

# CT-1000 Ver 7.0.01

## Direct Mass Flow Leak Test System Installation and Operation Manual

Table of Contents		Page
<b>1.00 CT-1000 LEAK TEST SYSTEM</b>	.....	6
<b>2.00 SYSTEM OVERVIEW</b>	.....	8
2.01 LCD Display Chart	.....	10
<b>3.00 SYSTEM SET UP MODE</b>	.....	11
3.01 External Program Selection	.....	11
3.02 External Program Pin Signals	.....	12
3.03 Typical PLC Wiring	.....	13
3.04 Example of Plug Wiring to Select Different Part #'s	.....	14
3.05 Calibration Protection	.....	15
3.06 Display of Leak Rate	.....	15
3.07 Abort Outputs	.....	15
3.08 Good Part Relay Output Delay	.....	15
3.09 RS232 Output	.....	15
3.10 Fast Cycle Delay Enable	.....	16
3.11 Fill Valve	.....	16
3.12 Pressure Units	.....	16
3.13 Pressure Decimals	.....	16
3.14 Flow Units	.....	16
3.15 Flow Decimals	.....	16
3.16 Flow Averaging	.....	17
3.17 Flash Error Messages	.....	17
3.18 Set Real Time Clock	.....	17
<b>4.00 Data Mode</b>	.....	19
4.01 Data Collection	.....	19
4.02 Downloading Data	.....	20
4.03 Data Format	.....	21

<b>Table of Contents Cont</b>	<b>Page</b>
<b>5.00 PART NUMBER SET UP MODE</b> .....	22
5.01 Part Number Setup Parameter Descriptions .....	23
5.02 Password .....	23
5.03 Part Number .....	23
5.04 Customer Code .....	23
5.05 Time Base .....	23
5.06 Fill Time .....	23
5.07 Fast Fill Pressure .....	23
5.08 Read Time .....	24
5.09 Leak Limit .....	24
5.10 Calibrated Leak .....	24
5.11 Maximum Allowable Slope .....	24
5.12 Minimum Negative Flow Below Zero .....	25
5.13 Pressure High Limit .....	25
5.15 Pressure Low Limit .....	25
5.16 Fast Fill Pressure Regulator .....	25
5.17 Set Pressure .....	25
5.18 Fast Cycle Delay .....	26
5.19 Setting Test Pressure Regulator .....	27
<b>6.00 SETUP SOFTWARE</b> .....	28
6.01 PC System Parameter Screen .....	28
6.02 PC Part Number Screen .....	29
6.03 Parameter Loading Instructions .....	30

<b>Table of Contents Cont</b>	<b>Page</b>
<b>7.00 CALIBRATION MODE</b> .....	31
7.01 CT-1000 Integrity Check.....	31
7.02 Automatic Calibration Static Procedure.....	33
7.03 Automatic Calibration Steps.....	34
<b>7.04 CALIBRATION CHECK PROCEDURE</b> .....	36
7.05 Adding The Calibrated Leak.....	36
<b>8.00 RS232 DATA OUTPUT</b> .....	38
8.01 RS232 Format .....	39
<b>9.00 PNEUMATIC CONNECTIONS</b> .....	40
9.01 TEST PORT .....	40
9.02 AIR SUPPLY .....	40
9.03 REF PORT .....	40
9.04 AUX PORT .....	41
9.05 CAL LEAK.....	41
9.06 EXH PORT.....	41
<b>10.00 ELECTRICAL CONNECTIONS</b> .....	42
10.01 TYPICAL USER CONNECTIONS USING 24 VDC SUPPLY TO 12 PIN CONNECTOR .....	43
10.02 TYPICAL USER CONNECTIONS WHEN USING AC ADAPTOR .....	44

<b>Table of Contents Cont</b>	<b>Page</b>
<b>11.00 RUN MODE</b> .....	45
11.01 V: Leak .....	46
11.02 Passed Test Counter .....	47
11.03 Failed Test Counter .....	47
11.04 Gross Failed Test Counter .....	47
11.05 Total Test Counter .....	47
11.06 Clear All Counters .....	47
11.07 Leak Rate .....	47
11.08 Current Pressure .....	47
11.09 Current Flow .....	47
11.10 Raw Flow .....	48
11.11 Raw Flow From Stabilization Time .....	48
11.12 Raw Flow From Read Time .....	48
11.13 Total Cycle Counter .....	48
<b>12.00 TROUBLE SHOOTING</b> .....	49
12.01 LCD Display Blank: .....	49
12.02 System will not start in Run Mode: .....	49
12.03 System stops part way through in Run Mode: .....	49
12.04 System stops part way through in Run Mode: .....	49
12.05 System Displays Error Code *U at end of read cycle .....	49
12.06 System Displays *D At End Of Read Cycle .....	50
12.07 System displays *- at end of read cycle .....	50

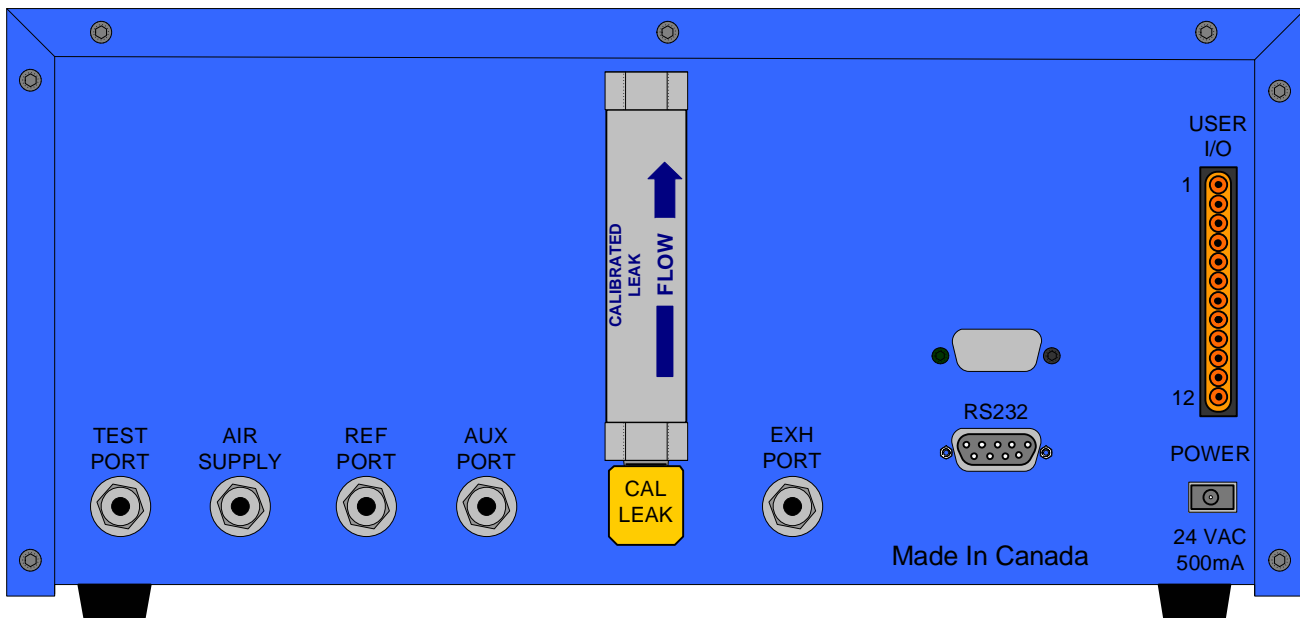
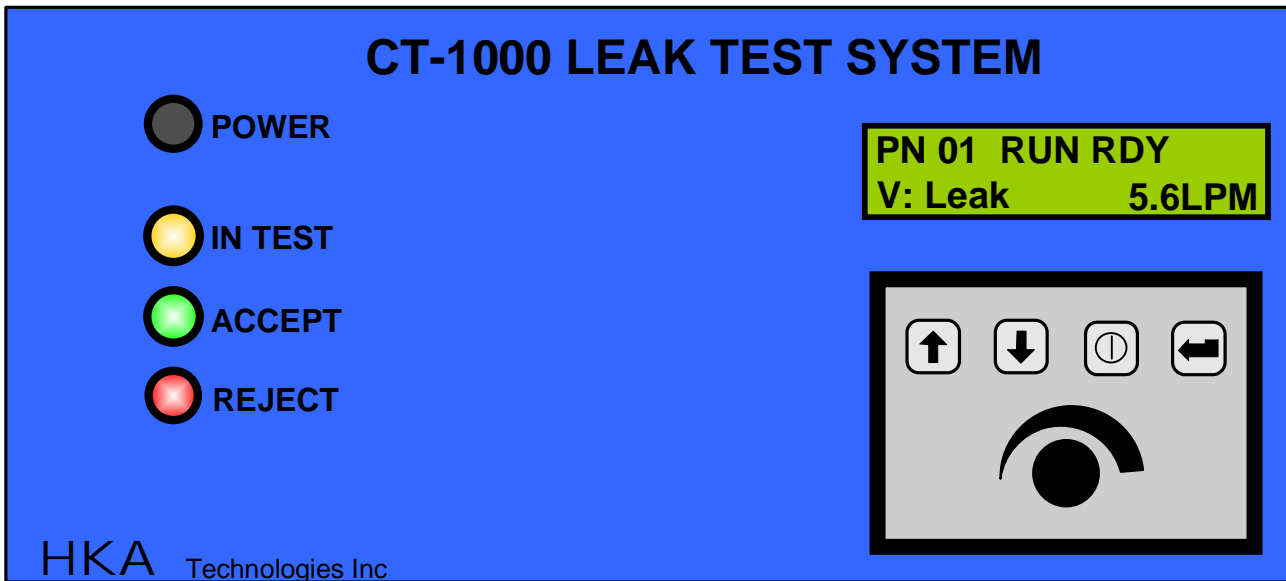
<b>Table of Contents Cont</b>	<b>Page</b>
12.08 System Will Not Accept Changes In Program Mode .....	50
12.09 System Stops Part Way Through In Calibration Mode .....	50
12.10 System Stops Part Way Through In Calibration Mode .....	50
12.11 System Stops At The End Of Comp Time .....	51
12.12 System Stops At The End Of Comp Time .....	51
12.13 System Stops At Mid Stab Time .....	51
12.14 System Stops At Start Of Test .....	51
12.15 System Fails Test .....	52
12.16 System Did Not Start Test (*E Appears At Test End) .....	52
12.17 System Did Not Start Test (*V Appears During Test) .....	52
12.19 *G Appears During Test .....	52
<b>13.00 CT-1000 OPTIONAL EXTRAS .....</b>	<b>53</b>
13.01 AC Adaptor .....	53
13.02 Manual Interface Box .....	53
13.03 External Part Isolation Valve .....	53
13.04 Graphing Software .....	53
<b>14.00 SPECIFICATIONS .....</b>	<b>54</b>
<b>15.00 WARRANTY .....</b>	<b>56</b>

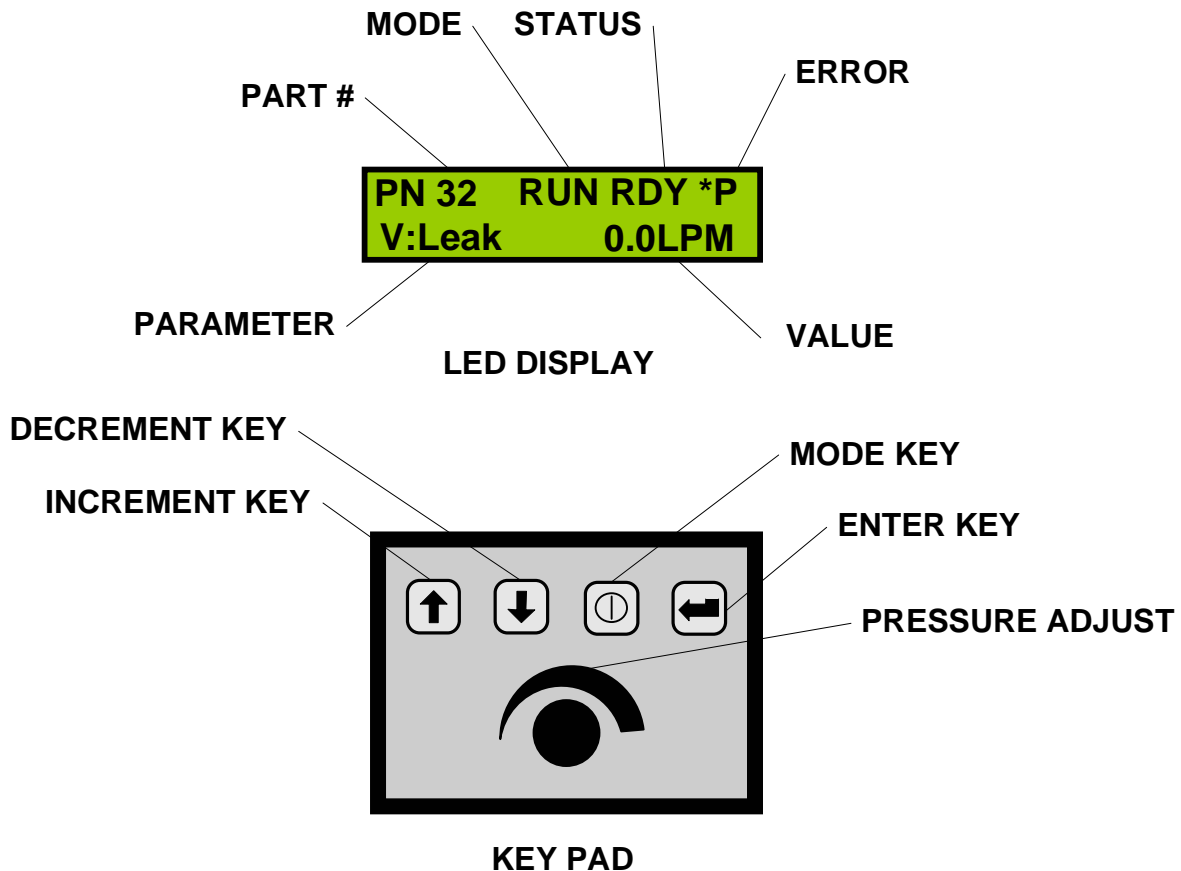
### 1.00 CT-1000 LEAK TEST SYSTEM

This configuration of the CT-1000 is a direct mass flow leak test system. It uses a mass flow transducer to accurately measure flow from a reference part to the test part.

The CT-1000 also incorporates a pressure transducer to enable accurate setting of the test pressure and to monitor the pressure during the test cycle.

The system uses advanced microprocessor circuitry to deliver superior performance at lowest cost.





A large backlit LCD readout displays all readings and set-up parameters.

Set up parameters for up to 32 different parts is stored in a non-volatile EEPROM that does not require battery backup.

Set-up and viewing operations are made through a four-button keypad located on the front panel or via set-up software when connected to a PC.

All process valves are air operated eliminating any heating effect on leak measurement caused by power dissipation in the solenoid coils.

The two-line backlit LCD display has five areas that show set up and running information.

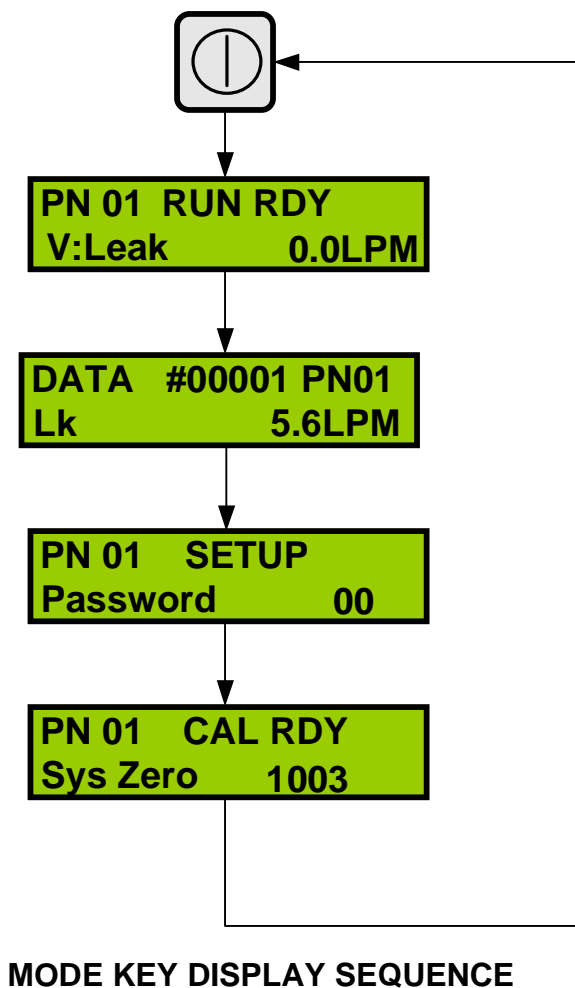
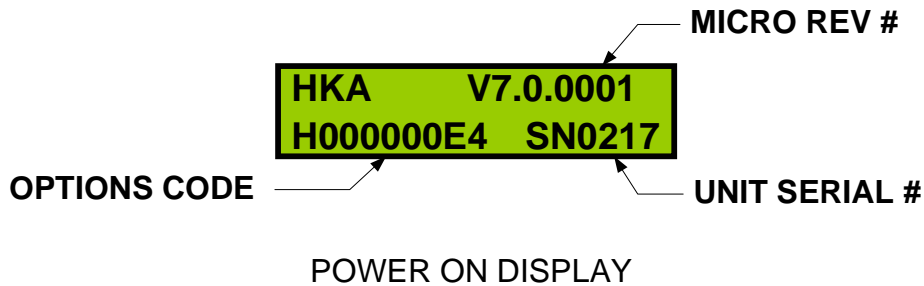
All external pneumatic connections are made to the manifold located at the rear of the leak test unit. These include ports for the reference part and the part under test, a port for the calibrated leak, air supply in and exhaust ports.

All electrical control connections are made through three connectors. A removable twelve-pin connector, a removable 9-pin male D-sub connector and a removable 9-Pin female D-sub connector. The unit can be powered either by applying 24 volts dc through the twelve pin connector or by the optional AC adapter.

The 9-Pin female D-sub RS-232 port on the rear panel allows connection to a PC for using four RS232 communication protocols plus optional HKA graphing software. The graphing software plots the flow during the leak test cycle. This is very useful for set-up and for ongoing monitoring of system performance. The graphical representation of the leak test process is ideal in determining the optimum test time for the part under the given test conditions. The 9-Pin male D-sub connector on the rear panel is for external program selection and the 12 pin connector is for control signals.

## 2.00 SYSTEM OVERVIEW

When the CT-1000 is first turned on the LCD display will show the power on screen for five seconds and then switch to the last screen that was on when the unit was powered off. If you want to view the power screen longer you must push and hold the up arrow key while it is displayed.





The CT-1000 system can be programmed to test up to 32 different parts as long as the test pressures are all within the range of the leak test unit. The calibrated leak used with the system must be in the correct order of magnitude for the parts family.

The test unit can be in one of four conditions as set by the "Mode" button (the button to the right of the down arrow) - Set Up Mode, Data Mode, Run Mode or Calibrate Mode.

When power is removed and re-applied to the unit it will always start in the same mode as it was in when power was turned off.

Repeatedly pushing the mode button will scroll from Run, to Data to Set Up to Calibrate, and back to Run. The selected Mode is indicated on the top line of the LCD display.

In Run or Calibrate Mode the left top of the LCD display is used to indicate any fault conditions or if there are no faults present "RDY" will be displayed indicating system is ready.

The bottom line of the LCD is used to display variable parameters for the test system.

The left half of the display identifies the parameter while the right half of the display identifies the numeric value of that parameter.

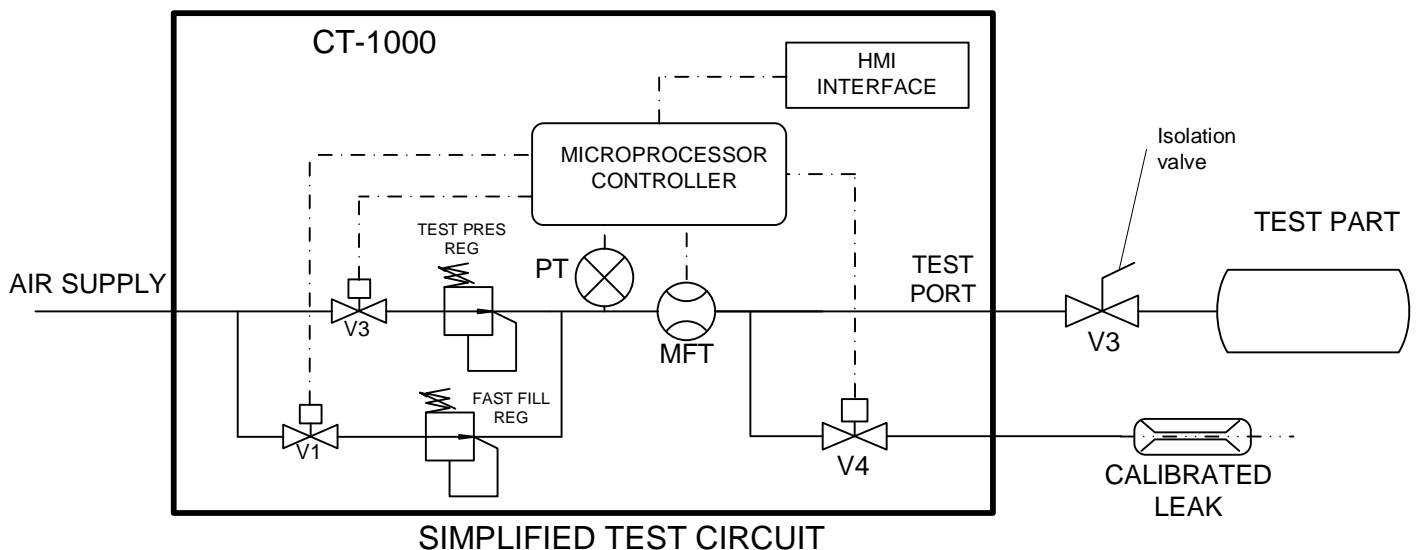
Pushing the enter button (right hand button) will scroll thru the various parameters available in the Mode selected.

In Set Up Mode only, the Up and Down arrow buttons can be used to change the numeric value of the parameter being displayed.

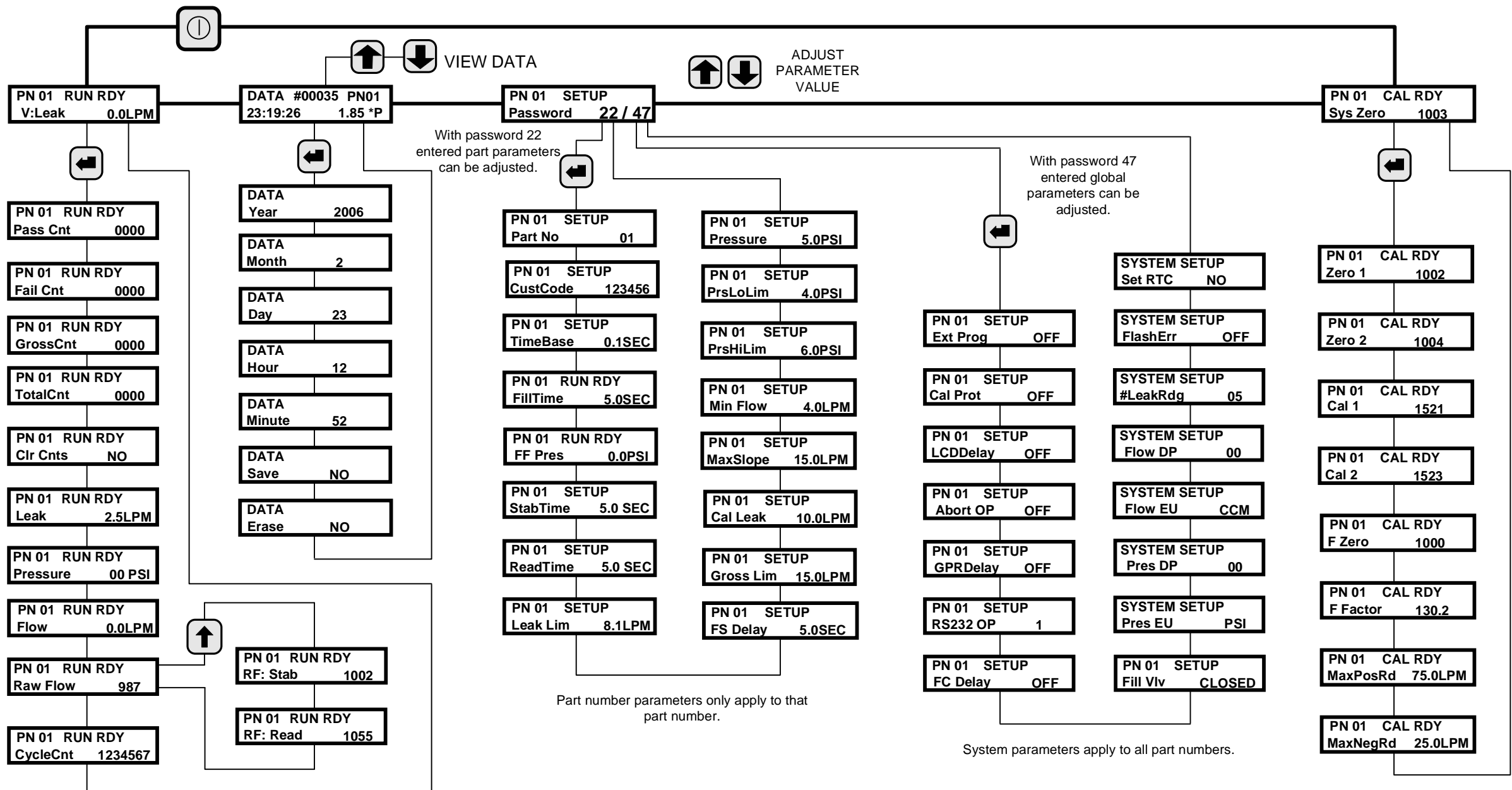
In order to change any value, the correct Password must have been entered. Without the correct Password, the various parameters can only be examined, not changed.

In Run Mode, the Up and Down arrow keys are only used to toggle between "YES" and "NO" for the parameter "Clear Counters".

There is also a non-reset able total counter that can only be reset by the factory.



## 2.01 STANDARD DIRECT MASS FLOW CT-1000 DISPLAYS VER 7.0



### 3.00 SYSTEM SET UP MODE

System setup Mode is used to set the parameters for the overall operation of the leak tester. NOTE all items in the system setup apply to all part numbers. The password 47 must be entered en-order to view or change any of the parameters.

The following describes each of the parameters in system setup Mode.

#### 3.01 External Program Selection (ON or OFF)

ON - Part numbers are selected via the male 9-pin D-sub Connector on the back of the unit.

OFF - Part numbers are selected via the parameter setup menu.



To switch between Internal and external part number selection push the mode key until **setup** is displayed in the top line of the LCD display. Now push the enter key until the **Password** parameter is displayed.



Using the up / down arrow keys enter the password **47**.

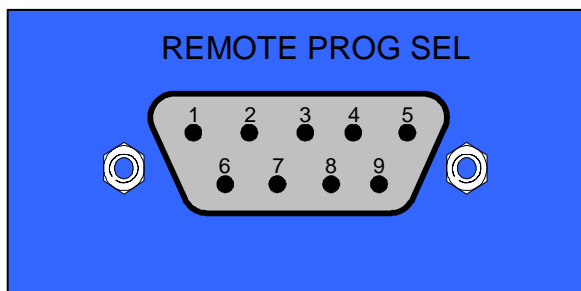


Push the enter key until the **Ext Prog** is displayed. Use the up or down arrow key to toggle between OFF and ON.

When the Ext Prog is ON part # selection is done via the 9-pin D-sub connector on the back of CT-1000. This overrides the local setting. Note that when Ext Prog is switched off the unit returns on the last part number used until it is locally changed.

### 3.02 External Program Pin Signals

Remote part # selection is done via a 9-Pin D-sub connector.



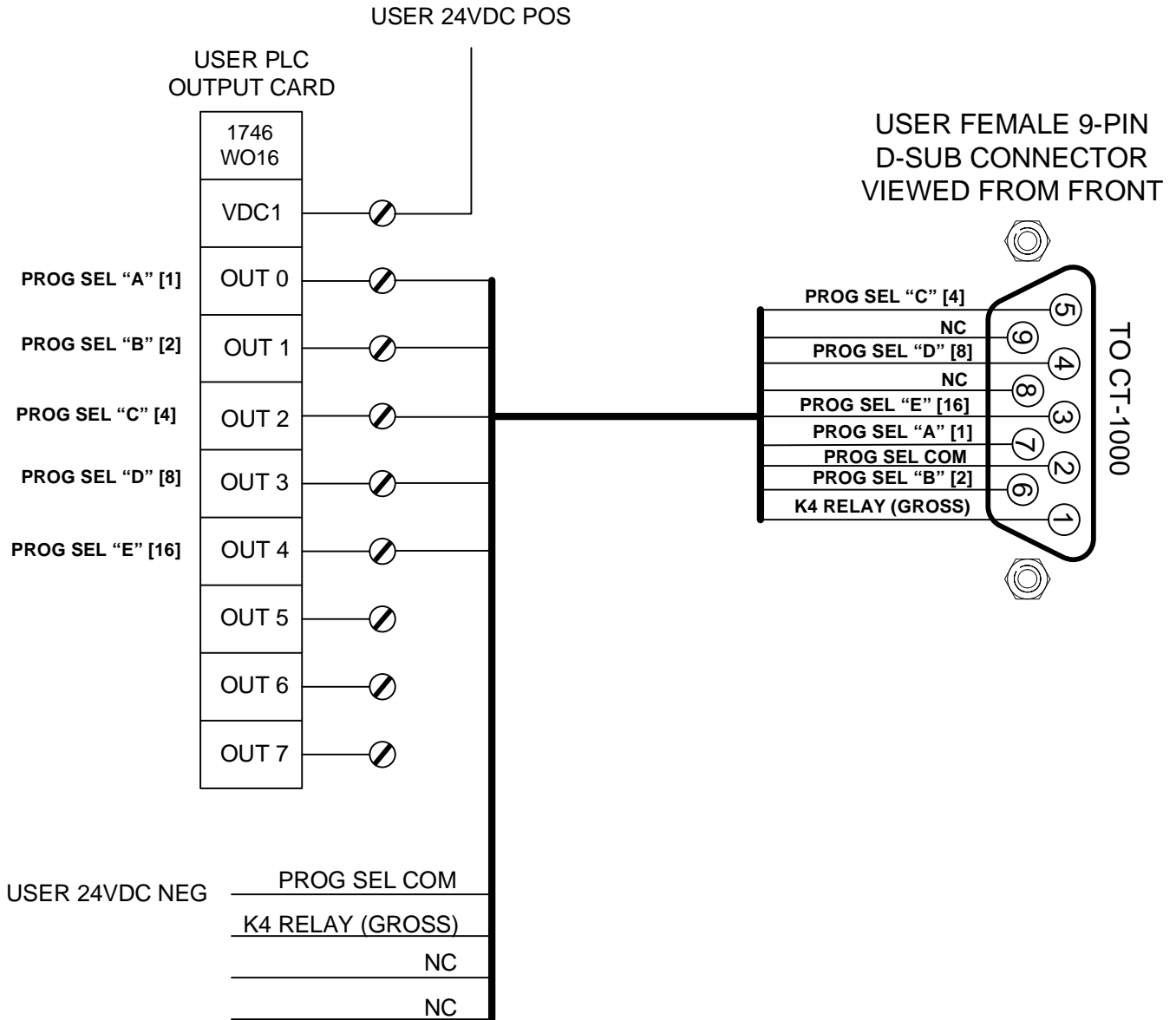
BACK OF CT-1000 9-PIN MALE

- PIN 1 - K4 RELAY GROSS
- PIN 2 - PROG SEL COM
- PIN 3 - PROG SEL "E"
- PIN 4 - PROG SEL "D"
- PIN 5 - PROG SEL "C"
- PIN 6 - PROG SEL "B"
- PIN 7 - PROG SEL "A"
- PIN 8 - NC
- PIN 9 - NC

The CT-1000 can be wired various ways for part number remote selection. The inputs used for part selection are bi-polar optic isolators. These allow either a positive or negative signal to be used. If a PLC is used it can use either source, sink or relay outputs to drive the CT-1000 part number selection. Another common method of part number selection is to have a plug, which is hard wired so that when it is plugged into the CT-1000 the desired part number is automatically selected. This is a common way of using multiple fixtures in a single leak test stand without introducing operator error when selecting which part # setup to be used.

A[1]	B[2]	C[4]	D[8]	E[16]	PART #
OFF	OFF	OFF	OFF	OFF	1
ON	OFF	OFF	OFF	OFF	2
OFF	ON	OFF	OFF	OFF	3
ON	ON	OFF	OFF	OFF	4
OFF	OFF	ON	OFF	OFF	5
ON	OFF	ON	OFF	OFF	6
OFF	ON	ON	OFF	OFF	7
ON	ON	ON	OFF	OFF	8
OFF	OFF	OFF	ON	OFF	9
ON	OFF	OFF	ON	OFF	10
OFF	ON	OFF	ON	OFF	11
ON	ON	OFF	ON	OFF	12
OFF	OFF	ON	ON	OFF	13
ON	OFF	ON	ON	OFF	14
OFF	ON	ON	ON	OFF	15
ON	ON	ON	ON	OFF	16
OFF	OFF	OFF	OFF	ON	17
ON	OFF	OFF	OFF	ON	18
OFF	ON	OFF	OFF	ON	19
ON	ON	OFF	OFF	ON	20
OFF	OFF	ON	OFF	ON	21
ON	OFF	ON	OFF	ON	22
OFF	ON	ON	OFF	ON	23
ON	ON	ON	OFF	ON	24
OFF	OFF	OFF	ON	ON	25
ON	OFF	OFF	ON	ON	26
OFF	ON	OFF	ON	ON	27
ON	ON	OFF	ON	ON	28
OFF	OFF	ON	ON	ON	29
ON	OFF	ON	ON	ON	30
OFF	ON	ON	ON	ON	31
ON	ON	ON	ON	ON	32

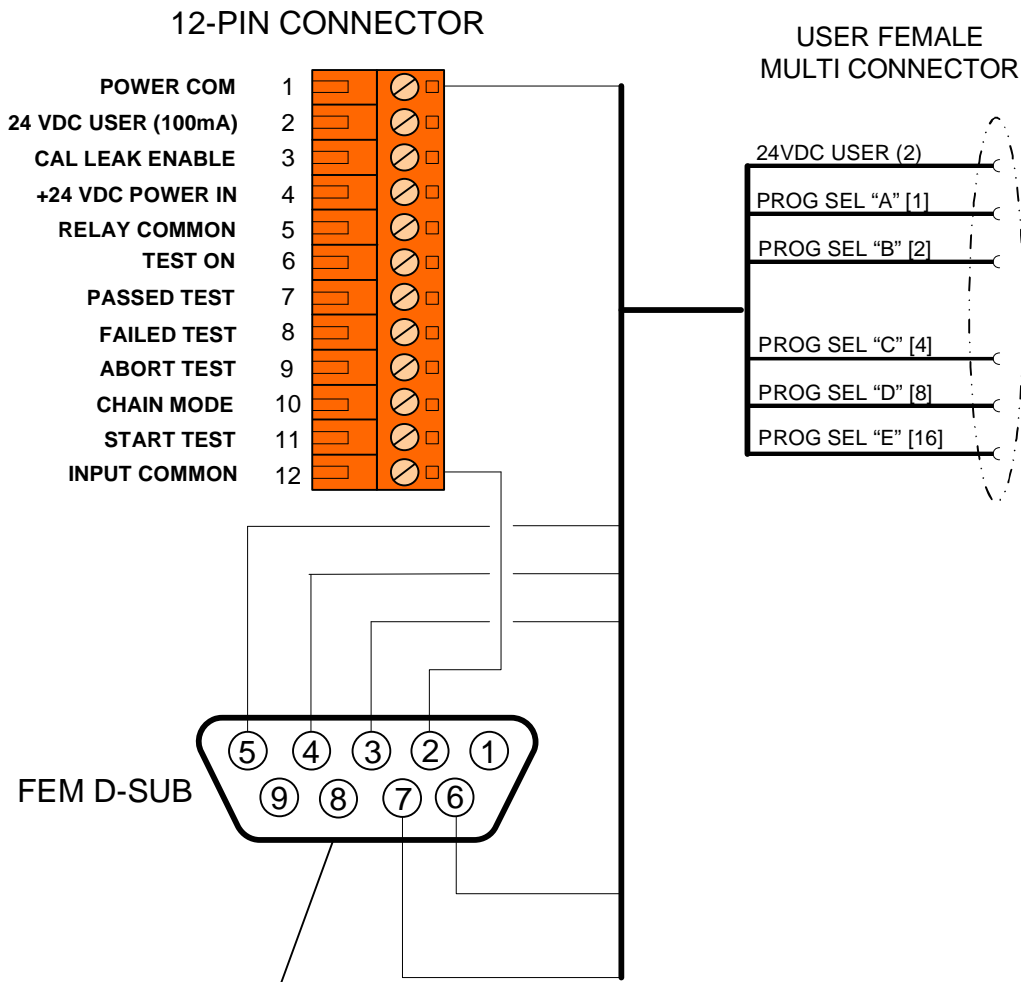
### 3.03 Typical PLC Wiring



### 3.04 Example of Plug Wiring to Select Different Part #'s

#### CT-1000

#### FIXTURE



12-PIN CONNECTOR

USER FEMALE MULTI CONNECTOR

USER MALE MULTI CONNECTOR MOUNTED ON THE TEST FIXTURE

- POWER COM 1
- 24 VDC USER (100mA) 2
- CAL LEAK ENABLE 3
- +24 VDC POWER IN 4
- RELAY COMMON 5
- TEST ON 6
- PASSED TEST 7
- FAILED TEST 8
- ABORT TEST 9
- CHAIN MODE 10
- START TEST 11
- INPUT COMMON 12

- 24VDC USER (2)
- PROG SEL "A" [1]
- PROG SEL "B" [2]
- PROG SEL "C" [4]
- PROG SEL "D" [8]
- PROG SEL "E" [16]

JUMPERS NEEDED TO SELECT PAR # 22  
 = [21] ONE LESS THAN 22 BECAUSE TO GET PART # 1 ALL PROG ARE OFF. SEE TABLE

JUMPERS NEEDED TO SELECT PAR # 11  
 = [10] ONE LESS THAN 11 BECAUSE TO GET PART # 1 ALL PROG ARE OFF. SEE TABLE

FEM D-SUB

PIN	ID
1	K4 RELAY GROSS
2	PROG SEL COM
3	PROG SEL "E" [16]
4	PROG SEL "D" [8]
5	PROG SEL "C" [4]
6	PROG SEL "B" [2]
7	PROG SEL "A" [1]
8	NC
9	NC

**3.05 Calibration Protection (OFF or ON)**

PN01 SETUP  
Cal Prot OFF

With this parameter set to "ON" a calibration can only take place when password "45" is entered.

**3.06 Display of Leak Rate (OFF or Time Value)**

PN01 SETUP  
LCDDelay OFF

When set to OFF the leak rate of the last test is displayed on the LCD until the start of the next test cycle. When a time value is entered in this parameter the leak rate is only displayed for the set time after which the leak rate is blanked out.

Use the up / down arrow keys to set a time. Once the time is a 0 seconds the display shows the parameter to be off.

**3.07 Abort Outputs (OFF or ON)**

PN01 SETUP  
Abort OP OFF

When the abort output is set to OFF all outputs from the CT-1000 turn off when an abort signal is sent to the CT-1000. When the abort output is set to ON the CT-1000's outputs remain in their last state.

**3.08 Good Part Relay Output Delay (OFF or Time Value)**

PN01 SETUP  
GPRDelay OFF

When set to OFF the output for a passed test remains on until the start of the next test. When set to a timed value the output for a passed test remains on only for the set time.

**3.09 RS232 Output (1 - 2 - 3 or 4)**

PN01 SETUP  
RS232 OP 01

RS232 OP sets the protocol of the RS232 port.

01 - Raw A/D count from mass flow transducer for HKA Graphing software.

02 - Sends scaled leak rate reading.

03 - Custom customer specified protocol.

04 - HKA real time data collection software.

For more information on the RS232 configuration go to section 8.

**3.10 Fast Cycle Delay Enable (OFF or ON)**

PN01	SETUP
FC Delay	OFF

When set to **OFF** fast cycle cannot be enabled on any part number. When set to **ON** fast cycle can be set to a user time or off in each part number setup.

**3.11 Fill Valve (OPEN or CLOSED)**

PN01	SETUP
Fill Vlv	OPEN

When set to **OPEN** the internal fill valve stays open at the end of a test which has failed. This allows the operator to physically look for where there are leaks so they can be marked or repaired. If the test passed the fill valve turns off. When set to **CLOSED** the fill valve closes at the end of every test regardless of a pass or fail.

**3.12 Pressure Units (kPa or PSI)**

PN01	SETUP
Pres EU	kPa

The units for pressure are selectable between kPa and PSI.

**3.13 Pressure Decimals (0-1-2)**

PN01	SETUP
Pres DP	1

Sets the number of decimals to display in the pressure display.

- 0 - 85 PSI
- 1 - 85.0 PSI
- 2 - 85.00 PSI

**3.14 Flow Units (SCCM or LPM)**

PN01	SETUP
Flow EU	LPM

The units for flow are selectable between SCCM or LPM.

**3.15 Flow Decimals (0-1-2)**

PN01	SETUP
Flow Dec	1

Sets the number of decimals to display in the flow display.

- 0 - 2 CCM
- 1 - 2.1 CCM
- 2 - 2.11 CCM

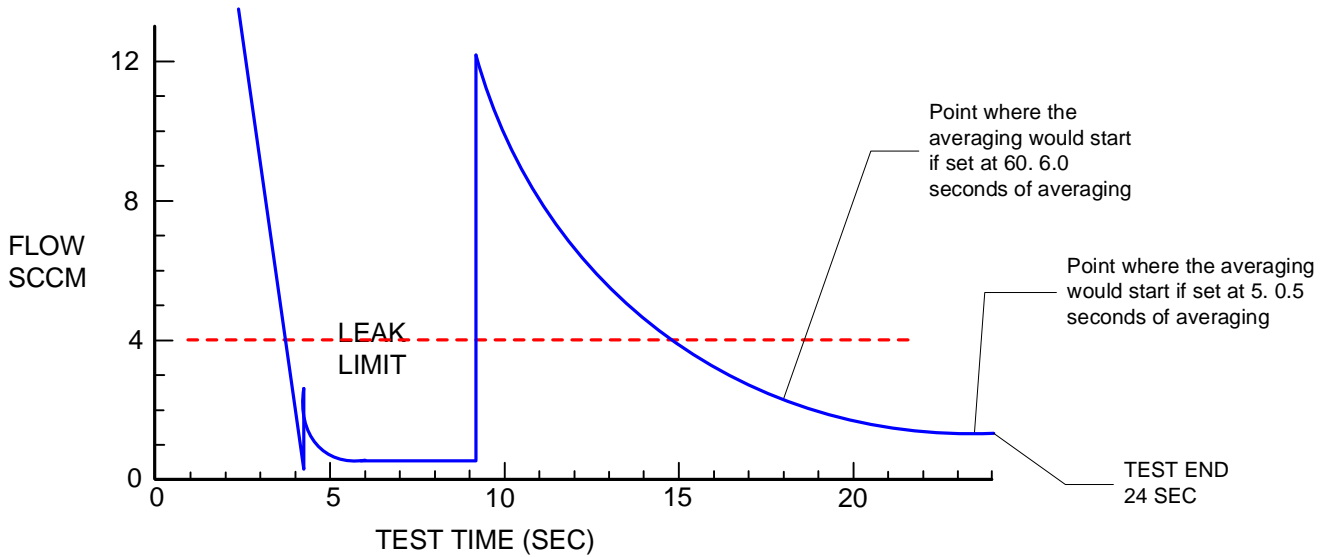


3.16 Flow Averaging (5-60)

**SYSTEM SETUP**  
**#LeakRdg 05**

Sets the number of flow readings used to calculate the final leak value. The readings are taken once for each 100ms. Time to take the readings is done within the read time.

GRAPH OF FLOW AVERAGING WITH UNIT SET WITH A 0.1 SEC TIME BASE



3.17 Flash Error Message (ON or OFF)

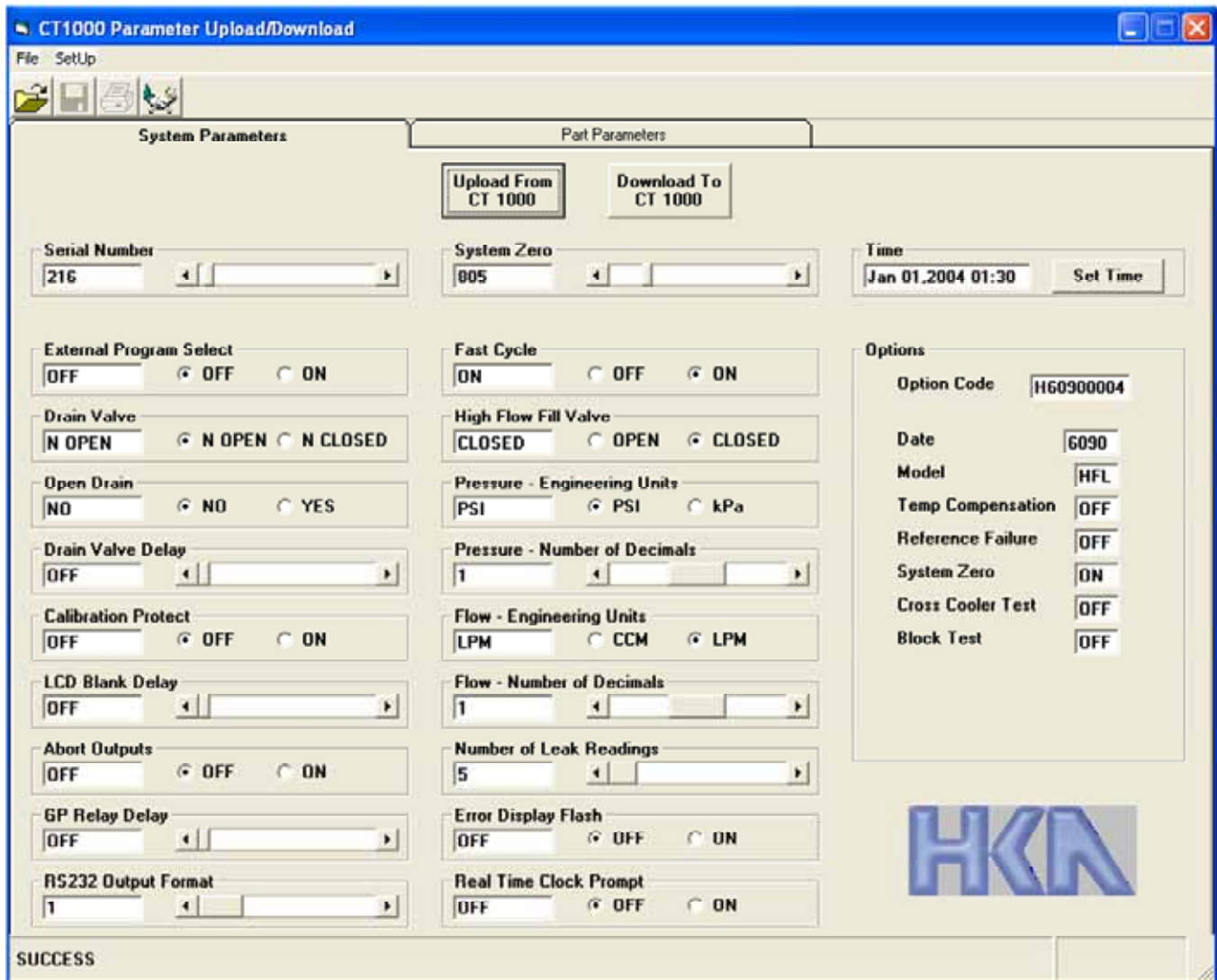
**SYSTEM SETUP**  
**FlashErr OFF**

When set to ON and an error occurs the display will automatically toggle between the normal end of test display and the error message. When set to off the error message is displayed when the down arrow key is pressed.

3.18 Set Real Time Clock (NO or YES)

**SYSTEM SETUP**  
**Set RTC YES**

When set to YES and power is removed from the unit when the unit gets power again the display will prompt you to set the clock. When set to NO the unit will return to the last state that it was in before the lost of power.



## 4.00 DATA MODE

The CT-1000 is now available with test data collection in micro versions 7.0 or higher. The data collection option allows the user to store a minimum of 5,000 leak test readings. The comma-delimited data can be uploaded to a PC via an RS-232 cable and used in Excel spread sheets or the data can be viewed on the CT-1000 display. The data is stored in the CT-1000 in FIFO order.

### 4.01 Data Collection

**DATA #00001 PN 01**  
**365;23;59 15.2\*U**

Day  
 Hour  
 Minute

*Data view mode display* When in this mode a minimum of 5,000 test results can be view. Push the up /down arrow keys to scroll through the data. The bottom left of the display shows the day, hour and minute of the test result displayed.

Error code if any.

Leak reading

**DATA**  
**Year 2006**

*Year display* Using the up or down arrow key set the year.

**DATA**  
**Month 12**

*Month display* Using the up or down arrow key set the month.

**DATA**  
**Day 120**

*Day display* Using the up or down arrow key set the day. The day is shown from 1 to 365.

**DATA**  
**Hour 23**

*Hour display* Using the up or down arrow key set the hour. The hour is shown as a 24 hour clock.

**DATA**  
**Minute 59**

*Minute display* Using the up or down arrow key set the minute.

**DATA**  
**Save YES**

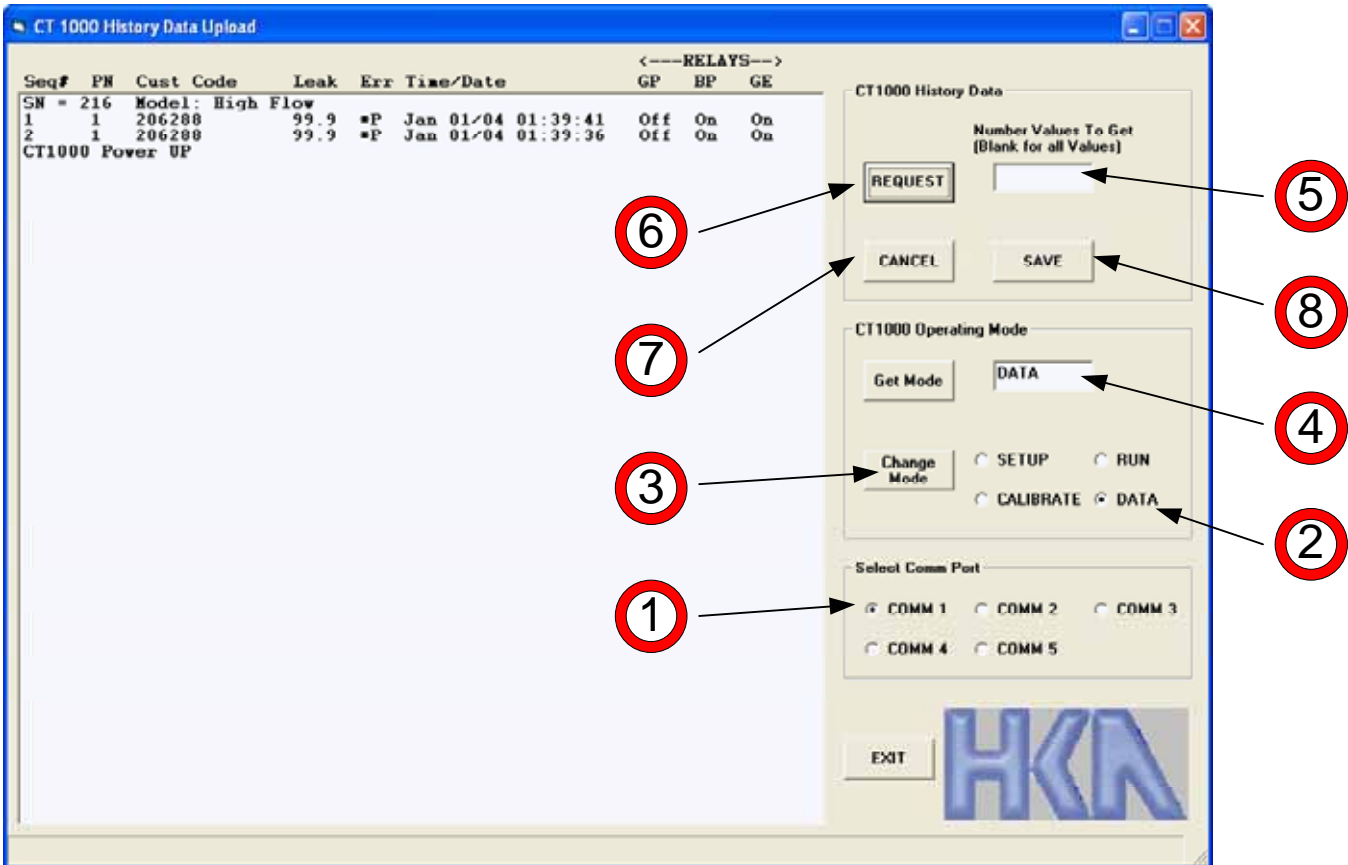
*Data saving enable display* When set to YES data is saved. When set to NO data is not saved.

**DATA**  
**Erase NO**

*Data erase display* When in this display pushing ether the up or down arrow key to set the value to yes then press the enter key this will erase all data. The default setting is no

### 4.02 Downloading Data

- Connect the 9 pin female RS-232 port of the CT-1000 to the 9 pin male port of the PC. Use a standard RS-232 cable.
- Run the history data program.
- The following screen will appear.



- 1 - Select the comm port you are physically connected to.
- 2 - Select data.
- 3 - Select the Change Mode button.
- 4 - The mode the unit is in will be displayed in this box. The unit must be in data mode to upload.
- 5 - Enter the number of data readings you want to upload or leave this blank to get all.
- 6 - Select the REQUEST button. The data will now be transferred to your PC.
- 7 - Press this button to cancel the data transmission.
- 8 - Once the transmission is complete press this button to save data.

### 4.03 Data Format

The data is saved with the .xls file extension and can be viewed and manipulated with Excel.

	A	B	C	D	E	F	G	H	I	J
1	SEQ#	PN	Cust Code	Leak	Error	Time/Date	GPRelay	BPRelay	GERelay	
2	SN = 216	Model: High Flow								
3	1	1	206288	99.9	*A	Jan 01/04 02:31:01	Off	Off	Off	
4	2	1	206288	99.9	*A	Jan 01/04 02:30:59	Off	Off	Off	
5	3	1	206288	99.9	*A	Jan 01/04 02:30:56	Off	Off	Off	
6	4	1	206288	99.9	*P	Jan 01/04 01:46:18	Off	On	On	
7	CT 1000 Power UP									
8	5	1	206288	99.9	*P	Jan 01/04 01:46:46	Off	On	On	
9	CT 1000 Power UP									
10	6	1	206288	99.9	*P	Jan 01/04 01:43:58	Off	On	On	
11	7	1	206288	99.9	*P	Jan 01/04 01:43:47	Off	On	On	
12	8	1	206288	99.9	*P	Jan 01/04 01:43:19	Off	On	On	
13	9	1	206288	99.9	*P	Jan 01/04 01:43:09	Off	On	On	
14	10	1	206288	99.9	*P	Jan 01/04 01:42:53	Off	On	On	
15	11	1	206288	99.9	*P	Jan 01/04 01:39:41	Off	On	On	
16	12	1	206288	99.9	*P	Jan 01/04 01:39:36	Off	On	On	
17	CT 1000 Power UP									
18										
19										
20										
21										
22										
23										
24										

Example of data format

## 5.00 PART NUMBER SET UP MODE

Part setup Mode is used to select the desired part number (1 thru 32) and to input or change any of the parameters associated with that part number. Password “22” is required to be entered before any changes can be made to a part numbers set up parameters. If the correct password is not entered parameters can only be viewed. When selecting times and values for the set-up of the unit it is better to start with longer times first and then optimize the times after the integrity of the entire air circuit is proven to be leak and influence free. The following is a list of items that you should understand their effect on the test set-up. All of these items should be considered for the entire test circuit, which includes, the test part the reference part and all connecting elements. This is because all the elements that are part of the test circuit are tested along with the part each and every time a test is run. Part number setup parameters can also be changed using the Parameter software.

### **Volume**

The larger the volume of the test circuit the longer it will take to fill. Fast fill should be used for larger parts.

### **Test pressure**

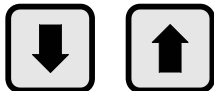
The higher the pressure the more volatile the test circuit will react to environmental changes.

### **Mechanical integrity of the test circuit**

Any change in test circuit volume during will require more time to stabilize out.

### **Testing environment**

If there are outside influences affecting the test circuit they will effect test times.



In system setup mode and part number setup mode with the correct password entered the up down arrow keys are used to set the parameter values.

## 5.01 Part Number Setup Parameter Descriptions

The new or revised parameters are saved in EEPROM any time the Mode is changed.

### 5.02 Password - (22, 45, 47)

```
PN 01  SETUP
Password  00
```

In order to change any value, the correct **Password** must have been entered. Without the correct Password, the various parameters can only be examined, not changed. The password remains active until it is changed or power to the unit is cycled.

22 - Allows changes in part # parameters.

45 - Allows a calibration to be done if calibration protection is set to on in system setup.

47 - Allows entry into system setup. Note once in system setup a second password is not needed to make changes.

### 5.03 Part Number - (1 to 32)

```
PN 01  SETUP
Part No  01
```

The standard CT-1000 can store 32 unique part numbers. Each Part No has its own setup and calibration parameters. The part number that is displayed in the upper left hand corner of the display is the one that you are viewing or adjusting.

### 5.04 Customer Code - (6 digit number)

```
PN 01  SETUP
CustCode 123456
```

Each part number can have a unique 6 digit number assigned to it. The number can be changed with the Up / Down arrow keys or by using the parameter software.

### 5.05 Time Base - (0.1 or 1.0)

```
PN 01  SETUP
TimeBase 1.0 SEC
```

With a 1.0 SEC **TimeBase**, each time parameter can be varied from 5 seconds to 999 seconds, while the 0.1 SEC time base allows time parameters to be varied from 0.5 seconds to 99.9 seconds.

### 5.06 Fill Time - (0 sec to 999 sec )

```
PN 01  SETUP
FillTime 15.0SEC
```

**FillTime** is time the part is filled with air at the test pressure regulator setting before going into read.

### 5.07 Fast Fill Pressure - (test pressure to unit max)

```
PN 01  SETUP
FF Pres  12PSI
```

**FF Pres** is the value of pressure that when reached, the pressure feed to the part is switched from the high pressure regulator to the test pressure regulator. If **FF Time** is set to 0.0 seconds this parameter is not displayed.

**5.08 Read Time** - (0 sec to 999 sec )

PN 01	SETUP
ReadTime	10.0SEC

**Read Time** is time required to get a stable reading of flow or to reach an acceptable value below the leak limit.

**5.09 Leak Limit** - (0.1 to 100 LPM )

PN 01	SETUP
Leak Lim	35.0LPM

**Leak Lim** If the leak reading is equal to or higher than this set point the unit will fail the part, display the leak reading and turn on the failed leak output.

**5.10 Calibrated Leak** - (Test part dependant)

PN 01	SETUP
Cal Leak	40.0LPM

**Cal Leak** this number must correspond to the leak value of the calibrated leak attached to the test unit. Note that since the rate of the calibrated leak will vary with pressure, the value displayed for the parameter Cal Leak must be the leak value at the set test pressure. More information on the calibrated leaks is detailed in the section calibration mode.

**5.11 Maximum Allowable Slope** - (0 to flow max)

PN 01	SETUP
MaxSlope	10.0LPM

**MaxSlope** With mass flow technology, the leak reading does not vary with time, after transient conditions are allowed to settle out. The value displayed can vary from 1.0 to 99.9 LPM. The value corresponds to the allowable change in leak during the last one third of the READ cycle. The value is calibrated in litres per minute. A low value such as 1 LPM will give a test error as indicated by an \*U or \*D (at the top right of the LCD display) if there is a very small slope in the leak reading during the last one third of read time. Conversely a high value such as 99.9 LPM will allow a large slope during the last one third of the read time without indicating any error condition. The \*U indicates an upward slope to the leak readings while an \*D indicates a downward slope to the leak readings. If either an \*U or \*D appears, the pass output is not turned on at the end of the Read time even if the final flow value was within the setup limits. This means that too much of a change in flow was happening to determine if the part was not leaking.



### 5.12 Minimum Negative Flow Below Zero - (0 to unit max flow)

<b>PN 01</b>	<b>SETUP</b>
<b>Min Flow</b>	<b>5.0LPM</b>

**Min Flow** Leak rates below “0” can occur when the unit is calibrated on a changing flow or if the part is over filled during fast fill. This parameter puts a limit on how much “negative” flow will be accepted and a pass output given at the end of the read cycle. If the value is outside limits an \*- will appear at the top right LCD display and the units fail light and signal will come on.

### 5.13 Pressure High Limit

<b>PN 01</b>	<b>SETUP</b>
<b>PrsHiLim</b>	<b>5.0PSI</b>

**Pres High** this is the high limit for the test pressure at which the system will indicate a fault (and abort the test sequence). The pressure is tested against this limit during the last third of the stabilization / fill state.

### 5.14 Pressure Low Limit

<b>PN 01</b>	<b>SETUP</b>
<b>PrLoLim</b>	<b>4.0PSI</b>

**Pres Low** this is the low limit for the test pressure at which the system will indicate a fault (and abort the test sequence). The pressure is tested against this limit during the last third of the stabilization / fill state.

Note that both these limits are checked in the last 3<sup>rd</sup> of the stabilization / fill time. If the actual pressure as read by the pressure transducer is within these limits the test will go into the read state. If the pressure is not within the limits a \*P be displayed in the status line and the test will be stopped.

### 5.15 Fast Fill Pressure Regulator

Fast fill pressure regulator is set at the time of ordering at the factory. If this requires to be changed please consult the HKA before attempting.

### 5.16 Set Pressure

<b>PN 01</b>	<b>SETUP</b>
<b>Set Pres</b>	<b>4.5PSI</b>

**Set Press** is the test pressure as set by the precision regulator. Typically the test pressure regulator is set to the customer requirements at the time of ordering. The regulator adjustment is located inside the CT-1000. This is to prevent inadvertent adjustment of the setting.

5.17 Fast Cycle Delay (OFF or SET TIME)

PN01 SETUP  
FC Delay OFF

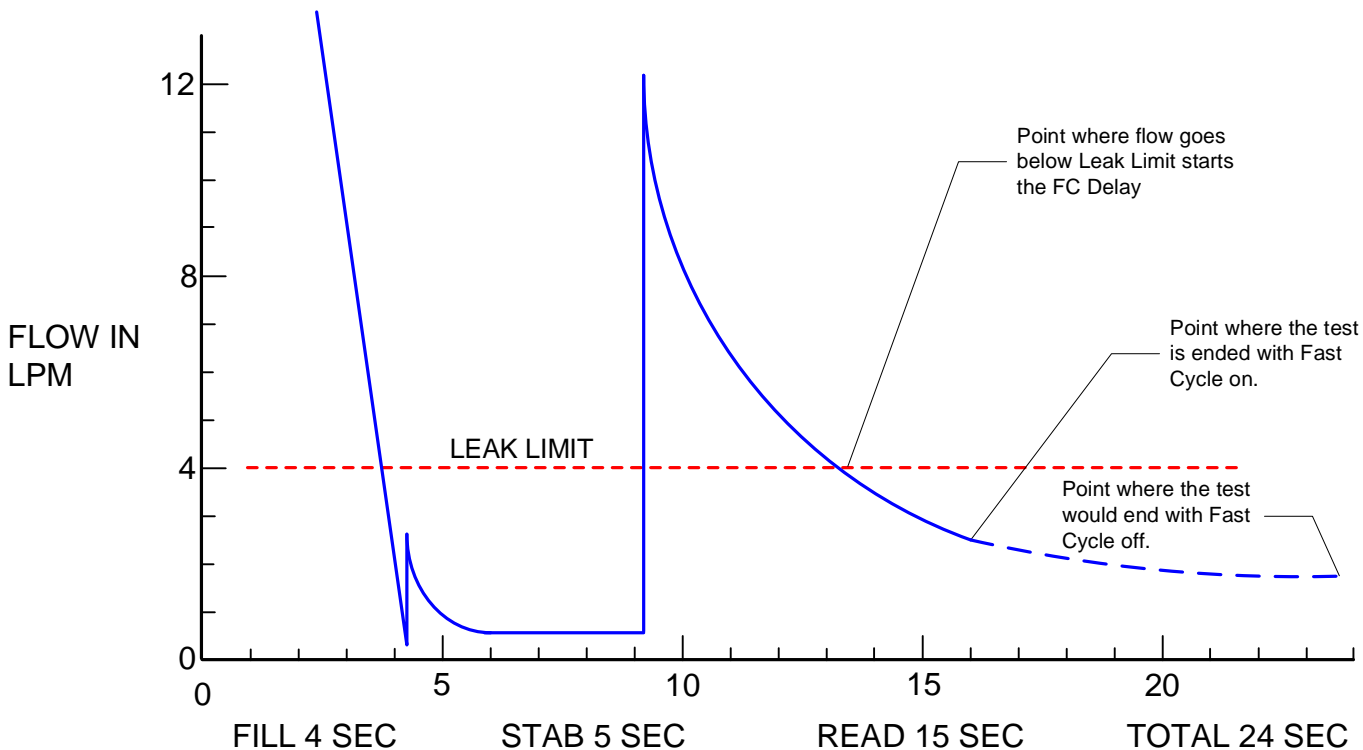
*FC Delay* is the delay time that the flow must be below the leak limit before the test is truncated.

Pushing the up arrow key will start to increment the delay time setting. The minimum setting is one second. To turn the fast cycle off hold the down arrow key until off is displayed.



PN01 SETUP  
FC Delay 1.0SEC

- Fast Cycle enables the user to shorten test times by ending the test before the read time is complete. The resulting leak rate will be above the actual leak rate but below the leak limit.
- If the flow does not go below the leak limit the fast cycle time does not start. The test runs its full length and the leak rate at the end of the test time is displayed.
- Fast Cycle must be enabled in the System Setup menu before a time delay can be entered in the Part Number Setup menu. See section 2.13.
- The slope of the flow must be zero or negative or the test will not be ended before the read time is complete.



### 5.18 Setting Test Pressure Regulator

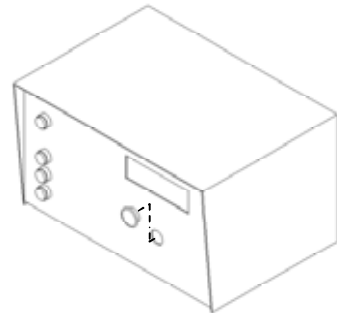
The precision test pressure regulator can be set from 0 - 15 PSI. **Never set the pressure higher than 15 PSI or damage to the mass flow transducer is possible.**

There must be air and power supplied to the unit as per the operating specifications in-order to set the pressure correctly.

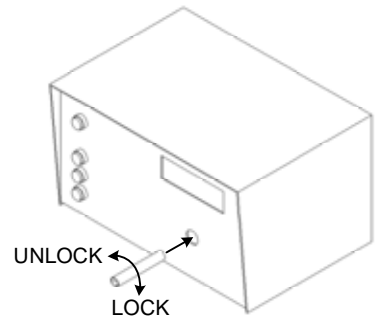
- On the back of the unit seal the test port.
- Go into setup mode enter “22” or the custom password.
- Using the enter key scroll through the parameters until **Set Pres** is displayed.



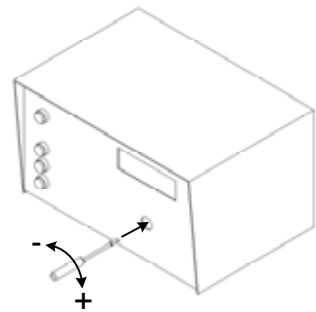
- Remove the button cover located in the center of the key pad.



- Insert a socket over the adjusting shaft and loosen the lock nut by turning counter clockwise.

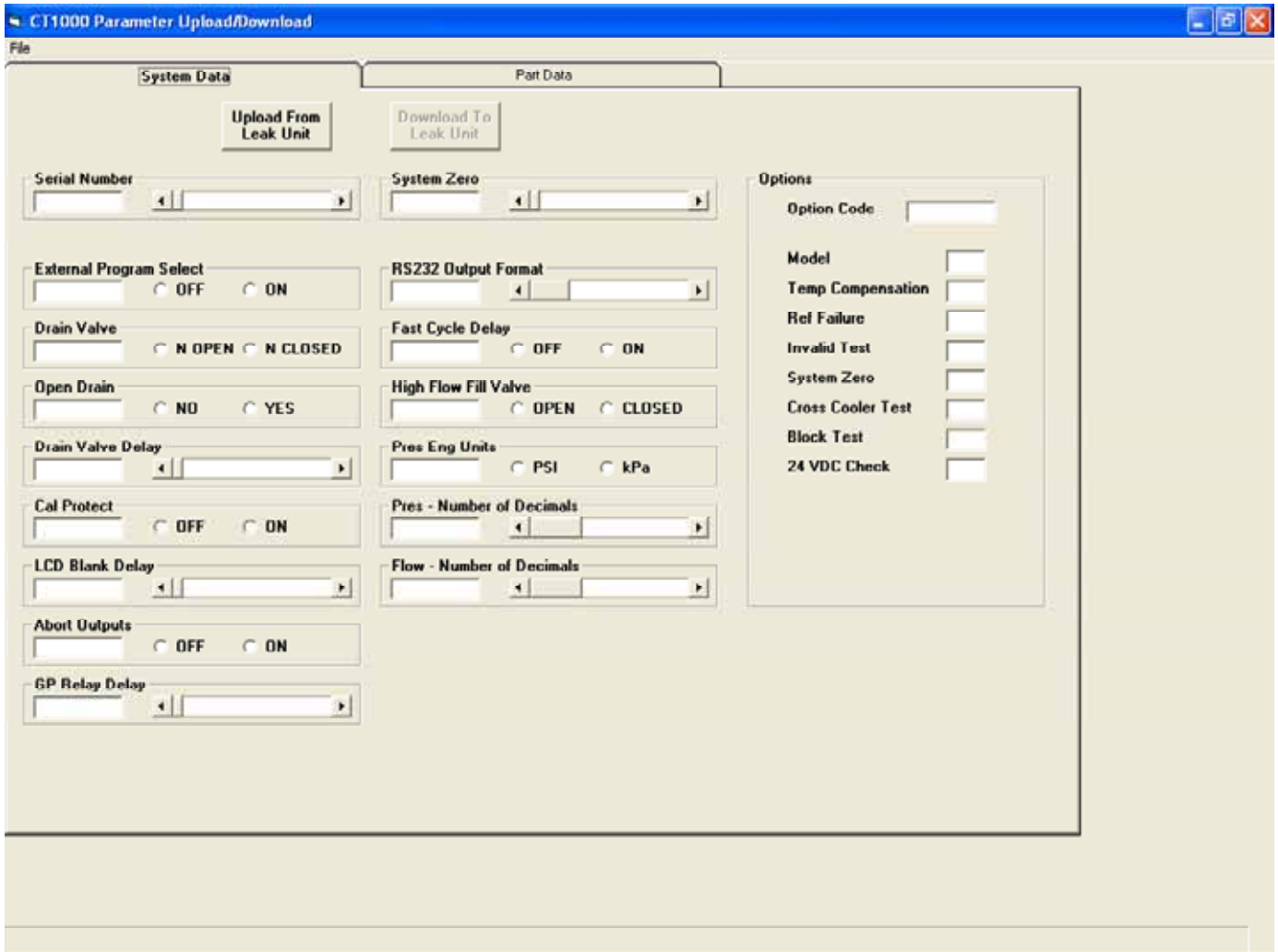


- Hold down either of the arrow keys. This will turn on the air and it will also allow you to view the actual pressure. While holding down the arrow key turn the screw driver to adjust the pressure. Once set tighten down the lock nut.



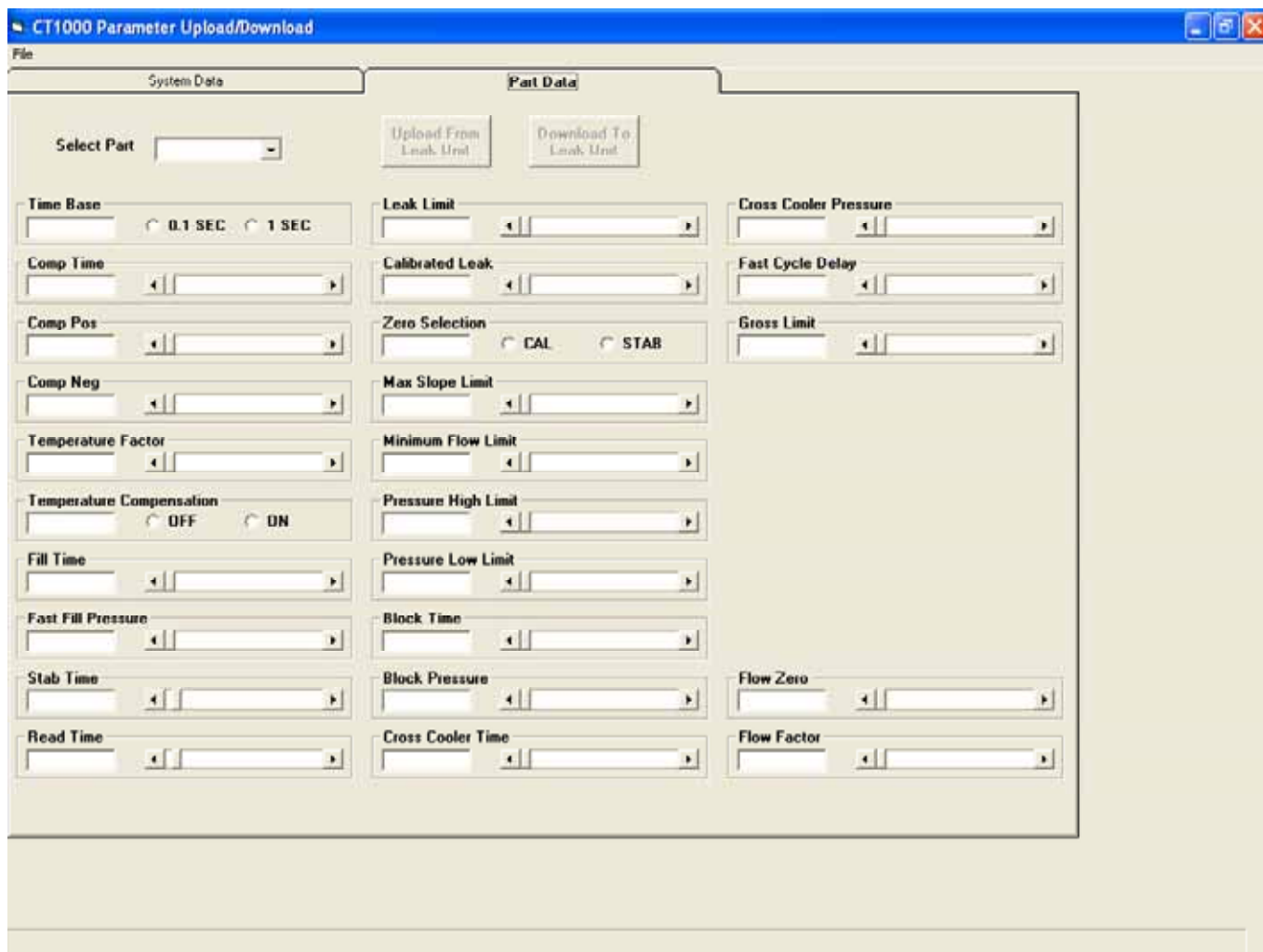
## 6.00 SETUP SOFTWARE

### 6.01 PC System Parameter Screen



Note that all parameters entered in this screen effect all of the part numbers. These are global parameters

### 6.02 PC Part Number Screen



Note that parameters entered in this screen effect only the part number that is selected in the select part drop down menu.

### 6.03 Parameter Loading Instructions

Using the supplied Parameter Upload/Download software all 32 part number setups can be configured, saved, sent to or received from the CT-1000 via a standard 9-Pin RS232 cable. The program has two different user screens. One is for the System Parameters the other is for the individual part numbers.

- Copy the file LKParamUpdDld.exe to your hard drive.
- Plug the male end of a 9-Pin RS232 communications cable into the CT-1000's Female RS232 port. Plug the other end of the cable into your PC's serial port.
- Put the CT-1000 into Setup Mode.
- Now run LKParamUpdDld.exe.
- Select which type of parameter you want to view or change. (System or Part #)
- Make the changes you want or just Upload the parameters from the CT-1000.
- Once done save the file with a different name than the file you opened.

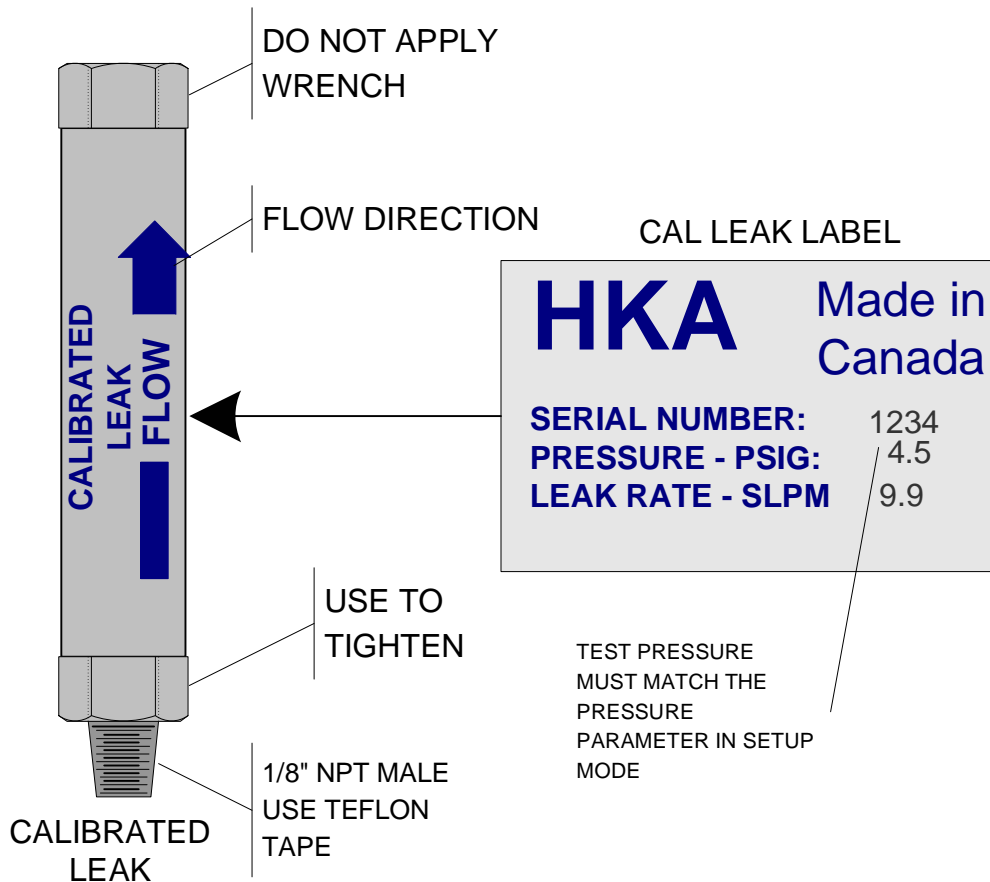
## 7.00 CALIBRATION MODE

After all the parameters have been programmed for a particular part, the system has to be calibrated to read the correct leak. There are two methods that can be used to perform a calibration. One is a static calibration the other dynamic calibration. For most applications a static calibration is recommended. The dynamic calibration method should only be used for situations where special testing methods need to be employed. The need for a dynamic calibration can be determined at the time of ordering. For further information on dynamic calibrating consult your HKA supplier.

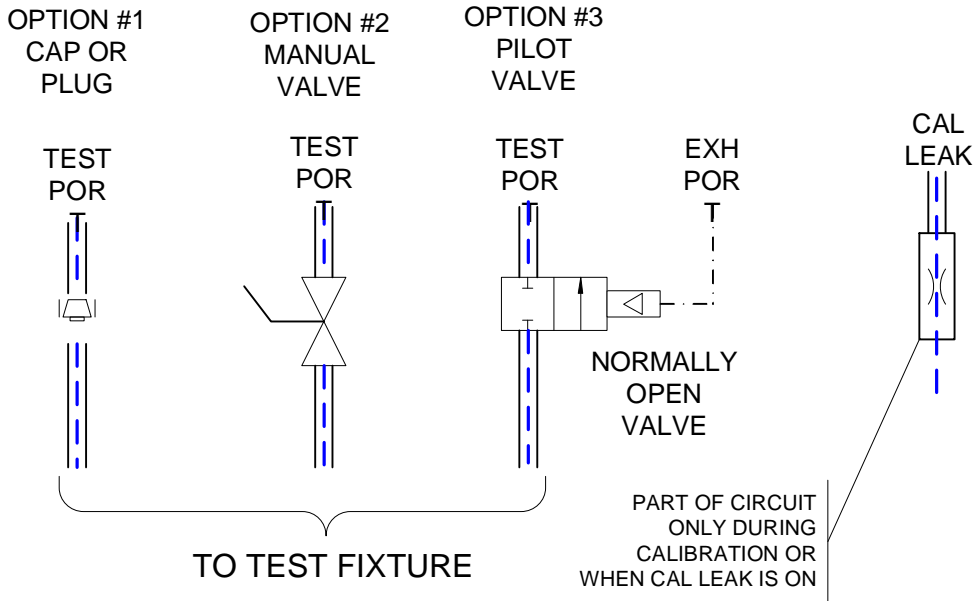
### 7.01 CT-1000 Integrity Check

The CT-1000 should be in a known state of zero leaks before any calibration. Values of leak rate the CT-1000 displays prior to calibration are not to be taken as correct. The CT-1000 integrity check is independent of the unit's calibration as the raw flow counts are unit less numbers.

Insure that all parameters have been entered in the setup mode and the test pressure is set to the desired test pressure. The test pressure must match the value that the calibrated leak was certified at. This can be read from the calibrated leaks label.



- ❑ Make sure that there is a no leak air seal on the test port. Any one of the following methods is acceptable.

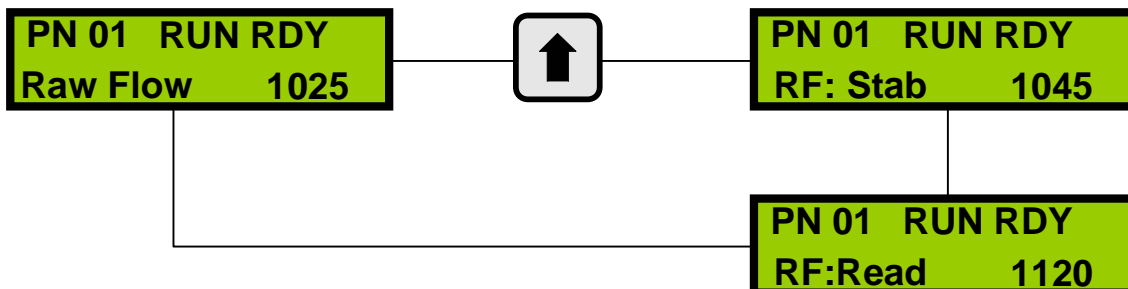


WHICH EVER OPTION IS USED IT MUST BE CLOSED FOR CALIBRATION OR CONFORMATION

- ❑ From the RUN RDY mode press the enter key until the LCD display is showing the Raw Flow parameter.



- ❑ Now start a test cycle. The cycle should complete without any errors. If errors are displayed in the status line of the LCD they must be addressed before you can continue (see trouble shooting). When the test is completed the values of raw flow saved by the unit can be viewed by pushing the up arrow key.





RF: Stab is the raw flow counts captured at the end of the stabilization cycle.

```
PN 01  RUN RDY
RF: Stab    1045
```

RF: Read is the raw flow counts captured at the end of the read cycle.

```
PN 01  RUN RDY
RF:Read   1120
```

The difference between RF Read and RF Stab should be within 5 counts with the test port plugged. If the counts are more than 5 check the plug and insure that is not leaking. This can be done with snoop or soapy water. If a leak cannot be found at the plug see the section on troubleshooting. If the difference is less than 5 continue on to the section Automatic Calibration Procedure.

## 7.02 Automatic Calibration Static Procedure

Note if Fast Cycle is going to be used for the production testing it must be turned off for calibration.

Once the integrity check has been done the CT-1000 can be automatically calibrated. Note that the test port is still plugged for the automatic calibration.

It is important to note that the calibration test sequence is identical to the run test sequence in terms of test pressure and times for the various states in the test sequence.

***If any of the parameters except Leak Limit or Pressure Limits are changed in program mode the system has to be recalibrated.***

Ensure a jumper is connected between terminals 2 and 3 of the user I/O connector, or a switch between these terminals is in the closed position or the user control has 24 volts on pin #3 of the twelve-pin connector.

The standard CT-1000 can run 10 part number set-ups. Each of these part numbers has its own calibration parameters. So for each part number used an automatic calibration must be run on that part number. The calibration procedure will run four automatic test cycles started by one test start signal. There is no pass or fail output given at the end of any of the four tests. This done so that, when the CT-1000 is part of an automated leak test system the controlling device sees the four tests as one and does not open seals or index between calibration cycles.

In the calibration process the test system first goes through two complete test sequences with the valve closed to the calibrated leak. This gives two "numbers" that correspond to a zero leak reading. If these two numbers are within an internal tolerance of each other, the two numbers are averaged to obtain a zero leak reference.

After the zero leak reference is obtained, the system again goes through two complete test sequences but this time with the valve open to the calibrated leak. The system now has two new readings, which correspond to the known leak rate. Again the two numbers are compared to each other and if within an internal tolerance, they are averaged together and used as the factor to calculate the leak rate.

### 7.03 Automatic Calibration Steps



PN 01	CAL RDY
Zero 1	000

- Scroll using the Mode key until the top line of the LCD displays CAL RDY.
- Provide one start signal to the CT-1000 (see signal definitions).
- The unit will automatically sequence through the following steps.

PN 01	CAL FILL
Zero 1	000

PN 01	CAL STAB
Zero 1	000

PN 01	CAL READ
Zero 1	000

- The CT-1000 will now display the result of the first zero test.

PN 01	CAL WAIT
Zero 1	1025

The waiting period between auto tests when a calibration is taking place is based on how long the total test time is for that particular set of parameters is. The wait time ensures that the part is completely drained prior to the start of the next test.

The CT-1000 will now go through the same steps 3 more times. The last display will be as follows when the calibration is complete. The only difference between your screen and this one will be the value of counts displayed.

<b>PN 01</b>	<b>CAL RDY</b>
<b>Cal 2</b>	<b>1520</b>

There is no "Pass" or "Fail" output given at the end of the automatic calibration. Once the LCD display is as shown above the calibration is complete.

The following summarizes the parameters that can be displayed when the system is in Calibration mode. Note all parameter values are automatically generated by the system in the calibration procedure and all of these values are dimensionless.

1. Zero 1 -first no leak value read
2. Zero 2 -second no leak value read
3. Cal 1 -first reading with calibrated leak
4. Cal 2 -second reading with calibrated leak
5. F Zero -offset (average of Zero 1, Zero 2)
6. F Fact -gain value (calculated from average of Cal 1 and Cal 2 and the value of the calibrated leak)
7. MaxPosRd -maximum value of positive flow the unit can read based on this calibration
8. MaxNegRd - maximum value of negative flow the unit can read based on this calibration

If the times for the various states (Fill Time, Stabilization Time, Read Time) are not long enough for the test conditions, the values of Zero 1 and Zero 2 or Cal 1 and Cal 2 may not be close enough for the system to get valid numbers for F Zero and F Fact.

If this is the case, an asterisk (\*) followed by a letter (A,P,S,Z) will appear at the top right of the LCD display.

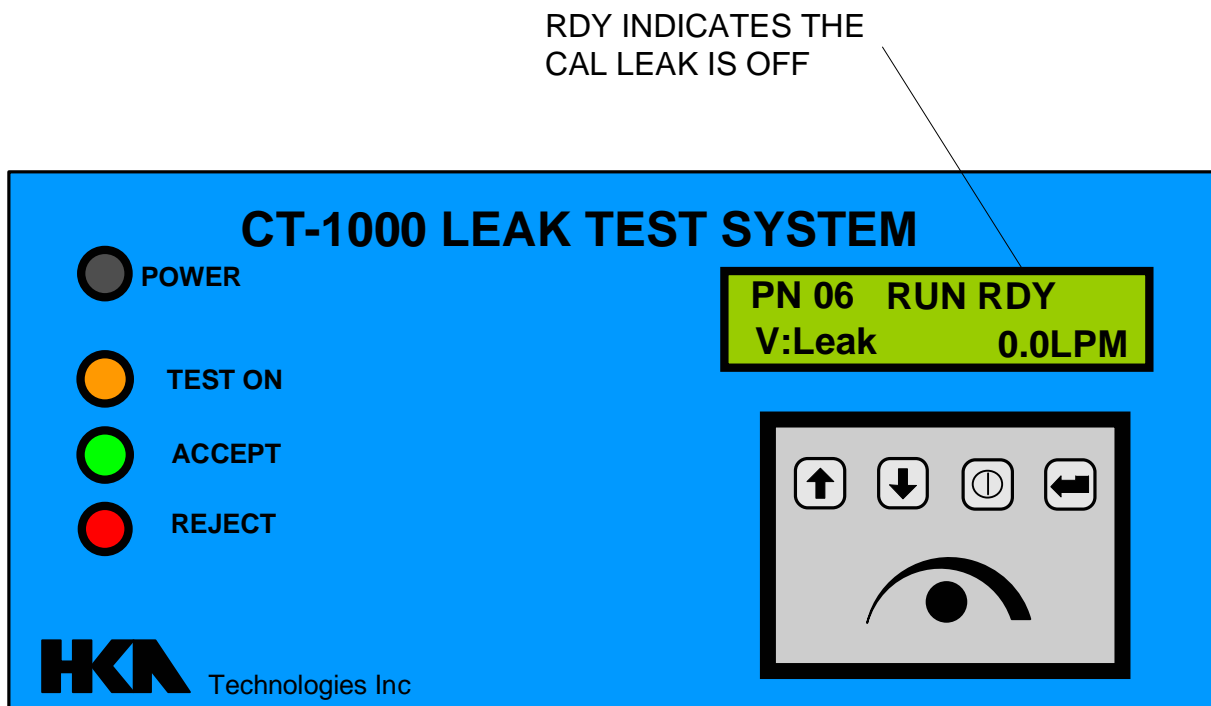
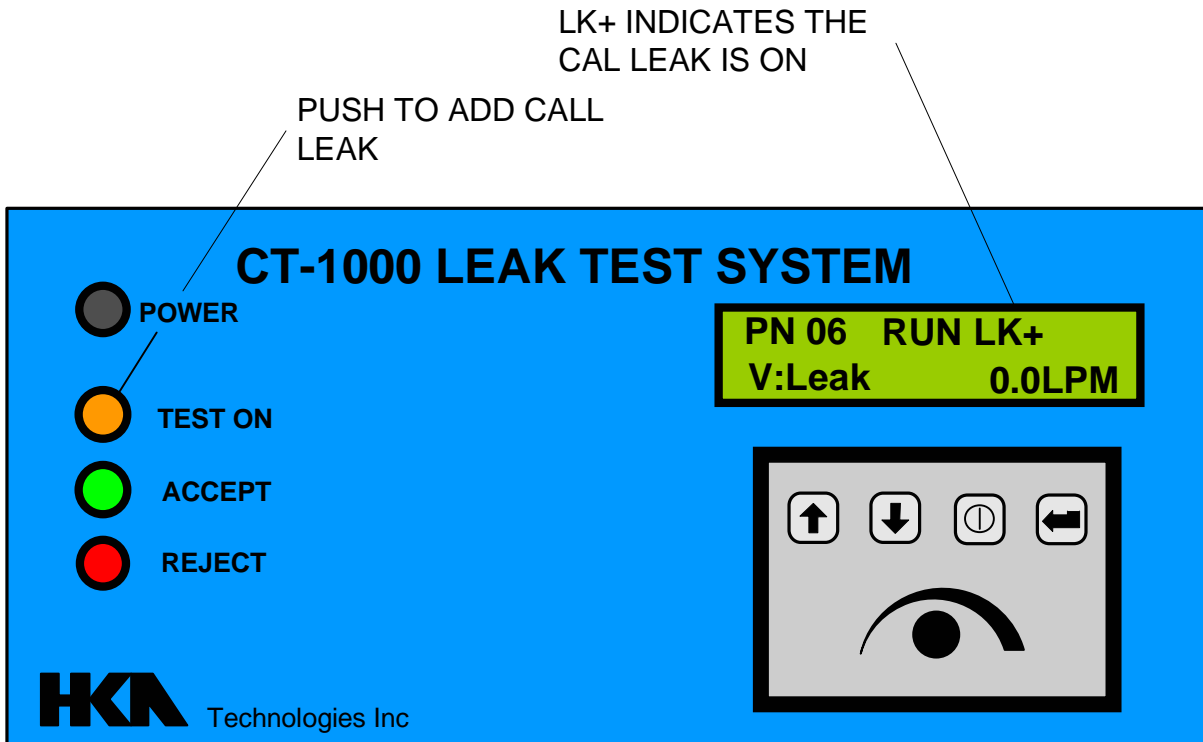
If this occurs, the calibration procedure will be aborted and no new values of F Zero and F Fact will be calculated.

For more information on calibration fault conditions, please refer to the section entitled "Troubleshooting".

## 7.04 CALIBRATION CHECK PROCEDURE

### 7.05 Adding The Calibrated Leak

Pushing the IN TEST pilot lamp / button adds the calibrated leak to the test circuit for the next test. The leak is only added for one test then the internal valve automatically removes the leak. The leak can also be turned off by sending the Abort signal to the CT-1000.



After doing a calibration a confirmation should be done. This can also be done as a first off check procedure for QC purposes.

- Isolate the test fixture from the test port of the CT-1000 and plug the test port so there is a leak free seal.
- The CT-1000 should be in RUN RDY Mode. Now run a normal test cycle. With the test port plugged the result of this test should be zero.
- Turn on the Calibrated leak and start a test cycle. The result of this test should be equal to the value of the calibrated leak.
- If both these test are display the expected result the system is ready for production.
- If ether of these tests does not yield the expected results check the following.
  - Make sure that the test pressure is set to the value as stamped on the calibrated leak.
  - Make sure there are not leaks in the isolation method used.
  - Make sure that the calibrated leak is wired correctly.
- If the expected results still are not arrived at refer to the troubleshooting section of this manual.

**8.00 RS232 DATA OUTPUT (Micro Ver 4.20 or higher)**

ABCCCDDEFGHHHIIJJJJKKKKLLLLMNNNOOOPPPQQRRSSSTTTUUUVVVVWXXXXYYZZA

where:

- 1[1] A = SOH
- 2[1] B = STX
- 3[3] C = Version Major / Minor / Maintenance
- 6[2] D = Part Number (1 - 10)
- 8[1] E = Mode
- 9[1] F = Test Status
- 10[1] G = Completion Status
- 11[3] H = Current Pressure Value (0 - 500)
- 14[3] I = Pressure Reference Value (0 - 500)
- 17[4] J = Scaled Flow rate (0 - 4095)
- 21[4] K = Flow scale factor (0 - 4095)
- 25[4] L = Zero offset value (0 - 4095)
- 29[1] M = Time base: 1 = 1.0 Second; 2 = 0.1 Second
- 30[3] N = COMP time (0 - 255), (0 - 999 for ver. 4.20 or later)
- 33[3] O = FILL time (0 - 255), (0 - 999 for ver. 4.20 or later)
- 36[3] P = STAB time (0 - 255), (0 - 999 for ver. 4.20 or later)
- 39[3] Q = READ time (0 - 255), (0 - 999 for ver. 4.20 or later)
- 42[2] R = Max positive flow limit at end of Comp time (0 - 50 sccm)
- 44[3] S = Max negative flow limit at end of Comp time (0 - 5.0 sccm)
- 47[4] T = TC Factor (0.0 - 10.0)
- 51[4] U = Leak limit (0.0 - 25.5)
- 55[4] V = Calibrated Leak (0 - 25.5)
- 59[1] W = Zero Selection: 1 = Cal; 2 = Stab
- 60[4] X = Leak slope limit (0.1 - 10.0) sccm / minute
- 64[3] Y = Leak negative limit (0.1 - 5.0) sccm / minute
- 67[2] Z = Pressure Tolerance (0 - 20)
- 69[1] A = EOT

The data from the RS232 port can be input to any IBM compatible computer system (PC).

There is no effect on the leak test system if the PC is connected to the RS232 port or not.

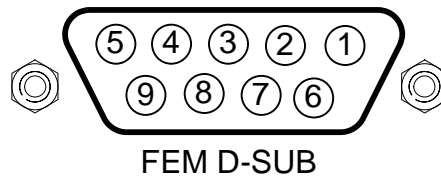
## 8.01 RS232 Format

The serial data has the following format:

Speed:	9600 baud
Parity:	none
Data:	8 bits
Stop Bits:	1
RS:	request to send suppressed
CS:	CS(0)
DS:	DS(0)
CD:	CD(0)

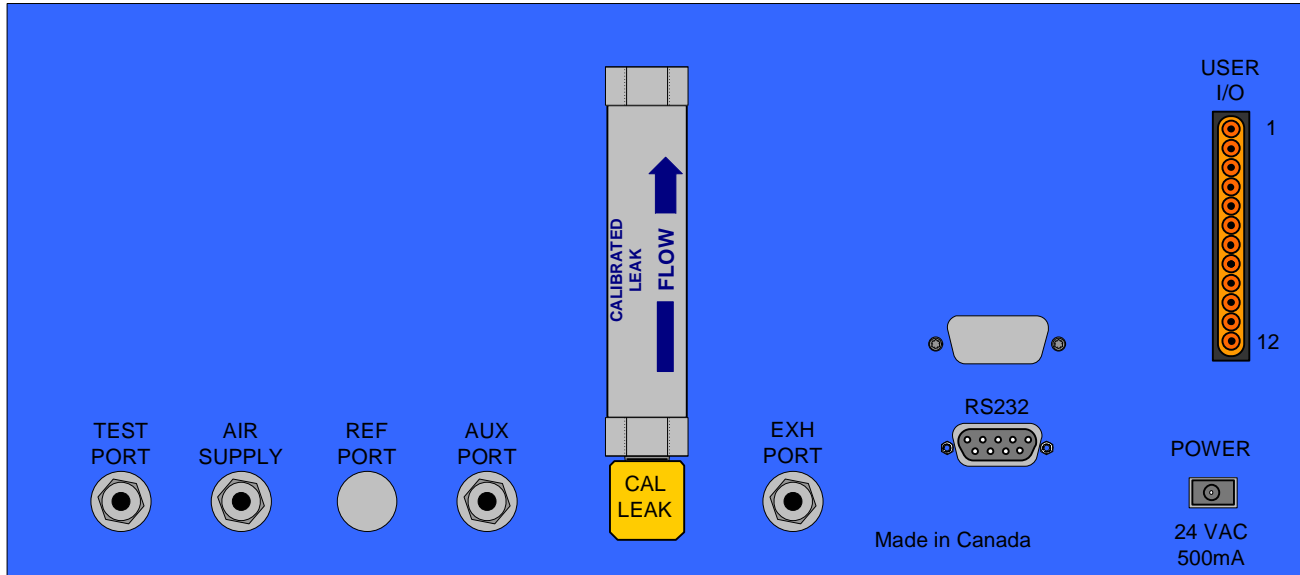
The RS232 uses a standard 9 pin sub miniature female "D" connector with the following pin assignments:

Pin 1	nc
Pin 2	data out
Pin 3	data in
Pin 4	joined to 6
Pin 5	common
Pin 6	joined to 4
Pin 7	joined to 8
Pin 8	joined to 7
Pin 9	nc



## 9.00 PNEUMATIC CONNECTIONS

All pneumatic connections are made through a manifold located at the back of the test system.



All connections have 1/8" NPT female threads except for the test port and aux port connection, which are 1/4" NPT female.

From left to right facing the rear of the test unit, the ports have the following functions.

### 9.01 TEST PORT

This port is connected to the part being leak tested. The fittings used should provide a reliable, leak free seal from the port to the part under test. The tubing should be kept as short as possible to reduce effective added volume of the test part.

### 9.02 AIR SUPPLY

The user must provide clean, dry air to the leak test system. Air should be filtered with a 50-micron maximum element, and depending on the level of moisture present in the air, may require the use of a desiccant type dryer. While any significant leaks on this port would waste air, there would be no effect on the accuracy of the leak test measurement. The supplied pressure should be not less than 60 psi or more than 125 psi.

### 9.03 REF PORT

The reference port is not typically used in direct mass flow applications.



### **9.04 AUX PORT**

Typically not used but in some cases can be used with fast fill.

### **9.05 CAL LEAK**

In order to set-up the system to test any part, an appropriate calibrated leak must be connected to this port again using quality no leak fittings. If ordered with the leak test unit, the calibrated leak will be factory installed. Once calibrated the cal leak is not required to run the test system, but it is required to perform periodic tests on the performance of the leak test system. It is recommended that a system performance check be done at the start of each shift of operation.

### **9.06 EXH PORT**

This port normally plugged. In some installations this port is used to pilot a normally open valve that isolates the test part from the CT-1000 during calibration and system checks.

## 10.00 ELECTRICAL CONNECTIONS

The user connector has screw terminals and is removable for easy wiring.

The terminal designations are from 1 to 12 starting at the top of the connector.

This connector is polarized and cannot be inserted in any but the correct position.

The CT-1000 leak test system may be powered through the 12-pin user connector with 24 volts DC, or using the AC adapter plug, which delivers 24 volts AC. The current draw for both is 500 mA.

There are three inputs to the test system; start test, abort test, output mode select.

These inputs can be powered from an external 24 DC source, or used with isolated contacts along with the 24 volts available on the user connector.

To use an external 24 volts for these inputs, connect terminal #12 to the output common of the user system and connect the positive signal outputs to terminals #9, #10, #11. The inputs draw 10 mA current each.

When driven from isolated contacts, join terminals #1 and #12 of the user connector.

There are three user outputs available on the 12-pin connector.

Terminal #4 is the common for all outputs that have isolated relay contacts rated at 5 amperes, 250 volts.

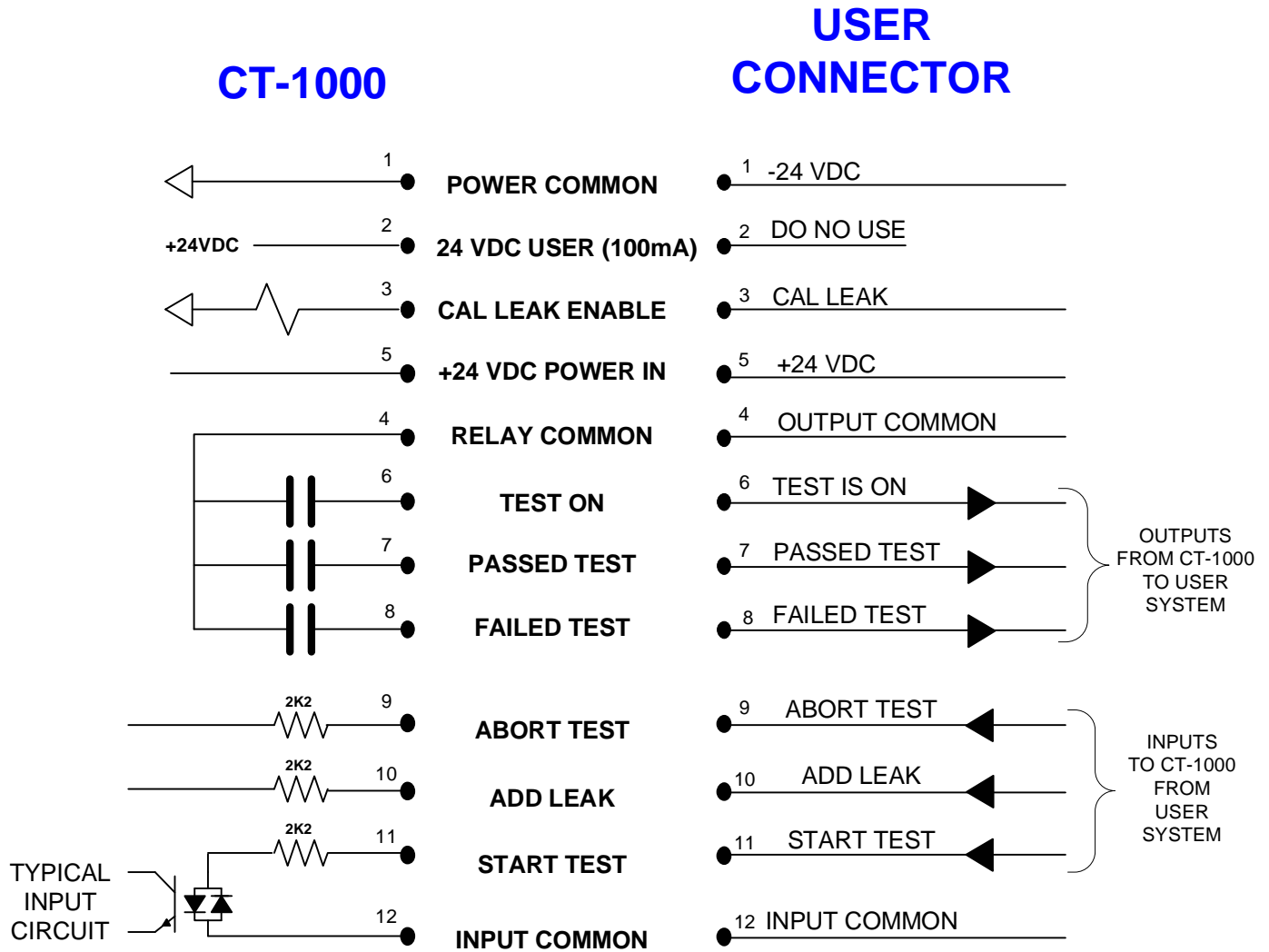
Terminal #6 relay contacts are closed for the duration of the test sequence - Test On output.

Terminal #7 is connected to the passed test relay contacts while terminal #8 is connected to the failed test relay contacts.

Terminal #3 is connected to the calibrated leak enable solenoid valve. For normal operation in Run mode and Calibration mode, this terminal is joined to terminal #2.

To enable the calibrated leak, disconnect the terminal #3 from terminal #2. If desired a switch may be used between terminals #2 and #3. With the switch closed, normal operation takes place. With the switch open, the calibrated leak is applied to the test part. A second way of enabling the calibrated leak is to provide a pulse to pin #10 for a duration of between 100 ms and 1 sec. This will add the leak for one cycle. The next cycle will be with the cal leak off and remain off until terminal #10 is pulsed again.

## 10.01 TYPICAL USER CONNECTIONS USING 24 VDC SUPPLY TO 12 PIN CONNECTOR



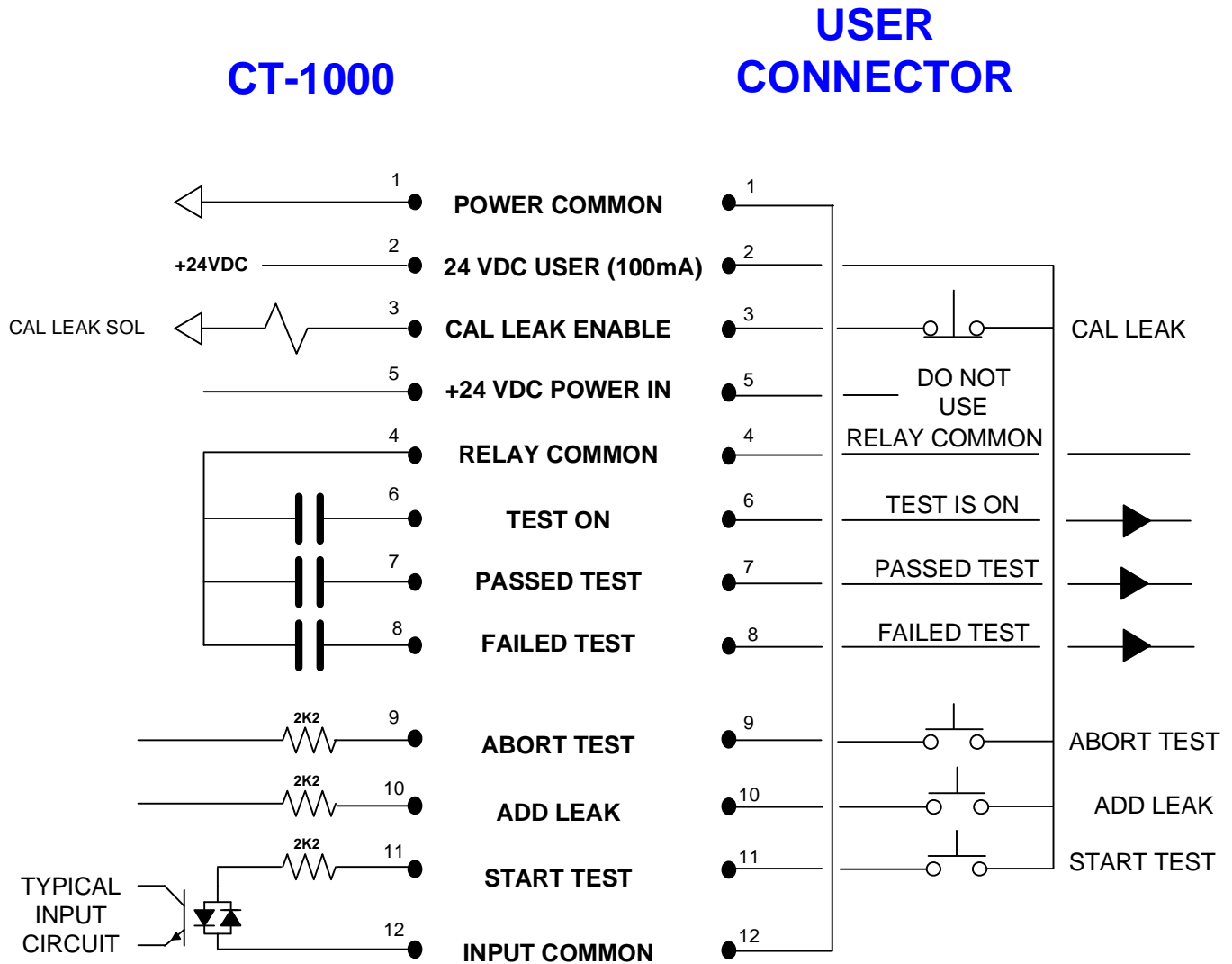
**CAL LEAK TERM #3** - PROVIDE +24 VDC TO THIS PIN FOR NORMAL OPERATION. REMOVE THE +24 VDC TO ADD CAL LEAK

**ABORT TEST TERM #9** - MOMENTARY SIGNAL BETWEEN 100 mS AND 1 SEC

**ADD LEAK ONCE TERM #10** - MOMENTARY SIGNAL BETWEEN 100 mS AND 1 SEC

**START TEST TERM #11** - MOMENTARY SIGNAL BETWEEN 100 mS AND 1 SEC

## 10.02 TYPICAL USER CONNECTIONS WHEN USING AC ADAPTOR



**CAL LEAK TERM #3** - CLOSED IS THE NORMAL POSITION.  
WHEN OPEN CAL LEAK IS ADDED TO THE TEST CIRCUIT

**ABORT TEST TERM #9** - MOMENTARY SIGNAL BETWEEN 100 mS AND 1 SEC

**ADD LEAK ONCE TERM #10** - MOMENTARY SIGNAL BETWEEN 100 mS AND 1 SEC

**START TEST TERM #11** - MOMENTARY SIGNAL BETWEEN 100 mS AND 1 SEC

## 11.00 RUN MODE

RUN Mode is the normal test state of the leak test system. To set the unit to run mode push the Mode key until RUN is displayed in the mode area. When in Run Mode, the top left of the LCD displays the part number while the top right displays "Run" followed by "RDY". The bottom line of the LCD can display a number of different parameters which are scrolled through by pushing the ENTER key.

The test is started in Run mode by momentarily connecting terminals #2 and #11 on the I/O connector. Once the test is in progress, it will complete the entire sequence unless the Abort input is made by momentarily connecting terminals #2 and #9 on the I/O connector.

The top line of the LCD display will show the part number on the left side of the display "PN xx" followed by "RUN" followed by "RDY" on the left side.

When the test has been started, the "RDY" will change to "FILL" indicating the sequence is at the Fill state.

When the Fill state is finished, the "FILL" will change to "STAB" indicating the Stabilization state.

At the end of the stabilization state, the display will read, "READ" until the test cycle is finished. When the Read cycle is complete, the top right display will again show "RDY" indicating the system is ready for the next test cycle.

During the test sequence, the test pressure is monitored during the Fill state and the Stabilization state.

If the test pressure is outside limits as specified by the Pressure and Press Tolerance parameters, the test sequence will be aborted and the top right of the LCD will display "RDY\*P" indicating a pressure fault has occurred.

The CT-1000 has three isolated output contacts for user interfacing. These are test in progress, passed test, and failed test.

The test in progress contacts are closed during the Fill, Stabilization, and Read states of the test sequence.

Either the test passed or test failed contacts will be closed at the end of the read cycle depending on the results of the leak test.

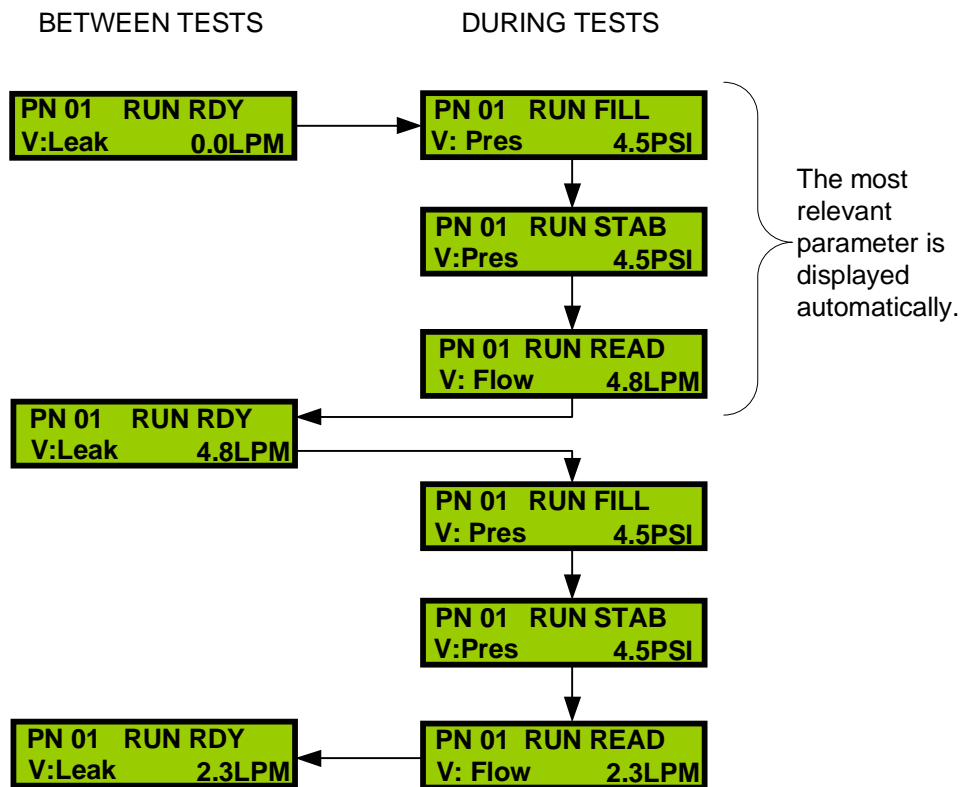
These contacts will be maintained until the start of the next test cycle or until power is turned off in the test unit.

The following summarizes the parameters that can be displayed or cleared when in Run Mode.

**PN 01 RUN RDY  
V:Leak 0.0LPM**

11.01 V: Leak is a variable parameter display, which will show pressure and flow automatically during a test. The following is the sequence of parameters shown when a test is run from the V: Leak display.

**STANDARD DIFFERENTIAL MASS FLOW CT-1000 V: LEAK  
AUTO DISPLAY**



When the CT-1000 is in run mode with the parameter V: Leak displayed the parameter will automatically change between pressure, flow and the result of the last test.

**11.02 Passed Test Counter**

PN 01 RUN RDY  
Pass Cnt 1234

**Pass Cnt** is the total number of tests, which passed since the last time the user counter reset was done.

**11.03 Failed Test Counter**

PN 01 RUN RDY  
Fail Cnt 1234

**Fail Cnt** is the total number of tests, which failed since the last time the user counter reset was done.

**11.04 Gross Failed Test Counter**

PN 01 RUN RDY  
Gross Cnt 1234

**Gross Cnt** is the total number of tests, which failed above the Gross Leak Limit since the last time the user counter reset was done.

**11.05 Total Test Counter**

PN 01 RUN RDY  
Total Cnt 1234

**TotalCnt** is the total number of tests; both passed and failed since the last time the user counter reset was done.

**11.06 Clear All Counters**

PN 01 RUN RDY  
Clr Cnts NO

**Clr Cnt** resets all counts to zero except for the system counter. The "Clr Cnts" is an abbreviation for Clear Counters and the default when this parameter is viewed is "No". To clear the counters use the Up arrow key to change the display to "Yes" and then push the ENTER key. All user counters are set to zero.



PN 01 RUN RDY  
Clr Cnts YES



**11.07 Leak Rate**

PN 01 RUN RDY  
Leak 2.3LPM

**Leak** is the leak rate of the last test done.

**11.08 Current Pressure**

PN 01 RUN RDY  
Pressure 4.5PSI

**Pressure** is the pressure as read by the pressure transducer during all states.

**11.09 Current Flow**

PN 01 RUN RDY  
Flow 0.0LPM

**Flow** corresponds to the current reading of the mass flow transducer at any point in time during the test.

### 11.10 Raw Flow

```
PN 01  RUN RDY
Raw Flow  1025
```

**Raw Flow** is the un-scaled output of the analog to digital converter. This is a continuous output. When the raw flow parameter is displayed there are two more values that can be viewed by pushing the up arrow key. These parameters are only stored until the next test. They can be used as aids in trouble shooting and set-up.

### 11.11 Raw Flow From Stabilization Time



```
PN 01  RUN RDY
RF: Stab  1045
```

**RF: Stab** is the raw flow value that is taken at the end of the stabilization time.

### 11.12 Raw Flow From Read Time



```
PN 01  RUN RDY
RF:Read  1120
```

**RF: Read** is the raw flow value that is taken at the end of the read time.

### 11.13 Total Cycle Counter

```
PN 01  RUN RDY
CycleCnt 123456
```

**CycleCnt** is the total number of completed tests the unit has done. This counter is only factory resettable.

When in Run Mode the bottom line of the LCD can be left displaying any of the parameters listed for Run mode, but the most common parameter to be displayed would be "V: Leak" indicating the varying parameters and the measured leak rate in sccm of the last part tested.



## 12.00 TROUBLE SHOOTING

The CT-1000 has some built in trouble shooting information. When an error occurs an asterisk (\*) will appear in the top right hand corner of the LCD display followed by a letter. If you push the up arrow key while the asterisk is displayed a brief description of the error will be displayed.

### 12.01 LCD Display Blank:

- Make sure power switch in on position
- Verify 24 volt supply to unit
- Make sure no shorts in field wiring to user I/O connector



### 12.02 System will not start in Run Mode:

- Check connections to user I/O connector
- Check for start signal from control device (PLC)

### 12.03 System stops part way through in Run Mode:

- \*P displayed at top right of LCD
- Verify air pressure to test system
- Gross leak in part under test
- Pressure dropped below limits during test



### 12.04 System stops part way through in Run Mode:

- \*A displayed at top right of LCD
- Abort input turned on during test



### 12.05 System Displays Error Code \*U At End Of Read Cycle

- Upward (positive) slope above limit at end of read cycle



### 12.06 System Displays \*D At End Of Read Cycle

- Downward (negative) slope above limit at end of read cycle.

PN 01 RUN RDY \*D  
V:Leak 0.0CCM



SLOPE ERROR  
NEGATIVE SLOPE

### 12.07 System Displays \*- At End Of Read Cycle

- Leak below zero at end of read cycle.

PN 01 RUN RDY \*-  
V:Leak 0.0CCM



FLOW ERROR  
UNDER NEG LIMIT

### 12.08 System Will Not Accept Changes In Program Mode

- Verify correct Password entered.
- See section 12.00 for passwords.

### 12.09 System Stops Part Way Through In Calibration Mode

- \*Z displayed at top right of LCD
- Two zero readings not within correct range or differ from each other by more than allowable amount.
- Leak in reference port or test port plumbing
- Part temperature changing during test cycle
- Programmed times too short for stable readings

PN 01 RUN RDY \*Z  
V:Leak 0.0CCM



CALIBRATION ERR  
ZERO READINS

### 12.10 System Stops Part Way Through In Calibration Mode

- \*S displayed at top right of LCD
- Two span readings not within correct range or differ from each other by more than allowable amount.
- Programmed times too short for stable readings

PN 01 RUN RDY \*S  
V:Leak 0.0CCM



CALIBRATION ERR  
SPAN TO SMALL

### 12.11 System Stops At The End Of Comp Time

Only if unit is equipped with Temperature Compensation option.

- \*M displayed at top right of LCD
- Flow measured during compensation time was higher than the unit could compensate for.
- Let test part cool down more before testing.

PN 01 RUN RDY \*M  
V:Leak 0.0CCM



TEMP COMP ERROR  
FLOW > POS LIMIT

### 12.12 System Stops At The End Of Comp Time

Only if unit is equipped with Temperature Compensation option.

- \*L displayed at top right of LCD
- Flow measured during compensation time was lower than the unit could compensate for.
- Let test part warm up more before testing.

PN 01 RUN RDY \*L  
V:Leak 0.0CCM



TEMP COMP ERROR  
FLOW > NEG LIMIT

### 12.13 System Stops At Mid Stab Time

- \*F displayed at top right of LCD
- Flow measured during stabilization time was too high as compared to sys zero.
- Part was not fully exhausted from previous test.
- Air source present external from the closed test circuit.

PN 01 RUN RDY \*F  
V:Leak 0.0CCM



FLOW ERROR TOO  
HI MID STAB TIME

### 12.14 System Stops At Start Of Test

- \*C displayed at top right of LCD
- Flow measured at the start of the test was varying to much from sys zero.
- Air source present external from the closed test circuit.
- Air flow caused by seals moving to final rest position to high.
- Possible contaminates in air supply.

PN 01 RUN RDY \*C  
V:Leak 0.0CCM



SYSTEM ZERO ERR  
RAW FLOW VARIES

### 12.15 System Fails Test

( If the unit is equipped with part blockage detection.)

- \*B displayed at top right of LCD
- Part under test has a blockage above criteria settings.

PN 01 RUN RDY \*B  
V:Leak 0.0CCM



BLOCKED PATH  
PRESSURE > LIMIT

### 12.16 System Did Not Start Test (\*E Appears At Test End)

- \*E displayed at top right of LCD
- When the system is in run ready mode and a test is not in progress the zero pressure monitor is active. The pressure measured by the transducer is compared to fixed zero limits.
- At the end of a test cycle the \*E will come on momentarily as the test circuit pressure comes within limits.

PN 01 RUN RDY \*E  
V:Leak 0.0CCM



PRESSURE SENSOR  
ZERO ERROR

### 12.17 System Did Not Start Test (\*V Appears During Test)

- \*V displayed at top right of LCD
- The system has an internal voltage monitor which checks the supply to a set of fixed limits.

PN 01 RUN RDY \*V  
V:Leak 0.0CCM



24 VOLT POWER  
OUT OF LIMITS

### 12.18 \*G Appears During Test

- \*G displayed at top right of LCD
- The flow was greater than the limit set for a gross leaking part but not enough to cause a pressure error.

PN 01 RUN RDY \*G  
V:Leak 9.2CCM



GROSS LEAK  
FLOW > LIMIT

## 13.00 CT-1000 OPTIONAL EXTRAS

For more detailed information on these options please contact HKA or visit our web site @ [hkatechnologies.com](http://hkatechnologies.com).

- **13.01 AC Adaptor**

Required if the unit is not powered from the 12-pin connector.

- **13.02 Manual Interface Box**

Provides Start, Abort and add cal leak buttons with indicator lights in a pre-wired box which directly plugs into the CT-1000.

- **13.03 External Part Isolation Valve**

The External Part Isolation Valve can be used so that a system check out procedure could be made to be automatic.

- **13.04 Graphing Software**

This software that runs on a standard IBM PC graphs and records each leak test done.

## 14.00 SPECIFICATIONS

Measurement system:	Mass Flow Transducer A/D Counts 0-4095
Number of Programs:	32
Program Storage:	Non-Volatile EEPROM
Display:	2 Lines x 16 Characters High Contrast Backlit LCD
Pressure Range:	Standard 0 - 125 psig (9.0 bar/g) Other ranges available
Leak Range:	0 - 100 lpm Using 0.1 lpm resolution
Test Parameters:	Fill Time        0.5 .... 25.5 sec. (0.5 - 999 sec) Stabilize Time 0.5 .... 25.5 sec. (0.5 - 999 sec) Read Time       0.5 .... 25.5 sec. (0.5 - 999 sec)
Internal Counters:	Total cycles    0 .... 65,536 Passed Test    0 .... 65,536 Failed Test     0 .... 65,536 Totalise        0....9,999,999 only factory resettable
User Inputs:	Start Test Abort Test Run Next Part (Chained)
User Outputs:	Test in Progress Passed Test Failed Test
User Connections:	12 pin removable connector (supplied with unit)

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Communications:	RS232 Serial Port (9 pin subminiature "D" conn.)
Air Requirements:	60 - 150 psig ( 4 - 10 bar/g) Clean, Dry Air.
Air Connections:	1/8 NPT Female Ports
Power Requirements:	24 VDC at 500 mA 24 VAC at 500 mA (optional adapter)
Dimensions:	12" wide, 6.75" high, 8" deep. (533 mm wide, 172 mm high, 203 mm deep)
Weight:	Approx. 6.4 lbs (2.9 kg)
Password:	22 factory Default ..... or _____ 45 factory Default ..... or _____ 47 factory Default ..... or _____
Calibrated Leak:	Required for set-up Specify leak rate and pressure (Option with test unit)

## 15.00 WARRANTY

The CT-1000 leak test system is guaranteed to be free from defects in materials and workmanship for a period of one year from date of purchase.

The warranty does not cover units that have been modified, abused, or improperly maintained or operated.

During the warranty period HKA will repair or replace at its option any unit that has been found to be defective.

Any product to be returned under this warranty, must have an authorization number from HKA and must be shipped prepaid to HKA in Burlington, Ontario or the nearest authorized representative.

HKA's liability for the leak test system is limited solely to the replacement or repair of the product, and HKA will not be liable for any consequential damages.

HKA reserves the right to make on going changes and upgrades the CT-1000 leak test unit, and has no obligation to make modifications to products previously sold.

Any units returned to HKA after the warranty has expired will be subject to charges for labour and materials and any shipping costs incurred.

For warranty, contact:

HKA Technologies Inc.  
3536 Mainway  
Burlington, Ontario  
L7M 1A8

(905) 336-8668 or FAX (905) 336-8805