



Instrumentation Ltd

# **Series 2255 Tank Monitor**

## **Installation, Configuration and Operation**

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The Minder 2250 Family offer comprehensive display and control facilities for all liquid storage tanks. Full details of the facilities offered are given in the **SETUP MODE** section, briefly though the options include :-

- Full compensation of any tank shape
- Special computational functions for Specific Gravity calculation / correction, and / or pressurised tanks.
- Up to 4 output relays for control or alarm purposes.
- Isolated & scaled 4-20mA signal retransmission.
- Serial / Multidrop communication to other devices - covered by addendum to standard manual.

Information is displayed in 2 ways, a 6 Digit LED shows current contents and alarm messages, while a 2 line 16 character LCD shows tank name, units of measure, and operational status. Five front panel buttons control unit operation, their actual function will depend upon the units mode, i.e. **RUN MODE** or **SETUP MODE**. Actual operation is consistent throughout all facilities. The Left/Right arrows are used to move the cursor to highlight the parameter of interest, the Up/Down arrows change the value, and the Enter button selects / stores the value. When changes are made, the unit will prompt “Save changes Y/N ?” before modifying its stored parameters.

## **RUN MODE**

This is the usual condition of the unit where it is monitoring and displaying the tank content. Button functions are as follows :-

- |           |  |
|-----------|--|
| <b>FC</b> | This switches the LCD between a display of Tank Name and Units (the default), and a Bargraph and % full indication. While the button is held the Free Capacity of the tank is shown. |
| <b>SP</b> | Shows the current settings of the units <b>SetPoints</b> . Also allows an operator to make changes to these  |

settings if this facility has been enabled in **SETUP** mode. Refer to **SETUP** mode for details of the settings available.

**SG** Shows the current value of **Specific Gravity** the unit is using. This may either be a value manually entered by the user, an active input value, or a value derived by calculations performed by the unit. Refer to **SETUP** mode for details of these options.

**ACK** Where **SetPoints** have been configured as alarms this button **ACK**nowledges any active alarms. Active alarms set the relay and are announced on the unit as a “**HiALRM**” or “**LoALRM**” display on the **LED** alternating with the normal content display, and details of which setpoint has activated on the **LCD**. Acknowledging an alarm causes the relay to reset to its default condition and clears the **LED** message. The **LCD** message will continue until the Setpoint’s clear condition is met. Note that when a Setpoint has been configured as a Control function the **LCD** will indicate an active condition, but the **LED** message does not appear and the **ACK** button has no effect.

**ENTER** The function of the enter key will vary depending upon the current mode.

It will be noted that the **FC** and **SG** keys have a common symbol above them. Pressing both keys simultaneously will toggle the **LED** between Bright and Dim display. The **SP** and **ACK** buttons also have a common symbol and pressing these together will toggle the **LCD** backlight on & off.

## **SETUP MODE**

Although its facilities are comprehensive the menu structure of the 2250 means setup is straightforward. Wherever possible the unit has been preprogrammed with all valid choices for a particular

parameter and selection is simply a matter of scrolling to the desired value and pressing **ENTER** to store.

To access **SETUP MODE** the **ENTER** button must be pressed and held for 5 seconds. The word **SETUP** will be displayed on the LED and the prompt “enter pass word” shown on the LCD. Key in the level 2 password (default 4321) and press **ENTER** to arrive at the main menu.

N.B. When a configurable parameter is being displayed the LCD will have an asterisk ( \* ) showing. In this case the **UP** arrow will be used to increase the selected parameter, otherwise the **UP** arrow will “step up” the menu structure. The **ENTER** key has the effect of selecting a highlighted menu option, or storing a configurable parameter (when the asterisk is showing) and “stepping up” the menu structure.

Before exiting **SETUP MODE** the unit will prompt “Save Changes Y/N ?” where any have been made. If changes are saved the unit will write the new values to its memory and perform a soft reboot to restart using the new data.

Note that some of the parameters detailed may be blocked or not available depending upon the initial purchase specification of the unit.

**Fig. 1** Page 17 gives a tabular representation of the complete menu structure. Using the code above each option, a full description of the function will be found below.

### **1 & 1A) SETPTS SP1 TO SP4**

Enables all Setpoint parameters to be set. The setpoint to be changed should be selected first, the configurable options are the same for all 4.

**1B) Level** Set the trigger point between 0 to 100.00 % of the parameter being monitored.

- 1C) Type** Set as Alarm which can be acknowledged & canceled, and Control which cannot.
- 1D) Opratr** Make on Rising value, make on Falling value or make on a deviation up or down from the trigger point
- 1E) Hyst** Enter the difference required between the trigger and reset points as a % of the parameter being monitored.
- 1F) Dbnce** Enter the time in seconds the Setpoint conditions must be met for before it triggers.
- 1G) Status** RO - Read Only, use this to review the status of the setpoint, possibilities are Inactive, Active and Un-Acknowledged, Active and Acknowledged.
- 1H) Flsafe** Enter the state in which the output relay associated with the Setpoint should be held when the setpoint is inactive. Choices are Normally Energised or Normally De-Energised.
- 1J) Input** Select which parameter the Setpoint is monitoring. Choose from Level, Volume, Top Pressure, or S.G. Note that the last 2 options are only available if the units Function is set for the appropriate Multi input formula (see under 10A - Func)

## 2) RUN MC

Enables or disables an operator from making changes to parameters while in RUN MODE.

**2A) Dimmer** Enables or disables the run mode Dimmer function.

**2B) Setpts** Enables or disables the operator from changing Setpoint parameters in run mode. The third option “Enabled with Password” will mean the user is prompted for the level 1 password (see 8A) before any changes can be made.

### **3) S.G.**

The menu option that appears will depend upon the function selected (see 10A).

**3A) User** For ‘Single’ and ‘Opt A’ functions, key in a value between 0.5000 and 3.000.

**3B) Input** Used with functions B and AB no user input is possible as the limits of SG value are set elsewhere.

**3C) Derived** Used with function D only. A minimum “default “ SG value must be keyed in for use when the unit cannot derive an SG value (refer to Function D description for more information)

### **4 & 4A) INPUT IP1 TO IP3**

These parameters are used to scale the input signal(s), converting the raw 4-20mA input into meaningful volumetric parameters for display & control. Access to IP 2 will only be possible when the function (see 10A) is set to Opt A, Opt B, or Opt D. Likewise access to IP3 is only possible when the function is set for Opt AB. Section 10A also details for which application each of the functions is used. The calculations given in the following sections are all that are actually required to configure the unit, but PSM will be pleased to advise on particular applications and provide relevant sample calculations. As the name & effect of these parameters vary, all possibilities are detailed under each function.

For **SINGLE** function only IP1 is used, with configuration parameters as follows :-

**4B) Zero** Used to correct the sensor fitting position relative to the tank baseline. The value is entered as a % (valid limits +/- 100.00) calculated as :-

$$\frac{\text{Transmitter fitting height}}{\text{Total tank depth}} \quad \times \quad 100$$

**4C) Range** Used to correct for any difference in the transmitter's calibrated range and the actual tank depth. The value entered as a % (valid limits 1 to 150.00) calculated as :-

$$\frac{\text{Total tank depth}}{\text{Transmitter set range}} \quad \times \quad 100$$

**4D) Scale** Used to correct for a non linear relationship between tank level and volume. The default settings are for a linear tank. Up to 20 points can be entered with % tank level being entered first, and % tank volume second, in pairs. The unit performs a linear interpolation between the entered points so where possible they should be concentrated in the most non-linear areas. Points should increase step by step and the last two should be 100% level and 100% volume. It is not necessary to enter all 20 points, as soon as 100% is entered for both Level & Volume the unit will "close" the table

**4E) Min** Not used for IP1

**4F) Max** Not used for IP1

**4G) Name** A free format field which allows the entry of the tank name which will be displayed. Name can be up to 16 characters including spaces.

**4H) E.Unit** - A free format field which allows the entry of the Engineering Unit which will be displayed. The unit can be up to 8 characters including spaces.

**4J) Cpcity** - Enter tank capacity, valid values are in the range 1.0000 to 999999.

***N.B. IP1 is used in all other functions, and is set as detailed above in all cases.***

For **function A** IP2 has the following configuration parameters:-

**4B) Zero** This parameter can be used to correct a zero offset error in the pressure transmitter. In practice though the transmitter should be zero checked at 4mA and the factor set at 0.00

**4C) Ratio** This parameter is used to bring the sensitivity of the level transmitter and the top pressure transmitter to parity, since it is quite likely that the top pressure transmitter will be of a lower range. The factor is entered as a % (in the range 1 to 100.00) and calculated as :-

$$\frac{\text{Set range of Input 2 sensor}}{\text{Set range of Input 1 sensor}} \times 100$$

**4D) Scale** This parameter can be used to correct for non linearity errors of the top pressure sensor. It is however more likely that it will be left at its default linear settings.

**4E) Min** This parameter is not used, any values entered will not have any effect.

**4F) Max** This parameter is not used, any values entered will not have any effect.

For **function B** IP2 has the following configuration parameters

- 4B) Zero** Normally set at 0.00. Refer to PSM before making any changes.
- 4C) Range** Normally set at 100.00. Refer to PSM before making any changes.
- 4D) Scale** Normally left as default, i.e. linear relationship. For temperature inputs however where correction is being made according to API or similar tables where the relationship between temperature and Density is non linear over the range of interest correction may be made.
- 4E) Min** Enter the S.G. value represented by the minimum input signal.
- 4F) Max** Enter the S.G. value represented by the maximum input signal.

*N.B. Normally when the input is directly related to density the minimum value will be at 4mA and maximum at 20mA, conversely when the input is from a temperature sensor it is likely the reverse will be the case.*

For **function D** IP2 has the following configuration parameters

- 4B) Zero** Normally set at 0.00. Refer to PSM before using other settings.
- 4C) Match** Used to match the sensitivity of the two level transmitters. the factor is entered as a percentage and calculated as :-

$$\frac{\text{Set range of Input 2 sensor}}{\text{Set range of Input 1 sensor}} \times 100$$

**4D) Scale** Normally left at default linear relationship. Refer to PSM before using other settings

**4E) Min** This parameter is not used, any values entered will not have any effect.

**4F) Distnc** This parameter identifies the mounting distance between the 2 transmitters. It is entered as a % (in the range 1 to 100.00) and calculated as :-

$$\frac{\text{Distance from Sensor 1 to sensor 2}}{\text{Set range of sensor 1}} \times 100$$

*N.B. sensor 1 is the lower sensor (IP1)*

For **function AB** IP2 and IP3 have the following configuration parameters

#### **FOR IP2**

**4B) Zero** This parameter can be used to correct a zero offset error in the pressure transmitter. In practice though the transmitter should be zero checked at 4mA and the factor set at 0.00

**4C) Ratio** This parameter is used to bring the sensitivity of the level transmitter and the top pressure transmitter to parity, since it is quite likely that the top pressure transmitter will be of a lower range. The factor is entered as a % (in the range 1 to 100.00) and calculated as :-

$$\frac{\text{Set range of Input 2 sensor}}{\text{Set range of Input 1 sensor}} \times 100$$

**4D) Scale** This parameter can be used to correct for non linearity errors of the top pressure sensor. It is

however more likely that it will be left at its default linear settings.

**4E) Min** This parameter is not used, any values entered will not have any effect.

**4F) Max** This parameter is not used, any values entered will not have any effect.

### **FOR IP3**

**4B) Zero** Normally set at 0.00. Refer to PSM before making any changes.

**4C) Range** Normally set at 100.00. Refer to PSM before making any changes.

**4D) Scale** Normally left as default, i.e. linear relationship. For temperature inputs however where correction is being made according to API or similar tables where the relationship between temperature and Density is non linear over the range of interest correction may be made.

**4E) Min** Enter the S.G. value represented by the minimum input signal.

**4F) Max** Enter the S.G. value represented by the maximum input signal.

***N.B. Normally when the input is directly related to density the minimum value will be at 4mA and maximum at 20mA, conversely when the input is from a temperature sensor it is likely the reverse will be the case.***

### **5) RESET**

Allows quick resetting of the various input scaling parameters to their default values. A confirmation prompt will appear.

## 6) OUTPUT

These parameters are used to define the operation of the 4-20mA output signal (if fitted).

**6A) Zero** This enables a suppression or elevation of the 4mA point. The value is entered as a % of 4-20mA. for example a value of 25% would mean the signal offset was 4mA. giving 8mA as a start point.

**6B) Span** This factor is entered in % and is used as a multiplier. For example a span factor of 50% would mean that the output was at 100% when the monitored parameter is at 50%

**6C) Invert** When Yes is selected the output signal is inverted i.e. when the monitored parameter is at its minimum the output is at maximum and vice versa.

**6D) Type** This defines which parameter the output reacts to.

## 7) FILTER

Enter a value between 1 & 99. The higher the value the slower the response time of the unit. This “smoothes” the display for tanks where the liquid level is not steady. For most applications a value between 5 & 10 is appropriate.

## 8) PASSWD

Restricts access to configuration facilities. A value of 0000 disables the protection.

**8A) Level 1** This password, when enabled (see **2 RUN MC**) restricts access to RUN MODE changes to Setpoint values and S.G. The default value is 1234

**8B) Level 2** This password is required to enter the SETUP MODE. Any changes made must be carefully noted, as, without the password, access will not be possible. The default value is 4321.

## 9) IDENT

Where a unit is connected and communicating to others via its RS485 serial port it requires a unique ident code. Set a number between 1 & 99.

## 10) PSMCFG

These parameters are **READ ONLY**. They identify the factory setup and unique calibration of each device. In the event of a problem with the unit, PSM may request this data to assist in fault finding.

**10A) Func** This parameter defines the basic function of the unit. There are 5 options as follows:-

**SINGLE** This function uses only IP1 which monitors the liquid level transmitter signal. It is for ventilated tank applications where the S.G. value is manually keyed in by the user.

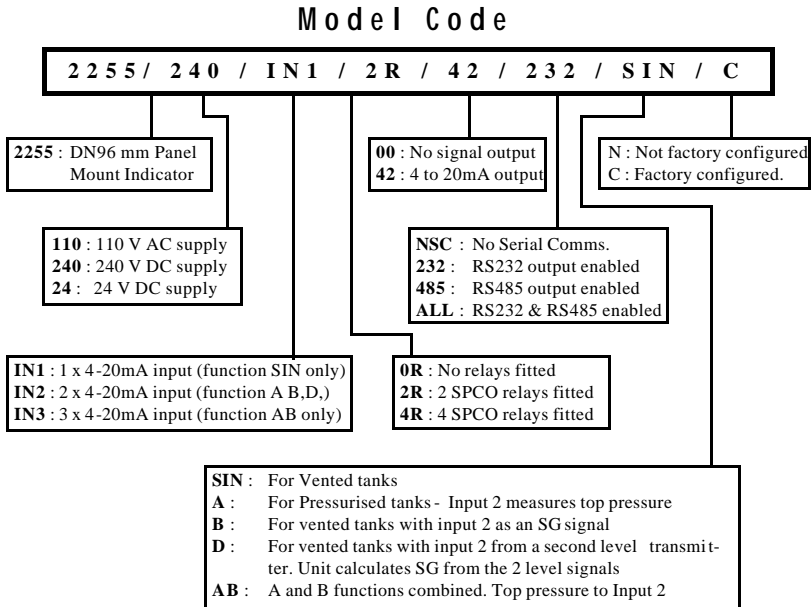
**Opt A** This function uses IP1 as above and IP2 to read the output of a Pressure transmitter mounted on top of the tank. It is for pressurised tank applications where S.G. value is manually keyed in.

**Opt B** This function uses IP1 as above and IP2 to read the output of a transmitter directly measuring either the liquid density, or the liquid temperature where the actual density of the liquid can be calculated from it. It is used on ventilated tanks where automatic S. G. correction is required.

- Opt D** This function uses IP1 as above and IP2 to monitor the output of a second liquid level transmitter mounted some way above the first. The unit calculates the actual liquid density based on a comparison of the value of both level transmitters. A default value is programmed ( see 3C) for when the upper level transmitter is not covered by the liquid and the formula cannot work. This is used on ventilated tanks.
- Opt AB** This function uses IP1 as above, IP2 to monitor a top mounted pressure transmitter, and IP3 to monitor an S.G. or temperature transmitter (as Opt B). For use on pressurised tanks where the S.G. is also an active input.
- 10B) An Cal** This parameter details the A to D calibration values which have been stored for each analogue input and the 4-20mA output.
- 10C) Serial** This parameter holds the units unique Serial Number. Where the unit was originally factory configured for the application advising PSM of this number will mean the original information can be retrieved from records.
- 10D) Anlg-O** This will advise if the 4-20mA analogue output has been factory enabled.
- 10E) SP E/D SP1-SP4** This advises which of the Setpoints have been factory enabled.
- 10F) Passwd** This leads to factory level calibration only. No user changes are possible.

## DIAGNOSTICS

To assist in initial setting up of the unit it incorporates a “virtual mA meter”. When in **RUN MODE** simultaneously pressing **SP & SG** buttons will switch the LCD display to show the mA signal it is seeing on each of its inputs (if enabled). Pressing **SP & SG** together for a second time reverts to the normal display.



MINDER 2250 MENU STRUCTURE

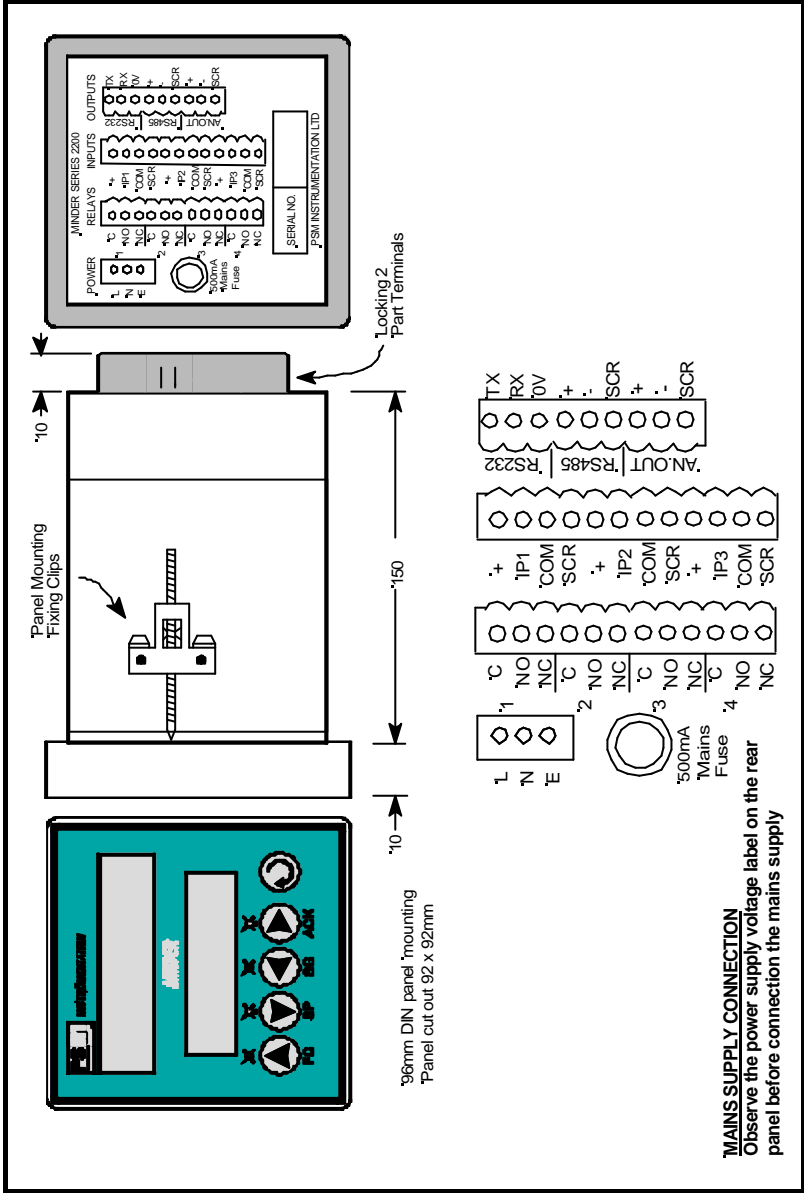
<b>1</b>	<b>SETPTS</b>	<b>2</b>	<b>RUN MC</b>	<b>3</b>	<b>S.G.</b>	<b>4</b>	<b>INPUT</b>	<b>5</b>	<b>RESET</b> Are you sure? Y/N	<b>6</b>	<b>OUTPUT</b>	<b>7</b>	<b>FILTER</b> Enter Numeric Value	<b>8</b>	<b>PASSWD</b>	<b>9</b>	<b>IDENT</b> Value 1-99	<b>10</b>	<b>PSMCFG</b>
<b>1A</b>	<b>SP1-SP4</b>	<b>2A</b>	<b>Dimmer</b> Enable Disable	<b>3A</b>	<b>User</b> Value from 0.5000 to 3.0000	<b>4A</b>	<b>IP1-IP3</b>	<b>5A</b>	<b>Are you sure?</b> Y/N	<b>6A</b>	<b>Zero</b> % value	<b>7A</b>	<b>Enter Numeric Value</b>	<b>8A</b>	<b>Level 1</b> std.=1234	<b>9A</b>	<b>Value 1-99</b>	<b>10A</b>	<b>Single</b>
<b>1B</b>	<b>Level</b> % value	<b>2B</b>	<b>Setpts</b> Enable Enable+PW Disable	<b>3B</b>	<b>Input</b> automatic	<b>4B</b>	<b>Zero*</b> % value	<b>5B</b>	<b>Y/N</b>	<b>6B</b>	<b>Span</b> % value	<b>7B</b>	<b>Level 2</b> std.=4321	<b>8B</b>	<b>Level 2</b> std.=4321	<b>9B</b>		<b>10B</b>	<b>Opt A</b> <b>Opt B</b> <b>Opt D</b> <b>Opt AB</b>
<b>1C</b>	<b>Type</b> Alarm Control			<b>3C</b>	<b>Derived</b> Enter Default Value	<b>4C</b>	<b>Range*</b> % value	<b>5C</b>	<b>Y/N</b>	<b>6C</b>	<b>Invert</b> Y/N	<b>7C</b>		<b>8C</b>		<b>9C</b>		<b>10C</b>	<b>An-Cal</b> IP1 IP2 IP3 An-Op
<b>1D</b>	<b>Opratr</b> MOR MOF DEV					<b>4D</b>	<b>Scale*</b> Look up	<b>5D</b>	<b>Y/N</b>	<b>6D</b>	<b>Type</b> Level Volume Top Pr** S.G.**			<b>8D</b>		<b>9D</b>		<b>10D</b>	<b>Serial</b> 8 digit no.
<b>1E</b>	<b>Hyst</b> % Value					<b>4E</b>	<b>Min*</b> Value	<b>5E</b>	<b>Y/N</b>					<b>8E</b>		<b>9E</b>		<b>10E</b>	<b>Anlg-O</b> Enabled Disabled
<b>1F</b>	<b>Dbnce</b> In secs					<b>4F</b>	<b>Max*</b> Value	<b>5F</b>	<b>Y/N</b>					<b>8F</b>		<b>9F</b>		<b>10F</b>	<b>SP E/D</b> <b>SP1-SP4</b> Enabled Disabled
<b>1G</b>	<b>Status-RO</b> Inactive Active/notack Active/ack					<b>4G</b>	<b>Name*</b> Enter text	<b>5G</b>	<b>Y/N</b>					<b>8G</b>		<b>9G</b>		<b>10G</b>	<b>Passwd</b> No entry
<b>1H</b>	<b>Fisafe</b> N.Enrg N.DeEnrg	<b>1J</b>	<b>Input</b> Level Volume Top Pr** S.G.**			<b>4H</b>	<b>E.Unit*</b> Enter text	<b>5H</b>	<b>Y/N</b>					<b>8H</b>		<b>9H</b>		<b>10H</b>	
						<b>4J</b>	<b>Cpcity*</b> max 6 digit	<b>5J</b>	<b>Y/N</b>					<b>8J</b>		<b>9J</b>		<b>10J</b>	

\* Titles are for input 1 only. Input 2 & 3 titles will vary depending on function (10A) in use

\*\* Only if Multi input unit

PW= Password

(RO) = Read only



**MAINS SUPPLY CONNECTION**  
 Observe the power supply voltage label on the rear panel before connection the mains supply



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