



Manual Addendum

Ultra Sensitivity Model T200U NO/NO₂/NO_x (Addendum to T200 Manual, PN 06858)

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ABOUT THIS MANUAL

This manual is to be used in conjunction with the Model T200 operation manual, part number 06858. Where operation of the Model T200U diverges from that of the Model T200, this manual takes precedence.

Note

A Repair Questionnaire is inserted at the end of this addendum; while the questionnaire includes “Appendix C” in its title, there is no Appendix A or Appendix B with this addendum.

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REVISION HISTORY

Date	Rev	DCN	Change Summary
2013 Feb 19	C	6670	Administrative and other minor updates
2012 Feb 07	B	6275	Administrative updates
2010 Sep 21	A	5849	Initial release

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SAFETY MESSAGES

Important safety messages are provided throughout this manual for the purpose of avoiding personal injury or instrument damage. Please read these messages carefully. Each safety message is associated with a safety alert symbol, and are placed throughout this manual and inside the instrument. The symbols with messages are defined as follows:



WARNING: Electrical Shock Hazard



HAZARD: Strong oxidizer



GENERAL WARNING/CAUTION: Read the accompanying message for specific information.



CAUTION: Hot Surface Warning



Do Not Touch: Touching some parts of the instrument without protection or proper tools could result in damage to the part(s) and/or the instrument.



Technician Symbol: All operations marked with this symbol are to be performed by qualified maintenance personnel only.



Electrical Ground: This symbol inside the instrument marks the central safety grounding point for the instrument.

CAUTION



This instrument should only be used for the purpose and in the manner described in this manual. If you use this instrument in a manner other than that for which it was intended, unpredictable behavior could ensue with possible hazardous consequences.

NEVER use any gas analyzer to sample combustible gas(es)!

Note

Technical Assistance regarding the use and maintenance of this instrument or any other Teledyne API product can be obtained by contacting Teledyne API's Technical Support Department:

Phone: 800-324-5190

Email: sda_techsupport@teledyne.com

or by accessing various service options on our website at

<http://www.teledyne-api.com/>.

CONSIGNES DE SÉCURITÉ

Des consignes de sécurité importantes sont fournies tout au long du présent manuel dans le but d'éviter des blessures corporelles ou d'endommager les instruments. Veuillez lire attentivement ces consignes. Chaque consigne de sécurité est représentée par un pictogramme d'alerte de sécurité; ces pictogrammes se retrouvent dans ce manuel et à l'intérieur des instruments. Les symboles correspondent aux consignes suivantes:



AVERTISSEMENT : Risque de choc électrique



DANGER : Oxydant puissant



AVERTISSEMENT GÉNÉRAL / MISE EN GARDE : Lire la consigne complémentaire pour des renseignements spécifiques



MISE EN GARDE : Surface chaude



Ne pas toucher : Toucher à certaines parties de l'instrument sans protection ou sans les outils appropriés pourrait entraîner des dommages aux pièces ou à l'instrument.



Pictogramme « technicien » : Toutes les opérations portant ce symbole doivent être effectuées uniquement par du personnel de maintenance qualifié.



Mise à la terre : Ce symbole à l'intérieur de l'instrument détermine le point central de la mise à la terre sécuritaire de l'instrument.

MISE EN GARDE



Cet instrument doit être utilisé aux fins décrites et de la manière décrite dans ce manuel. Si vous utilisez cet instrument d'une autre manière que celle pour laquelle il a été prévu, l'instrument pourrait se comporter de façon imprévisible et entraîner des conséquences dangereuses.

NE JAMAIS utiliser un analyseur de gaz pour échantillonner des gaz combustibles!

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1. OVERVIEW

The Model T200U is a close derivative of the Model T200 NO_x Analyzer. The main differences are as follows.

- The T200U is more sensitive at low NO_x levels than a standard T200. The instrument has a user selectable full scale range of 0-5 PPB to 0-2000 PPB of NO_x.
- The reaction cell is gold plated. In addition, there is a pre-reactor, which allows the measurements of any hydrocarbon interferences in the sample stream.
- The sample flow is 1000 cc/min.
- The T200U is equipped with a high performance pump, capable of producing a reaction cell pressure of less than 5 Inch Hg absolute.

Because the T200U is a close derivative of the T200, the Model T200 instruction manual continues to be valid as the reference manual covering the details of the instrument's components and operation.

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2. SPECIFICATIONS AND AGENCY APPROVALS

PARAMETER	SPECIFICATION
Ranges (Physical Analog Output)	Min: 0-5 ppb Full scale Max 0-2000 ppb Full scale (selectable, independent NO, NO ₂ , NO _x ranges and auto ranging supported)
Measurement Units	ppb, ug/m ³ (user selectable Single, independent or auto ranges)
Noise at Zero ¹	<25 ppt (RMS)
Noise at Span ¹	<0.5% of reading (RMS) above 5 ppb
Lower Detectable Limit ¹	50 ppt (RMS)
Zero Drift ²	<0.1 ppb / 24 hours
Span Drift ²	<0.5% of reading or 50 ppt RMS whichever is greater / 24 hrs
Lag Time ¹	20 seconds
Rise / Fall Time ^{1,3}	<50 sec to 95%
Linearity	1% of full scale or ± 0.1 ppb whichever is greater
Precision	0.5% of reading above 5 ppb
Sample Flow Rate	1100 cm ³ /min ±10%
Power, Analyzer	100V-120V, 60 Hz (62W); 220V-240V, 50 Hz (58W)
Power, Ext Pump	110V-120V, 60 Hz (240W), 220V-240V, 50 Hz (155W)
Analog Output Ranges	All outputs: 10V, 5V, 1V, 0.1V (selectable) Three outputs convertible to 4-20 mA isolated current loop All ranges with 5% under/over range
Recorder Offset	± 10%
Standard I/O	1 Ethernet: 10/100Base-T 2 RS-232 (300 – 115,200 baud) 2 USB device ports 8 opto-isolated digital status outputs (7 defined, 1 spare) 6 opto-isolated digital control inputs (4 defined, 2 spare) 4 analog outputs

PARAMETER	SPECIFICATION
Optional I/O	1 USB com port 1 RS485 8 analog inputs (0-10V, 12-bit) 4 digital alarm outputs Multidrop RS232 3 4-20mA current outputs
Analog Output Resolution	1 part in 4096 of selected full-scale voltage
Temperature Range	5 - 40°C (20-30°C within drift and noise specifications, and operating with EPA equivalency)
Humidity	0-95% RH non-condensing
Hydrocarbon Interference	Propylene rejection ratio > 20,000:1 Ethylene rejection ratio > 40,000:1
Voltage Coefficient	< 0.1% per V
Dimensions H x W x D	7" x 17" x 23.5" (178mm x 432 mm x 597 mm)
Weight, Analyzer	40 lbs (18 kg)
Weight, Ext Pump Pack	21 lbs (9.5 kg)
Environmental ⁴	Installation Category (Over-voltage Category) II, Pollution Degree 2

⁽¹⁾ As defined by the USEPA

⁽²⁾ At constant temperature and voltage

⁽³⁾ With adaptive filter, > 20 ppb change

2.1 EPA Equivalency Designation

Teledyne API's T200U nitrogen oxides analyzer is designated as a reference method, RFNA 1194-099, for NO₂ measurement, as defined in 40 CFR Part 53, when operated under the conditions defined for the T200 analyzer (manual PN 06858), except ambient temperature range and vacuum pump pressure as follows:

- Ambient temperature range of 20 to 30°C.
- Gas flow supplied by External vacuum pump capable of 4 in-Hg-A or less at 1 standard liters per minute (slpm).

2.2 Approvals and Certifications

The Teledyne API Model T200U analyzer was tested and certified for Safety and Electromagnetic Compatibility (EMC). This section presents the compliance statements for those requirements and directives.

2.2.1 SAFETY

IEC 61010-1:2001, Safety requirements for electrical equipment for measurement, control, and laboratory use.

CE: 2006/95/EC, Low-Voltage Directive

North American:

cNEMKO (Canada): CAN/CSA-C22.2 No. 61010-1-04

NEMKO-CCL (US): UL No. 61010-1 (2nd Edition)

2.2.2. EMC

EN 61326-1 (IEC 61326-1), Class A Emissions/Industrial Immunity

EN 55011 (CISPR 11), Group 1, Class A Emissions

FCC 47 CFR Part 15B, Class A Emissions

CE: 2004/108/EC, Electromagnetic Compatibility Directive

2.2.3. OTHER TYPE CERTIFICATIONS

MCERTS: Sira MC 050068/05

For additional certifications, please contact Customer Service.

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3. INSTRUMENT LAYOUT

Figure 3-1 shows the internal chassis layout of the T200U.

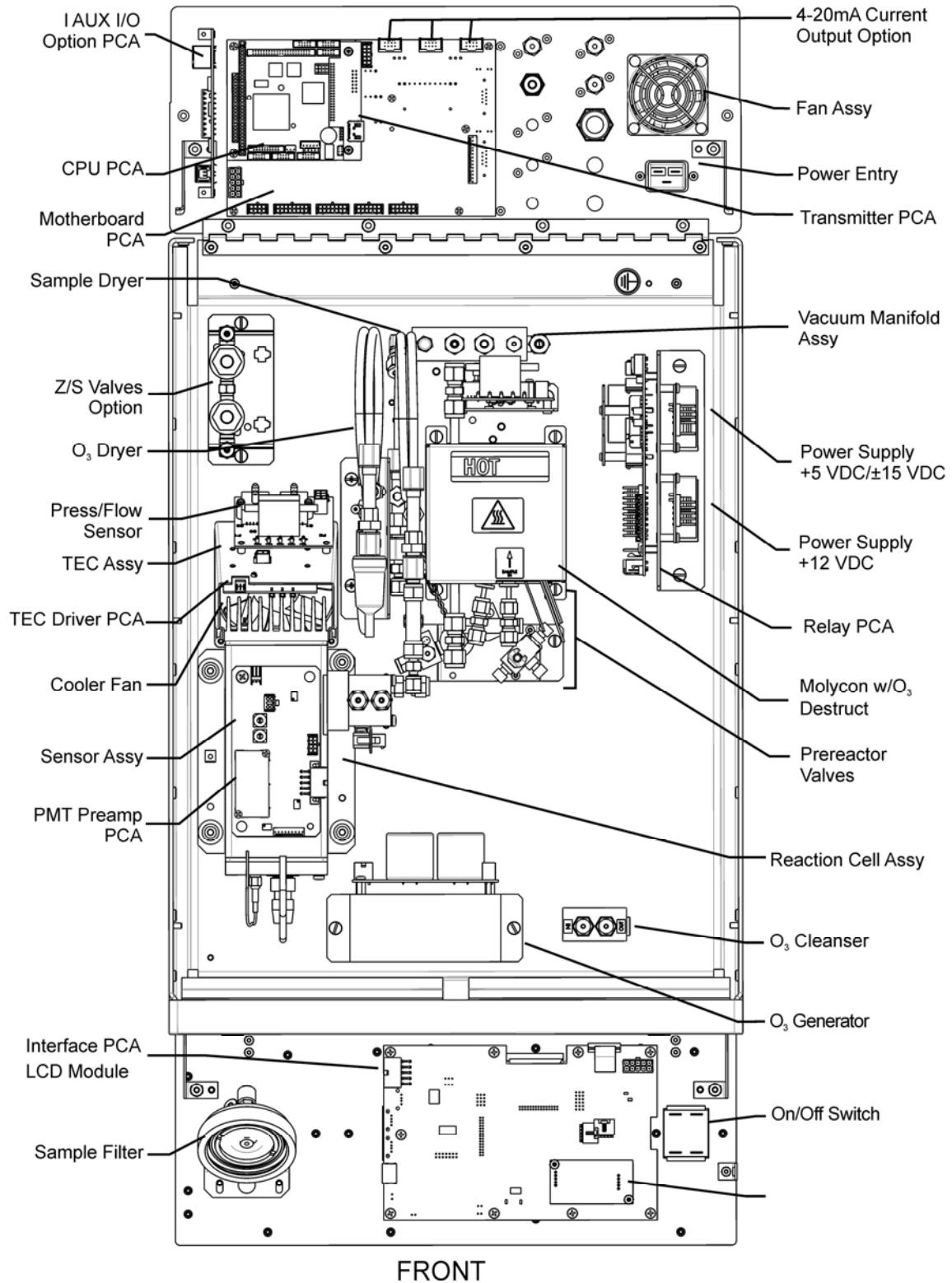


Figure 3-1. T200U Internal Chassis Layout

4. PNEUMATICS

Figure 4-1 shows the internal pneumatics of the T200U in its standard configuration, along with the optional Zero/Span valves. The sample flow is 1000 cc/min.

Also, during Auto Zero mode, the sample gas is routed through a pre-reactor before the mixture goes through the reaction cell. Since the reaction rate constant between NO and ozone is several times faster than the reaction rate constant between hydrocarbons and ozone, this mechanism helps to eliminate the interference effects of hydrocarbons in NO_x measurements.

In addition, the T200U is equipped with a high performance pump, capable of producing a reaction cell pressure of less than 5 Inch Hg absolute.

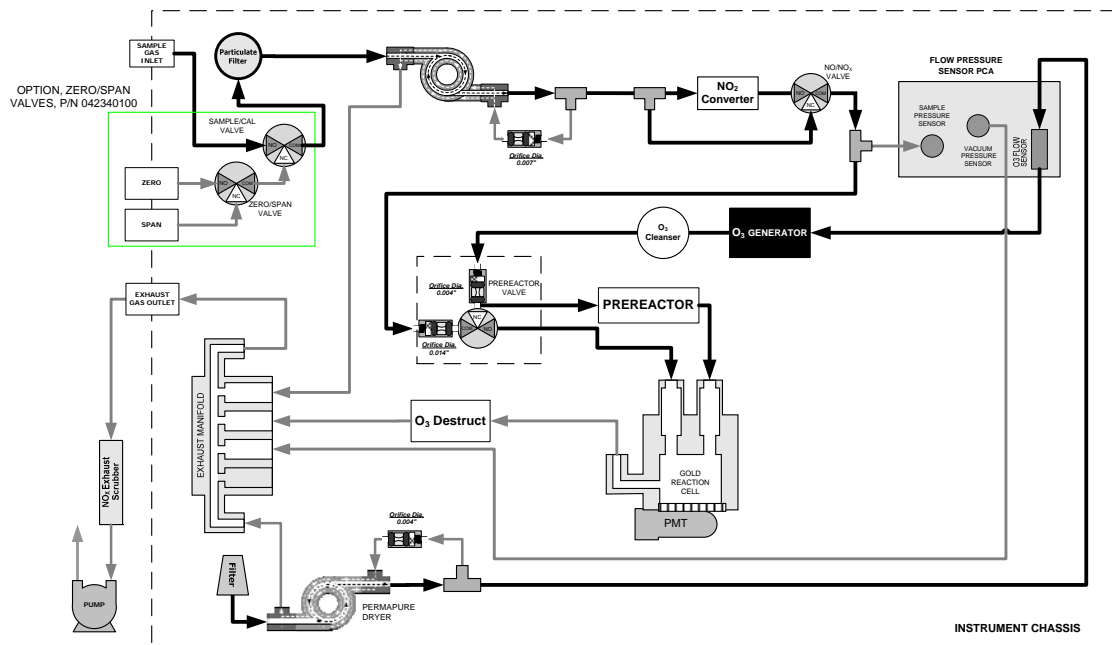


Figure 4-1. T200U Pneumatic Diagram with Zero/Span Option

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5. TEST FUNCTIONS

Some test functions differ between the T200U and the T200. Please refer to Appendix C, this addendum for the test functions in the T200U.

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6. SPARE PARTS LIST

The following pages contain the Spare Parts List and the Recommended Spares Stocking Levels for your analyzer.

Note

Use of replacement parts other than those supplied by TAPI may result in non-compliance with European standard EN 61010-1.

Note

Due to the dynamic nature of spare parts lists, please refer to the Website or call Customer Service for most recent updates.

T200U Spare Parts List
 PN 06848A DCN5809 08/18/2010
 1 of 3 page(s)

Part Number	Description
000940100	CD, ORIFICE, .003 GREEN
000940400	CD, ORIFICE, .004 BLUE
000941100	CD, ORIFICE, .014 ORG/VIOLET
001330001	SLEEVE, GOLD PLATED, NOX
001761800	ASSY, FLOW CTL, 90CC, 1/4" TEE-TMT, B
002270100	AKIT, GASKETS, WINDOW, (12 GASKETS = 1)
002730000	CD, FILTER, 665NM (KB)
004330000	ZERO AIR SCRUBBER (NO/NO2)
005960000	AKIT, EXP, 6LBS ACT CHARCOAL (2 BT=1)
005970000	AKIT, EXP, 6LB PURAFIL (2BT=1)
009690200	AKIT, TFE FLTR ELEM (FL19,100=1) 47mm
009690300	AKIT, TFE FLTR ELEM (FL19, 30=1) 47mm
011310000	ASSY, DRYER, NOX
011630000	HVPS INSULATOR GASKET (KB)
013140000	ASSY, COOLER FAN (NOX/SOX)
014030000	AKIT, NOX EXPENDABLES, IZS
014080200	ASSY, HVPS, NOX
016290000	WINDOW, SAMPLE FILTER, 47MM (KB)
016300900	ASSY, SAMPLE FILTER, 47MM, ANG BKT, 5UM
024600100	ASSY, PREREACTION NO/NOX VALVE
024930000	CD, PMT, NOX
037860000	ORING, TEFLON, RETAINING RING, 47MM (KB)
039700100	HEATER, BAND, TYPE K, DUAL VOLTAGE(KB)
040010000	ASSY, FAN REAR PANEL
040030800	PCA, PRESS SENSORS (2X), FLOW, (NOX)
040400000	ASSY, HEATERS/THERMAL SWITCH, RX CELL
040410500	ASSY, VACUUM MANIFOLD
040420200	ASSY, O3 GEN BRK, HIGH-O/P
041510200	ASSY, PRESS/FLOW SENSOR, NOX
041800300	PCA, PMT PREAMP, (OBS)
041800600	PCA, PMT PREAMP, VR,
041920000	ASSY, THERMISTOR
042340100	OPTION, ZERO/SPAN VALVES, (KB)
042680100	ASSY, VALVE (SS)
043420000	ASSY, HEATER/THERM, O2 SEN
044340000	ASSY, HTR, BYPASS MANIFOLD
044540000	ASSY, THERMISTOR, NOX
044600000	AKIT, SPARES, NOX
045230100	PCA, RELAY CARD
045230200	PCA, RELAY CARD
045430000	ASSY, DRYER, O3, W/RELAYS & BRKT *
04550010A	ASSY, ORIFICE HOLDER, 4 MIL
04550030A	ASSY, ORIFICE HOLDER, 10 MIL, (NOX) (KB)
045500400	ASSY, ORIFICE HOLDER, 3 MIL

T200U Spare Parts List
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Part Number	Description
046030000	AKIT, CH-43, 3 REFILLS
046480000	ASSY, DILUTION MANIFOLD, (KB)
046490000	OPTION, DILUTION MANIFOLD (KB)
047150000	AKIT, EXPENDABLES, NOX
049310100	PCA,TEC DRIVER,PMT,(KB)
049760300	ASSY, TC PROG PLUG, MOLY,TYP K, TC1
050700200	KIT, RELAY BD NOX CONFIGURATION
051210000	DESTRUCT w/FTGS, O3 *
051990000	ASSY, SCRUBBER, INLINE EXHAUST, DISPOS
052820000	ASSY, IZS, HEATER/THERM, NOX
052930200	ASSY, BAND HEATER TYPE K, NOX
055300000	AKIT, PUMP REBUILD, THOMAS 2688, DUAL HD
055740000	ASSY, PUMP, NOx PUMP PACK, 115V/60HZ
055740100	ASSY, PUMP, NOx PUMP PACK, 220V/60HZ
055740200	ASSY, PUMP, NOx PUMP PACK, 220V/50HZ
056490000	FILTER, DFU, DESORBER (SOAKED)
058021100	PCA, E-SERIES MOTHERBD, GEN 5-ICOP (ACCEPTS ACROSSER OR ICOP CPU)
058230000	ASSY, O3 CLEANSER, ALUMINUM
059940000	OPTION, SAMPLE GAS CONDITIONER, NOX*
062390000	ASSY, MOLY GUTS w/WOOL
062420200	PCA, SER INTRFACE, ICOP CPU, E- (OPTION) (USE WITH ICOP CPU 062870000)
064540000	ASSY, PUMP NOX INTERNAL, 115V/60HZ
064540100	ASSY, PUMP NOX INTERNAL, 230V/60HZ
064540200	ASSY, PUMP NOX INTERNAL, 230V/50HZ
066970000	PCA, INTRF. LCD TOUCH SCRNM, F/P
067240000	CPU, PC-104, VSX-6154E, ICOP *
067300000	PCA, AUX-I/O BD, ETHERNET, ANALOG & USB
067300100	PCA, AUX-I/O BOARD, ETHERNET
067300200	PCA, AUX-I/O BOARD, ETHERNET & USB
067900000	LCD MODULE, W/TOUCHSCREEN
068250100	DOM, w/SOFTWARE, T200U *
068810000	PCA, LVDS TRANSMITTER BOARD
069500000	PCA, SERIAL & VIDEO INTERFACE BOARD
072150000	ASSY. TOUCHSCREEN CONTROL MODULE
072820000	KIT, T200U MANUAL
CN0000073	POWER ENTRY, 120/60 (KB)
FL0000001	FILTER, SS
FL0000003	FILTER, DFU (KB)
FM0000004	FLOWMETER (KB)
FT0000010	CONNECTOR-ORING, SS, 1/8" (HK)
HW0000005	FOOT
HW0000020	SPRING
HW0000030	ISOLATOR
HW0000036	TFE TAPE, 1/4" (48 FT/ROLL)
HW0000099	STANDOFF, #6-32X.5, HEX SS M/F
HW0000101	ISOLATOR

T200U Spare Parts List
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Part Number	Description
HW0000453	SUPPORT, CIRCUIT BD, 3/16" ICOP
KIT000051	AKIT, REBUILD, RX CELL AMBIENT
KIT000095	AKIT, REPLACEMENT COOLER
KIT000115	OPTION, SAMPLE GAS COND, (KB)
KIT000156	OPTION, CARRYING HANDLE
KIT000253	ASSY & TEST, SPARE PS37
KIT000254	ASSY & TEST, SPARE PS38
OR0000001	ORING, 2-006VT *(KB)
OR0000002	ORING, 2-023V
OR0000025	ORING, 2-133V
OR0000027	ORING, 2-042V
OR0000034	ORING, 2-011V FT10
OR0000039	ORING, 2-012V
OR0000044	ORING, 2-125V
OR0000046	ORING, 2-019V
OR0000083	ORING, 105M, 1MM W X 5 MM ID, VITON
OR0000086	ORING, 2-006, CV-75 COMPOUND(KB)
OR0000094	ORING, 2-228V, 50 DURO VITON(KB)
PU0000047	PUMP, THOMAS 2688VE44, 2 HEAD, 115V/60HZ
PU0000048	PUMP, THOMAS 2688VGH144, 230V 50/60HZ CE
PU0000083	KIT, REBUILD, PU80, PU81, PU82
RL0000015	RELAY, DPDT, (KB)
SW0000025	SWITCH, POWER, CIRC BREAK, VDE/CE *
WR0000008	POWER CORD, 10A(KB)

Appendix C
Warranty/Repair Questionnaire
T200U/UP and M200EU/EUP
 (06863B, DCN6247)



CUSTOMER: _____ PHONE: _____

CONTACT NAME: _____ FAX NO. _____

SITE ADDRESS: _____

MODEL SERIAL NO.: _____ FIRMWARE REVISION: _____

1. ARE THERE ANY FAILURE MESSAGES? _____

PLEASE COMPLETE THE FOLLOWING TABLE: (NOTE: *DEPENDING ON OPTIONS INSTALLED, NOT ALL TEST PARAMETERS SHOWN BELOW WILL BE AVAILABLE IN YOUR INSTRUMENT*)

*IF OPTION IS INSTALLED

PARAMETER	RECORDED VALUE	ACCEPTABLE VALUE
RANGE	PPB	50 PPB TO 2,000 PPB
NO _x STAB	PPB	≤ 0.1 PPB WITH ZERO AIR
SAMPLE FLOW	CM ³	1,000 ± 100
OZONE FLOW	CM ³	80 ± 15
PMT SIGNAL WITH ZERO AIR	MV	-20 TO 150
PMT SIGNAL AT SPAN GAS CONC	MV PPB	0-5,000MV 0-2,000 PPB
NORM PMT SIGNAL AT SPAN GAS CONC	MV PPB	0-5,000MV 0-2,000PPB
PREREACTION	MV	-20 TO 150
HVPS	V	400 – 900
RCELL TEMP	°C	40 ± 1
BOX TEMP	°C	AMBIENT ± 5°C
PMT TEMP	°C	5 ± 2°C
MF TEMP	°C	40 ± 1°C
U/EU models only: MOLY TEMP	°C	315 ± 5°C
UP/EUP models only: O3KL TEMP	°C	200 ± 5°C
RCEL PRESS	IN-HG-A	<4" (CONSTANT)
SAMP PRESS	IN-HG-A	~ 1-5" < AMBIENT (CONSTANT)
NO _x SLOPE		1.0 ± 0.3
NO _x OFFSET		-50 TO 50
NO SLOPE		1.0 ± 0.3
NO OFFSET		-50 TO 50
ETEST	PMT MV	2000 ± 1000
OTEST	PMT MV	2000 ± 1000
Values are in the Signal I/O		
REF_4096_MV	MV	4096mv ±2mv and Must be Stable
REF_GND	MV	0± 0.5 and Must be Stable

TELEDYNE API CUSTOMER SERVICE

EMAIL: api-customerservice@teledyne.com

PHONE: (858) 657-9800 TOLL FREE: (800) 324-5190 FAX: (858) 657-9816

Appendix C
Warranty/Repair Questionnaire
T200U/UP and M200EU/EUP
(06863B, DCN6247)



2. WHAT ARE THE RCELL & SAMPLE PRESSURES WITH THE SAMPLE INLET ON REAR OF MACHINE CAPPED?

RCELL PRESS - _____ IN-HG-A SAMPLE PRESSURE - _____ IN-HG-A

3. WHAT ARE THE FAILURE SYMPTOMS? _____

4. WHAT TEST(S) HAVE YOU DONE TRYING TO SOLVE THE PROBLEM? _____

5. IF POSSIBLE, PLEASE INCLUDE A PORTION OF A STRIP CHART PERTAINING TO THE PROBLEM. CIRCLE PERTINENT DATA.

THANK YOU FOR PROVIDING THIS INFORMATION. YOUR ASSISTANCE ENABLES TELEDYNE API TO RESPOND FASTER TO THE PROBLEM THAT YOU ARE ENCOUNTERING.