AQUA
Measure Instrument Co.
Moisture Register Products Division
9567 Arrow Route Suite E
Rancho Cucamonga, CA 91730 · USA
909.941.7776 · 800.966.4788 · Fax 909.941.1830

Model 910-sT System with NIR Sensor

OPERATING MANUAL

Moisture Measuring and Control System

Manual P/N 552950

This is a general user manual for the 910-sT Moisture Measuring System. It contains a description of the system and its components, guidelines for installation, and instructions for on-line operation. We strongly recommend that you review this manual before using your 910-sT System. The information on this manual has been carefully checked and is believed to be entirely reliable. However, no responsibility is assumed for inaccuracies. Furthermore, Moisture Register Products reserves the right to make changes without prior notice to any products herein to improve reliability, function, or design.

AQUA
Measure Instrument Co.
Moisture Register Products Division
9567 Arrow Route Suite E
Rancho Cucamonga, CA 91730 · USA
909.941.7776 · 800.966.4788 · Fax 909.941.1830

910-sT, With NIR SENSOR

MOISTURE MEASURING AND CONTROL SYSTEM USER MANUAL

P/N 552950

This is a general user manual for the 910-sT Moisture Measuring System. It contains a description of the system and its components, guidelines for installation, and instructions for on-line operation. We strongly recommend that you review this manual before using your 910-sT System. The information on this manual has been carefully checked and is believed to be entirely reliable. However, no responsibility is assumed for inaccuracies. Furthermore, Moisture Register Products reserves the right to make changes without prior notice to any products herein to improve reliability, function, or design.

910-sT NIR Sensor

User Manual

REV	E.O.	DESCRIPTION	DATE	APPROVED
A	32362	Release	04/09	07/9
B	32403	Installation & Operation Information for Smart II Blower Controller Board	11/12	04/13
C	32405	Release S2COMM-1 Software Ver.2.0.4 W/Enhancements	02/13	5/13
D	32424	Release S2COMM-1 Software Ver.2.0.5 W/Enhancements	08/13	J.W.L.

UNPACKING AND EQUIPMENT EXAMINATION 910-ST SYSTEM

General. - All packing crates and containers should be carefully inspected for shipping damage. If damage is noted, do not open crates. Notify the carrier immediately for insurance instructions. The insurance agent should be present during unpacking if damage is evident.

Examination - Mechanical. - Examine all equipment carefully for any irregularities. Check the IR lens, cables, cable lengths, and electronic console for damage and against the packing list for completeness.

Examination - Electrical. - To insure that the 910-sT is not damaged from improper connections upon initial installation, it is recommended that all wiring be double checked utilizing the wiring instructions in this manual.

WARNING

The Moisture Register Products Company can not be responsible for damage due to improper connections made by the customer. Therefore, it is suggested that the services of our Field Service Department be obtained to assist in the setup and initial installation checkout.

The Service Engineer will thoroughly check and inspect all electrical interconnections prior to system start-up.

Equipment Storage. - The packing list should be verified and inspection for shipping damage should be conducted before storing. The equipment should be stored in a dry place.

Return of Goods. - In no case may products or parts be returned without Seller's prior written permission. Products or parts returned under the Equipment Guarantee must be shipped with transportation charges prepaid. All other returns must be shipped with transportation charges prepaid and will be subject to a restocking charge. Only products of standard Moisture Register Products will be accepted for return. Products which are specially modified or produced to the Buyer's specifications will not be accepted for return.

TABLE OF CONTENTS

APPENDIX I

910-sT INSTALLATION WIRING CONNECTION, DESCRIPTION

APPENDIX II

NOTES ON NUMERICAL VALUES USED IN 910-sT SYSTEM

APPENDIX III

POSSIBLE CONFIGURATIONS OF THE 910-sT SYSTEM

APPENDIX IV

RECOMMENDED SPARE PARTS

APPENDIX V

910-sT SYSTEM SOFTWARE AND FIRMWARE VERSIONS

APPENDIX VI

NOTES ON OPERATION OF RS232 PORT WITH WINDOWS BASED COMPUTERS

APPENDIX VII

DRAWINGS

APPENDIX VIII

SMART COMMUNICATOR FOR WINDOWS

FORWARD: GENERAL COMMENTS ON THE 910-sT MOISTURING MEASURING SYSTEM

PURPOSE: The 910-sT Moisture Measuring System is intended to serve as a local display of process moisture content, but also to provide a 4-20 mA process control signal. The System is designed to be operated continuously, and is not to be turned off by the local operator.

INSTALLING: The installation process consists of the following:

1. Physical installation of Sensor and Console unit, and required conduit and electrical supply connections.
2. Connection of the cables to the Sensor
3. Connection of the wiring to the factory process monitor.
4. Verification of operation and the correctness of installation during periods of process operation.
5. Determine Product Calibrations during initial installation, or during Subsequent maintenance.
6. Closing Enclosure and tightening screw clamps to prevent the entrance of dust and/or water during normal operation.

.

OPERATING: Once installed, the 910-sT System operating parameters can be programmed, product calibrations selected, and normal operation accomplished using the touch screen display. There are no operator adjustments or controls within the Console Enclosure.

MAINTAINING: Maintenance may be occasionally required for calibrating, replacement of the Console fuse, or for servicing of the Sensor. See the Maintenance section of this manual for suggested maintenance. Maintenance must be performed by qualified maintenance personnel.

A power switch is provided within the Enclosure as a convenience to the maintenance person when servicing the System. The Enclosure is opened using a screwdriver (tool) to release the enclosure cover clamps.

Access to the Sensor must be done in a clean environment, so it must be removed from the process line and returned to the factory for service or serviced in clean technical area.

SPECIAL NOTE: The Console will not operate unless the NIR Sensor cables are attached and connected.

910-sT MOISTURE MEASURING SYSTEM DESCRIPTION:

The 910-sT System is designed to measure moisture content in processed materials using Near Infra-Red Reflectance (NIR). This technique has been perfected on instruments such as the BSP-901, BSP-4000, Smart NIR System, and MCP-1. Moisture Content in materials such as paper, chemicals, pharmaceuticals, and food products can effectively be measured using NIR.

The 910-sT NIR Sensor is of a robust anodized aluminum construction, with internal Non-Volatile (N-V) memory holding all application operating parameters. The Sensor is sealed against the ingress of dust and moisture with an equivalent of the NEMA-4 rating.

The 910-sT System addresses the contemporary needs of the process industry in a number of areas:

1. Simple application to PLC and other data logging inputs with an isolated and scaled 4 mA. -> 20 mA. output.

2. Calibration (linearization) Factors are contained in the Sensor N-V memory and allow direct outputs scaled in moisture percentage.

3 Automatic IR Signal Gain Control accommodates a wide variety of products without manual gain adjustment.

4 Isolated Loss-of-Product (LOP) output switch allows determination of lack of product in the production process. System holds last moisture output value in LOP condition.

5 Proprietary IR Pre-Amplifier design with improved IR Signal processing results in a major increase in signal to noise ratio.

6 Various operating parameters are conveniently entered using the Touch Screen Display.

The 910-sT Console unit is enclosed in a rugged steel housing, and includes a touch screen computer for operation and control of the system, and for local moisture observation.

The interconnecting cables supplied with the 910-sT System use water and dust proof military grade connectors for highest reliability. Local wiring is routed through sealed cord-grips as required for the installation.

The console unit is vented and fan cooled. The Console is not water proof or splash proof. A debris filter is provided on the inlet fan and must be changed periodically.

910-sT SYSTEM DESCRIPTION: (Continued)

The 910-sT NIR System consists of the following items:

1.	910-sT NIR Sensor	552362
2.	910-sT Console Unit	552937-2
3.	IR Sensor Signal Cable (25 ft. Std.)	551695-003
4.	IR Sensor AC Power Cable (25 ft. Std.)	552448
5.	910-sT NIR System Manual	552950
6.	S2Comm-1 Software Disk	552993

OPTIONAL at extra cost:

7.	NIR Calibration Check Fixture (High Reflect.)	551769
8.	NIR Calibration Check Fixture (Low Reflect.)	551823

IR SENSOR:

The NIR Sensor is constructed of anodized aluminum, assembled with stainless steel hardware and sealed with O-rings to provide maximum protection to the enclosed optics and electronics. This construction also provides maximum protection to the materials being measured. The Sensor is sealed to NEMA-4 specifications for resistance to casual water splashing. If high humidity, heavy spray or washdown protection is required, an external splash cover or a positive dry gas purge system is recommended. The Sensors can be provided with fittings for this requirement.

The NIR Sensor contains a proprietary IR Signal Amplifier which provides a minimum distortion signal to the 910-sT Console resulting in an optimum signal to noise ratio. The Sensor electronics also contain the System N-V Memory, the AGC circuitry, and robust electronic protection devices which will eliminate damage to the electronics from typical transient sources.

All the low level digital and analog signals are carried in the Signal Cable, while the AC power to the filter-wheel motor and high current IR Lamp voltage is carried in a separate cable. Isolation of the IR Signal from the AC power results in a low noise and sensitive system.

The IR Signals are generated from a single electronically cooled detector cell which is exposed alternately, through a pair of NIR optical filters, to infra-red energy reflected from the product. A synchronizing signal is also generated which is used by the console to properly generate a moisture content value.

A brilliant IR Source is used to illuminate the product being measured. This provides a large immunity to variations in ambient light, and improved thermal stability over the range of temperatures found in the industrial process. The life of the IR source is expected to exceed 7 years.

IR SENSOR INSTALLATION:

The IR Sensor can be installed either on a flat surface (angle iron), or a rod or pipe with a diameter not exceeding 0.87 in. (22 mm) using 1/4-20 bolts (See Dwg. MRC003842). The Sensor must be installed such that the distance from the average level of the product to the optics end of the unit is 9.0 in., plus, minus 1.0 in. (228 mm, +25 mm, -25 mm). Variations of product distance in excess of this recommendation may result in less measurement accuracy, or a Loss-of-Product alarm depending upon the amount of variation.

The IR Sensor is designed for operation in ambient temperatures from 0 deg.C. to 50 deg.C. Operation outside this temperature range may result in less measurement accuracy, or damage to the Sensor electronics in the case where the 50 deg.C. value is exceeded. Cooled enclosures and water cooling options are available where Sensors must be operated at extreme temperatures. The Factory should be consulted for application assistance.

Sensors contain a thermal measurement device which allows determination of the highest temperature to which the Sensor was exposed. Exposure of the Sensor to excess temperatures will void our Warranty.

910-sT CONSOLE UNIT

The 910-sT Console Unit contains the power supplies and processing electronics which result in a calibrated and scaled moisture content output signal. The Console Unit contains a Touch Screen computer for operation, control, and which displays the moisture content percentage directly at the Unit. A 4-20mA output signal is also available which can be connected to PLC units, data loggers, host computers, etc. to allow process control and remote monitoring of the process moisture.

The Console Unit operates from a source of 117 VAC, 60 Hz (optional connection for 230 VAC, 50 Hz when ordered). Power requirements are less than 120VA.

System maintenance is accomplished on the touch screen computer using the S2COMM-1 software provided. Appendix I describes how this Software is used. The Serial Data Port and 4-20 mA current source are isolated to enhance operating reliability. The LOP alarm condition is available as an isolated transistor pull down.

An isolated 4 mA. -> 20 mA. current output is available for long distance runs to the process controlling area. The current loop allows a total of 900 Ohms of accumulated load resistance which will allow for more than one loop powered DPM as well as the use of the PLC input, and/or other data logging input impedanc

When the current loop output is used, it is necessary that the isolated LOP alarm open-collector transistor be used as a digital input signal to the PLC or data logger to announce the condition of the product passing by the NIR Sensor. When LOP occurs, the 910-sT Console holds the last value of moisture content percent. The red LED is illuminated on the Console board during the LOP condition. This condition is reflected by a constant value of output loop current, and constant value of moisture percentage sent out the serial data line.

910-sT CONSOLE UNIT: (Continued)

The LOP condition can exist because of a bright reflecting object in the Sensor field (shiny conveyor), or an absence of any reflecting object at all (no product). Also, the LOP condition will result when the Moisture Signal Channel reflects too little IR Signal because of excess moisture content. LOP alarm levels are adjusted by values entered through the Serial Data Port. LOP also will signal any failure of the IR Source Lamp, contamination of the Optics, or other unusual problem which may render the moisture signal inaccurate.

The Console electronics are all on one circuit board in the 910-sT Console. A fast micro-controller unit and 12-bit ADC combine to provide very accurate and immediate measurements of the peak values of the IR Signal from the Sensor. A complete moisture content percentage is measured and calculated during each revolution of the IR Filter Wheel, or approximately 28 times per second. Both the current loop output and the serial data output are updated each turn of the filter wheel for fastest process response.

The magnitude of the IR Cal. Sig. is evaluated each turn of the filter wheel, and the AGC Amplifier in the Sensor is adjusted to maintain a constant output signal value.This allows the optimum range for the ADC to be used at all times, and the consequent low signal to noise ratio found in this System. If the IR Signal falls below the level where the AGC System can not additionally increase gain, a yellow LED (Max.Gain) is illuminated on the Console board.

Product moisture content percentage calibration (linearization) is done by entering values via the Serial Data Port to a Calibration Table. The Calibration Table can contain as many as seven (7) data pairs. Typically three (3) data pairs will provide an excellent linearization of the raw IR Signal over normal ranges of moisture content.

Using the Communicator software, calibration can easily be achieved in an on-line process simply by measuring the raw IR Signal at the same time a process sample is taken. After determining the moisture content by standard means, the moisture percentage can later be entered in the Calibration Table, completing the process. See Appendix VIII for operation of the Smart Communicator for Windows (S2COMM-1).

910-sT CONSOLE INSTALLATION:

The 910-sT Console Unit should be installed at a location which has convenient access, is dry and reasonably dust free. AC power (117 VAC 50/60 Hz or 230 VAC 50/60Hz) must be provided to the Console Unit.

Ventilation of the 910-sT Console is accomplished by two blowers located on the bottom of the enclosure. The filter on the inlet blower must be changed periodically depending on the ambient dust conditions. The 910-sT Console must not be installed where the ambient air temperature will exceed 40 deg. C.

Some 910-sT System accessory components (described separately) do require special services, or construction depending upon the application. The standard 910-sT System herein described requires no special services.

Note that the Console has been wired to either 117 VAC or 230 VAC at the factory.

Supply wiring to the 910-sT Console Unit should be at least #18 AWG, and run to the Unit in a manner in accordance with local wiring codes.

A mains circuit breaker is not required because the 910-sT Console Unit contains an internal overcurrent protective device. It would be convenient for servicing and maintenance purposes however, if a circuit breaker or disconnect switch was placed near the 910-sT Console Unit. Power drawn by the 910-sT System does not exceed 120 VA.

The cables to the Sensor are shielded, so it is not necessary to run them through conduit. They should be routed so as to not be damaged during the normal operation of the process.

Cables will probably be run for the 4 mA. -> 20 mA. current output, and/or the LOP alarm switch. It is not necessary to run these cables through conduit, although it is recommended for protection purposes. This wiring is generally provided by the customer, and should be suitable for the application. Full isolation is provided at the 910-sT Console interface so ground loops will not be a problem.

Table 1

Number	Symbole	Publication	Description
1		IEC 417, No. 5031	Direct current
2		IEC 417, No. 5032	Alternating current
3		IEC 417, No. 5033	Both direct and alternating current
4		IEC 617-2, No. 02–02–06	Three–phase alternating current
5		IEC 417, No. 5017	Earth (ground) TERMINAL
6		IEC 417, No. 5019	PROTECTIVE CONDUCTOR TERMINAL
7		IEC 417, No. 5020	Frame or chassis TERMINAL
8		IEC 417, No. 5021	Equipotentiality
9		IEC 417, No. 5007	On (Supply)
10		IEC 417, No. 5008	Off (Supply)
11		IEC 417, No. 5172	Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION (equivalent to Class II of IEC 536 –see annex H)
12	 Background colour – yellow; symbol and outline – black	ISO 3864, No. B.3.6	Caution, risk of electric shock
13	Symbol under consideration		Easily–touched higher temperature parts
14	 Background colour – yellow; symbol and outline – black	ISO 3864, No. B.3.1	Caution (refer to accompanying documents)

USER CONNECTION TO THE 910-sT CONSOLE:

AC power is connected to the screw terminal block on the white sub-panel identified as power input. Connections to the AC neutral (N) and AC line (1) are made on the respective pins of the terminal block. AC ground (G) is made to the designated screw terminal mounted directly on the sub-panel. The cord-grip(s) must be removed if conduit is used for AC power and/or signal cables. Replace the cord grip with raintight or liquidtight compression conduit connectors. See drawing 552395 for details.

Table 1, Page 8 explains the various symbols used on labels and in drawings for this equipment.

See Appendix IV for a table of USER CONNECTIONS.

The 4 mA. -> 20 mA. current loop is available at the ten (10) screw terminal block J4. Screw terminal 8 (+) is the current source and screw terminal 9 is the current return (-) connection. Screw terminal 10 can be used for a cable shield ground (if used), as it connects directly to the Console enclosure. If a 1 V. -> 5 V. output is desired, a 250 Ohm 0.1% resistor can be connected to screw terminals 4 and 7. With this connection, the voltage output will be available on terminals 8 (+) and 9 (-).

The LOP transistor collector pull-down is at terminals 1 and 2 of block J4. Terminal 1 is the collector and terminal 2 is the emitter of the isolated optical coupled transistor. Terminal 3 is for a cable shield ground (if used). Drawing 552363, sheet 1 of 4 and 552395 sheet 1 of 2 detail these output terminals.

Screw Terminal blocks J1 and J2 do not contain User Connections.

The three (3) adjustment controls on the 910-sT Console board have been factory-set and should not be adjusted in the field.

INITIAL START-UP:

Before turning the System ON, all cable connections should be checked and verified. Be sure that the connector screw rings are fully down and tight so that the internal sealing O-rings are being compressed. Verify that the NIR Sensor is installed correctly and is the correct distance from the product. Verify also that product is either stationary or running under the Sensor.

The Sensor must be connected to the Console before turning the System ON.
Verify AC power connection, then turn the Power Switch ON. The Sensor should emit a spot of light. The Sensor N-V Memory has been initialized with a one-to-one calibration, and other parameters such that the output signals will not be in electrical saturation.

The S2COMM-1 program will automatically start when the console is turned ON. The main window will show ñStartò and the white box on the right side will show S2COMM-1. Press the S2COMM-1, then press the Select Sens. Bar above ñStartò. This will bring up the correct calibraton file and operating parameters for the System Sensor.

The red LED (Loss of Product) and/or yellow LED (Max.Gain) may flash while the detector cell cooler is coming to equilibrium.

If either the red or yellow LED is still glowing after one minute, the product which is under the Sensor is less reflective than expected, and the System will consequently operate with less accuracy than normal. The LOP value should be checked (Initial Start-up, below), and should never be less than 1500. The Factory should be consulted immediately if this condition is observed.

When the System is turned ON, it will READ the Sensor N-V RAM memory and show the Cal. Table values.

The **READ** of the Sensor N-V memory should be as shown in the appropriate reference (see Software instructions, Appendix VIII). Select the LOP Reading. You should see a LOP value of approximately 3000. This number will flicker up and down around 3000 indicating that the AGC is operating correctly. **Gain adjustment is fully automatic over a wide range of material reflectances.**

Next, select the Cal.Sig. Reading. You should see a value which is usually between 1000 and 2000, and is dependent upon the product under the NIR Sensor. If the process is operating and the product is moving under the Sensor, some variation in the value will be noted.

Last, select the Moisture % Reading. With the Factory installed one-to-one calibration, you should see the same numbers as seen in the Cal.Sig. box, except there will be a 10.00 to 1000 relationship.

If the various tests outlined above are successful, the System can now be Calibrated.

CALIBRATING THE 910-sT SYSTEM:

The following instructions assume the use of the 910-sT S2COMM-1 operating software, as the directions apply to the entry screen for that program (see Appendix VIII).

1. Determine how many Calibration Table data pairs will be taken. If the range of moisture content to be measured is more than 4 or 5 percent, a three (3) point calibration should be made. For narrow ranges, a two (2) point calibration is adequate.
2. Adjust the process so as to be running the **driest** product which can be tolerated. When the process is stable, press program cal table. If it is stable within plus, minus two (2) counts, use the copy button next to the top cal sig. box to capture the value. If the variation is more, write down ten (10) or twenty (20) values in succession and average them. Then hand enter the value in the top cal sig. box. During the time you are averaging Cal.Sig. values, take a sample of the product, and place it in a sealed container for moisture determination by standard means.
3. Change the process to make an **average** moisture content product. Repeat the process and place the average value in second cal sig. box.
4. Again change the process to the **wettest** value that can be tolerated. Repeat the process, with the Cal.Sig. value being entered in third cal sig. box.
5. Select a suitable Data File name, and enter it in the white box at the upper right. Click on the SEND ALL button to save the screen data to that file.
6. Take the three (3) product samples to the laboratory for a standard percent moisture content determination.
7. When the lab. moisture values are available, enter them in the appropriate moisture % box, the lowest going into the top box, the next into the second box and the highest moisture product into the third box.
8. Lastly, enter the number `9999' in the Cal.Sig. box which is next highest. In this case, 9999 would go into box number four.
9. Enter the Data File name again in that box, and click SEND ALL to save the Data File to disk.
10. Now touch return.
11. After the last Send has been acknowledged, Select the Moisture read-out. You should see moisture values which represent those which you expect in the process. The value will probably be jumping around considerably because of small variations in the moisture content of the fresh product. Try various values of smoothing constant by writing a value into that box, then Sending it by touching the label of the box
12. Set the HI LOP and LO LOP values when the process is not running product. With the conveyor belt or process empty of product, Select the LOP display. The value will usually be low, unless there is a significant reflection from a shiny metal conveyor. Pick a LO LOP value somewhat above the value displayed, but not less than 600. Enter the value in that box, and Send it by touching its label.

CALIBRATING THE 910-St SYSTEM: (Continued)

13. Select a HI LOPvalue above 3500, as this will prevent erratic triggering in cases where the AGC has not yet stabilized. Unless the LO LOP value is a factor, a good setting for these values is 4000 for HI LOP and 800 for LO LOP.

14. Once all the operating parameters have been entered, be sure that they are saved to the appropriate Date File name, and also has been Sent to the 910-sT Sensor using the Send All button.

Note that NIR Moisture measurement is limited to the surface and near surface of the material. The NIR Sensor uses intense IR illumination of the material, allowing measurement in some materials as deep as 0.039 in. (1.0 mm).

The accuracyof the 910-sT System is only as good as the accuracy of the calibration process. Controlled testing has shown that the 910-sT System is usually more precise than the method by which it is calibrated. For best results, product samples should be calibrated by a standard industry test, and results from the 910-sT System should not be compared with another moisture measuring instrument or quick test method.

CAUTION: DO NOT DISCONNECT OR CONNECT SENSOR CABLES WITH POWER ON. DOING SO CAN POSSIBLY CORRUPT DATA IN SENSOR MEMORY.

TECHNICAL SPECIFICATIONS:

910-sT MOISTURE MEASURING (DRY) SYSTEM

GENERAL:

1. The System is intended for Indoor use.
2. The System will operate safely and correctly to an altitude up to 2000 M (6536 Ft.).
3. The System is rated for Installation Category II at the mains supply connection, and Installation Category I at the signal input and output connections.

Moisture Measurement Range:	0% --> 60% (Wet Wt.)
Measurement Accuracy, typical:	plus, minus 0.25% of Moisture.

Note:	Moisture Measurement Accuracy is dependent upon the accuracy by which the moisture content of the calibration samples was determined by the standard testing method.

Digital Moisture Output Signal Precision:	1 part in 4095
S2comm Display Precision:	1 part in 4095
Analog Moisture Output Signal:	4.0 mA --> 20.0 mA current loop.
Maximum Current Loop Load Resistance:	900 Ohms
Analog Output Signal Precision:	1 part in 4095
Short Term Drift (operating noise):	3 parts in 4095
Long Term Drift (30 days):	10 parts in 4095
Thermal Drift (variable):	Less than 1 part in 4095 per deg.C.
Loss of Product Alarm Switch Load:	One (1) TTL Load

TECHNICAL SPECIFICATIONS: SENSOR:

Dual Wavelength Infra-Red Spectrophotometer (DRY).

Measurement wavelengths: Reference = 1.80 uM
Signal = 1.94 uM

Infrared Detector: Electronically Cooled Lead Sulfide

Measurement Frequency: 28 per. Sec.

IR Source: Quartz Halogen Lamp

Expected Lamp Life: Seven (7) years

Expected Commutating Motor Bearing Life: Five (5) years.

Sensor Features:

Voltages supplied to Sensor: Plus 15 VDC, 0.1 A
Neg. 15 VDC, 0.1 A
Plus 5.0 VDC 3.0 A
117VAC 50/60 Hz, 12 VA

Ambient Temperature Range: 0 deg.C to 50 deg.C

Ambient Humidity Range: Maximum relative humidity 80% for temperatures up to 31° C decreasing linearly to 50% relative humidity at 40° C

Sensor Sealed to equivalent of NEMA-4.

Note:	Sensor has not been evaluated by any agency for this rating.

Sensor Weight: 6.1 Kg (13.5 Lb.)

Sensor Dimensions: 368mm x 267mm x 137mm
(14.5ò x 10.5ò x 5.375ò)

Two multi-wire cables supply power and signals to Sensor.

Note:	Cables are Water Tight when installed and tightened correctly.

Cable Length: 7.6 M (25 Ft.) Both Cables.

Mains connections and other input/output signals are intended to be routed through conduit. Sealed cord grips are provided for installations not requiring conduit.

TECHNICAL SPECIFICATIONS: 910-sT CONSOLE:

Console Functions:

a) Supply Power to Sensor.

b) Interpret Signals From Sensor.

c) Convert and Send Signals to Process Controller, and Touch Screen Computer.

d) Receive Commands from Touch Screen Computer

Console Features:

a) Isolated RS-232/RS-485 data port for Touch Screen Display

b) Isolated 4.0 mA --> 20.0 mA analog output.

c) Isolated Loss of Product Alarm Transistor.

d) Isolation of User Terminals from Console Circuit is greater than 500 VAC (rms) or 500 VDC.

e) Moisture Percent Reading Touch Screen Display.

f) Operation is from Built-in Touch Screen Computer.

g) High Accuracy A/D and D/A conversions.

h) Fast (20 mHz) Micro-Controller Unit.

Console Power Requirements:

117 VAC, 50/60 Hz, 120 VA
Tolerance: ± 10%

Optional:

230 VAC, 50/60 Hz, 120 VA
Tolerance: ± 10%

Console Enclosure:

Hinged Cover Clamped Steel Enclosure

Note:	The Enclosure is vented and cooled with two internal blower fans.

Ambient Temperature Range: 0 deg.C to 40 deg.C

Ambient Humidity Range: 5% to 95%, non-condensing

Console Weight: 9.1 Kg (20.0 Lb.)

Console Dimensions: 317mm x 343mm x 165mm (12.5ò x 13.5ò x 6.5ò)

MAINTENANCE

CLEANING: To maintain proper operation of the 910-sT System it is necessary to periodically inspect the NIR Sensor for accumulations of dust or other debris. First brush any accumulated dust from the body of the Sensor. This will maintain good heat transfer and allow proper cooling.

Next, inspect the optical lens of the NIR Sensor for dust or other contamination. Dust and contamination should be removed with a soft cotton cloth or lens tissue wetted with water or isopropyl alcohol. After cleaning, the lens should be dried with a clean dry soft cotton cloth or lens tissue.

Note that a dust shield is available as an accessory, where heavy concentrations of dust cause a rapid build up on the Sensor lens.

The 910-sT Console unit can be cleaned if required by using the same methods and materials as used for the Sensor. The blower filters must be replaced periodically.

CAUTION: If the 910-sT System is not installed as specified or if the System is used in a manner other than specified in these instructions, the safety protection provided by the design and hardware of the System may be impaired.

When installed the 910-sT System does not require preventative maintenance for safety purposes. However, the blower filter on the console must be replaced periodically. For best measurement reliability, maintenance of the IR Source and Sensor Motor Bearings is required on an infrequent basis. See suggestions elsewhere in this manual (Page 16).

If the cables from the 910-sT Console Unit to the 910-sT Sensor have not been installed in a protected race-way or conduit, they should be periodically inspected for the integrity of the outer covering and shield braid. Failure of the six (6) conductor cable insulation and protective covering can result in exposure of the 117 VAC wiring contained therein.

If the mains power wiring has not been run through conduit or other mechanical protective means, this wiring should be periodically inspected for wear or insulation failure.

The following parts of the 910-sT System are only available at Moisture Register Products Div. and must be replaced by their technicians because they are critical to the accurate performance of the System.

1. Sensor IR Detector Cell -- MRC004080.
2. Sensor Motor Bearings -- 532886.

Additionally, the parts listed below for the 910-sT System are also only available at Moisture Register Products Div., but can be replaced in the field by a competent technician:

MAINTENANCE :(Continued)

3. Blower filter: Part number 533294

4. Fuse: Part number 532885

The RATING of the overcurrent protective fuse located inside the 910-sT Console Unit is 1.0 A when the 910-sT System is wired for 230 VAC. For 117 VAC the RATING of the fuse is 2.0 A. For either voltage, the IEC 127 Code is `T'.

IR SENSOR LAMP REPLACEMENT

The instructions for the IR Lamp replacement are included in the Lamp replacement kit.. The Lamp kit is Part Number MRC006030-K.

OTHER MAINTENANCE FOR 910-ST NIR SYSTEMS

The 910-sT Systems are robust designs intended for continuous duty performance in the industrial environment. As such there is no periodic or routine maintenance required, except for replacing the blower filter periodically. Components are rated conservatively for their particular application. However, there are two items which have a limited life: the IR source lamp, and the filter wheel motor

The IR source lamp is predicted to last some seven (7) or more years. Its life will be reduced in instances of increased mechanical vibration, and by repeated turning on and off. Failure of the IR source will be evidenced by a sudden Loss of Product alarm with no moisture signal activity. A conservative maintenance schedule for the IR source lamp would be to replace it every three (3) years. This can be done in the field by a qualified technician.

The IR filter wheel motor has ball bearings which are specially greased for the application. The life of these bearings is typically in excess of ten (10) years, unless the Sensor is subject to excessive mechanical vibration or heat. Failure of the motor bearings will show up as a loss of moisture signal activity. A conservative maintenance schedule for replacement of the filter wheel motor bearings is every five (5) years.

Motor bearing replacement must be done at the factory due to the need for special pre-load jigs and a monitored burn-in period.

All other components are expected to last in excess of ten (10) years, with failures being of a random nature of the type expected with normal statistical wear-out. No maintenance schedule can be suggested with components of this type.

Environmental stresses such as high or condensing humidity, high temperatures, extreme vibrations, ESD, power line transients, etc. will all tend to reduce the life of electronic components according to the exposure of the specific component to the particular stress. It is not possible to suggest a maintenance schedule which addresses reduced life due to unusual stresses.

OTHER MAINTENANCE FOR 910-sT NIR SYSTEMS (Continued).

A calibration test fixture is optional which will allow the operator to determine that the Calibration Signal from the System remains consistent from time to time. Some components fail in a mode which causes their performance to drift with time instead of failing catastrophically. Periodic use of the test fixture is recommended as a means to insure that the System is operating with no long term drift. A monthly calibration check is recommended.

TECHNICAL ASSISTANCE:

Technical assistance, the location of the nearest Authorized Service, product literature, accessories, or supplies can be obtained by contacting the Company between 6:00 AM and 11:30 AM or 1:00 PM to 4:00 PM Pacific Local time Monday ï Thursday at:

Moisture Register Products Div.
Aqua Measure Instrument Co.
9567 Arrow Route Suite E
Rancho Cucamonga, California 91730

TEL: (909) 941-7776

FAX: (909) 941-6444

E-mail: sales@aquameasure.com

Website: www.moistureregisterproducts.com

APPENDIX I

910-sT INSTALLATION WIRING CONNECTIONS, DESCRIPTION:

AC POWER CONNECTIONS: The Power Entry terminal block mounted on the Console/Power unit panel plate is used for connections for either 117 VAC or 230 VAC 50/60 Hz power to the 910-sT System. Wired Connections are as follows:

For 117 VAC:

TERM	DESCRIPTION	WIRE COLOR	VOLTAGE	CURRENT
GND	Chassis	GND GRN/YEL	N/A	N/A
N	Mains Neutral	LT.BLU	117V AC	2.0 A
1	Mains Hot	BRN	117V AC	2.0 A

Wired for 230 VAC:

TERM	DESCRIPTION	WIRE COLOR	VOLTAGE	CURRENT
GND	Chassis	GND GRN/YEL	N/A	N/A
N	Mains Neutral	LT.BLU	230V AC	1.0 A
1	Mains Hot	BRN	230V AC	1.0 A

Note that the Power Ground connection is made directly to the panel plate at the screw so indicated. See drawings 552395 & 552454 for details. AC voltages are measured from Mains Neutral to Mains Hot.

CURRENT SIGNAL and LOP OUTPUT CONNECTIONS: Screw terminal block (J4) on the Console circuit board is used for connections for the 4 -> 20 mA Output Current Signal and also the transistor switch closure for the Loss of Product (LOP) Alarm function.
The connections are as follows:

J4 TERM.	DESCRIPTION	WIRE COLOR
1	Opto transistor collector	None Supplied
2	Opto transistor emitter	None Supplied
3	Chassis ground for cable shield	None Supplied
4	250 Ohm resistor option	
5	No Connection	
6	No Connection	
7	250 Ohm resistor option	
8	Current Signal Source (+)	None Supplied
9	Current Signal Return (-)	None Supplied
10	Chassis ground for cable shield	None Supplied

All voltage levels at this connector will be less than 24 VDC with current levels less than 20 mA., and are measured with respect to the particular circuit common, or return.

SERIAL INPUT/OUTPUT (RS-232) CONNECTIONS: The Serial I/O connections at J3 require four (4) wires. The wiring colors are as shown below:

J3 TERM.	DESCRIPTION	WIRE COLOR
1	Transmit to Touch Screen	RED
2	Receive from Touch Screen	WHT
3	Transmit BUSY to Touch Screen	BLK
4	Common (GND)	

All voltage levels at this connector will be less than +,- 20 VDC with current levels less than 20 mA., and are measured with respect to J3-Pin 4 (Serial Data Common).

910-sT INSTALLATION WIRING CONNECTIONS, DESCRIPTION (Continued)

SENSOR CABLE CONNECTION: The power to and signals from the Sensor are available on the Console/Power unit through two (2) circular sealed connectors.The made-up cables provided with the System are attached by the installer to the mating connectors.The installer should see that the connector fastening rings are screwed tightly to assure that the connector pins are properly seated, and that the moisture sealing features of the connectors are secure.

The seventeen (17) pin connector carries no voltages in excess of 20 VDC, or currents greater than 1.0 A.

The six (6) pin connector carries transformer isolated 117 VAC, 50/60 Hz. at approximately 12 VA power, as well as 5.2 VDC at a current not exceeding 5 A.

APPENDIX II

NOTES ON NUMERICAL VALUES USED IN 910-sT SYSTEM:

INTRODUCTION: The 910-sT System has been configured for operation specifically as a Dry Moisture Measurement System. Generally this covers a range from 0.0 % to approximately 30 % moisture content by the wet weight basis. Consequently, for best accuracy in this operating range, certain restrictions are placed on the maximum value of the numerical values used in the System.

The 910-sT System has been evaluated with this configuration in the Wet moisture range from approximately 30% to approximately 65% moisture content (wet weight basis). The System will operate satisfactorily in this range, but some materials may require that the math algorithms be changed to allow higher values of Cal.Sig. or other parameters for best operating results.

MOISTURE CONTENT: The System will not permit moisture content values in excess of 99.99 to be entered. It is the intent of this System that it be used primarily on materials which are calibrated on a wet weight basis. If the calculated moisture content exceeds 100.00 percent, the display will show only the rightmost four (4) digits. Thus 104.59% becomes 4.59%.

CALIBRATION SIGNAL: This System will not permit values of Cal.Sig. exceeding 4095 to be entered in the Calibration Table. The System will correctly generate Cal.Sig. values up to 6553 for use in the calibration math routines, at which time the digital math routines will roll over and generate an incorrect output result.

LOSS OF PRODUCT: The LOP Signal can range from 0 to 4095. When the AGC is in its operating range the LOP will not exceed approximately 3500. The LOP Alarm values entered must also be in this range. Note that a Cal.Sig. greater than 4000 can be prevented from generating an incorrect moisture result by entering a LO LOP value of 800. With the AGC controlling LOP at 3000, and since LOP operates on the High Reference peak or the Low Signal peak, LOP Alarm will occur at a Cal.Sig. of 3750 by virtue of alarming at the Low Level of 800. The LOP Alarm condition freezes the moisture content output at the last value before LOP.

SMOOTHING CONSTANT: The maximum Smoothing Constant which can be entered is 999. This corresponds to a Smoothing Time Constant of approximately 34 seconds. Probably much too long for a practical installation.

NOTES ON NUMERICAL VALUES USED IN 910-sT SYSTEM: (Continued)

4-20 MA SCALING: The entries for these factors are in moisture content. The moisture values which can be entered here range from 0.0 % to 99.99 %. A direct reading current display can be obtained over the range from 4.0% to 20.0% by entering 20.0 and 4.0 in the entry boxes. When scaled this way, if the moisture content exceeds 20.4%, the current output will stop increasing.

DATAFILE: The entry here is a standard DOS file name of up to eight (8) alpha-numeric characters, followed by nothing, or a period and three more alpha-numeric characters. Pick a name which is related to the material being tested and record the name in a log. The data structure is in ASCII, which allows the files to be printed directly from DOS, or in Word from Notepad.

APPENDIX III

POSSIBLE CONFIGURATIONS OF THE 910-sT SYSTEM:

INTRODUCTION: The 910-sT System can be configured a wide variety of ways to suit the needs of the industrial process. This Appendix will describe a number of configurations of this System.

MINIMUM CONFIGURATION: The minimum System consists of the 910-sT NIR Sensor and 910-sT Console. The output signal is from the isolated 4 - 20 mA converter and isolated LOP Alarm open collector transistor. These signals are fed to a central PLC, resulting in a calibrated stand-alone sensor and local moisture display.

An internal RS-232 link is used from the console board to the touch screen display to permit calibration, operation, and display of moisture content.

SYSTEM WITH INTEGRAL OUTPUT DISPLAY: A Touch Screen computer display is factory-installed in the lid of the Console Enclosure.

SYSTEM WITH REMOTE DISPLAY: This System employs the 4 - 20 mA current loop as the signal to drive the Remote Display. The Console 0 - 4.0V signal is not isolated or buffered, so is not suited for Remote Display operation.

The Remote meter can either be a current loop powered LCD Display or a LED Display meter which is locally powered by a five (5) Volt supply in the Remote meter enclosure. The use of a local supply will preserve current loop isolation when using the LED Display.

The Current Loop can also be run through the PLC for central process control or data logging.

APPENDIX IV

RECOMMENDED SPARES FOR 910-sT SYSTEM

	ITEM	PART NO.
1.	IR SOURCE LAMP KIT	MRC006030-K
2.	LOSS OF PRODUCT ALARM OPTO-COUPLER	532536-001
3.	CONSOLE FUSE 2 AMP, FOR 117V AC	503118
4.	CONSOLE FUSE 1 AMP, FOR 230V AC	532885
5.	FILTER REPLACEMENT PADS (5)	533294

APPENDIX V

910-sT SYSTEM SOFTWARE AND FIRMWARE VERSIONS:

1. 910-ST Console Firmware:

File name:	N5_6SMRT.ASM
Version:	5.6
Document Control:	552401

2. 910-ST Communicator Software:

File name:	S2COMM_1_204
Version:	2.0.4
Document Control:	552993

APPENDIX VI

NOTES ON OPERATION OF RS-232 PORT WITH TOUCH SCREEN COMPUTERS

INTRODUCTION: While the 910-sT Communicator Program contains commands that are intended to set the serial port parameters, it is best to be sure that the Windows software set-up screens are also set to the correct port parameters.

RS-232 PORT SETTINGS:	
Baud rate:	9600
Data bits:	8 bit
Parity check:	none
Stop bits:	1
Flow control:	Hardware
Advanced:	De-select FIFO buffers

HOW TO GET THERE FROM THE DESKTOP: To make these settings follow the path outlined below:

1. Double click My Computer icon
2. Double click Control Panel folder
3. Double click System icon
4. Select Device Manager tab
5. Double click Ports (COM & LPT)
6. Double click COM1
7. Select Port Settings
8. Set boxes as shown above
9. Click Advanced
10. Click to remove check mark in FIFO box
11. Return by clicking OK and closing open windows

IF YOU HAVE TROUBLE: It is possible that there may be software conflicts that may disable the RS-232 (COM1) port if other software is loaded to the Touch Screen display. It may be possible to confirm port operation by using the HyperTerminal Accessory to see the continuous data stream coming from the 910-sT System. Open the **HyperTerminal as follows:**

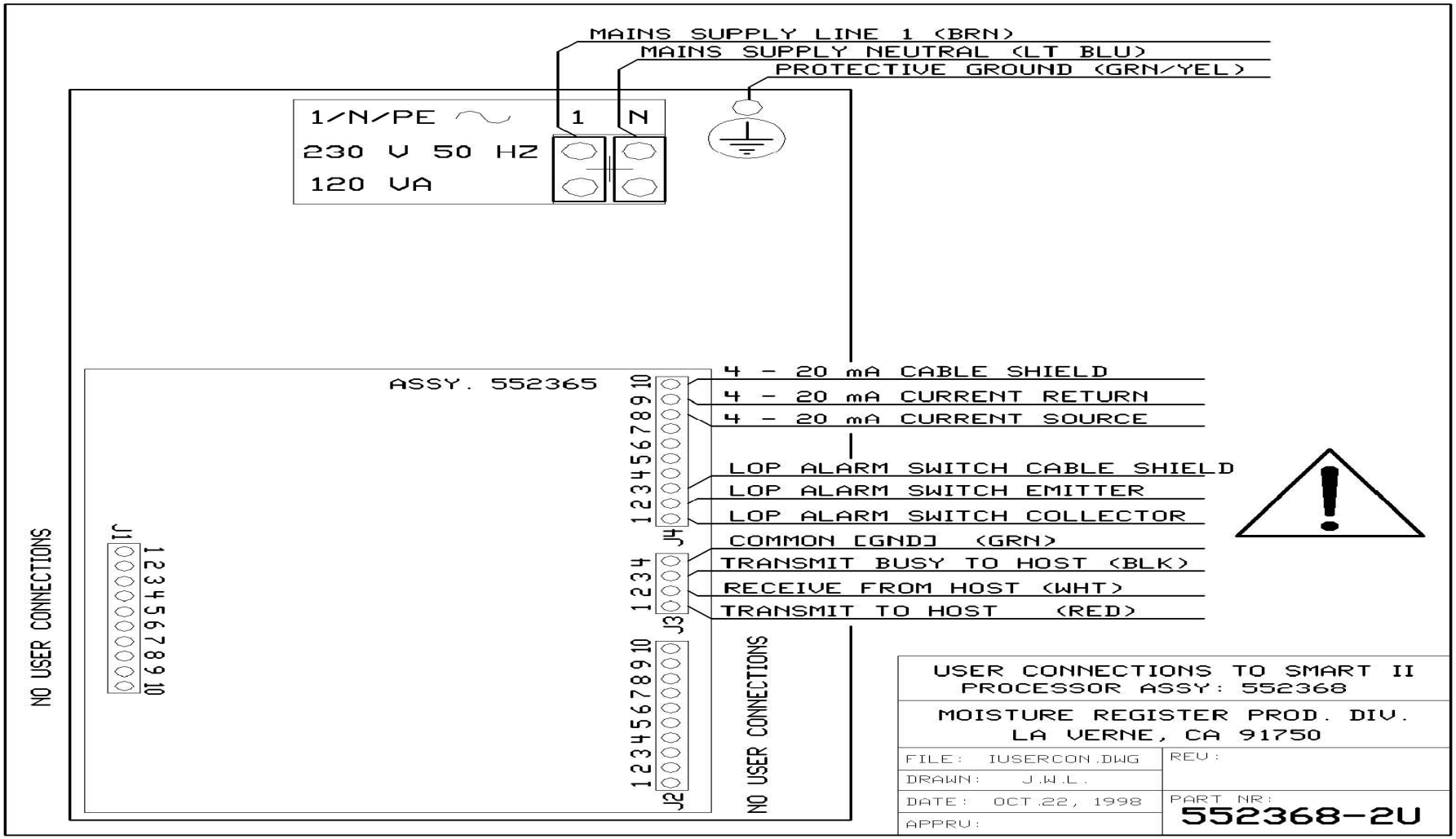
1. Click on Start
2. Mouse to Programs
3. Mouse to Accessories
4. Mouse to HyperTerminal (W95)
   to Communications, then HyperTerminal (W98)
5. Click on HyperTerminal
6. Double click on Hypertrm
7. Enter a Name & select an Icon, then OK
8. Connect using: Direct to Com1, then OK
9. Port settings: 9600,8,None,1,Hardware
10. Click Advanced: Click box to remove FIFO check mark, else Cancel
11. OK COM1 Properties Box
12. Streaming data should be available on the HyperTerminal Screen

OTHER NOTES: In one instance, it was found that Palm Pilot software drivers for Com1 were interfering with the RS-232 port and prevented operation with the 910-sT System. These drivers were evidently loaded during computer startup.

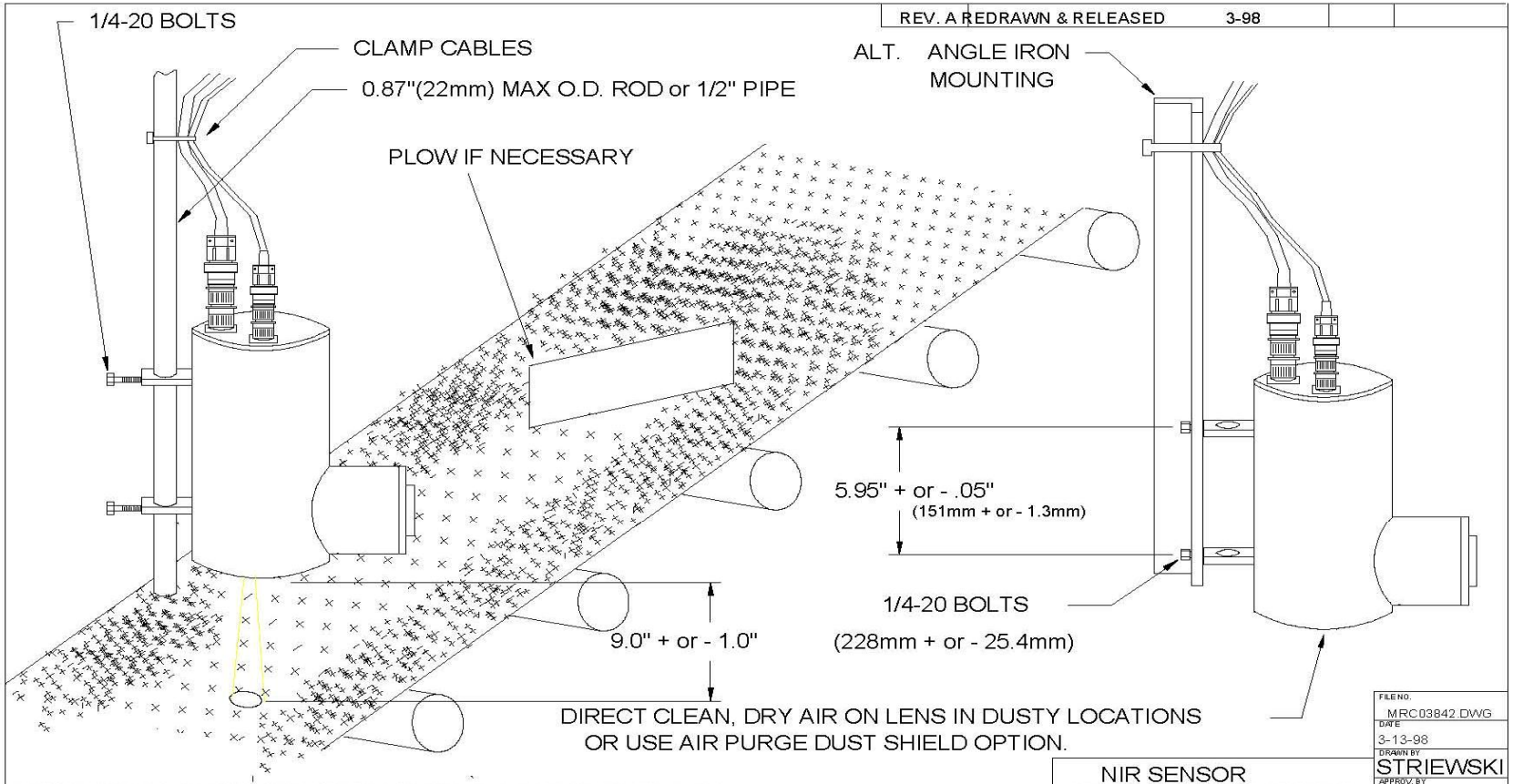
APPENDIX VII

DRAWINGS:

USER CONNECTIONS TO 910-sT CONSOLE ASSY. 552368	552368-2U
NIR SENSOR INSTALLATION DRAWING	MRC003842
910-ST MOISTURE MEASURING SYSTEM (INSTALLATION DRAWING), 2 SHEETS	552395
910-ST CONSOLE ASSEMBLY (USER CONNECTIONS)	552454
NIR & 910-ST SENSOR ASSEMBLY	552700
SMART II NIR SYSTEM WITH AIR	552573


MAINS SUPPLY LINE 1 (BRN)
MAINS SUPPLY NEUTRAL (LT BLU)
PROTECTIVE GROUND (GRN/YEL)
1/N/PE
230 V 50 HZ
120 VA
1
N
ASSY. 552365
4 - 20 mA CABLE SHIELD
4 - 20 mA CURRENT RETURN
4 - 20 mA CURRENT SOURCE
LOP ALARM SWITCH CABLE SHIELD
LOP ALARM SWITCH EMITTER
LOP ALARM SWITCH COLLECTOR
COMMON [GND] (GRN)
TRANSMIT BUSY TO HOST (BLK)
RECEIVE FROM HOST (WHT)
TRANSMIT TO HOST (RED)
J1
J2
J3
J4
NO USER CONNECTIONS
NO USER CONNECTIONS
USER CONNECTIONS TO SMART II
PROCESSOR ASSY: 552368
MOISTURE REGISTER PROD. DIV.
LA VERNE, CA 91750
FILE: IUSERCON.DWG
DRAWN: J.W.L.
DATE: OCT.22, 1998
APPRV:
REV:
PART NR:
552368-2U

REV. A REDRAWN & RELEASED 3-98

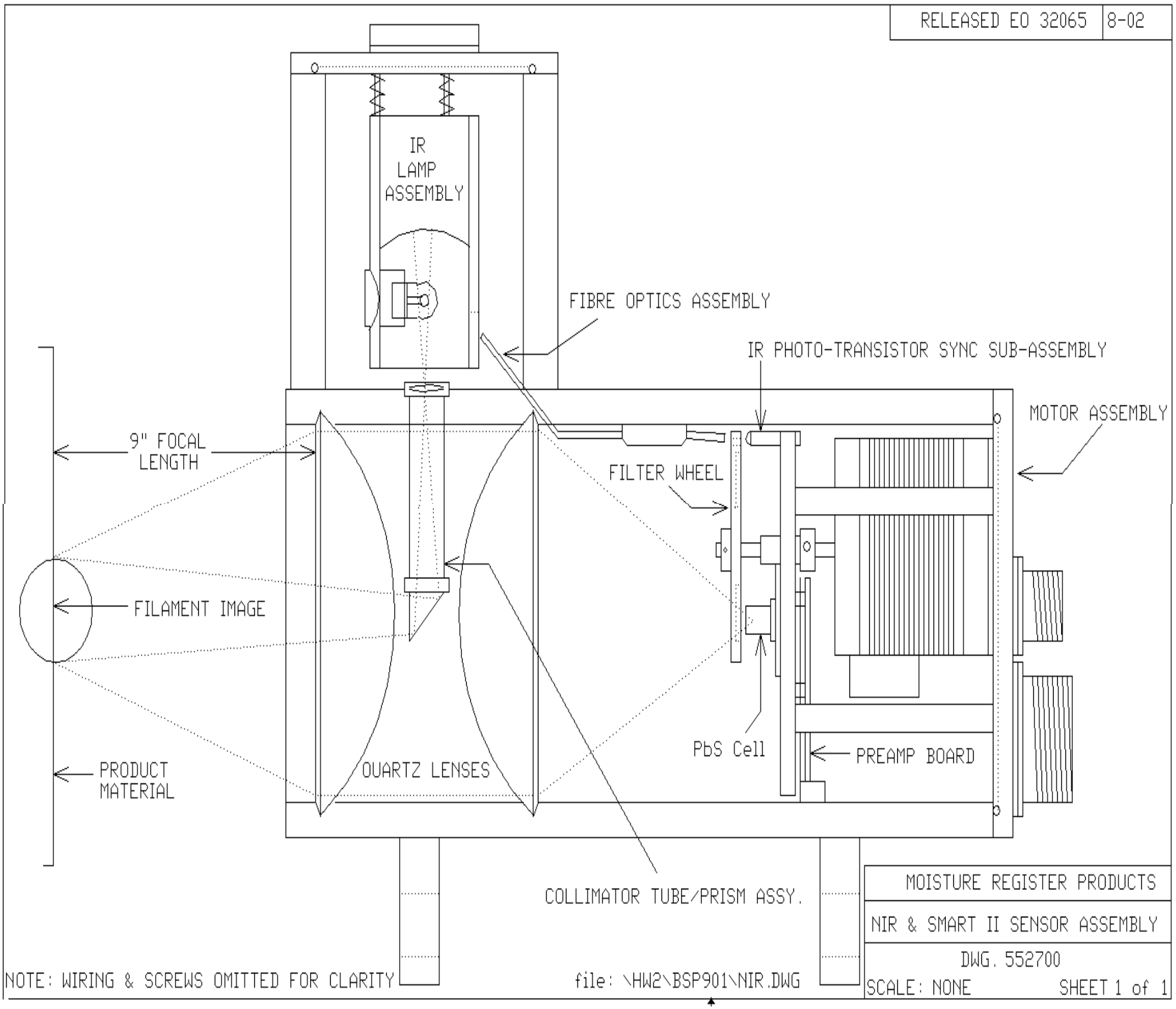


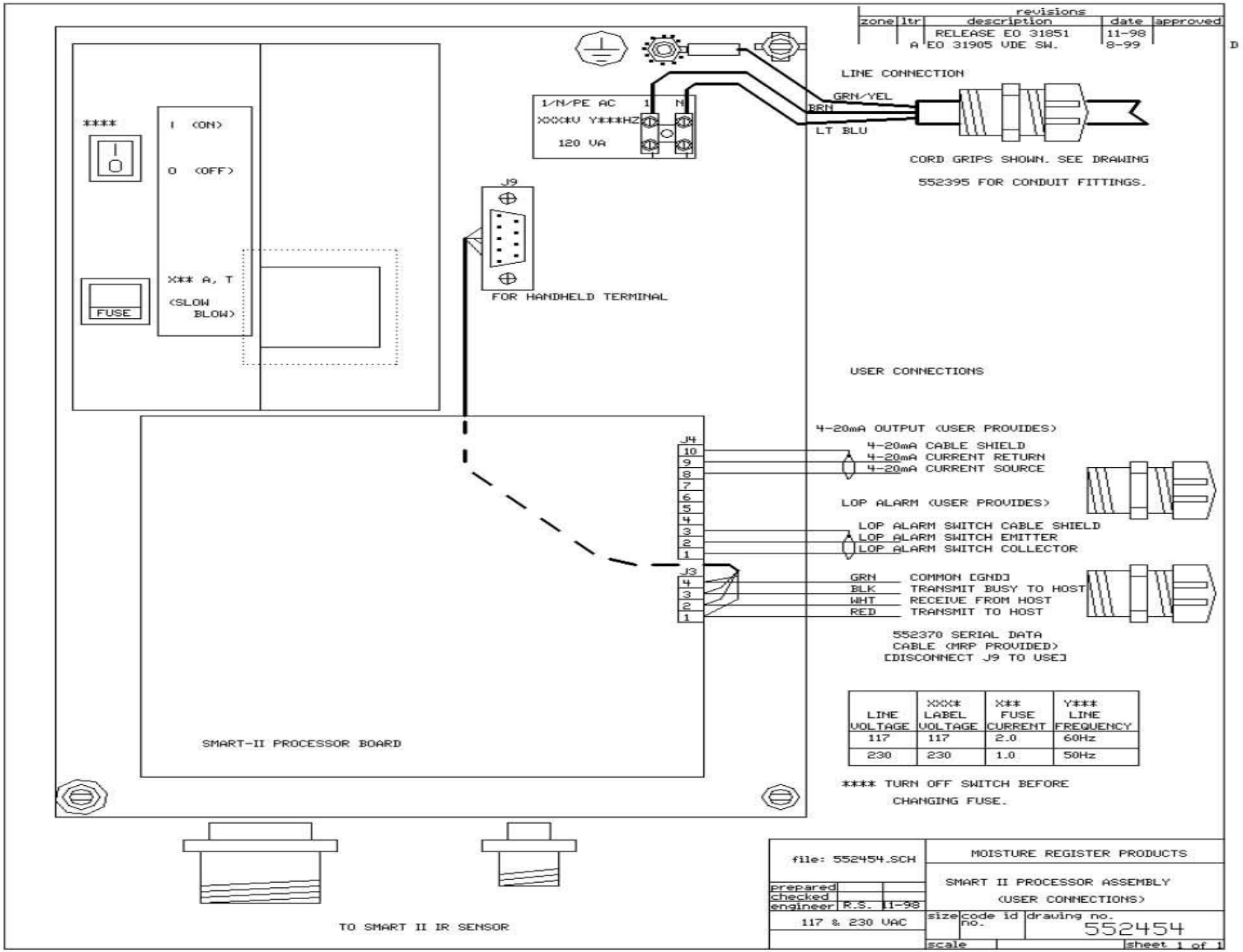
NOTE: TILT HEAD 20 DEG. TO VERTICAL IF LOSS-OF-PRODUCT LEVEL IS EXCESSIVE. (SHINY MATERIAL)

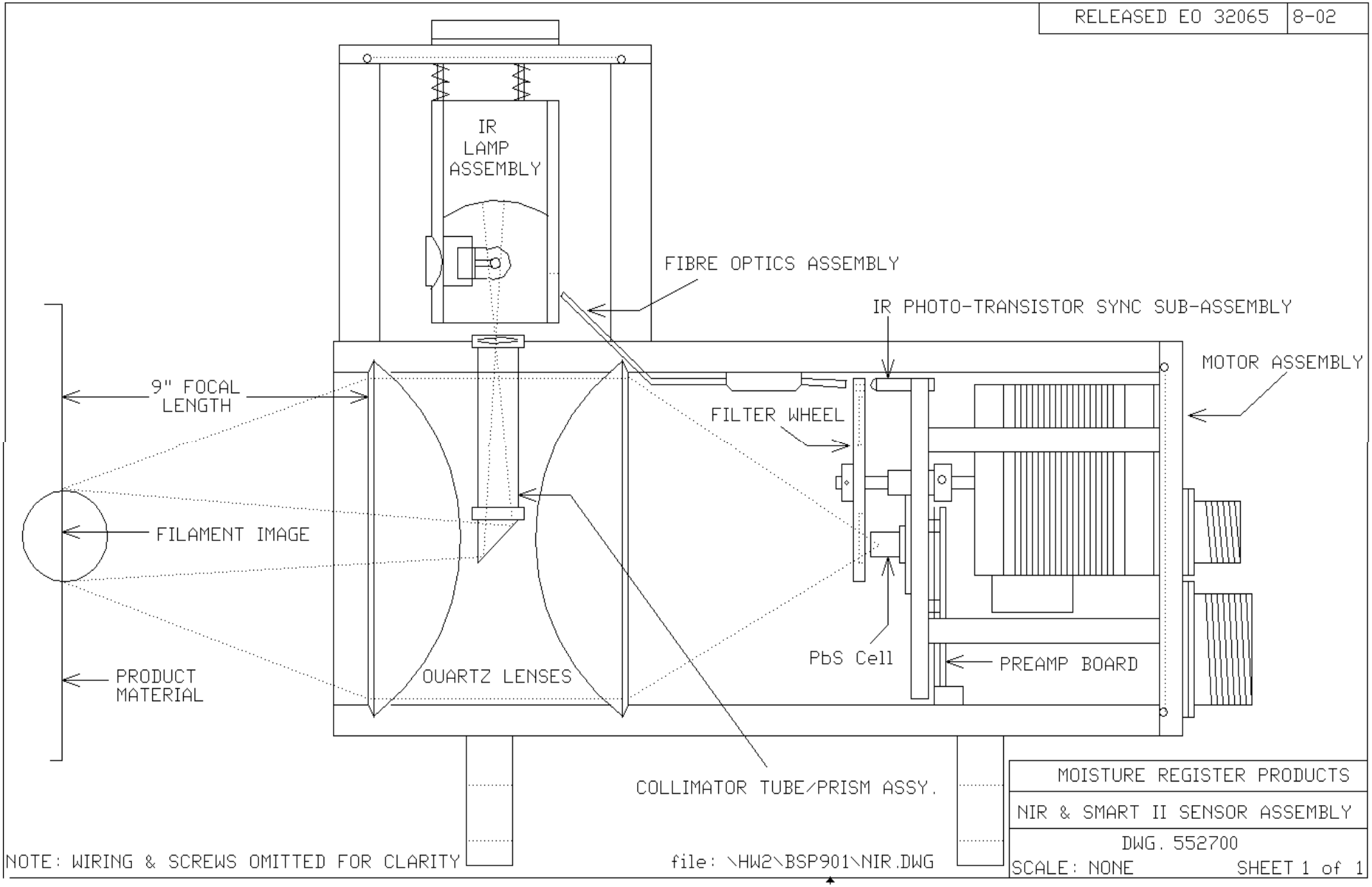
NIR SENSOR
(INSTALLATION DRAWING)

MOISTURE REGISTER PRODUCTS

FILE NO. MRC03842.DWG
DATE 3-13-98
DRAWN BY STRIEWSKI
APPROV. BY
DWG. NO. MRC003842
SHEET 1 OF 1


RELEASED EO 32065 | 8-02
IR
LAMP
ASSEMBLY
FIBRE OPTICS ASSEMBLY
IR PHOTO-TRANSISTOR SYNC SUB-ASSEMBLY
MOTOR ASSEMBLY
9" FOCAL
LENGTH
FILTER WHEEL
FILAMENT IMAGE
PbS Cell
PREAMP BOARD
PRODUCT
MATERIAL
QUARTZ LENSES
COLLIMATOR TUBE/PRISM ASSY.
MOISTURE REGISTER PRODUCTS
NIR & SMART II SENSOR ASSEMBLY
DWG. 552700
SCALE: NONE
SHEET 1 of 1
NOTE: WIRING & SCREWS OMITTED FOR CLARITY
file: \HW2\BSP901\NIR.DWG


revisions
zone | ltr | description | date | approved
RELEASE EO 31851 | 11-98
A EO 31905 VDE SW. | 8-99
D
LINE CONNECTION
GRN/YEL
BRN
LT BLU
1/N/PE AC
XXXXV Y***HZ
120 VA
1
N
CORD GRIPS SHOWN. SEE DRAWING
552395 FOR CONDUIT FITTINGS.
****
I (ON)
O (OFF)
FUSE
** A, T
(SLOW BLOW)
J9
FOR HANDHELD TERMINAL
USER CONNECTIONS
4-20mA OUTPUT (USER PROVIDES)
J4
10
9
8
7
6
5
4
3
2
1
4-20mA CABLE SHIELD
4-20mA CURRENT RETURN
4-20mA CURRENT SOURCE
LOP ALARM (USER PROVIDES)
LOP ALARM SWITCH CABLE SHIELD
LOP ALARM SWITCH EMITTER
LOP ALARM SWITCH COLLECTOR
J3
4
3
2
1
GRN COMMON (GND)
BLK TRANSMIT BUSY TO HOST
WHT RECEIVE FROM HOST
RED TRANSMIT TO HOST
552370 SERIAL DATA CABLE (MFR PROVIDED)
(DISCONNECT J9 TO USE)
SMART-II PROCESSOR BOARD
LINE VOLTAGE | XXX* LABEL VOLTAGE | ** FUSE CURRENT | Y*** LINE FREQUENCY
117 | 117 | 2.0 | 60Hz
230 | 230 | 1.0 | 50Hz
**** TURN OFF SWITCH BEFORE CHANGING FUSE.
TO SMART II IR SENSOR
file: 552454.SCH
prepared
checked
engineer R.S. 11-98
117 & 230 VAC
MOISTURE REGISTER PRODUCTS
SMART II PROCESSOR ASSEMBLY
(USER CONNECTIONS)
size | code id no. | drawing no. 552454
scale | sheet 1 of 1


RELEASED EO 32065 | 8-02
IR
LAMP
ASSEMBLY
FIBRE OPTICS ASSEMBLY
IR PHOTO-TRANSISTOR SYNC SUB-ASSEMBLY
MOTOR ASSEMBLY
9" FOCAL
LENGTH
FILTER WHEEL
FILAMENT IMAGE
PbS Cell
PREAMP BOARD
PRODUCT
MATERIAL
QUARTZ LENSES
COLLIMATOR TUBE/PRISM ASSY.
MOISTURE REGISTER PRODUCTS
NIR & SMART II SENSOR ASSEMBLY
DWG. 552700
SCALE: NONE
SHEET 1 of 1
NOTE: WIRING & SCREWS OMITTED FOR CLARITY
file: \HW2\BSP901\NIR.DWG

APPENDIX VIII

OPERATING INSTRUCTIONS FOR SMART II BLOWER BOARD

INTRODUCTION: When the Smart II System includes an Opto-Port with the Air Blast feature, the Smart II Blower Board is provided to control the System timing. This circuit board is mounted over one of the power supplies and is connected to the System with wires to the +15V power, Sync. Signal, and to the solenoid air valve circuit. See drawing No. 552573 (Wiring Diagram).

OPERATION: The Blower Board first opens the solenoid air valve, causing a one second air blast to clear the Opto-Port window. An operator selected Collection Time immediately follows. Then the Smart II is allowed to READ the new sample for one second. The cycle repeats then with a new air blast.

TIMING: A six (6)-position DIP switch is mounted on the Blower Board. This switch controls the time for collecting the sample of new material on the Opto-Port window. It is labeled "Time Between Blows". Positions 1 through 5 (labeled on the switch) provide a selection of times from two (2) seconds through 62 seconds. When the switches are in the ON position, the total collection time is the sum of the times (in seconds) shown on the circuit board adjacent to the particular switch/switches.

For example, if the switches labeled 1 and 2 (on the switch) are in the ON position, the collection time will be six (6) seconds (2 + 4).

Both the BLOW time and the READ times are fixed at one (1) second.

FUNCTION: Position 6 on the DIP switch is used to enable or disable the Blower Board functions. In the ON position the air blast functions are operating. When switch 6 is OFF, the Smart II System operates normally. It is convenient to disable the automatic air blast function when performing calibrations or when Standardizing.

APPENDIX VIII (Continued)

OPERATING INSTRUCTIONS FOR SMART II BLOWER BOARD

COMMUNICATING WITH SMART II W/ BLOWER

1. The Blower Cycle:

a. Read for one (1) second.

b. Blow for one (1) second.

c. Wait for a time which is one second shorter than the indication on the Blower

Time Selector Switch.

d. Repeat from a. above.

The only time that the Smart II Processor can be communicated with is during the one second read time. Communication can be achieved during any one of 28 specific times during this one second period, and is controlled by the Processor-Host handshake signal. Once communication is started, the serial data line will continue to function independently of the blow cycle until the full communication is completed. If communication is attempted at a time other than the one second read time, a COM ERROR will be signaled on the Communicator screen. This ERROR LED will stay lit until a correct communication is achieved.

As an example, if the Blower Cycle time is set to 4 sec., communication should be attempted after 3 seconds and before 4 seconds have passed from the end of the air blow. This is the one second period just before the solenoid air valve is turned on.

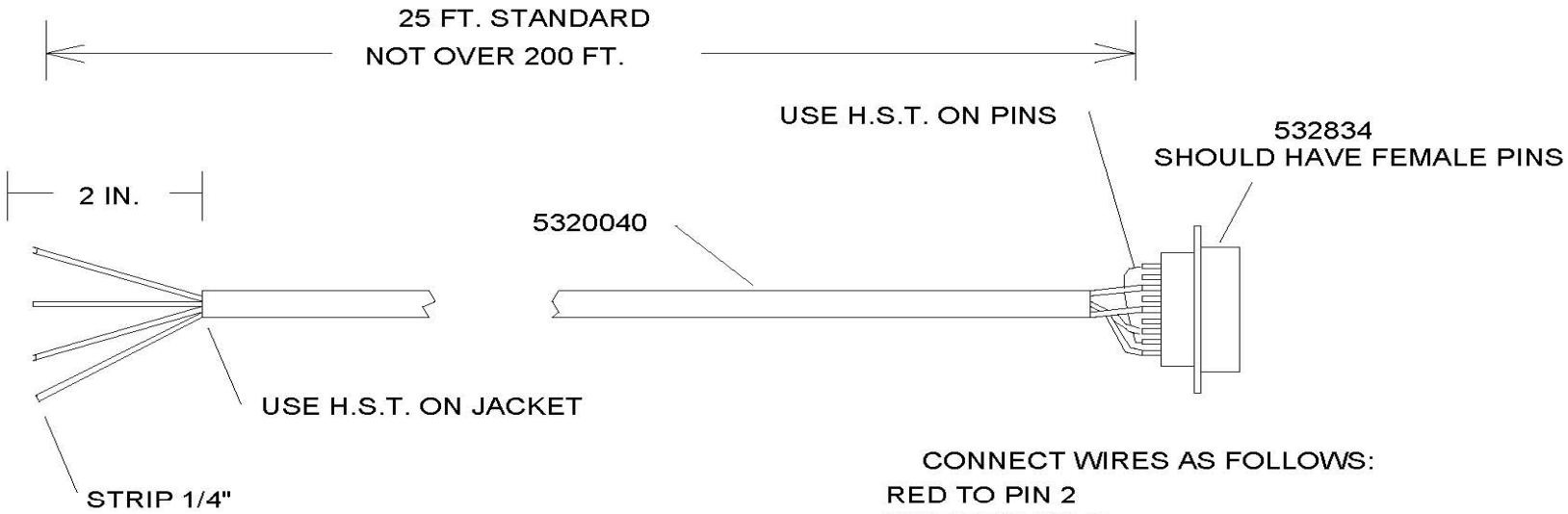
2. Possible error in RS-232 wiring:

Attached find drawing 552370 for the RS-232 Cable Assembly. Note that there is a jumper required from pin 4 to pin 6 on the connector at the computer. If this jumper wire is not in place on that connector, it will often cause the host computer to not recognize that the Smart Processor is sending a handshake signal, and fail to communicate. When the characters sent by the Communicator Program are not received as echoes from the Smart Processor, the COM ERROR LED will show red.

The use of shielded twisted pair wire should not cause the RS-232 serial communication process to fail, unless the cable run is too long or the insulation on the wire is too thin. Both items will cause higher capacitance across the RS-232 wiring (or to shield) which will limit the peak value of the RS-232 signal, and cause signal failure. We recommend a length not to exceed 200 ft. for the RS-232 cable.

These drawings apply equally when the Smart II Blower Board is used on the Smart II NIR Moisture Measuring System or on the 910-sT NIR Moisture Measuring System. The parts locations vary from instrument, but the wiring and functionality is the same.

nr.	revisions	date	engr
A	RELEASE	12-97	R.S.

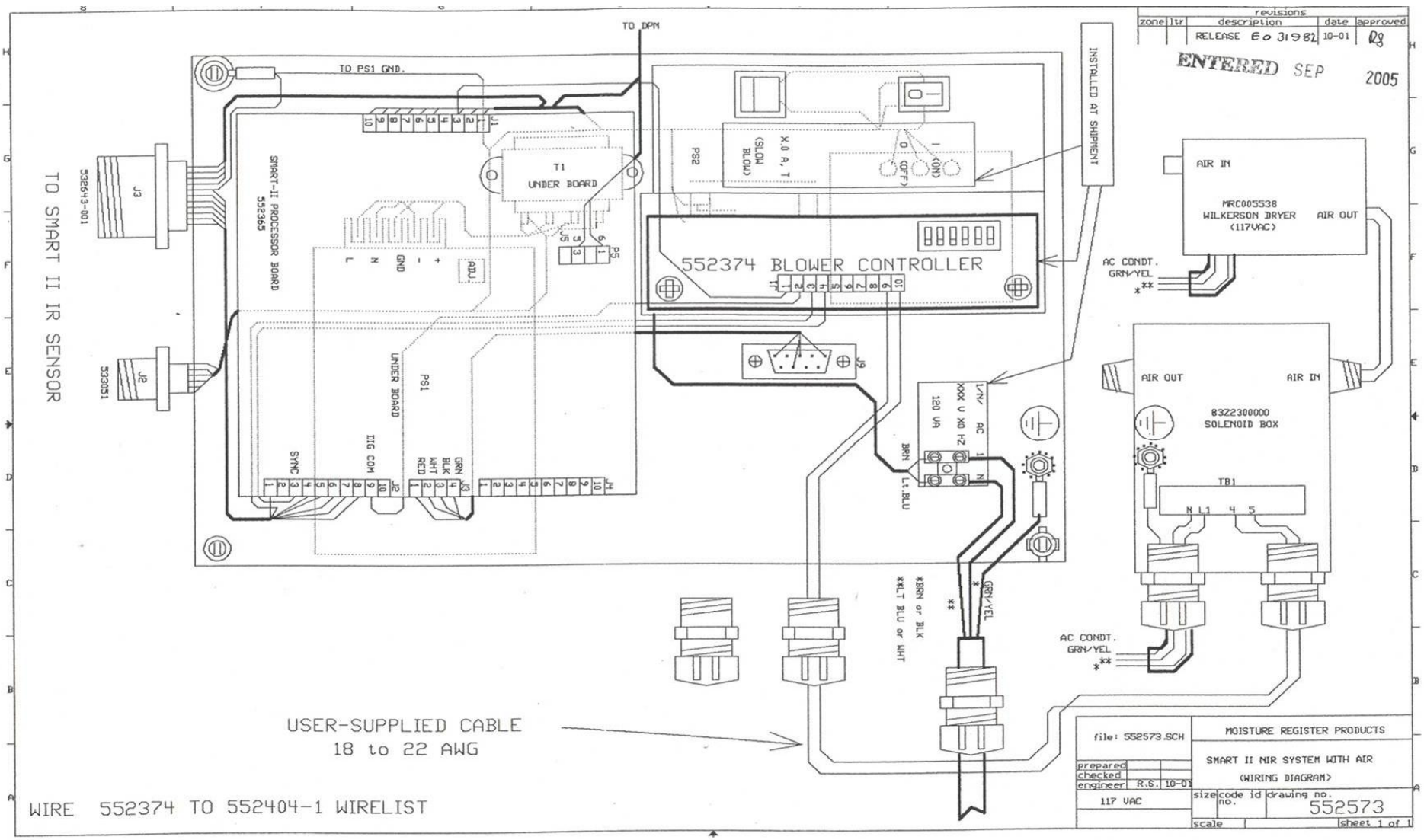


CONNECT WIRES AS FOLLOWS:

RED TO PIN 2
WHITE TO PIN 3
GREEN TO PIN 5
BLACK TO PIN 8
BROWN JUMPER PIN 4 TO 6

INSTALL 532835 COVER AFTER WIRING

next assy:	MOISTURE REGISTER PROD. DIV. LA VERNE, CA.		
file: 552370.DWG AUTOCAD	SMART II RS-232 CABLE ASSY.		
drawn: J.W.L.	date: 12-11-97		dwg. nr.: 552370
apprvd:	scale:	sheet: 1 of 1	


TO DPM
TO PS1 GND.
INSTALLED AT SHIPMENT
revisions
zone | ltr | description | date | approved
RELEASE Eo 31981 | 10-01 | DS
ENTERED SEP 2005
TO SMART II IR SENSOR
538643-001
J3
J2
533051
SMART-II PROCESSOR BOARD
552365
T1
UNDER BOARD
PS2
X.0 A, T
(SLOW BLOW)
O (OFF)
I (ON)
552374 BLOWER CONTROLLER
J5
P5
J9
UNDER BOARD
PS1
SYNC
DIG COM
GRN
BLK
WHT
RED
ADJ.
L
N
GND
-
+
AIR IN
MRC005538
WILKERSON DRYER
AIR OUT
(117VAC)
AC CONDT.
GRN/YEL
**
AIR OUT
AIR IN
83Z2300000
SOLENOID BOX
TB1
N L1 4 5
120 VA
BRN
Lt.BLU
*BRN or BLK
**LT BLU or WHT
GRN/YEL
USER-SUPPLIED CABLE
18 to 22 AWG
WIRE 552374 TO 552404-1 WIRELIST
file: 552573.SCH
prepared
checked
engineer R.S. 10-01
117 VAC
MOISTURE REGISTER PRODUCTS
SMART II NIR SYSTEM WITH AIR
(WIRING DIAGRAM)
size code id no. drawing no. 552573
scale
sheet 1 of 1