

**Model 301DIV**  
**SIGNAL CONDITIONING AMPLIFIER**

Revision B  
July 20, 2005

UDT Instruments  
8581 Aero Drive  
San Diego, CA 92123

Phone (858) 279-8035  
Fax (858) 576-9286



Dear Valued Customer:

The conventional fuse in your Model 301-DIV has been replaced with a self-resetting fuse. This new "fuse" is actually a PTC (positive thermal coefficient) device, which significantly increases resistance when current in the 301-DIV reaches an unsafe level. This change was made to better protect your 301-DIV and to eliminate the need for you to send the 301-DIV back to the manufacturer if a fuse is accidentally blown.

If the PTC device has either shut down your equipment or has increased resistance to the point where it affects unit performance, simply turn off the equipment and allow the PTC device to cool for about 15 to 20 seconds. The 301-DIV may then be turned back on.

Please note that the most common way in which current is increased to an unsafe level is by improperly biasing the detector diode. If there is any doubt as to the correct way to bias your particular detector, please contact UDT Instruments technical support.

# MODEL 301DIV SIGNAL CONDITIONING AMPLIFIER



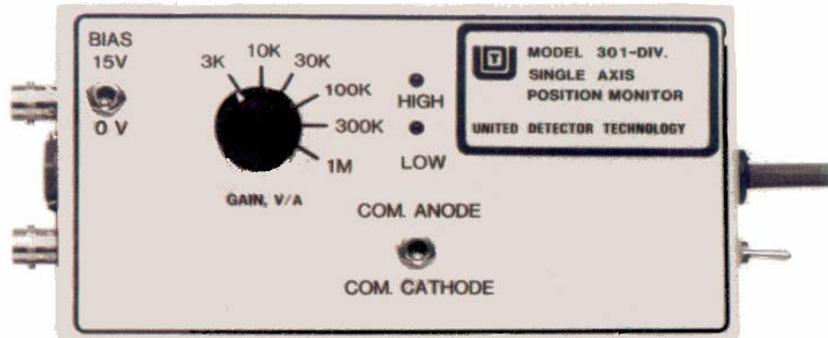
The Model 301DIV amplifier module is a member of UDT's growing family of conditioning amplifiers. It interfaces position-sensing photodetectors with indicators and controls supplied by the user.

This versatile system is used with bi-cells and quadrant detectors for nulling and centering operations, or with lateral-effect detectors for continuous position measurement. It can also be used to normalize the differential output of two discrete-element detectors.

The Model 301DIV provides transimpedance amplifiers to condition the detector signals, as well as the differential amplifiers necessary to generate a position-related analog output. Two modules are required when monitoring both axes of quadrant or lateral-effect detectors. With dual-axis systems, the Model 1000 electronic collimator is available for measuring very small changes in angular displacement.

In addition to measuring differential output to determine position, the system also divides by the summed output in order to cancel the effects of variations in incident light intensity during measurement.

The amplifier module's six selectable input ranges accommodate detector signals ranging from 3  $\mu$ A to 2 mA. LED indicators help users select the proper range setting. Output



signals are normalized to 10V maximum, user adjustable.

The standard Model 301DIV has a frequency range of DC to 5 kHz. A 30 kHz version is also available for high-speed applications.

## COMPLETE DETECTOR/ CABLE ASSEMBLIES.

For ease of installation and accuracy of measurement, UDT offers detector/cable assemblies which ensure proper interconnection between photodetector and amplifier pins.

UDT photodetectors are selected for high responsivity, low noise, long-term stability, uniformity, and linearity over a wide dynamic range.

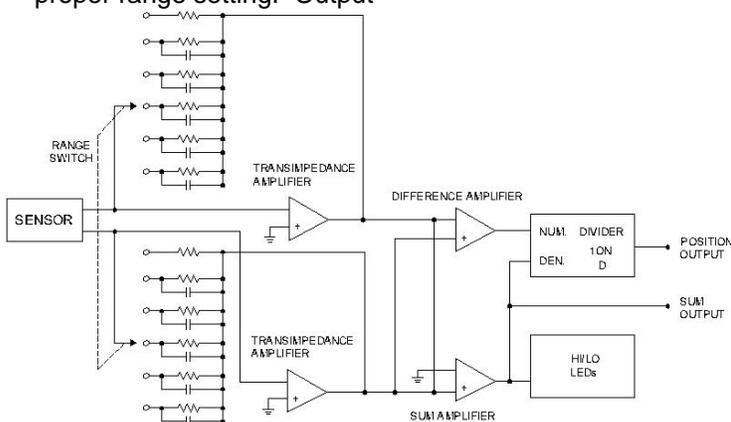
## OTHER FAMILY MEMBERS

The Model 431 is a dual-channel amplifier that provides a digital display of X and Y positions. And the Op-Eye series of multi-channel computer interfaces provide cost-effective conditioning of optical

sensors for use with popular computers. Op-Eye systems can accommodate up to 4 dual-axis detectors, 8 single-axis detectors, 16 discrete sensors, or any combination thereof. Systems are available for Apple II and IBM personal computers and their compatibles, any computer having an RS-232C or IEEE-488 port, and computers that have an internal A/D converter.

## APPLICATIONS

Applications are many and varied. UDT remote position-sensing sensors are used in centering and nulling operations measurement of position of robotics and other production equipment, alignment of machine tools, measurement of the curvature of optical surfaces, and laser alignment.



*Simplified Block Diagram  
of 301DIV*



### 301DIV OPERATING INSTRUCTIONS

1. Connect detector(s) in accordance with detector connection instructions.
2. Select detector polarity: Common anode for UDT, LSC and SC series, or common cathode for SPOT series.
3. Select detector bias. Caution: 15V bias and wrong polarity can damage detectors.
4. Connect 301DIV to AC line, and connect monitor instruments such as digital voltmeters, oscilloscopes or recorders, to sum and position outputs.
5. Illuminate the detector.
6. Turn instrument power on.
7. Check that the sum output is positive. If it is not, check detector wiring, and verify detector polarity.
8. Set range switch for proper sensitivity. Select highest position possible, without lighting HI light level LED.
9. It is recommended that Schottky barrier detectors be biased, for maximum lifetime and performance. Schottky detectors can be identified by absence of a "D" suffix in their model number. Lateral-effect devices tend to saturate at moderate light levels. This may be observed by scanning a light spot across the detector along one axis. If the sum output (sum of X and Y-axes for dual-axis operation) shows a broad dip near the center of the detector, biasing is required. Biasing may also

be desirable when using the 301DIV-30kHz. Since the bias reduces the detector junction capacitance, higher speed response is possible from the detector.

10. If it is necessary to adjust the zero or range of the 301DIV output to accommodate the readout device, adjust the CAL and ZERO potentiometers with a small-blade screwdriver. To return full output to 10V, turn the CAL potentiometer fully clockwise. To return the ZERO potentiometer to electrical zero, select two 100 K ohm to 1 Meg ohm resistors matched within 0.15%, and connect one resistor between each amplifier input pin (E and D) and common (H). Then adjust the zero potentiometer for 0V at the position output connector.

#### DETECTOR CONNECTION INSTRUCTIONS

If UDT detector/cable assemblies are employed, connect the cable output connector to the 301DIV input.

If component level detectors are to be used, carefully connect as follows:

#### PIN-LSC/5D, PIN-LSC/30D.

Connect detector outputs (end points) to amplifier inputs E and D, and detector common (center pin) to amplifier input H.

(See Fig. 1)

#### PIN-LSC/4, PIN-LSC/9.

Connect detector pins labeled (-) to amplifier inputs E and D, and detector common (+) to input H. Only one (+) pin need be connected. As usual, bias is recommended when using Schottky barrier devices. (See Fig. 1)

#### PIN-SC/4D, PIN-SC/10D, PIN-SC/25D

Two amplifiers are required for dual-axis operation. Connect X-pins to inputs E and D, and Y-pins to inputs A and B on amplifier #1. On amplifier #2, jumper inputs A and B to inputs E and D. (Y-axis pins may be directly connected to amplifier #2 (if preferred). Also connect detector common to input H on amplifier #1 and interconnect input F on both amplifiers. (See Figs. 1 & 2)

#### PIN-SC/50

Same connections as for PIN-SC/4D. As usual, bias is recommended when using Schottky barrier devices. (See Figs. 1 & 2)

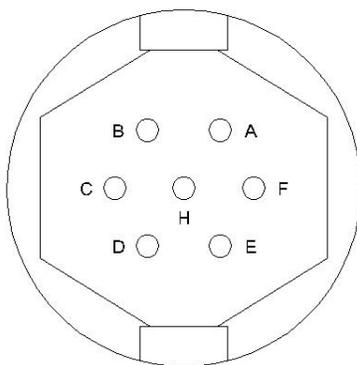
#### PIN-SPOT/2D

Connect detector outer pins to inputs E and D, and detector common to input H. (See Fig. 1)

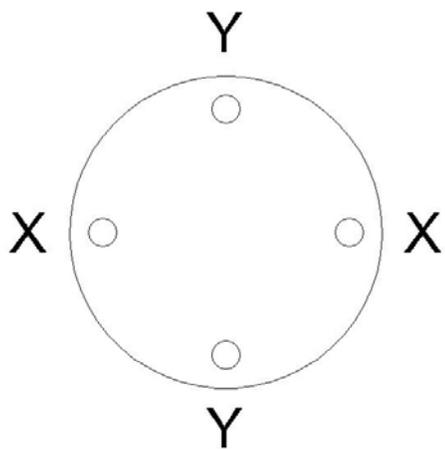
#### PIN-SPOT/4D, PIN-SPOT/9D

Two amplifiers required. Connect same as PIN-SC/4D, except connect detector common to input F on amplifier #1. (See Figs. 1 & 3)

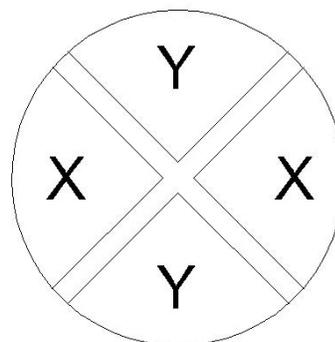
For best results, insure that the amplifier inputs are fully shielded. Use input F for shield ground.



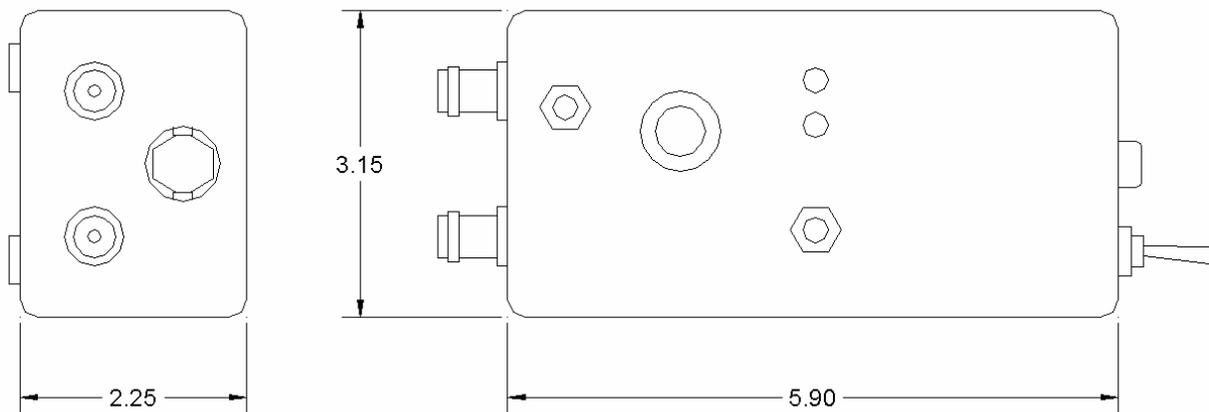
**Figure 1**  
**Input Connector Orientation**



**Figure 2**  
**Detector Orientation**



**Figure 3**



All dimensions in inches

**SPECIFICATIONS**

<b>Input Current Range</b>	<b>GAIN at sum output (V/A)</b>	<b>Frequency Bandwidth</b>
1 mA to 3 mA	3K	Standard DC to 5 kHz
300 μA to 1 mA	10K	Optional DC to 30 kHz
100 μA to 300 μA	30K	(Model 301DIV-30kHz)
30 μA to 100 μA	100K	
10 μA to 30 μA	300K	<b>DC drift</b> 10 mV/C° for 10 V full scale
3 μA to 10 μA	1000K	<b>Noise, rms</b> 2 mV for 10 V full scale
<b>Range Selector</b> 6-position rotary switch		<b>Output Impedance</b>
<b>Detector bias</b> Selectable 0 VDC (photovoltaic) or 15 VDC (photoconductive)		Standard <1 ohm
<b>Detector polarity</b> Selectable common anode (LSC and SC series) or common cathode (SPOT series)		30 kHz version 100 ohm
<b>Output voltage</b>		<b>Range Indicators</b> HI/LO signal level LEDs aid in setting range switch to proper value
Sum $GAIN \times (ID + IE)$		<b>Output Adjustments</b>
Position $\frac{(ID - IE)}{(ID + IE)} \times 10 V$		CAL Adjustable scale factor for position output
<b>Output Voltage Range</b>		ZERO Provides ± 2.5 V zero offset
Sum 0 to 10 V		<b>Power Requirements</b>
Position ±10 V		Standard Model 105 to 125 V, 50/60 Hz, 5 watts
<b>Output Connectors</b> BNC		(301DIV)
<b>Operating Temperature</b> 0 to 50°C		Optional Model 210 to 250 V, 50/60 Hz, 5 watts
		(301DIV-230 V)

**UDT POSITION-SENSING DETECTOR/CABLE ASSEMBLIES**

<b>MODEL NBR</b>	<b>DESCRIPTION</b>
1232	PIN-SC/25D Detector/Cable Assembly
1233	PIN-SC/10D Detector/Cable Assembly
1237	PIN-SC/50 Detector/Cable Assembly
1238	PIN-LSC/5D Detector/Cable Assembly with 35-mm lens adaptor
1239	PIN-LSC/30D Detector/Cable Assembly with 35-mm lens adaptor
1240	PIN-SPOT-SC/9D Detector/Cable Assembly
1241	PIN-SC/4D Detector/Cable Assembly
1242	PIN-SPOT-2D Detector/Cable Assembly
---	PIN-LSC/4 Detector only



Website: [www.udtinstruments.com](http://www.udtinstruments.com)

Rev B  
July 20, 2005



## ADDENDUM: CE MARK EXCLUSIONS

1. The instrument is not intended for use in high humidity, high pollution, or explosive environments.
2. The instrument and related accessories are “CE” compliant when operated in the manufacturer’s recommended configuration, and in accordance with the exclusions described in this addendum. UDT Instruments does not accept responsibility for “CE” compliance if the instrument is used in a non recommended configuration.
3. All semiconductor devices are susceptible to electrostatic discharges (**ESD**). Ensure that the unit is switched off before connecting or disconnecting any cable(s) or accessories. Failure to do so can cause “**ESD**” damage and reduce the lifetime of the instrument drastically.
4. Units with ieee-488 capability must use a shielded cable; similar to Hewlett-Packard part number HP10833x or Io-Tech part number CA-7-X, to maintain compliance.
5. All coaxial cables must be less than 3 meters long.
6. All battery-operated units have batteries that **are not** replaceable by the customer, and can only be charged with the battery charger supplied with the unit by UDT Instruments.
7. **Cleaning:** Special care must be used when cleaning the instrument. The body, or any labels, should only be cleaned with a soft damp cloth, and a very light concentration of mild soap. Failure to do so may scratch the surface or damage any anti-glare coatings.

**Never use alcohol, acetone, or other chemical solvents to clean any part of the unit.**



# Product Warranty

## Warranty Provisions

UDT Instruments warrants the items delivered hereunder to be free from defects in material and workmanship, and to conform to current UDT Instruments specifications at the time of sale. Purchaser shall have a period of one year from date of acceptance of the items to return deficient items to UDT Instruments for correction. Material will be considered accepted 30 days after receipt by purchaser unless UDT Instruments is notified of acceptance earlier.

UDT Instruments agrees to repair or replace at the place of manufacture, without charge, all items returned, transportation prepaid, for inspection at the UDT Instruments factory within the warranty period, provided: (1) such inspection discloses to the satisfaction of UDT Instruments that the defects are as above specified; and, (2) the material has not been subjected to misuse, improper maintenance, negligence or accident, damaged by excessive radiation, voltage, current or otherwise damaged by misuse.

The item returned shall only be accepted when accompanied by a written statement setting forth the nature and suspected cause of the alleged deficiencies.

This warrant is expressly in lieu of all other warranties, express, implied or statutory, and all other obligations or liabilities on the part of UDT Instruments. In no event shall UDT Instruments be liable for claims, demands or damages of any nature, however denominated, except that UDT Instruments liability shall be to repair defective items at its factory, or supply replacement parts in accordance with the terms of this warranty.

When equipment is shipped FOB UDT Instrument's factory, and when said equipment fails to perform according to specifications upon receipt, a claim should be made immediately against the shipping agency.

### SHIPMENT AND PAYMENT

UDT Instruments payment terms are Net 30 days. Shipment will be made FOB Baltimore, MD.

## Warranty Return Procedures

**Note: If this device has warranty and calibration seals, all warranties and calibrations are void if these seals are broken.**

1. Please review terms of purchase and date of shipment to determine if product is warranted and whether or not it is within warranty period. Adjustment cannot be made for product out of warranty.
2. If product is subject to warranty, prior to return of product, telephone, write or fax UDT Instruments at the above address.  
  
Product malfunctions should be reported to the Sales Department at the earliest possible time, since there are many occasions when technical assistance may obviate the need for returning products or can prevent product damage. Upon verification that warranty service is required, the Sales Department will issue a Return Material Authorization number (RMA number). The RMA number must appear on the outside of the shipping container for proper receipt.
3. It is necessary in all instances that the "return report" form be completed. Please photocopy and fill out the return report located in your product manual.

4. Repack the product carefully in the same manner it was originally packaged, preferably using the original shipping carton and packaging material. Pack the completed "return report" with the product making sure the RMA number is clearly visible on the outside of the container. Ship the product prepaid to UDT Instruments.

5. UDT Instruments will advise your company of its findings as to warranty consideration at the earliest possible time.

# UDT INSTRUMENTS RMA FORM

8581 Aero Drive • San Diego, CA 92123 Phone (858) 279-8035 Fax (858) 576-9286

http://www.udtinstruments.com

**RMA REQUEST DATE** \_\_\_\_\_ **RMA NUMBER** \_\_\_\_\_ (assigned by UDT)\*

Please check appropriate box: **CALIBRATION**      **REPAIR**      **WARRANTY**

<b>BILL TO:</b>		<b>SHIP TO:</b>	
<b>ATTN:</b>		<b>ATTN:</b>	
<b>Street Address</b>		<b>Street Address</b>	
<b>City, State, Zip</b>		<b>City, State, Zip</b>	
<b>E-Mail Address</b>		<i>Preferred Payment:</i> Visa    Master Card <b>Credit Card #</b>	
<b>PHONE NUMBER</b> -   -	<b>FAX NUMBER</b> -   -	<b>NAME ON CREDIT CARD/EXP DATE</b>	<b>PO #</b>
<b>Please provide <u>your shipping carrier, preferred method of shipment and shipping carrier account #</u></b> FEDEX    UPS    DHL    Other _____ <b>Shipping Carrier Account #</b> _____ Method of Shipment (eg. Overnight, Next Day, 2 <sup>nd</sup> Day, 3 <sup>rd</sup> Day, Red, Blue, Orange, Ground) _____			

QTY	INSTRUMENT DESCRIPTION	INST. SERIAL #	SENSOR DESCRIPTION	SENSOR SERIAL #
<b>Electrical Calibration of all meters (REQUIRED)..... \$100.00</b>				
<b>DETAILED CALIBRATION INSTRUCTIONS</b>				

QTY	INSTRUMENT DESCRIPTION	INST. SERIAL #	SENSOR DESCRIPTION	SENSOR SERIAL #
<b>Electrical Calibration all meters (REQUIRED)..... \$100.00</b>				
<b>DETAILED CALIBRATION INSTRUCTIONS</b>				

**TOTAL ESTIMATE:** \_\_\_\_\_ **US Dollars**

If the unit is in need of repair, an evaluation fee of \$175.00 will apply. If the cost of the repair exceeds the evaluation fee, the customer will be notified for approval **BEFORE** any work is performed.

_____	_____	_____
<b>Tonda Arbaugh</b>	<b>Customer Approval</b>	<b>Date</b>
tarbaugh@udtinstruments.com		

**We would PREFER to use your shipping carrier when sending back your unit(s).**

Otherwise, all orders will be shipped UPS Ground Pre-Paid and this fee will be added to the invoice unless specified otherwise in the shipping carrier box above.

**\*RMA Numbers (upon issue from UDT Instruments) are valid for 60 calendar days!**