# MTII-4200 FIELDBUS
## LEVEL TRANSMITTER
## Installation, Operation & Maintenance Instructions

| | |
|---|---|
| Section: | M500 |
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| Supersedes: | ( n/a ) |

## 1. INTRODUCTION

The Jerguson Model MTII4200 is a loop-powered Fieldbus level transmitter intended to be used in conjunction with the Jerguson Magnicator II magnetic liquid level gage.

The part number designator for the MTII4200 can be found below.

MODEL NUMBER DESIGNATION

MTII4200–#–#–#–#–#–#–###

COMM OPTION:
H=4–20mA W/HART
F=FIELDBUS

HOUSING:
A=EPOXY COATED ALUMINUM
S=316 STAINLESS STEEL

TRANSMITTER ORIENTATION:
A=TOP LEFT HAND
B=TOP RIGHT HAND
C=BOTTOM RIGHT HAND
D=BOTTOM LEFT HAND

MOUNTING STYLE:
S=STANDARD (DEFAULT)
H=HIGH TEMP EXTENDED

ACTIVE SENSING LENGTH:
IN INCHES. 12 THRU 240/234 INCHES IN 6 INCH INCREMENTS

ALARM SETTING:
L=3.85 mA (DEFAULT)
H=22.5 mA
X=NONE (FIELDBUS)

LCD DISPLAY:
M=mA OUTPUT (DEFAULT)
I=INCHES
P=PERCENTAGE
X=NO DISPLAY (FIELDBUS)

There are two main components that make up the MTII4200. These two components are the electronics housing and the sensor housing (see Figs. 1 & 2). These two components are assembled at the factory and should not be separated in the field.

Figure 1. MTII4200-F-A-D-S-x-x-xxx Straight Bottom Left Hand Assembly

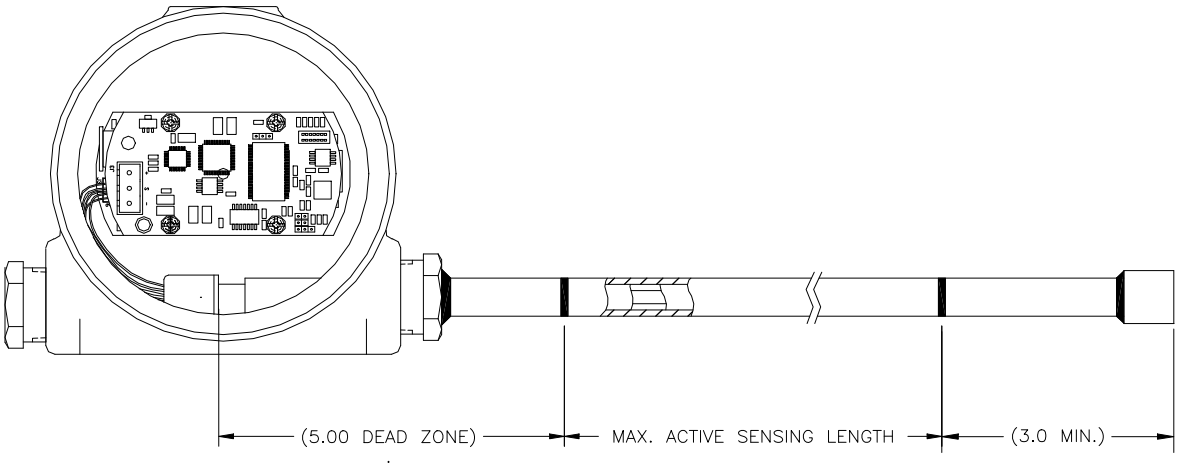
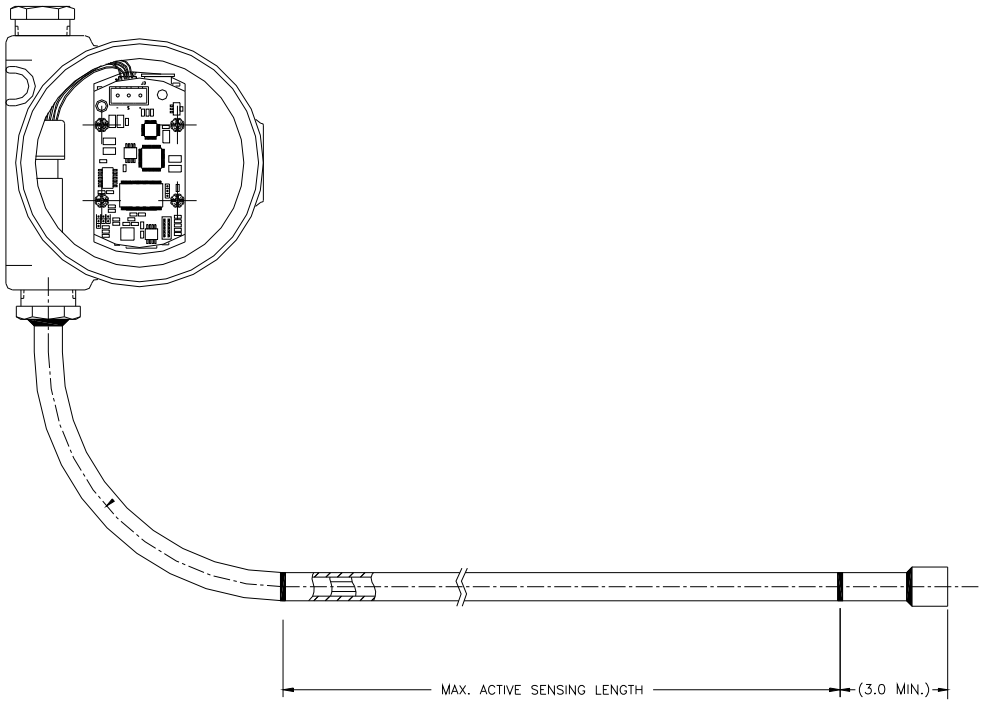


Figure 2. MTII4200-F-A-D-H-x-x-xxx Bent Bottom Left Hand Angled Assembly




## 2. PRODUCT DESCRIPTION

The MTII4200 liquid level sensor is a multifunctional transmitter with Fieldbus. It provides an analog output of level and the Fieldbus digital protocol. Outputs can be monitored using a Fieldbus device (hand-held or PC-compatible software). The MTII4200 transmitters are available in a single cavity explosion-proof enclosure.

### 2.1 MTII4200 Transmitter Specifications

| PARAMETER | SPECIFICATIONS |
|---|---|
| **LEVEL OUTPUT** | |
| **Measured Variable:** | Liquid level, interface level |
| **Output:** | Fieldbus |
| **Full Range:** | 12 to 300 in. (46 to 762 cm) |
| **Non-linearity:** | 0.008% F.S. or 1/16 in. (1.46 mm) whichever is greater |
| **Hysteresis:** | 0.002% F.S. or 0.01 in. ( 0.366 mm) whichever is greater either direction |
| **Time constant:** | 1 to 3 seconds |
| **Sensor Operating Temperature:** | -40 to 257°F (-40 to 125°C) Ambient |
| **GAUGE INPUT** | |
| **Input Voltage Range:** | 9 to 32 VDC ( bus powered ) |
| **Reverse Polarity Protection:** | Series diodes |
| **Transient Protection:** | Stage 1: line-to-ground surge suppressors; IEC 61000-4-5<br>Stage 2: line-to-line and line-to-ground transient suppressors; IEC 61000-4-4 |
| **CALIBRATION** | |
| **Zero Adjust Range:** | Anywhere within the active length |
| **Span Adjust Range:** | 0.5 ft. (152 mm) from zero to Full Scale |
| **ENVIRONMENTAL** | |
| **Humidity:** | 0 to 100% R.H., non-condensing |
| **Electronics Operating Temperature:** | -30 to 160°F (-34 to 71°C) |

| | |
|---|---|
| **Vessel Pressure:** | Dependent on float pressure rating, 18.7 bar /275 psi max |
| **FIELD INSTALLATION** | |
| **Mounting:** | Directly to Magnicator II |
| **Wiring:** | 2-wire connection, shielded cable or twisted pair to screw terminals through a 3/4 in. NPT conduit opening |
| **FIELDBUS COMMUNICATIONS** | |
| **Method of Communication:** | H1 |
| **Baud Rate:** | 31.25 KBPS |
| **AGENCY APPROVALS** | |
| **Factory Mutual (FM)** | Explosion-proof:<br>Class I, Div 1, Groups B, C, D<br>Class II, Div 1, Groups E, F, G<br>Class III, Div 1 |
| **Enclosure:** | Type: 4X |

### 2.2 Theory of Operation

The MTII4200 transmitters precisely sense the position of an external float by applying an interrogation pulse to a waveguide medium. This current pulse causes a magnetic field to instantly surround the waveguide. The magnet installed within the float also creates a magnetic field. Where the magnetic fields from the waveguide and float intersect, a rotational force is created (waveguide twist). This, in turn, creates a torsional sonic pulse that travels along the waveguide.

The head of the transmitter houses the sensing circuit, which detects the torsional sonic pulse and converts it to an electrical pulse. The distance from a reference point to the float is determined by measuring the time interval between the initiating current pulse and the return pulse and knowing the precise speed of these pulses. The time interval is converted into the digital data.

## 3. INSTALLATION/MOUNTING

### Mounting

The MTII4200 is designed to mount directly to the outside of the Magnicator II chamber.

1. The MTII4200's electronics should be mounted at the top of the Magnicator II chamber. (The enclosure will be mounted above the top of the gage chamber in high temperature applications)
2. Place the spacer blocks under the sensor housing and secure the transmitter to the chamber using the supplied hose clamps.
3. Align the low-level range marking on the sensor housing with the centerline of the lowest process connection.
4. Ensure that the clamps are tight.
5. To test if the gauge is properly tightened, pull up on the electronics housing. The gauge should not move.

## 4. ELECTRICAL CONNECTIONS AND WIRING PROCEDURES

### Electrical Connections

The MTII-4200 is connected to the Fieldbus wiring bus via the 3 pin terminal plug on the internal PCB. The signal designations are indicated on the PCB's silkscreen adjacent to the applicable terminal. Figures 3 and 4 illustrate a typical Fieldbus H1 network, its components, and the electrical connections.

Figure 3 Fieldbus Network Diagram

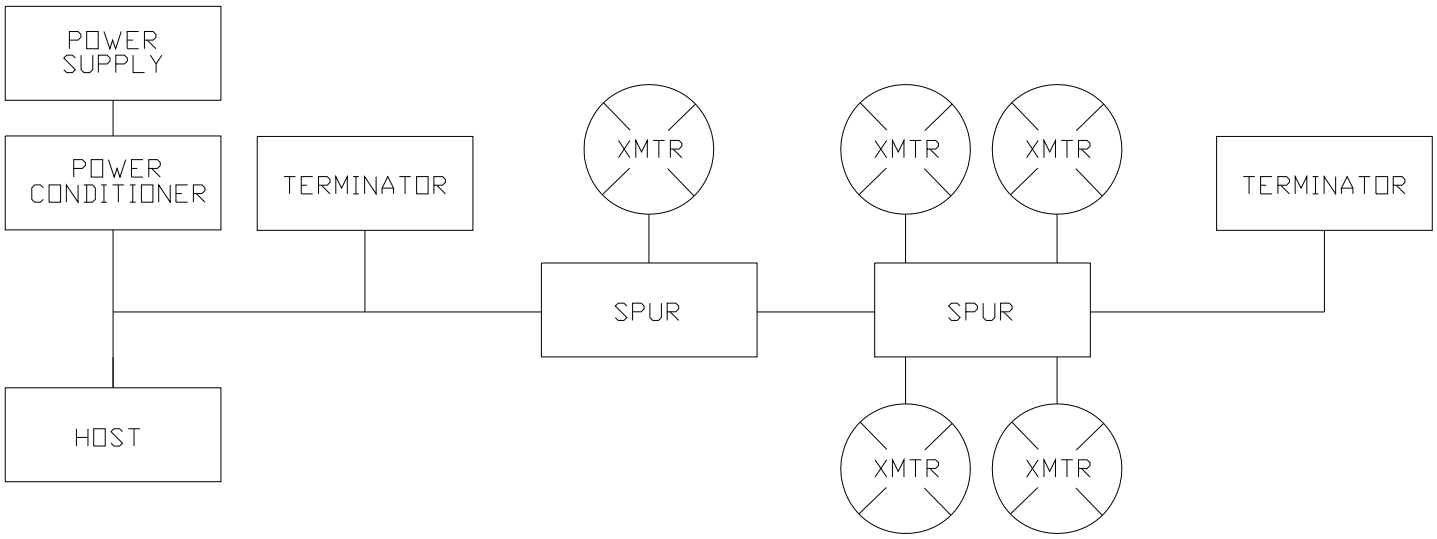
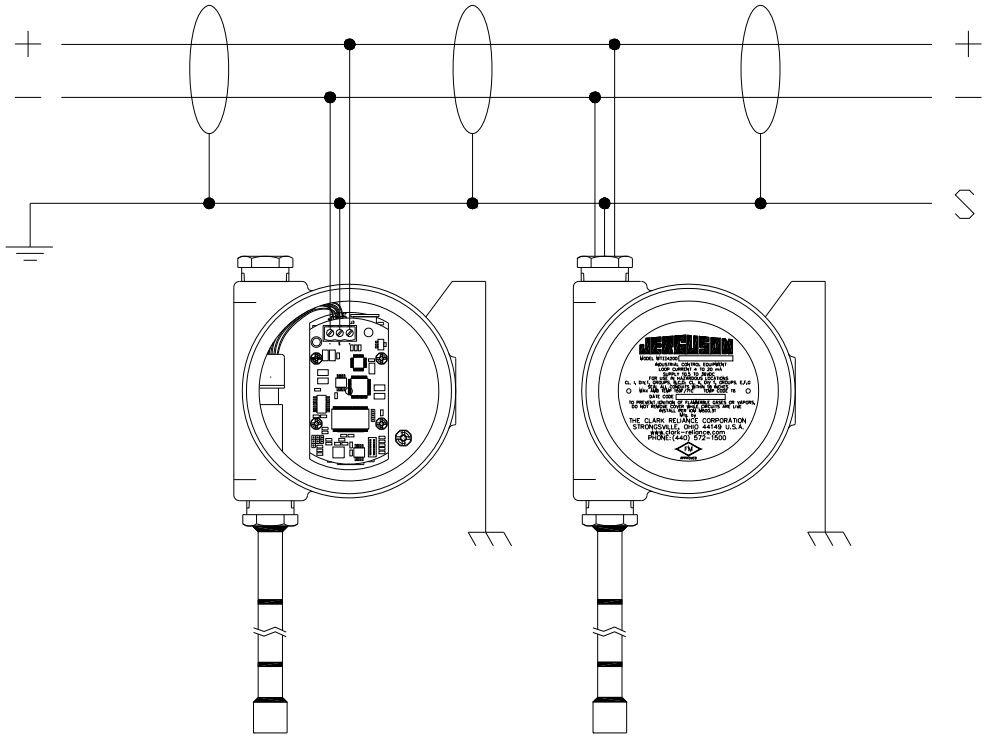



Figure 4 Transmitter Wiring Diagram ( H1 segment )




NOTE: For explosion-proof installations, all wiring shall be in accordance with the National Electric Code ANSI/NFPA 70, Article 501-30.

### 4.1 Cable Specifications

**Parameter Specification**
Type A Fieldbus Cable
Minimum Cable Size: 18 AWG or heavier (1.024 mm diameter)
Cable Type: Single pair shielded or multiple pair with overall shield, 90+ coverage
Attenuation: 3 db/km at 39KHz
Characteristic Impedance: 100 ohms ±20% at 31.25 KHz

### 4.2 Safety Recommendations for MTII4200 Transmitter

Always follow applicable local and national electrical codes and observe polarity when making electrical connections. Never make electrical connections to the MTII4200 transmitter with power turned on. Make sure that no wire strands are loose or sticking out of the terminal block connection which could short and cause a problem. Make sure that no wire strands, including shield, are in contact with the electronic module enclosure. The electronics module enclosure is grounded through internal circuitry and electrically isolated from the explosion-proof enclosure.

## 5. SYSTEM CHECK

After completing the MTII4200 wiring, the system is ready to be checked out. Apply power to the network. Using a DC volt-meter, measure the voltage across the + and - connections. The voltage must be between 9 and 32 VDC. If the voltage levels are too low, shut down the system. Check for shorts, power supply voltage, and excessive loop resistance.

## 6. MAINTENANCE

Magnicator II liquid level gauges use magnetostrictive technology and only have one moving part—the float. This technology ensures no scheduled maintenance or re-calibration is required.

However, Jerguson recommends that you check the sensor pipe annually for build up of process material. Floats should move freely along the sensor pipe. If they do not, routine cleaning should be performed.

## 7. FIELDBUS INTERFACE

Refer to the documentation supplied with your specific Fieldbus software package or hand held communicator for details on performing sensor calibration. A DD, ( Device Description ), file will be needed to communicate and translate the data to and from the MTII transmitter. This file is platform/device independent so any Foundation™ Fieldbus certified platform or Host can operate the device. A DD file is similar to a driver that a PC uses to operate printers and pluggable USB devices. The file is available by downloading it from our website at http://www.clark-reliance.com/download. The file is MTS_FF_DD_2008_10_09.zip.

The MTII transmitter contains two transmitter blocks; Setup and Factory. All information needed to setup, calibrate, and troubleshoot are located in the Transducer block. Note that some parameters are password protected, ( consult the factory for further information ).

The MTII is designed as a Link Master and can be used as a primary or secondary LAS, ( Link Active Scheduler ). For the majority of systems the Host will be the primary LAS with a field device acting as a secondary LAS for backup, in the event the primary LAS fails. The MTII can typically be used as a secondary LAS.

Setup and calibration can be performed by any host with a different process. Below are common parameters that may need to be customized to your specific application.

NOTE: When editing parameters, the OOS mode, ( Out of Service ), will have to be entered. When entering this mode, most Host systems will warn you that this may upset the process and possibly create a dangerous situation in your plant. Before making this change, verify that taking this transmitter Out of Service will not negatively affect control of your plant.

### 7.1 Command/Data Parameters

| Setup Transducer Block | | |
|---|---|---|
| Index | Parameter Mnemonic | Description |
| 1 | ST_REV | |
| 2 | TAG_DESC | |

| | | |
|---|---|---|
| 3 | STRATEGY | |
| 4 | ALERT_KEY | |
| 5 | MODE_BLK | |
| 6 | BLOCK_ERR | |
| 7 | UPDATE_EVT | |
| 8 | BLOCK_ALM | |
| 9 | TRANSDUCER_ DIRECTORY | |
| 10 | TRANSDUCER_ TYPE | |
| 11 | XD_ERROR | |
| 12 | COLLECTION_ DIRECTORY | |
| ( Dynamic Variables ) | | |
| 13 | PRODUCT_LEVEL_AI | Output Level 1 Product |
| 17 | GOVP | GOVP=Total Volume |
| 25 | GOVT | GOVT=GOVP |
| 26 | GOVU | GOVU= Working Capacity - GOVT |
| ( Setup Parameters ) | | |
| 30 | WORKING_CAPACITY | Working Capacity of Tank |
| 34 | VOL_CALC_MODE | This the mode the volume calculations are performed by 1=Use Strap Table or 0=Use Sphere Calculations |
| 35 | SPHERE_RADIUS | The radius of the sphere when volume calculations are performed (using the sphere calculation mode). |
| 36 | SPHERE_OFFSET | The offset of the sphere when volume calculations are performed (using the sphere calculation mode). |
| 37 | AVERAGE_INTERVAL | All level, temperature, and volume calculations can be averaged using timed method |
| 38 | ALARM_STATUS | |
| 40 | VOL_CAL_ERR_STATUS | If there is no error performing the volume calculations, then the value is zero, otherwise the value is a non-zero code. |
| 43 | VOLUME_UNITS | Liters, Millimeters$^3$, M$^3$, In$^3$, Ft$^3$, Gallons, Barrels |
| 44 | LENGTH_UNITS | Millimeters, Centimeters, M, Kilometers, Inches, Feet, Yards |
| 46 | TANK_OFFSET | This is the value that will be added or subtracted from the level measurement. This allows the tank level reading to be calibrated to the Users gauged tank reading (or other reference guide). |
| 47 | INTERFACE_TANK_OFFSET | This is the value that will be added or subtracted from the interface measurement. This allows the tank interface reading to be calibrated to the Users gauged tank reading (or other reference guide). |
| 48 | CAL_CURRENT_PROD_LEV | This is used to calibrate the level measurement. This allows the User to enter the hand gauged tank reading (or other level reference guide) of the Product and the device will calculate the necessary calibration offset. The calculated value will then be stored as the Tank Offset. |
| 50 | ALARM_UNITS | This parameter programs the units for the alarm. Product and Interface can be Volume or Length unit types, however Roof can only be in Length units |
| 53 | PRODUCT_HI_ALM | The value for which the Product can not be >=. Make sure the value is programmed in the current Alarm unit type. |
| 54 | PRODUCT_LO_ALM | The value for which the Product can not be <=. Make sure the value is programmed in the current Alarm unit type. |
| 59 | NUM_STRAP_TAB_ENTRIES | The value specifies the number of strap table entries to be used in the tank-strapping table. Table size can range from 2 to 100 entries. |
| 60-63 | STRAP_TABLE_LEVEL | |
| 64-67 | STRAP_TAB_VOL | |

**Factory Transducer Block**

| Index | Parameter Mnemonic | Description |
|---|---|---|
| 1 | 1ST_REV | |
| 2 | TAG_DESC | |
| 3 | STRATEGY | |
| 4 | ALERT_KEY | |
| 5 | MODE_BLK | |
| 6 | BLOCK_ERR | |
| 7 | UPDATE_EVT | |
| 8 | BLOCK_ALM | |

| | | |
|---|---|---|
| 9 | TRANSDUCER_DIRECTORY | |
| 10 | TRANSDUCER_TYPE | |
| 11 | XD_ERROR | |
| 12 | COLLECTION_DIRECTORY | |
| 13 | PASSWORD | Password, 43991 |
| 14 | REG_MEAS_LENGTH | Length of Transmitter |
| 15 | REG_SER_NO | Serial Number |
| 16 | REG_SW_REV | Software Revision |
| 17 | REG_GRADIENT | Gradient |
| 19 | REG_SIGNAL_GAIN | Signal Gain |
| 20 | REG_MIN_TRIG_LEVEL | Min Trigger Level |
| 21 | REG_TRANSMIT_DELAY | Transmission Delay, Always 0 |
| 22 | REG_SARA_BLANKING | Sara Blanking |
| 24 | REG_DELTA | Delta |
| 42 | REG_TRIGGER-LEV0 | |

### 7.2 Rosemount 375 DD Menu Tree

SETUP BLOCK ( User )
- FB Dynamic Variables
- Other Dynamic Variables
- Alarm Status
  - Alarm Status
  - VCF Calc Error Status ( N/A )
  - Volume Calc Error
- Setup Parameters
  - Data From Device
    - Units
      - Length Units
      - Temperature Units ( N/A )
      - Volume Units
      - Mass Units ( N/A )
      - Density Units ( N/A )
    - Alarms
    - Offsets
      - Enter Product Offset
      - Enter Interface Offset ( N/A )
      - Enter Current Product Level
      - Enter Current Interface Level ( N/A )
  - Volume Calculations
    - Temperature Correction Methods ( N/A )
    - Volume Calculations
      - Mode
      - Working Capacity
      - Average Interval

FACTORY BLOCK ( Factory Setting & Defaults )
- Password
- Settings
  - Gradient
  - Serial Number
  - Software Revision
  - Number of DT's ( N/A )
  - Signal Gain
  - Min Trigger Levels
  - Transmission Delay
  - SARA Blanking
  - Magnet Blanking ( N/A )

Delta
Measure Interface First ( N/A )
Digital Temperature Setup
Float Configuration ( N/A )
Set Trigger Levels ( N/A )

### 7.3 Units

The MTII transmitter allows the User to select the units for length and volume as indicated in the parameters chart, numbers 44 and 43 respectfully.

### 7.4 Calibration

Calibration can be done either using the current tank level or entering an offset for the product level. The TANK_OFFSET contains a values that adjust the reference point for the zero point on the transmitter. By adjusting the offsets up and down the User can change the value the transmitter outputs. An alternative method of calibration is to use CAL_CURRENT_PROD_LEV to calibrate the product level. In order to do so, the tank should be static and the User can hand gauge the tank. The User can then take the hand gauge measurement and input it into the transmitter. Make sure that the level does not move from the time the measurement is taken until the transmitter is calibrated. The transmitter will take the current level that is entered and calculate the offsets for the User.

### 7.5 Volume Calculation

The MTII transmitter will calculate the volume of the vessel using either a sphere or a strap table formula. The User can choose which method by selecting a 1 for Strap Table or 2 for a sphere under VOL_CACL_MODE. When selecting the sphere method, the User will have to enter the SPHERE_RADIUS and SPHERE_OFFSET. Despite which method is chosen, the User should enter the WORKING_CAPACITY and AVERAGE_INTERVAL. When the User selects to calculate volume based off of a strap table, the User will need to enter the Strap table. The first step is to enter the NUM_STRAP_TAB_ENTRIES between 2 and 100. For each strap table point, the User will have to enter the STRAP_TAB_LEVEL and STRAP_TAB_VOL for each entry.

## 8. SPARE PARTS

| | |
|---|---|
| MTII4200 Transmitter PCB Board Set: | V21087 |
| Spare 3 pin Terminal Plug: | E H 3 FTB |
| Replacement Nylon 4-40 x 0.25 screw: | X174761 |
| Replacement Nylon Hex 4-40 x 0.5 standoff: | X175571 |
| Replacement Nylon Hex 4-40 x 1.0 standoff: | X175567 |