

## INSTALLATION AND USER MANUAL

### AIRTECT LM2050 SERIES

### MICROPROCESSOR CONTROLLED

### LEAK MONITOR SYSTEM

VERSION : A1

DATE : OCT '99

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# 1. GENERAL INFORMATION

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## 1.1 APPLICATIONS.

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The AIRTECT LM2050 is a microprocessor controlled monitoring system designed to provide early warning of plastics leakage which may occur within the injection moulding process. The LM2050 represents a step forward in operational protection for both the moulding machine and the associated tooling. Potential plastics leakage points are as follows...

- \* THE NOZZLE/SPRUE BUSH REGION IN STANDARD MOULDS
- \* THE NOZZLE/SPRUE BUSH REGION IN HOT RUNNER MOULDS
- \* THE MULTIPLE INJECTION POINTS WITHIN HOT RUNNER MOULDS

The LM2050 system consists of a main control unit which provides local monitoring of the main potential leak location (Primary injection nozzle). In order to provide satisfactory monitoring within Hot Runner systems, the system may be extended to give additional protection to a number of extra leak locations in multiples of eight, i.e. 1...8 1...16... etc. This is achieved by means of a multi-point Manifold unit which communicates with the controller where the decision and display functions are provided.

## 1.2 LM2050 MAIN CONTROL UNIT.

---

This unit contains all the necessary Hardware and Software control program to allow the system to be used as a stand alone leak monitor, or as a single point plus multi-point leak monitor when used in conjunction with a multi-point expansion Manifold.

The unit is housed in a robust steel case which is attractively designed, and its size allows for unobtrusive installation on any moulding machine. The PVC front decal is highly resistant to wear and tear, and is easily maintained.

LM2050 provides substantial visual information by means of three high brightness LED's and a 2 line X 16 character LCD display, giving leak location information, and other operational data. Three tactile membrane type switches allow easy system operation and convenient user programming.

The unit is easily surface mounted using the "lay-on" bracket provided. A 12...24 VDC power source, and a supply of dry filtered compressed air is required.

### **1.3 MULTI-POINT MANIFOLD UNIT**

---

The LM2050 multi-point Manifold unit is connected to the Main control and Display unit via a 4-core serial power/communication cable. The Manifold is manufactured with leak sensor units in multiples of eight. i.e. 8-point... 16 point... 24 point etc. The unit is powered via the 4-core cable and only requires a supply of dry filtered compressed air.

The unit is housed in a robust steel housing, totally encapsulated against the ingress of water and other contaminants. The Manifold unit incorporates a LED indicator which displays Manifold operational status, and also provides useful diagnostic information should cable or communication malfunction occur. A power LED is also provided.

### **1.4 AIR LOSS**

---

Both the main Control and Display unit and the Manifold unit are protected by supply air pressure loss sensors. Various programmable options are available to suit individual operational needs, and are fully explained under "system programming". The relevant state is displayed by the Control and Display unit.

### **1.5 COMMUNICATIONS**

---

All Manifold units, and indeed other peripheral devices are continuously monitored for the following...

- (1) Response to controller interrogation
- (2) Data integrity
- (3) Cable damage/connection

The system response to detected malfunction or loss of information is again programmable to suit individual operational needs, and is fully explained under “system programming”.

### **1.6 OUTPUTS**

---

Voltage free normally open and normally closed relay contact pairs are available for interlock connection to the moulding machine, or relays/sounders etc. The activation of the output relay may be (a) programmed to be instantaneous, or (b) it may be delayed for a preset period of time, e.g. to allow the injection cycle to complete, or other appropriate action to be taken, or (c) the relay may be programmed to be inoperative.

### **1.7 PROGRAMMING.**

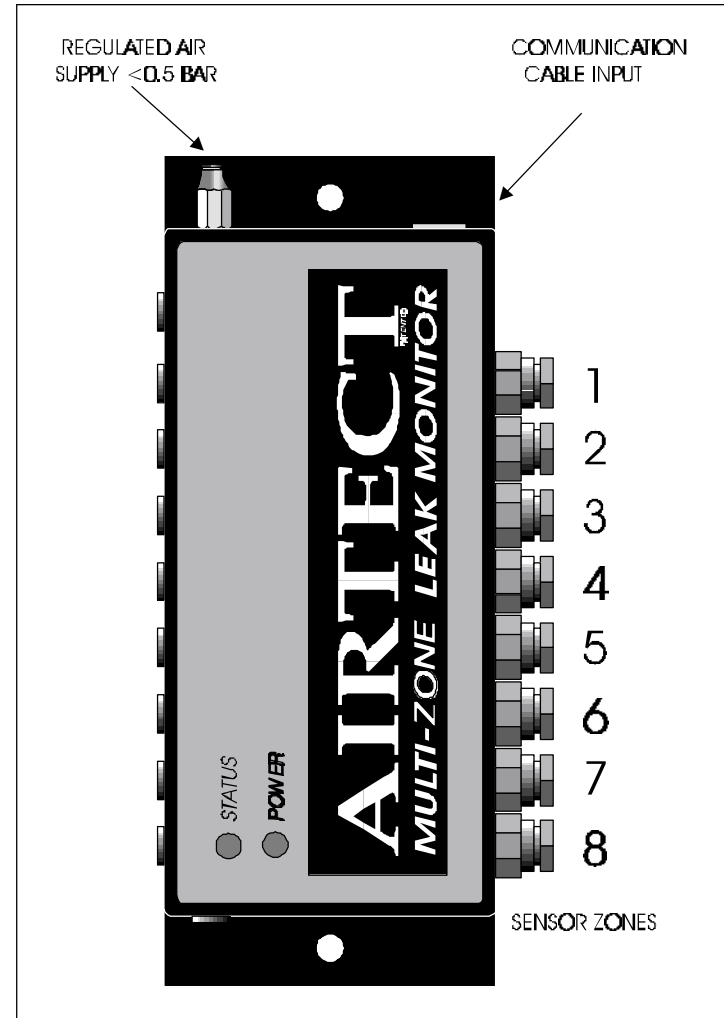
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The AIRTECT LM2050 is programmed on site via the three integrated tactile membrane push buttons. Programming is straightforward, and is assisted by means of the status LEDS, the control unit buzzer, and the 2 line X 16 character LCD display.

## 2. LM2050 MAIN CONTROL UNIT



### 3. LM2050 MULTI-POINT MANIFOLD





## 4. FEATURES

- \* INSTANTANEOUS OR DELAYED INTERLOCK RELAY ON LEAK DETECTION, OR RELAY INOPERATIVE.
- \* INSTANTANEOUS OR DELAYED INTERLOCK RELAY ON AIR LOSS/FAULT CONDITION, OR RELAY INOPERATIVE.
- \* VISUAL DISPLAY OF LEAK LOCATION VIA 32 CHARACTER LCD DISPLAY
- \* VISUAL DISPLAY OF OTHER ALARM FUNCTIONS VIA 32 CHARACTER LCD DISPLAY
- \* VISUAL DISPLAY OF CURRENT STATUS VIA HIGH BRIGHTNESS LEDS.
- \* AUDIBLE ALARM INDICATION.
- \* RELAY BYPASS FUNCTION ALLOWS CONTINUED OPERATION UNDER SUPERVISED CONDITIONS.
- \* ALL FUNCTIONS PROGRAMMABLE VIA FRONT PANEL.
- \* PROGRAMMING RETAINED AFTER COMPLETE POWER FAILURE.
- \* ANNUNCIATOR WARNING CANCEL WITHOUT CLEARING FAULT INDICATION WARNING.
- \* CONTINUOUS SYSTEM INTEGRITY MONITOR.
- \* FAIL SAFE OPERATION.
- \* "SUPERVISOR ONLY" SECURITY INTERLOCK PERIPHERAL AVAILABLE.
- \* REMOTE SIGNALLING MODULE AVAILABLE FOR "OFF-SITE" COMMUNICATION
- \* AUDIBLE INDICATION OF KEYPRESS.
- \* AUDIBLE ERROR INDICATION.

## 5. SPECIFICATION

POWER SUPPLY :	12...24 VOLTS DC (NOMINAL)
CURRENT CONSUMPTION :	50 m/A MAX (no outputs driven)
OUTPUT 1 :	VOLTAGE FREE NORMALLY OPEN RELAY CONTACTS RATED 2.0A @ 24V dc 0.5A @ 115V ac
OUTPUT 2 :	VOLTAGE FREE NORMALLY CLOSED RELAY CONTACTS RATED 2.0A @ 24V dc 0.5A @ 125 V ac
W X Y Z :	W... -12V DC X.... DATA FROM REMOTE Y.... DATA TO REMOTE Z... +12V 250mA. MAX
AIR PRESSURE RANGE :	4.0...7.0 Kg/cm <sup>2</sup> .
AIR CONSUMPTION	<0.01 CFM/SENSOR
OPERATING PRESSURE :	<0.5 Kg/cm <sup>2</sup> .
ACTIVATION PRESSURE	20 mBAR
OPERATING TEMPERATURE :	-15°C TO +60°C.
MOUNTING (CONTROLLER) :	SURFACE MOUNTED USING KEYED FIXING PLATE PRO- VIDED.
MOUNTING (MANIFOLD) :	SURFACE MOUNTED USING 2 FIXING HOLES PROVIDED.
SIZE (CONTROLLER) :	H 140 mm, W 100mm, D35 mm.
SIZE (8 PORT MANIFOLD) :	H 65mm, W 120 mm, D 50 mm.
WEIGHT (CONTROLLER) :	APPROX. 700 gm.

## 6. INSTALLATION

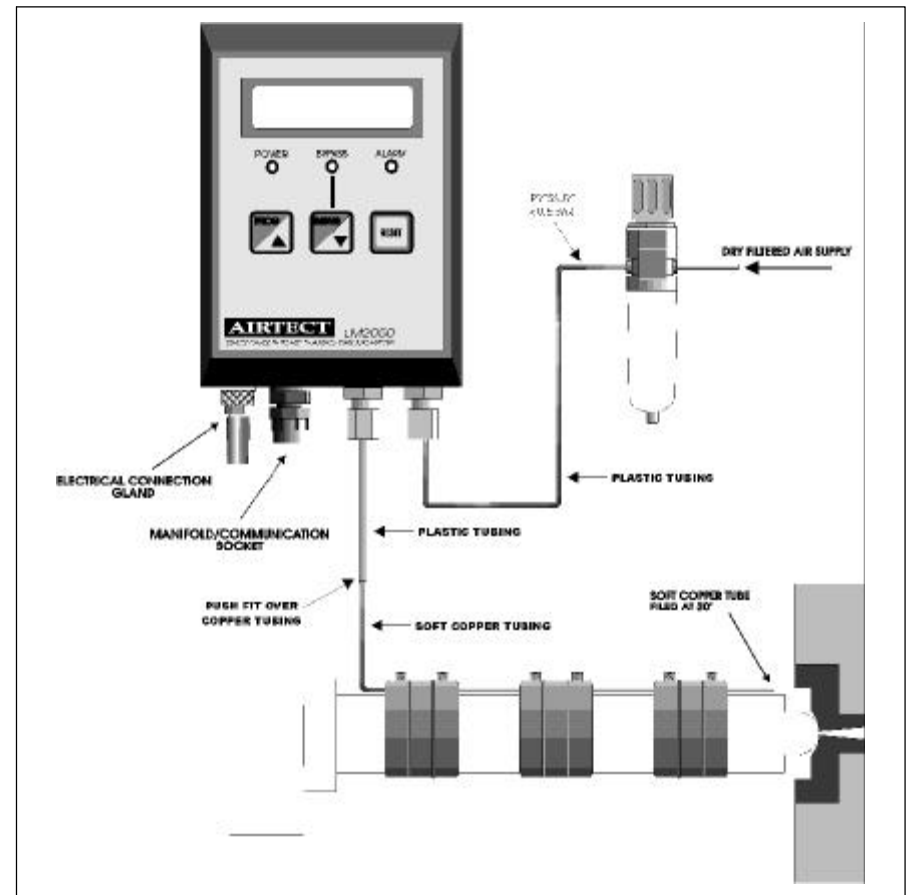
### 6.1 MOUNTING THE LM2050 CONTROL UNIT

The LM2050 has been designed for simple installation. In order to mount the unit, it is not necessary to open the housing. Fix the mounting bracket to the moulding machine using suitable 3mm screws. Simply clip the LM2050 housing onto the mounting bracket and pull downwards to ensure a secure fix.

**As the correct operation of the system is virtually dependant on correct installation, it is prudent to to ensure neat and proper workmanship.**

**EXERCISE EXTREME CARE IN MOUNTING/HANDLING THE MAIN CONTROL UNIT TO AVOID DAMAGE TO THE MANIFOLD/COMMUNICATION CONNECTOR (FIG. 1)**

6. INSTALLATION



**6.2 PNEUMATIC CONNECTIONS**

Connect the compressed air source to the input port of the air pressure regulator via plastic or braided hose, preferably using a permanent type connection.

Connect the outlet port of the regulator to the to the input port of the Control unit using 4mm plastic tube.

Connect plastic tube to the outlet of the Control unit, and connect it to the copper tube which is run along the barrel.

loosen the machine nozzle heater band clamps and slip the copper tubing in between gap under clamp bolts. Run the copper sensor tube along the barrel in between the gap under the heater band clamps and terminate it at the front heater band, approximately 20-40mm from the sprue bush

Connect the plastic tube from the outlet of the control unit to the copper tube at the throat end of the barrel where it is cooler. The 4MM plastic will normally push up over the copper tube to create an air-tight joint.

### **6.3 MANIFOLD ELECTRICAL CONNECTION**

The electrical connection between the Multi-point Manifold unit and the LM2050 main control unit is made using the special cable provided.

Enter one cable end plug into the socket provided in the LM2050 main control unit. Rotate the plug carefully until the “key” allows the plug to enter the socket. Screw up the knurled nut on the plug while feeding the plug into the socket, until the plug is “home”. Fit the other end of the cable to the socket provided in the Multi-point Manifold unit.

#### 6.4 ELECTRICAL CONNECTION LM2050

The LM2050 Control unit is provided with 2.5M of 6-core cable already connected. Should it be necessary to extend this cable to reach between the LM2050 and the machine control panel, then the following wiring code should be followed.

<b>RED</b>	<b>+12...24 VDC</b>
<b>BLUE</b>	<b>SUPPLY 0V</b>
<b>GREEN/YELLOW</b>	<b>N/C CONTACT</b>
<b>BLACK/WHITE</b>	<b>N/O CONTACT</b>

#### 6.5 MACHINE INTERLOCK CONNECTIONS.

Many factors will influence the use to which the leak monitor is put. This could vary from a local audible warning in non-critical applications, to a total instant shut-down in the case of an internal leak in a complex hot runner tool.

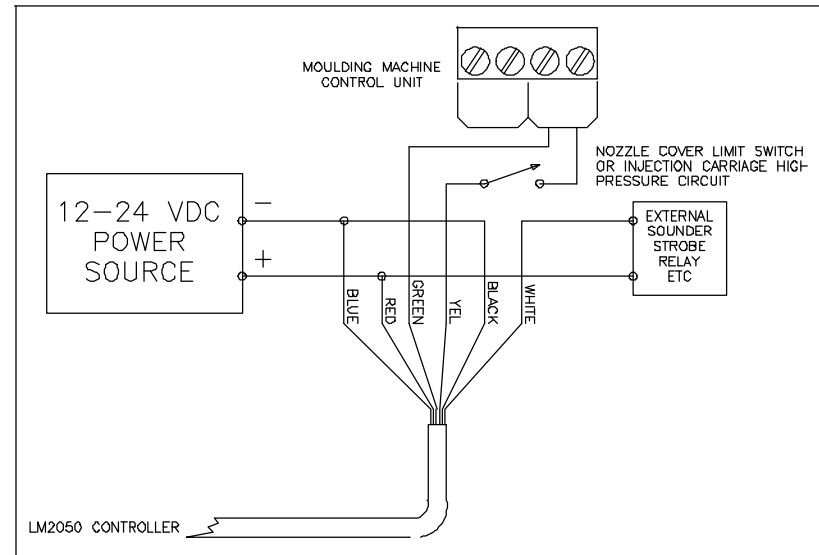
The following should be used as a guide...

The normally open contacts would normally be used to activate a remote visual/audible warning system.

The normally closed circuit would be wired in series with a suitable shut down circuit, possibly in series with the nozzle cover limit switch circuit, or perhaps in series with the injection carriage high pressure confirmation switch circuit within the machine control panel.

A study of the machine control schematic should indicate the most appropriate control point.

Ensure that the available machine supply is sufficient to supply any external sounders, strobes or other warning devices. The LM2050 current requirement is, in most cases, small enough to be ignored.



6. INSTALLATION

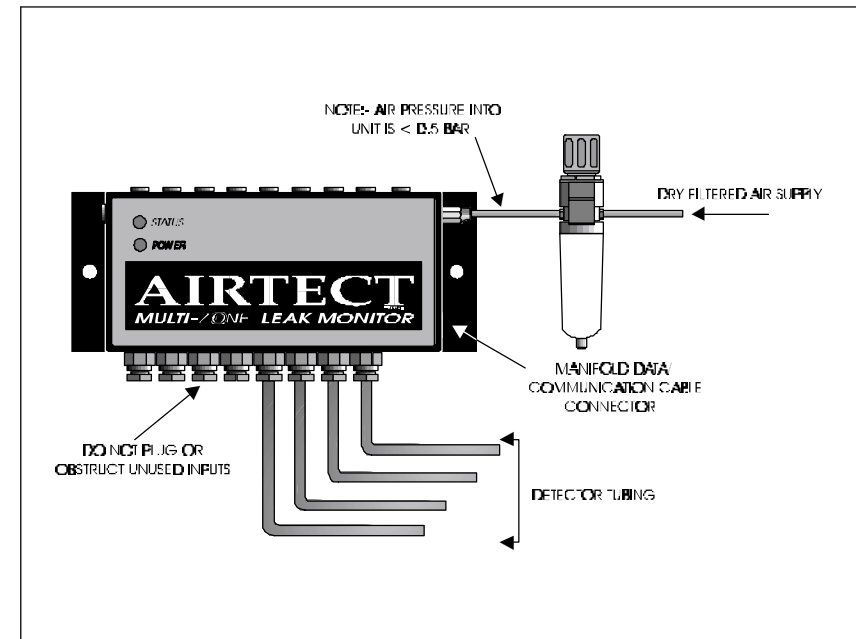
**6.6 LM2050 MANIFOLD PNEUMATICS**

Remove the back plate of mould.....

Run soft copper tubes into likely leak locations following the route of heater and thermocouple wiring. Ensure that the ends of the tubes protrude further than the entry points of the wiring to the heaters/thermocouples as these are generally destroyed if covered by leaking plastic .

Ensure that the ends of the tubes have been neatly cut and that there is a clear air passage (very low air volume).

Terminate the other end of the tubes at the expansion manifold using the compression fittings. **TIGHTEN WELL**. Do not plug any/unused inputs as this will cause these locations to alarm.





## 7. OPERATION

### 7.1 GENERAL.

For correct operation, the AIRTECT LM2050 requires a 12-24 VDC power source, and a supply of dry, filtered compressed air. When both are connected, the green "power" LED will illuminate, indicating the unit is ready for use. The LCD will show the software and firmware version numbers for a few seconds, and then display...

A rectangular LCD display showing the text: \*AIRTECT LM2050\*  
System Normal... in a monospaced font.

### 7.2 SINGLE POINT MONITOR.

When the regulated air supply is connected to the input of the control unit and a copper tube connected to the output port is terminated close to the potential leak site (most likely the nozzle/sprue bush area), then the system will operate in its factory set mode.

### 7.3 MULTI-POINT MONITOR.

The LM2050 remote manifold unit requires a separate supply of dry, filtered compressed air, and when connected to the LM2050 Control/Display unit via the 4-core communication cable, then the indications should be as in 7.1 above, and the system will operate in its factory set mode.

7. OPERATION

**7.4 AIR LOSS**

The LM2050 system relies on a steady supply of dry filtered compressed air. Should this supply cease or be interrupted, either at the controller or at the multi-port Manifold in a larger system, the controller will enter Air-loss mode.

- (1) BUZZER WILL SOUND
- (2) INTERLOCK RELAY WILL ACTIVATE  
AS PROGRAMMED
- (3) DISPLAY WILL INDICATE...

Air Pressure LOW  
in Control Unit!

This condition will be maintained until the alarm is cancelled by pressing the **[RESET]** button, and the air supply is restored.

**7.5 LEAK DETECTED (SINGLE POINT MONITOR)**

Should an obstruction (plastic leak) occur at the primary injection nozzle the following is the sequence of events

- (1) BUZZER WILL SOUND
- (2) INTERLOCK RELAY WILL ACTIVATE  
AS PROGRAMMED
- (3) DISPLAY WILL INDICATE

Leak Detected !!  
at Main Nozzle..

### 7.6 SILENCE ALARM

---

The internal buzzer of the LM2050 control unit may be silenced by depressing the **[RESET]** switch on the front of the unit. This action “acknowledges” the alarm condition by the operator. The LM2050 display continues to indicate the alarm condition, and the alarm relay (if programmed) remains activated.

### 7.7 BYPASS ALARM

---

If it is determined that the leak condition is not serious enough to suspend operation, or temporary action is taken to reduce the leakage to an acceptable level, then the alarm condition may be “bypassed” by depressing the **[BYPASS]** switch on the front of the LM2050 control unit. The switch must be held in the depressed state for at least 5 seconds before the LM2050 will acknowledge the bypass command.

- (1) ALARM LED WILL EXTINGUISH
- (2) BYPASS LED WILL FLASH
- (3) INTERLOCK RELAY WILL DE-ACTIVATE
- (4) DISPLAY WILL INDICATE



Leak Bypassed !!  
at Main Nozzle.

### 7.8 ALARM RESET

---

When the reason for the plastic leak condition has been examined and corrected, the LM2050 will automatically be restored to the “standby” condition. The LM2050 will reset and clear all alarm messages if...,

- (a) All alarms have been acknowledged.
- (b) All leak conditions have been eliminated.
- (c) The copper tube(s) end(s) have been cleared of any debris.

### 7.9 LEAK DETECTED (MULTI-POINT UNIT)

The operation of the LM2050 multi-point leak monitor is identical to the single point unit with the addition that leaks detected by the multi-point manifold unit(s) have the location of the leak identified by a number from 01 to 63, depending on the size of the manifold unit(s) fitted. Thus, a leak at location 15 would be reported as follows...



Where multiple leaks occur, the locations are reported in ascending numerical order. A leak at the primary injection point is still reported as (Main Nozzle), and is reported last in order.

When the bypass function is activated in multi-leak situations, all leak locations existing at that time are bypassed.

A "new" leak will re-activate the sounder and the programmed alarm sequence.

The control and display system will report the "list" of leak locations, followed by any existing bypassed locations.

### 7.10 BYPASS REMINDER

The LM2050 control unit buzzer will emit two one second beeps at approx 50-60 second intervals, to remind the operator that the detected leak(s) have been bypassed and that a constant check should be kept to ensure that the situation has not deteriorated. This bypass reminder may be disabled if desired by a programming option.

### 7.11 MULTI POINT STATUS INDICATOR

The multi-point manifold unit is fitted with a LED marked "STATUS". Under normal operating conditions, this LED should flash briefly once every few seconds, indicating that the system is functioning normally. Should communication be lost with the main control unit, or in the case of a cable fault, then the status LED will flash continuously, indicating the malfunction. The main control unit will probably be also displaying the message....

```
!Manifold(s) not  
Responding....!!
```

## 8. PROGRAMMING LM2050

---

All programming instructions are entered via the LM2050 control and display unit front panel. All programming actions are accomplished by a simple sequence of button presses on the **[PROG]** **[RESET]** and **[BYPASS]** switches. The following functions are programmable....

- \* RESTORE LM2050 TO FACTORY SETTINGS
- \* SET INTERLOCK RELAY TIMER (00-99 Seconds)
- \* SELECT UNIT AS SINGLE/MULTI-ZONE MONITOR
- \* SELECT CONTROLLER ZONE ON/OFF
- \* ACTIVATE/DEACTIVATE BYPASS REMINDER
- \* INTERLOCK RELAY INSTANT/TIMED ON LEAK
- \* INTERLOCK RELAY ACTIVE/INACTIVE ON LEAK
- \* INTERLOCK RELAY INSTANT/TIMED ON AIR LOSS
- \* INTERLOCK RELAY ACTIVE/INACTIVE ON AIR LOSS

### 8.1 AUTOMATIC MODE

When power is first applied to the LM2050, the control unit loads the factory default program settings, then interrogates the communication lines to determine if any remote multi-point manifolds exist on the system. If such manifolds are found to exist, the LM2050 logs on and records the locations of these manifolds, and automatically sets itself up in the appropriate operating mode.

If subsequently, a manifold is removed or disconnected from the system, either through a fault condition or a deliberate change in tooling/manifold setup, the LM2050 will detect this condition and report it as a communication failure. No leak detection function can be accomplished in this mode. The following message will be shown in the display....



```
!Manifold(s) not
Responding...!!
```

If this situation is as a result of a fault condition, normal operation will be restored automatically on clearing the fault and re-starting the monitor.

If a change has been made in the operational configuration of the LM2050, then it will be necessary to (a) re-program the unit to reflect the changed status, or (b) default the unit to the factory settings, or (c) re-program the unit as a single point monitor.

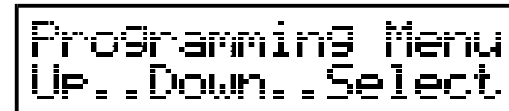
A more complete explanation of the above procedure is covered in the following section on programming the LM2050.

## 8.2 ENTER PROGRAMMING MODE

In order to place the LM2050 in programming mode, the unit must be in standby mode, i.e. no alarm or bypass condition should exist. The display should show “**System Normal**”, and the green “power” LED should be illuminated.

It is also permissible to enter programming mode during a “**Manifolds(s) not responding**” condition, this may be necessary to reset the LM2050 back to factory settings. (see previous section 8.1).

With the conditions existing as discussed above, depress and hold the **[PROG]** switch. It is necessary to hold the switch depressed for at least 5 seconds before the unit will accept the command. The unit will enter programming mode and the display will show....



```
Programming Menu
Up . Down . Select
```

## 8.3 SELECT OPTION TO PROGRAM

LM2050 must first be in programming mode, see section 8.2 above.

Successive depressions of the **[BYPASS]** switch will step “down” through the menu, successive depressions of the **[PROG]** switch will step “up” through the menu.

Depress and release the **[BYPASS][PROG]** switches until the required program function to be changed appears in the display.



#### 8.4 RESTORE LM2050 TO FACTORY PROGRAMMING

ACTIVATION OF THIS OPTION WILL RE-INSTALL THE FACTORY PROGRAMMING. THIS WILL RETURN THE LM2050 TO THE CONFIGURATION IN SECTION 8.14.

```
Restore Unit..to
Factory Settings
```

Select option by depressing the [RESET] button.

NOTE: The programming mode will be aborted, and the display will return to standby mode.

#### 8.5 SET INTERLOCK RELAY TIMER (00-99 Seconds)

```
Interlock Relay
Timer (secs)= XX
```

Select option by depressing the [RESET] button.

```
Interlock Relay
Tens..Units.. XX
```

Adjust "tens" by pressing [PROG] button...

Adjust "units" by pressing [BYPASS] button...

Select desired delay (shown) by depressing the [RESET] button.

### 8.6 SELECT UNIT AS SINGLE/MULTI-ZONE MONITOR

---

```
Use Monitor as..  
Single Zone Unit
```

Toggle option by depressing the [RESET] button.

```
Use Monitor as..  
Multi-Zone Unit
```

### 8.7 SELECT CONTROLLER ZONE ON/OFF

---

```
Controller Zone  
***** ACTIVE *****
```

Toggle option by depressing the [RESET] button.

```
Controller Zone  
*** INACTIVE ***
```

If the controller zone is set to “active”, then the controller must be supplied with a regulated air source, otherwise the alarm “Air Pressure Low in control unit” will be displayed.

### 8.8 ACTIVATE/DEACTIVATE BYPASS REMINDER

---

```
Bypass Reminder
***** ACTIVE *****
```

Toggle option by depressing the [RESET] button.

```
Bypass Reminder
***** INACTIVE *****
```

### 8.9 ALARM RELAY INSTANT/TIMED ON LEAK

---

```
LEAK... Interlock
Relay Timed... YES
```

Toggle option by depressing the [RESET] button.

```
LEAK... Interlock
Relay Timed... NO
```

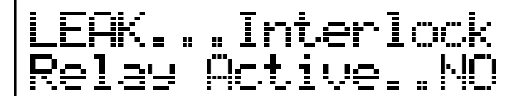
### 8.10 INTERLOCK RELAY ACTIVE/INACTIVE ON LEAK

---



```
LEAK... Interlock
Relay Active.. YES
```

Toggle option by depressing the **[RESET]** button.



```
LEAK... Interlock
Relay Active.. NO
```

### 8.11 INTERLOCK RELAY INSTANT/TIMED ON AIR LOSS

---



```
Supply Air... LOW
Relay Timed.. YES
```

Toggle option by depressing the **[RESET]** button.



```
Supply Air... LOW
Relay Timed.. NO
```

### 8.12 INTERLOCK RELAY ACTIVE/INACTIVE ON AIR LOSS

---



Supply Air...LOW  
Relay Active...YES

Toggle option by depressing the [RESET] button.



Supply Air...LOW  
Relay Active...NO

### 8.13 SAVE SETTINGS AND QUIT PROGRAMMING MODE

---



Programming Menu  
Save/Quit Menu..

Select option by depressing the [RESET] button.

NOTE: The current (displayed) options will be stored in non-volatile memory, the programming mode will be aborted, and the display will return to standby mode.

### 8.13 FACTORY SETTINGS

---

The LM2050 factory programmed settings are as follows...

RELAY TIMER	10 SECONDS
SINGLE/MULTI	SINGLE ZONE MONITOR
CONTROLLER ZONE	ACTIVE
BYPASS REMINDER	ACTIVE
LEAK INTERLOCK RELAY	TIMED
LEAK INTERLOCK YES/NO	YES
LOSS INTERLOCK RELAY	TIMED
LOSS INTERLOCK YES/NO	YES

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