

TABLE OF CONTENTS

SECTION 1	Description
SECTION 2	Principal of Operation
SECTION 3	Installation and Operation
SECTION 4	Applications
	A. Velocities and Flow Rates
	Inside Ducts
	B. Pipe Velocities and Mass
	Flow Measurements
SECTION 5	Specifications
SECTION 6	Maintenance
	A. Cleaning
	B. Calibration
SECTION 7	Drawings and Parts List
SECTION 8	Available Options and Accessories
SECTION 9	Warranty

May, 1986

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- A41035001 Rev. 0 -

SECTION 1

Description

The KURZ series 410DC/410ADC 2-wire DC powered velocity transmitters are rugged industrial grade velocity meters for measuring velocities in ducts and pipelines. They feature a one piece package configuration ideal for use as a 2-wire velocity transmitter.

The 410DC uses the standard 316 probe. The sensor is mounted on the end of a 1/4" OD 304 Stainless Steel probe approximately 12" long. A current transmitter is attached to the end of the probe and is mounted in a rugged aluminum junction box.

The 410ADC is identical except it features the all metal clad Stainless Steel sensor mounted on a 1/2" OD tube support. The large metal sensor is extremely rugged and excellent for use in those harsh environments where, before the 410ADC, particulates made it hard to set an accurate reading. Because of the size of the metal sensor, it is inherently more resistant to dirt buildup and particulate contamination since the corresponding heat loss per centimeter is less.

Power of 15-20 Vdc, supplied to the transmitter over the two-wire hookup, runs the sensor. The output current over the two-wire hookup represents the output signal. This feature allows for remote placement of the transducer and the output signal is unaffected by EMI or cable resistance. Each unit is furnished with calibration data showing output current versus flow velocity. Standard operating temperature of flow is up to 250°F with higher temperatures available.

Overall, the series 410DC/410ADC allow for ease of flow measurement and signal transmission over long distances. Because the output current is conditioned, these units are also interchangeable allowing for inspection, cleaning and servicing with a spare sensor in place.

SECTION 2

Principle of Operation

The basic sensing element of the Series 410DC/410ADC Velocity Transmitters is the Kurz Instruments, Inc. "DuraFlo"™ probe. The "DuraFlo"™ probe consists of two integral sensors: a velocity sensor and a temperature sensor. The velocity sensor is a constant-temperature thermal anemometer which measures "standard" velocity (referenced to 25°C and 760 mm Hg), or mass flow, by sensing the cooling effect of the moving flowstream as it passes over the heated sensor. The velocity sensor is heated electronically by the control circuitry in the electronics package. The velocity sensor is rugged and large; it is not a fragile "hot-wire" and therefore is breakage resistant and insensitive to particulate contamination. The temperature sensor accurately compensates for a wide range of temperature variations. The temperature of the velocity sensor is approximately 75°F above ambient temperature.

The probe can be used directly to measure air velocity in open spaces, ducts, supply and return openings, and gas pipelines.

It should be noted that the velocity reads of all KURZ Air Velocity Probes are referenced to standard conditions of 25°C and 760 mm Hg pressure, and therefore directly measure the local mass velocity of the air. In order to obtain the actual velocity, a simple density correction may be used, as follows:

$$V_{act} = V_{ind} \times p(s)/p(a)$$

where $p(s)$ = air density at standard conditions
of 25°C and 760 mm Hg

$p(a)$ = actual air density at local temperature
and barometric pressure

V_{act} = actual air velocity in feet per minute, and

V_{ind} = indicated velocity on KURZ Air Velocity
Meters

Normally, this correction is small and may be neglected. In many applications, however, it is the mass velocity which is needed and no density calculation is required.

SECTION 3

Installation and Operation

Installation

To install a KURZ Series 410DC/410ADC, simply insert the probe in the duct or pipeline through a compression fitting. Metal ferrules may be used to lock the probe into higher pressure lines. Orient the sensing element so the air flows through the protective window perpendicular to the probe. Since mounting attitude is unimportant, sensor may be installed vertically or horizontally without affecting readings. For "hot tap" type installation, ball valve retractor assemblies are available as options. Probe mounting adaptors are also available for most installations. (See Drawing 41000-008.)

Operation

The KURZ Series 410DC/410ADC are 15-20 Vdc powered. Each unit has been factory calibrated to specification with data and certification to NBS.

To operate, simply hook up power to terminals marked "+ -" on the printed circuit board. (Drawing 46530-13.) These units have a reserve polarity protection circuit, so hookup is almost foolproof. The probe connections have been prewired into the circuit board at the factory, so no user hookup is needed.

Output current is transmitted over the 2-wire hookup cable. This current can be transmitted to any distance as long as sufficient voltage is available at the probe head. By simply running this current through a 1 ohm resistor, a corresponding MV signal may be read by a data acquisition system.

Warning: Do not hook up DC power to any terminal having a probe connection and do not disconnect any probe connection with power applied. Extensive probe damage may occur and warranty may be voided.

SECTION 4

ApplicationsA. Velocities and Flow Rates Inside Ducts.

The Series 410DC can be used to obtain the velocity of supply and return openings and ducts. In either case, locate the probe in the flow with the air flowing perpendicularly to the window probe tip. Before mounting in ducts where flow profile may be uneven, a traverse may be taken to insure that the probe is located in a section of the duct that best represents the average velocity.

Where it is necessary to obtain the total flow in the duct, use the equation:

$$Q = A \times V$$

Where:

Q = Quantity of air in standard cubic feet per minute

A = Area of the opening in square feet (ft²)

V = Velocity of air in standard feet per minute

For best reading, KURZ recommends that installation be 10 duct diameters downstream of any obstruction, (i.e., valve, elbow tee, bend).

B Pipe Velocities and Mass Flow Measurements.

The KURZ Series 410ADC is ideal for measuring of mass velocities in pipelines and harsher environments.

Simply install the probe in the pipeline using a compression fitting or ball valve retractor assembly. Centerline measurement is recommended with 10 pipe diameters upstream and 3 downstream. Because KURZ sensors automatically compensate for temperature and pressure, the output is related to SCFM/FT². Direct mass flow calibrations, high temperature configurations, high pressure calibrations, are all available.

SECTION 5

Specifications

Accuracy

± (2% reading + 1/2% of full scale) for velocity and flow
over a temperature range of 0°C-50°C.

Repeatability

±.25% of reading

Temperature Ranges

Probe: -55°C - 125°C

Response Time

Model 410DC - .1 second
Model 410 ADC - .5 second

Pressure Rating of Sensor

Model 410DC - 100 psig
Model 410ADC - 1000 psig

Power

15-20 Vdc regulated
Check model for current draw

Net Weight

Model 410DC - 1 lb.
Model 410ADC - 4 lbs.

Construction

Series 410 DC: Aluminum weatherproof junction box with Stainless Steel probe. Glass and epoxy mounted sensor, 12' length.

Series 410ADC: Aluminum junction box, Class 1, Groups C, D. Class 2 Groups E, F, G, rated for hazardous and explosive environments. All Stainless Steel sensor and probe with silver solder weld.

Probe Dimensions

Series 410DC: 1/4" O.D. 12" length

Series 410ADC: 1/2" O.D. 12" length

<u>Model Number</u>	<u>Range (SFPM)</u>	<u>Output Current</u>
410DC-0	0-100	100-200 mA
410DC-1	0-300	100-300 mA
410DC-2	0-1250	100-300 mA
410DC-3	0-2500	100-300 mA
410DC-4	0-6000	100-300 mA
410DC-5	0-12000	100-400 mA
410ADC-1	0-300	150-400 mA
410ADC-2	0-1250	150-400 mA
410ADC-3	0-2500	150-400 mA
410ADC-4	0-6000	150-450 mA
410ADC-5	0-12000	150-500 mA

SECTION 6

Maintenance

Cleaning

Although the relative large diameter of the sensor renders it immune to particulate contamination in most environments, continuous use in dirty environments may necessitate periodic cleaning. The 410ADC's all metal clad sensor can be scrubbed with fine steel wool to clean if needed or may be scrubbed with a solvent solution and a brush.

Calibration

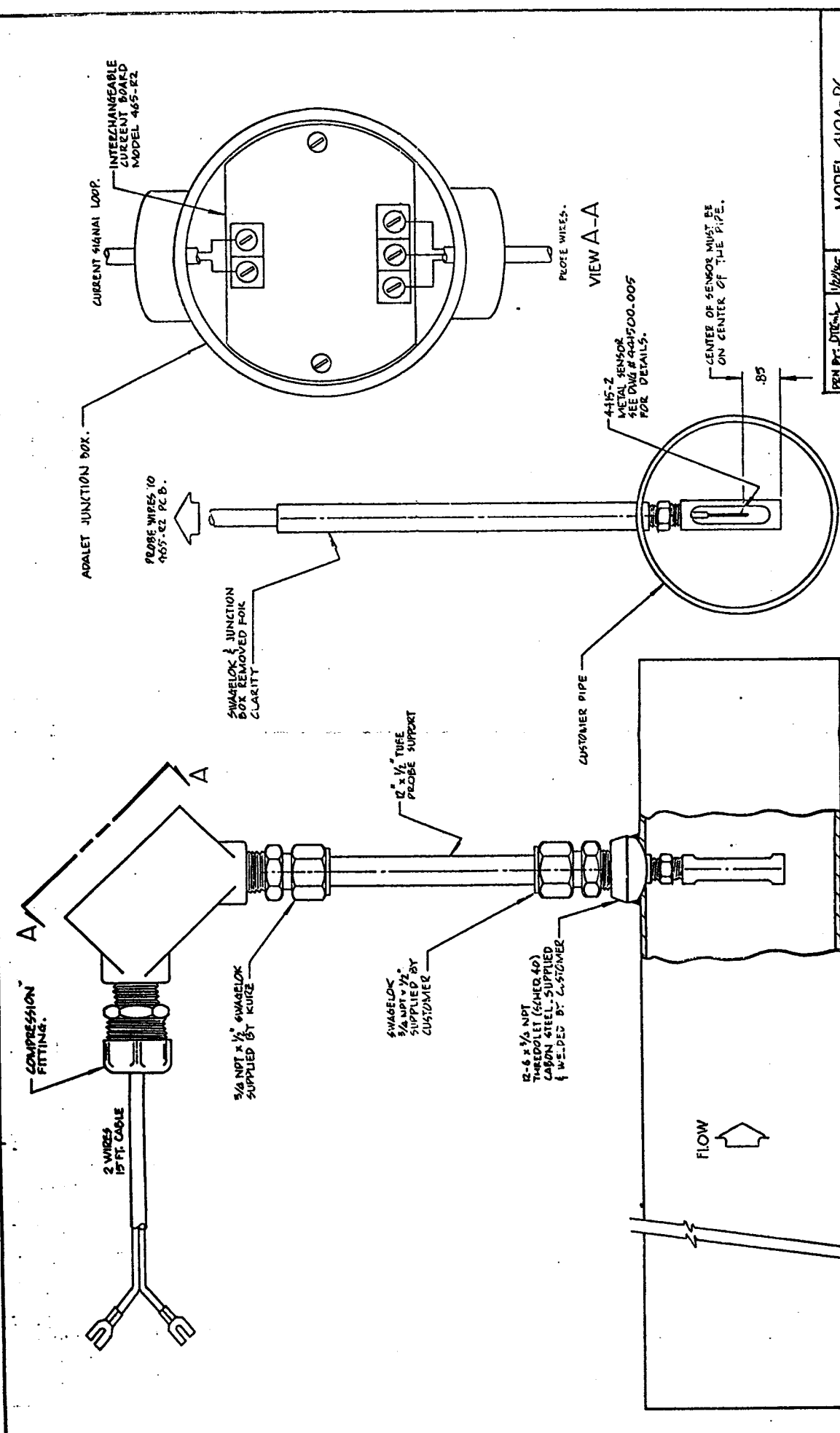
Calibration should be checked periodically, normally annually, depending on accuracy requirements and extent of instrument use.

Calibration requires the user's ability to set up standard NBS traceable flows across the sensor. Calibration tunnels are available from Kurz Instruments, Inc., or the unit may be returned to Kurz Instruments, Inc. Service Department.*

*Kurz Instruments, Inc.
2411 Garden Road
Monterey, CA 93940
Attention: Service Department

Please call for return authorization number prior to returning instrument.

SECTION 7
DRAWINGS AND PARTS LIST



PEN PR. DIRECTION	1/2 INCH
CHKD BY	T.S.
APP'D BY	J.P.S.

MODEL 410A-DC SYSTEM INSTALLATION	
REV.	SHT. OF
B	10

SCALE : /
 TOLERANCE
 .XX ± .01
 .XXX ± .003

KURZ
 INSTRUMENTS INC.

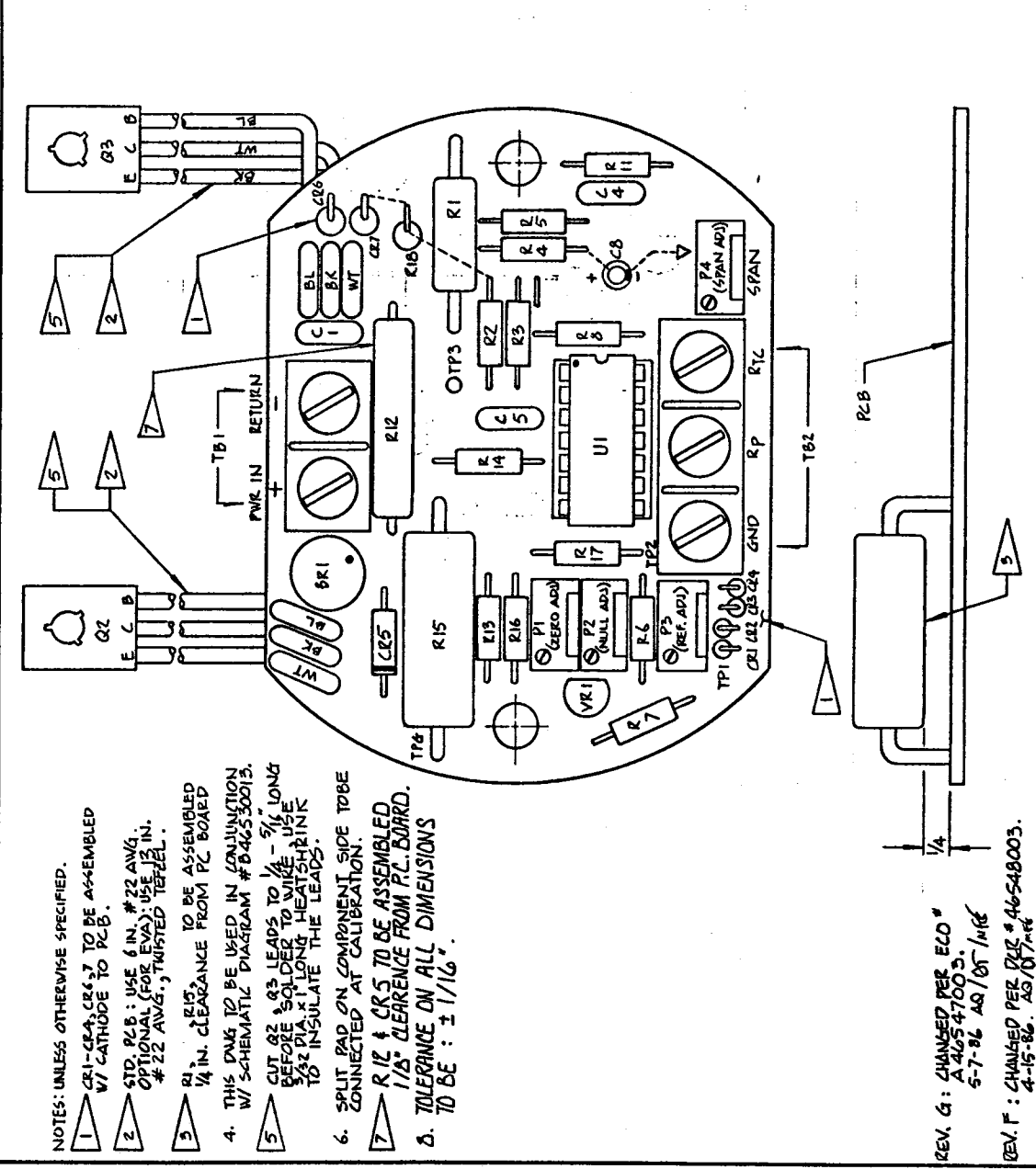
POST OFFICE BOX 408 • 20 VILLAGE SQUARE • CARMEL VALLEY, CALIFORNIA 95008 • (408) 988-3421 • TELEX 251706

REVISIONS	
REV.	DESCRIPTION
A	NOTES ADDED
B	NOTE B UPDATED
C	CHANGED CR5 FROM IN4729 TO IN4001
D	ADDED CR7

REV.	DATE	BY
A	4/24/85	JTC.
B	7/3/85	AR
C	9/5/85	JTC
D	3/14/86	JTC

REF. DESG.	DESCRIPTION	QTY.
C8	CAPACITOR 4.7µf-50V MONOLITHIC	1
R16	RESISTOR 7.87 KΩ	1
R15	5-Ω DALE RS-5 1%	1
R14	3.32 KΩ	1
R11	100 Ω	1
R19	1 KΩ	1
R8, R17	10 KΩ	2
R7	2.49 KΩ	1
R6	2.8 KΩ	1
R1-R5	RESISTOR SELECTED (TEMP. COMP.)	6
P3, P4	POTENTIOMETER 10 KΩ #4W103	2
P2	POTENTIOMETER 2 KΩ #44W202	1
P1	POTENTIOMETER 500 Ω #64W501	1
Q2	TRANSISTOR MJE 370	1
Q3	TRANSISTOR MJE 500	1
CR5	DIODE IN4001	1
CR1-CR4	DIODE IN914	4
C1, C5	CAPACITOR .1µf-50V MONOLITHIC-CERAMIC	2
C4	CAPACITOR .02µf 50V	1
BR1	BRIDGE RECTIFIER 335C020	1
VR1	VOLTAGE REGULATOR LM336-Z 5V	1
TB2	TERMINAL STRIP TRW 3 PIN	1
TB1	TERMINAL STRIP TRW 2 PIN	1
UI	QUAD OP-AMP LM324	1
	14 PIN DIP SOCKET	1
	465-R3 PCB	1

PARTS LIST	
REV. BY: DTR/ML	7/25/85
CHKD: SA	7/29/85
APPD: MTC	7/1/85
SCALE: 2/1	TOLERANCE .XX ± .01
	.XXX ± .003
MODEL 465-R3	INTERCHANGEABLE CURRENT PCB
	COMPONENT LAYOUT
B	B-46531014
REV. G	SHT 1



REF. DESG.	DESCRIPTION	QTY.
R12	RESISTOR 15 Ω 5W OHMITE (TYP.)	1
CR5-CR7	DIODE IN5346B 9.1V 5W	2

OPTIONAL PARTS LIST (FOR INTRINSIC SAFETY CIRCUIT)

NOTES: UNLESS OTHERWISE SPECIFIED.

1. CR1-CR4, CR7 TO BE ASSEMBLED W/ CATHODE TO PCB.
2. STD. PCB: USE 6 IN. #22 AWG. OPTIONAL (FOR EVA): USE 1/2 IN. #22 AWG., TWISTED TOGETHER.
3. R1, CR5 TO BE ASSEMBLED 1/4 IN. CLEARANCE FROM PCB BOARD W/ SCHEMATIC DIAGRAM #846530013.
4. THIS DIAG TO BE USED IN CONNECTION WITH SCHEMATIC DIAGRAM #846530013.
5. CUT CR2, CR3 LEADS TO 1/4 - 5/16" LONG BEFORE SOLDERED TO WIRE. USE 3/32 DIA. X 1" LONG HEATSHRINK TO INSULATE THE LEADS.
6. SPLIT PAD ON COMPONENT SIDE TO BE CONNECTED AT CALIBRATION.
7. R12 & CR5 TO BE ASSEMBLED 1/16" CLEARANCE FROM PCB BOARD.
8. TOLERANCE ON ALL DIMENSIONS TO BE: ± 1/16".

REV. G: CHANGED PER ELO # 4-15-86, AS/10/7/86
5-7-86 AR/01/1/86

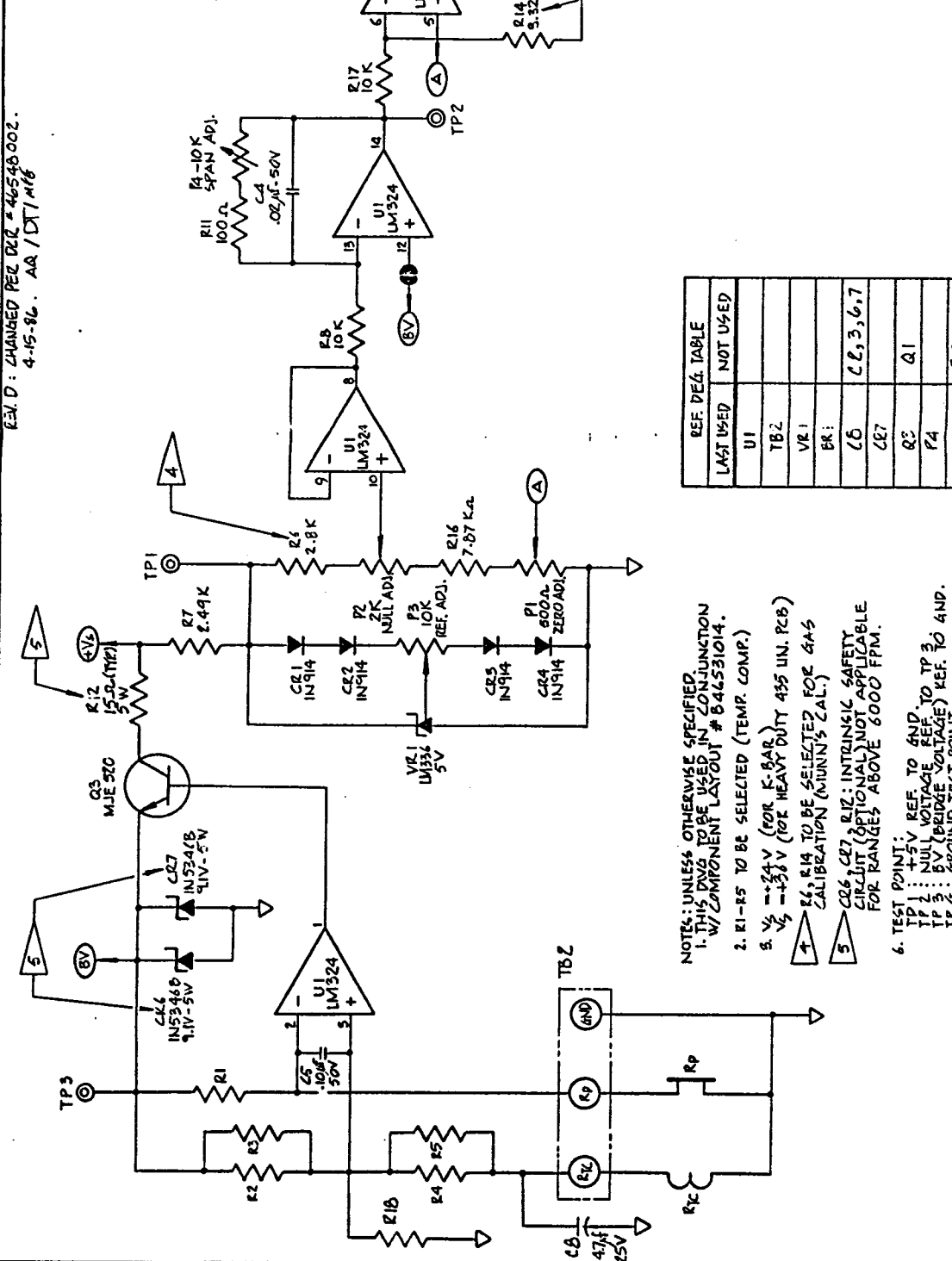
REV. F: CHANGED PER DLE # 46548003.
4-15-86, AS/10/7/86

REV. E: CHANGED CR5 FROM MJE 370 TO MJE 500
REVISED CR2, CR3, CR7 & Q1; R9, R10
ADDED CR8 & R18, CHANGED VALUE OF
C1, C5 FROM .02µf TO .1µf; R7 FROM
3.45 KΩ TO 2.49 KΩ AND P3 FROM 2K TO
10K. 3/14/86 AR/DTR/ML



REV. D : CHANGED PER DRG # 46548002.
4-15-86. AA / DT / MIB

REV.	DESCRIPTION	DATE	BY
A	CHANGED CR5 FROM IN4729 TO IN4001	9/5/85	DT.
B	ADDED C7	3/11/86	DT
C	REMOVED C2,3,6,7,9,10 ADDED C6 & R18. CHANGED VALUE OF C1,5 FROM .02 TO .1M; R7 FROM 3.44K TO 2.49K; P3 FROM 2K TO 10K; Q3 FROM MJE370 TO MJE520	3/4/86	AA / DT / MIB



REF. DES. TABLE	LAST USED	NOT USED
U1		
TP2		
VR1		
BR1		
C6		C2, 3, 6, 7
C7		
Q3		Q1
P4		
R15		R9, 10

- NOTE: UNLESS OTHERWISE SPECIFIED,
1. THIS DVG. TO BE USED IN CONJUNCTION W/ COMPONENT LAYOUT # B46531014.
- R1-R5 TO BE SELECTED (TEMP. COMP.)
 - V₂ = +24V (FOR K-BAR)
 - V₃ = +58V (FOR HEAVY DUTY 455 UN. PCB)
 - C1, R14 TO BE SELECTED FOR GAS CALIBRATION (MUNN'S CAL.)
 - CR6, CR7, R12: INTRINSIC SAFETY CIRCUIT (OPTIONAL) NOT APPLICABLE FOR RANGES ABOVE 6000 FPM.
 - TEST POINT:
TP1: +5V REF. TO GND.
TP2: NULL VOLTAGE REF. TO TP3.
TP3: 5V (BRIDGE VOLTAGE) REF. TO GND.
TP4: GROUND TEST POINT.
 - CIRCUIT STILL FUNCTION EVEN THE LEADS ARE REVERSED.
 - REMOVED

SCALE : NONE
TOLERANCE
XX ± .01
XXX ± .003



REV.	DATE	BY
1	2/27/85	DT
2	3/23/85	DT
3	7/13/85	DT

MODEL 465-R3
INTERCHANGEABLE CURRENT PCB
SCHEMATIC DIAGRAM.

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SECTION 8

Options and Accessories

Special Length Probes
Ball Valve Retractor Assemblys
High Temperature Configurations
High Pressure Calibrations
Probe Mounting Adaptor
Compression Fittings and Threadolets
Specialty Gas Calibrations
Calibration Tunnels

WARRANTY STATEMENT

All products from KURZ INSTRUMENTS, INC. are warranted against defective materials or workmanship to the original purchaser for a period of one year from the original purchase date under normal use and service.

Defective parts will be repaired, adjusted, and/or replaced at no charge when the instrument is returned prepaid to KURZ INSTRUMENTS, INC. Please call for a Return Authorization Number.

The Warranty is VOID if the instrument has been visibly damaged by accident, misuse or has been serviced or modified by any person other than KURZ INSTRUMENTS, INC.

This Warranty contains the entire obligation of KURZ INSTRUMENTS, INC. and no other warranties expressed, implied or statutory are given.