Summary of the features and settings that affect the automatic pressure behavior of the GCALCURX PLC program.

The GCALCURX name stands for **G**aliso Calibration station Current PLC program version X. It represents an attempt on the part of Galiso to use the same software that our customers use for pressure control in order to better find problems and answer customer questions when they experience problems with the automatic pressure control capability of the Recortest 4 system. The program came out of the effort to provide Cylinder Services in Dallas TX with a reliable pressure control program that can meet Airgas calibration pressure requirements of calibration pressures that are within 10 psi of the target. To do this the way that the operator adjustable settings work were modified and additional features were added. A summary of these changes are:

Correction Value Setting: 0-500

85 = Performs a leak test @ 85% of test pressure and determines the pressure increase when the pressure valve closes for testing very small cylinders, calculates the air to water pressure ratio and then pressurizes to 95%, calculates the air to water pressure ratio and then goes to target pressure. This setting is recommended for testing cylinders where it is critical that the first pressure test is valid. This is the case with certain cylinders used in aircraft applications. This setting is valuable for testing very small medical and aircraft cylinders.

95 = Pressurizes to 95% of test pressure, calculates the air to water pressure ratio and then pressurizes to target. This is the setting recommended for most cylinder testing applications.

495 = same Pressurization sequence as 95 with automatic cycle pressure feature that pressurizes to target, waits 4 seconds and then checks pressure accuracy, waits 8 seconds then bleeds pressure for 8 seconds and starts again. Each pressure cycle is counted and each pressure that is accurate to .3% is counted providing an evaluation of system pressurization accuracy repeatability. This is recommended for trouble shooting purposes and was used to test the reliability of the pressure control features of this program.

500 = Locks the expansion reading at .1 increments through the entire test which is helpful for troubleshooting expansion problems and testing system component performance such as the Test Head and Test Jacket seal.

0-84, 86-94, 96-494, 496-499 = Available numbers for future development. Use of one of these numbers will pressurize directly to target with the last piston ratio that was calculated using 85 or 95 as the Correction Value Setting.

Piston Ratio Setting: 70-105

Provides the ability to adjust the amount of air that is supplied to the pump to achieve target pressure quickly or stall before target and then incrementally increase with the variable rate. In other words if the piston ration has be accurately set, when it comes time for the software to go to the target pressure it should either stall or surpass the target by the same percentage as this setting. A quick way to test production cylinders is to first get an accurate piston ratio for the target pressure of the size cylinder being tested using a Correction Value of 95 and then change the Correction Value to 0 and the Piston Ratio to 105.

Variable Rate Setting: .1-10

Increment value for increasing pressure to the pump when the rate of pressure increase falls below 2 psi per second. For very small cylinders use 1 and for very large cylinders use 10.

These are the three settings that the operator can control. There are also the following features.

Functionality in Pressure Control:

In order to separate the amount of air needed to overcome friction when the pump is stalled from the amount of air needed to reach the target pressure there is are now two separate air values that are added to the pump when the pump stalls before target.

1 .When the rate of pressure falls below 2 psi per second before target pressure is achieved, the distance to the target pressure is calculated and supplied to the pump in air pressure. This additional air is maintained until the pressure is above target.

2. The incremental air supplied by the Variable Rate Setting is increased until the pump starts moving again and then this pressure value is set to zero.

3. There is a limit to the amount of air that is supplied to the pump through the incremental Variable Rate Setting to help prevent pressures above 108% of target.

A test of this program provided 888 pressures that were accurate to .3% of 3000 psi target out of a total of 948 pressure cycles.

Thankfully yours, the Galiso team