INSTRUCTION MANUAL

MODEL 108A/E
Total Sulfides in CO_2 Analyzer

Addendum to M100A Instruction Manual (021640000)
OR
Addendum to M100E Operation Manual (045150100)

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1 WARRANTY

ADVANCED POLLUTION INSTRUMENTATION DIVISION (T-API)

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Prior to shipment, Teledyne API equipment is thoroughly inspected and tested. Should equipment failure occur, Teledyne API assures its customers that prompt service and support will be available.

COVERAGE

After the warranty period and throughout the equipment lifetime, Teledyne API stands ready to provide on-site or in-plant service at reasonable rates similar to those of other manufacturers in the industry. All maintenance and the first level of field troubleshooting are to be performed by the customer.

NON- TELEDYNE API MANUFACTURED EQUIPMENT

Equipment provided but not manufactured by Teledyne API is warranted and will be repaired to the extent and according to the current terms and conditions of the respective equipment manufacturers warranty.

GENERAL

Teledyne API warrants each Product manufactured by Teledyne API to be free from defects in material and workmanship under normal use and service for a period of one year from the date of delivery. All replacement parts and repairs are warranted for 90 days after the purchase.

If a Product fails to conform to its specifications within the warranty period, Teledyne API shall correct such defect by, in Teledyne API's discretion, repairing or replacing such defective Product or refunding the purchase price of such Product.

The warranties set forth in this section shall be of no force or effect with respect to any Product: (i) that has been altered or subjected to misuse, negligence or accident, or (ii) that has been used in any manner other than in accordance with the instruction provided by Teledyne API or (iii) not properly maintained.

THE WARRANTIES SET FORTH IN THIS SECTION AND THE REMEDIES THEREFORE ARE EXCLUSIVE AND IN LIEU OF ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE OR OTHER WARRANTY OF QUALITY, WHETHER EXPRESSED OR IMPLIED. THE REMEDIES SET FORTH IN THIS SECTION ARE THE EXCLUSIVE REMEDIES FOR BREACH OF ANY WARRANTY CONTAINED HEREIN. TELEDYNE API SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR RELATED TO THIS AGREEMENT OF TELEDYNE API'S PERFORMANCE HEREUNDER, WHETHER FOR BREACH OF WARRANTY OR OTHERWISE.

TERMS AND CONDITIONS

All units or components returned to Teledyne API should be properly packed for handling and returned freight prepaid to the nearest designated Service Center. After the repair, the equipment will be returned, freight prepaid.

1.1 Claims for damaged shipments

All instruments should be thoroughly inspected immediately upon receipt. Material in the container should be checked against the enclosed packing list. If the contents are damaged and/or the instrument fails to operate properly, the carrier and API should be notified immediately.

The following documents are necessary to support claims:

- Original freight bill and bill of lading
- Original invoices or photocopy of original invoice
- Copy of the packing list
- Photographs of damaged equipment and container
-

1.2 Claims for shipping discrepancies

All containers should be checked against packing list immediately upon receipt. If a shortage occurs, notify the carrier and Teledyne API immediately. Teledyne API will not be responsible for shortages against the packing list unless they are reported immediately.

The following information is necessary to make a claim:

- The instrument model number
- Serial number
- Sales order number or purchase order number

Upon receipt of a claim, Teledyne API will advise disposition of the equipment for repair or replacement.

2 INTRODUCTION

The M108A consists of two major assemblies: a modified M100A SO2 analyzer and an M501TS thermal converter. This manual addendum describes the specifics of the M108A configuration and should be used in conjunction with the M100A Manual (p/n 02164).

2.1 Specifications

2.1.1 Analyzer Specifications

The specifications for the SO_2 analyzer are contained in the M100A manual.

2.1.2 M501TS Converter Specifications

TABLE 2.1 – M501TS Converter Specifications

Specification	Value	Unit
Maximum Flow Rate	1000	cc/min
Nominal Flow Rate (CO2)	625	cc/min
Nominal Flow Rate (Air/N2)	450	cc/min
Maximum TS Concentration for specified conversion efficiency	20	ppmv
Minimum Conversion Efficiency (In CO2 matrix) H_2S COS, CS_2	 98 90	%
Least Discernible Level (LDL)	See M100A Manual	
Operating Converter Temperature	1000	˚ C
Maximum Converter Temperature	1050	˚ C
Power	100-120/220-240 VAC 50/60 Hz, 440 watts	
Weight	24 (11)	lbs. (kg)
Dimensions	7 x 17 x 22 (178 x 432 x 559)	inches (mm)

2.2 The M108A Total Sulfides in CO_2 Analyzer

The Teledyne API Model 108A Total Sulfides in CO_2 analyzer, is designed to measure mixed sulfur impurities, collectively referred to as Total Sulfides (TS), in carbon dioxide (CO_2) gas. Since there is no SO_2 scrubber in the system, the instrument reading is the sum of the reduced sulfur compounds and SO_2. The M108A consists of a modified M100A UV Fluorescence SO_2 Analyzer, with special software, and a M501TS high temperature quartz thermal converter.

The M501TS primarily consists of a heated, temperature controlled quartz tube. Sulfur compounds are heated to approximately 1000 ˚C as they pass through the quartz tube and are converted to SO_2 in the following manner:

$$TS + O_2 \text{ --> } SO_2$$

Since the gas being analyzed is essentially CO_2, which generally contains no oxygen, there is an assembly to add approximately 6% oxygen to the sample before it passes through the converter. This dilution of the sample gas is corrected for by the software and calibration procedure. The added oxygen allows the sulfur compounds to be oxidized to SO_2 making the M108A respond to the total number of sulfur molecules in the sample gas. Any SO_2 present in the sample is unaffected by the converter and adds to the measured concentration. The sample gas then passes to a modified M100A analyzer where the SO_2 and converted compounds are analyzed as SO_2.

2.3 Configurations

There are three configurations available:

1. The standard unit consisting of:
   - A modified M100A Fluorescent SO_2 Analyzer
   - A M501TS High Temperature Thermal Converter

   External Span, Internal Zero With High-performance Charcoal Scrubber for Zero
   See Figure 2.1 for the pneumatic diagram, and section 2.4 for details on operation of the M501TS

2. The standard unit described above plus:
   - An Internal Zero/Span (IZS) Option with H_2S permeation tube

   The IZS option uses sample gas (passed through a special, high-performance charcoal scrubber) to dilute H_2S from the perm tube for span calibration checks. See Figure 2.2 for the pneumatic diagram

3. The standard unit described above plus:
   - An external M702 calibrator for blending tanks of H_2S span gas with process CO_2.

   See Figure 2.3 for the pneumatic diagram

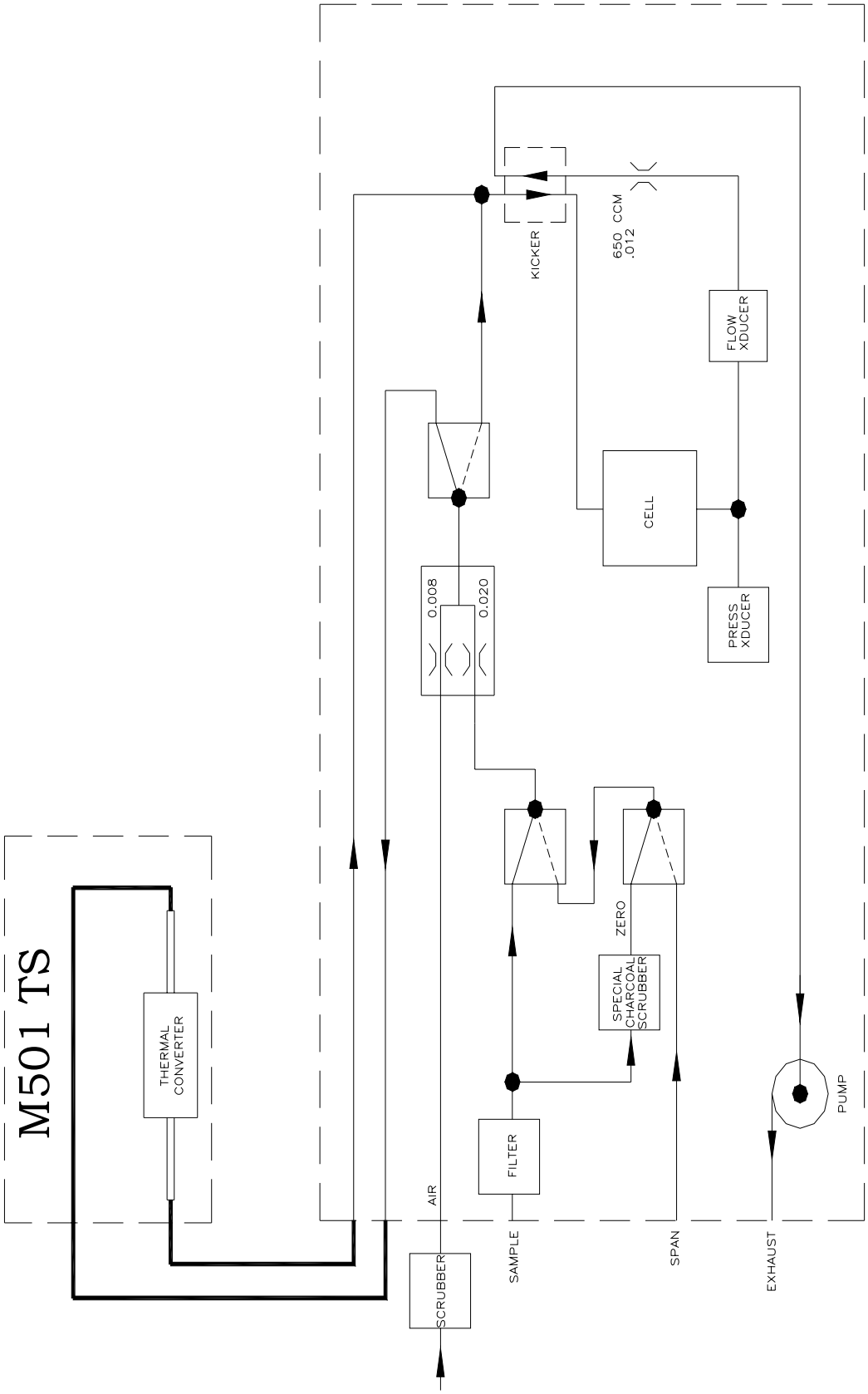


Figure 2.1 – M108A BASIC Configuration

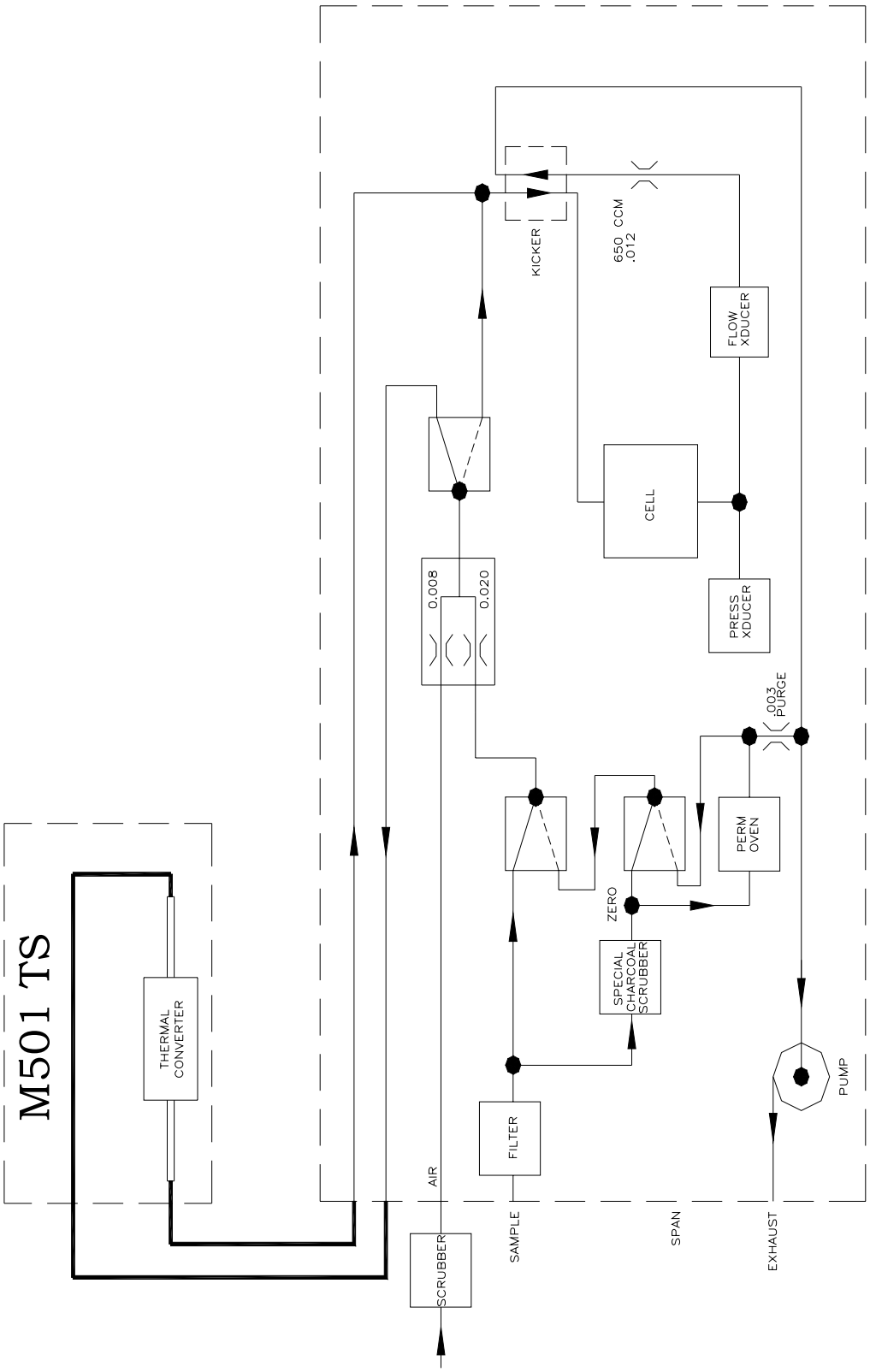


Figure 2.2 – M108A with IZS/Permeation Tube Option

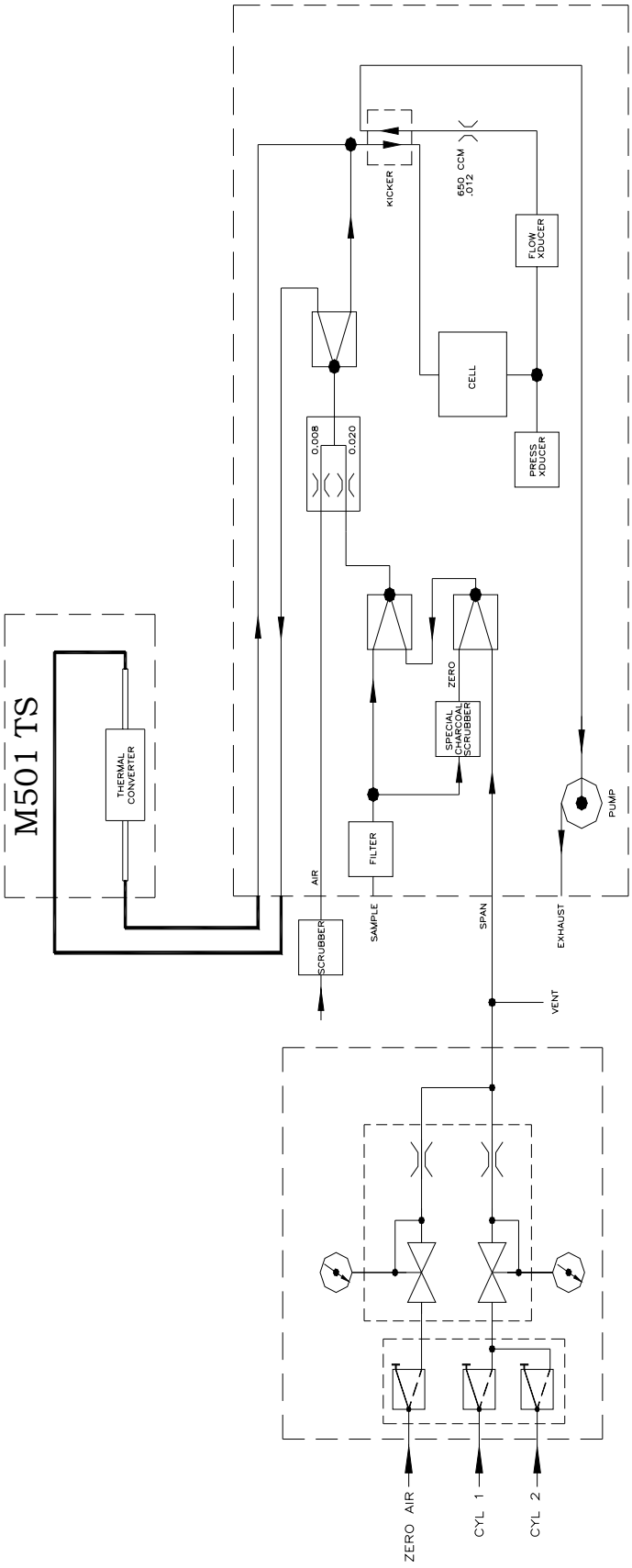


Figure 2.3 – M108A with M702 Calibrator Option

2.4 The M501TS – Total Reduced Sulfur Converter

The M501TS oxidizes reduced sulfur compounds to SO_2 in a high temperature quartz oven. A front panel mounted programmable digital temperature controller regulates power to the heater. Power to the heater is switched by a solid state, zero-crossing relay. An over/under-temperature alarm contact closure is located on the rear panel. The alarm set point is adjustable in the temperature controller. The heater temperature is sensed by a Type S (Platinum-Rhodium) thermocouple probe inserted in the bore alongside the quartz tube.

The quartz tube carrying the sample mixture runs through the core of the heater and is heated by radiation from electrical heating elements at the heater bore surface. See Figure 2.4 for a layout view of the converter.

WARNING !
INSURE PROPER LINE VOLTAGE IS SELECTED PRIOR TO PLUGGING UNIT INTO POWER SOURCE.

WARNING !
THE QUARTZ TUBE AND HEATER ARE VERY HOT
DO NOT TOUCH

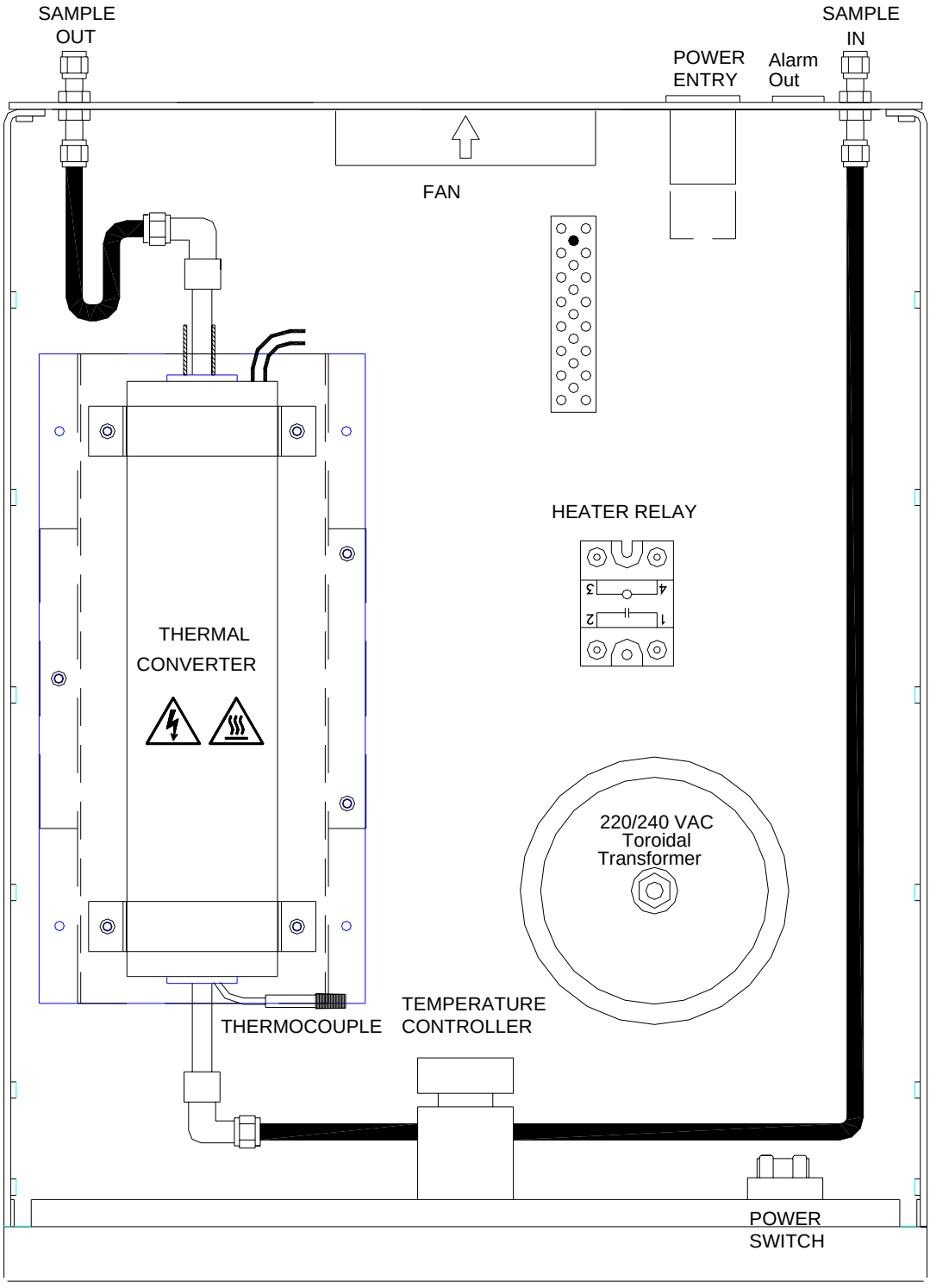


Figure 2.4 – M501TS CONVERTER Layout

2.5 Installation

The M108A consists of two chassis. There is a power cord for each that should be plugged into the correct AC mains receptacle. See the tag on the rear panel of each chassis for the voltage and frequency configuration. The power connection must be made with an approved three-wire-grounded power cord.

The pneumatic connections are shown in Figure 2.5.

- Connection to the TS analyzer must be made with Teflon tubing.
- Connect the sample inlet to the labeled fitting.
- The sample exhaust must be routed to a well-ventilated area away from the air inlet for the zero air scrubber on the rear panel.

CAUTION !
DO NOT BLOCK THE SIDE AND BACK VENTILATION OF THE M501TS CONVERTER

The overall pneumatic diagrams of the Model 108A are shown in Figures 2.1, 2.2, and 2.3.

CAUTION !
DO NOT OPERATE WITHOUT THE COVER OF THE M501TS CONVERTER INSTALLED

OVEN TEMPERATURE WILL NOT REGULATE PROPERLY WITHOUT THE COVER IN PLACE

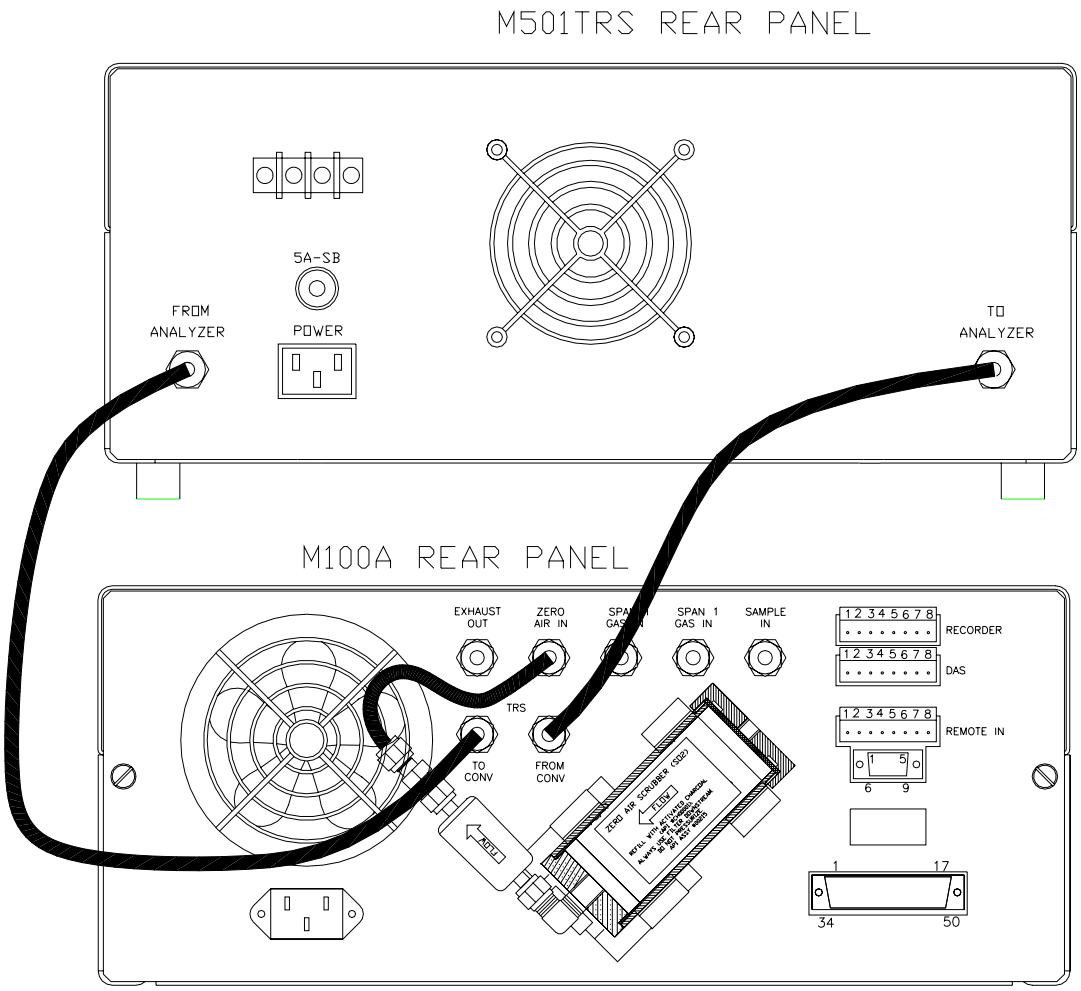


Figure 2.5 – M108A Pneumatic Connections

2.6 Operation and Calibration

Refer to the M100A manual for the overall operation of the SO_2 analyzer. This unit has some unique operating characteristics and calibration procedures detailed below.

The basic purpose of this instrument is to analyze CO_2 sample gas for sulfur containing impurities. Typically the impurities should be at low levels; therefore it is especially important that the zero calibration of the analyzer is done accurately so that even small levels of impurities can be detected. Also, a source of CO_2 that is free of sulfides is required for accurate zero calibration of the instrument. If the 'zero gas' used to zero the instrument is contaminated, the process gas will read artificially low, sometimes even showing a negative TS concentration. Standard CO_2 bottles can have unacceptably high levels of sulfur compounds in them. Beverage grade CO_2 should be used as a diluent as well as the 'zero gas' source for calibration of the M108A.
Since CO_2 strongly quenches the SO_2 fluorescence reaction, the instrument sensitivity will be greatly reduced when using CO_2 as the balance gas. Therefore it is imperative that the M108A be calibrated using CO_2 as the balance gas when it will be measuring TS in a gas matrix that is primarily CO_2.

CO_2 liquefies when compressed, and sulfur compounds do not stay dissolved in liquid CO_2. Therefore it is not practical to use compressed gas bottles of H2S in CO_2 for calibration purposes. TAPI therefore recommends that H_2S in N_2 bottles be used for calibration of the M108A, and that a calibrator be used to mix zero gas (CO_2) into the cal gas stream, making the final calibration gas mostly CO2.

2.7 TS and Zero Air Scrubbers

There are two charcoal scrubbers in the analyzer chassis of the M108A. The scrubber canister on the outside of the rear panel of the analyzer is a standard charcoal scrubber that supplies zero air for the diluter assembly. The second scrubber is located inside the analyzer behind the sample filter. This scrubber uses a specially impregnated charcoal (TAPI Part# CH_52) which is especially effective in scrubbing TS gasses. This filter is used to scrub TS from the inlet sample gas for use in zero calibrating the analyzer.

2.8 M501TS Temperature Controller

A front panel-mounted programmable controller maintains the heater temperature. The "Fuji Electric PXZ Series Operation Manual" is included with the documentation for this instrument. The controller has been set up at the factory. Should further adjustments be necessary, a brief summary of the operation of the controller is included.

By pressing the PV/SV button in the lower left corner of the controller, you can see the Present Value "PV" (actual temperature) or the Set Value "SV" (Set point Value).

2.8.1 Changing the Temperature Set Point

The temperature can be adjusted to temperatures other than 1000 C. However, TAPI recommends that the converter always be left at the nominal temperature of 1000 C. The converter has not been tested for conversion efficiency or reliability at other temperatures, and TAPI does not guarantee warranty support or that the converter will meet published specifications if the operating temperature is changed.. To adjust the operating temperature, follow these steps:

1. Select SV with the PV/SV button,

2. Select the Set-Point value at approximately 1000^{o}C by Press the "up-arrow" under the digit you want to change, (the digit will flash).

NOTE:
DO NOT SET THE TEMPERATURE HIGHER THAN 1050^{O}C

3. Press the "up-arrow" under the digit or the "down-arrow" at the left to scroll the digit to the desired value.

4. Repeat for the other two digits,

5. Press the ENTER button.

6. Select PV with the PV/SV button to observe the actual temperature. Allow temperature to equilibrate for a minimum of 30 to 45 minutes.

2.8.2 Adjusting the P-I-D Parameters

In the event that the control parameters must be changed or in the event that a new controller is installed, it must be reprogrammed to suit the thermal characteristics of the instrument. It is recommended that the Auto Tune function be used to set the control functions if reprogramming is necessary.

The following table is a guide to the approximate values for setting the parameters that will produce the initial settings for the auto-tune function. Below is a summary of the auto-tune procedure, refer to the Fuji Manual for more detailed information.

To perform Auto Tune function, first set the SV to the desired temperature, and then set the parameter A7 to 1, then press ENTER.

The controller will begin the auto-tune process, which takes several minutes. The decimal point at the lower right of the display will blink, indicating the controller is auto-tuning. During the process, the temperature may oscillate ±100^{o}C or more. When the process is completed, the decimal point will stop blinking.

NOTE:
It is normal for the ceramic heating element to emit a red glow at the operating temperature.

Table 2.4 includes typical values for a convert set up for operation on 115V/60Hz. The P, I and d values (shown as shaded in the table below) may be different for individual converters and AC mains voltages, and will vary somewhat after auto-tuning.

Table 2.4 – Temperature Controller – Initial Settings

PRESS	DISPLAY	INITIAL VALUE
SEL	**P** PROP BAND	UP/DOWN SET TO "11"
SEL	**i** INTEGRAL	SET TO "10"
SEL	**d** DERIVATIVE TIME	SET TO "7.7"
SEL	**AL** LOW ALARM SETPOINT	SET TO "50" (C BELOW FINAL SETVALUE)
SEL	**AH** HIGH ALARM SETPOINT	SET TO "50" (C ABOVE FINAL SETVALUE)
SEL	**7C** CYCLE TIME	SET TO "2"
SEL	**HYS** HYSTERESIS	SET TO "3"
SEL	**A7** AUTOTUNE	SET TO "0" (OFF)
SEL	**LOC** LOCK	"0" (OPEN) "1" (LOCKED) "2" (SV ONLY OPEN)

Table 2.5 shows a Secondary Menu of parameters that set more basic parameters of the controller, these include the thermocouple type, the temperature units etc.

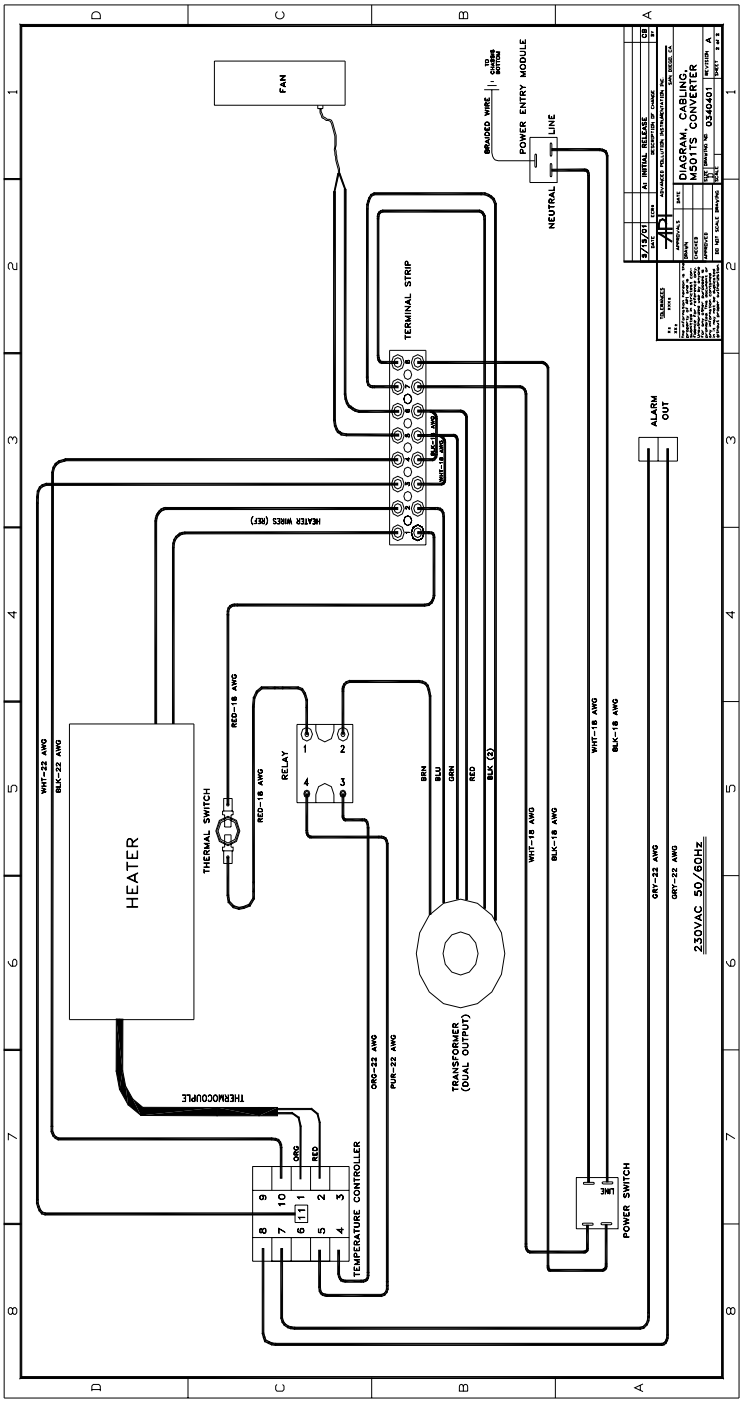
Table 2.5 – Temperature Controller - Secondary Menu

PRESS	DISPLAY	PARAMETER VALUE
SEL	HOLD TILL **p-n1**	SET TO “0”
SEL	**p-n2**	SET TO “6” (TYPE S THERMOCOUPLE)
SEL	**p-dF** DIGITAL FILTER	SET TO “5”
SEL	**P-SL** LOWER LIMIT	SET TO “32” (32C)
SEL	**P-SU** UPPER LIMIT	SET TO “1050” (1050C)
SEL	**P-AL** ALARM TYPE2	SET TO “10”
SEL	**P-AH** ALARM TYPE 1	SET TO “10”
SEL	**P-An** HYTERESIS	SET TO “3”
SEL	**P-dP** DECIMAL LOCATION	SET TO “0”
SEL	**PVOF** PROCESS OFFSET	LEAVE AT “0”
SEL	**SVOF** SET POINT OFFSET	LEAVE AT “0”
SEL	**P-F**	SET TO “ºC” (CENTIGRADE)
SEL	**FUZZY** FUZZY LOGIC	SET TO “ON”

3 TROUBLESHOOTNG

NO POWER:	Plugged in? Switched on? Circuit breaker Tripped?
NOT HEATING:	PV/SV switch to PV. Is it heating? PV/SV switch to SV. Set point correct? Socket in place on back of temperature controller? Check M501TS wiring diagram Figure 3.1 Thermocouple has failed? 'UUUU' shown on front panel of 501TS. Also, check thermocouple resistance.
TS ANALYZER UNSTABLE:	Leak-check. (Pressurize and see if pressure falls. Use soap bubble to find leak.)
EFFICIENCY <90%:	Leaking? Leak-check. Plugged? Compare flow through and bypassing converter. Flow too high? Set-point temperature optimized? Span gas correct? Contaminated? Check inside of Teflon tubing.
CONVERTER TEMP UNSTABLE:	Perform auto-tune procedure in Section 2.7.2.

Figure 3.1 – M501TS Wiring Diagram



3.1 SO_2 Analyzer Maintenance

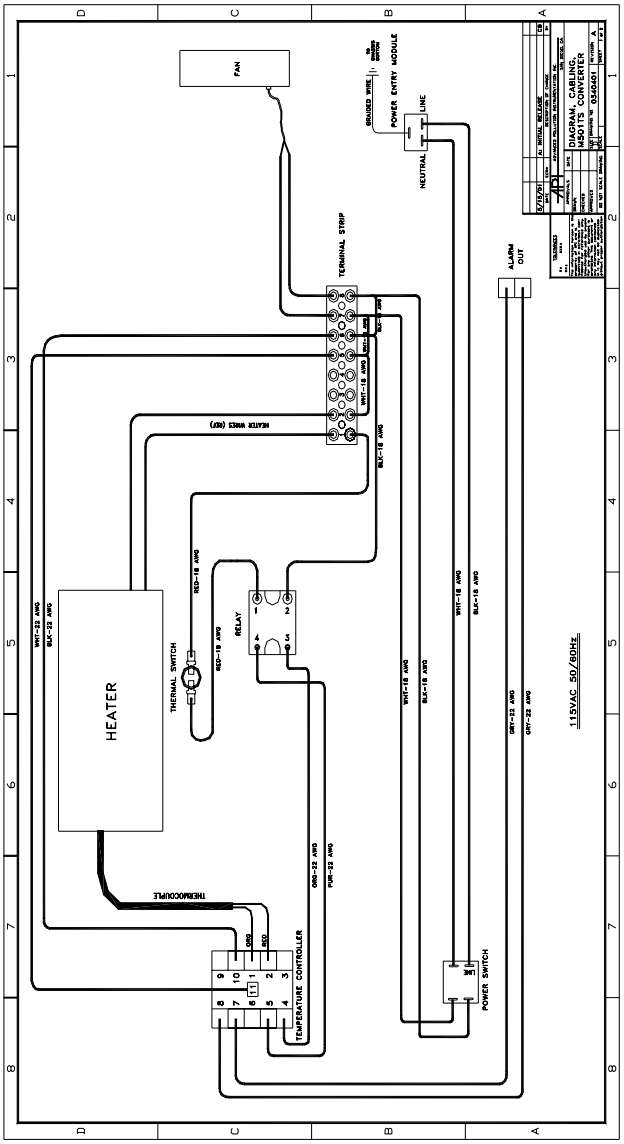


Figure 3.2 M501TS Wiring Diagram, 220V Systems

Maintenance of the SO_2 analyzer is covered in Section 8 of the M100A manual.

Unlike the M100A, the M108A has one standard charcoal scrubber on the rear panel of the SO_2 analyzer instrument chassis, and another special charcoal scrubber inside the chassis. The zero calibration (and thus the overall accuracy of the instrument) is dependent on high quality

zero air. **Make sure that the charcoal is replaced at the 3-month interval suggested in the M100A maintenance schedule. Also be sure not to mix charcoal between the inner and outer scrubber canisters, they are different materials.**

3.2 Changing the Quartz Tube

1. Turn off M501TS and allow it to cool to room temperature.
2. See Figure 2.4. – M501TS Layout
3. Remove the screws from the top inside of the front panel and fold panel downward.
4. Loosen front and rear fittings at each end of the tube.
5. Carefully slide the tube out of the heater – the ceramic bushings at each end of the heater are very fragile.
6. Slide the new tube into the heater, and re-connect the fittings.
7. Leak check the unit.
8. Replace the thermocouple making sure that it is fully inserted into the indentation in the body of the quartz tube.
9. Check the converter efficiency. See Section 4.3

3.3 Checking the Converter Efficiency

After maintenance it is good practice to check the converter efficiency. To check the converter efficiency, perform the following procedure:

1. Produce a calibration gas of 400 ppb H_2S in CO_2 at a flow greater than the demand of the instrument; vent the excess gas out of the room.
   - When using a calibrator or gas blender to generate H_2S span gas (either permeation tube or tank) with CO_2 gas as the diluent, please remember that rotameters and mass flow controllers are calibrated with air or nitrogen. Using them with CO_2 will produce large calibration errors (as large as 30% or more), since CO_2 gas has considerably different characteristics. Contact the manufacturer of your mass flow measurement/control device for instructions on how to use it to measure CO_2 flow. Or use a flowmeter such as a soap bubble, or BIOS – DryCal flowmeter that measures volume flow

2. Allow the M108A to stabilize at span for at least 30 minutes.
3. Check the converter efficiency by adjusting the converter's temperature controller set point:
   - Starting at the converters normal set-point of 1000 ^oC, lower the set-point temperature of the Converter in 5^oC increments (allowing 10 minutes minimum settling time between increments) until a drop of approximately 5% of Full Scale is observed. Note the Thermal Converter temperature at this point.
   - Verify that the converter efficiency does not drop by 5% until the temperature has dropped by at least 40 ^oC,
   - Return the temperature set point to 1000 ^oC.

3.4 Sample Diluter Maintenance

The sample diluter is used to inject a small amount of ambient air into the sample stream to provide oxygen for the converter. The diluter is located on the inside rear panel of the SO_2 analyzer. It consists of a stainless steel block and 2 orifices to control the amount of sample and air that is blended.

There should be no periodic maintenance required on this assembly, but a diagram is included in case rebuilding of this assembly is required. The assembly is shown in Figure 3.3.

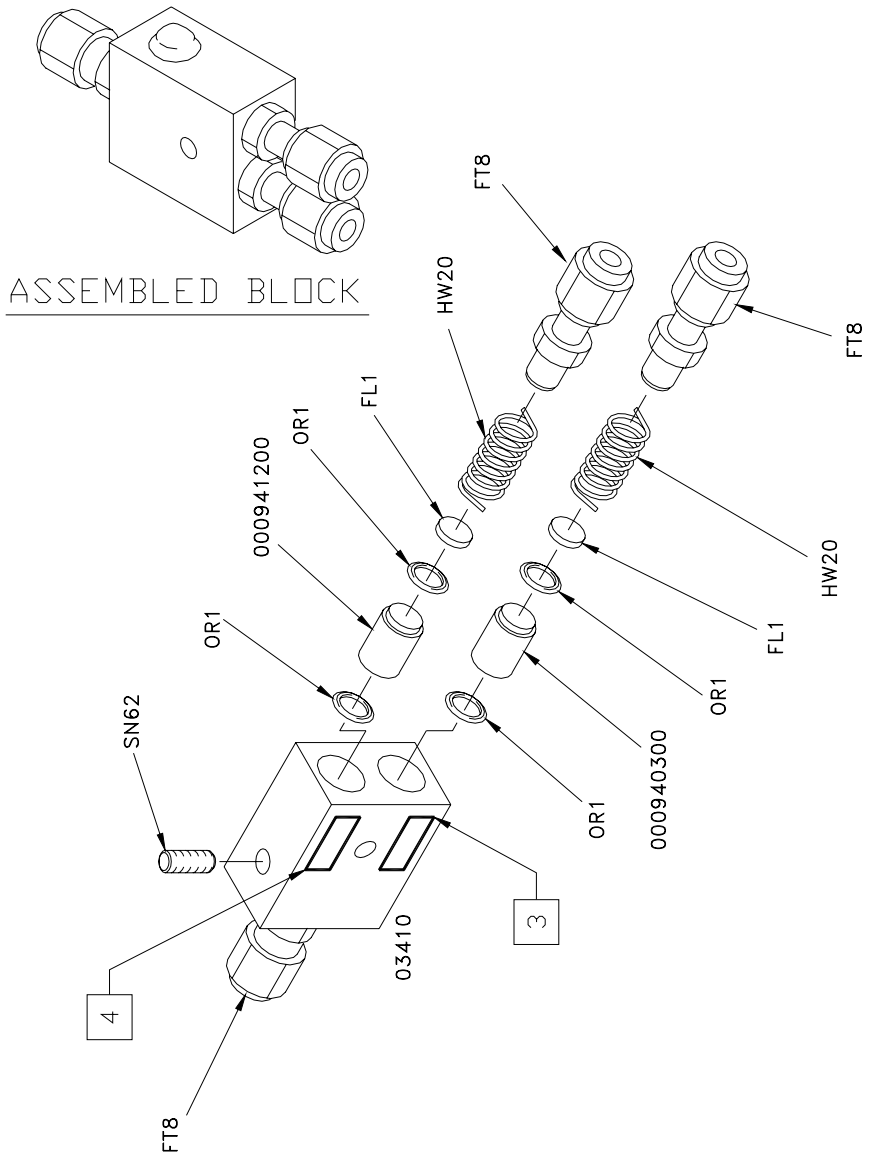


Figure 3.3 – Diluter Flow Block Assembly

3.5 Thermocouple Replacement

Continuous operation at 1000 C will eventually degrade the performance of the thermocouple used to sense the temperature of the quartz oven. The following instructions describe how to install a new thermocouple into the converter heater block. This is a replacement thermocouple (KIT000255). Teledyne API recommends updating any older thermocouples with the new version. The following instructions provide the necessary information to remove the existing thermocouple and replace it with the new one supplied in Kit 255.

You will need the following tools:

- Nutdriver, $^{5}/_{16}$
- Nutdriver, $^{11}/_{32}$
- Diagonal Cutter

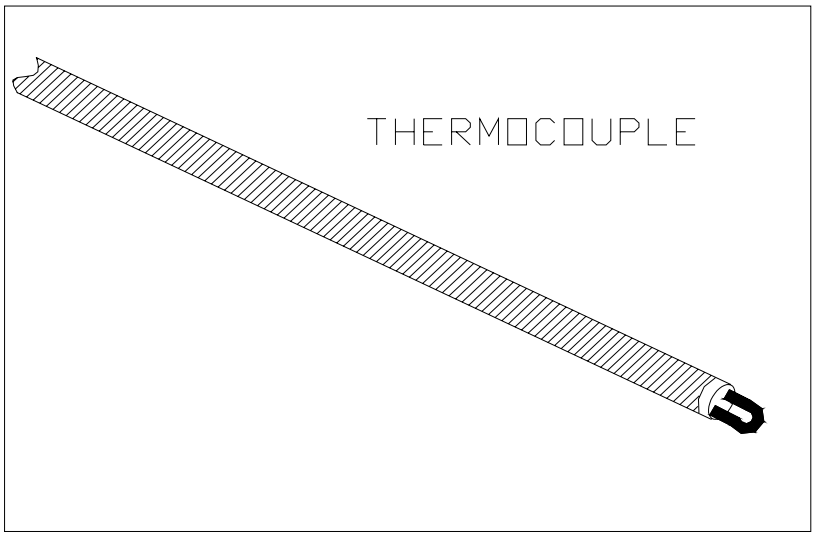
You must obtain the following replacement parts kit for TAPI:

- KIT000255

Once you have the right tools and parts, follow this procedure to replace the thermocouple.

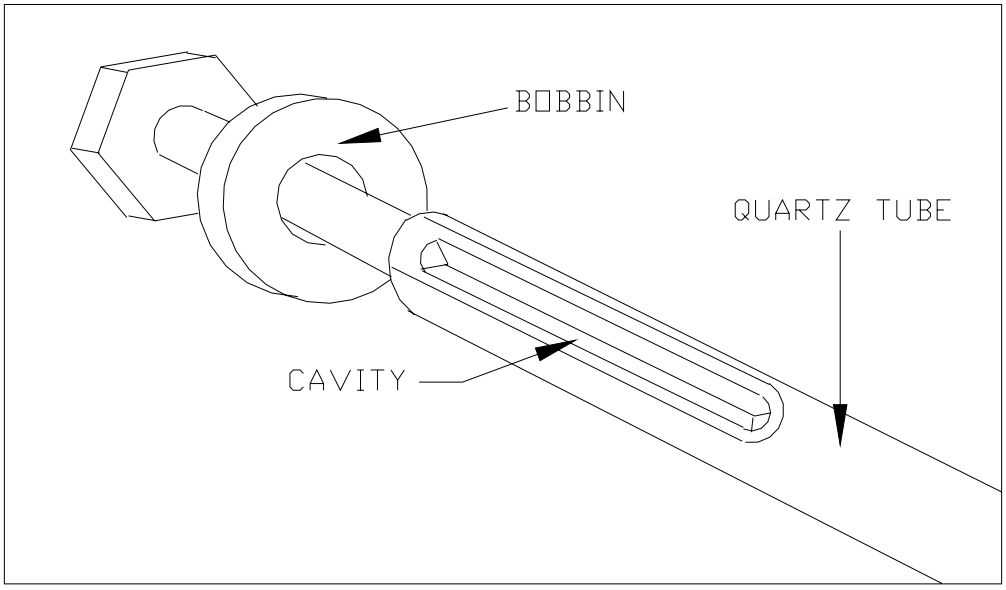
1. Ensure power is removed from the M501TS Converter. If the Converter has been operational you will need to wait for 2 hours for the Converter oven to cool before continuing with the replacement of the thermocouple.
2. Remove the cover from the Converter chassis.
3. Unscrew the (4) nuts that secure the front panel to the chassis. They are located just behind the Front Panel along the top.
4. Lower the Front Panel to gain easier access to the end of the quartz tube.
5. Unscrew the (3) nuts that secure the inner cover that protects the Heater Block and quartz tube. Remove this cover.
6. Cut the tie-wrap that secures the thermocouple to the fitting at the end of the quartz tube.
7. Loosen the teflon fitting at the end of the quartz tube taking care not to put any stress on the tube and slide the fitting off the tube.
8. Remove the thermocouple.
9. Disconnect the thermocouple wires from the Temperature Controller noting that the ‘Orange’ wire goes to pin 1 and the ‘red’ wire goes to pin 2.

Figure 3.4



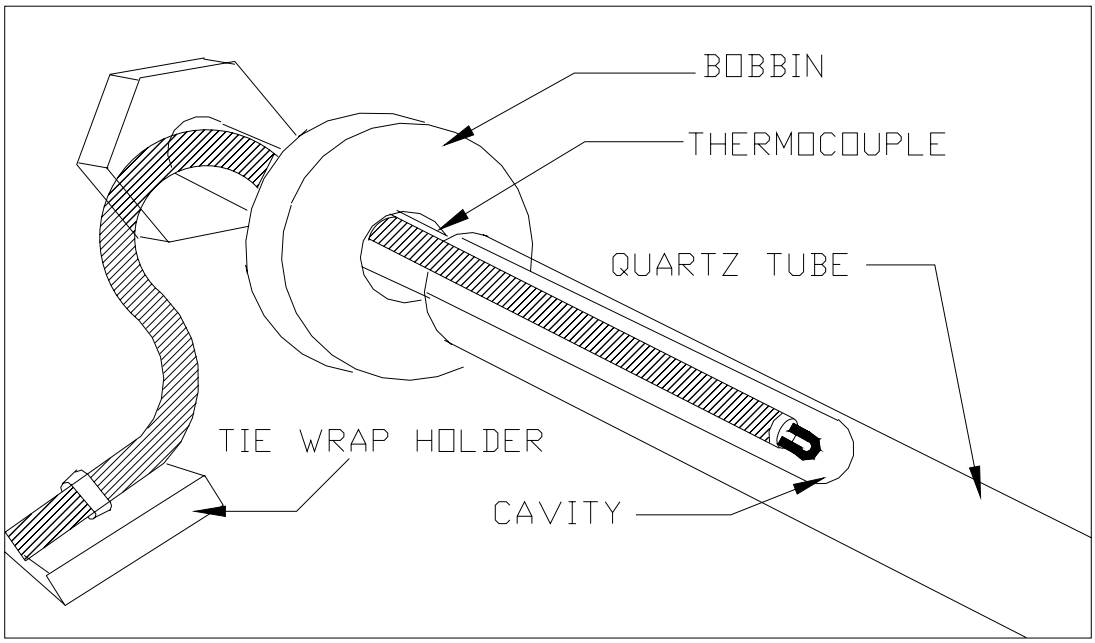
1) In preparation for installing the new thermocouple, look into the end of the Heater Block. You will see that there is an indentation (cavity) in the fat part of the quartz tube. This is where the thermocouple you are installing will reside. Refer to FIGURE 3.5.

Figure 3.5



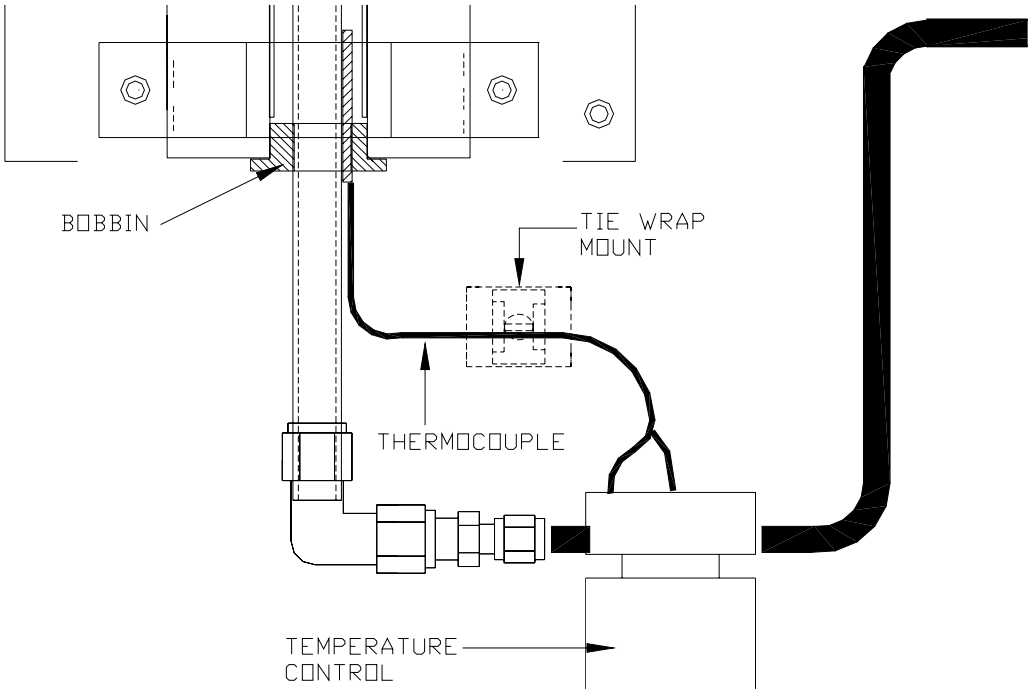
2) The thermocouple should slide into the Heater Block and into the indentation of the quartz.
3) Align the thermocouple with this cavity and carefully push the thermocouple all the way into the cavity until it comes to a stop, which is the end of the cavity of the quartz tube.
4) The thermocouple should now be properly residing in the cavity of the quartz tube. Refer to Figure 3.6

Figure 3.6



5) Reconnect the teflon fitting that was removed earlier from the end of the quartz tube. Take care not to put any stress on the quartz tube as the teflon fitting is tightened
6) Place the Tie Wrap Hold down in the location shown in the Figure 3.7

Figure 3.7



7) Form the Thermocouple wire so that it rests in the cavity with little movement.

8) Connect the (2) wires of the thermocouple to the Temperature Controller. The "Orange" wire should be connected to pin 1 and the "red" wire should be connected to pin 2.

9) At this point, all connections have been made, both electrically and pneumatically. A leak check should be performed on the Converter to verify that all connections are leak free. If a leak is detected, the leak should be resolved before continuing.

10) Install the inner cover of the Heater Block and secure with the (3) nuts. Close the Front Panel and secure with the (4) nuts. Install the top cover on the Converter chassis.

11) The Converter is now ready for the application of power. You will be looking for an indication from the temperature controller that it is functioning correctly and driving the heater to the desired "set" temperature. Apply power now.

12) You will need to check the Temp Controller to be sure that it knows which type of Thermocouple is has in it. follow the directions in Section 2.8.2 of this document to be sure that the temp controller is set properly.

13) You will need to perform a function in the Temperature Controller called "auto-tune". This will tune the Temperature Controller to the new thermocouple. This procedure should be performed after the Converter comes to the regulated temperature.

14) Refer to the M108A Manual to see information regarding the "Auto-Tune" procedure.

15) After the "Auto-Tune" process is completed, verify that the "process" temperature is indicating that the desired temperature is stable and being regulated.

16) The converter is now ready for operation.

4 SPARE PARTS

Please use the M100A spare parts list and expendables lists (found in its manual) when ordering most spares and expendables for the M108A. Additional spare parts for the M108A are shown below. Please note that the internal scrubber cartridge takes a special scrubber material, TAPI's standard Sox scrubber material is not appropriate for use in the internal scrubber assembly. The external scrubber does take standard scrubber material.

Part No	DESCRIPTION
CP0000017	TEMPERATURE CONTROLLER
RL0000020	RELAY
FA0000006	FAN
HE0000007	HEATER
059220000	THERMOCOUPLE, TYPE S, ALUMINUM SHEATH
037100000	TUBE, QUARTZ
FT0000238	ELBOW UNION (10mmX1/4")
SW000038	OVER TEMPERATURE SWITCH
000940300	ORIFICE, ∅.020"
000941200	ORIFICE, ∅.008"
FL0000001	FILTER, SS
OR0000001	O-RING, 2-006VT
FL0000003	FILTER, DFU
004021300	FLOW/PRESS SENSOR BOARD W/ CO2 FLOWMETER, M108A
014910000	Z/S VALVE ASSY, M108A
037320000	ASSY, SWITCHING VALVE, M108A
040031100	PCA, OXY FLOW SENSOR
059430000	ASSY, SWITCHING VALVE, M108E
059430100	ASSY, Z/S VALVE, M108E
037310000	ASSY, DILUTION FLOW CONTROL BLOCK
037340000	ASSY, ZERO AIR SCRUBBER
037340100	ASSY, ZERO AIR SCRUBBER (T5)

Expendables

Part No	DESCRIPTION
018770100	EXPENDABLES KIT, M108A
039620100	KIT, INTERNAL TS SCRUBBER REFILL (included in 018770100 kit)
KIT000245	KIT, THERMOCOUPLE REPLACEMENT (included in 018770100 kit), TYPE S

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5 INSTRUMENT TEST & CALIBRATION RECORD

Table 5.1 - Final Test and Calibration Values

TEST Values	Observed Value	Units	Nominal Range	Ref. Sect. M100A Manual
RANGE		PPB	50 - 20,000	5.3.4
STABIL		PPB	0.0 - 2	5.2.1,9.1.1, Table 9.1, 9.2.5
PRESS		" HG	24 - 35	9.1.1, 9.3.6, Table 9.1
SAMP FL		CC / MIN	500 - 700 w/CO_2	9.2.2, 9.3.6, Table 9.1
PMT		MV	0 - 5000	9.4.1
UV LAMP		MV	3500 - 4000	9.4.2
STR. LGT		PPB	< 60	Table 9.1
DRK PMT		MV	< 50	9.4.3, Table 9.1
DRK LMP		MV	< 50	Table 9.1
SLOPE			1.0+/-.3	7.10
OFFSET		MV	< 100	7.10
HVPS		V	400 - 900 constant	9.3.10
DCPS		MV	2500 +/- 200	9.3.5
RCELL TEMP		°C	50 +/- 1	9.3.7
BOX TEMP		°C	8-50	9.3.4.1
PMT TEMP		°C	7.9 +/- 1	9.3.9
IZS TEMP		°C	50 +/-.3	9.5.4
Electric Test				
PMT Volts		MV	1000 +/-200	9.1.3.2
TS Conc.		PPB	500 +/- 100	9.1.3.2
Optic Test				
PMT Volts		MV	1000 +/- 200	9.1.3.3
TS Conch		PPB	500 +/- 100	9.1.3.3

Table 5.1 – Continued (Values w/ CO_2 where applicable)

Span and Cal Values				
Parameter	**Observed Value**	**Units**	**Nominal Range**	**Ref. Sect. M100A Manual**
TS Span Conc.		PPB	20 - 20,000	Table 7.3
TS Slope			1.0 +/- .3	7.10
TS Offset		MV	< 100	7.10
Noise at Zero (rms)		PPB	< 0.2	Table 9.1
Noise at Span (rms)		PPB	< 0.5	Table 9.1
PMT at Zero (SO_2/CO_2)		MV		
PMT at Span (SO_2/CO_2)		MV		
Measured Flows				
Parameter	**Observed Value**	**Units**	**Nominal Range**	**Ref. Sect. M100A Manual**
Sample Flow w/ CO_2		cc/min	500 - 700	9.2.2, 9.3.6, Figure 9.6
Sample Flow w/Air		cc/min	400 - 600	9.2.2, 9.3.6, Figure 9.6
Sample Press w/CO_2		" HG	24 - 27	
IZS Purge Flow		cc/min	50 +/- 10	6.3
H_2S Conversion Efficiency	Expected = _____ PPB		Actual = _____ PPB	Efficiency = _____ % (100 ± 2%)

Factory Installed Options	**Option Installed**
Power Voltage/Frequency	
Rack Mount, w/ Slides	
Rack Mount, w/ Ears Only	
Internal Zero/Span - IZS	
Permeation Tube (Output Specification)	
4-20 MA Current Loop Output	
External Pump	

PROM Rev #: _____ M108TS S/N: _____
M501TS S/N: _____

Date: _____ Technician: _____

USER NOTES: