# ADDENDUM

# *MODEL T700U CALIBRATOR*

**(Addendum to the T700 Operation Manual, P/N 06873)**

**© TELEDYNE API**
**9970 CARROLL CANYON ROAD**
**SAN DIEGO, CA 92131-1106**

| | |
|---|---|
| **Toll-free Phone:** | **800-324-5190** |
| **Phone:** | **+1 858-657-9800** |
| **Fax:** | **+1 858-657-9816** |
| **Email:** | **api-sales@teledyne.com** |
| **Website:** | **http://www.teledyne-api.com/** |




06876C DCN7095
22 May 2015

# 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:**

**Telephone: 800-324-5190**

**Email: sda_techsupport@teledyne.com**

**or by accessing various service options on our website at http://www.teledyne-api.com/**

This page intentionally left blank.

# ABOUT THIS MANUAL

This manual is intended for use in conjunction with the Model T700 Dynamic Dilution Calibrator Operation Manual, part number 06873.

# REVISION HISTORY

| Date | Rev | DCN | Change Summary |
|---|---|---|---|
| 2015 May 22 | C | 7095 | Administrative updates |
| 2012 May 08 | B | 6403 | Specifications and AUTO mode |
| 2010 October 06 | A | 5858 | Initial Release |

This page intentionally left blank.

# CONTENTS



# LIST OF FIGURES

This page intentionally left blank.

# 1. OVERVIEW

This addendum supplements the T700 Operation Manual, PN 06873, with details specific to the operation of the T700U calibrator. The T700U is a modified version of the T700 calibrator, equipped with a special ozone generator capable of producing stable ozone concentrations for Gas Phase Titration (GPT) calibrations and Ozone generation at much lower levels than the standard T700.

# 2. T700U SPECIFICATIONS

**Table 2-1: Dilution System**

| Parameter | Specification |
|---|---|
| Flow Measurement Accuracy | ± 1.0% full Scale |
| Repeatability of Flow Control | ± 0.2% full Scale |
| Linearity of Flow Measurement | ± 0.5% full Scale |
| Flow Range of Diluent Air | 0 to 10 SLPM |
| Flow Range of Cylinder Gases | 0 to 200 cc/min |
| Zero Air Required | 10 SLPM @ 30 psi Optional: 20 SLPM @ 30 psi |
| CAL Gas Input Ports | 4 (configurable) |
| Diluent Gas Input Ports | 1 |

**Table 2-2: $NO_2$ Generation (GPT modes)**

| Parameter | Specification |
|---|---|
| Minimum Output | 20 ppb LPM |
| Minimum Concentration: | 3 ppb |
| Precision | ± 2.0% (with GPTPS) |

**Table 2-3: Ozone Generator Module**

| Parameter | Specification |
|---|---|
| Maximum Output | 6 ppm LPM |
| Minimum Output | 20 ppb LPM |
| Minimum Ozone Concentration | 3ppb |
| Response Time | 180 seconds to 98% |
| Optical Feedback | Standard |

**Table 2-4: UV Photometer Option**

| Parameter | Specification |
|---|---|
| Range | 100 ppb to 10 ppm (selectable) |
| Precision | 1.0 ppb |
| Linearity | 1.0% of reading |
| Rise/Fall Time | <20 seconds (photometer response) |
| Response Time | 180 seconds to 95% (system response) |
| Zero Drift | <1.0 ppb / 24 hours |

**Table 2-5: Electrical and Physical Specifications**

| Parameter | Specification | |
|---|---|---|
| AC Power | Rating | Typical Power Consumption |
| | 100-240 V~ 50/60 Hz, 1.5 A | 115 V: 76 W 230 V: 80 W |
| Analog Outputs | 1 user configurable output | |
| Analog Output Ranges (Test Channel) | 10V, 5V, 1V, 0.1V (selectable) | |
| Analog Output Resolution | 1 part in 4096 of selected full-scale voltage (12 bit) | |
| Standard I/O | 1 Ethernet: 10/100Base-T<br>2 RS-232 (300 – 115,200 baud)<br>2 USB device ports<br>8 digital control outputs<br>12 digital control inputs<br>8 digital status outputs | |
| Optional I/O | 1 USB com port<br>1 RS485<br>Multidrop RS232 | |
| Operating Temperature Range | 5-40ºC | |
| Humidity Range | 0 - 95% RH, non-condensing | |
| Environmental | Installation Category (Over Voltage Category ) II<br>Pollution Degree 2<br>Intended for Indoor Use Only at Altitudes ≤ 2000m | |
| Dimensions (H x W x D) | 7” x 17” x 24” (178 mm x 432 mm x 609 mm) | |
| Weight | 31 lbs (14.06 kg);<br>39.2 lbs (17.78 kg) with optional photometer, GPT, and $O_3$ generator | |

# 3. OPERATIONAL MODES

The new T700U ozone generator is designed to operate in two modes: a high range mode, which gives similar performance as a standard T700 ozone generator, and a low range, or "fractional" mode for producing low levels of ozone during a GPT calibration.

The low range mode is supported in the following T700U Generation modes:

- AUTO (when generating ozone)
- GPTPS
- GPT
- GPTZ (accessed from the GEN menu, see the T700 operator's manual for more details.)

The selection of low range generator operation is made automatically by the T700U software, based on the $O_3$ concentration and total flow specified. For $O_3$ output < 500 PPB • L PM, the low range operation is invoked.

## 3.1. AUTO

The AUTO mode can be used to generate ozone as a calibration gas for performing calibrations and calibration checks on ambient ozone analyzers.

When generating very low levels of ozone, care must be taken to ensure that the concentration-flow product is kept above the 20 ppb*LPM minimum value. This value is the target concentration (in ppb) multiplied by the total flow value.

Example: To determine the minimum flow rate required to generate 3 ppb:

3 ppb * X LPM > 20 ppb*LPM

Or

X LPM > (20 ppb * LPM) / (3 ppb) = 6.7 LPM

Therefore, the flow rate should be a minimum of 6.7 LPM to generate 3 ppb.

These equations can be used to determine the minimum flow rate for any desired concentration.

# 3.2. GPTPS (GPT PRE-SET)

The GPTPS mode is used to fine-tune the ozone generator calibration to improve the accuracy of the $O_3$ concentration during a subsequent GPT. This function is only available if the optional $O_3$ photometer is installed in the instrument.

During a GPTPS calibration, the internal photometer is used to measure the $O_3$ output and the $O_3$ GEN DRIVE value is adjusted to achieve the specified $O_3$ concentration. Once the concentration has stabilized (as indicated by the ACTIVE led switching from a blinking state to a constant on state), the instrument will store the updated $O_3$ GEN DRIVE value for later use when performing an actual GPT.

The following parameters must be entered for GPTPS:

| Parameter | Definition | Notes |
|---|---|---|
| NO Concentration (ppb) | NO concentration that will be used in subsequent GPT | During the GPTPS, there is no NO gas generated. Instead, zero air is allowed to flow through the cal gas MFC at the same flow-rate that will be used during the GPT. |
| $O_3$ Concentration | $O_3$ concentration target | |
| Total Flow | Total output flow rate for subsequent GPT | The Total Flow parameter is used to calculate the Diluent flow required as follows: Diluent flow = Total Flow – $O_3$ Gen Flow – NO Cal Gas Flow |

The parameters entered for the GPTPS should be identical to the parameters that will be entered for the GPT. If a multi-point GPT is to run, then a separate GPTPS should be run for each $O_3$ concentration point.

## 3.2.1. GPTPS FREQUENCY

The GPTPS is an optional function used to increase the accuracy of the $O_3$ concentrations during a GPT. The GPTPS function is not required to be performed before each GPT; however, doing so will provide the best $O_3$ accuracy possible. If somewhat less precision can be tolerated from one GPT calibration to the next, then the GPTPS function can be run less frequently. The operator will need to determine the appropriate frequency based on their requirements.

# 3.3. GPTZ (GPT ZERO)

The GPTZ mode is used for obtaining the baseline NO and $NO_X$ readings for calculating the NOx converter efficiency. These readings are referred to as $[NO]_{orig}$ and $[NO_X]_{orig}$ , respectively in the EPA calibration guidelines. (1), (2)

During GPTZ, NO gas is generated in the same manner as a GPT calibration, except that the $O_3$ generator lamp is un-energized, thus producing no $O_3$. This allows accurate measurement of the baseline NO and $NO_X$ readings from the instrument under test.

## 3.3.1. GPTZ VS. AUTO GENERATION MODES

It may appear that the GPTZ and AUTO Generation modes are performing the same function: generating NO cal gas at a specified concentration and flow rate. However, there is an important difference in the flow configuration of these two modes.

In GPTZ mode, the total flow includes flow from the (un-energized) $O_3$ generator. This flow is not directly measured by the calibrator. The $O_3$ generator flow is measured at the factory and programmed into the T700U and assumed to be constant thereafter. Since pressure and temperature changes between the factory cal and the customer's ambient conditions cannot be accounted for, there may be small discrepancies between the actual $O_3$ generator flow and the assumed flow that is used in the dilution calculations that the T700U performs. Since these small flow discrepancies are present in both the GPTZ and GPT modes, they do not affect the accuracy of the converter efficiency calculations.

For the best overall dilution accuracy, for span calibrations for instance, the AUTO mode should still be used.

## 3.3.2. GPT

The GPT mode is used for performing the actual NO + $O_3$ titration used to produce the NO2 test gas. This mode allows for the measurement of the $[NO]_{rem}$ and $[NO_x]_{rem}$ readings referred to in the EPA calibration guidelines (1), (2).

# 4. GPT SETUP

Careful consideration must be given to the various parameters involved in the setup of a GPT calibration, such as total flow, NO flow, NO concentration, $O_3$ concentration and NO gas bottle concentration.

These guidelines assume that the user has already established the target $O_3$ and NO concentrations based on other criteria.

# 4.1. FLOW SETUP

The following requirements should be used for determining total flow:

- Instrument's Flow Demand

  The number and flow rate requirements of the instruments sampling from the output of the calibrator. The flow demand of all instruments connected to the test manifold, even those not directly involved in the testing, must be taken into account. The minimum output flow rate should be calculated as the sum of all instrument demand flows plus 10% minimum excess. (1)

- Target $O_3$ Concentration

  The output flow must be chosen to keep the $O_3$ generator output above the minimum specification of 20 PPB □LPM. The minimu
  then be calculated using the following equation:

$$F_T \geq \frac{20\,ppb \bullet LPM}{O_3 Conc}$$

- NO Flow Requirements

  To achieve a reasonable response time during the GPT and to satisfy the EPA requirement(1) (2) that the residence time in the GPT reaction chamber be less than two minutes, the NO flow rate should be **greater than 45 cc/min**. Therefore, larger dilution flows may be required to achieve low concentrations of NO. An appropriate NO gas bottle concentration must be used in order to achieve this flow rate.

# 4.2. EXAMPLE GPT SEQUENCE

The following example shows the steps performed for a typical GPT calibration using the T700U. Note that this example assumes that a zero and span calibration has already been performed on the $NO_X$ analyzer per EPA guidelines [1].

**Gas Bottle: 1.0 PPM NO**

| Step | Generation Mode | | Notes | Values Obtained for Converter Efficiency Calculations [1] |
|---|---|---|---|---|
| **1** | **GEN-GPTPS** | | Optional step. Used to increase the accuracy of the $O_3$ concentration during GPT generation mode. | N/A |
| | NO Conc | 10 PPB | | |
| | $O_3$ Conc | 8 PPB | | |
| | Total Flow | 8 SLPM | | |
| | Target NO Flow (calculated by T700U) | 80 SCCM | | |
| **2** | **GEN-AUTO-ZERO** | | Optional step. Used to verify zero calibration of $NO_X$ analyzer. | N/A |
| | Total Flow | 8 SLPM | | |
| **3** | **GEN-AUTO-GPT** | | Produces $NO_2$ test gas using GPT with the ozone generator ON. The $O_3$ lamp drive value is used from the previous GPTPS. | $[NO]_{rem}$, $[NO_x]_{rem}$ |
| | NO Conc | 10 PPB | | |
| | $O_3$ Conc | 8 PPB | | |
| | Total Flow | 8 SLPM | | |
| | Target NO Flow (calculated by T700U) | 80 SCCM | | |
| **4** | **GEN-AUTO-GPTZ** | | Delivers NO gas only for determining baseline (“orig”) NO and $NO_X$ values. Ozone generator is OFF. | $[NO]_{orig}$, $[NO_x]_{orig}$ |
| | NO Conc | 10 PPB | | |
| | $O_3$ Conc | 8 PPB | | |
| | Total Flow | 8 SLPM | | |
| | Target NO Flow (calculated by T700U) | 80 SCCM | | |

# 5. TYPICAL $NO_X$ ANALYZER RESPONSE

The chart below shows the typical response of a low level $NO_X$ analyzer, such as a T200U, when subjected to the GPT sequence described above.

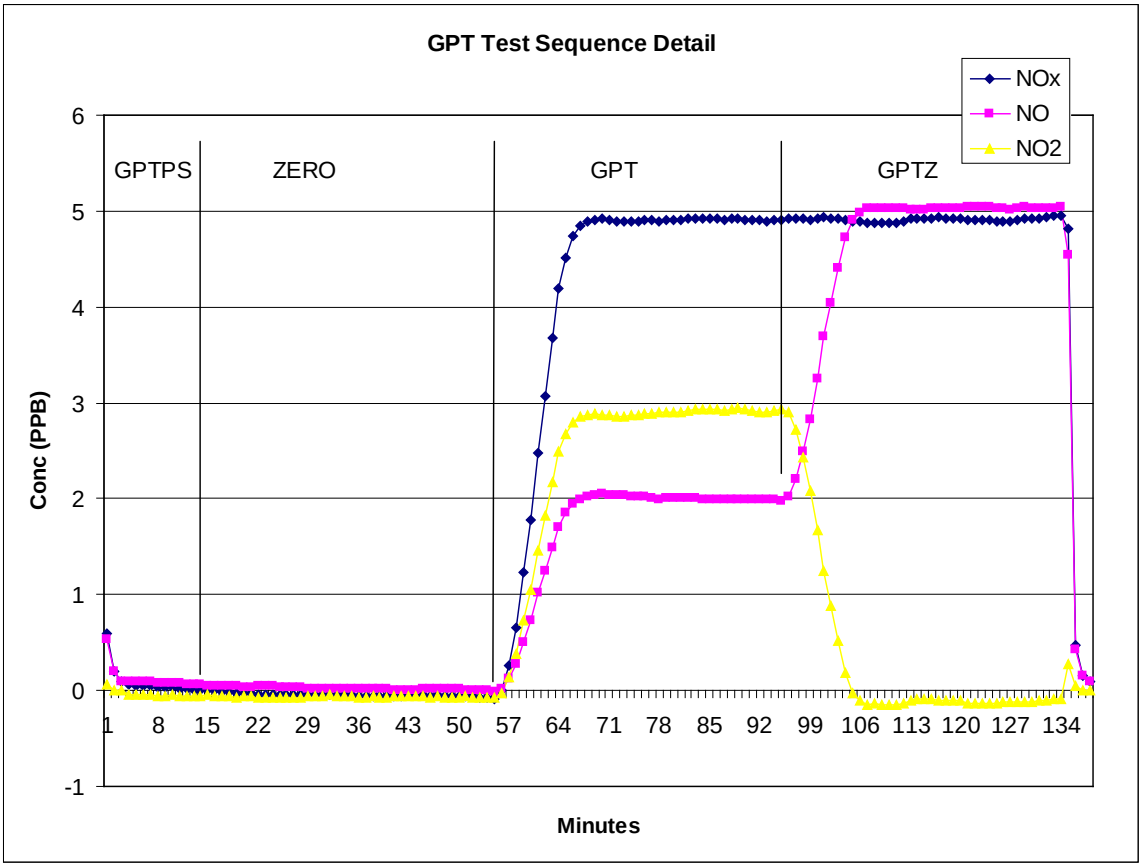


**Figure 1. $NO_X$ Analyzer Typical Response to GPT Test Sequence**

# 6. PNEUMATIC DIAGRAMS

The pneumatic diagrams shown below can be used as an aid for troubleshooting.

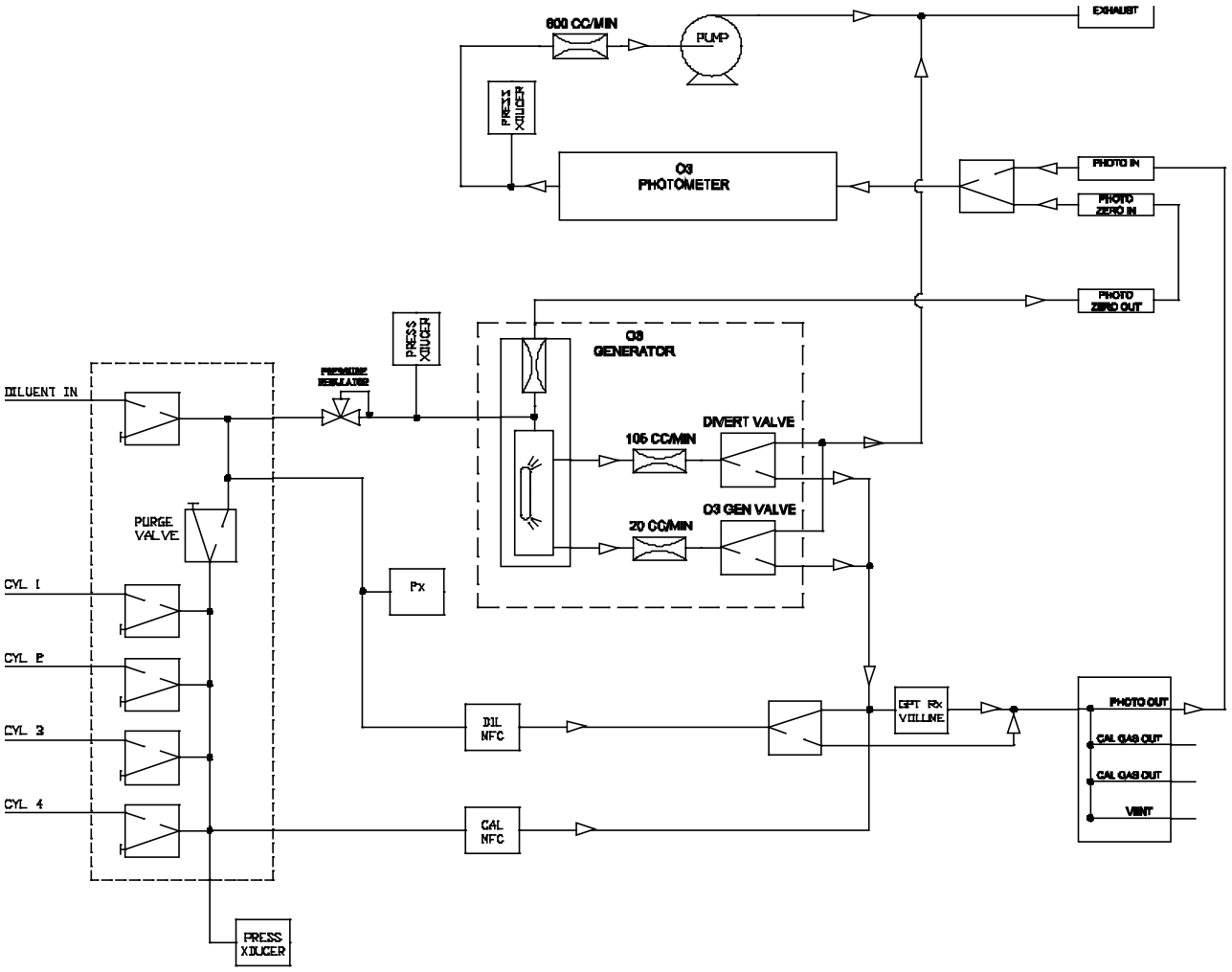


**Figure 2. T700U Pneumatic Diagram, Base Configuration**

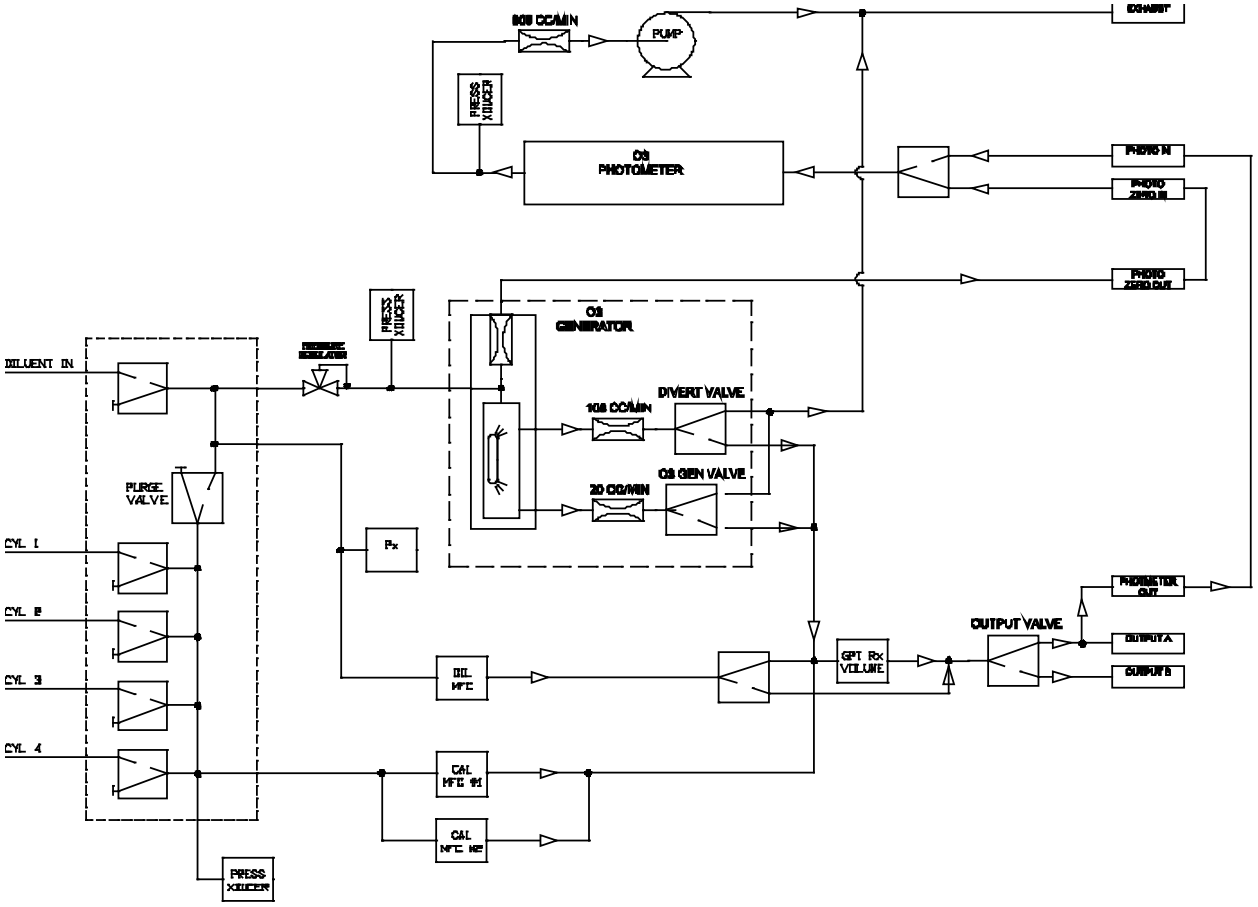


**Figure 3. T700U Pneumatic Diagram, with Dual Output and Three MFC Options**

# 7. REFERENCES

1. 40 CFR part 50 Appendix F, “Measurement Principle and Calibration Procedure for the Measurement of Nitrogen Dioxide in the Atmosphere (Gas Phase Chemiluminescence)”
2. E. C. Ellis, “Technical Assistance Document for the Chemiluminescence Measurement of Nitrogen Dioxide,” EPA-E600/4-75-003, Environmental Monitoring and Support Laboratory, Research Triangle Park, NC 27711.

# APPENDIX A - Menu Trees

**Please refer to Appendix A of the T700 manual.**

This page intentionally left blank.

# T700U Spare Parts List

PN06853B DCN6014 03/10/2011



| Part Number | Description |
|---|---|
| 000940100 | ORIFICE, 3 MIL, 03 GEN |
| 003290000 | THERMISTOR, BASIC (VENDOR ASSY)(KB) |
| 006120100 | ASSY, UV LAMP, OZONE GENERATOR |
| 014540300 | CONTROLLER, MFC, HFC-212, 100SCCM * |
| 014550300 | CONTROLLER, MFC, HFC-212, 10 SLM * |
| 014570100 | ASSY, INLET MANIFOLD, (KB) |
| 014900000 | ASSY, GPT |
| 016590100 | ASSY, GPT VALVE |
| 022710000 | ABSORPTION TUBE, QUARTZ, (KB) |
| 024710000 | ASSY, TUBING, CLEAR FEP 1/8" (TU1), 6FT |
| 024720000 | ASSY, TUBING, (B/F) TU0000002, 6FT |
| 024730000 | ASSY, TUBING, TU0000005, 6FT |
| 024750000 | ASSY, TYGON TUBING (B/F) TU0000009, 6FT |
| 040010000 | ASSY, FAN REAR PANEL |
| 040030500 | PCA, PRESS SENSORS (2X) |
| 040030600 | PCA, PRESS SENSORS (1X), OZONE OPT |
| 041200000 | PCA, DET PREAMP w/OP20 |
| 041200200 | PCA, DET PREAMP w/OP20 |
| 041240001 | MANIFOLD, DETECTOR, (KB) |
| 041270000 | LAMP BLOCK, (KB) |
| 041280000 | LAMP SPACER, (KB) |
| 041300000 | EXAUST MANIFOLD, (KB) |
| 041440000 | PCA, DC HEATER/TEMP SENSOR, OPTICAL BENCH |
| 041660100 | PCA, UV LAMP P/S, O3 GEN, * |
| 042010000 | ASSY, SAMPLE THERMISTOR |
| 045230100 | PCA, RELAY CARD |
| 046740000 | ASSY, PUMP, 12VDC (OP63) |
| 048190300 | ASSY, RELAY/PS, CAL |
| 049290000 | CLIP, THERMISTOR HOLDER |
| 050490000 | ASSY, O3 GENERATOR W/BRKT & REG |
| 050500000 | ASSY, O3 GENERATOR, 5LPM |
| 052400000 | ASSY, BENCH UV LAMP, (BIR), CR * |
| 052910200 | ASSY, OPTICAL BENCH, CAL |
| 054690000 | PCA, VALVE DRIVER, M700E |
| 055020000 | ASSY, INLET MANIFOLD W/PCA |
| 055210000 | OPTION, PHOTOMETER |
| 055220000 | ASSY, VALVE, PHOTOMETER |
| 055240000 | OPTION, OZONE, CAL (KB) |
| 055270000 | ASSY, EXHAUST MANIFOLD, (KB) |
| 055560000 | ASSY, VALVE, VA59 W/DIODE, 5" LEADS |
| 056440000 | ASSY, VALVE (VA23) |
| 056450000 | ASSY, VALVE (VA32) |
| 056970000 | PCA, EXT O/P ADPTR, LDS, (OPT) |
| 057230000 | PCA, SINGLE VALVE DRIVER (OPTION) |

# T700U Spare Parts List

PN06853B DCN6014 03/10/2011



| Part Number | Description |
|---|---|
| 057360000 | ASSY, 3/8" VENT ADAPTER |
| 057400001 | FRONT FERRULE,SS,1/4",SILCOSTEEL |
| 057520001 | FRONT FERRULE,SS, 1/8",SILCOSTEEL |
| 057630000 | ASSY, DUAL OUTPUT VALVE |
| 058021400 | PCA, E-SERIES MTHRBRD, M700E, GEN 5-I (ACCEPTS ACROSSER OR ICOP CPU) |
| 058430001 | FT 40 FITTING BODY, SILCOSTEEL COATED |
| 058440001 | FT 36 FITTING BODY, SILCOSTEEL COATED |
| 060340001 | FT 85 FITTING BODY, SILCOSTEEL COATED |
| 061630000 | ASSY, FILTER, DFU, DESORBER (SOAKED) |
| 063110000 | PCA, DC HEATER/THERM, 100W |
| 064130000 | ASSY, DC HEATER/THERM PCA, O3 GEN |
| 066970000 | PCA, INTRF. LCD TOUCH SCRN, F/P |
| 067240000 | CPU, PC-104, VSX-6154E, ICOP *(KB) |
| 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(KB) |
| 068300100 | DOM, w/SOFTWARE, STD, T700U * |
| 068810000 | PCA, LVDS TRANSMITTER BOARD |
| 069500000 | PCA, SERIAL & VIDEO INTERFACE BOARD |
| 072150000 | ASSY. TOUCHSCREEN CONTROL MODULE |
| 072860000 | KIT, T700U MANUAL |
| CN0000073 | POWER ENTRY, 120/60 (KB) |
| CN0000458 | CONNECTOR, REAR PANEL, 12 PIN |
| CN0000520 | CONNECTOR, REAR PANEL, 10 PIN |
| CN0000640 | CONNECTOR, REAR PANEL, 14 PIN |
| FM0000004 | FLOWMETER (KB) |
| FM0000007 | REGULATOR, PRESSURE, 0-30PSI(KB) |
| FT0000013 | CONNECTOR-M, T, 1/8" (KB) |
| FT0000036 | TEE-TTT, SS, 1/4" (HK) |
| FT0000040 | UNION, BULKHEAD, SS, 1/4" (HK) |
| FT0000056 | TEE-TTT, SS, 1/8" (HK) |
| FT0000085 | PORT CONNECTOR, SS, 1/4" (HK) |
| FT0000134 | BLKHD, UNION, REDUCING, SS, 1/4-1/8 (HK |
| FT0000151 | UNION, CROSS, TFE, 2-1/4", 2-1/8" KB |
| FT0000192 | ELBOW, B, 1/8 X 1/4 TUBING |
| FT0000278 | FEMALE COUPLING, 10-32, BRASS |
| FT0000279 | HEX EXTENSION, B, 10-32 M-F |
| FT0000321 | PORT CONNECTOR, SS, 1/8" (HK) |
| FT0000332 | FITTING, 9 MIL, ZERO AIR FLOW |
| FT0000364 | .003 ORIFICE, 10-32 X 10-32 W/ORING, BRA |
| FT0000429 | ORIFICE, BARB, SS, 0.012" |
| HW0000005 | FOOT |
| HW0000120 | SHOCKMOUNT, GROMMET ISOLATOR |
| HW0000149 | SEALING WASHER, #10 |
| HW0000327 | HEATSINK CLIP, TO-220 |

# T700U Spare Parts List

PN06853B DCN6014 03/10/2011



| Part Number | Description |
|---|---|
| HW0000328 | INSULATING THERMAL PAD, TO-220 |
| HW0000356 | PAD, THERMAL, TO-220, W/ ADHV |
| HW0000453 | SUPPORT, CIRCUIT BD, 3/16" ICOP |
| KIT000253 | ASSY & TEST, SPARE PS37 |
| KIT000289 | AKIT, UV LAMP P/S PCA, 041660100 |
| KIT000290 | AKIT, UV LAMP P/S PCA, 041660500 |
| OP0000014 | LAMP WINDOW, OPTICAL BENCH |
| OP0000031 | WINDOW, OPTICAL BENCH & OZONE GEN FEEDBACK |
| OR0000001 | ORING, SAMPLE FLOW & OZONE GENERATOR |
| OR0000013 | ORING, 2-112V |
| OR0000026 | ORING, ABSORPTION TUBE |
| OR0000039 | ORING, OPTICAL BENCH & OZONE GEN FEEDBACK |
| OR0000046 | ORING, 2-019V |
| OR0000048 | ORING, OZONE GEN UV LAMP |
| OR0000077 | ORING, 2-018V |
| OR0000089 | ORING, OPTICAL BENCH |
| PS0000039 | PS, SWITCHING, 12V/7.5A (KB) |
| PS0000040 | PS,EXT,AC/DC (90-264V/47-63HZ),12V/3.75A |
| SW0000025 | SWITCH, POWER, CIRC BREAK, VDE/CE *(KB) |
| WR0000008 | POWER CORD, 10A(KB) |

This page intentionally left blank.

| Appendix C<br>Warranty/Repair<br>Questionnaire<br>T700U, M700EU<br>(06878B, DCN7095) | TELEDYNE<br>ADVANCED POLLUTION INSTRUMENTATION<br>Everywhereyoulook™ |
|---|---|

CUSTOMER: _____ PHONE: _____

CONTACT NAME: _____ FAX NO. _____

SITE ADDRESS: _____

MODEL TYPE: _____ SERIAL NO.: _____ FIRMWARE REVISION: _____

Are there any failure messages? _____

PLEASE COMPLETE THE FOLLOWING TABLE (Depending on options installed, not all test parameters shown will be available in your calibrator):

| PARAMETER | RECORDED VALUE | ACCEPTABLE VALUE |
|---|---|---|
| A-CAL | LPM* | TARG CAL ± 1% |
| T-CAL | LPM* | 0.001 – 0.100 SLPM |
| A-DIL | LPM* | TARG DIL ± 1% |
| T-DIL | LPM* | 0.01 – 10 SLPM |
| O3GEN FRAC | | REFERENCE ONLY |
| O3GENREF [1] | mV | 0 – 5000mV |
| O3FLOW [1] | LPM* | 0.100 ± 0.025 SLPM |
| O3GENDRV [1] | mV | 0 – 5000mV |
| O3LAMPTMP [1] | ºC | 48 ± 1ºC |
| CAL PRES | PSI | 25 – 35PSI |
| DIL PRES | PSI | 25 – 35PSI |
| REG PRES [1] | PSI | 8 ± 1PSI |
| T-GAS | | n/a |
| A-GAS | | T-GAS ± 1% |
| T-O3 [1] | | n/a |
| A-O3 [1] | | T-O3 ± 1% |
| T-FLW | LPM* | ± 1% of (A-CAL+A-DIL) |
| BOX TMP | ºC | AMBIENT ± 5ºC |
| PERM1 TMP [2] | ºC | 50 ± 1ºC |
| PERM FLW [2] | LPM* | 0.100 ± 0.025 SLPM |
| PH MEAS [1] | mV | 2500 – 4800mV |
| PH REF [1] | mV | 2500 – 4800mV |
| PH FLW [1] | LPM | 0.720 – 0.880LPM |
| PH LTEMP [1] | ºC | 58 ± 1ºC |
| PH PRES [1] | IN-HG | AMBIENT ± 1 IN-HG |
| PH STEMP [1] | ºC | AMBIENT ± 3ºC |
| PH SLOPE [1] | | 0.85-1.15 |
| PH OFFST [1] | PPB | 0 ±10 PPB |

[1] If respective option installed. [2] If permeation tube installed. *Standard flow

TELEDYNE API TECHNICAL SUPPORT
Email: sda_techsupport@teledyne.com
PHONE: (858) 657-9800 TOLL FREE: (800) 324-5190 FAX: (858) 657-9816

| Appendix C<br>Warranty/Repair<br>Questionnaire<br>T700U, M700EU<br>(06878B, DCN7095) | TELEDYNE<br>ADVANCED POLLUTION INSTRUMENTATION<br>Everywhereyoulook™ |
|---|---|

What is measured photometer flow rate _____cc/min

What is measured $O_3$ generator flow rate? _____cc/min

What is the pressure change during the **AUTO LEAK CHECK** procedure? _____ psi

What are the failure symptoms? _____

_____

_____

_____

What tests have you done trying to solve the problem? _____

_____

_____

_____

_____

Thank you for providing this information. Your assistance enables Teledyne Instruments to respond faster to the problem that you are encountering.

**OTHER NOTES:** _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

TELEDYNE API TECHNICAL SUPPORT
Email: sda_techsupport@teledyne.com
PHONE: (858) 657-9800 TOLL FREE: (800) 324-5190 FAX: (858) 657-9816