.00	30	86.00	75	167.00
-59	-74.20	-14	6.80	31	87.80	76	168.80
-58	-72.40	-13	8.60	32	89.60	77	170.60
-57	-70.60	-12	10.40	33	91.40	78	172.40
-56	-68.80	-11	12.20	34	93.20	79	174.20
-55	-67.00	-10	14.00	35	95.00	80	176.00
-54	-65.20	-9	15.80	36	96.80	81	177.80
-53	-63.40	-8	17.60	37	98.60	82	179.60
-52	-61.60	-7	19.40	38	100.40	83	181.40
-51	-59.80	-6	21.20	39	102.20	84	183.20
-50	-58.00	-5	23.00	40	104.00	85	185.00
-49	-56.20	-4	24.80	41	105.80	86	186.80
-48	-54.40	-3	26.60	42	107.60	87	188.60
-47	-52.60	-2	28.40	43	109.40	88	190.40
-46	-50.80	-1	30.20	44	111.20	89	192.20
-45	-49.00	0	32.00	45	113.00	90	194.00
-44	-47.20	1	33.80	46	114.80	91	195.80
-43	-45.40	2	35.60	47	116.60	92	197.60
-42	-43.60	3	37.40	48	118.40	93	199.40
-41	-41.80	4	39.20	49	120.20	94	201.20
-40	-40.00	5	41.00	50	122.00	95	203.00
-39	-38.20	6	42.80	51	123.80	96	204.80
-38	-36.40	7	44.60	52	125.60	97	206.60
-37	-34.60	8	46.40	53	127.40	98	208.40
-36	-32.80	9	48.20	54	129.20	99	210.20

°C to °F (continued)

C	F	C	F	C	F	C	F
100	212.00	145	293.00	190	374.00	235	455.00
101	213.80	146	294.80	191	375.80	236	456.80
102	215.60	147	296.60	192	377.60	237	458.60
103	217.40	148	298.40	193	379.40	238	460.40
104	219.20	149	300.20	194	381.20	239	462.20
105	221.00	150	302.00	195	383.00	240	464.00
106	222.80	151	303.80	196	384.80	241	465.80
107	224.60	152	305.60	197	386.60	242	467.60
108	226.40	153	307.40	198	388.40	243	469.40
109	228.20	154	309.20	199	390.20	244	471.20
110	230.00	155	311.00	200	392.00	245	473.00
111	231.80	156	312.80	201	393.80	246	474.80
112	233.60	157	314.60	202	395.60	247	476.60
113	235.40	158	316.40	203	397.40	248	478.40
114	237.20	159	318.20	204	399.20	249	480.20
115	239.00	160	320.00	205	401.00	250	482.00
116	240.80	161	321.80	206	402.80	251	483.80
117	242.60	162	323.60	207	404.60	252	485.60
118	244.40	163	325.40	208	406.40	253	487.40
119	246.20	164	327.20	209	408.20	254	489.20
120	248.00	165	329.00	210	410.00	255	491.00
121	249.80	166	330.80	211	411.80	256	492.80
122	251.60	167	332.60	212	413.60	257	494.60
123	253.40	168	334.40	213	415.40	258	496.40
124	255.20	169	336.20	214	417.20	259	498.20
125	257.00	170	338.00	215	419.00	260	500.00
126	258.80	171	339.80	216	420.80	261	501.80
127	260.60	172	341.60	217	422.60	262	503.60
128	262.40	173	343.40	218	424.40	263	505.40
129	264.20	174	345.20	219	426.20	264	507.20
130	266.00	175	347.00	220	428.00	265	509.00
131	267.80	176	348.80	221	429.80	266	510.80
132	269.60	177	350.60	222	431.60	267	512.60
133	271.40	178	352.40	223	433.40	268	514.40
134	273.20	179	354.20	224	435.20	269	516.20
135	275.00	180	356.00	225	437.00	270	518.00
136	276.80	181	357.80	226	438.80	271	519.80
137	278.60	182	359.60	227	440.60	272	521.60
138	280.40	183	361.40	228	442.40	273	523.40
139	282.20	184	363.20	229	444.20	274	525.20
140	284.00	185	365.00	230	446.00	275	527.00
141	285.80	186	366.80	231	447.80	276	528.80
142	287.60	187	368.60	232	449.60	277	530.60
143	289.40	188	370.40	233	451.40	278	532.40
144	291.20	189	372.20	234	453.20	279	534.20

°F to °C

F	C	F	C	F	C	F	C
-112	-80.00	-67	-55.00	-22	-30.00	23	-5.00
-111	-79.44	-66	-54.44	-21	-29.44	24	-4.44
-110	-78.89	-65	-53.89	-20	-28.89	25	-3.89
-109	-78.33	-64	-53.33	-19	-28.33	26	-3.33
-108	-77.78	-63	-52.78	-18	-27.78	27	-2.78
-107	-77.22	-62	-52.22	-17	-27.22	28	-2.22
-106	-76.67	-61	-51.67	-16	-26.67	29	-1.67
-105	-76.11	-60	-51.11	-15	-26.11	30	-1.11
-104	-75.55	-59	-50.56	-14	-25.56	31	-0.56
-103	-75.00	-58	-50.00	-13	-25.00	32	0.00
-102	-74.44	-57	-49.44	-12	-24.44	33	0.56
-101	-73.89	-56	-48.89	-11	-23.89	34	1.11
-100	-73.33	-55	-48.33	-10	-23.33	35	1.67
-99	-72.78	-54	-47.78	-9	-22.78	36	2.22
-98	-72.22	-53	-47.22	-8	-22.22	37	2.78
-97	-71.67	-52	-46.67	-7	-21.67	38	3.33
-96	-71.11	-51	-46.11	-6	-21.11	39	3.89
-95	-70.55	-50	-45.56	-5	-20.56	40	4.44
-94	-70.00	-49	-45.00	-4	-20.00	41	5.00
-93	-69.44	-48	-44.44	-3	-19.44	42	5.56
-92	-68.89	-47	-43.89	-2	-18.89	43	6.11
-91	-68.33	-46	-43.33	-1	-18.33	44	6.67
-90	-67.78	-45	-42.78	0	-17.78	45	7.22
-89	-67.22	-44	-42.22	1	-17.22	46	7.78
-88	-66.67	-43	-41.67	2	-16.67	47	8.33
-87	-66.11	-42	-41.11	3	-16.11	48	8.89
-86	-65.55	-41	-40.56	4	-15.56	49	9.44
-85	-65.00	-40	-40.00	5	-15.00	50	10.00
-84	-64.44	-39	-39.44	6	-14.44	51	10.56
-83	-63.89	-38	-38.89	7	-13.89	52	11.11
-82	-63.33	-37	-38.33	8	-13.33	53	11.67
-81	-62.78	-36	-37.78	9	-12.78	54	12.22
-80	-62.22	-35	-37.22	10	-12.22	55	12.78
-79	-61.67	-34	-36.67	11	-11.67	56	13.33
-78	-61.11	-33	-36.11	12	-11.11	57	13.89
-77	-60.55	-32	-35.56	13	-10.56	58	14.44
-76	-60.00	-31	-35.00	14	-10.00	59	15.00
-75	-59.44	-30	-34.44	15	-9.44	60	15.56
-74	-58.89	-29	-33.89	16	-8.89	61	16.11
-73	-58.33	-28	-33.33	17	-8.33	62	16.67
-72	-57.78	-27	-32.78	18	-7.78	63	17.22
-71	-57.22	-26	-32.22	19	-7.22	64	17.78
-70	-56.67	-25	-31.67	20	-6.67	65	18.33
-69	-56.11	-24	-31.11	21	-6.11	66	18.89
-68	-55.56	-23	-30.56	22	-5.56	67	19.44

°F to °C (continued)

F	C	F	C	F	C	F	C
68	20.00	113	45.00	158	70.00	203	95.00
69	20.56	114	45.56	159	70.55	204	95.55
70	21.11	115	46.11	160	71.11	205	96.11
71	21.67	116	46.67	161	71.67	206	96.67
72	22.22	117	47.22	162	72.22	207	97.22
73	22.78	118	47.78	163	72.78	208	97.78
74	23.33	119	48.33	164	73.33	209	98.33
75	23.89	120	48.89	165	73.89	210	98.89
76	24.44	121	49.44	166	74.44	211	99.44
77	25.00	122	50.00	167	75.00	212	100.00
78	25.56	123	50.56	168	75.55	213	100.55
79	26.11	124	51.11	169	76.11	214	101.11
80	26.67	125	51.67	170	76.67	215	101.67
81	27.22	126	52.22	171	77.22	216	102.22
82	27.78	127	52.78	172	77.78	217	102.78
83	28.33	128	53.33	173	78.33	218	103.33
84	28.89	129	53.89	174	78.89	219	103.89
85	29.44	130	54.44	175	79.44	220	104.44
86	30.00	131	55.00	176	80.00	221	105.00
87	30.56	132	55.56	177	80.55	222	105.55
88	31.11	133	56.11	178	81.11	223	106.11
89	31.67	134	56.67	179	81.67	224	106.67
90	32.22	135	57.22	180	82.22	225	107.22
91	32.78	136	57.78	181	82.78	226	107.78
92	33.33	137	58.33	182	83.33	227	108.33
93	33.89	138	58.89	183	83.89	228	108.89
94	34.44	139	59.44	184	84.44	229	109.44
95	35.00	140	60.00	185	85.00	230	110.00
96	35.56	141	60.55	186	85.55	231	110.55
97	36.11	142	61.11	187	86.11	232	111.11
98	36.67	143	61.67	188	86.67	233	111.67
99	37.22	144	62.22	189	87.22	234	112.22
100	37.78	145	62.78	190	87.78	235	112.78
101	38.33	146	63.33	191	88.33	236	113.33
102	38.89	147	63.89	192	88.89	237	113.89
103	39.44	148	64.44	193	89.44	238	114.44
104	40.00	149	65.00	194	90.00	239	115.00
105	40.56	150	65.55	195	90.55	240	115.55
106	41.11	151	66.11	196	91.11	241	116.11
107	41.67	152	66.67	197	91.67	242	116.67
108	42.22	153	67.22	198	92.22	243	117.22
109	42.78	154	67.78	199	92.78	244	117.78
110	43.33	155	68.33	200	93.33	245	118.33
111	43.89	156	68.89	201	93.89	246	118.89
112	44.44	157	69.44	202	94.44	247	119.44

°F to °C (continued)

F	C	F	C	F	C	F	C
248	120.00	293	145.00	338	170.00	383	195.00
249	120.55	294	145.55	339	170.55	384	195.55
250	121.11	295	146.11	340	171.11	385	196.11
251	121.67	296	146.67	341	171.66	386	196.66
252	122.22	297	147.22	342	172.22	387	197.22
253	122.78	298	147.78	343	172.78	388	197.78
254	123.33	299	148.33	344	173.33	389	198.33
255	123.89	300	148.89	345	173.89	390	198.89
256	124.44	301	149.44	346	174.44	391	199.44
257	125.00	302	150.00	347	175.00	392	200.00
258	125.55	303	150.55	348	175.55	393	200.55
259	126.11	304	151.11	349	176.11	394	201.11
260	126.67	305	151.67	350	176.66	395	201.66
261	127.22	306	152.22	351	177.22	396	202.22
262	127.78	307	152.78	352	177.78	397	202.78
263	128.33	308	153.33	353	178.33	398	203.33
264	128.89	309	153.89	354	178.89	399	203.89
265	129.44	310	154.44	355	179.44	400	204.44
266	130.00	311	155.00	356	180.00	401	205.00
267	130.55	312	155.55	357	180.55	402	205.55
268	131.11	313	156.11	358	181.11	403	206.11
269	131.67	314	156.67	359	181.66	404	206.66
270	132.22	315	157.22	360	182.22	405	207.22
271	132.78	316	157.78	361	182.78	406	207.78
272	133.33	317	158.33	362	183.33	407	208.33
273	133.89	318	158.89	363	183.89	408	208.89
274	134.44	319	159.44	364	184.44	409	209.44
275	135.00	320	160.00	365	185.00	410	210.00
276	135.55	321	160.55	366	185.55	411	210.55
277	136.11	322	161.11	367	186.11	412	211.11
278	136.67	323	161.67	368	186.66	413	211.66
279	137.22	324	162.22	369	187.22	414	212.22
280	137.78	325	162.78	370	187.78	415	212.78
281	138.33	326	163.33	371	188.33	416	213.33
282	138.89	327	163.89	372	188.89	417	213.89
283	139.44	328	164.44	373	189.44	418	214.44
284	140.00	329	165.00	374	190.00	419	215.00
285	140.55	330	165.55	375	190.55	420	215.55
286	141.11	331	166.11	376	191.11	421	216.11
287	141.67	332	166.67	377	191.66	422	216.66
288	142.22	333	167.22	378	192.22	423	217.22
289	142.78	334	167.78	379	192.78	424	217.78
290	143.33	335	168.33	380	193.33	425	218.33
291	143.89	336	168.89	381	193.89	426	218.89
292	144.44	337	169.44	382	194.44	427	219.44

Hexadecimal Conversions

Hex Number	Decimal Digit 000X	Decimal Digit 00X0	Decimal Digit 0X00	Decimal Digit X000
0	0	0	0	0
1	1	16	256	4,096
2	2	32	512	8,192
3	3	48	768	12,288
4	4	64	1,024	16,384
5	5	80	1,280	20,480
6	6	96	1,536	24,576
7	7	112	1,792	28,672
8	8	128	2,048	32,768
9	9	144	2,314	36,864
A	10	160	2,560	40,960
B	11	176	2,816	45,056
C	12	192	3,072	49,152
D	13	208	3,328	53,248
E	14	224	3,584	57,344
F	15	240	3,840	61,440

Example: Data register reports the value 0384. From the second column, you would find the conversion value for the “4”. This equals 5. Next, you find the value for the “8” in the third column. This equals 128. You would then find the value for the “3” in the forth column. This equals 768. Finally, find the value for the “0” in the fifth column. This equals 0. You would then add the found values to find the value of the Data register in milliseconds. 5 + 128 + 768 + 0 = 901 milliseconds or 90.1 seconds.

Remote Access and Control of Solutions Plus (Optional)

Introduction

It is possible to access, reflect and control a Solutions Plus from a PC by using the VNC client program **Remote Access Viewer** together with the built-in VNC server in the Solutions Plus. Remote Access Viewer is a free remote control software derived from the software package TightVNC. It is also possible to use a web browser as a viewer, see the section *Using a Web Browser as a Viewer*.

VNC (Virtual Network Computing) is a client/server software package allowing remote network access to graphical desktops. Basically, when using VNC, it is possible to access a PC or other PC-based equipment, for example a Solutions Plus that is connected to the Internet from any other Internet-connected PC anywhere.
It can be very helpful to use the Remote Access function for the Solutions Plus when for example performing remote customer support, remote control and troubleshooting.

Remote Access Viewer presents an image of the Solutions Plus on the PC monitor. The image in Remote Access Viewer is updated at regular intervals or when requested.
The Remote Access function has the same function as the actual Solutions Plus.

Installing Remote Access Viewer

Remote Access Viewer is VNC client program used for remote access and control of an Solutions Plus.

System Requirements

To use Remote Access Viewer, a PC with at least 5 MB of available memory and Microsoft Windows 2000/XP Professional is required. Remote Access Viewer can be used on either a color or monochrome screen. Microsoft Internet Explorer version 5.0 or later must be installed on the PC.

Activate Java console

In Microsoft Internet Explorer, it can be useful to activate the Java console function when troubleshooting. Select Tools/Internet Options in Internet Explorer, click Advanced and select the box for Activate Java console. Restart the browser. Also check that the latest version of Microsoft Virtual Machine or Sun Microsystems Java Virtual Machine is installed on the PC.
Download the latest version, if necessary, from the Java web page (*http://www.java.com/*, search for Virtual Machine).

Installing

Double-click on the file **RemoteAccessViewerSetup.exe** on your PC. Follow the instructions in the Remote Access Viewer Setup Wizard to install Remote Access Viewer.
Clicking **Start** and selecting **All Programs/Remote Access Viewer/Remote Access Viewer** starts the program.

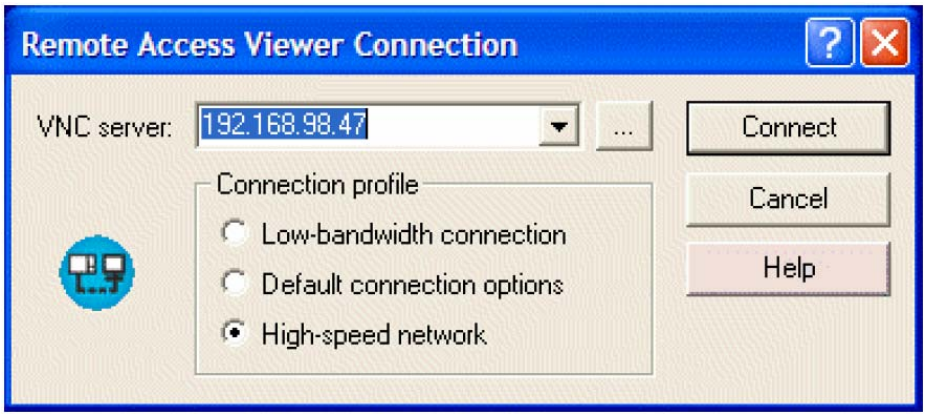
Uninstalling

Remote Access Viewer can be uninstalled by using the **Add/Remove Programs** utility in the Control Panel. The Remote Access Viewer installation does not copy any files into the system directory on your PC.
Make sure that Remote Access Viewer is not running before uninstalling.

Connecting to the Solutions Plus

Connection to the Solutions Plus (the VNC server) from the PC with the VNC client program Remote Access Viewer is accomplished by entering the Solutions Plus' IP address (or host name).

Start Remote Access Viewer by clicking **Start** and selecting **All Programs/Remote Access Viewer/Remote Access Viewer**. Click **Help** view the help file for the program.



VNC server

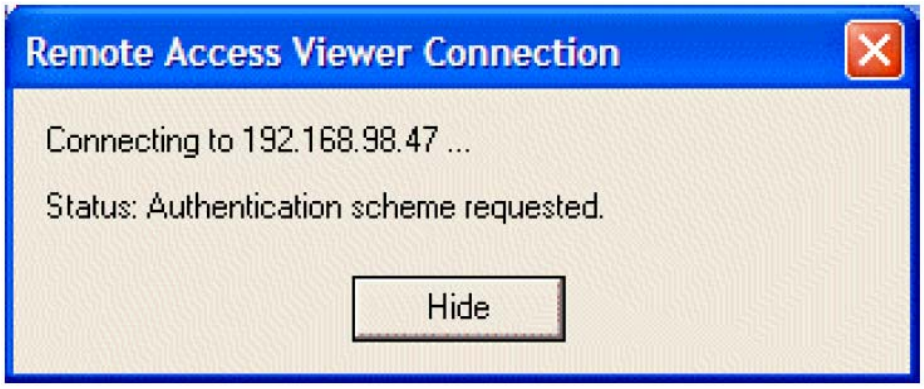
Enter the Solutions Plus's IP address or select an already used IP address in the drop-down list.

Connection profile

Select a profile that matches the speed of your network connection.
Low-bandwidth connection: This connection profile is optimized for a lowbandwidth network connection. Use this profile if you are using a 56Kbps modem to access the Solutions Plus.
High-speed network: connection: This connection profile is optimized for a high-speed network connection. Choose this profile if you are accessing an Solutions Plus in the same Ethernet LAN (Local Area Network) as your PC or over a 10/100Mbit LAN.

Note:
Using the Low-bandwidth connection will enable JPEG compression at the lowest image quality (8 bit colors), consuming a minimum of the bandwidth available.

Simply click **Connect** to attempt to connect to the Solutions Plus with the specified IP address.



VNC Authentication

When Remote Access Viewer is connecting it will prompt for a password.

Session password

Enter the password **Enviro** for full control.
The Solutions Plus should now be displayed on your PC.

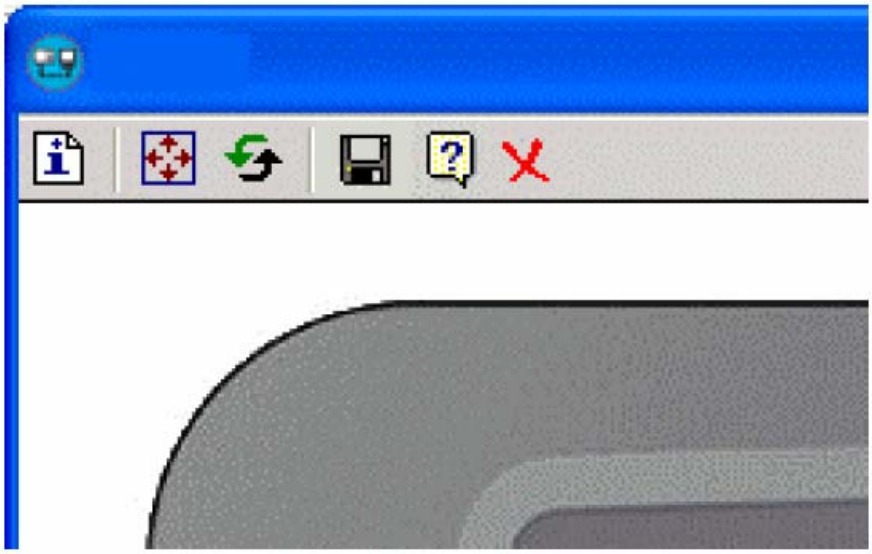
Connecting using .brav files

You can save connection options to a *.brav file for later use. Save the connection options by clicking on the save symbol or by right-clicking in the title bar of Remote Access Viewer (where the name of the Solutions Plus is shown) when it is connected to the Solutions Plus and select
Save connection info as....
Use the option **...** button in the Remote Access Viewer Connection dialog to load a previously saved *.brav file, the connection options in the file will then be used to make the connection to the Solutions Plus. The file format .brav was automatically registered on your PC when you installed Remote Access Viewer.

Using Remote Access Viewer

Remote Access Viewer presents an image of the Solutions Plus on the PC monitor. The image in Remote Access Viewer is updated at regular intervals or when requested. The Remote Access function has the same function as the actual Solutions Plus.

The Toolbar



The icons in the Remote Access Viewer toolbar have the following functions:

Toolbar icon	Description
	Displays information about the connection to the operator terminal.
	Enables full-screen viewing mode. To exit from full screen mode, use Crtl + Esc, right-click on the taskbar icon for Remote Access Viewer and uncheck **Full screen**.
	Request screen refresh.
	Save connection options to a *.brav file. See the section *Connecting using .brav files*.
	Displays help (Contents & Index) for Remote Access Viewer.
	Disconnect.

Controlling the Solutions Plus

Clicking with the mouse on the function keys on the Solutions Plus image or with the PC keyboard controls the Solutions Plus. On an Solutions Plus with a touch screen, you click directly on the screen. Text strips for the Solutions Pluss are not shown in Remote Access Viewer.

Security

Remote Access Viewer encrypts passwords sent over the network but the rest of the traffic is sent as is, unencrypted. Using Remote Access Viewer over the Internet or other untrusted networks can be a security risk.

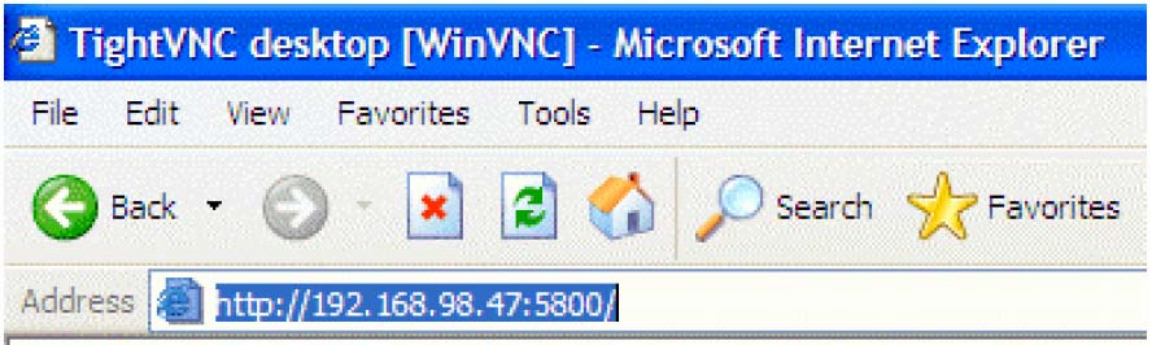
Note:
The Internet is not the same thing as an Ethernet LAN (Local Area Network). It is considered safe to use Remote Access Viewer in a stand-alone LAN.

Using a Web Browser as a Viewer

The built-in VNC server in the Solutions Plus also contains a small VNC applet. You can connect to the Solutions Plus with a web browser that supports Java applets, e.g. Microsoft Internet Explorer. The picture of the Solutions Plus frame is not displayed when a web browser is used as a viewer. Only the contents of the Solutions Plus's display are shown.

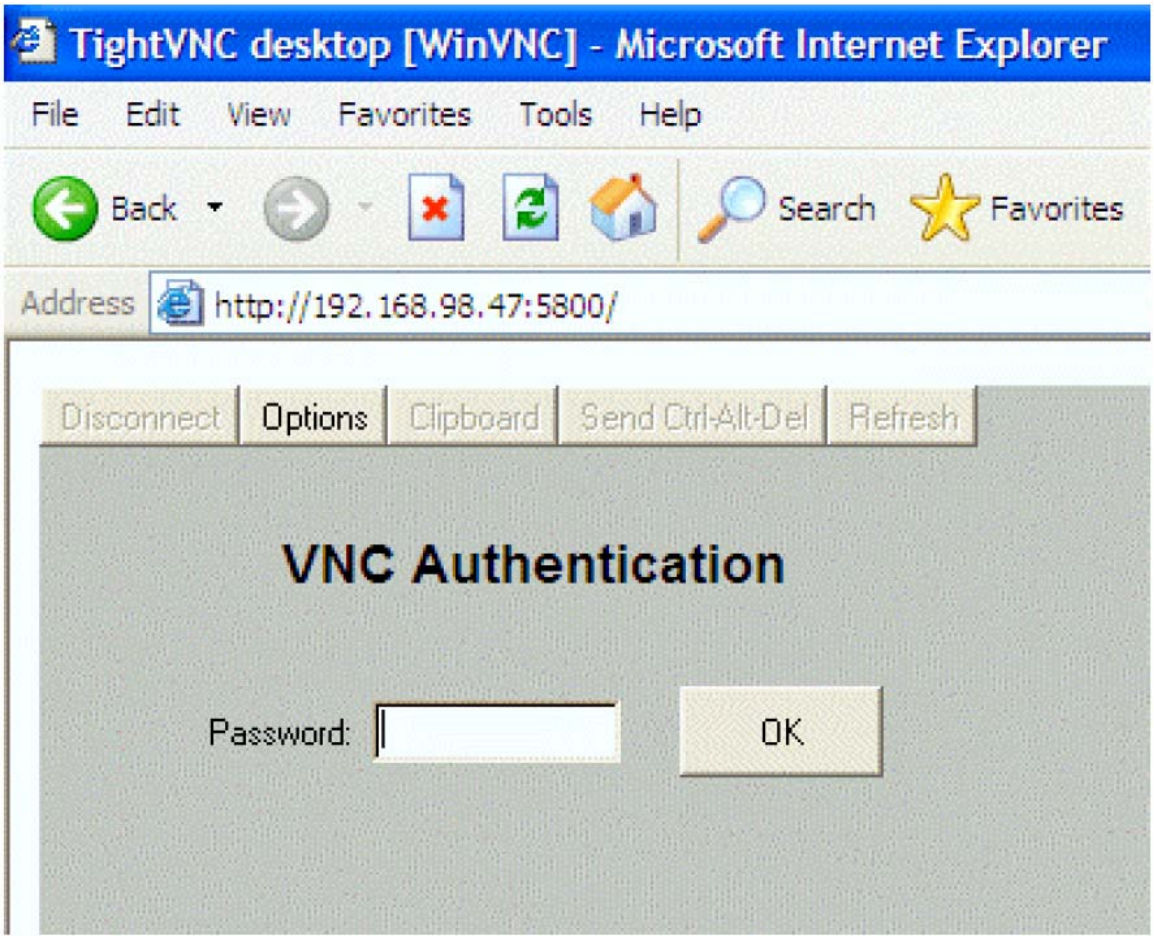
Connecting to the Solutions Plus

The VNC server listens for HTTP (Hypertext Transfer Protocol) connections on TCP (Transmission Control Protocol) port 5800 (as set in Solutions Plus for the Remote Access function, see the section *Settings in the Solutions Plus*).
Enter the Solutions Plus's IP address followed by : (colon) and the TCP port number 5800 in the web browser's Address field, for example **http://192.168.98.47:5800/** if the Solutions Plus's IP address is 192.168.98.47.



VNC Authentication

When the web browser is connecting it will prompt for a password.



Password

Enter the password that was set in the Solutions Plus. See the section *Settings in the Solutions Plus*.
The Solutions Plus should now be displayed in the web browser on your PC.

Note:
It is not recommended to connect to the Solutions Plus via a proxy.

Setting the IP Address for the Solutions Plus

Setting the IP address in Windows XP

To set the IP address within Windows XP and Windows 2000, complete these steps.

1. You will need to connect a USB keyboard to the Solutions Plus for the following operation.

2. Depress and release the “Windows” key on the keyboard to bring up the Start Menu.

3. Touch **Control Panel**.

4. On the control panel, double-click **Network Connections**.

5. Double-click **Local Area Connection 2**.

6. Click **Properties**.

7. Select **Internet Protocol (TCP/IP)**, and then click **Properties**.

8. **Use an IP Address of your choice or one assigned by your IT Department**.

9. Complete the **IP address and Subnet mask** fields by using the values in step 8.

10. Click **OK** on the Local Area Connection Properties window. It is not necessary to restart your Solutions Plus.