3001 INSTA-TRANS

REPAIR PROCEDURE

Warranty

This equipment is sold subject to the mutual agreement that it is warranted by us free from defects of material and of construction, and that our liability shall be limited to replacing or repairing at our factory (without charge, except for transportation), or at customer plant at our option, any material or construction in which defects become apparent within one year from the date of shipment, except in cases where quotations or acknowledgements provide for a shorter period. Components manufactured by others bear the warranty of their manufacturer. This warranty does not cover defects caused by wear, accident, misuse, neglect or repairs other than those performed by Teledyne or an authorized service center. We assume no liability for direct or indirect damages of any kind and the purchaser by the acceptance of the equipment will assume all liability for any damage which may result from its use or misuse.

We reserve the right to employ any suitable material in the manufacture of our apparatus, and to make any alterations in the dimensions, shape or weight of any parts, in so far as such alterations do not adversely affect our warranty.

Important Notice

This instrument provides measurement readings to its user, and serves as a tool by which valuable data can be gathered. The information provided by the instrument may assist the user in eliminating potential hazards caused by his process; however, it is essential that all personnel involved in the use of the instrument or its interface, with the process being measured, be properly trained in the process itself, as well as all instrumentation related to it.

The safety of personnel is ultimately the responsibility of those who control process conditions. While this instrument may be able to provide early warning of imminent danger, it has no control over process conditions, and it can be misused. In particular, any alarm or control systems installed must be tested and understood, both as to how they operate and as to how they can be defeated. Any safeguards required such as locks, labels, or redundancy, must be provided by the user or specifically requested of Teledyne at the time the order is placed.

Therefore, the purchaser must be aware of the hazardous process conditions. The purchaser is responsible for the training of personnel, for providing hazard warning methods and instrumentation per the appropriate standards, and for ensuring that hazard warning devices and instrumentation are maintained and operated properly.

Teledyne Analytical Instruments, the manufacturer of this instrument, cannot accept responsibility for conditions beyond its knowledge and control. No statement expressed or implied by this document or any information disseminated by the manufacturer or its agents, is to be construed as a warranty of adequate safety control under the user's process conditions.

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3001 INSTA-TRANS REPAIR PROCEDURE

- Initial Testing / Inspection
- Disassembly / Reassembly Procedures
- PCB Inspection & Assessment
- Trouble Shooting
- Spare Parts, & Tooling List

Right Angle 3001 Analyzer

Initial Inspection and Assessment

- Inspect the analyzer for broken or missing parts or screws. Refer to the parts list for any required replacement parts.

CAUTION: USE ONLY STAINLESS STEEL HARDWARE TO REPLACE ANY MISSING HARDWARE.

Note: The electronics are sensitive to ESD; always follow standard ESD control techniques to avoid damaging the circuitry.

- Inspect the analyzer for any signs of internal moisture contamination. Any condensation or fog which appears on the display window must be addressed.
- Verify that the keypad overlay is in good repair. Note any damage to the keypad that would allow moisture to enter and address the cause.
- Remove the cell holder cap and verify that the O-ring is in place.
- Verify that the sensor and the sensor spacer are installed properly (if included).

Functional Testing

The following items are required to validate the proper functioning of the analyzer.

- **DC power source:** The DC power source should be ether battery power or a linear power supply. Switching power supplies create RF noise which may interfere with the proper evaluation of the analyzer. The recommended voltage is 24VDC.
- **Signal / power cable:** PN: B71625A (The final letter A,B,C, or D indicates the length of the cable) The B71625A cable is 24” long.

- **Micro-fuel cell sensor:** (i.e. B1, B1C, or B2C is recommended). It must be known that the MFC used is in good working condition.
- **Cell spacer:** This item is included with the analyzer when shipped from the factory and should be inside the analyzers cell holder. The cell spacer is always required whenever a non-Insta-Trace sensor is used. It is also found on the spare parts list.
- **DVM:** Digital voltmeter used to measure the current through the analyzer.

Procedure:

1. Install the cable with the DVM in series to measure the current through the analyzer. The cable should be attached to the power source with a fuse in series (.5A Slow Blow). The 3001 Insta-Trans internal circuitry includes a series protection diode to protect the analyzer from reverse connections.

   Attach the red lead to the positive source. Attach the black lead to the DVM. The other DVM lead is attached to the negative power source.

2. Remove the sensor from the analyzer.
3. Power up the unit and verify that the display digits are lit.
4. Verify that the analyzer's display will return to zero (00.0+/-.2).
5. Verify that the current measured through the analyzer is 4.0 ma. Use the RANGE key to select each range, and verify that the display will read zero and the current is 4.0 ma.
6. Install the sensor and sensor spacer. Note that the sensor is inserted into the cell holder first with the concentric rings toward the two cell

Proper Sensor Installation

holder contact pins. The cell spacer is installed with the slotted end toward the sensor.

7. Install the cell holder cap.
8. Power up the analyzer.
9. Use the range key to select 0-25% range. It will appear as XX.X%.
10. Use the COARSE and FINE keys to set the display to indicate 20.9%.
11. Verify the following:
    - CRS indicator is displayed when the COARSE key is selected.
    - FIN indicator is displayed when the FINE key is selected.
    - RUN indicator returns in approximately 1 min after the last key is selected.
    - Current is 17.5ma.

Note: The sensor output will take a significant amount of time to stabilize, do not be concerned if the O2 readings continue to drift during this test.

    - Verify that the O2 reading and the analyzer current are stable over a short time interval of a few minutes.

12. If the instruments Span cannot be set to 20.9%, remove the sensor and measure its current output. The current should be approximately 450 microamps at 72°F.
13. Measure the open circuit voltage on the sensor. The open circuit voltage should be 0.68 VDC. The sensor output will vary significantly with temperature.

If the analyzer passes the above tests, it is considered functional and can be returned to service.

Unit Disassembly

The gaskets used in this instrument typically can be reused after servicing the analyzer. Always use blue Loctite where indicated to ensure integrity and reliability of the analyzer.

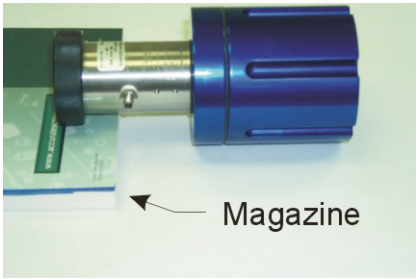
Use care when attempting to break the large gasket seal to avoid damaging the internal components. The large gasket forms an adhesive bond which will resist detachment. Refer to the pictures below for the proper technique.

To disassemble the unit:

Separating the Analyzer:

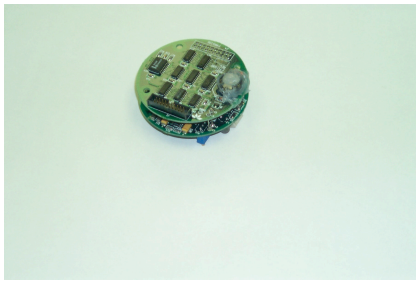
1. Remove the four screws which retain the mounting bracket and the sensor cap. Remove the sensor spacer, and sensor. Note that the screw which holds the cell cap faces down with the ground strap on the left hand side. Set these parts aside.
2. Remove the four screws which attach the cover to the analyzer base. Note these screws may be retained by the gasket after they are fully unscrewed.
3. Place the analyzer horizontally on a firm non-marring surface. Place a 0.55 inch thick stack of paper or a magazine under the cell holder retaining ring to limit its travel. There should be a gap of 1/8 inch or less between the cell holder retaining ring and the support.
4. Using both hands press down on both halves of the analyzer. The analyzer should part cleanly. The pictures at the left show the proper supporting technique for each analyzer type. Remove the lower analyzer section, unplug the ribbon cable from both PCBs, and collect the hardware.

Properly supported 3001 for disassembly (right angle design)



Properly supported 3001 for disassembly (Straight design)

Removing Logic and I/O PCB:



Logic and Input/Output PCB

1. Remove the logic and I/O PCB by removing the three retaining standoffs and the two electrical connections. The standoffs are best removed using a pair of needle-nose pliers unlocking the standoffs one at a time.
2. Remove the sensor cable by depressing the connector lock.
3. Remove the two power/signal connections with a small screwdriver. Note for reassembly, the white wire is attached to pin 1.

Removing the Cell Holder:

Cell holder with 90degree right angle adapter

At this stage of disassembly, cell holder can now be removed. Prior to disassembly, note the orientation between the power connector and the cell holder for reassembly.

1. Remove the ground wire retaining screw, and the four cell holder retaining screws.

Note: On right angle units there is a 90 degree welded elbow between the cell holder and the cover base. The screws which are used to attach the base assembly to the elbow are sealed with blue Loctite.

Cell Holder Inspection and Testing:

1. Inspect the wiring on the top of the cell holder for signs of water, contamination, or damage. If any contamination is found, clean the wiring and the terminals with isopropyl alcohol and dry.
2. Using a DVM:

a. Measure between the black and red leads and verify there is no continuity (greater than 10M resistance).

b. Verify that there is no continuity between red or black lead and the green lead.

c. Verify there is no continuity between the cell holder and the red, black or green lead.

d. Measure between the green and white lead, this is the thermistor it should measure approximately 16.6K at 25C.

Note: If there is continuity between the red and black lead, the contamination could be inside the cell holder.

Cover Assembly:

C76296 Assembly tool

Cover assembly being disassembled

The disassembly of the top assembly requires special tooling and should be avoided if possible. The analyzer cover assembly must be held rigidly in place for this operation.

1. Insert the tool and use a proper bar to unscrew the locking ring in a CCW direction. Use care to avoid damaging the keyboard connector. Fully unscrew the retaining ring and lift it out of the cover.

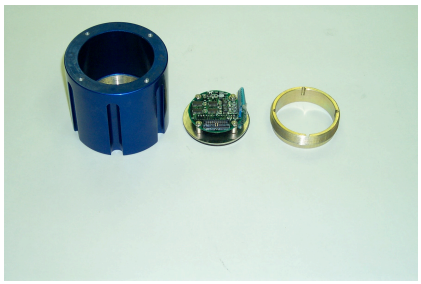
Note: On reassembly, apply silicon grease to the retaining ring threads and front surface.

2. At this point, the keyboard assembly can be removed. Note there is an indexing hole in the cove (see photograph). A set screw on the keyboard assembly fits in the index to align the PCB assembly. The set screw is locked in place with blue Loctite and the gasket is bonded in place on the keyboard overlay with two small

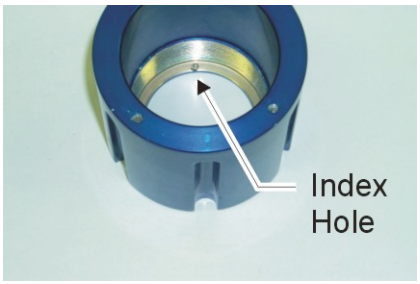
Keyboard assembly

drops of cyanoacrylate adhesive adjacent to the location of the set screw.

3. Remove the 4 nuts securing the PCB to the keypad mounting plate. These nuts are assembled using blue Loctite.



Cover assembly parts



Cover showing the index hole for the keyboard

Reassembling the Cover Assembly

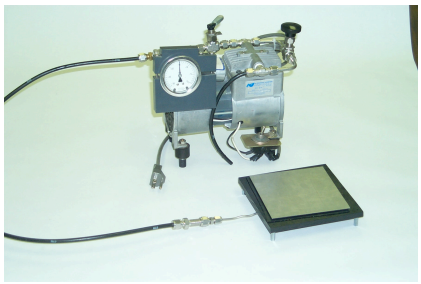
When the top assembly is reassembled, inspect it to determine if the keyboard is properly indexed. Use the vacuum test fixture to determine if it is properly sealed.

Using the Vacuum Test Fixture

1. Verify that the fixture will maintain vacuum at -15 inches Hg for 1 min.
2. Attach the cover assembly to the test fixture and test the cover at -5 inches Hg. The cover must maintain the -5 inches of Hg for 1 minute to be considered properly sealed.

If the cover assembly fails this test, it must be reworked.

A disassembled 30001 Analyzer (straight design) is shown in the photograph on the next page.

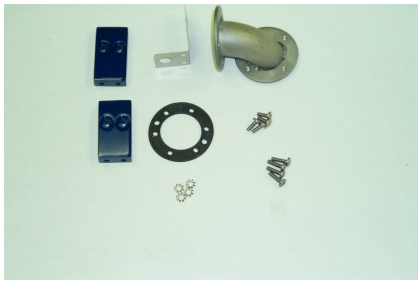


Vacuum test fixture

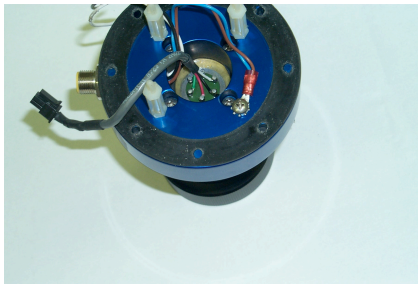
Vacuum test

Additional Disassembly Photographs

Dissembled 3001 analyzer (straight design)



Right angle conversion parts



Lower assembly without PCBs

Top view of cell holder

PCB Repair

Board level repairs are not recommended

Display PCB

Inspect the display for any signs or contamination. If contamination is found or suspected remove the PCB for proper cleaning.

1. Remove the four nuts securing the PCB
2. Remove the keypad ribbon connector
3. Remove the PCB.

After cleaning, allow the PCB to fully dry prior to testing. Note the ribbon cable has a polarizing key at both ends.

Troubleshooting

Most analyzer problems are the result of sensor failures, or power supply issues. The best way to determine if the sensor is causing problems is to replace it with a known-good functioning sensor. Most sensor failures result in noise, spiking or failure to span.

Power supply issues often show up as the inability to change ranges, noise, or catastrophic analyzer failure due to over-voltage. Voltage exceeding 31 VDC will damage the circuitry. Switching power supplies may result in EMI related interference with the circuitry.

Most analyzer logic functions are controlled by the logic PCB and the display PCB.

Analyzer Does Not Change Ranges Properly

- Verify that the operating voltage at the analyzer is adequate. The minimum operating voltage across the analyzer is 9.3VDC.
- Verify that the keypad and the ribbon cable are properly attached.
- Check for signs of moisture contamination. If present, clean and dry the PCB's and connectors.

Analyzer Experiencing Noise Problems

This can be caused by a bad sensor, noisy power supply, or EMI noise source near the analyzer or power leads.

- Substitute a known good sensor.
- Replace the power source with a battery or linear power supply with short interconnection leads.

If these measures fail to rectify the problem suspect the I/O board (Input/Output). This problem can be caused by a noisy power supply or amplifier.

Analyzer Experiencing Display Problems

If the display is not functioning properly the problem could be caused by the display, logic or other circuitry.

First determine if the 4-20 mA loop current is correct. This would imply that the other analyzer functions may be operating correctly. It should be noted that the display on this analyzer is a DPM with special enunciators. The input is 0-0.1V signal voltage, a +5 VDC power supply and some enunciator selection signals. This part can be replaced with the use of the proper tools. See the spare parts list at the end of this document.

I/O and Logic PCB Problems

Inspect the PCBs for any signs of water or contamination. If any contamination is found or suspected, clean the PCBs with isopropyl alcohol. If this is not successful, the PCBs can be cleaned with soap and warm water followed by alcohol. Allow the PCBs to fully dry prior to testing.

If the analyzer will not change ranges, or can not change modes from RUN to CRS and to FIN, there may be a problem with the logic PCB. These problems may also be rooted in the display PCB as well. The best way to troubleshoot this is to substitute a known-good board.

If there is a problem with the logic board it is most likely caused by contamination. However, a failed ribbon cable or internal power supply could be suspected as well.

Drawings

C72103	FINAL ASSEMBLY
B71626	CELL BODY WIRING ASSY
C71133	MEMBRANE SWITCH PANEL ASSY
M72103	MANUAL 3001 (FM)

Spare Parts Listing

A71477	MEMBRANE SWITCH GASKET
B70990	SMALL ROUND GASKET
B71164	LARGE ROUND GASKET
C71165	MEMBRANE SWITCH ASSY (INCLUDES PCB, & SPACERS)
C71133	MEMBRANE OVERLAY
B71162	CELL HOLDER SEALING COLLAR
D71159A	PCB, DISPLAY(UNTESTED)
D71159B	PCB, MIDDLE LOGIC (UNTESTED)
D71159C	PCB, BOTTOM ANALOG (UNTESTED)
B71475	CELL SPACER (std)
B66378	CELL SPACER (INSTA-TRACE)
C71133	MEMBRANE SWITCH PANEL ASSY (DOES NOT INCLUDE PCB, OR SPACERS)
B71099	PCB RETAINING RING
B71858	RT/ANGLE WELDMENT ADAPTER
B72126	RT/ANGLE GROUND STRAP
B70988C	MOUNTING BKT RT/ANGLE SIDE MEMBER (2 REQUIRED)
B70988A	MOUNTING BKT BASE
B70988B	MOUNTING BKT SIDE MEMBER (2 REQUIRED)
C76296	3001 ASSY TOOL (FOR THE R&R OF THE KEYBOARD ASSY, & C71160A PCB)
O290	O-RING CELL HOLDER (VITON)
O301	O-RING CELL HOLDER (KALREZ)
CP2070	CONNECTOR, POWER/SIGNAL
B71625D	25 FT INTERCONNECTION CABLE ASSY
B71625A	2 FT INTERCONNECTION CABLE ASSY
B72087	CELL HOLDER INSTA-TRACE
B70986	CELL HOLDER STD.

C6689-B2C B2C SENSOR
C6689-B1C B1C SENSOR
C6689-B1 B1 SENSOR
C6689-A2C A2C SENSOR
B71875 STD INSTA-TRACE SENSOR
B617 MTL 7087+ SAFETY BARRIER
B616 MTL 787+ SAFETY BARRIER
B604 MTL 5041 SAFETY BARRIER
D510 DPM