KURZ™
INSTRUMENTS INC.
MONTEREY, CALIFORNIA

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

360148
Revision A

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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, accessories or important documents such as the calibration certifications are not discarded with the packing material. Store these documents and other information pertinent to your order for future reference. If any parts are missing, contact Customer Service toll-free at (800) 424-7356 ext 319; FAX (408) 646-1033.

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 Authorization (RA) number from Kurz Customer Service; call:

   (800) 424-7356 ext. 319

   DO NOT return any equipment without an RA number.

2. Your correspondence must include:

   - The Kurz purchase order number on the customer invoice.
   - Reference all documents and correspondence to the RA number.
   - The name and telephone number, including the area code and extension (if any), of the person Kurz can contact regarding the equipment. Also include a return address to which the equipment is to be sent to.
   - A description the problem and a request for corrections to be performed at the Kurz factory and the application conditions under which the unit was operating.

3. Return the equipment and report to this address:

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

   Attn: Customer Service
   RA#: _____

Note: It is customer responsibility to clean equipment prior to return. Kurz is not equipped to clean potentially hazardous chemical compounds from returned equipment.

1.3 Product Description

The Model 455 Jr consists of the following components:

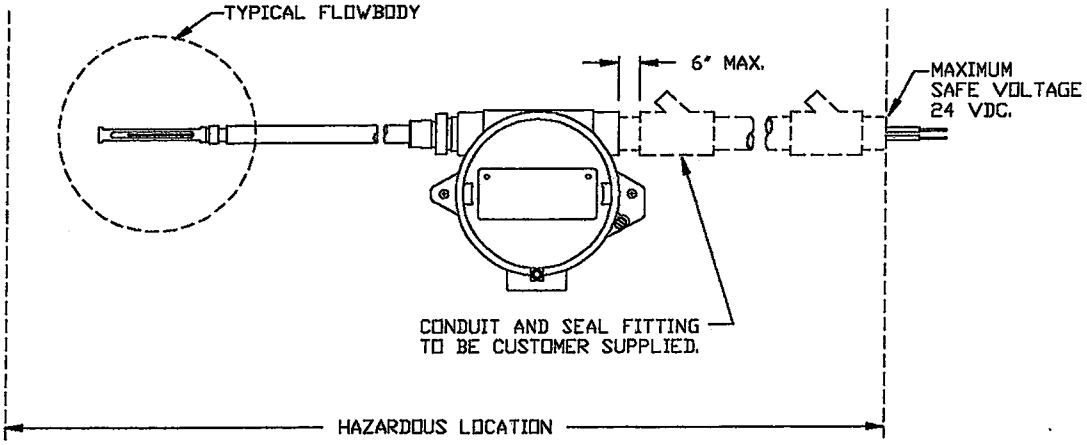
- Series 450 insertion mass flow element
- Series 155 Jr flow computer/transmitter

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 sends signals to the Series 155 Jr Mass 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 and the two wires used for the velocity sensor (Rph and Rpc) must be within +/- 0.01 ohms of each other.

Figure 1-1. *Model 450FM or 450CSA Installation*



APPROVED EXPLOSION PROOF FOR CLASS I, DIV. 1, GROUPS B, C, & D.
WIRE ALL CIRCUITS PER PROPER CODES & STANDARDS.

TA VERSION SHOWN

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 can be constructed from a variety of materials, with two sensor support diameters and six sensor types to meet the customer's application.

The response time for velocity changes at 4,000 SFPM (Standard Feet per Minute) is 1–3 seconds for all velocity sensors.

The temperature response time for the following MetalClad sensor types is 10 seconds:

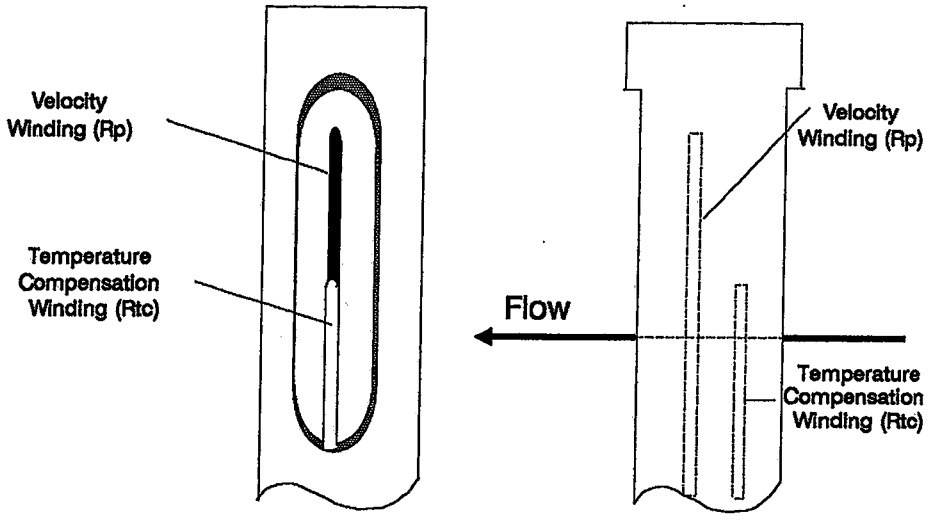
- Miniature Dual (MD)
- Large Dual (LD)
- Large Triple Sting (LT)
- Large Temperature (TL)

These MetalClad sensor types provide an even faster response time of 1–3 seconds:

- Fast Large Dual (FD)
- Fast Large Triple (FT)

The 450 can be used in hazardous locations if ordered with the FM (Factory Mutual) or CSA (Canadian Standards Association) approval ratings. The dual-sting sensor can withstand yaw and rotational deviations of ± 15 degrees from an ideal mounting attitude with only 1% measurement error.

Figure 1-2. *The Dual-Sting MetalClad Sensor*



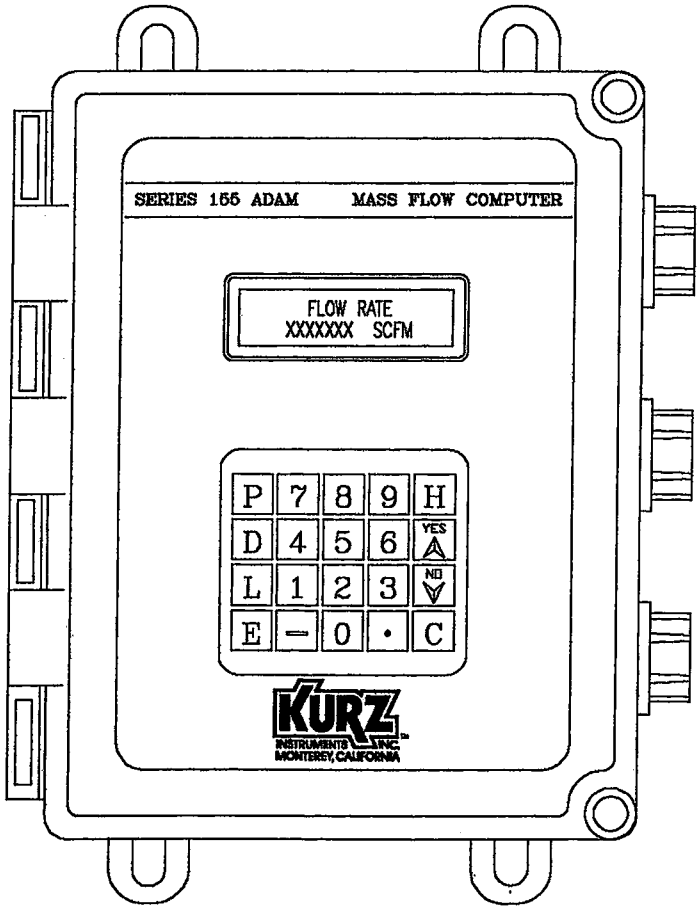
1.3.2 The Series 155 Jr Mass Flow Computer/Transmitter

The Series 155 Jr is a microprocessor-based Mass Flow Computer/ Transmitter. Kurz Instruments preconfigures the Series 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

Figure 1-3. *The Series 155Jr Mass Flow Computer/Transmitter (Shown Below in NEMA 4 Fiberglass Enclosure)*



Features of the Series 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 Series 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 externally powered, AC/DC isolated, and self-powered 4–20 mA signals
- Outputs up to 2 scaled linear 0–5 Vdc analog signals indicating the flow measurements for selected meters
- Four 5 amp. alarm relays
- One flow control driver to operate the Model 730 valve
- Built-in field calibrator
- 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 Series 155 Jr:

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

Control Driver Output and Alarm Relays

If you purchased the control driver output feature for the Series 155 Jr, your system has the 730 valve. The 730 flow control valve is an electrical metering valve that combines the electric drive motor, the valve body, and limit switches. The 730 valve controls the sample flow rate. The valve opens or closes in response to a +15V or -15 VDC correction signal from the Series 155 Jr. If the sample flow rate is too low (when compared with the average velocity in the stack or duct), the valve opens to increase the sample flow rate. If the sample flow rate is too high (when compared with the average velocity in the stack or duct), the valve closes to decrease the sample flow rate.

The standard valve incorporates a high torque DC gear motor designed to be operated by "error signals" from the Series 155 Jr. The Series 155 Jr converts the low-level logic signal from the Series 155 Jr to +15 or –15VDC signals, which the 730 valve interprets as open valve and close valve.

The flow coefficient (C_V) of the 730 valve is linear over a wide range due to its nearly 300° rotation between a closed condition and full open. The standard full open to full close time is 30 seconds, unless an optional valve speed has been specified. In addition, the orifice size is unaffected by changes in system pressure and the valve remains in its last position during constant flow or during power shutoff.

Because the motor is used only when the valve moves to a new position during flow control, the motor operates briefly and is usually idle. In this application, the motor should have an extremely long life and should not require replacement of the brushes.

If your system has the alarm relay feature, you have four definable alarm relays, which can be used to provide an audible or visual indication that an alarm condition has occurred. For example, you define an alarm to indicate an out of tolerance flow or sensor kickout failure.

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 is 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 diameters upstream and ten diameters 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 ext 319;
   FAX (408) 646-1033.

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 shield of the twisted two-wire pair from the Killark enclosure to the Series 155 Jr enclosure ground lug. The wires connect to terminal block 3 (TB3) on the Series 155 Jr input/output board. See the engineering drawings in Appendix A to identify and locate terminal specifics.
6. Connect the Series 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.
8. Install the Model 730 valve, and vacuum pump (or other vacuum system) in the appropriate location(s). In some installations, the valve, and pumps are housed in the system enclosure. Other Model 455 Jrs have installed and connected the flow meter, the valve, two pumps, and the pump switchover components on a single pump skid.

   The drawings in Appendix A provide detailed information on the installation of these components.

   Orient the valve so that the sample line can be connected between the inlet of the valve and the outlet (short pipe section) on the Series 450 probe or flow splitter body. The outlet of the 730 valve should be oriented so that the sample line can be connected to the inlet of the pump. The inlet and outlet are marked on the valve.

   Install the vacuum pump(s) or other system used to draw the sample through the sampling nozzles. Orient the pump so that the pump inlet can be connected to the sample line from the 730 valve.
9. Connect the sample line from the manifold system to the inlet of the Series 450 probe or flow splitter. If the 450 or flow splitter outlet is not directly connected to the 730 valve inlet, connect a sample line between them. Connect the sample line between the pump inlet and the valve outlet if it is not already installed. Finally, connect the sample return line to the pump outlet.

10. Connect the appropriate secondary sample lines to the sample flow splitter, if appropriate.

11. Mount the base of the system enclosure.

NOTE: Using the highest quality fasteners in an installation configuration offers generous safety factors.

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.

2.1 Electrical Connections

Connect all wires as shown in the engineering drawing titled, "Wiring Diagram, Hook-Up 155 Jr" in Appendix A.

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

- Two-wire hookup cable connections
- Customer-supplied external devices connections, i.e. alarms, printers, etc.
- Input power wiring connections

2.1.1 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), 230 VAC ± 10.0% at 50/60 Hz, and 24.0 VDC, 1.0% 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 Series 155 Jr input/output board.

Table 2-1. *AC Power Input Wiring.*

Terminal Placements	AC Power
TB1-1	AC
TB1-2	ACC
TB1-3	GND

Table 2-2. *DC Power Input Wiring.*

Terminal Placements	DC Power
TB2-1	+24.0 VDC
TB2-2	GND

2.1.2 Flow Element Two-Wire Conductor Cable Connections

The two-wire conductor cable connects the Flow Element Current Board and the Series 155 Jr. One wire provides a voltage supply to the current board from the linearizer board; the other wire transmits the sensor's return signal from the current 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 Series 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.

2.1.3 Connecting Optional Modules to the Series 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.

2.2 Verifying Wiring Connections

To verify the wiring connections on the Series 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.

End of Section 2

3 Operation

This section describes the Series 155 Jr keys and functions, what happens at startup, and how to use the Series 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.

You can find more information about the Series 155 Jr in these sections:

- Appendix A contains a state diagram of Series 155Jr operation.
- Appendix B contains the Technician-Level menus and commands
- Appendix C contains the PID (Proportional Integral Derivative) displays and menus
- Appendix D describes the Upload/Download Program
- Appendix E explains the Series 155 Jr Serial Port Connections.

3.1 Keys and Functions

You can operate the Series 155 Jr directly using the Series 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 Series 155 Jr display.

Each Series 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 Series 155 Jr key functions are described in Table 3-1.

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

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 printer connected to the Series 155 Jr, pressing this key sends data to the printer port.	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. When selecting alphanumeric characters using the Series 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. When selecting alphanumeric characters using the Series 155 Jr keypad, pressing the Down-Arrow key decrements to the previous letter or number (...C,B,A or ...3,2,1).	‡
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. Minus sign.	–
•	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 Series 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 Series 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 Series 155 Jr displays to the terminal or PC (by means of the "primary" RS-232 port)
- Send Series 155 Jr configuration data to the terminal or PC (by means of the "primary" RS-232 port)
- Send Series 155 Jr log data to the terminal or PC (by means of the "secondary" RS-232 port — if you purchased this option)

Table 3-2. Series 155 Jr ASCII Key Functions.

ASCII KEY	FUNCTION
+	Toggles echo on and echo off to a terminal or PC screen. When echo is on, information sent to the Series 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 Series 155 Jr passes the memory test, you see messages indicating the following information:

- System time of day clock
- Initialization messages
- Allows the analog inputs to stabilize
- Calculates the time of the next scheduled printout
- Starts Executive Mode

3.3 Executive Mode

After startup, the Series 155 Jr automatically enters the Executive Mode. In Executive Mode, the Series 155 Jr has an Automatic Display Loop to which 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" information 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." If your system has a PID loop configured and it's turned on, you can press "D," and then "E" to display values other than those in the Automatic Display Loop. You can press "C" to return to Executive Mode.

To display meter information:

1. Press YES/UP–ARROW and NO/DOWN–ARROW to select a meter, and then press "D."
2. You will see the meter identification (if you assigned one) or a preassigned 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 "D" to proceed to the next display:

- flow rate in the preset units, such as SCFM (Standard Cubic Feet per Minute) or PPH (Pounds per Hour)
- totalized flow (TOT) in the preset 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 multiple channels, you see the channels included
- input volts for each channel in the meter

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

- temperature (in degrees Fahrenheit or Centigrade)
- calibration factor
- averaged channels for the selected meter, or single channel
- 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 (if you have a serial printer connected)
- Set the meter data
- Set the box filter
- Select the analog output
- Set the alarms
- Set channel kick out
- See input volts

This section is organized by the options listed above, and how you would encounter them as you moved through the Program Menu.

If you have purchased the following options (which have been preprogrammed at the factory), you will also see the following information displayed:

- PID (Proportional Integral Derivative, see Appendix C)
- Channel kickout
- Temperature mapping

You can modify existing settings in Program Mode by adjusting values using the YES/UP–ARROW and NO/DOWN–ARROW keys, or entering a value, and then pressing "E." Pressing "E" alone will not enter new data. After you successfully enter new data, the Series 155 Jr will display the following message:

NEW DATA ACCEPTED

To enter Program Mode:

1. Press "P" when the system is in Executive Mode.
2. Using the keypad, type the 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
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 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

This is a 24-hour clock/calendar. Although the time of day is displayed to the second, the system records only to the minute. The system time is kept accurate 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 Series 155 Jr to send the meter data to a printer at specified time intervals. You can also send the meter data from the Series 155 Jr to an ASCII terminal or PC through the secondary RS-232 port. For example, a log of the meter data might contain the following information:

```
Time: 16:22  6/30/92

METER #1  ID:MASS
FLOW RATE 0.0002
SCFMTOT= 4126.56 SCF ET =   452.2 MIN
AVERAGE VELOCITY 0.2 SFPM
FLOW AREA  0.0001 SQ FT
CALIBRATION FACTOR 1.000
AVG'D CHS A
A=0.0002  SCFM INPUT=0.000 VDC
```

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 Series 155 Jr calculates flow measurements based on the sensor(s) output. A "meter" can be an individual sensor (channel), the averaged measurements of multiple channels, or the sum of multiple meters. Meter identifications are preset at the factory, however, you can change the identification for a meter.

Any modifications you make with the Set Meter Data command will automatically display when you are 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.

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

NOTE: These options correspond to preset factory definitions based on your order, so you will 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, press YES/UP–ARROW or NO/ DOWN–ARROW to see the flow display in SCFM.

   If you specified PPH as the units, press YES/UP–ARROW or NO/ DOWN–ARROW to display the PPH (or the metric equivalent), then press "E."

   Set the specific gravity before indicating which sensors (defined as channels) to include in this meter. The default value for specific gravity is 1. Press YES/UP–ARROW or NO/DOWN–ARROW to the channel prompt, and then press "E"

   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 exclude 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, temperature rates, or flow profiles. 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) in the given units. 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" (or "P") sends you to the next menus, which is "Set Box Filter."

3.5.5 Set Box Filter Size

The analog channel inputs to the Series 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 2 analog output channels. Each channel can output a linear 0–5 VDC signal, which drives a 4–20 mA 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 the analog output to proper meter; it can be assigned to any meter. There are up to 16 meters available.

3. Select a meter, 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 flow rate (0 VDC is the default value) and the high flow rate (5 VDC is the default value). After typing the values, press "E."

   If the meter is a temperature meter, set the low and high temperature values. 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 (4 mA) 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 (12 mA), which is half way between 0–5 VDC (4–20 mA). If the flow is 12,000, a 5.000 VDC (20 mA) signal will be output.

3.5.7 Set Alarms

Although there are 4 alarms in the Series 155 Jr, one alarm is assigned at the factory for Global Kick Out; by default, this is the last-selected alarm. You can assign the remaining 3 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, turn the alarm OFF until the condition is corrected; turn the alarm ON once the condition is corrected. Alarms will automatically reset when the alarm condition is corrected.

3.5.8 Set Channel Kick Out

The factory assigns an alarm (the highest of the assigned alarms) as Global Kick Out, which "kicks out" any sensor readings higher or lower than the selected percentage of full scale. Channel kick out lets you specify which channel(s) to omit from the average.

To set channel kick out:

1. Press "P" 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." 110% is the default.
4. Type a low kick out value (percentage of full scale) and press "E." –1% is the default.
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 go to the Program Menu.

3.5.9 See Input Volts

See Input Volts is a "trouble-shooting" indicator. You can display the input volt values and the original calibrated values from the linearizer tables before a calibration factor is applied.

To see input volts:

1. Press "P" 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 UNITSINPUT=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

4 Maintenance

This section describes the routine maintenance for the 455 Jr. To ensure reliability, periodically return the unit to the Kurz factory for repairs or recalibration.

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

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

Experience has demonstrated the long-term stability of the calibrations performed on the system before shipment. To maintain NIST traceability on the instrument calibration, annual calibrations are recommended.

- Clean the sensors and flow body, as needed
- Verify output signals

Continuous use under extreme conditions can necessitate periodic cleaning of the sensors and the internal parts of the flow body. The sensors and flow body should be examined every 90 days for most applications. When the sensor is operating in particularly dirty or particle-laden environments, check every 30 days. If your system operates in clean-air applications, check every 180 days.

If the sensors and/or flow bodies need cleaning, use cleaning processes that effectively clean without damaging surface finishes, material properties, or the metallurgical structure of the materials. The sensor can be bent or broken by careless treatment; a bent sensor can develop a short and need to be replaced.

You can flush the sensor and flow body with any solvent you believe effective in removing the contaminants. Cleaning agents used for cleaning stainless steel components must contain less than 250 ppm chlorides. Rinse water must contain less than 50 ppm chlorides. Turn off the power before cleaning.

Some sensors might have small specs of excess metal adhering to their stainless steel sheaths, which in no way degrade the performance of the system. Do not attempt to remove the specs; doing so might change the system's calibration.

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.

If you suspect there is a input power problem, check for these conditions:

1. The wiring connections and system interconnections are correctly connected (see Section 2.1, "Electrical Connections").
2. No flow or a maximum of 30 FPM (feet per minute) is passing the sensors.
3. AC power input is supplied to the system.

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.

NOTE: You must have written authorization from Kurz Instruments, Inc. to perform any warranty service at the customer's site. Only a certified electrical technician should perform nonwarranty service.

End of Section 4

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.

Drawing Number	Revision	Description
000155-14	A	Assy, ADAM Jr. 8 x 6 x4 FG Enclosure.
000450-10	A	Series 450 Probe Outline Dwg. Sensor Electronics Attached Option.
000450-11	A	Series 450 Probe Outline Dwg. Sensor Electronics Separated Option.
000450-12	A	Series 450 Probe Outline Dwg. FM and CSA Approval Version.
000455-01	B	Outline Dwg., Ball Valve Retractor, BVR-08.
000455-02	B	Outline Dwg., Ball Valve Retractor, BVR-16.
000455-03	A	Compression Fitting, 8AD8 & 16AD16, Outline & Installation Detail.
000455-04	A	Probe Mounting Adaptor PMA-08 & PMA-16, Outline & Installation Detail.
000455-05	A	Welded Compression Fitting 8AD8WD & 16AD16WD Outline & Installation Detail.
000455-08	A	Outline Dwg., Ball Valve Retractor With Flange, BVR-08-Fl.
000455-09	A	Outline Dwg., Ball Valve Retractor With Flange, BVR-16-Fl.
340155-26	C	Model 155, Microprocessor Module, State Diagram
340155-29	A	Wiring Diagram, Hook-Up, 155 Jr.

B Technician-Level Menus

This appendix contains the menus and commands that technicians can use to modify the Series 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:

- Series 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 Series 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. The DVM registers 0.000 Vdc because the reference is on the ground.

   Press YES/UP–ARROW or NO/DOWN–ARROW on the front panel of the Series 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 S1 to 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 Series 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.

CAUTION: 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 Series 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 Series 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."

   After you have completed calibrating the Series 155 Jr, 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 Series 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" (on the Series 155 Jr keypad) to return to Executive Mode.

End of Appendix B

C PID Displays and Menus

PID (Proportional Integral and Derivative) is a mathematical algorithm for looking at an isokinetic system's closed-loop parameters. This appendix contains the Series 155 Jr PID displays and menus.

C.1 PID Display Mode

To display PID data parameters:

1. From Executive Mode, press "D" to go to Display Mode. Press YES/UP–ARROW or NO/DOWN–ARROW until you see the following message,

   DISPLAY PID

2. Press "E," then press YES/UP–ARROW or NO/DOWN–ARROW until you see the PID number you want to display; press "E" again.

   When you display a PID meter, you see the following information. Press "E" to proceed to the next display.

   - PID meter is ON or OFF, and the system time and date
   - PID meter logging is ON or OFF
   - Setpoint volume, or percentage of referenced meter
   - PID meter offset
   - feed back (FB) meter assigned to PID
   - feed back meter flow rate
   - maximum set point
   - minimum set point
   - reference temperature

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. For example, when the PID log is ON, you will see information similar to the following logged to your printer:

   Time: 16:22 6/30/92
   PID #1 STEP: 1
   #1 SP 2000 SCFM
   #1 +/- 500 SCFM
   #1 ERR 999.8 SCFM
   #1 Tp 1000 MS
   #1 OPEN VALVE
   #1 FB VELOCITY 0.2 SFPM
   #1 REF VELOCITY 0.2 SFPM

   Time: 16:22 6/30/92
   PID #2 STEP: 1
   #2 SP 2000 SCFM
   #2 +/- 500 SCFM
   #2 ERR 1999.8 SCFM
   #2 Tp 1000 MS
   #2 OPEN VALVE
   #2 FB FLOW RATE 0.2 SFPM

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 3.5.5, "Set Box Filter Size," 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 Series 155 Jr timed pulse width calculation exceeds this value. If you enter a negative value for T_{pmax}, the Series 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, press "E" to return to the Program Menu.

End of Appendix C

D Upload/Download Program

As an accessory feature to this product, you can upload configuration files from your Personal Computer's hard disk to the Series 155 Jr, or download configuration files from the Series 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.

Depending on which accessory feature you purchased with your system, the Upload/Download program will have different start-up procedures.

The instructions in this appendix assume that you have correctly connected the cables from the Series 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.

If you ordered the Kurz laptop Personal Computer with the Upload/Download program included, your computer has been programmed to automatically start the MENU program when you boot-up your computer.

If you ordered the Upload/Download program for use with your own IBM-compatible computer, create a directory off the root directory of Drive C, called LOAD. Copy the diskette contents into the directory (C:\LOAD). To start the Upload/Download program, change the directory to C:\LOAD and type MENU↵ to start the MENU program.

Once you have started the MENU program, these options are available:

- Move configuration from the Series 155 Jr to PC
- Move configuration from PC to Series 155 Jr
- Create printable configuration file
- Enter Series 155 Jr terminal mode
- Exit to DOS

D.1 Uploading Configuration Files to the Personal Computer

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

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

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

1. Once you are in the Menu program, select Option 1 from the menu by typing the following,

   1↵

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

   1↵

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, the following command would upload 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 uploading from the Series 155 Jr to your Personal Computer hard disk. When the file is created, you see the following message and return to the DOS prompt.

   *** UPLOAD COMPLETE ***

D.2 Downloading Configuration Files to the Series 155 Jr

Downloading configuration files to the Series 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 download configuration files from your Personal Computer to the Series 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 Series 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 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 downloading to the Series 155 Jr from your Personal Computer hard disk. When the procedure is complete, you see the following message and return to the DOS prompt.

   *** DOWNLOAD COMPLETE ***

D.3 Creating Printable Configuration Files

Before you can create a printable configuration file, you must first download the configuration file from the Series 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 your DOS manual for file naming conventions.)

To create a printable file of a configuration file downloaded from the Series 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.

End of Appendix D

E Series 155 Jr Serial Connections

This appendix contains the Series 155 Jr serial port (RS-232) connections to a remote ASCII terminal, an IBM-compatible personal computer, or a serial printer.

You specify the logging intervals and start time with the Series 155 Jr software. For more information, see Section 3.5.3 "Set Log Intervals." An alarm condition will automatically create a log of the alarm data.

The Series 155 Jr has one, "primary" terminal port, but it can be ordered with a "secondary" printer port. The Series 155 Jr port connections are DB-9 female. Use a "straight-through" 9-pin to 9-pin cable.

Table E-1 lists the Series 155 Jr' RS-232 port protocol, Table E-2 lists the standard 9-pin connector interface, and Figure E-1 illustrates the pin assignments for the Series 155 Jr' terminal and printer ports.

Table E-1. *Series 155 Jr RS-232 Port Protocol.*

Baud rate:	1200
Parity:	None or Ignore
Data bits:	8 bits
Stop bits:	1 or 2
Start/Stop Enable:	Enable
Control Character:	Normal
Line feed:	Yes

Table E-2. *Standard 9-Pin Connector Interface.*

PIN	SYMBOL	DESCRIPTION
1		Carrier Detect
2	RXD	Receive Data
3	TXD	Transmit Data
4	DTR	Data Terminal Ready
5	GND	Ground
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Clear to Send
9		Ring Indicator