

Macurco™ HD-6

Hydrogen Detector, Controller and Transducer User Instructions



IMPORTANT: Keep these user instructions for reference.

Table of Contents

1	General Safety Information	4
1.1	General Description	4
1.2	List of warnings and Cautions	4
2	Use Instructions and Limitations	5
2.1	Use For	5
2.2	Do NOT use for	5
2.3	Features	6
2.4	Specifications	6
2.4.1	6-Series Low Voltage	6
3	Installation Instructions	6
3.1	Location	7
3.2	Installation	7
3.2.1	6-Series Low Voltage	7
3.3	Terminal Connection	12
3.3.1	6-Series Low Voltage	12
4	Operations	13
4.1	Power up	13
4.2	Display turned “On”	13
4.3	Display turned “Off”	13
4.4	4-20 mA Loop	14
4.5	Default – Factory Settings	15
4.5.1	Selecting Default Configuration – “dEF”	15
4.5.2	Power-Up Test Setting – “PUT”	16
4.5.3	Display Setting – “dSP”	16
4.5.4	Buzzer Setting – “bUZ”	16
4.5.5	Alarm Relay Setting – “ArS”	16
4.5.6	Alarm Relay Configuration – “Arc”	16
4.5.7	Alarm Relay Latching – “ArL”	17
4.5.8	Fan Relay Setting – “FrS”	17
4.5.9	Fan Relay Delay Setting – “Frd”	17
4.5.10	Fan Relay Minimum Runtime Setting – “Frr”	17
4.5.11	Fan Relay Latching Setting – “FrL”	17
4.5.12	Trouble Fan Setting – “tFS”	17
4.5.13	4-20mA Output setting – “420”	17
5	Troubleshooting	18
5.1	On-Board Diagnostics	18
5.1.1	4-20mA troubleshooting	18
5.1.2	“t” error codes	18
5.2	Sensor Poisons	19
5.3	End-of-Life Signal	19
6	Maintenance	19
6.1	Cleaning	19
7	Testing	20
7.1	Testing	20
7.1.1	Operation Test	20
7.1.2	Manual Operation Test	20
7.2	Calibration and Test Kits	21

7.3	Gas Testing	22
7.3.1	Testing the Fan Relay	22
7.3.2	Testing the Alarm Relay	23
7.3.3	Testing the 4-20mA loop	23
7.4	Field Calibration Procedure	23
7.4.1	Zero The Sensor	23
7.4.2	Calibrate the Sensor	24
8	Appendix A – Table of Images	25
9	Appendix B – Menu Structure	26
9.1	Main Menu	26
9.2	Auto Test Menu “bUZ”	27
9.3	Select Test Menu “tst”	28
9.4	Calibration Menu “CAL”	35
9.5	Sensor Reset Menu “SEn”	Error! Bookmark not defined.
11	Macurco Gas Detection Product limited warranty	36
	Technical Support Contact Information	36
	General Contact Information	36

1 General Safety Information

The following instructions are intended to serve as a guideline for the use of the Macurco HD-6 Hydrogen Detector. This manual will refer to these devices as HD-6 unless content is specific to a model. This manual is not to be considered all-inclusive, nor is it intended to replace the policy and procedures for your facility. If you have any doubts about the applicability of the equipment to your situation, consult an industrial hygienist or call Technical Support at 1-844-325-3050.

1.1 General Description

The Macurco HD-6 is a dual relay Hydrogen (H₂) detector, controller, and transducer. The HD-6 has selectable 4-20 mA output, buzzer and digital display options. It is an electronic detection system used to measure the concentration of Hydrogen and provide feedback and automatic exhaust-fan control to help reduce H₂ concentrations in parking garages, maintenance facilities or other commercial applications. The HD-6 is a low-level meter capable of displaying in the range 0-50% LEL (Lower Explosive Limit) of Hydrogen. The HD-6 is factory calibrated and 100% tested for proper operation but can also be calibrated in the field.

The HD-6 is intended to be mounted on a 4x4 electrical box. It can operate in a stand-alone application or can be connected to a building automation system, UL Listed Control Panel, or other control device that accepts 4-20mA analog input. The HD-6 is compatible with the Macurco DVP Control Panel family.

1.2 List of warnings and Cautions

 WARNING
Each person using this equipment must read and understand the information in this user manual before use. Use of this equipment by untrained or unqualified persons or use that is not in accordance with this user manual, may adversely affect product performance.
Use only for monitoring the gas which the sensor and monitor is designed to detect. Failure to do so may result in exposures to gases not detectable and cause serious injury or death. For proper use, see supervisor or user manual, or contact Technical Support at 1-844-325-3050.
This equipment may not function effectively below -22°F or above 158°F (-30°C or above 70°C). Using the detector outside of this temperature range may adversely affect product performance.
This detector helps monitor for the presence and concentration level of a certain specified airborne gas. Misuse may produce an inaccurate reading, which means that higher levels of the gas being monitored may be present and could result in overexposure and cause serious injury or death. For proper use, see supervisor or User manual, or contact Technical Support at 1-844-325-3050.
Do not disassemble unit or attempt to repair or modify any component of this instrument. This instrument contains no user serviceable parts, and substitution of components may impair product performance.
Using a certified gas with a concentration other than the one listed for this detector when conducting a calibration or calibration verification test (bump test) will produce inaccurate readings. This means that higher levels of the gas being monitored may be present and could result in overexposure. For proper use, see supervisor or User manual, or contact Technical Support at 1-844-325-3050.

The following steps must be performed when conducting a calibration or calibration verification test (bump test) to ensure proper performance of the monitor. Failure to do so may adversely affect product performance.

- When performing a calibration or calibration verification test (bump test), only use certified calibration gas at the required concentration level.
- Do not test with expired calibration gas.
- Do not cover or obstruct display or visual alarm cover.
- Ensure sensor inlets are unobstructed and are free of debris

Failure to follow instructions outlined in this user manual can result in sickness or death.

2 Use Instructions and Limitations

WARNING

Each person using this equipment must read and understand the information in this user manual before use. Use of this equipment by untrained or unqualified persons or use that is not in accordance with this user manual, may adversely affect product performance.

NOTE: Combustible gas detectors will respond to a wide range of hydrocarbons, including aerosol sprays, cleaning solvents, paint thinner, and other common household items. Be alert to other hydrocarbons near the detector before assuming the unit is false alarming or is defective.

2.1 Use For

The HD-6 provides H₂ detection and automatic exhaust fan control for automotive maintenance facilities, enclosed parking garages, utility rooms, battery rooms, warehouses and other commercial applications. The HD-6 can be used stand alone, with the Macurco DVP-120 Detection and Ventilation Control Panel, other 12 VAC or 24 VDC fire/security panels or building automation systems.

WARNING

Use only for monitoring the gas which the sensor and monitor is designed to detect. Failure to do so may result in exposures to gases not detectable and cause serious injury or death. For proper use, see supervisor or user manual, or contact Technical Support at 1-844-325-3050.

2.2 Do NOT use for

The HD-6 is not intended for use in hazardous locations or industrial applications such as refineries, chemical plants, etc. Do not mount the HD-6 where the normal ambient temperature is below -22°F or exceeds 158°F (-30°C or above 70°C). The HD-6 mounts on a type 4S electrical box supplied by the contractor. Do not install the HD-6 inside another box unless it has good air flow through it.

WARNING

This equipment may not function effectively below -22°F or above 158°F (-30°C or above 70°C). Using the detector outside of this temperature range may adversely affect product performance.

2.3 Features

- HD-6: ETL listed for Hydrogen to UL2075¹ and UL/ULC 588¹
- Low-level meter capable of displaying from 0-50% LEL of Hydrogen
- Selectable fan and alarm relay activation
- 5 A SPDT fan relay controls starters of exhaust fans
- 0.5 A N.O. or N.C. alarm relay connects to warning devices or control panels
- 4-20 mA Current Loop
- HD-6 mounts on a standard 4x4 electrical box and becomes cover for the box
- Supervised system: any internal detector problem will cause the fan and/or Alarm relay to activate
- Calibration kit is available. One screw allows access for calibration or gas test

¹Where required by federal, state, local regulations or the Authority Having Jurisdiction, HD-6 required to be used with Listed Horn/Strobe model 78-2900-0211-X* to meet the 85dB(A) Audibility requirements of Standards UL 2075.

*Where "X" represents lens cover color, R for red lens cover, G for green lens cover, B for blue lens cover, O for amber lens cover, C for clear lens cover.

2.4 Specifications

- Shipping Weight: 1 pound (0.45 kg)
- Size: 4 1/2 x 4 x 2 1/8 in. (11.4 X 11.4 X 5.3 cm)
- Color: White or Dark gray
- Connections: plugs/terminals
- Mounting box: (not included) 4x4 electric
- Fan relay: 5 A, 240 VAC, pilot duty, SPDT, latching or non-latching
- Fan relay actuation: selectable at diS (disable), 2-20 % LEL
- Fan Relay Delay settings of 0, 1, 3 (default), 5, and 10 minutes
- Fan Relay Minimum Runtime settings are 0 (default), 3, 5, 10 or 15 minutes
- Fan relay latching or not latching (default) selectable
- Alarm relay: 0.5A 120 V, 60 VA
- Alarm relay actuation: selectable N.O. (default) or N.C.
- Alarm relay latching or not latching (default) selectable
- Alarm relay settings: diS (disable), 2-20% LEL (20% LEL is default)
- Current Loop, 4-20 mA for 0-50% LEL H2, selectable to 'bAS' (default), 'EnH', OFF
- Buzzer: 85 dBA at 10cm settable to off (default) or on
- Digital display: 3-digit LED selectable to off (default) or on.
- Operating Environment: -22°F to 158°F (-30°C to 70°C), 10 to 90% RH non-condensing

2.4.1 6-Series Low Voltage

- Power: 3 W (max) from 12 to 24 VAC or 12 to 32 VDC
- Current @ 24 VDC: 75 mA in alarm (two relays), 50 mA (fan relay only) and 23 mA standby

3 Installation Instructions

WARNING

This detector helps monitor for the presence and concentration level of a certain specified airborne gas. Misuse may produce an inaccurate reading, which means that higher levels of the gas being monitored may be present and could result in

overexposure and cause serious injury or death. For proper use, see supervisor or User manual, or contact Technical Support at 1-844-325-3050.

3.1 Location

Because hydrogen is lighter than air, the HD-6 is normally mounted high on a wall or column (about one foot down from the ceiling) in a central area where air movement is generally good. The unit, on average, can cover approximately 900 sq. ft. (84 sq. meters) to 1,257 sq. ft. (117 sq. meters). However, coverage depends on air movement within the room or facility. The coverage depends on air movement within the room or facility. Extra detectors may be needed near any areas where people work or where the air is stagnant. Some of the factors that affect the coverage area are application type, personnel work areas and movement, room size, air movement, potential threat, mounting location, along with other site-specific factors that must be considered. Please check local regulations or requirements prior to installation. The HD-6 mounts on a 4x4 electrical box supplied by the contractor. Do not install the HD-6 inside another box unless it has good air flow through it. Do NOT mount the HD-6 where the normal ambient temperature is below -22°F or exceeds 158°F (below -30°C or above 70°C).

NOTE: The HD-6 was factory-calibrated at 10% LEL Hydrogen in ambient conditions of approximately 70°F (21°C) and 50% relative humidity. If the HD-6 is to be installed in an environment which conditions are significantly different than factory-calibration conditions, the unit should be field-calibrated upon installation to ensure accuracy.

3.2 Installation

3.2.1 6-Series Low Voltage

1. The HD-6 mounts on a 4" square (or 4x4) electrical box supplied by the contractor. Do not mount the HD-6 inside another box, unless it has good air flow through it.
2. Connect the HD-6 to Class 2 power supply only. It is suggested to use a separate transformer for powering the unit or units because of possible interferences from other devices on the same power supply.
3. The HD-6 was factory-calibrated at 10% LEL Hydrogen in ambient conditions of approximately 70°F (21°C) and 50% relative humidity. If the HD-6 is to be installed in an environment which conditions are significantly different than factory-calibration conditions, the unit should be field-calibrated upon installation to ensure accuracy.
4. Connect the HD-6 to the control cables with terminal plugs. When making connections, make sure the power is off.
5. There are two terminals for Power: 12 to 24 VAC or 12 to 32 VDC, with no polarity preference.
6. There are two terminals for the dry alarm relay contacts, again with no polarity preference. The alarm relay can switch up to 0.5 A 120 V, or 60 VA. The alarm relay is activated if gas reaches or exceeds the alarm settings. See section [4.5 Default – Factory Settings](#) of this User manual for details on relay settings.
7. The alarm relay can be configured to normally open (default) (N.O.) or normally closed (N.C.) and will activate if the gas concentration exceeds alarm set point. It will deactivate once the gas concentration drops below the alarm set point. Note that the “disable” setting will cause the alarm relay not to engage at all.
8. The Alarm Relay can be configured for latching or non-latching (default) when activated (when the gas concentration exceeds alarm relay set point). Once latched in, power will need to be interrupted or the “TEST” button pressed to un-latch the relay condition (assuming gas concentration is below the alarm relay set point).
9. The dry contact, SPDT fan relay has three terminals. The common (COM.), normally open (N.O.) and the normally closed (N.C.) contact. The fan relay can switch up to 5.0 A up to 240 VAC. See section [4.5 Default – Factory Settings](#) of this User manual for details on relay settings.
10. The Fan Relay can be configured for latching or non-latching (default) when activated (when the gas concentration exceeds fan relay set point). Once latched in, power will need to be interrupted or the “TEST” button pressed to un-latch the relay condition (assuming gas concentration is below the fan relay set point).

11. The Fan Relay will engage if the hydrogen concentration is exceeded for longer than the Fan Relay Delay time. Unless it is configured for latching, the fan relay will disengage once both of these conditions have been met:

- Hydrogen concentration has dropped below fan setting
- Fan Relay Run time has been exceeded

Note that the “disable” fan setting will cause the fan relay to not engage. The fan relay will engage in trouble fault condition (if the Trouble Fan Setting Option is set to “ON”) and will disengage once trouble fault condition is cleared.

12. The Current Loop is 4 mA in clean air and 4-20 mA for 0-50% LEL hydrogen.

NOTE: 22 to 12 AWG wire shall be used. Wire used shall meet the temperature range of the detector i.e. -22°F to 158°F (-30°C to 70°C).

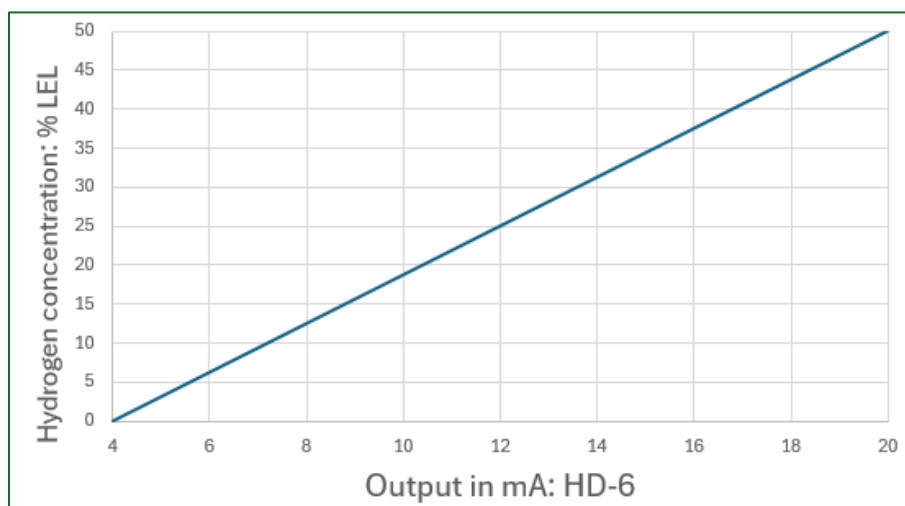


Figure 3-1 6-Series 4-20 mA Output diagram

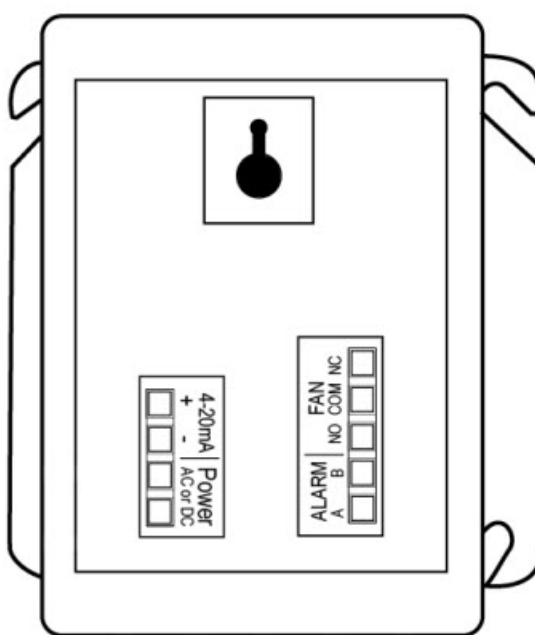


Figure 3-2 6-Series Rear View

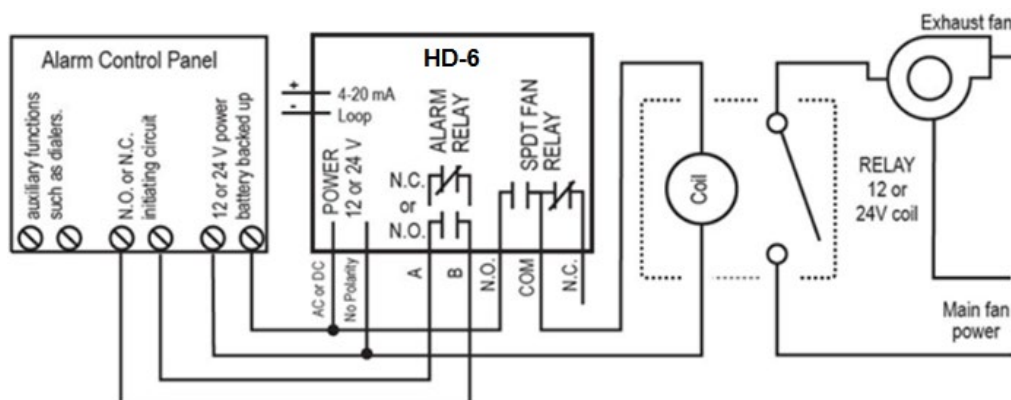


Figure 3-3 6-Series Alarm Control Panel diagram

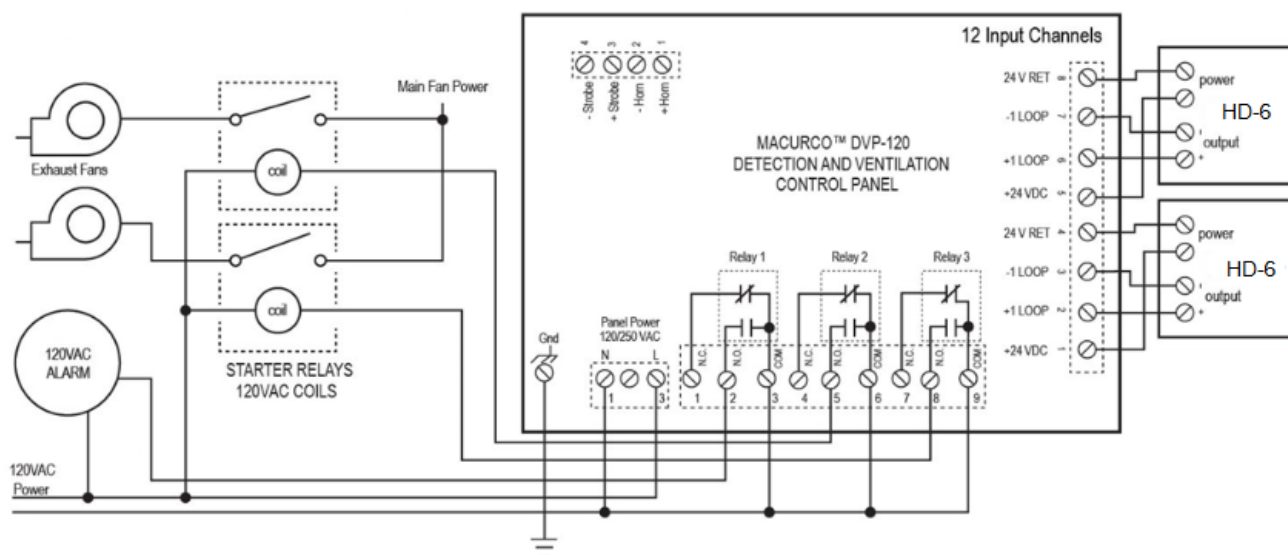


Figure 3-4 6-Series DVP-120 Control Panel diagram

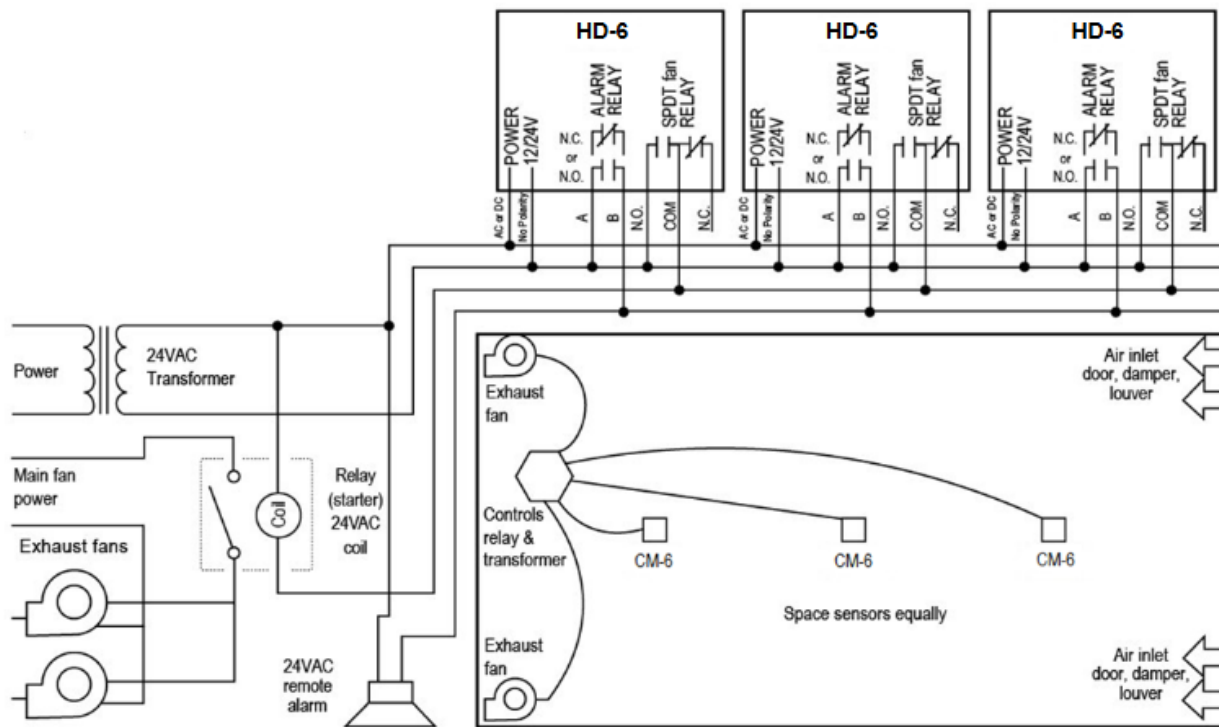


Figure 3-5 6-Series Multiple Device diagram

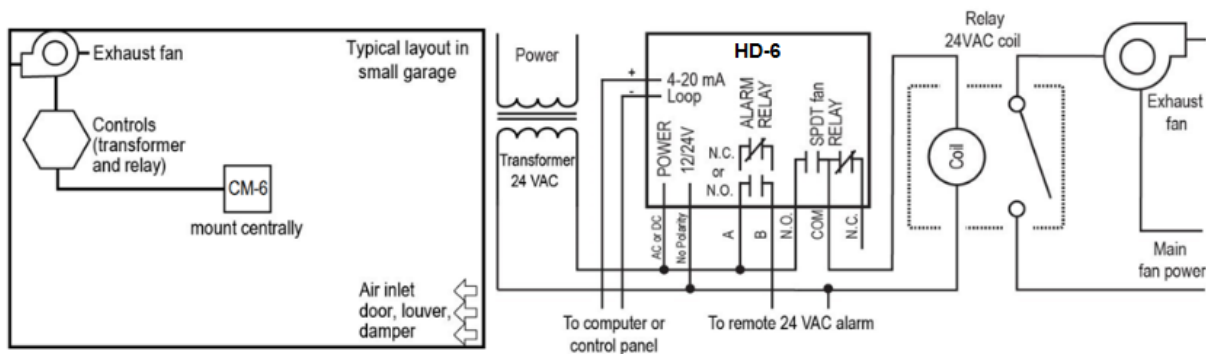


Figure 3-6 6-Series Stand Alone Diagram

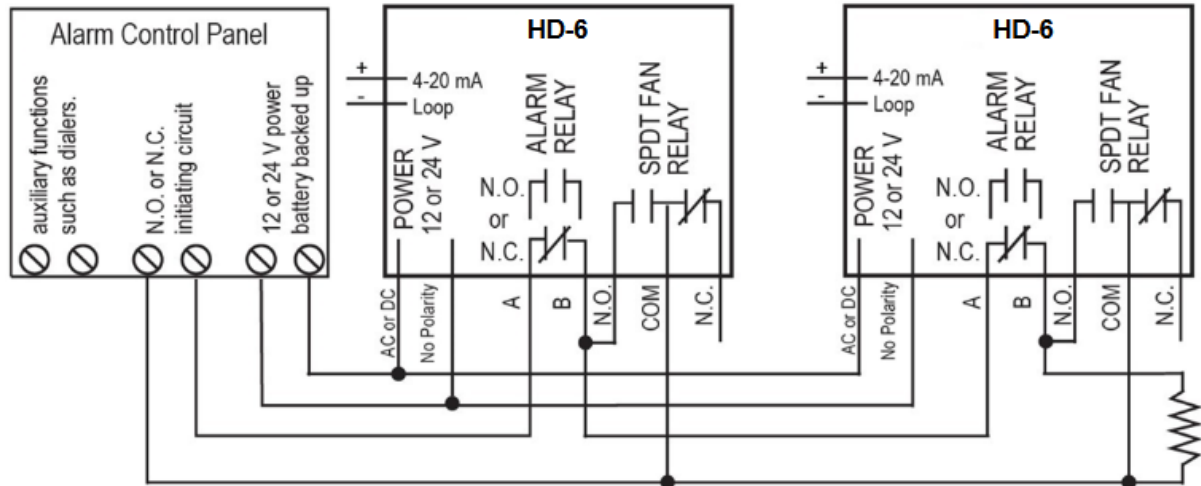


Figure 3-7 6-Series Alternate Alarm Panel

In this application (above) the Fan or primary relay is used as a low-level alarm relay. The Alarm or secondary relay is used as a supervisory relay when utilized in the normally closed configuration. The HD-6 monitors all critical functions of the unit through software diagnostics that continually test and verify its operations. If a problem is found, the unit will switch to a fail-safe/error mode or trouble condition. In this error mode the Fan* and Alarm relays will be activated indicating the trouble condition at panel and the HD-6 display will flash the error. *See section [4.5.11 Trouble Fan Settings – “tFS”](#) for options.

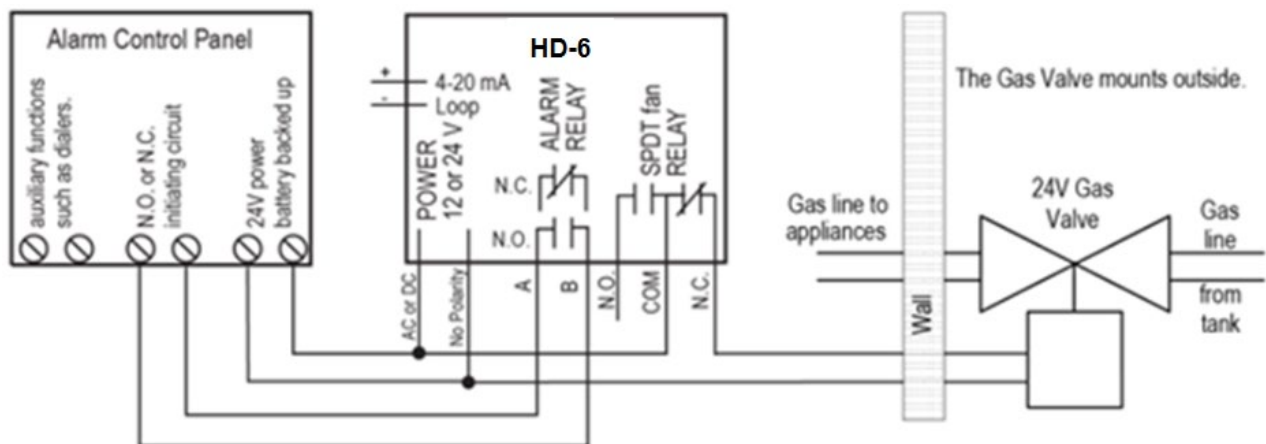


Figure 3-8 6-Series Alternate Alarm Panel

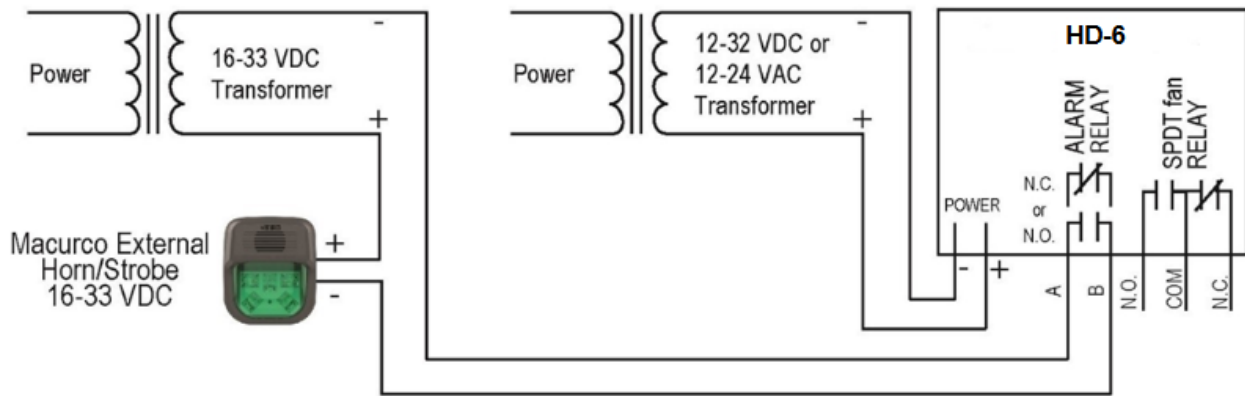


Figure 3-9 6-Series Horn & Strobe Combo Wiring

Macurco External Horn/Strobe model number is 78-2900-0211-X, where X represents lens color, R for red lens cover, G for green lens cover, B for blue lens cover, O for amber lens cover, C for clear lens cover. Sound pressure for Horn/Strobe model is at least 85dB at 10 feet.

NOTE: The final installation of HD-6 system, including secondary wiring from controller to sensors shall comply with requirements of "Class 1" in approved raceways or conduits.

3.3 Terminal Connection

3.3.1 6-Series Low Voltage

With the exception of the safety ground, all field wiring is completed via modular connectors (provided). After wiring, simply plug the modular connectors into the matching connectors on the back side of the detector.

NOTE: 22 to 12 AWG wire shall be used. Wire used shall meet the temperature range of the detector i.e. -22°F to 158°F (-30°C to 70°C).

3.3.1.1 Mains Power Connection

Connect the HD-6 to Class 2 power supply only. It is suggested to use a separate transformer for powering the unit or units because of possible interferences from other devices on the same power supply. Connect the HD-6 to the control cables with terminal plugs. When making connections, make sure the power is off. There are two terminals for Power: 12 to 24 VAC or 12 to 32 VDC, with no polarity preference

Ensure that the wire cannot be easily pulled from the connector. Plug the modular connection into the Fan/Power connection and ensure that it latches into the header properly.

3.3.1.2 Fan Relay Connection

All of the SPDT Fan relay terminals are available at the Fan/Power modular connector. Each Fan relay terminal normally open, common and normally closed (NO, COM and NC) can accommodate a wire size 12 to 22 AWG. To install the wiring for the relays, disconnect the connector from the header. Strip the insulation of each wire back approximately 1/4 in. (6.5 mm), insert the bare wire into the terminal and tighten the screw clamp. Ensure that the wire cannot easily be pulled from the connector. Plug the modular connection into the Fan/Power connection and ensure that it latches into the header properly.

3.3.1.3 Alarm Relay Connection

The external alarm connections (A and B) are available at the Alarm modular connector. There is no polarity for these connections. To install the wiring for the alarm contacts, disconnect the connector from the header on the detector. Strip the insulation of each wire back approximately 1/4 in. (6.5 mm), insert the bare wire into the terminal and tighten the screw clamp. Ensure that the wire cannot easily be pulled from the connector. When the wires are connected seat the modular connector into the header ensuring that the latch engages

3.3.1.4 4-20 mA Signal Connection

The positive and negative 4-20mA signal connections (+ and -) are available at the 4-20mA modular connector, a 2-position connector. To install the wiring for the 4-20 mA contacts, disconnect the connector from the header on the detector. Strip the insulation of each wire back approximately 1/4 in. (6.5 mm), insert the bare wire into the terminal and tighten the screw clamp. Ensure that the wire cannot easily be pulled from the connector. When the wires are connected seat the modular connector into the header ensuring that the latch engages

4 Operations

4.1 Power up

The HD-6 cycles through an internal self-test cycle for the first minute that it is powered. The unit will execute the test cycle any time power is dropped and reapplied (i.e. power failure). During the self-test cycle the unit will display the firmware version number, then count down from 60 to 0 (if the display setting is “On”) and finally go into normal operation. The alarm relay will be activated for 10 seconds and the fan relay for 60 seconds during the power-up cycle unless the “Power Up Test” (PUt) option is OFF. The indicator light (LED) will flash green during the self-test cycle. At the end of the 1-minute cycle, the unit will take its first sample of the air and the indicator light will turn solid green.

4.2 Display turned “On”

Clean Air – With the display function turned “On”, the HD-6 will show the current concentration of % LEL H2 or “0.0” (zero) in clean air.

Fan level – When the CO concentration reaches the Fan Relay setting (10.0 % LEL, for example) the display will flash back and forth between “FAn” and “10.0” or current concentration of gas.

Alarm level – With the display function turned “On” and the H2 concentration reaching the Alarm Relay setting, (20.0 % LEL, for example) the display will flash back and forth between “ALr” and “20.0” or current concentration of gas. The buzzer will sound indicating “Alarm” if the buzzer is turned “On”.

Trouble – With the display function turned “On” and the device is in trouble state, the display will display the “t” Error code (t01 for example). If the Trouble Fan Setting is enabled, the fan relay will switch, activating the relay. See section [4.5.11 Trouble Fan Setting – “tFS”](#) and section [5.1.2 “t” Error Codes](#).

4.3 Display turned “Off”

Clean Air – With the display function turned “Off”, the display does not show the H2 concentration. Only the Power indicator light on will be on.

Fan Level – When the H2 concentration reaches the fan relay setting (10.0 % LEL, for example) the display will show “FAn” continuously as long as the fan relay is enabled. This appears as slowly flashing “FAn”.

Alarm Level – With the display function turned off the display does not show the H2 concentration but will show “ALr” when the Alarm relay is activated.

Trouble – With the display function turned “Off” and the device is in a trouble state, the display will display the “t” Error code (t01 for example). If the Trouble Fan Setting is enabled, the Fan relay will switch activating the relay. See Section [4.5.11 Trouble Fan Setting – “tFS”](#) and Section [5.1.2 “t” Error Codes](#).

4.4 4-20 mA Loop

4-20mA settings selected to ‘bAS’ or ‘EnH’ is considered as 4-20mA function turned ON.

Clean Air – With the 4-20 mA function turned “On” and the current concentration of H2 % LEL at “0” (zero), the 4-20mA loop will output 4 mA.

Gas read – With the 4-20 mA function turned “On” the output will read between 4 mA and 20 mA depending on the current concentration of CO.

Trouble – With the 4-20 mA function turned “On” and Trouble Fan Setting enabled. The 4-20mA loop will output 1 mA or 24 mA depending on the Trouble condition. See Section [5.1 On-Board Diagnostics](#).

4.5 Default – Factory Settings

The HD-6 comes pre-programmed with these default settings:

Setting:	Default:
Power Up Test	On
Display	On
Buzzer	On
Alarm Relay Setting	20% LEL
Alarm Relay Configuration	Normally Open (NO)
Alarm Relay Latching	Off
Fan Relay Setting	10% LEL
Fan Relay Delay	3 minutes
Fan Relay Minimum Runtime	0 minutes
Fan Relay Latching	Off
Trouble Fan Setting	Off
4-20mA	bAS (basic)

To change settings, remove the Philips screw on the front of the HD-6. Pull off the front cover of the unit.

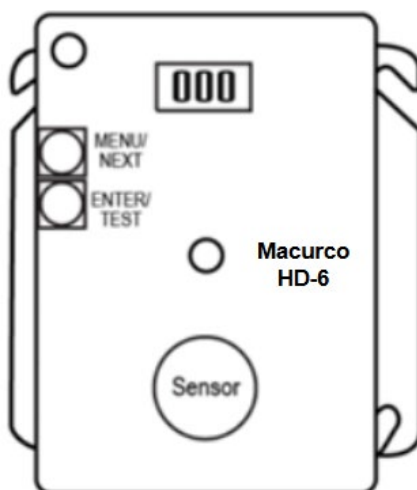


Figure 4-1 Board View

To reset the device to factory settings, see section 4.5.1 Selecting Default Configuration – “dEF”

4.5.1 Selecting Default Configuration – “dEF”

To select the Default Configuration, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. The first selection is the “dEF” or Default setting. Push **Enter**. If it is already in Default configuration, there will be no action. If it is not already in Default configuration, “CUS” will be displayed. Push **Next** to change it to “YES” (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “dEF” in the con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

4.5.2 Power-Up Test Setting – “PUT”

To select the Power Up Test Configuration, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. Then push the **Next** button to get to the second selection “PUT” or Power Up Test setting. Push **Enter**. If the testis “On” push **Next** to turn it “OFF” (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “PUT” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

4.5.3 Display Setting – “dSP”

To select the Display Configuration, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. Then push the **Next** button to get to the third selection “dSP” or Display setting. Push **Enter**. If the display is “On” push **Next** to turn it “OFF” (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “dSP” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

4.5.4 Buzzer Setting – “bUZ”

To select the Buzzer Configuration, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. The forth selection is the “bUZ” or Buzzer setting. Push **Next** twice to get to “bUZ” then **Enter**. If the display is “On” push **Next** to turn it “OFF” (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “bUZ” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

4.5.5 Alarm Relay Setting – “ArS”

To select the Alarm Relay Setting, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. The fifth selection is the “ArS” or Alarm Relay Setting. Push **Next** three times to get to “ArS” then **Enter**. If the display is “dIS” (disabled) push **Next** to change it to 2-20 % LEL (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “ArS” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

4.5.6 Alarm Relay Configuration – “Arc”

To select the Alarm Relay Configuration, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. The sixth selection is the “Arc” or Alarm Relay Configuration. Push **Next** four times to get to “Arc” then **Enter**. If the relay is “nO” (normally open) push **Next** to turn it to “nC” (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “Arc” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

NOTE: If either relay setting is set to “dis” then the other relay cannot also be disabled

NOTE: If ArS is set to “dis”, the fan relay delay “Frd” is set to 0 and cannot be changed.

Previous Alarm Level Notification

NOTE: If Alarm Relay Latching is turned Off. Once the detector’s gas reading has gone above alarm relay setpoint and gas reading has subsequently fallen below alarm setpoint, unit will display “PAL” Previous Alarm Level alternating with the current gas reading. This is to notify the user that an alarm condition has previously occurred. The alarm notification (“PAL”) can be cleared from the display by pressing the E/T button or cycling the power.

NOTE: If the Alarm Relay is set to “dIS” disable and Fan relay latching is off, once the detector’s gas reading has gone above fan relay setpoint and gas reading has subsequently fallen below the fan setpoint, unit will display “PAL” Previous Alarm Level alternating with the current gas reading. This is to notify the user that an alarm condition has previously occurred. The alarm notification (“PAL”) can be cleared from the display by pressing the E/T button or cycling the power.

4.5.7 Alarm Relay Latching – “ArL”

To select the Fan Relay Latching Option, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. The tenth selection is the “ArL” or Fan Relay Latching Option. Push **Next** nine times to get to “ArL” then **Enter**. If latching is “OFF” push **Next** to turn it to “ON” (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “ArL” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

4.5.8 Fan Relay Setting – “FrS”

To select the Fan Relay setting, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. The seventh selection is the “FrS” or Fan Relay setting. Push **Next** five times to get to “FrS” then **Enter**. If the fan relay is “dIS” (disabled) push **Next** to change it to 2-20% LEL (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “FrS” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

NOTE: If either relay setting is set to “dis” then the other relay cannot also be disabled

4.5.9 Fan Relay Delay Setting – “Frd”

To select the Fan Relay Delay setting, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. The eighth selection is the “Frd” or Fan Relay Delay. Push **Next** six times to get to “Frd” then **Enter**. If the delay is “0” (disabled) push **Next** to change it to 1, 3, 5, or 10 minutes (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “Frd” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

NOTE: If ArS is set to “dis”, the fan relay delay “Frd” is set to 0 and cannot be changed.

4.5.10 Fan Relay Minimum Runtime Setting – “Frr”

To select the Fan Relay Minimum Runtime setting, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. The ninth selection is the “Frr” or Fan Minimum Run Time. Push **Next** seven times to get to “Frr” then **Enter**. If the runtime is “0” (disabled) push **Next** to change it to 3, 5, 10 or 15 minutes (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “Frr” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

4.5.11 Fan Relay Latching Setting – “FrL”

To select the Fan Relay Latching Option, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. The tenth selection is the “FrL” or Fan Relay Latching Option. Push **Next** nine times to get to “FrL” then **Enter**. If latching is “OFF” push **Next** to turn it to “ON” (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “FrL” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

4.5.12 Trouble Fan Setting – “tFS”

To select the Trouble Fan Setting Option, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. The eleventh selection is the “tFS” or Trouble Fan Setting Option. Push **Next** ten times to get to “tFS” then **Enter**. If Trouble Fan Setting is “OFF” push **Next** to turn it to “ON” (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “tFS” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

4.5.13 4-20mA Output setting – “420”

To select the 4-20mA Output Option, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. The twelfth selection is the “420” or 4-20mA Output Option. Push **Next** eleven times to get to “420” then **Enter**. If the 4-20mA is “bAS” push **Next** to turn it to “EnH” (flashing) and push **Next**

one more time to turn it to “OFF” (flashing). Then push **Enter** to confirm the change (solid) and push **Enter** again to return to “420” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

5 Troubleshooting

5.1 On-Board Diagnostics

The HD-6 monitors all critical functions of the unit through software diagnostics that continuously test and verify unit operations. If a problem is found, the unit will switch to a fail-safe/error mode or trouble condition. In this error mode, the Alarm relay will be activated, the 4-20 mA current loop will go to 24 mA, the unit will display the error code, the green status indicator LED light will flash, and the buzzer will chirp intermittently. The Fan relay will also engage if the Trouble Fan Setting Option is set to “ON”. This is a safety precaution. To clear this mode, turn off power to the unit for a few seconds or push the ENTER/TEST switch (inside the unit). This will cause the unit to restart the 1-minute self-test cycle.

5.1.1 4-20mA troubleshooting

- 0 mA is most likely a connection problem
- 4-20 mA is normal gas reading range (0-200 ppm)
- 24 mA indicates a Trouble condition

5.1.2 “t” error codes

tXX	
t01	Sensor Fatal Error/ Sensor missing
t02	Temperature compensation failure
t04	EEPROM bad checksum
t08	Sensor is shorted
t10	Bad EEPROM
t20	Bad calibration
t40	Factory calibration failure
t80	Read ADC failure
t100	Under range
t200	Sensor expired / End of Life
t8000	Calibration Overdue

NOTE:

- T8000 has highest priority among all trouble code i.e. if T8000 error code exists along with other ‘t’ error code then the 4-20mA output is 1mA if T8000 exist.
- T8000 is resolved only with successful field calibration.
- If there are multiple error codes existing at the same time, the displayed code will be the sum of error codes. E.g. Unit will display t03 if t01 and t02 exist at same time, t180 if t100 and t80 exist at the same time etc.

If the sum for a digit (ones, tens or hundreds) is greater than 9, it will display corresponding hexadecimal representation of the sum. Following table shows the hexadecimal representation for number from 10 to 15.

Decimal Number	Hexadecimal Representation displayed on UNIT
10	A

11	b
12	C
13	d
14	E
15	F

Table 5-1 Hexadecimal Display

E.g. unit will display t0A if t02 and t08 exist at same time. Similarly, tC0 if t40 and t80 exist at the same time.

For trouble codes over 2 digits, the display will alternate 'tXX' and 't.YY' where XX corresponds to first two digits and YY (note '.' after 't') corresponds to last two digits of trouble code. E.g. the display will alternate between t01 and t.00 for t100, t02 and t.00 for t200 and t80 and t.00 for t8000.

If the error mode repeats frequently, check for continuous power and proper voltage. If power is not the problem and a unit has repeating error conditions, it may need to be returned to Macurco for service, per these User Instructions.

If the error mode indicates "Sensor expired" see the Sensor Life Reset section of these User Instructions

5.2 Sensor Poisons

The sensor in the detector is designed with extreme sensitivity to the environment. As a result, the sensing function may become deteriorated if it is exposed to contaminants, a direct spray from aerosols such as paints, silicone vapors, etc., or to a high density of corrosive gases (such as hydrogen sulfide, sulfur dioxide) for an extended period of time.

5.3 End-of-Life Signal

The HD-6 has a long life, non-replaceable electrochemical sensor. Ten (10) years after the HD-6 is installed the sensor end-of-life signal will be activated indicating that the HD-6 has reached the end of its typical usable life. The end-of-life signal will cause an error code t200 "Sensor expired". See Section 5.1.2 "t" Error Codes.

The end-of-life signal can be silenced for 10 days by pressing the "ENTER/TEST" button or by temporarily dropping power to the unit. The end-of-life signal provides the user an opportunity to test and/or calibrate the sensor assuring that it is still performing within acceptable parameters though the sensor is nearing the end of its expected life. The silence function will continue to be available every 10 days after the HD-6 initiates the initial end-of-life signal. After this 30-day period the HD-6 can no longer be silenced and must be replaced.

6 Maintenance

The HD-6 is low maintenance. The unit uses a long-life electrochemical sensor that has a 10-year life expectancy (in normal conditions). The detector's performance should be tested regularly by using gas as detailed in the Testing and Field Calibration sections. All maintenance and repair of products manufactured by Macurco are to be performed at the appropriate Macurco manufacturing facility. Macurco does not sanction any third-party repair facilities

6.1 Cleaning

Cleaning of the external surfaces is best carried out using a damp cloth with a mild detergent or soap. Use a vacuum cleaner with soft brush to remove dust or contamination under the cover. Do not blow out the sensor with compressed air.

NOTE: Avoid the use of harsh cleaning materials, abrasives, and other organic solvents. Such materials may permanently scratch the surfaces and damage the display window, labels, sensor, or instrument housing.

7 Testing

WARNING

Using a certified gas with a concentration other than the one listed for this detector when conducting a calibration verification test (bump test) will produce inaccurate readings. This means that higher levels of the gas being monitored may be present and could result in overexposure. For proper use, see supervisor or User manual, or contact Technical Support at 1-844-325-3050.

All HD-6 units are factory calibrated, 100% tested for proper operation and accuracy of $\pm 10\%^*$. During normal operation the green status indicator LED light will be on steady, the fan & alarm relay will be in standby mode and the 4-20 mA output will be 4mA (in clean air). The unit also performs a regular automatic self-test during normal operation. If the unit detects an improper voltage or inoperable component, it will default into Error mode. In this error mode, the Alarm relay will be activated, the 4-20 mA current loop will go to 24 mA, the unit will display the error code, the green status indicator LED light will flash, and the buzzer will chirp intermittently. The Fan relay will also engage if the Trouble Fan Setting Option is set to "ON".

*Tested at 20% LEL hydrogen at ambient conditions.

7.1 Testing

7.1.1 Operation Test

Check that the green HD-6 status indicator LED light is illuminated continuously. If not, do not proceed with the tests. If the unit is in error mode, contact your local representative or Macurco technical service representative for information on resolving the problem.

1. Remove the single screw in the middle of the front cover of the HD-6.
2. Remove the front cover.
3. Observe the LED light on the front of the HD-6.
4. If the light is solid green proceed to step 6.
5. If the green status indicator LED light is off or flashing, refer to the General section above.
6. Locate the switch labeled ENTER/TEST on the left side of the printed circuit board. Press the Test switch once.
7. The HD-6 will step through a cycle test:
 - a. The display progresses through the BUZ (Buzzer Test) Art (alarm relay test), Frt (fan relay test) then 42t (4-20 mA output test). Make sure that the settings are "on" or not disabled "diS".
 - b. During the first 3 seconds of the test cycle, the display will show BUZ and set off the audible buzzer
 - c. The alarm relay will be closed for 5 seconds, any devices connected to that relay will be tested.
 - d. The Fan relay will be activated for the next 1 minute of the test, so if the fan circuits are wired in their normal manner, the fan should run.
 - e. The 4-20mA output will then ramp up from 4 to 16 mA over the next 130 seconds of the test, so if the circuit is wired in the normal manner, the control panel or building automation system should respond.
 - f. At the end of the test cycle, the fan & alarm relay will be in standby mode and the 4-20 mA output will return to 4 mA (in clean air).
8. When testing is completed reassemble the unit or units.

7.1.2 Manual Operation Test

This option gives the user the opportunity to manually initiate an individual test for each relay, the analog output and the sensor response to gas. From normal operation mode press the Next button 2 times to get to the Test Mode (tSt). Press

the Enter button once to get into the Test Menu. Press the Next button to scroll through the five test options and press Enter to initiate the selected test. Note that if the relay or 4–20 mA output has been disabled, the test selection will not be displayed in the test menu.

bUZ- Buzzer Test, 3 seconds

Art - Alarm Relay Test, 5 seconds

Frt - Fan Relay Test, 60 seconds

42t - 420 loop test, 130 seconds

gtS - Gas Test, 3 minutes (no output to the panel during the gas test)

The display will flash during the test, or in the case of the gas test, the gas level will alternate with gtS. Once the test is complete, the display will return to steady display. To exit the test menu, press the **Next** button until “End” is displayed then, press **Enter** to return to normal mode.

7.2 Calibration and Test Kits

WARNING

The following steps must be performed when conducting a calibration or calibration verification test (bump test) to ensure proper performance of the monitor. Failure to do so may adversely affect product performance.

- When performing a calibration or calibration verification test (bump test) only use certified calibration gas at the required concentration level.
- Do not test with expired calibration gas.
- Do not cover or obstruct display or visual alarm cover.
- Ensure sensor inlets are unobstructed and are free of debris

Failure to follow instructions outlined in this user manual can result in sickness or death.

NOTE: The HD-6 was factory-calibrated at 10% LEL Hydrogen in ambient conditions of approximately 70°F (21°C) and 50% relative humidity. If the HD-6 is to be installed in an environment which conditions are significantly different than factory-calibration conditions, the unit should be field-calibrated upon installation to ensure accuracy.

NOTE: The HD-6 cannot be field calibrated in environmental conditions below 32°F (0°C)

- When performing a calibration or calibration verification test (bump test) only use certified calibration gas at the required concentration level. Do not calibrate with expired calibration gas.
- If the instrument cannot be calibrated, do not use until the reason can be determined and corrected.
- Do not cover or obstruct display or visual alarm cover.
- Ensure sensor inlets are unobstructed and is free of debris

A Field Calibration Kit, Cal-Kit 1, and one bottle of calibration gas is needed to complete gas test. These are available through local distribution or from Macurco.

NOTE: HD-6 must be tested or calibrated at regular intervals in accordance with the requirements of the National Fire Protection Association (NFPA) 720 or local code requirements. It is recommended to test or calibrate HD-6 at least annually.

Contents of the Cal-Kit 1

REV – 1.0.0

[34-2900-OPHD-6]

21 | Page

- Cal-Kit 1 (30-0011-1110-2)
 - Calibration Case
 - Two feet of Tygon tubing
 - Cal Hood-Macurco Pack
 - 0.2 LPM Gas regulator (F)

Also needed are the following gas bottles (Sold Separately):

- Qty 1 H₂-10% LEL (37-0232-5134-1) Hydrogen H₂ Cal Gas Cylinder 34L, 10% LEL (M) **(For Calibration)**
- Qty 1 H₂-20% LEL (37-0232-6134-1) Hydrogen H₂ Cal Gas Cylinder 34L, 20% LEL (M) **(For Gas Testing)**

Cal-Kit 1 Information

Several detectors can be calibrated with one Cal-Kit. The only limitation is the amount of gas in the cylinder. The 34-liter cylinder has approximately 170 minutes of continuous calibration run time. The gas cylinder should be replaced when the pressure gauge on the regulator shows 25-psi or less.

Note: For optimum test results it is suggested that the unit be in clean air, green light on, and be in a low ambient air flow.

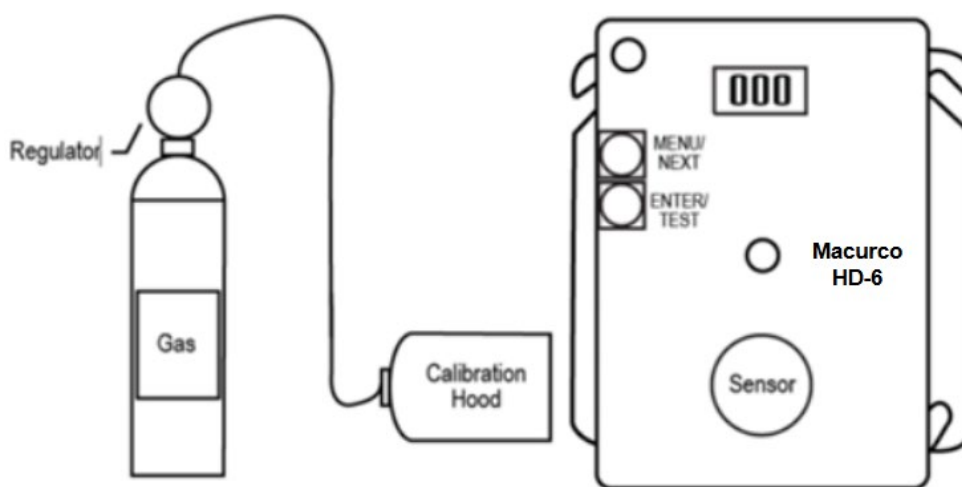


Figure 7-1 Calibration Kit Connection

7.3 Gas Testing

7.3.1 Testing the Fan Relay

1. Remove the Philips screw on the front of the HD-6. Remove the front cover.
2. Open the Cal-Kit 1. Connect the 10% LEL gas cylinder to the regulator.
3. Check the pressure gauge on the regulator. If you have 25-psi or less, you will need to replace the gas canister.
4. Assemble regulator, hose and Test Hood and place the Test Hood over the H₂ sensor.
Note: The time to activate the Fan relay depends on the delay setting.
5. Turn on the regulator to start the gas flow and wait with the gas applied continuously.
6. With the display function turned "On", the HD-6 will show the current concentration of H₂ or "0" (zero) in clean air. When the H₂ concentration reaches the Fan Relay setting (5.0% LEL, for example) the display will flash back and forth between "FAn" and "current gas reading". With the display function turned "Off", the display does not show the H₂ concentration, but will show "FAn" as long as the fan relay is activated.

Note: If the Fan relay does not close within 2 minutes, there are four possibilities:

- a. Gas cylinder is empty, check the pressure gauge. Replace the gas cylinder if 25psi or less.
 - b. Unit needs to be re-calibrated (go through recalibration and re-test).
 - c. Detector needs servicing (return unit to factory for servicing).
 - d. Detector has fan relay set to disable (diS) or 20% LEL. Set fan relay to 5% LEL and repeat the test.
7. Remove the gas from the sensor. Proceed to Test the Alarm relay or replace the top cover.

7.3.2 Testing the Alarm Relay

Note: The H2 concentration to activate the Alarm relay depends on the setting.

1. Connect the 10% LEL cylinder of hydrogen to the regulator.
2. Check the pressure gauge. If there is 25psi or less the cylinder should be replaced.
3. Place the Test Hood over the H2 sensor. Turn on the regulator to start the gas flow.
4. The Fan relay should activate according to the settings.
5. With the display function turned “On” and the H2 concentration reaching the Alarm Relay setting, (5.0% LEL, for example) the display will flash back and forth between “ALr” and “current gas reading”. The buzzer will sound indicating “Alarm” if the buzzer is turned “On”. With the display function turned off the display does not show the H2 concentration but will show “ALr” when the Alarm relay is activated.

Note: If the Alarm relay fails to operate within 2 minutes, there are four possibilities:

- a. Gas cylinder is empty, check the pressure gauge. Replace the gas cylinder if 25-psi or less.
 - b. Unit needs to be re-calibrated (go through recalibration and re-test).
 - c. Detector is in need of servicing (return unit to factory for servicing).
 - d. Detector has Alarm relay set to disable (diS). Set Alarm relay to 5.0% LEL and repeat the test.
6. Remove the gas from the sensor after Test. Proceed to Test the 4-20mA output or replace the top cover.

7.3.3 Testing the 4-20mA loop

1. Connect the 10% LEL cylinder of hydrogen to the regulator.
2. Check the pressure gauge. If there is 25-psi or less the cylinder should be replaced.
3. Place the cap from the regulator over the H2 sensor. Turn on the regulator to start the gas flow.
4. The Fan relay should activate according to the settings.
5. The Alarm relay should activate according to the settings.
6. The 4-20 mA output should ramp up from 4mA in clean air to 20mA at 50% LEL. See 4-20 mA diagram within ‘Installation’ section.

Note: If the 4-20mA output does not ramp up within 2 minutes, there are four possibilities:

- a. Gas cylinder is empty, check the pressure gauge. Replace the gas cylinder if 25-psi or less.
 - b. Unit needs to be re-calibrated (go through recalibration and re-test).
 - c. Detector is in need of servicing (return unit to factory for servicing).
 - d. Detector has 4-20 mA option set to “OFF”. Set 4-20mA option to “On” and repeat the test.
7. Remove the gas from the sensor. Re-assemble the HD-6 (make sure the LED is aligned with the front case hole). You are done.

7.4 Field Calibration Procedure

Note: For optimum calibration results the unit should be in clean air and be in a low ambient air flow.

7.4.1 Zero The Sensor

1. Remove the Philips screw on the front of the HD-6. Pull the front cover of the unit off.
2. To select Calibration Zero Mode (000), from normal mode, press the Next button four times to reach the CAL or Calibration Menu.
3. Press the Enter button to display “000” – Calibration Zero Mode.

4. Press the Enter button and the display will read 0 alternating with 000 (blinking) indicating zero calibration in progress (about 3 minutes).
5. If the zero calibration is successful, the display will read “0” alternating with “PAS”. Zero calibration is completed.
6. If the process was not successful, the display will flash “FAil”. The zero calibration has failed. If this occurs, repeat steps 1 through 4. If the sensor fails to zero twice, contact Technical Support: 1-877-367-7891.
7. To return to Normal Mode, press Enter and press Next until “End” is displayed. Press Enter to return to Normal Mode.

7.4.2 Calibrate the Sensor

1. Remove the Philips screw on the front of the HD-6. Pull the front cover off the unit.
2. Assemble the 10% LEL hydrogen cylinder and regulator together. Check the pressure gauge on the regulator. If you have 25-psi or less you will need to replace the gas canister.
3. Place the calibration hood over the gas sensor.
4. To select Calibration Span Mode (SPn), from normal mode, press the Next button four times to reach the CAL or Calibration Menu.
5. Then press the Enter button to get to “000” Calibration Zero Mode, then press the Next button to get to “SPn” – Calibration Span Mode.
6. Press the Enter button and the display will read “10” alternating with “HY”, indicating the sensor is looking for gas.
7. Start applying gas to the sensor. The HD-6 will look for gas for 45 seconds. If no gas is applied or detected, the display will return to CAL.
8. When the sensor detects the gas, the display will flash back and forth between the gas concentration and “SPn” and the calibration will progress. The display will show this for a maximum of 165 seconds.
9. When the calibration is successful, the display will flash between “10” and “PAS”.
10. Remove the gas. The display will return to “SPn”, then normal mode. The calibration is complete.
11. If the calibration fails, the display will flash back and forth between the gas concentration and FAL (fail). If this occurs, check the pressure gauge on the regulator. If the pressure is less than 25-psi the flow of gas may not be adequate to properly calibrate the unit. If there is proper pressure in the cylinder repeat steps 4 through 11. If the unit fails to calibrate twice contact Macurco Technical Assistance at 1-877-367-7891.
12. Disassemble the cylinder and regulator.
13. Re-assemble the GD-6 (make sure the LED is aligned with the hole in the front case).
14. See Calibration Flowchart on the inside of the housing.

8 Appendix A – Table of Images

Figure 3-1 6-Series 4-20 mA Output diagram 8

Figure 3-2 6-Series Rear View 9

Figure 3-3 6-Series Alarm Control Panel diagram 9

Figure 3-4 6-Series DVP-120 Control Panel diagram..... 9

Figure 3-5 6-Series Multiple Device diagram10

Figure 3-6 6-Series Stand Alone Diagram.....10

Figure 3-7 6-Series Alternate Alarm Panel.....11

Figure 3-8 6-Series Alternate Alarm Panel.....11

Figure 3-9 6-Series Horn & Strobe Combo Wiring.....12

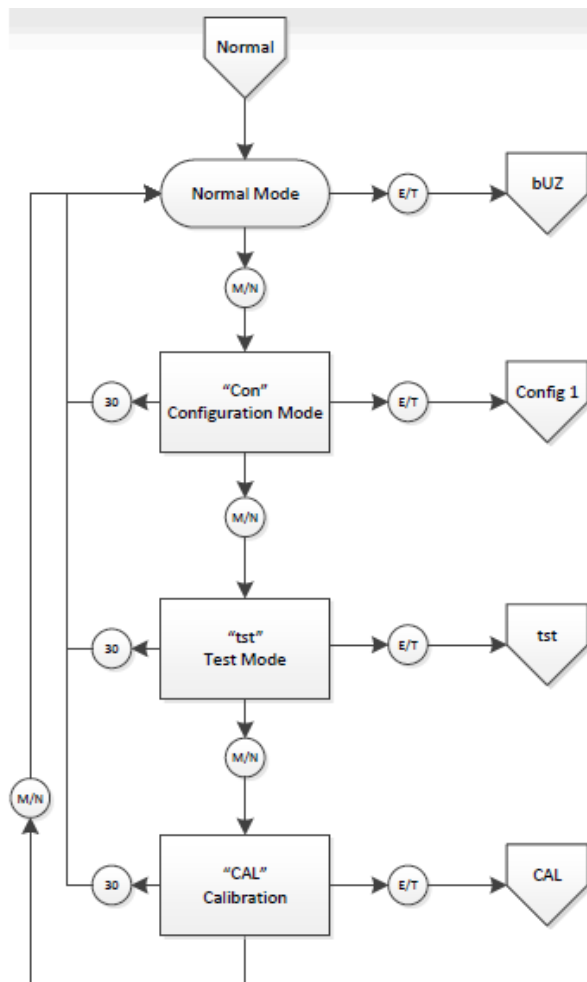
Figure 4-1 Board View15

Table 5-1 Hexadecimal Display.....19

Figure 7-1 Calibration Kit Connection.....22

9 Appendix B – Menu Structure

9.1 Main Menu

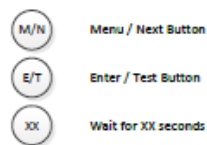


NOTES:

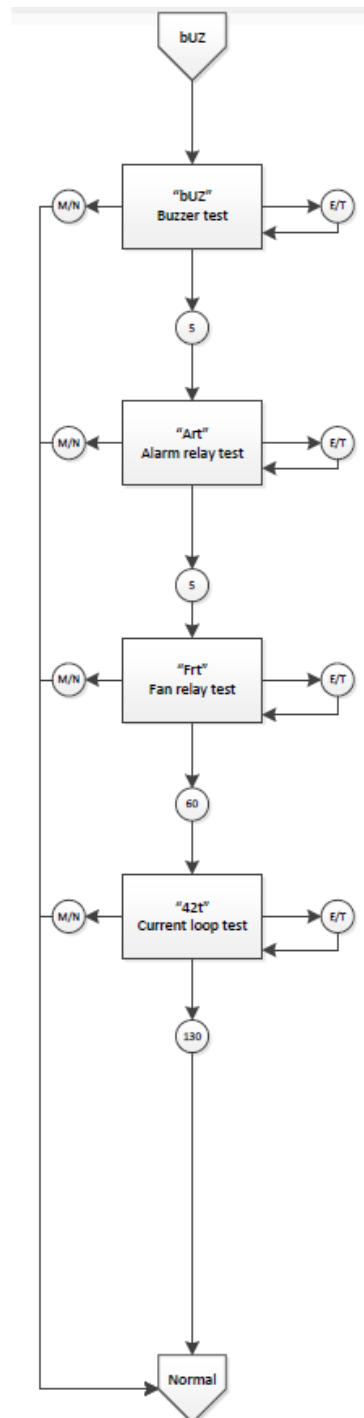
1. Firmware version 1.00

NOTES:

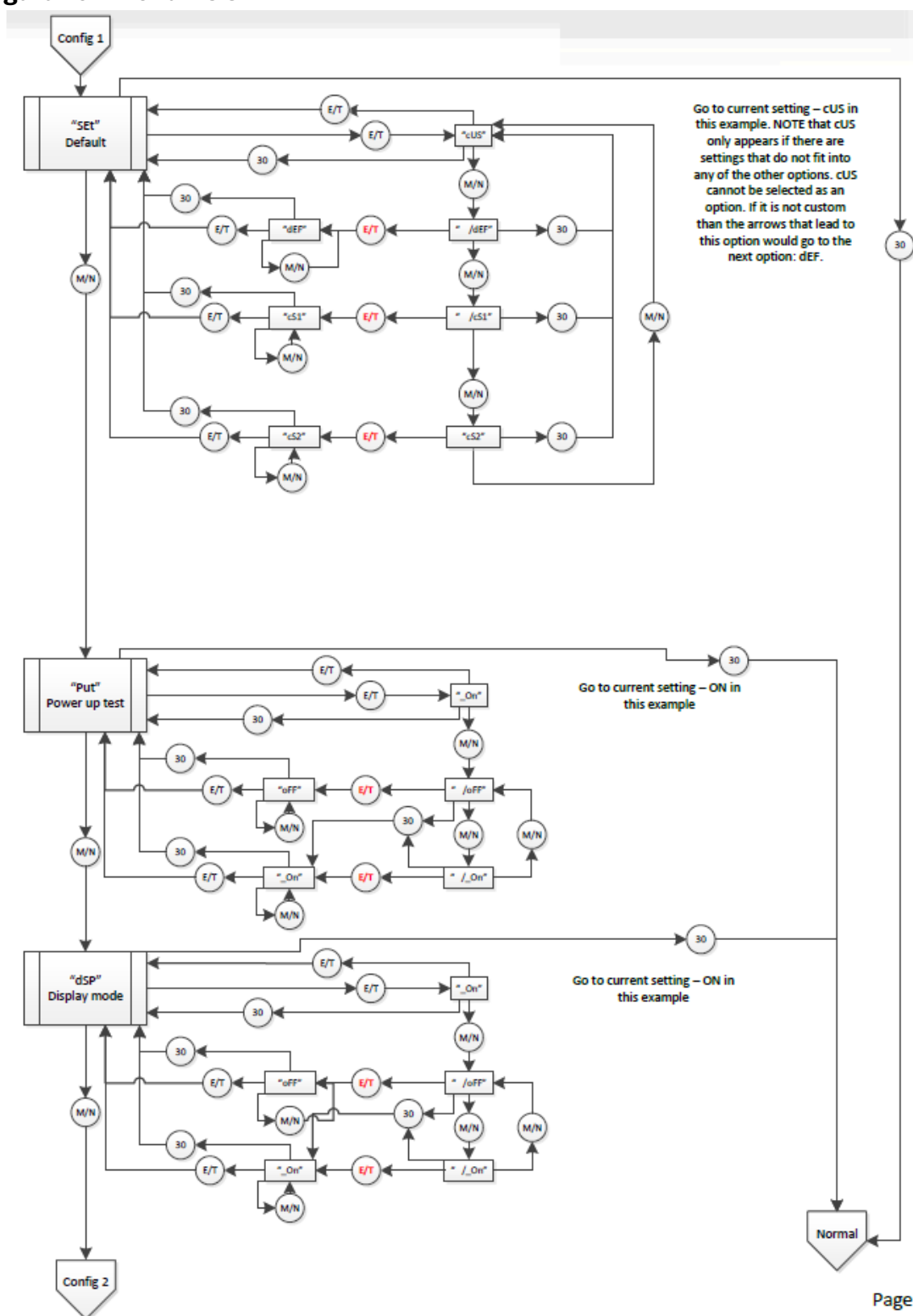
1. Sensor settings are in the sensor settings spreadsheet. Any settings here are for demo purposes only.
2. RED indicates where changes are made to the configuration.
3. quotation marks are what is shown on the display. When there are two strings within quotation marks separated by a slash (e.g. " /_On") this indicates display alternating between the strings.

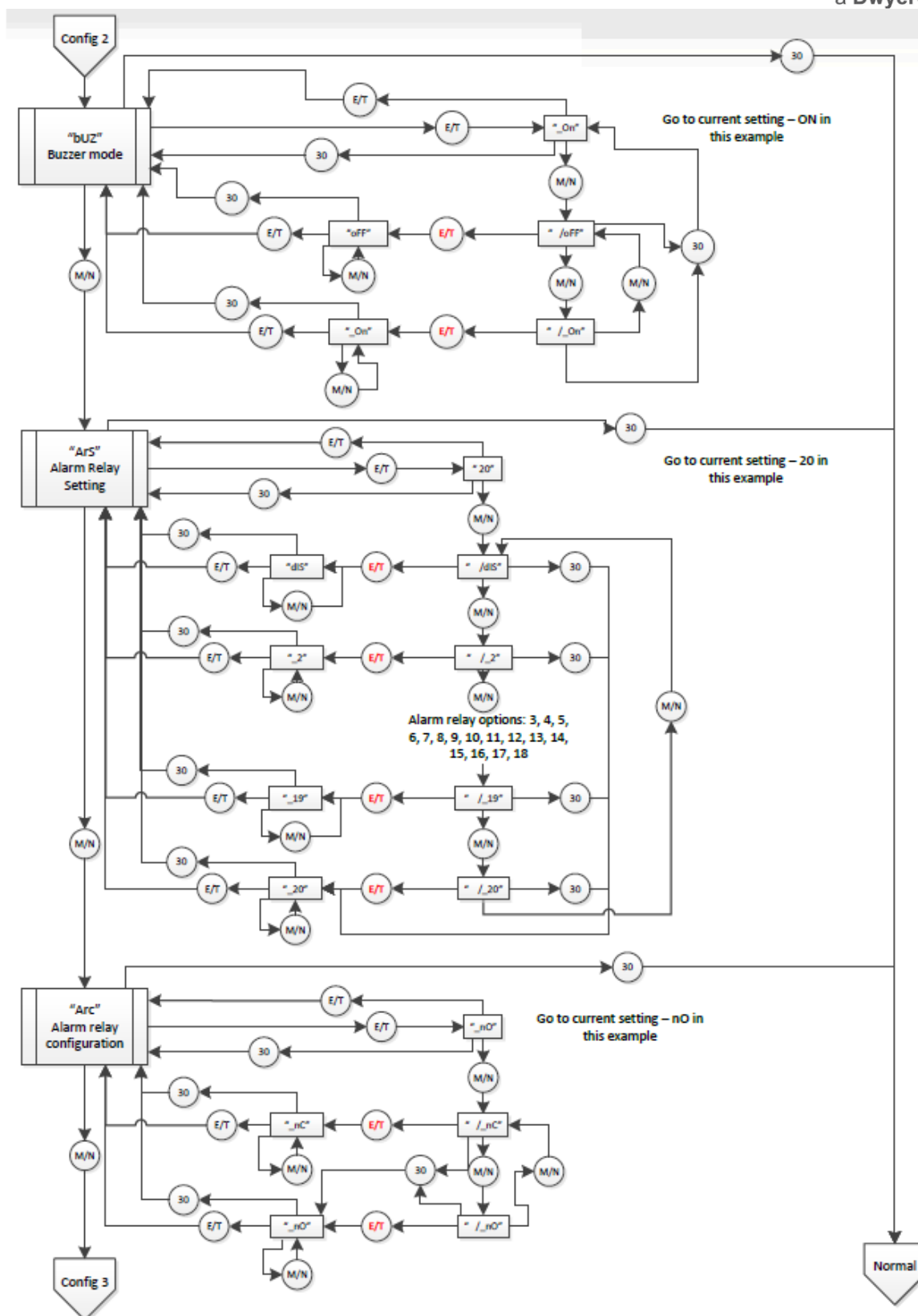


9.2 Auto Test Menu “bUZ”



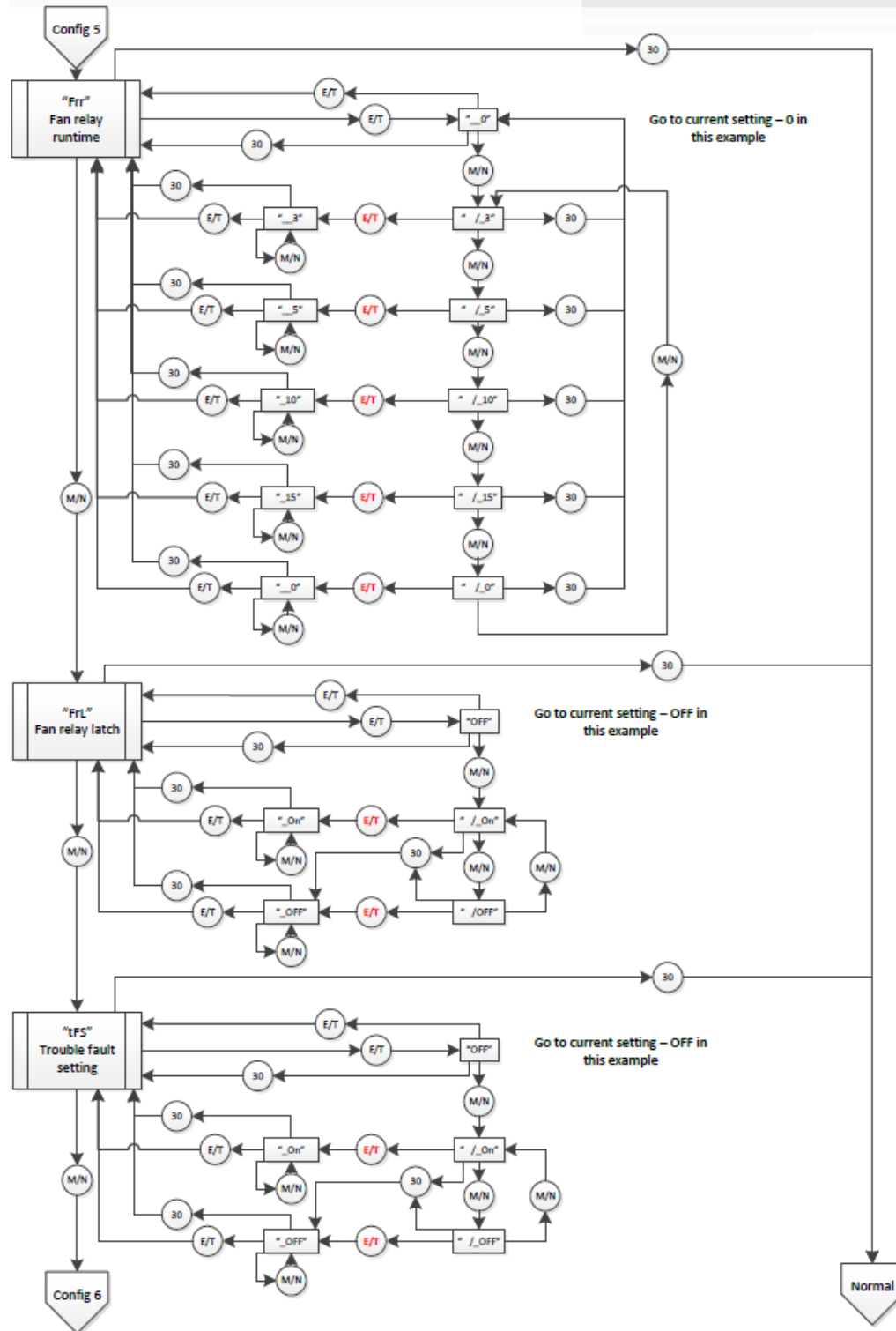
9.3 Configuration Menu “CON”





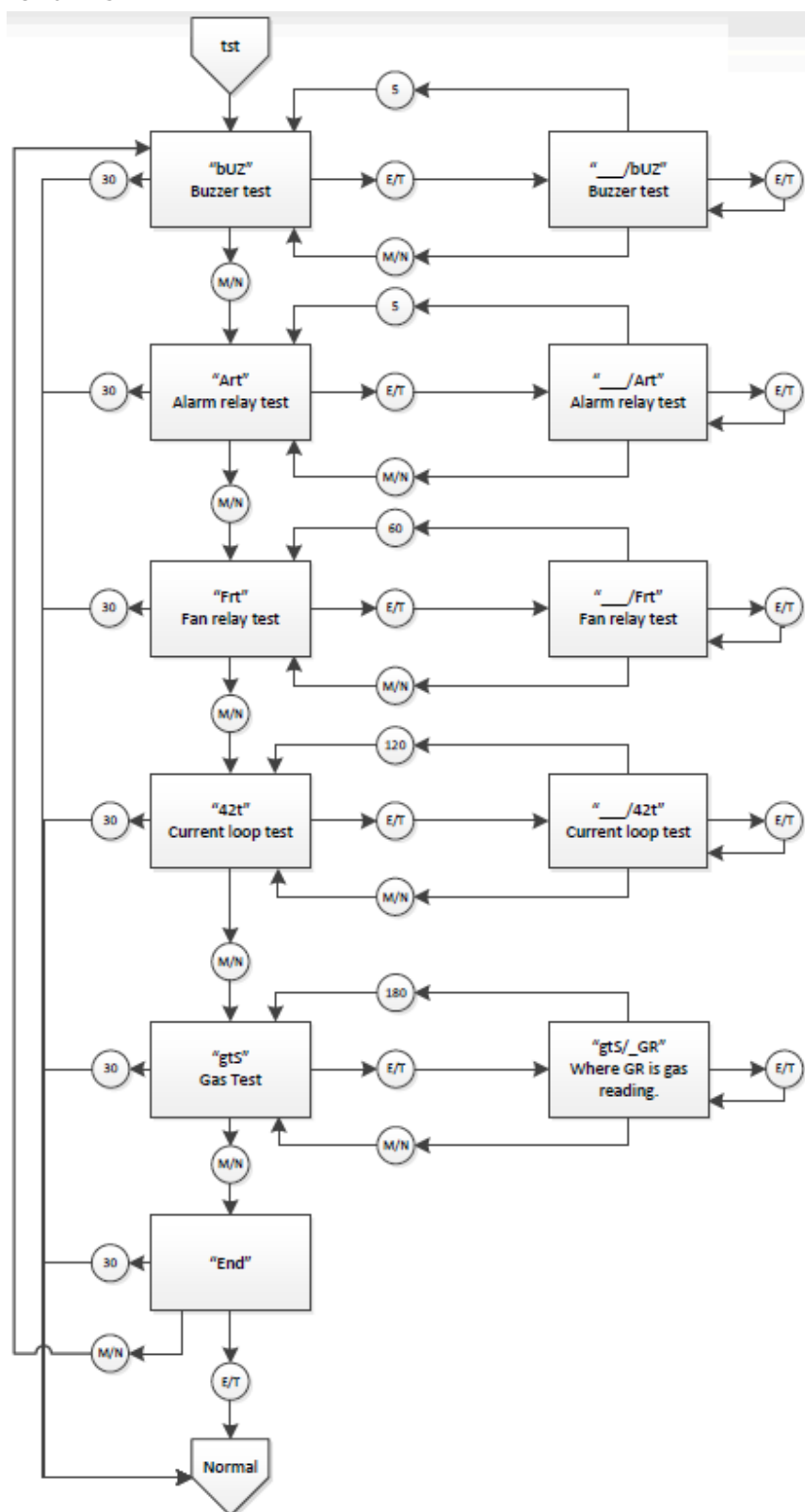








9.4 Select Test Menu "tst"



```

graph TD
    CAL{{CAL}} --> ZM["000" Zero mode]
    ZM --> WZG["_0/Air" Waiting for zero gas]
    WZG --> GOK90{Gas OK within 90 secs?}
    GOK90 -- YES --> GR000["GR/000" Gas reading alternates with 000 until stable 45 s]
    GOK90 -- NO --> GRFAIL000["GR/FAIL" alternate gas reading with FAIL]
    GR000 --> ZOK000{Zero OK?}
    GRFAIL000 --> ZOK000
    ZOK000 -- YES --> GRPAS000["GR/PAS" gas reading alternating with PAS]
    ZOK000 -- NO --> ZM
    GRPAS000 --> ZM
    ZM --> SPN["SPn" Span Gas]
    SPN --> WSG["9AS/10" Calibration gas level alternates with gas type selected]
    WSG --> GOK135{Gas OK within 135 secs?}
    GOK135 -- YES --> GRSPN["GR/SPn" Gas reading alternates with SPn until stable 150 s]
    GOK135 -- NO --> GRFAILSPN["GR/FAIL" alternate gas reading with FAIL]
    GRSPN --> SOK{Span OK?}
    GRFAILSPN --> SOK
    SOK -- YES --> GRPASSPN["GR/PAS" gas reading alternating with PAS]
    SOK -- NO --> SPN
    GRPASSPN --> END["End"]
    END --> CAL
    END --> NORMAL{{Normal}}
    GRPAS000 --> NORMAL
    GRPASSPN --> NORMAL
  
```

The flowchart illustrates the calibration sequence for the 000 mode. It begins with a 'CAL' input leading to the '000' Zero mode. The process involves waiting for zero gas, checking if the gas is OK within 90 seconds, and then alternating between 'GR/000' and 'GR/FAIL' readings. If the gas is OK, it proceeds to 'GR/PAS' gas reading alternating with PAS. If not, it loops back to the '000' Zero mode. The sequence then moves to the 'SPn' Span Gas mode, where it checks if the gas is OK within 135 seconds and alternates between 'GR/SPn' and 'GR/FAIL' readings. If the gas is OK, it proceeds to 'GR/PAS' gas reading alternating with PAS. If not, it loops back to the 'SPn' Span Gas mode. The final state is 'Normal'.

10 Macurco Gas Detection Product limited warranty

Macurco warrants the HD-6 gas detector will be free from defective materials and workmanship for a period of two (2) years from date of manufacture (indicated on the inside cover of the HD-6), provided it is maintained and used in accordance with Macurco instructions and/or recommendations. If any component becomes defective during the warranty period, it will be replaced or repaired free of charge, if the unit is returned in accordance with the instructions below. This warranty does not apply to units that have been altered or had repair attempted, or that have been subjected to abuse, accidental or otherwise. The above warranty is in lieu of all other express warranties, obligations, or liabilities. THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE ARE LIMITED TO A PERIOD OF TWO (2) YEARS FROM THE PURCHASE DATE. Macurco shall not be liable for any incidental or consequential damages for breach of this or any other warranty, express or implied, arising out of or related to the use of said gas detector. Manufacturer or its agent's liability shall be limited to replacement or repair as set forth above. Buyer's sole and exclusive remedies are return of the goods and repayment of the price, or repair and replacement of non-conforming goods or parts.

Macurco Inc.

1504 W 51st St
Sioux Falls, SD 57105

Technical Support Contact Information

Phone: 1-844-325-3050
Fax: 1-605-951-9616
Email: Macurco_support@dwyeromega.com
Website: www.macurco.com/support/

General Contact Information

Phone : 1-877-367-7891
Fax : 1-605-951-9616
Email : Macurco_info@dwyeromega.com
Website: www.macurco.com

Rev – 1.0.0
Issue Date: 05.15.2026
Document No: 34-2900-OPHD-6
© Macurco 2026. All rights reserved.



