KURZ
INSTRUMENTS INC.

Model 455Jr
Single-Point Insertion
"SMART" Mass Flow Meter
User's Guide

360148A

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Contents

1 Introduction

This section describes the procedure for returning damaged equipment, an overview of the Model 455 Jr System, and the NIST-traceable calibration and unit specifications.

1.1 Receipt of Equipment

When you receive your equipment, carefully check that your order has been filled correctly and that no damage has occurred:

1. Check the outside packing carton for damage incurred in shipment. If the packing carton is damaged, the local carrier should be notified at once regarding their liability. Submit a report to:

   Kurz Instruments, Inc.
   2411 Garden Road
   Monterey, CA 93940

   Attn: Customer Service

2. Remove the packing slip from its envelope and check that the carton contains all parts listed.
3. Make sure spare parts or accessories are not discarded with the packing material. If any parts are missing, contact Customer Service toll-free at (800) 424-7356.

1.2 Return Shipment

If equipment must be returned to Kurz for warranty repair, the shipper pays for transportation charges. Kurz will return the equipment under warranty prepaid.

To return equipment to Kurz, follow these steps:

1. Obtain a Return Material Authorization (RMA) from Kurz Customer Service; call:

   (800) 424-7356

   DO NOT return any equipment without an RMA.

2. Your correspondence must include,

   - The Kurz purchase order number on the customer invoice
   - The name and telephone number, including the area code and extension (if any), of the person Kurz can contact regarding the equipment
   - A description the problem and request corrections to be performed at the Kurz factory

3. Return the equipment and report to this address:

   Kurz Instruments, Inc.
   2411 Garden Road
   Monterey, CA 93940

   Attn: Customer Service

1.3 Product Description

The Model 455 Jr consists of the following components:

- Series 450 insertion mass flow element
- Model 155 Jr flow computer/transmitter

The Series 450 insertion mass flow element consists of a dual-sting sensor and probe support that attaches to a sensor electronics card, which receives power from and send signals out to the Model 155 Jr flow computer/transmitter.

There are two sensor electronics configurations:

- With the Transmitter Attached (TA) configuration, the two-wire sensor electronics card is mounted in the Killark enclosure, directly attached to the sensor support.
- With the Transmitter Separate (TS) configuration, the two-wire electronics card is mounted in a remote enclosure connected by a sensor extension cable to a terminal junction box directly attached to the sensor support. The maximum separation length is 500 feet, if each sensor extension wire is less than 2 ohms.

1.3.1 The Series 450 Insertion Mass Flow Element

The 455 Jr uses thermal convective mass flow measurement, which utilizes a constant temperature anemometer. Kurz mass flow meters feature the MetalClad™ dual-sting, thermal sensor. The flow element is constructed from a variety of materials, with two sensor support diameters and five sensor types to meet the customer's application. The dual-sting sensor can withstand yaw and rotational deviations of ± 15 degrees from an ideal mounting attitude with only 1% measurement error.

1.3.2 The Model 155 Jr Flow Computer/Transmitter

The Model 155 Jr is a microprocessor-based flow computer/ transmitter. Kurz Instruments preprograms the Model 155 Jr before shipment.

The standard system transmitter enclosure is constructed of either painted steel or fiberglass. UL listed and CSA certified enclosures are constructed to these specifications:

- NEMA 4X fiberglass enclosure
- NEMA 4 painted steel enclosure
- NEMA 7 and 9
- NEMA 7 and 9 with window

Features of the Model 155 Jr include the following:

- 20-key keypad, two-line 16 character LCD display/exterior, and user-friendly help screens, 24-hour clock/calendar
- American or International units (such as SCFM or SCMM)
- Two RS-232 ports to connect a serial printer or computer terminal to receive output from the Model 155 Jr.
- Displays user-entered meter I.D. number, 24 hour clock/calendar, flow rate (SCFM or PPH), average velocity (SFPM), specific gravity (if PPH selected), variable velocity profile factor for each defined meter, user-entered flow area and averaged channels
- User and Technician security codes limit access to critical areas of the system.
- Easy, all-digital input calibration
- Lagrangian polynomial linear interpolation for maximum accuracy
- Conditions and linearizes up to 2 sensor inputs (flow rate or temperature)
- Outputs up to 2 scaled linear 0–5 Vdc analog signals indicating the flow measurements for selected meters
- User-selected digital filtering
- Kicks out sensor readings outside of a specified range
- Reads and displays input voltages from each sensor
- Built-in flow totalizers for each meter

You can purchase the following accessories for the Model 155 Jr:

- An IBM-PC compatible, laptop Personal Computer with the Upload/Download/Dump software program, which functions as a remote terminal and data recorder.
- Upload/Download/Dump software programs, which you can use on an IBM-PC compatible computer connected to the Model 155 Jr.

1.4 NIST-Traceable Calibration

The Model 455 Jr is factory-calibrated and traceable to the National Institute of Standards & Technology (NIST).

A Calibration Data and Certification Document is packaged with each unit per specified scaled velocity or mass flow range. The factory calibration are in standard conditions referenced to a temperature of 77°F (25°C) and an atmospheric pressure of 29.92 inches (760 mm) of mercury (Hg).

NOTE: Factory calibration is also available at 32°F (0°C) and 1 BAR pressure.

End of Section 1

2 Installation

Portions of the installation procedures described in this section might not apply to your system configuration, however, we recommend that you read this section. If further assistance is needed with your installation, contact your Kurz sales representative or contact Customer Service.

To install the 455 Jr, follow these steps:

1. If possible, locate the probe at least three pipe or duct diameter upstream and ten diameter downstream from the nearest bend, elbow, or other obstruction in the pipe or duct to be monitored.
2. Check that the location provides clearance for inserting and removing the Series 450 probe; the clearance from the pipe or duct and any obstruction should be at least the probe's length, plus the Killark enclosure, and 2–3 inches for maneuverability.

NOTE: Do not install the Killark enclosure close to a hot duct or stack. The ambient temperature around the Killark enclosure should not exceed 50°C.

3. Mount the sensor in the pipe or duct at a point where the velocity closely approximates the average velocity. For some applications, you can assume that the center point of the pipe or duct represents a point of average velocity, such as:

   - a high degree of accuracy is not critical.
   - the pipe or duct is so small that it is impractical to mount the sensor anywhere other than the center.
   - the flow profile is turbulent and of high velocity; many points of average velocity are likely.
   - the flow profile is known to be uniform.

   Even under these circumstances, you might want to calculate a half-traverse or double-traverse average before deciding on center mounting. If you need information about how to perform these calculations, contact Kurz Customer Service, (800) 424-7356.

4. Rotate the probe so that the sensor shield window allows unobstructed air flow over the sensor. The shorter element should be upstream of the longer element.
5. Connect the two-wire, twisted, shielded pair from the Killark enclosure to the Model 155 Jr enclosure ground lug. The wire connects to terminal block 3 (TB3) on the Model 155 Jr input/output board. See the engineering drawings in Appendix A to identify and locate terminal specifics.
6. Connect the Model 155 Jr to the power source.

NOTE: Do not supply power to the system without connecting the sensors; otherwise, you could overheat the board components.

7. After plugging in the power cord, turn on the power switch.

2.1 Mechanical Installation

To ensure a successful installation, do not locate the enclosure subject to sudden temperature changes, drafts or near equipment radiating significant heat. Allow adequate space for cable connectors and wiring. Proper clearance ensures easy access for routine maintenance and trouble-shooting.

In securing the system transmitter enclosure,use the highest quality fasteners in a configured installment offering generous safety factors.

NOTE: Refer to the engineering drawings in Appendix A for the outline dimensions and mounting holes for the system transmitter enclosure.

2.2 Electrical Connections

Connect all wires as shown in the engineering drawings in Appendix A.

If not already connected by the Kurz factory before shipment, the wiring connections pertaining to the Model 155 Jr consist of the following:

- Input power wiring connections
- Two-wire hookup cable connections
- Customer-supplied external devices connections

2.2.1 Power Input Wiring Connections

Power sources to the system should be checked to ensure that the power is fairly clean and stable, for example 115 Vac ± 10.0% at 60 Hz (Standard), 230Vac ± 10.0% at 50/60 Hz, and 24.000 Vdc, 0.5% regulation. After you check all connections, you can turn on the power to the system.

Tables 2-1 and 2-2 list the power input connections for the Model 155 Jr input/output board.

Table 2-1. *AC Power Input Wiring*

Terminal Placements	A.C. Power
TB1-1	AC
TB1-2	ACC
TB1-3	GND

Table 2-2. *DC Power Input Wiring*

Terminal Placements	D.C. Power
TB2-1	+24.000 Vdc
TB2-2	GND

2.2.2 Two-Wire Conductor Cable Connections

Kurz Instruments provides a limited length of test cable (18 AWG) for bench-test purposes only. Do not use the test cable for process operations. Customer to replace as required.

The two-wire conductor cable connects the Model 465R_x Current-Transmitter Board and the Model 155 Jr. One wire provides a voltage supply to the current-transmitter board from the linearizer board; the other wire transmits the sensor's return signal from the current-transmitter board to the system transmitter (linearizer board).

NOTE: If you are using shielded cable, connect the shield as shown on the field wiring drawing in Appendix A.

Select a cable length and wire gauge so that the maximum loop resistance does not exceed 4.0 ohms. If you use heavier wire, you can position the system transmitter enclosure further from the sensor electronics enclosure. Refer to Table 2-3 for approximate loop resistance for the two-wire cable connected to the Model 155 Jr.

Table 2-3 applies to stranded copper wire at 65°F (18°C). Resistance in other kinds of wire or in stranded copper wire at different temperatures varies. AWG numbers are inversely proportional to the size of wire. For example, the smallest AWG number specifies the largest diameter wire.

Table 2-3. *Two-Wire Loop Resistance*

APPROXIMATE LOOP RESISTANCE AT 65° F (18° C)			
AWG Number	Ohms Per Feet	Maximum Cable Per Feet	
		Loop	Run
4	.0003	13,333	6,667
8	.0005	8,000	4,000
10	.0008	5,000	2,500
12	.002	2,000	1,000
14	.003	1,333	667
16	.005	800	400
18	.008	500	250
20	.012	333	167
22	.019	211	105
24	.030	133	67
28	.077	52	26

For systems with velocity sensors, the two-wire conductor cable connects to the Model 465R7 Current-Transmitter Board (one per sensor):

- One wire connects to terminal block 1, terminal screw 2 (TB1-2) to provide a 24.000 Vdc supply.
- The second wire connects to terminal block 1, terminal screw 1 (TB1-1) to transmit the sensor's current-return signal.

For systems with a temperature sensor, the two-wire conductor cables connects to the Model 604 Current-Transmitter Board:

- One wire connects to terminal block 2, terminal screw 2 (TB2-2) to provide a 15.000 Vdc supply.
- The second wire connects to terminal block 2, terminal screw 1 (TB2-1) to transmit sensor's current-return signal.

You can connect the temperature sensor's two-wire cable to the Model 604 Current-Transmitter Board interchangeably. Appendix A contains the wiring diagram for the Current-Transmitter Board.

2.2.3 Connecting Optional Modules to the Model 155 Jr

You can connect your own external devices to the signal outputs and alarm contact outputs. Refer to Appendix A for all engineering drawings.

2.3 Verifying Wiring Connections

To verify the wiring connections on the Model 155 Jr, follow these steps:

1. Check system wiring against the Kurz system drawings provided with your equipment and against the architect/engineer or OEM equipment vendor drawing to ensure that terminations have not changed during the design process or installation.
2. Perform point-to-point tests to ensure that signal cables, power cables, ground wires, and other system connections are complete. This test minimizes equipment failures caused by improper wiring.
3. Do **NOT** supply power to the system until this check-out procedure is satisfactorily completed.

2.4 Maintenance

You can perform minor, routine maintenance on the mechanical and electronic configurations of the 455 Jr.

NOTE: Always turn off the power before dismantling the system for repair, recalibration, or cleaning!

The system transmitter enclosure and the electronic components should be periodically inspected and cleaned. The factory calibration of the unit remains stable for up to several years. To maintain NIST-traceability, Kurz Instruments recommends annual recalibrations. If the unit requires recalibration while still under warranty, contact Kurz Customer Service.

Even minor repairs can require electronic components or wiring connections to be replaced or repaired. For all repairs, use only certified electrical technician familiar with electronic test equipment and measurements. For major repairs, return the unit to the Kurz factory for service. Kurz Instruments provides technical assistance over the phone to qualified repair personnel. For more information, call Customer Service.

End of Section 2

3 Operation

This section describes the Model 155 Jr keys and functions, what happens at startup, and how to use the Model 155 Jr menus and user-definable commands.

NOTE: Keep in mind that not all the menus and commands described in this manual might pertain to your specific system configuration; however, this section describes each command and function.

Appendix A contains a state diagram of Model 155 Jr operation. See Appendix B for Technician-Level menus and commands, Appendix C for PID (Proportional Integral Derivative) displays and menus, and Appendix C for Upload/Download Tunnel Data procedures.

3.1 Keys and Functions

You can operate the Model 155 Jr directly using the Model 155 Jr display and keypad, or you can use an ASCII terminal, or Personal Computer (PC) executing ASCII terminal emulation software. Using an ASCII terminal or PC offers the advantages of being remote from the system (up to 50 feet) and displaying more data at one time than the 32-character Model 155 Jr display.

Each Model 155 Jr key has a corresponding key on the ASCII terminal or PC keyboard. You press these keys to program and display information about the system setup and status. The Model 155 Jr key functions are described in Table 3-1.

Table 3-1. The Model 155 Jr Keypad and ASCII Keyboard.

MODEL 155 JR KEY	FUNCTION	DESCRIPTION	ASCII KEY
P	Program	Starts Program Mode where you enter an access code, then can reset totalizers, system time and date, log interval, meter data, box filter, and so on.	P
D	Display	Starts Display Mode where you can see Meter ID, time and date, flow rate, totalized flow and elapsed time, average velocity, and so on.	D
L	Log	If you have a Data MPP-20 Serial/Parallel Alphanumeric Thermal Printer connected to the Model 155 Jr, pressing this key sends data to the printer.	L
E	Enter	Enters setup variables in Program Mode.	[CR]
H	Hold	Holds current display until the Clear key is pressed.	H
^ Yes	Up Arrow Yes	Press this key to move to the next item down in a menu, or to move right to the next menu. If you typing alphanumeric keys using the Model 155 Jr keypad, pressing the Up-Arrow key increments to the next letter or number (A,B,C... or 1,2,3...).	^
v No	Down Arrow No	Press this key to move to the previous item in a menu, or to move left to the previous menu. If you are typing alphanumeric keys using the Model 155 Jr keypad, pressing the Down-Arrow key decrements to the previous letter or number (...C,B,A or ...3,2,1).	v
C	Clear	Press this key to cancel a response and return to the previous command or menu. Pressing the Clear key repeatedly returns you to the Executive Mode.	C
–	Hyphen	For text entry.	–
•	Period	For text entry.	•
0–9	0–9	For text entry.	0–9

NOTE: If you are using an ASCII terminal or PC with the Model 155 Jr, refer to your hardware's documentation for information regarding the location and function of keys. The ASCII terminal or PC keyboard key that corresponds to Model 155 Jr's "E" key (Enter) can differ from terminal to terminal. Sometimes "Enter" is denoted by "Carriage Return" [CR].

If your system is connected to an ASCII terminal or PC, you can:

- Echo Model 155 Jr displays to the terminal or PC
- Send Model 155 Jr log data to the terminal or PC
- Send Model 155 Jr configuration data to the terminal or PC

ASCII KEY	FUNCTION
+	Toggles echo on and echo off to a terminal or PC screen. When echo is on, information sent to the Model 155 Jr display echoes to the ASCII terminal or PC screen. Pressing " + " again turns off the echo.
Q	Sends system configuration data, which are not in a data log, to an ASCII terminal or PC display.
?	Displays a list of help functions for selection.

3.2 Startup

When you turn on the power to the microprocessor module, the data logging system initiates a memory check. As the Model 155 Jr passes the memory test, you see messages indicating the following information:

- System time of day clock
- Initialization messages
- Prints out a "power-failed at ..." message and the data that was stored in non-volatile memory before the power failure occurred
- Allows the analog inputs to stabilize
- Clears and restarts the totalizer
- Calculates the time of the next scheduled printout
- Prints out a "power-up at ..." message and the current data
- Starts Executive Mode

3.3 Executive Mode

After startup, the Model 155 Jr automatically enters the Executive Mode. In Executive Mode, the Model 155 Jr has an Automatic Display Loop where it returns any time the keypad is inactive for 5 minutes. If the system is not in Executive Mode, you can press "C" repeatedly to return there.

The Automatic Display Loop cycles through display screens providing this information:

- Kurz Instruments banner and the system time and date
- Press "D" to exit the Automatic Display Loop and enter an alternate display loop that displays additional information
- Press "P" to exit the Automatic Display Loop and enter the Program Mode
- Press "H" to hold and update one of the displays in the Automatic Display Loop. Press "H" twice to see the Help screens
- Press "L" to log the system status to a serial printer

3.4 Display Mode

From Executive Mode, you press "D," and then "E" to display values other than those in the Automatic Display Loop.

To display meter information:

1. Press YES/UP–ARROW and NO/DOWN–ARROW to cycle through the list of defined meters. Select a meter, press "D."
2. You will see the meter identification (if you assigned one) or a pre-assigned meter number, and the time and date; press "D" to start the display.

When you display a flow meter, you see the following information; press "E" to proceed to the next display:

- flow rate in the pre-set units, such as SCFM (Standard Cubic Feet per Minute) or PPH (Pounds per Hour)
- totalized flow (TOT) in the pre-set units, such as SCF (Standard Cubic Feet) or LBS (pounds), and elapsed time (ET) in minutes
- average velocity in SFPM (Standard Feet per Minute)
- the specific gravity (if applicable)
- flow area in square feet
- calibration factor
- if the meter is a sum flow meter, you see which meters are added or subtracted to determine the sum
- if the meter is assigned to several meters, you see the meters included
- input volts for each channel in the meter

When you display a temperature meter, you see the following information; press "E" to proceed to the next display:

- temperature (in degrees Fahrenheit or Centigrade)
- calibration factor
- averaged channels for the selected meter, or single channel
- if the meter is assigned to several meters, you see the meters included
- input volts and degree reading for each channel in the meter

NOTE: The calibration factor is a correction factor applied to the linearized signal to compensate for an uneven profile in a duct or stack. You can apply up to 7 calibration factors to the linearized signal for each meter in the system. This allows the signal to be corrected at different flows, according to the flow profile. See "3.5.4 Set Meter Data."

3.5 Program Mode

From Executive Mode, press "P" to go to Program Mode. Once you are in Program Mode, you enter an access code to see the menus.

The Program Menu offers these options:

- Reset the totalizers
- Set the system time and date
- Set the log interval
- Set the meter data
- Set the box filter
- Select the analog output
- Set the alarms
- Set channel kick out
- See input volts

Appendix A contains a state diagram of the Model 155 Jr interface. Appendix B describes the technician-level access to Program Mode. Appendix C describes the PID display and program menus. Appendix D explains how to use the upload/download/dump configuration files programs.

To enter Program Mode:

1. Press "P" when the system is in Executive Mode.
2. Using the keypad, type a 6-digit access code and press "E."
3. If you enter the correct access code, the system displays the first Program Menu choice. If you incorrectly enter the access code, this message displays for 2 seconds:

   INVALID CODE 600 - 016
4. When you no longer see this message, you can enter the correct access code.

To cycle through the Program Menu options:

1. Press "P."
2. When you reach the option you want, press "E."
3. After you press "E," you can perform the action for the option you chose.

3.5.1 Reset Totalizers

To reset the stack flow totalizers:

1. Press "P" from Program Mode to enter the Program Menu.
2. Enter a valid access code; you will see this message,

   PRESS ENTER TO RESET TOTALIZERS
3. If you press "E," you see this message,

   ARE YOU SURE?

   To answer yes, press YES/UP–ARROW, then press "E." You will see a message indicating that the totalizers are reset. If you do not want to reset the totalizer, press NO/DOWN–ARROW, and then press "E" to go to "Set Time & Date."

3.5.2 Set Time and Date

The system time of day displayed in this form:

hh:mm mm/dd/yy

Although the time of day is displayed to the second, the system records only to the minute. The system time is kept current with a battery-backed clock.

To set a time or date value, you must set all time and date values in the order in which they display. When you modify a value, you see two lines; the top line shows the current time and date, and the bottom line shows the first digit of the current time displayed.

To set the system time or date:

1. Press "P" from Program Mode to enter the Program Menu.
2. Press YES/UP–ARROW or NO/DOWN–ARROW till you see "Set Time & Date," then press "E."
3. You see two lines; the top line shows the current time and date, and the bottom line shows the current 2-digit hour value.

   If the hour value is correct, press "E" to go on to minute. If the hour value is incorrect, enter a new 2-digit value.

   If you change the value, the digits you enter display in the bottom line. Press "E" to enter the new hours value and update the top line of the display.
4. Each time you press "E" you proceed to the next value: hour, minute, month, day, and year. Press "E" to keep the current values, or type a new value and then press "E." After you type a value and press "E," the top line is updated to reflect your change.

   After you set the year value and press "E," you go to "Set Log Interval."

When you reset the clock, the seconds value is set to 00. If the time of day is critical down to the seconds in your application, press "E" key to enter the year value at precisely the beginning of the minute.

3.5.3 Set Log Intervals

You can program the Model 155 Jr to send the meter data to a printer at specified time intervals. You can also send the meter data from the Model 155 Jr to an ASCII terminal or PC through the RS-232 port.

To set the log interval:

1. Press "P" when you are in the Program Menu until you see this message,

   PRESS ENTER TO SET LOG INTERVAL

2. Press "E" to see the current interval setting in hours and minutes.

   The time interval is set in two different entries, first you type an hour value, then a minute value. You see two lines; the top line shows the current log interval, and the bottom line shows the current 3-digit hour value.

3. If the hour value is correct, press "E" to go on to the minute interval. To change the hour value, type a new value, then press "E."

   If you change a value, the digits display in the bottom line. Press "E" to enter the new hour value and update the top line of the display.

4. If the minute value is correct, press "E." To change the minute value, type a new value, and then press "E" to go to "Set Meter Data."

3.5.4 Set Meter Data

The Model 155 Jr calculates flow measurements based on the sensor(s) output. Each physical sensor in the system is a "channel" to the Model 155 Jr. A "meter" can be an individual sensor, the measurements of selected channels, or the sum of selected meters.

Set Meter Data lets you generate or change the meter data in Display Mode. The system will prompt you to select one of the meters. Use the YES/UP–ARROW and NO/DOWN–ARROW keys to cycle through the list of meters (up to 16) or enter a meter number.

To set meter identification:

1. Press "P" when you are in the Program Menu until you see this message,

   PRESS ENTER TO SET METER DATA

   After you press "E," you see this message

   PRESS ENTER TO SET METER #1
   (METER 000001)

   To specify an identification for meter #1, press "E."

2. Type up to 12 characters using the YES/UP–ARROW and NO/DOWN–ARROW keys. Pressing these keys cycles through the list of alphanumeric characters and some special characters (such as hyphen and blank space). Press "E" to enter each character.

   Meter identifications are pre-set at the factory, however, you can change the identification for a meter, or you can assign an additional meter. You can specify up to 16 meter identifications.

To set meter data:

1. After you have reviewed the meter IDs, press "P." At this point, you can assign functions to each meter. You see the following message:

   NEXT TYPE, ^ V

   Press YES/UP–ARROW or NO/DOWN –ARROW to cycle through the meter types:

   - Insertion flow meter (velocity or mass flow rate)
   - In-line flow meter
   - Temperature
   - Sum flow meter

   These options correspond to preset factory definitions based on your order, so you might not see all the options listed above for each meter.

2. Depending on the meter type you assigned in Step 1 (above), you will go to one of these procedures:

   For insertion and in-line meters, you see the flow display in SCFM (or SCMM), then PPH (or KGH). When you press "E," you set the specific gravity, indicate which channels to include in this meter. Press YES/UP–ARROW or NO/DOWN–ARROW to the channel prompt.

NOTE: If you specified PPH as the units, you specify specific gravity before indicating which channels to include in this meter.

   For temperature meters, you indicate which channels to include in this meter.

   For sum flow meters, you specify which meters to add or subtract from the sum. Press " + " to add, "–" to subtract, or NO/DOWN–ARROW to not use this meter.

3. Type the flow area in square feet (for all meter types except temperature), then press "E."

4. Define the number of calibration factor data points to adjust the meter's readings at various flow rates or temperature rates. You can define up to 7 points possible for digital linearization using second order Lagrangian interpolations; the default calibration factor is 1.

5. Define the calibration factor (correction factor) at a given SCFM. You can enter values from 0.001 to 9.999; the default value is 1.000 at no flow. Press "E" to define more calibration factors. After defining the last calibration factor, pressing "E" cycles lets you set the meter data for Meter #2. When you have set the meter data for all the defined meters, pressing "E" sends you to "Set Box Filter."

3.5.5 Set Box Filter Size

The analog channel inputs to the Model 155 Jr are filtered using a digital filtering algorithm known as a "boxcar filter." This algorithm takes the average of the last several readings. The size of the box filter is equal to the number of readings to be averaged. When you set the box filter size, you specify how many readings will be averaged for each channel.

Averaging over a large number of readings is analogous to putting a large filter capacitor on the input. A large box filter slows down the system response because there is a 2.4 seconds between the reads of each channel. A small box filter can cause the system to be susceptible to transient pulses.

To set box filter size:

1. When you are in the Program Menu, press "P" until you see this message,

   PRESS ENTER TO SET BOX FILTER

2. After you press "E," the system prompts you to select a channel; channels display only in sequence.

   Press YES/UP–ARROW and NO/DOWN–ARROW to cycle through the channel list; press "E" to select a channel.

3. Type a box filter size from 1 to 16, then press "E;" the default value is 1.

   After entering the box filter size and pressing "E," the system returns you to the channel listing except after entering the last channel's box filter size. Press "E" to "Set Analog Output."

3.5.6 Set Analog Output

You can set up to 8 analog output channels. Each channel can output a linear 0–5 Vdc signal that represents one of the following choices:

- Average velocity
- Flow rate
- Temperature

To set analog output:

1. When you are in the Program Menu, press "P" until you see this message,

   PRESS ENTER TO SET ANALOG OUT

2. After you press "E," the system displays this message,

   PRESS ENTER FOR ANALOG OUT 1

   Press "E," then assign a meter number to analog output 1. There are up to 16 meters available.

3. Type a meter number, then press "E."

4. Assign the analog a function to represent (either average velocity or flow rate for a mass flow meter, or temperature for a temperature meter). Press YES/UP–ARROW to cycle through the list. When you see the function you want converted to the analog output signal, press "E."

5. If the meter is a flow meter, set the low and high flow rates. After typing the values, press "E."

   If the meter is a temperature meter, set the low and high temperatures. After typing the values, press "E."

   After you have set analog outputs for all the meters in your system, press "E" to go to "Set Alarms."

If you set these analog output values, the output signal will be a 0–5 Vdc linear representation of the average velocity representing a flow range of 0–12,000 SFPM. When the average velocity measured is 0 SFPM, a 0.000 Vdc signal will be output. When the average velocity is 6000 SFPM (half way between 0–12,000 SFPM) the output signal will be 2.500 Vdc (half way between 0–5 Vdc). If the flow is 12,000, a 5.000 Vdc signal will be output.

3.5.7 Set Alarms

Although there are 16 alarms in the Model 155 Jr, one alarm is assigned at the factory for Global Kick Out. You can assign the remaining 15 independent alarms to any meter in your system. You can set alarms for these conditions:

- A flow rate higher or lower than a high or low set-point
- A velocity reading higher or lower than a high or low set-point
- A temperature higher or lower than a high or low set-point
- A channel kick out (any channel removed from the average because it is higher or lower than a specified range)
- A non-isokinetic condition

To set an alarm:

1. Press "P" when you are in the Program Menu until you see this message,

   PRESS ENTER TO SET ALARMS

   Press "E." To set Alarm 1, press "E" again.
2. Assign a meter number to the alarm, and press "E."
3. Set the alarm on or off, and press "E."
4. Set the alarm relay as normally open (N.O.) or closed (N.C.). Each alarm can be independently used as N.O. or N.C. relay. See the engineering drawings in Appendix A for the location of the output terminals that connect external devices to the alarm relay contacts.

5. After you select a relay choice and press "E," you see a list of flow conditions to assign to the alarm. Use YES/UP–ARROW and NO/DOWN–ARROW to cycle through the list. Press "E" to select the flow condition under which the alarm activates.

6. For flowrate, velocity, and temperature alarms, press "E" and the system prompts you to assign values to the alarm (LO, HI, or HOL). Type your choice and press "E."

   For a channel kickout alarm, press "E" to return to the alarm selection list where you designate an alarm for a meter instead of Global Kickout.

   You select a "non-isokinetic" alarm only for an isokinetic system. After you press "E," enter a reference flow meter and a velocity difference for the two meters.

7. Set the alarm's threshold. Low alarms (LO) activate when flow equals or is less than the alarm set-point. High alarms (HI) activate when flow equals or is greater than the alarm set-point. High or low alarms (HOL) activate when flow is greater than or less than the alarm set-point.

NOTE: When an alarm activates, set the alarm to OFF until the condition is corrected. Reset the alarm to ON once the condition is corrected.

3.5.8 Set Channel Kick Out

The factory assigns an alarm (defined by the maximum channels in your system) as Global Kick Out, which "kicks out" any sensor readings higher or lower than the selected percentage of full scale. Set channel kick out lets you specify which channel(s) to kick out of the average.

To set channel kick out:

1. Press "P" when you are in the Program Menu until you see this message,

   PRESS ENTER TO SET CHAN KICKOUT
2. Press "E," then set channel kick out ON or OFF.
3. Type a high kick out value (percentage of full scale) and press "E."
4. Type a low kick out value (percentage of full scale) and press "E."
5. Set the alarm to be turned ON or OFF, and press "E."
6. Assign an alarm relay of N.O. (normally open) or N.C. (normally closed); press "E" to return to the Program Menu.

3.5.9 See Input Volts

The factory assigns input volt values from the original calibrated values in the linearizer tables before a calibration factor is applied.

To see input volts:

1. Press "P" when you are in the Program Menu until you see this message,

   PRESS ENTER TO SEE INPUT VOLTS

2. After you press "E," use YES/UP–ARROW and NO/DOWN–ARROW to cycle through the list of channels. The input volts are displayed in this format:

   A=XXXX.XX UNITS
   INPUT=XXXX VDC

   Where "A" indicates Channel A, "UNITS" is SFPM (SCFM, DEGF, and so on), and "XXXX VDC" indicates input volts (Vdc).

End of Section 3

A Engineering Drawings

This appendix contains the engineering drawings for the Model 455 Jr.

NOTE: To perform your own warranty service, you must first obtain written authorization from Kurz Instruments, Inc. **Unauthorized service performed during the warranty period voids your warranty.** Read the warranty statement on the copyright page of this manual before performing any services.

REVISIONS					
REV.	DESCRIPTION	BY	CHKD	APRVD	DATE
A	RELEASE TO PRODUCTION	DFS	[illegible]	BL	10/6/92

155 JR ENCLOSURE

OPTIONAL CONNECTIONS

RS-232 DATA OUTPUT PORT ⚠

RS-232 COMMUNICATIONS PORT ⚠

CABLE 90 ON TB9

TB15 TB16 TB17 TB18 TB19 TB20 ADAM JR. INTERFACE

TB11 TB12 TB13 TB14

TB9 TB10

J7 J8

⚠ ⚠ ⚠

TB8 TB7 TB6 TB5 TB4 TB3

NOT USED

250Ω 1/2 W

5Ω

TB1 (HOT) (NEUTRAL) (EARTH GND)

TB2

FUSE 115V 1/2A 230V 1/4A

AC ACC GND — AC POWER

+ − — 24 DC POWER INPUT OPTION

OPTIONAL CONNECTIONS

TB9 – 1 (+) 0–5	} ANALOG OUT 1	
TB9 – 2 ⏚		
TB10 – 1 (+) 0–5	} ANALOG OUT 2	
TB10 – 2 ⏚		
TB11 – 1	} 4–20mA OUT 1	
TB11 – 2		
TB12 – 1		
TB12 – 2		
TB13 – 1	} 4–20mA OUT 2	
TB13 – 2		
TB14 – 1		
TB14 – 2		
TB15 – 1	} ALARM OUT 1	
TB15 – 2		
TB16 – 1	} ALARM OUT 2	
TB16 – 2		
TB17 – 1	} ALARM OUT 3	
TB17 – 2		
TB18 – 1	} ALARM OUT 4	
TB18 – 2		
TB19 – 1 (+)	} MOTOR 1	
TB19 – 2 (–)		
TB20 – 1 (+)	} MOTOR 2	
TB20 – 2 (–)		

(OPT.) TEMP. SENSOR INPUT +
(OPT.) TEMP. SENSOR INPUT –

FLOW SENSOR INPUT +
FLOW SENSOR INPUT –

TEMP. TRANSMITTER ENCL.

(OPT.) TEMP SENSOR OUTPUT –
(OPT.) TEMP SENSOR OUTPUT +

TYPICALLY A LOOP POWERED 4–20 mA CONNECT TRANSMITTER

RTDL RTDH RTDS

MODEL 604

FLOW TRANSMITTER ENCL.

FLOW SENSOR OUTPUT –
FLOW SENSOR OUTPUT +

POWER REQUIRED ≈100 TO 700 mA AT 24 VDC

RPS RPL RPH RTCL RTCH

MODEL 465

SAMPLE DIAGRAMS, 4–20 mA CONNECTIONS

CUSTOMER SUPPLIED

LOOP POWERED

15V 4–20mA TB11–1 (TB13–1) TB11–2 (TB13–2) TB12–1 (TB14–1) TB12–2 (TB14–2) 250Ω 1–5V 24V

SELF POWERED

15V 4–20mA TB11–1 (TB13–1) TB11–2 (TB13–2) JUMPER TB12–1 (TB14–1) TB12–2 (TB14–2) 250Ω 1–5V

NOTES:

1. THIS WIRING DIAGRAM IS USED IN CONJUNCTION WITH PARENT NUMBERS 750101.
2. REF. DESIGNATORS AND PIN NUMBERS ARE FOR REF. ONLY, AND MAY NOT APPEAR ON COMPONENTS

⚠ 4–20 mA COMPLIANCE, 7 TO 50 VDC.

⚠ TB3–1 THRU TB8–1 (INPUTS 1 THRU 6) 0–5 VDC MAX. TB3–2 THRU TB8–2 (OUTPUTS 18 TO 24 VDC).

⚠ SOLDER PAD GND FOR ⊖ EXTERNAL INPUT.

⚠ TERMINAL PORT DCE J5

PIN		CUSTOMER CONNECT
N/C	1	9 PIN TO 9 PIN CABLE, STRAIGHT THROUGH
TXD1	2	
RXD1	3	
DTR	4	
GND	5	
DSR	6	
RTS	7	
CTS	8	
N/C	9	

⚠ PRINTER PORT DCE J7

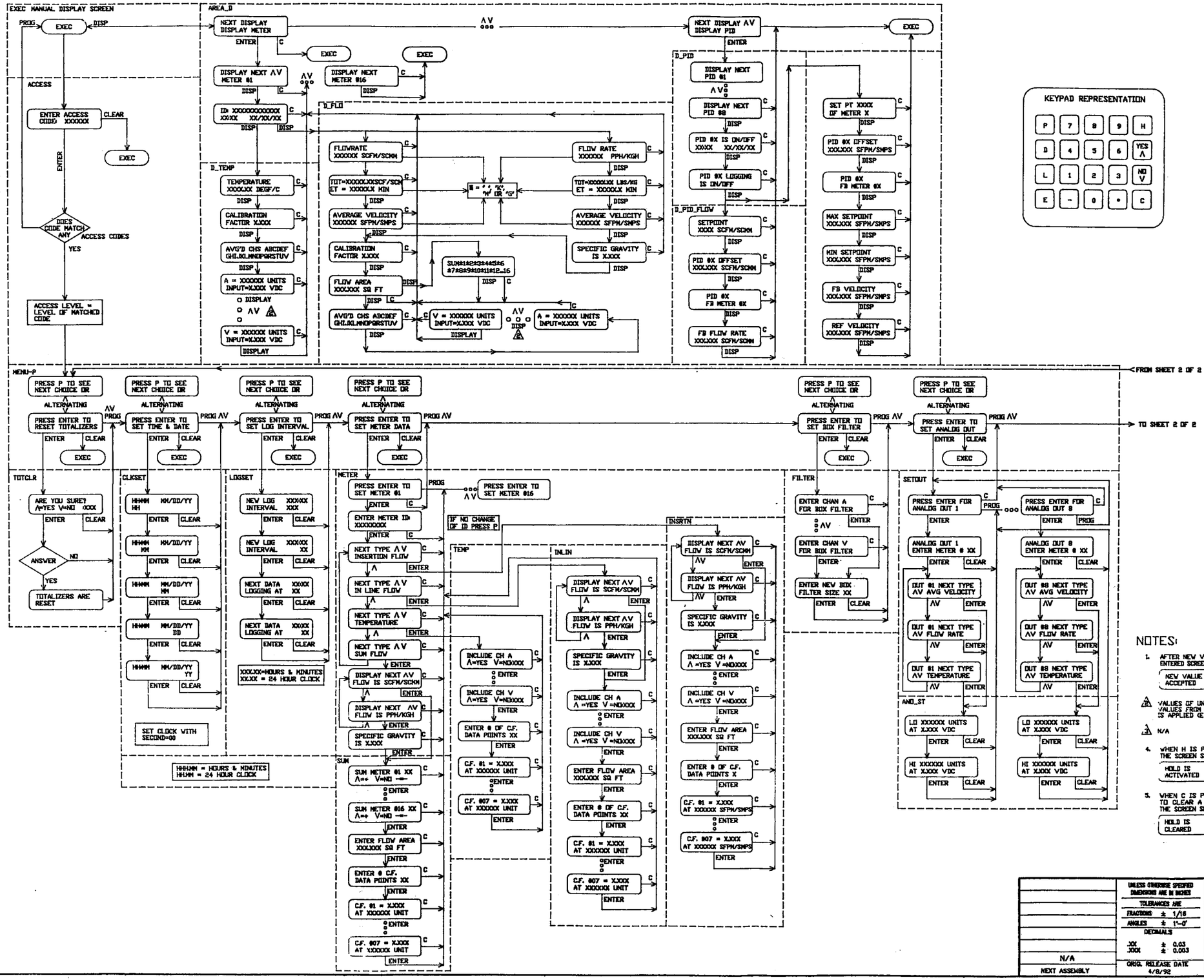
PIN		CUSTOMER CONNECT
N/C	1	9 PIN TO 9 PIN CABLE, STRAIGHT THROUGH
TXD0	2	
RXD0	3	
DTR	4	
GND	5	
DCD0	6	
RTS0	7	
CTS0	8	
N/C	9	

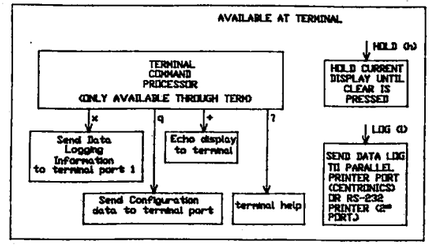
⚠ TEST POINTS.

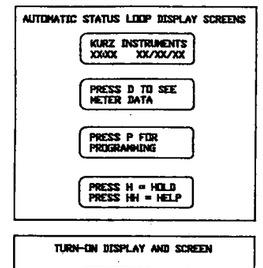
TP1 +2.500 REF
TP2 +5V
TP3 –9V
TP4 +10V
TP5 –5V
TP6 +12V
TP7 +15V

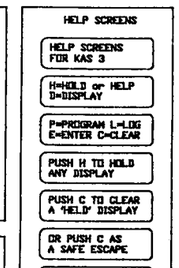
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	APPROVALS		
TOLERANCES ARE	DRAWN BY DFS	DATE 9/29/92	KURZ INSTRUMENTS, INC.
FRACTIONS ± 1/16	CHECKED BY [illegible]	DATE 10-6-92	WIRING DIAGRAM, HOOK–UP, 155 JR.
ANGLES ± 1°–0'	APPROVED B. Lubo	DATE 10/6/92	
DECIMALS .X ± 0.1 .XX ± 0.03 .XXX ± 0.003			DWG. SIZE D — DWG. NO. 340155–29 — REV. A
N/A NEXT ASSEMBLY	ORIG. RELEASE DATE		SCALE NTS — SHEET 1 OF 1

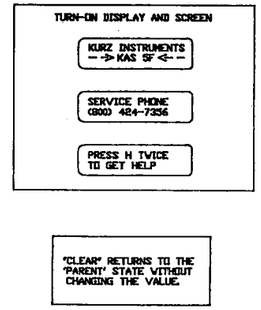
REVISIONS					
REV.	DESCRIPTION	BY	CHKD	APRVD	DATE
1	PRELIMINARY RELEASE	R.P.	T.E.	B.L.	4/8/92
A	REVISED PER ECO #47941	R.P.	T.E.	B.L.	8/14/92











NOTES:

1. AFTER NEW VALUE IS ENTERED SCREEN SHOWS: NEW VALUE ACCEPTED
2. VALUES OF UNITS ARE ORIGINAL CALIBRATED VALUES FROM LINEARIZER TABLES BEFORE C.F. IS APPLIED (E V/N0.
3. N/A
4. WHEN H IS PRESSED THE SCREEN SHOWS: HOLD IS ACTIVATED
5. WHEN C IS PRESSED TO CLEAR A HOLD THE SCREEN SHOWS: HOLD IS CLEARED

ADAM SOFTWARE
KAS-5F-14
KAS-5F-22
11-11-91 VERSION

INCLUDES:
1. SIX DIGIT FLOATING POINT MATH
2. ENGLISH/INTERNATIONAL UNITS
3. PPH/KGH SELECTION WITH SETTABLE AIR DENSITY AND SPECIFIC GRAVITY -TOTALIZERS IN LBS/KG
4. 16 METERS
5. GLOBAL CHANNEL KICKOUT MOVED TO LAST SELECTED ALARM
6. METER ID EXPANDED TO 12 DIGITS
7. C.F. FACTORS ADDED TO TEMP METERS
8. "SEE INPUT VOLTS" DATA ADDED TO "DISPLAY NEXT METER" DATA

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	APPROVALS		
TOLERANCES ARE	DRAWN BY R. PROVOST	DATE 10/17/91	
FRACTIONS ± 1/16	CHECKED BY T. ELLIS	DATE 4/8/92	
ANGLES ± 1°-0'	APPROVED B.L.	DATE 4/8/92	
DECIMALS .XX ± 0.03 .XXX ± 0.003			
N/A NEXT ASSEMBLY	ORIG. RELEASE DATE 4/8/92		

KURZ INSTRUMENTS, INC.

TITLE: MODEL 155, MICROPROCESSOR MODULE, STATE DIAGRAM PROGRAM KAS 5F-14/22

DWG. SIZE: D | DWG. NO. 340155-26 | REV. A | SCALE FULL | SHEET 1 OF 3

TO SHEET 1 OF 2

FROM SHEET 1 OF 2

FROM SHEET 3 OF 3

TO SHEET 3 OF 3

MENU-P

PRESS P TO SEE NEXT CHOICE OR
ALTERNATING
PRESS ENTER TO SET ALARMS
ENTER CLEAR
EXEC

WHEN ALARM(S) IS ACTIVATED "C" CLEARS DISPLAY ONLY, ALARM IS STILL ACTIVATED UNLESS PROGRAMMED TO OFF AND AUTOMATICALLY "REARMS" WHEN ALARM CONDITION IS ELIMINATED.

PRESS P TO SEE NEXT CHOICE OR
ALTERNATING
PRESS ENTER TO SET CHAN KICKOUT
ENTER CLEAR
EXEC

PRESS P TO SEE NEXT CHOICE OR
ALTERNATING
PRESS ENTER TO SEE INPUT VOLTS
ENTER CLEAR
EXEC

ACCESS CODE
USER
TECH

PRESS P TO SEE NEXT CHOICE OR
ALTERNATING
PRESS ENTER TO SET PID DATA
ENTER CLEAR
EXEC

PRESS P TO SEE NEXT CHOICE OR
ALTERNATING
PRESS ENTER TO CONTROL PID
ENTER CLEAR
EXEC

PRESS P TO SEE NEXT CHOICE OR
ALTERNATING
PRESS ENTER TO CALIBRATE
ENTER CLEAR
EXEC

PRESS P TO SEE NEXT CHOICE OR
ALTERNATING
PRESS ENTER TO SET LINEARIZERS
ENTER CLEAR
EXEC

PROG ∧V

ALH_MN

PRESS ENTER TO SET ALARM 1
PRESS ENTER TO SET ALARM XX
ENTER PROG
ALARM 1 ENTER METER #XX
ALARM XX ENTER METER #XX
ALARM 1 IS XXX ∧=ON V=OFF
ENTER CLEAR

ALH_DC

ALARM 1 IS XXX ∧=NO. V=NC.
ENTER CLEAR

SETOUT

ALARM 1 NEXT ∧V FLOWRATE
∧V ENTER
ALARM 1 NEXT ∧V VELOCITY
∧V ENTER
ALARM 1 NEXT ∧V TEMPERATURE
∧V ENTER
ALARM 1 NEXT ∧V CHANNEL KICKOUT
∧V ENTER
ALARM 1 NEXT ∧V NON-ISOKINETIC
∧V ENTER

ALH_NI

ENTER REF FLOW METER # XX
ENTER
ENTER VELOCITY DIFF XXX SFPM/SMPS
ENTER

ALH_HL_SCFM/SCMM

ALARM 1 IS XXX 1=LO 2=HI 3=HOL
ENTER
LO ALARM AT XXXXXX SCFM/SCMM
ENTER
HI ALARM AT XXXXXX SCFM/SCMM
ENTER

ALH_HL_SFPM/SMPS

ALARM 1 IS XXX 1=LO 2=HI 3=HOL
ENTER
LOW ALARM AT XXXXXX SFPM/SMPS
ENTER
HIGH ALARM AT XXXXXX SFPM/SMPS
ENTER

ALH_HL_DEGC/DEGF

ALARM 1 IS XXX 1=LO 2=HI 3=HOL
ENTER
LOW ALARM AT XXXX.XX DEGF/DEGC
ENTER
HIGH ALARM AT XXXX.XX DEGF/DEGC
ENTER

CH_KICK

CHAN KICKOUT XXX ∧=ON V=OFF
ENTER
HIGH KICKOUT AT XXX % FULL SCALE
ENTER
LOW KICKOUT AT -XXX %FULL SCALE
ENTER
ALARMXX XXX ∧=ON V=OFF
ENTER
ALARMXX XXX ∧=NO. V=NC.

CHANNEL KICKOUT ALARM IS AUTOMATICALLY DESIGNATED AS THE HIGHEST NUMBER ALARM SELECTED IN "CONFIGURE SYSTEM."

SEE_ID

∧ = XXXXXX UNITS INPUT=XXXX VDC
DISPLAY
V = XXXXXX UNITS INPUT=XXXX VDC
DISPLAY

PID_DATA

PRESS ENTER TO SET PID 1
CLEAR
AV
PRESS ENTER TO SET PID 8
PID X ENTER FB METER X
PID X IS XXX ∧=ON V=OFF
PID X LOG IS ∧=ON V=OFF
NEXT TYPE ∧V ISO-KINETIC
ENTER
∧V
NEXT TYPE ∧V FLOW

PID_FLOW

SETPOINT AT XXX.XXX SCFM/SCMM
PID X OFFSET AT XXX.XXX SCFM/SCMM
PID X DEADZONE XXXX SEC
PID X Kp XXX
PID X Kd XXX
PID X Tpmn XXXX MS
PID X Tpmax XXXX SEC
PID X Tpmech XXXX MS
PID X Tpman XXX.XXX SEC
PID X Tpmandz XXX.XXX MS
ENTER DIRECTION ALARM XX
ENTER ENABLE ALARM XX

PID_ISOKINETIC

ENTER REF METER X
MAX SETPOINT AT XXX.XXX SFPM/SMPS
MIN SETPOINT AT XXX.XXX SFPM/SMPS
SET PT XXXX OF METER X
PID X OFFSET AT XXX.XXXSFPM/SMPS
PID X DEADZONE XXXX SEC
PID X Kp XXX
PID X Kd XXX
PID X Tpmn XXXX MS
PID X Tpmax XXXX SEC
PID X Tpmech XXXX MS
PID X Tpman XXXX MS
PID X Tpmandz XXXX MS
ENTER DIRECTION ALARM XX
ENTER ENABLE ALARM XX

CTRL_PID

PRESS ENTER TO CONTROL PID 1
AVo
PRESS ENTER TO CONTROL PID 6
X AV FLOW RATE XXX.XXX SCFM/SCMM

CAL_MN

PRESS ENTER FOR INPUT CAL.
PRESS ENTER FOR OUTPUT CAL.

CAL.DVM

SET "ZERO" VOLTS CH A =XXXX VDC
SET SPAN VOLTS CH A =XXXX VDC
SET "ZERO" VOLTS CH V =XXXX VDC
SET SPAN VOLTS CH V =XXXX VDC

CALANO

SET "ZERO" VOLTS CH 1 = 0.000 VDC
SET SPAN VOLTS CH 1 = 5.000 VDC
SET "ZERO" VOLTS CH 8 = 5.000 VDC
SET SPAN VOLTS CH 8 = 5.000 VDC

LINMEN

PRESS ENTER TO LINEARIZE CH A
PRESS ENTER TO LINEARIZE CH V

LIN_SEL

TYPES: SFPM SMPS SCFM SCMM DEGF DEGC
CHAN A IS XXXX NEXT TYPE AV
CHAN V IS XXXX NEXT TYPE AV

LIN_PTS

ENTER # OF CH A DATA POINTS XX
ENTER # OF CH V DATA POINTS XX

LIN_TBL

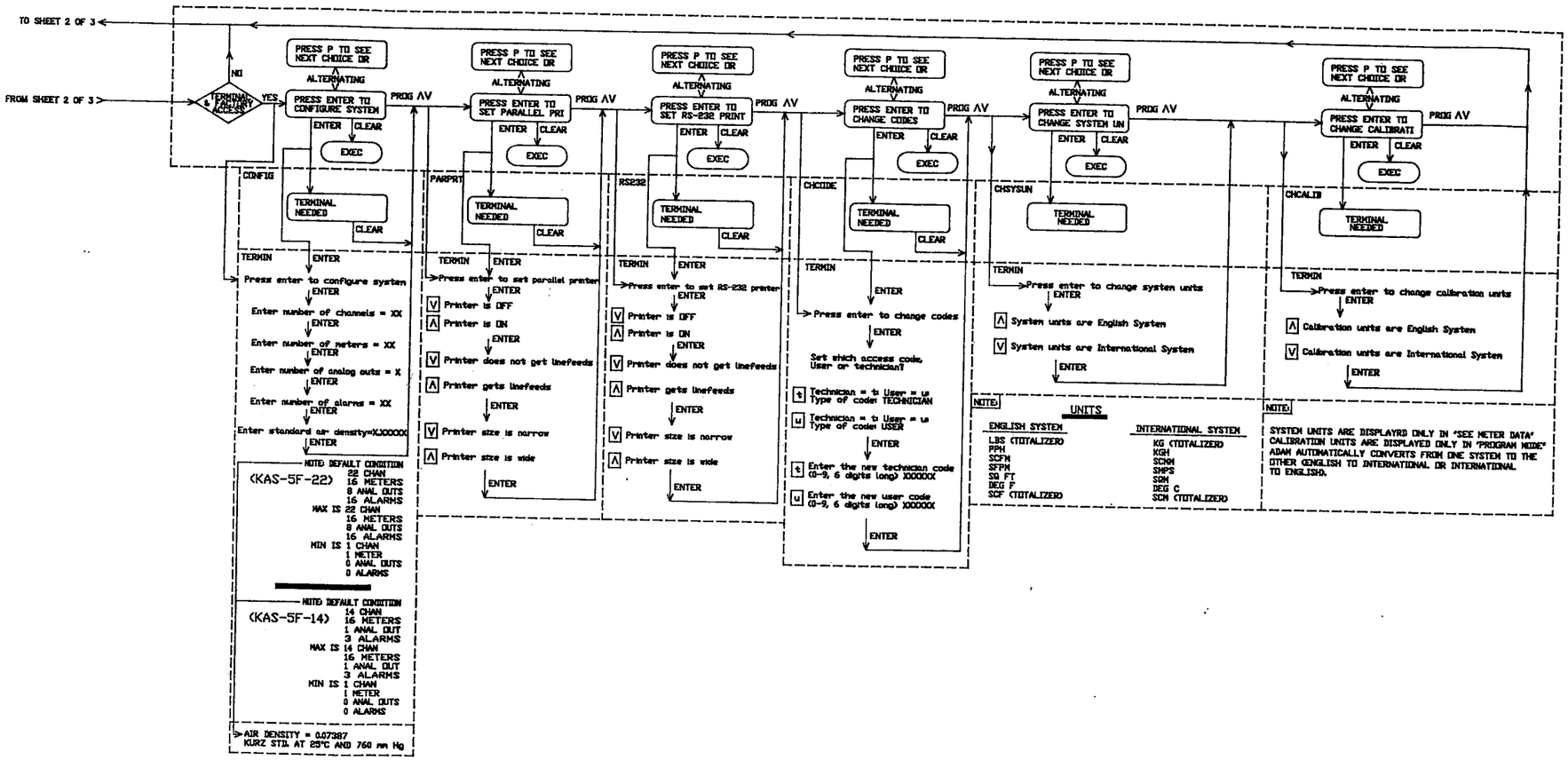
PT A1 XXXX VDC AT XXXXXX UNITS
PT A15 XXXX VDC AT XXXXXX UNITS
PT V1 XXXX VDC AT XXXXXX UNITS
PT V15 XXXX VDC AT XXXXXX UNITS

NOTES:

1. AFTER NEW VALUE IS ENTERED SCREEN SHOWS
   NEW VALUE ACCEPTED
2. VALUES OF UNITS ARE ORIGINAL CALIBRATED VALUES FROM LINEARIZER TABLES BEFORE C.F. IS APPLIED OR V/NO.
3. N/A
4. WHEN H IS PRESSED THE SCREEN SHOWS
   HOLD IS ACTIVATED
5. WHEN C IS PRESSED TO CLEAR A HOLD THE SCREEN SHOWS
   HOLD IS CLEARED

ADAM SOFTWARE
KAS-5F-14
KAS-5F-22
11-11-91 VERSION

DWG. SIZE	DWG. NO.	REV.
D	340155-26	A
	SCALE FULL	SHEET 2



FOR INTERNAL USE ONLY

NOTES:

1. AFTER NEW VALUE IS ENTERED SCREEN SHOWS:
   NEW VALUE ACCEPTED
2. VALUES OF UNITS ARE ORIGINAL CALIBRATED VALUES FROM LINEARIZER TABLES BEFORE C.F. IS APPLIED (E V/10.
3. N/A
4. WHEN H IS PRESSED THE SCREEN SHOWS:
   HOLD IS ACTIVATED
5. WHEN C IS PRESSED TO CLEAR A HOLD THE SCREEN SHOWS:
   HOLD IS CLEARED

ADAM SOFTWARE
KAS-5F-14
KAS-5F-22
11-11-91 VERSION

DWG. SIZE	DWG. NO.	REV.
D	340155-26	A
SCALE FULL		SHEET 3

REVISIONS					
REV.	DESCRIPTION	BY	CHKD	APPVD	DATE
1	PRELIMINARY RELEASE	RP		BL	6-1-92

EXEC MANUAL DISPLAY SCREEN

PROG → EXEC (DISP)

ACCESS

ENTER ACCESS CODE: XXXXXX (CLEAR → EXEC)

ENTER → DOES CODE MATCH ANY ACCESS CODES?

YES → ACCESS LEVEL = LEVEL OF MATCHED CODE

AREA_S

NEXT DISPLAY DISPLAY METER (ENTER → EXEC) ∧∨ NEXT DISPLAY ∧∨ DISPLAY PID (ENTER → EXEC)

DISPLAY NEXT ∧∨ METER 01 (DISP) ∧∨ DISPLAY NEXT METER 816 (DISP → EXEC)

ID XXXXXXXXXXXX XXXXX XX/XX/XX (DISP)

D_TEMP

TEMPERATURE XXXXXX DEGF/C (DISP)

CALIBRATION FACTOR X.XXX (DISP)

AVG'D CHS ABCDEF GHIJKLMNOPQRSTUV (DISP)

A = XXXXXX UNITS INPUT=X.XXX VDC (DISP)

o DISPLAY ✳ o ∧∨ o

V = XXXXXX UNITS INPUT=X.XXX VDC (DISP) DISPLAY

D_LIN

FLOWRATE XXXXXX SCFM/SCMM (DISP)

TOT=XXXXXX.XXSCF/SCM ET = XXXXX.X MIN (DISP)

AVERAGE VELOCITY XXXXXX SFPM/SMPS (DISP)

CALIBRATION FACTOR X.XXX (DISP)

FLOW AREA XXX.XXX SQ FT (DISP)

AVG'D CHS ABCDEF GHIJKLMNOPQRSTUV (DISP)

B = " " "M" OR "ST"

FLOW RATE XXXXXX PPH/KGH (DISP)

TOT=XXXXXX.X LBS/KG ET = XXXXX.X MIN (DISP)

AVERAGE VELOCITY XXXXXX SFPM/SMPS (DISP)

SPECIFIC GRAVITY IS X.XXX (DISP)

SUM#1#2#3#4#5#6 #7#8#9#10#11#12...16 (DISP C)

V = XXXXXX UNITS INPUT=X.XXX VDC (DISP) DISPLAY

A = XXXXXX UNITS INPUT=X.XXX VDC (DISP C)

D_PID

DISPLAY NEXT PID 01 (DISP) ∧∨ DISPLAY NEXT PID 06 (DISP)

PID 0X IS ON/OFF XXXX XX/XX/XX (DISP)

PID 0X LOGGING IS ON/OFF (DISP)

SETPOINT XXXX SCFM/SCMM (DISP)

PID 0X OFFSET X.XXXXXX SCFM/SCMM (DISP)

PID 0X FB METER 0X (DISP)

FB FLOW RATE X.XXXXXX SCFM/SCMM (DISP)

PID 0X IS ON/OFF XXXX XX/XX/XX (DISP)

PID 0X LOGGING IS ON/OFF (DISP)

SETPOINT XXXX SCFM/SCMM (DISP)

PID 0X OFFSET X.XXXXXX SCFM/SCMM (DISP)

PID 0X FB METER 0X (DISP)

FB FLOW RATE X.XXXXXX SCFM/SCMM (DISP)

MENU→

PRESS P TO SEE NEXT CHOICE DR (ALTERNATING)

PRESS ENTER TO RESET TOTALIZERS (ENTER CLEAR → EXEC) (AV PROG)

PRESS ENTER TO SET TIME & DATE (ENTER CLEAR → EXEC) (PROG AV)

PRESS ENTER TO SET LOG INTERVAL (ENTER CLEAR → EXEC) (PROG AV)

PRESS ENTER TO SET METER DATA (ENTER CLEAR → EXEC) (PROG AV)

PRESS ENTER TO SET BOX FILTER (ENTER CLEAR → EXEC) (PROG AV)

PRESS ENTER TO SET ANALOG OUT (ENTER CLEAR → EXEC) (PROG AV)

FROM SHEET 2 OF 2

TO SHEET 2 OF 2

TOTCLR

ARE YOU SURE? A=YES V=NO XXX (ENTER CLEAR)

ANSWER → NO / YES → TOTALIZERS ARE RESET

CLKSET

MMMM MM/DD/YY HH (ENTER CLEAR) → MMMM MM/DD/YY HH → MMMM MM/DD/YY DD → MMMM MM/DD/YY YY

SET CLOCK WITH SECOND=00

MMMM = HOURS & MINUTES
MMMM = 24 HOUR CLOCK

LOGSET

NEW LOG INTERVAL XXXXXX (ENTER CLEAR)

NEW LOG INTERVAL XXXXXX

NEXT DATA LOGGING AT XX

NEXT DATA LOGGING AT XXXXX

XXXX=HOURS & MINUTES
XXXX = 24 HOUR CLOCK

METER

PRESS ENTER TO SET METER 01 (ENTER C PROG) ∧∨ PRESS ENTER TO SET METER 816

ENTER METER ID XXXXXXXX (ENTER C)

IF NO CHANGE OF ID PRESS P

NEXT TYPE ∧∨ INSERTION FLOW (ENTER C)

NEXT TYPE ∧∨ IN LINE FLOW (ENTER C)

NEXT TYPE ∧∨ TEMPERATURE (ENTER C)

NEXT TYPE ∧∨ SUM FLOW (ENTER C)

DISPLAY NEXT ∧∨ FLOW IS SCFM/SCMM (ENTER C)

DISPLAY NEXT ∧∨ FLOW IS PPH/KGH (ENTER C)

SPECIFIC GRAVITY IS X.XXX (ENTER C)

TEMP

INCLUDE CH A ∧=YES V=NO/XXX (ENTER)

INCLUDE CH V ∧=YES V=NO/XXX (ENTER)

ENTER # OF C.F. DATA POINTS XX (ENTER)

C.F. 01 = X.XXX AT XXXXXX UNIT (ENTER)

C.F. 807 = X.XXX AT XXXXXX UNIT (ENTER)

INLIN

DISPLAY NEXT ∧∨ FLOW IS SCFM/SCMM (ENTER C)

DISPLAY NEXT ∧∨ FLOW IS PPH/KGH (ENTER C)

SPECIFIC GRAVITY IS X.XXX (ENTER C)

INCLUDE CH A ∧=YES V=NO/XXX (ENTER)

INCLUDE CH V ∧=YES V=NO/XXX (ENTER)

ENTER FLOW AREA XXX.XXX SQ FT (ENTER)

ENTER # OF C.F. DATA POINTS XX (ENTER)

C.F. 01 = X.XXX AT XXXXXX UNIT (ENTER)

C.F. 807 = X.XXX AT XXXXXX UNIT (ENTER)

INSRTN

DISPLAY NEXT ∧∨ FLOW IS SCFM/SCMM (ENTER C)

DISPLAY NEXT ∧∨ FLOW IS PPH/KGH (ENTER C)

SPECIFIC GRAVITY IS X.XXX (ENTER C)

INCLUDE CH A ∧=YES V=NO/XXX (ENTER)

INCLUDE CH V ∧=YES V=NO/XXX (ENTER)

ENTER FLOW AREA XXX.XXX SQ FT (ENTER)

ENTER # OF C.F. DATA POINTS X (ENTER)

C.F. 01 = X.XXX AT XXXXXX SFPM/SMPS (ENTER)

C.F. 807 = X.XXX AT XXXXXX SFPM/SMPS (ENTER)

SUM

SUM METER 01 XX ∧=> V=NO <= (ENTER C)

SUM METER 816 XX ∧=> V=NO <= (ENTER C)

ENTER FLOW AREA XXX.XXX SQ FT (ENTER)

ENTER # C.F. DATA POINTS XX (ENTER)

C.F. 01 = X.XXX AT XXXXXX UNIT (ENTER)

C.F. 807 = X.XXX AT XXXXXX UNIT (ENTER)

SUMST = SCFM OR SCMM PPH OR KGH

FILTER

ENTER CHAN A FOR BOX FILTER (ENTER) ∧∨ ENTER CHAN V FOR BOX FILTER (ENTER)

ENTER NEW BOX FILTER SIZE XX (ENTER CLEAR)

SETOUT

PRESS ENTER FOR ANALOG OUT 1 (ENTER C PROG) ∧∨ PRESS ENTER FOR ANALOG OUT 8 (ENTER C PROG)

ANALOG OUT 1 ENTER METER # XX (ENTER CLEAR)

ANALOG OUT 8 ENTER METER # XX (ENTER CLEAR)

OUT 01 NEXT TYPE ∧∨ AVG VELOCITY (ENTER)

OUT 01 NEXT TYPE ∧∨ FLOW RATE (ENTER)

OUT 01 NEXT TYPE ∧∨ TEMPERATURE (ENTER)

OUT 08 NEXT TYPE ∧∨ AVG VELOCITY (ENTER)

OUT 08 NEXT TYPE ∧∨ FLOW RATE (ENTER)

OUT 08 NEXT TYPE ∧∨ TEMPERATURE (ENTER)

AND_ST

LO XXXXXX UNITS AT X.XXX VDC (ENTER CLEAR)

HI XXXXXX UNITS AT X.XXX VDC (ENTER CLEAR)

LO XXXXXX UNITS AT X.XXX VDC (ENTER CLEAR)

HI XXXXXX UNITS AT X.XXX VDC (ENTER CLEAR)

✳ VALUES OF UNITS ARE ORIGINAL CALIBRATED VALUES FROM LINEARIZER TABLES, BEFORE C.F. IS APPLIED OR V/NO

KEYPAD REPRESENTATION

P	7	8	9	H
D	4	5	6	YES ∧
L	1	2	3	NO ∨
E	-	0	.	C

AVAILABLE AT TERMINAL

TERMINAL COMMAND PROCESSOR
ONLY AVAILABLE THROUGH TERM

- S: Send Data Logging Information to terminal port 1
- Q: Echo display to terminal
- ?: Terminal help
- Send Configuration data to terminal port

HOLD (H): HOLD CURRENT DISPLAY UNTIL CLEAR IS PRESSED

LOG (L): SEND DATA LOG TO PARALLEL PRINTER PORT CONTINUOUS OR RS-232 PRINTER (PORT J)

AUTOMATIC STATUS LOOP DISPLAY SCREENS

KURZ INSTRUMENTS XXXXX XX/XX/XX

PRESS D TO SEE METER DATA

PRESS P FOR PROGRAMMING

PRESS M = MOLD PRESS HH = HELP

TURN-ON DISPLAY AND SCREEN

KURZ INSTRUMENTS --->KAS 4S<---

SERVICE PHONE (800) 424-7356

PRESS H TWICE TO GET HELP

CLEAR RETURNS TO THE "PARENT" STATE WITHOUT CHANGING THE VALUE.

HELP SCREENS

- HELP SCREENS FOR MAS 3
- H=HELP or HELP D=DISPLAY
- P=PROGRAM L=LOG E=ENTER C=CLEAR
- PUSH H TO HOLD ANY DISPLAY
- PUSH C TO CLEAR A "HELP" DISPLAY
- OR PUSH C AS A SAFE ESCAPE
- PUSH H TWICE TO GET HELP
- PUSH D FOR MORE FLOW DATA
- PUSH P TO SEE OR CHANGE SYSTEM
- TO MAKE A CHANGE PUSH ∧∨ OR PUSH
- DIGIT KEYS AND THEN PRESS ENTER
- PUSH E TO ACCEPT DISPLAYED CHOICE
- CLEAR ESCAPES WITHOUT CHANGE

ADAM SOFTWARE
KAS-SF-14
KAS-SF-22
9-24-91 VERSION

INCLUDES
1. SIX DIGIT FLOATING POINT MATH
2. ENGLISH/INTERNATIONAL UNITS
3. PPH/KGH SELECTION WITH SETTABLE AIR DENSITY AND SPECIFIC GRAVITY. -TOTALIZERS IN LBS/KG
4. 16 METERS
5. GLOBAL CHANNEL KICKOUT MOVED TO LAST SELECTED ALARM.
6. METER ID EXPANDED TO 32 DIGITS
7. C.F. FACTORS ADDED TO TEMP METERS
8. "BOX INPUT VOLTS" DATA ADDED TO "DISPLAY NEXT METER" DATA

NOTES:

1. AFTER NEW VALUE IS ENTERED SCREEN SHOWS: NEW VALUE ACCEPTED
2. ⚠ N/A
3. ⚠ N/A
4. WHEN H IS PRESSED THE SCREEN SHOWS: HOLD IS ACTIVATED
5. WHEN C IS PRESSED TO CLEAR A HOLD THE SCREEN SHOWS: HOLD IS CLEARED

FOR INTERNAL USE ONLY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± 1/32
ANGLES ± 0°-30'
DECIMALS
.X ± 0.1
.XX ± 0.01
.XXX ± 0.005
.XXXX ± 0.0010
ENGR. RELEASE DATE

N/A
NEXT ASSEMBLY

APPROVALS		
DRAWN BY	R. PROVOST	DATE 10/17/91
CHECKED BY		DATE 4-2-92
APPROVED		DATE 4-2-92

KURZ INSTRUMENTS, INC.

TITLE: MODEL 155, MICROPROCESSOR MODULE, STATE DIAGRAM PROGRAM KAS 5F-14/22

DWG. SIZE D | DWG. NO. 340155-26 | REV. 1 | SCALE FULL | SHEET 1 OF 2

TO SHEET 1 OF 2

FROM SHEET 1 OF 2

FROM SHEET 3 OF 3

TO SHEET 3 OF 3

MENU-P

PRESS P TO SEE NEXT CHOICE OR

ALTERNATING

PRESS ENTER TO SET ALARMS — PROG ΔV — ENTER — CLEAR — EXEC

WHEN ALARM(S) IS ACTIVATED "C" CLEARS DISPLAY ONLY. ALARM IS STILL ACTIVATED UNLESS PROGRAMMED TO OFF AND AUTOMATICALLY "RESETS" WHEN ALARM CONDITION IS ELIMINATED.

PRESS ENTER TO SET CHAN KICKOUT — PROG ΔV — ENTER — CLEAR — EXEC

PRESS ENTER TO SEE INPUT VOLTS — PROG ΔV — ENTER — CLEAR — EXEC

ACCESS CODE — USER / TECH

PRESS ENTER TO SET PID DATA — PROG ΔV — ENTER — CLEAR — EXEC

PRESS ENTER TO CONTROL PID — PROG ΔV — ENTER — CLEAR — EXEC

PRESS ENTER TO CALIBRATE — PROG ΔV — ENTER — CLEAR — EXEC

ALR_NM

PRESS ENTER TO SET ALARM 1 — PROG — C — ENTER

PRESS ENTER TO SET ALARM XX — C — ENTER — PROG

ALARM 1 ENTER METER #XX — PROG — C — ENTER

ALARM XX ENTER METER #XX — C — ENTER — PROG

ALARM 1 IS XXX A=ON V=OFF — ENTER — CLEAR

ALR_DC

ALARM 1 IS X.X A=HLD V=NLC — ENTER — CLEAR

SETDBT

ALARM 1 NEXT ΔV FLOWRATE — C — ENTER

ALARM 1 NEXT ΔV VELOCITY — C — ENTER

ALARM 1 NEXT ΔV TEMPERATURE — C — ENTER

ALARM 1 NEXT ΔV CHANNEL KICKOUT — C — ENTER

ALARM 1 NEXT ΔV NON-ISOKINETIC — C — ENTER

ALR_HL_SCFM/SCMM

ALARM 1 IS XXX 1=LO 2=HI 3=HDL — C — ENTER

LO ALARM AT XXXXXX SCFM/SCMM — C — ENTER

HI ALARM AT XXXXXX SCFM/SCMM — C — ENTER

ALR_HL_SFPM/SMPS

ALARM 1 IS XXX 1=LO 2=HI 3=HDL — C — ENTER

LOW ALARM AT XXXXXX SFPM/SMPS — C — ENTER

HIGH ALARM AT XXXXXX SFPM/SMPS — C — ENTER

ALR_NI

ENTER REF FLOW METER # XX — C — ENTER

ENTER VELOCITY DIFF XXX SFPM/SMPS — C — ENTER

ALR_HL_DEGC/DEGF

ALARM 1 IS XXX 1=LO 2=HI 3=HDL — C — ENTER

LOW ALARM AT XXXX.XX DEGF/DEGC — C — ENTER

HIGH ALARM AT XXXX.XX DEGF/DEGC — C — ENTER

CH_KICK

CHAN KICKOUT XXX A=ON V=OFF — C — ENTER

HIGH KICKOUT AT XXX % FULL SCALE — C — ENTER

LOW KICKOUT AT -XXX %FULL SCALE — C — ENTER

ALARMXX XXX A=ON V=OFF — C — ENTER

ALARMXX X.X A=HLD V=NLC — C — ENTER

CHANNEL KICKOUT ALARM IS AUTOMATICALLY DESIGNATED AS THE HIGHEST NUMBER ALARM SELECTED IN "CONFIGURE SYSTEM."

SEE_IO

A = XXXXXX UNITS INPUT=X.XXX VDC — C

O DISPLAY

V = XXXXXX UNITS INPUT=X.XXX VDC — C — DISPLAY

VALUES OF UNITS ARE ORIGINAL CALIBRATED VALUES FROM LINEARIZER TABLES BEFORE CF, IS APPLIED, OR V/HO

PID_DATA

PRESS ENTER TO SET PID 1 — CLEAR

ΔV

PRESS ENTER TO SET PID 8

PID X ENTER FB METER X — CLEAR

PID X IS XXX A=ON V=OFF — CLEAR

PID X LOG IS A=HLD V=NLC — CLEAR

NEXT TYPE ΔV ISO-KINETIC — ENTER — CLEAR

NEXT TYPE ΔV FLOW — CLEAR

PID_ISOKINETIC

ENTER REF METER X — CLEAR

MAX SETPOINT AT XXX.XXX SCFM/SCMM — CLEAR

MIN SETPOINT AT XXX.XXX SCFM/SCMM — CLEAR

SET PT 100% XXXX DF METER — CLEAR

PID X OFFSET AT XXX.XXXSCFM/SCMM — CLEAR

PID X DEADZONE XXXX SEC — CLEAR

PID_FLOW

SETPOINT AT XXX.XXX SCFM/SCMM — CLEAR

PID X OFFSET AT XXX.XXX SCFM/SCMM — CLEAR

PID X DEADZONE XX.XX SEC — CLEAR

PID X Kp X.XX — CLEAR

PID X Kd X.XX — CLEAR

PID X Tpmin XX.XX MS — CLEAR

PID X Tpmax XX.XX SEC — CLEAR

PID X Tpmanx XX.XX MS — CLEAR

PID X Tpmanx XXX.XX MS — CLEAR

ENTER DIRECTION ALARM XX — CLEAR

ENTER ENABLE ALARM XX — CLEAR

CTRL_PID

PRESS ENTER TO CONTROL PID 1 — AV — ENTER — CLEAR

X AV FLOW RATE X.XXXXXX SCFM/SCMM — C — ENTER

PRESS ENTER TO CONTROL PID 8 — ENTER — CLEAR

X AV FLOW RATE X.XXXXXX SCFM/SCMM — C — ENTER

CAL_NM

PRESS ENTER FOR INPUT CAL. — PROG ΔV — ENTER — CLEAR

PRESS ENTER FOR OUTPUT CAL. — PROG ΔV — ENTER — CLEAR

CALSVM

SET "ZERO" VOLTS CH A =X.XXX VDC — ENTER — CLEAR

SET SPAN VOLTS CH A =X.XXX VDC — ENTER — CLEAR

SET "ZERO" VOLTS CH V =X.XXX VDC — ENTER — CLEAR

SET SPAN VOLTS CH V =X.XXX VDC — ENTER — CLEAR

CALAMB

SET "ZERO" VOLTS CH 1 = 0.000 VDC — ENTER — CLEAR

SET SPAN VOLTS CH 1 = 5.000 VDC — ENTER — CLEAR

SET "ZERO" VOLTS CH 8 = 0.000 VDC — ENTER — CLEAR

SET SPAN VOLTS CH 8 = 5.000 VDC — ENTER — CLEAR

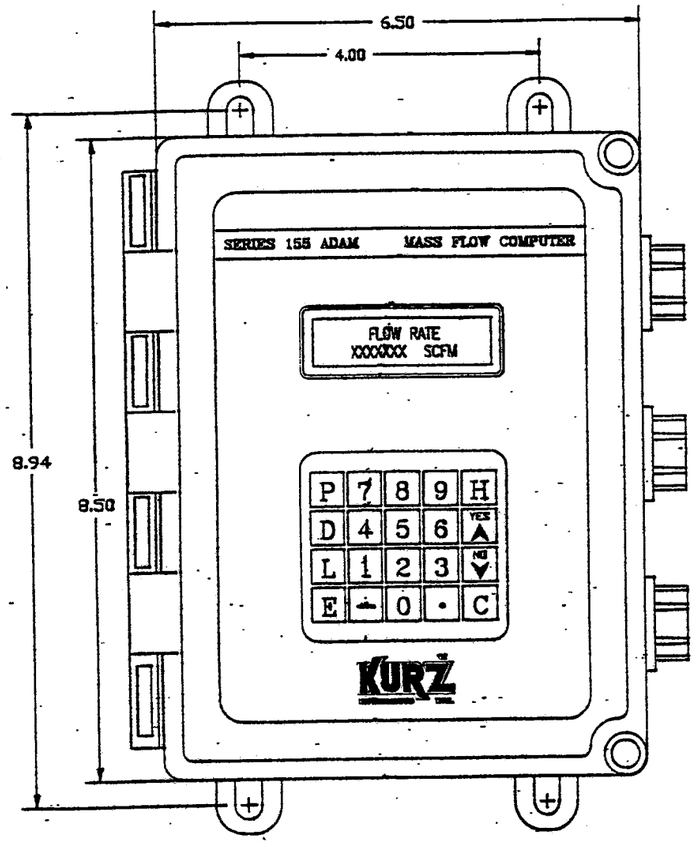
NOTES:

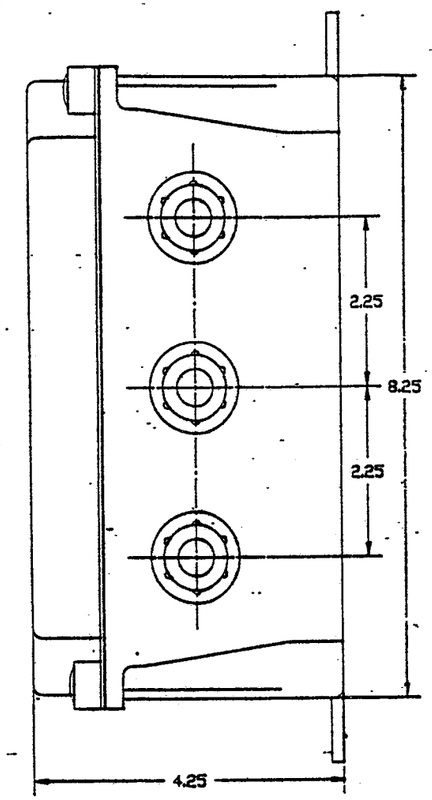
1. AFTER NEW VALUE IS ENTERED SCREEN SHOWS: NEW VALUE ACCEPTED
2. ⚠ N/A
3. ⚠ N/A
4. WHEN H IS PRESSED THE SCREEN SHOWS: HOLD IS ACTIVATED
5. WHEN C IS PRESSED TO CLEAR A HOLD THE SCREEN SHOWS: HOLD IS CLEARED

ADAM SOFTWARE
KAS-5F-14
KAS-5F-22
9-24-91 VERSION

FOR INTERNAL USE ONLY

DWG. SIZE	DWG. NO.	REV.
D	340155-26	1
SCALE FULL	SHEET 2 OF 2	





FEATURE 1	
OPT	4–20mA OUTPUTS OPTION
88	NO 4–20mA OUTPUTS
04	(1) LOOP POWERED, AC/DC ISOLATED OR (1) SELF POWERED AC ISOLATED
05	(2) LOOP POWERED, AC/DC ISOLATED OR (2) SELF POWERED AC ISOLATED

FEATURE 2	
OPT	0–5VDC OUTPUTS OPTION
88	NO 0–5VDC OUTPUTS
01	(1) 0–5VDC OUTPUT
02	(2) 0–5VDC OUTPUTS

FEATURE 3	
OPT	ALARM RELAYS/ CONTROL DRIVER OUTPUTS
88	NO ALARM OR CONTROL DRIVER OUTPUTS
05	(4) ALARM RELAY OUTPUTS, 5 AMP.
06	2 FLOW CONTROL DRIVERS
07	2 FLOW CONTROL DRIVERS AND (4) ALARM RELAY OUTPUTS, 5 AMP.

FEATURE 4	
OPT	ZERO/SPAN CALIBRATOR OPTION
88	NO CALIBRATOR
04	ZERO/SPAN FIELD CALIBRATOR

FEATURE 5	
OPT	INPUT POWER OPTION
01	115 VAC, 50/60 Hz
02	230 VAC, 50/60 Hz
03	24 VDC ± 10%
99	SPECIAL

FEATURE 6	
OPT	RS–232 SERIAL COMMUNICATION PORT OPTION
88	RS–232 PORT WHICH ECHOS DISPLAY/KEYPAD AND ALLOWS USE OF COMPUTER TERMINAL FOR PROGRAMMING AND FACTORY CONFIGURATION
01	RS–232 SERIAL DATA OUTPUT PORT
99	SPECIAL

FEATURE 7	
OPT	PRINTER OPTION
88	NO PRINTER

NR	FEATURE 7	SEE CHART	PRINTER OPTION.
NR	FEATURE 6		RS 232 DATA OUTPUT PORT OPTION.
R	FEATURE 5		INPUT POWER OPTION.
NR	FEATURE 4		ZERO/SPAN CALIBRATOR OPTION.
NR	FEATURE 3		ALARM OUTPUT OPTION.
NR	FEATURE 2		0–5VDC OUTPUT OPTION.
NR	FEATURE 1	SEE CHART	4–20mA OUTPUT OPTION.
FEATURE CHART			

PARENT NUMBER F1 F2 F3 F4 F5 F6 F7

7501101	ASSY, 155 ADAM JR.	010431
PARENT NO.	DESCRIPTION	ITEM 9 NO.
PARENT NUMBER OPTIONS LIST		

REVISIONS					
REV.	DESCRIPTION	BY	CHKD	APPVD	DATE
A	RELEASE PER ECO 417797				

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± 1/32
ANGLES ± 0°-30'
DECIMALS
.X ± 0.1
.XX ± 0.05
.XXX ± 0.020
.XXXX ± 0.0010
ENGR. RELEASE DATE

APPROVALS

DRAWN BY	DATE 8-3-92
CHECKED BY	DATE 8-3-92
APPROVED	DATE 8-3-92

<EDIT ASSEMBLY

KURZ INSTRUMENTS, INC.

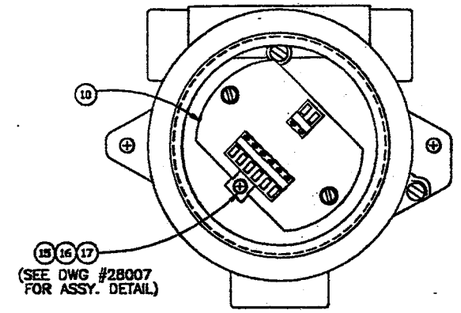
TITLE: ASSY, ADAM JR. 8X6X4 FG ENCL.

SIZE	DWG. NO.	REV.
D	000155-14	A

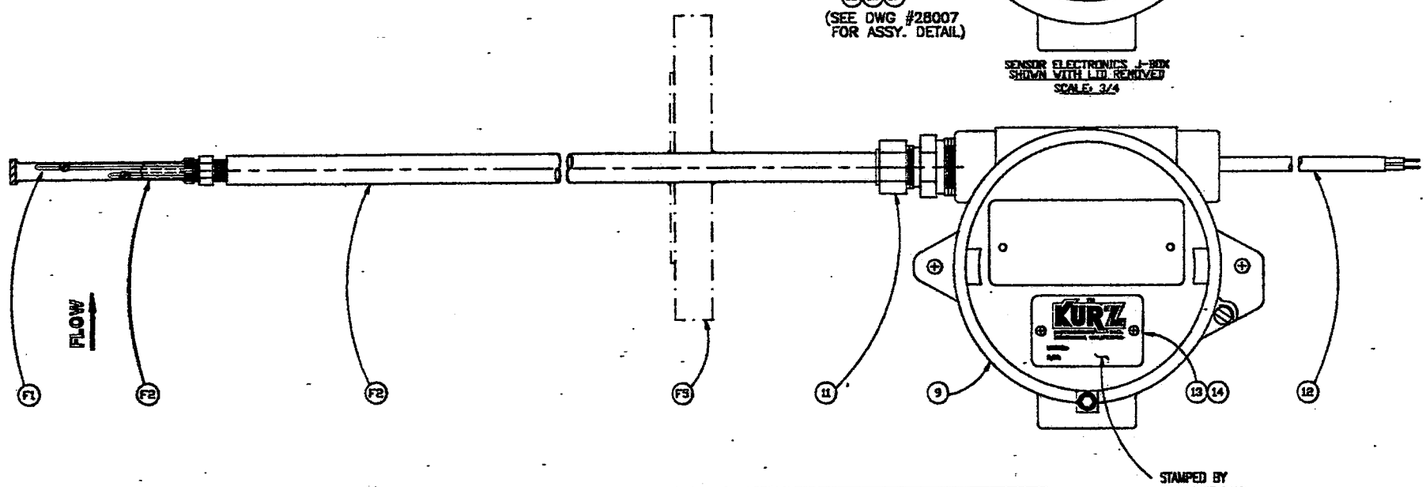
SCALE 1 = 1 SHEET 1 OF 1

NOTES: UNLESS OTHERWISE SPECIFIED
1. USE SILVER GOOP (OR EQUIV.) FOR PIPE THREAD CONNECTIONS
2. USE LOCKTITE FOR FASTENER THREADS
3. APPLY THERMAL COMPOUND TO TRANSISTOR BEFORE ASSEMBLE
4. FLANGE MAT'L WILL BE THE SAME AS SUPPORT & SHIELD MAT'L

REVISIONS					
REV.	DESCRIPTION	BY	CHKD	APPRVD	DATE
1	PRELIMINARY REVIEW	D.T.	—	—	9.4.91
A	RELEASE TO PRODUCTION (ECO 47857)	D.T.	[illegible]	[illegible]	11.15.91



SENSOR ELECTRONICS J-BOX SHOWN WITH LID REMOVED
SCALE: 3/4



FEATURE 1				
OPTION	SENSOR MATERIAL	752601/752603	752605	QTY.
02	316SS	130029-01	130029-11	1
03	HAST. C276	130029-05	130029-15	1
04	MONEL	130029-00	130029-00	1
05	TITANIUM	130029-00	130029-00	1
06	HARD NICKEL-CHROME ON 316SS	130029-00	130029-00	1
07	TITANIUM NITRIDE ON 316SS	130029-00	130029-00	1
99	SPECIAL	130029-00	130029-00	1

FEATURE 2						
OPTION	SUPPORT & SHIELD		PART No.			
	MAT'L	LENGTH	SUPPORT	QTY.	SHIELD	QTY.
21	316SS	3"	150013-01	1	150017	1
22	↑	6"	150013-02	1	150017	1
23	↕	12"	150013-04	1	150017	1
24	↕	24"	150013-05	1	150017	1
25	↓	36"	150013-06	1	150017	1
29	316SS	SPECIAL	150013-00	1	150017	1
31	HAST. C276	3"	150229-01	1	150230	1
32	↑	6"	150229-02	1	150230	1
33	↕	12"	150229-04	1	150230	1
34	↕	24"	150229-05	1	150230	1
35	↓	36"	150229-06	1	150230	1
39	HAST. C276	SPECIAL	150229-00	1	150230	1
41-45	MONEL	3"-36"				
49	MONEL	SPECIAL				
51-55	TITANIUM	3"-36"				
59	TITANIUM	SPECIAL				
91-95	SPECIAL	3"-36"				
99	SPECIAL	SPECIAL				

FEATURE 3			
GAS VELOCITY CALIBRATION FULL SCALE RANGE			
OPTION	ENGLISH	OPTION	METRIC
02	300 SFPM	52	1.5 SMPS
04	600	54	3
06	1000	56	5
08	2000	58	10
10	3000	60	15
12	4000	62	20
14	6000	64	30
16	9000	66	40
18	12000 SFPM	68	60 SMPS
99	SPECIAL RANGE/UNITS		

FEATURE 4			
OPTION	RFI PROTECTION CIRCUIT	PART No.	QTY.
88	NO RFI PROTECTION CIRCUIT	—	—
01	RFI PROTECTION CIRCUIT	700450-05	1

FEATURE 5 (4)			
OPTION	SUPPORT WITH WELDED FLANGE	PART No.	QTY.
88	NO FLANGE	—	—
01	1/2" ASA R.F., 150#	150232-01	1
02	1/2" ASA R.F., 300#	150232-02	1
11	3/4" ASA R.F., 150#	150232-03	1
12	3/4" ASA R.F., 300#	150232-04	1
21	1" ASA R.F., 150#	150232-05	1
22	1" ASA R.F., 300#	150232-06	1
31	1-1/2" ASA R.F., 150#	150232-07	1
32	1-1/2" ASA R.F., 300#	150232-08	1
99	SPECIAL	150232-00	1

FEATURE 6			
OPTION	SPECIALTY GAS CALIBRATION		PRESSURE RANGE
01	AIR		0-100 PSIG
04	AIR		0-150
08	ARGON	(Ar)	0-150
14	CARBON DIOXIDE	(CO_2)	0-150
18	DRY CHLORINE	(Cl_2)	0-150
40	NITROGEN	(N_2)	0-150
44	OXYGEN	(O_2)	0-150 PSIG
99	SPECIAL		SPECIFY

PARENT NUMBER — F1 F2 F3 F4 F5 F6

QTY.	PART NO.	DESCRIPTION	ITEM
1	190308	WASHER, #4, MICA, RECT.	17
1	190298	SCR, #4-40, 5/16 LG., CAPTIVE	16
1	190295	WASHER, #4, SHOULDER, NYLON	15
2	190284	SCR., #2-56, 3/16 LG., PH, SS.	14
1	170093	LABEL, MODEL/SERIAL No.	13
1	260036-10	CABLE, 2 COND., SHIELDED, PVC, 18 GA, 15FT.	12
1	010310	COMP. FTG, 1/2" TUBE x 3/4" NPT, MALE, CS.	11
1	420160	PCB ASSY, 465R7	10
1	110180	J-BOX, KILLARK ENC.	9
			8
			7
1	SEE CHART	FEATURE 6: SPECIAL GAS CALIBRATION	6
1	↑	FEATURE 5: SUPPORT WITH FLANGE	5
1	↕	FEATURE 4: RFI PROTECTION CIRCUIT	4
1	↕	FEATURE 3: CALIBRATION RANGE	3
1	↓	FEATURE 2: SUPPORT & SHIELD	2
1	SEE CHART	FEATURE 1: SENSOR MAT'L	1

PARTS LIST

N/A
NEXT ASSEMBLY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± 1/32
ANGLES ± 0°-30'
DECIMALS
.X ± 0.1
.XX ± 0.01
.XXX ± 0.005
.XXXX ± 0.0010
DRWG. RELEASE DATE 11.15.91

APPROVALS

		DATE
DRAWN BY	T. ELLIS	2/28/91
CHECKED BY	[illegible]	12/04/91
APPROVED		DATE

KURZ INSTRUMENTS, INC.

TITLE
SERIES 460 PROBE ASSY., -08-TA-AT/HT-LD/FD

DWG. SIZE D | DWG. NO. 752601 | REV. A
SCALE 1=3/4 & NOTED | SHEET 1 OF 1

B Technician-Level Menus

This appendix contains the menus and commands that technicians can use to modify the Model 155 Jr configuration. Access to these menus is limited; only those who know the technician-level access code can see these menus.

To see the technician-level menus:

1. From Executive Mode, press "P" to go to Program Mode.
2. Type the 6-digit, technician-level access code, and press "E." The technician-level menus offer these options:

   - Set linearizers
   - Calibrate (input and output calibration)

To set the correct system variables, a certified technician will need the following equipment:

- Model 155 Jr Flow Computer/Transmitter
- Calibration and Certification Document
- Calibrated digital volt meter (DVM) accurate within ± 0.001 Vdc (according to NIST).

B.1 Calibrate

The Calibrate command lets you set the input and output calibration for each channel in your system.

B.1.1 Set Input Calibration

A "zero" voltage of 0.000 Vdc and a "span" voltage of (approximately) 3.000 Vdc are standard values preset at the Kurz factory.

To set the input calibration:

1. Press "P" from the Program Menu until you see the following message,

   PRESS ENTER TO CALIBRATE

   After you press "E," you see the following message,

   PRESS ENTER FOR INPUT CAL

2. After you press "E," the system prompts you to set the zero voltage reading for Channel A.

   Open the Model 155 Jr enclosure, connect the black lead of the DVM to the ground end (right end) of the 5.0-ohm resistor (R1). Move the jumpers on the triple-six header (W2) from the two columns of pins on the right to the two columns of pins on the left. Next, connect the red lead of the DVM to the triple-six header (W2).

   Set the switch (S1) directly below W2 to the right; because the reference is on the ground, the DVM registers 0.000 Vdc.

   Press YES/UP–ARROW or NO/DOWN–ARROW on the front panel of the Model 155 Jr to set a zero voltage reading for Channel A, then press "E."

3. To set the span voltage reference for Channel A, set S1to the left. The DVM registers a simulated sensor output signal of approximately 3.000 Vdc.

   To set the span voltage for Channel A to coincide with the DVM display of (approximately) 3.000 Vdc, press the YES/UP–ARROW or NO/DOWN–ARROW on the front panel of the Model 155 Jr, and then press "E."

   After you press "E," you can continue to calibrate the input for each channel in the system. You can have up to 22 input channels. After setting the input calibration for the last channel in the system, press "E" to set output calibration.

NOTE: Do not subject a channel to more than 1.000 amperes for longer than 60 seconds. Doing so, damages the channel.

If you have completed calibrating the Model 155 Jr at this point, disconnect the DVM, and move the jumpers on W2 to the two right columns of pins. Moving the jumpers from the left to right resets the Model 155 Jr from calibration mode to operation mode.

B.1.2 Set Output Calibration

Unlike setting the input calibration, the system readout remains constant while the output of the portable digital voltmeter changes. Thus, the "zero" voltage is programmed to read 0.000 Vdc and the "span" voltage is programmed to read 5.000 Vdc for each applicable channel in the system.

To set the output calibration:

1. Press "P" from the Program Menu until you see the following message,

   PRESS ENTER TO CALIBRATE

   After you press"E," press YES/UP–ARROW or NO/DOWN–ARROW until you see the following message,

   PRESS ENTER FOR OUTPUT CAL

2. Press "E," then place a digital voltmeter on the terminal placements for Channel 1's analog output signal. If the voltage is not 0.000 Vdc, press YES/UP–ARROW or NO/DOWN–ARROW until the DVM reads 0.000 Vdc, then press "E."

3. The span voltage for Channel 1 should read 5.000 Vdc. While continuing to monitor the Channel 1's analog output signal, check that the DVM measures 5.000 Vdc. If it does not, press YES/UP–ARROW or NO/DOWN–ARROW until the digital voltmeter reads 5.000 Vdc, then press "E."

   After you press "E," you will continue to set the output calibration for each channel in the system. You can have up to 8 output channels. After setting the output calibration for the last channel in the system, press "E" to go to "Set Linearizers."

   If you have completed calibrating the Model 155 Jr at this point, disconnect the DVM, and move the jumpers on W2 to the two right columns of pins. Moving the jumpers from the left to right resets the Model 155 Jr from calibration mode to operation mode.

B.2 Set Linearizers

To linearize each channel in the system, you need to reference the Calibration Data and Certification Document that was shipped with the product. The Calibration Data and Certification Document provides a linearization table, which correlates the number of data points and the input and output voltage for each data point of the thermal mass flow sensor in the system.

To set the linearizers:

1. Press "P" from the Program Menu until you see the following message,

   PRESS ENTER TO SET LINEARIZERS

2. After you press "E," you will see this message,

   PRESS ENTER TO LINEARIZE CH A

3. Select the engineering units of measure for Channel A. Press YES/UP–ARROW and NO/DOWN–ARROW until you see one of the following units, then press "E,"

   - SFPM or SMPS
   - SCFM or SCMM
   - DEGF or DEGC

Refer to the Calibration Data and Certification Document for the units of measurement.

Type the data points for Channel A. Press YES/UP–ARROW and NO/DOWN–ARROW until you see the correct number, then press "E." You can find the number of data points in the linearization table, in the Calibration Data and Certification Document.

4. Repeat these steps for the remaining data points in the Calibration Data and Certification Document.

After you press "E," you will continue to set the calibration points for each channel in the system. You can have up to 22 channels (A–V). After setting the data points for the last channel in the system, press "C" to return to Executive Mode.

C.2 PID Program Mode

To set PID data parameters:

1. If you have access to the PID Menu, you can press "P" at the Program Menu until you see this option:

   PRESS ENTER TO SET PID DATA

2. Press "E;" to set PID 1, press "E." You can set parameters for up to 8 PIDs.
3. Assign a feedback meter number to PID 1. Type a value from 1 to 16 indicating the meter to be controlled by this PID, then press "E."
4. Turn the PID control loop ON or OFF. Press YES/UP–ARROW or NO/DOWN–ARROW to display your choice, then press "E."
5. Turn the log for this PID ON or OFF. Press YES/UP–ARROW or NO/DOWN–ARROW to display your choice, then press "E."

   If you set the PID log to ON, the PID controller's actions are sent to the printer.
6. Choose from one the following PID flow control types:

   - flow (uses a fixed set point)
   - isokinetic (uses a reference meter)

   Press YES/UP–ARROW or NO/DOWN–ARROW to display your choice, then press "E."
7. Set the reference meter to provide the set point reference, then press "E."
8. Set the maximum set point. The units will be SFPM or SMPS for isokinetic meters, and SCFM, PPM, or KPM for flow meters. Type a 6-digit value, then press "E."

   If the reference set point goes above this value, the PID controls the flow at this value.
9. Set the minimum set point. The units will be SFPM or SMPS for isokinetic meters, and SCFM, PPM, or KPM for flow meters. Type a 6-digit value, then press "E."

   If the reference set point goes below this value, the PID controls the flow at this value. After you press "E," you see the actual setpoint display as a percentage of the full-scale referenced meter's flow; this value should remain at 100%, which is the default value.

10. Set the allowed offset (deviation) from the set point. The units will be SFPM or SMPS for isokinetic meters, and SCFM, PPM, or KPM for flow meters. Type up to 6 digits, then press "E."

11. Specify the allowable interval after a PID action before reading the meter and starting another action (meter and sensor settling time).

    You can enter a dead zone value from 2.4 seconds to 1 hour (3600 seconds). The system will round any value to a 2.4-second increment.

    DO NOT use a boxcar filter if you are setting a PID dead zone. See Section 3.4.6, "Set Box Filter," for information about setting a boxcar filter.

12. Set the proportional constant (K_p). Type a value from .01 to 1.0 (the default value is .6), then press "E."

13. Set the derivative constant (K_d). Type a value from .01 to 1.0 (the default value is .75), then press "E."

14. Assign a minimum timed pulse width (T_{pmin})to the valve, in 10-millisecond increments, then press "E."

15. Assign a maximum timed pulse width (T_{pmax})to the valve, in second increments, then press "E." This value will be used anytime the Model 155 Jr timed pulse width calculation exceeds this value. If you enter a negative value for T_{pmax}, the Model 155 Jr uses T_{pmin} as the default value.

16. Set the mechanical dead zone (T_{pmech}) in 10-millisecond increments. This value is used when the valve changes direction. This time is not used in the timed pulse width calculation, but is added to it.

17. Set the "manual" timed pulse width (T_{pman}) in 10-millisecond increments, then press "E." This value will be used when the manual control overrides the PID control of the valve.

18. Specify the time between manual pulses (T_{pmandz}) in milliseconds, then press "E."

19. Set the valve direction for the controlling alarm. Press YES/UP–ARROW and NO/DOWN–ARROW to cycle through the available alarm numbers; the direction alarm is always an even value. Press "E" to select an alarm number.

20. Select the alarm that enables the motor drive pulses. Press YES/UP–ARROW and NO/DOWN–ARROW to cycle through the available alarm numbers; the enable alarm number is always an odd value. Press "E" to select an alarm number.

Follow Steps 1 through 20 for each PID that you define. After defining PID data, press "P" to set PID control.

To set PID control:

1. Press "P" at the Program Menu until you see this option:
   PRESS ENTER TO CONTROL PID
2. Press "E;" to control PID 1, press "E" again. You can control up to 8 PIDs, depending on how many you defined. Specifying a PID number turns off the PID automatic-control loop; this allows manual control.
3. Press YES/UP–ARROW to open the valve with pulses as set in Steps 17 and 18 (see above). Press NO/DOWN–ARROW to close the valve. Flow changes are monitored by the displayed flow rate.

   Repeat these steps to set the control for each PID you defined. When you have set PID control for the last PID you defined, pressing "E" returns you to the Program Menu.

D Upload/Download Tunnel Data

This system allows you to upload configuration files from your Personal Computer's hard disk to the Model 155 Jr, or download configuration files from the Model 155 Jr to your computer's hard disk. You can also save the information stored in a configuration file on your computer's hard disk to a printable file.

The instructions in this appendix assume that you have correctly connected the cables from the Model 155 Jr to your Personal Computer, and that you are using communication port 1 (COM1).

NOTE: The ↵ character in the following instructions indicates that you press the Enter key on your computer's keyboard.

Your laptop Personal Computer has been programmed to automatically start the MENU program when you boot-up your computer. Once you have started the MENU program, these options are available:

- Move configuration from the ADAM to PC
- Move configuration from PC to ADAM
- Create printable configuration file
- Enter ADAM terminal mode
- Exit to DOS

D.1 Downloading Configuration Files to the Personal Computer

A configuration set-up is the unique data entered into the Model 155 Jr microprocessor, which defines the applications that the system will perform. Each configuration set-up is given a unique DOS filename, such as TUNNEL-A.

We suggest performing the download procedure each time you use the system.

NOTE: The system can function with incorrect data, but it will be inaccurate.

To download configuration files from the Model 155 Jr to your Personal Computer, follow these steps:

1. At the C:\> prompt, type

   MENU↵

2. Select Option 1 from the menu by typing the following,

   1↵

3. You are prompted to enter the communications port number that connects the Personal Computer to the Model 155 Jr. At the COM Port 1 or 2 prompt, type

   1↵

4. You are prompted to enter the name of the configuration file. Type the path and file name of the configuration file on your hard disk.

   For example, the following command would download the configuration file to a file called TUNNEL-A (there is no file extension) on Drive C of your hard disk, in a directory called TUNNELS.

   C:\TUNNELS\TUNNEL-A↵

   You will see many messages echoing to your Personal Computer screen indicating that the configuration data is downloading from the Model 155 Jr to your Personal Computer hard disk. When the file is created, you see the following message and return to the DOS prompt.

   *** DOWNLOAD COMPLETE ***

D.2 Uploading Configuration Files to the Model 155 Jr

Uploading configuration files to the Model 155 Jr from your laptop Personal Computer is necessary only if changes are made in the field.

NOTE: If you modify the configuration files in any manner, be sure to send a copy of the updates Kurz Instruments Customer Service so the current configuration files will always be on file.

To upload configuration files from your Personal Computer to the Model 155 Jr, follow these steps:

1. At the C:\> prompt, type

   MENU↵

2. Select Option 2 from the menu by typing the following,

   2↵

3. You are prompted to enter the communications port number that connects the Personal Computer to the Model 155 Jr. At the COM Port 1 or 2 prompt, type

   1↵

4. You are prompted to enter the name of the configuration file. Type the path and file name of the configuration file on your hard disk.

   For example, the following command would upload a configuration file called STACK_Z (there is no file extension) in the root directory of Drive C on your hard disk.

   STACK_Z↵

   You will see many messages echoing to your Personal Computer screen indicating that the configuration data is uploading to the Model 155 Jr from your Personal Computer hard disk. When the procedure is complete, you see the following message and return to the DOS prompt.

   *** UPLOAD COMPLETE ***

D.3 Creating Printable Configuration Files

Before you can create a printable configuration file, you must first download the configuration file from the Model 155 Jr to your Personal Computer's hard disk. You can download the file to any existing directory on your hard disk; you can have up to 8 characters in the filename, and a three-character file extension according to the standard DOS filenaming conventions. (See you DOS manual for file naming conventions.)

To create a printable file of a configuration file downloaded from the Model 155 Jr to your hard disk, follow these steps:

1. At the C:\> prompt, type

   MENU↵

2. Select Option 3 from the menu by typing the following,

   3↵

3. You are prompted to enter the name of the configuration file. Type the path and file name of the configuration file on your hard disk. For example,

   C:\STAKDATA\STACK_Z↵

4. You are then prompted to enter the name of the output file (the printable file). Type the path and file name of the configuration file. For example the following command creates a file called STACK_Z.PRN in a directory called STAKDATA on Drive C,

   C:\STAKDATA\STACK_Z.PRN↵

   When the file is created, you see the following message and return to the DOS prompt.

   ***** DUMP COMPLETE *****

To print your file, use the DOS PRINT or COPY commands. See your DOS manual for information about how to use these commands.