PWM Retransmit Feature

Overview

Frequently in large capacity environmental test chamber and wind tunnel applications, heating and cooling equipment is partitioned into multiple stages. These are usually referred to as high stage and low stage heat or cool or large liquid and small liquid solenoids. The Synergy Controller provides up to eight PWM Retransmit Outputs that can be used to control these stages in a linear and continuous fashion.

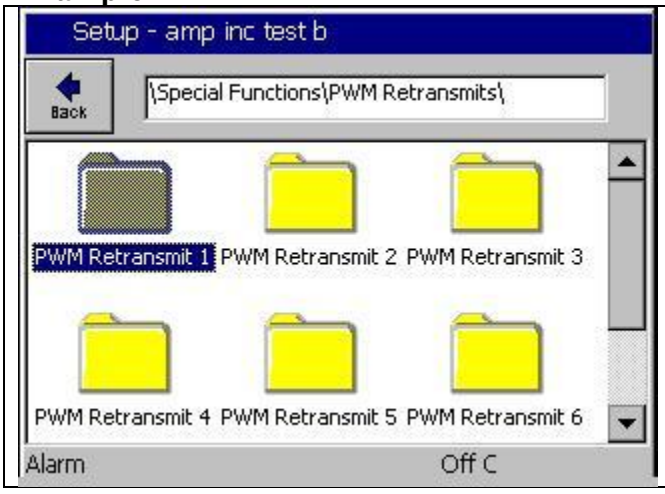
In addition to staging, the PWM Retransmit Outputs can be used to control any system or user functions requiring a PWM (i.e. Time proportioning) control signal. Setpoints, process data, constants, and internal PID values can be transmitted this way. The PWM Retransmit Feature provides programmable scaling and can be controlled thru a set of communication commands or APIs.

The following section will guide you through the setup for PWM Retransmit 1 for a custom PID Cooling output. A second example at the end of the application note provides setup for heater staging.

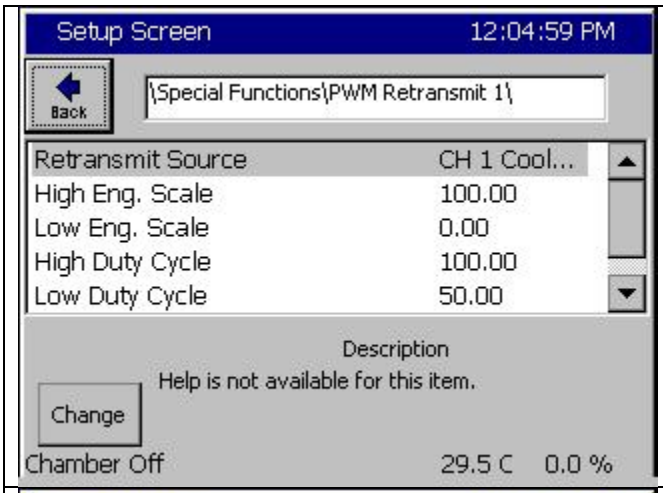
Note that this feature was introduced in Version 2.9.6 Build 786 and is supported on both the full sized Synergy Micro and the ¼ DIN Synergy Nano models. Contact the factory to upgrade your controller software if required.

Also note that the Chamber Definition File (CDF) must map the desired PWM primitives to an appropriate output.

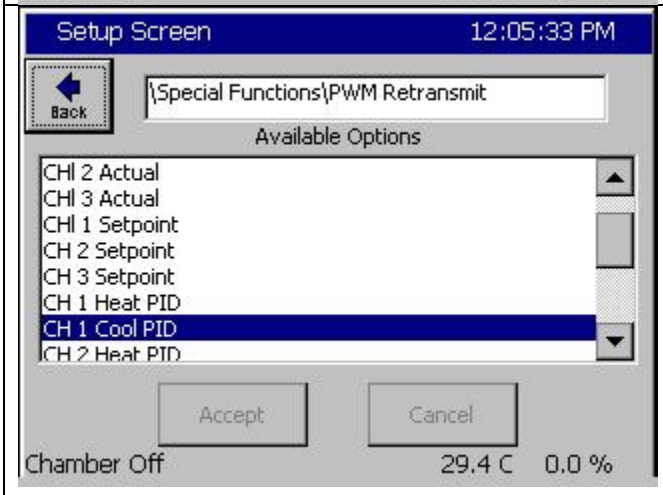
Example 1:



To configure the PWM Retransmit Output, open the ***SETUP*** screen on the Synergy Controller and browse to the folder on the left.

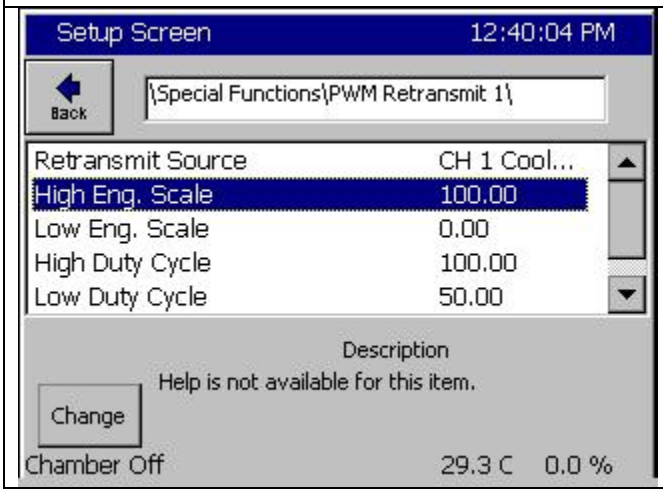


Open the Setup\Special Functions\PWM Retransmit 1 folder. Select the Retransmit Source parameter and press the **Change** button.



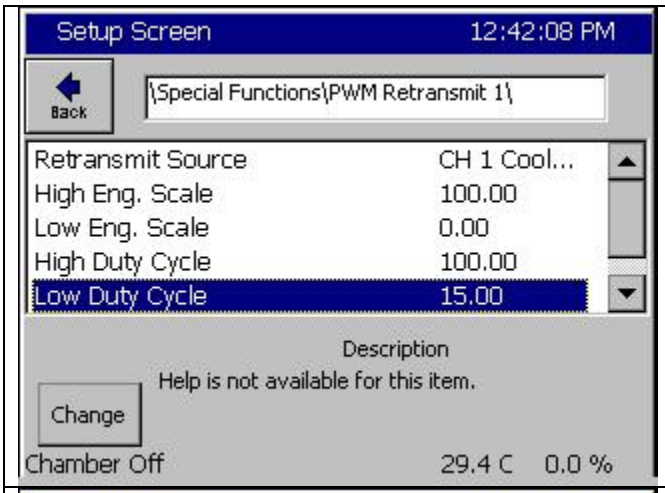
Select the desired variable from the list and press **Accept**.

API Command:
PWMxSRC [0 - 17]
See constants definition list below.



Adjust the Engineering Scaling as required. To retransmit the Channel 1 Cooling PID in the example, set the High and Low Engineering Scale to 100% and 0% respectively.

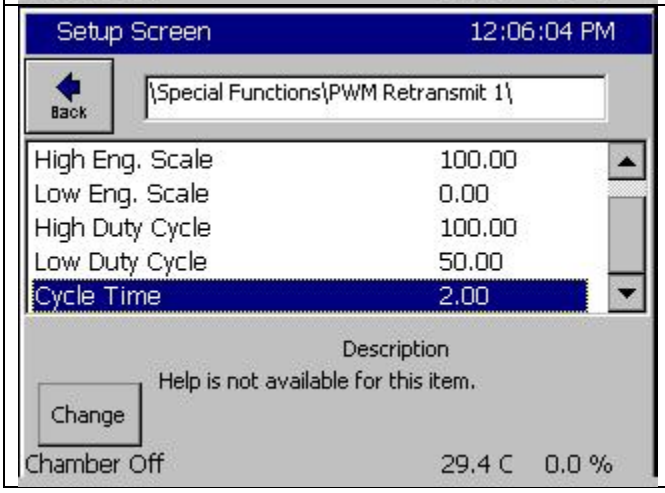
API Commands:
PWMxENGMAX [-200 - 5000]
PWMxENGMIn [-200 - 5000]



Adjust the Duty Cycle Scaling as required. To retransmit the Channel 1 Cooling PID in the example, so the minimum output duty cycle is 15%, and the maximum output duty cycle is 100% set the High and Low Duty Cycle to 100% and 15% respectively.

Note that a constant PWM output can be set by setting both the High and Low Duty Cycle parameters to the desired constant value.

API Commands:
PWMxDUTYMAX [0 - 100]
PWMxDUTYMIN [0 - 100]

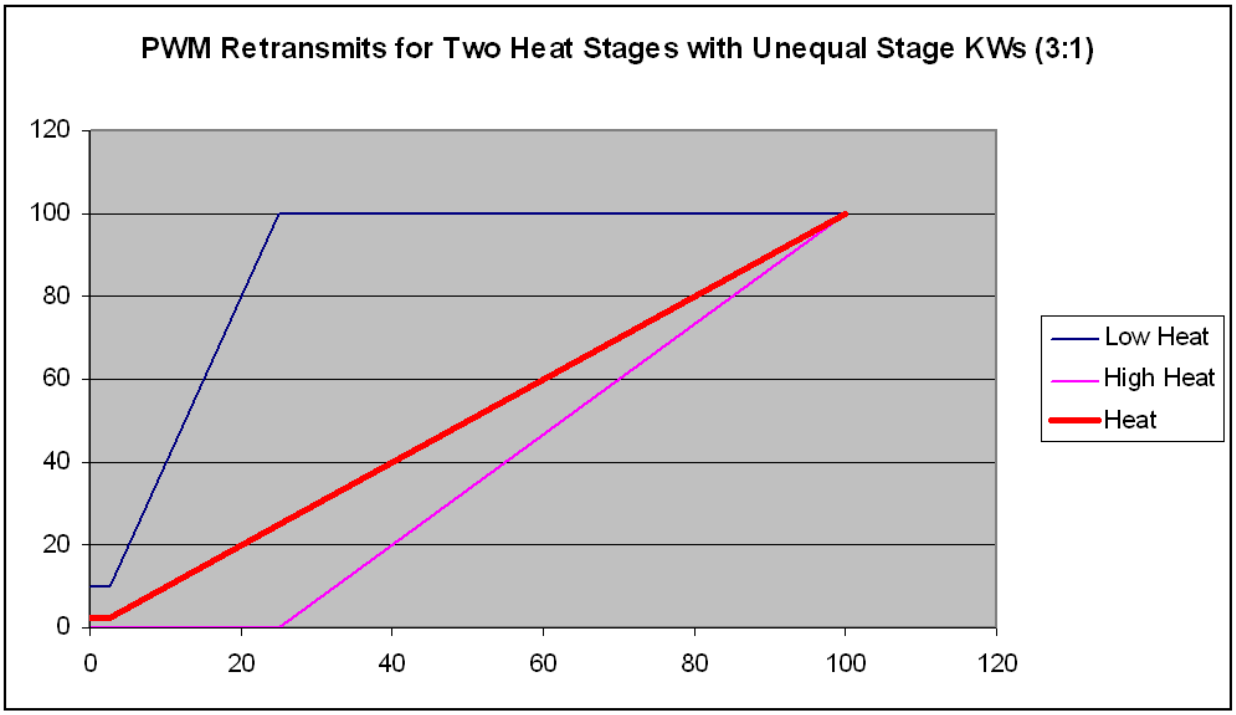


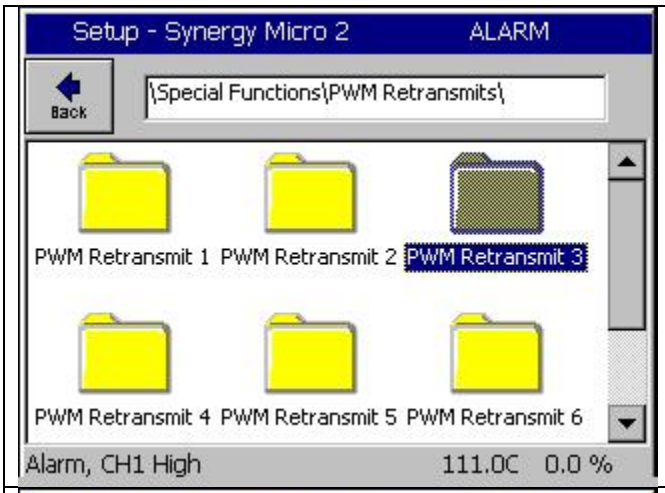
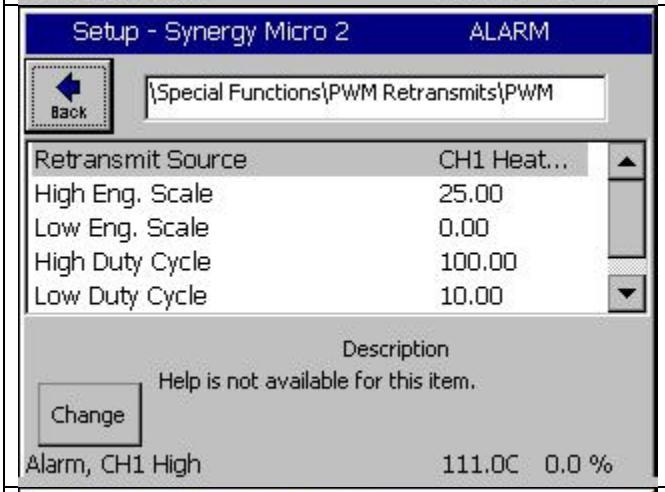
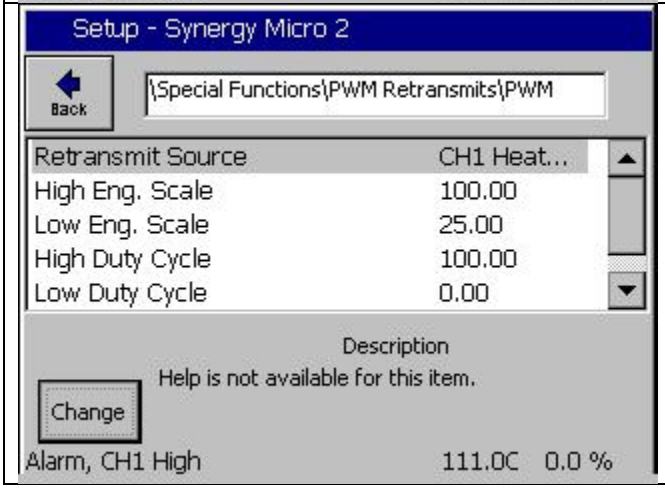
Set the Cycle Time (period) of the PWM output in seconds using the Cycle Time parameter as shown at left.

API Commands:
PWMxCYCLE [0 - 60 Seconds]

Example 2:
As mentioned in the introduction at the beginning of this application note, the heaters in a fast ramp chamber will often be divided into two stages. Sometimes these stages are not equal wattages. The PWM Retransmit Feature can be setup to partition and linearize the control of the heating system between multiple stages.

In addition, a small minimum heat output can sometimes improve control performance. In the following example, the high stage to low stage heater capacity is 3:1 (i.e. 3KW to 1KW) and 2.5% minimum heat is desired. The chart below represents this configuration. The X Axis is the Channel PID Heat Output.



	Browse to the PWM Retransmit Folder as shown at left.
	Set PWM3 for Low Stage Heat Set the Retransmit Source to CH1 Heat PID. Set the 4 parameters as shown at left. Then set the Cycle Time as required.
	Set PWM 4 for High Stage Heat Set the Retransmit Source to CH1 Heat PID. Set the 4 parameters as shown at left Then set the Cycle Time as required.

The Application Programming Interface commands (APIs) for the PWM Retransmit feature are as follows:

= PWMxSRC n where n is [0 - 17] Example: = PWM1SRC 8
n selects the source variable for the PWM output x .

0 - Off
1 - CH 1 Actual
2 - CH 2 Actual
3 - CH 3 Actual
4 - CH 1 Setpoint
5 - CH 2 Setpoint
6 - CH 3 Setpoint
7 - CH 1 Heat PID
8 - CH 1 Cool PID
9 - CH 2 Heat PID
10 - CH 2 Cool PID
11 - CH 3 Heat PID
12 - CH 3 Cool PID
13 - CH 1 Cascade Air
14 - CH 2 Cascade Air
15 - CH 3 Cascade Air

= PWMxENGMAX [-200 - 5000] Example: = PWM1ENGMAX 100
This sets the maximum PID % which will be sent to the Olympic board

= PWMxENGMIN [-200 - 5000] Example: = PWM1ENGMIN 0
This sets the minimum PID % which will be sent to the Olympic board

= PWMxDUTYMAX [0 - 100%] Example: = PWM1DUTYMAX 100
This sets the maximum value of the sensor/input being used. This is used in calculating the % output

= PWMxDUTYMIN [0 - 100%] Example: = PWM1DUTYMIN 15
This sets the minimum value of the sensor/input being used. This is used in calculating the % output

= PWMxCYCLE [0 - 60 Seconds] Example: = PWM1CYCLE 2
This sets the cycle time for the PWM x output.

Note: In the APIs list above, x is 1 for PWM Retransmit 1, and x is 2 PWM Retransmit 2

About Tidal Engineering

Headquartered in Randolph, NJ, Tidal Engineering Corporation has been designing and building award-winning embedded hardware and software for test and measurement and data acquisition applications since 1992. The company is recognized for technical expertise in such areas as Embedded IEEE 488, and turnkey SCADA (Supervisory Control and Data Acquisition) systems. Tidal's products are available exclusively through ADI American Distributors Inc., an ISO-9002 certified distributor of electronic and electromechanical components and assemblies.

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