O P E R A T I N G M A N U A L

CI–100

Crucible Indexer

PN 074–544–P1D

INFICON

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CI–100

Crucible Indexer

PN 074–544–P1D

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DECLARATION OF CONFORMITY

This is to certify that this equipment, designed and manufactured by:

INFICON Inc.
Two Technology Place
East Syracuse, NY 13057
USA

Meets the essential safety requirements of the European Union and is placed on the market accordingly. It has been constructed in accordance with good engineering practice in safety matters in force in the Community and does not endanger the safety of persons, domestic animals or property when properly installed and maintained and used in applications for which it was made.

Equipment Description: **CI-100 Crucible Indexer and all its options**

Applicable Directives:

2014/35/EU (LVD)

2014/30/EU (General EMC)

2011/65/EU (RoHS)

Applicable Standards:

Safety:	EN 61010-1: 2010 Safety Requirements for Electrical Equipment For Measurement, Control, And Laboratory Use. PART 1: General Requirements
Emissions:	EN 61326-1: 2013 (Radiated & Conducted Emissions) (EMC – Measurement, Control & Laboratory Equipment) CISPR 11/EN 55011 Edition 2009-12 Emission standard for industrial, scientific, and medical (ISM) radio RF equipment FCC Part 18 Class A emissions requirement (USA)
Immunity:	EN 61326-1: 2013 (Industrial EMC Environments) (EMC – Measurement, Control & Laboratory Equipment)
RoHS2:	Fully Compliant

CE Implementation Date: January 2004 (Revised August, 2015)

Authorized Representative: Steven Schill

Thin Film Business Line Manager
INFICON, Inc.

ANY QUESTIONS RELATIVE TO THIS DECLARATION OR TO THE SAFETY OF INFICON'S PRODUCTS SHOULD BE DIRECTED, IN WRITING, TO THE AUTHORIZED REPRESENTATIVE AT THE ABOVE ADDRESS.

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THIS WARRANTY IS MADE AND ACCEPTED IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WHETHER OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE, AS BUYER'S EXCLUSIVE REMEDY FOR ANY DEFECTS IN THE PRODUCTS TO BE SOLD HEREUNDER. All other obligations and liabilities of Seller, whether in contract or tort (including negligence) or otherwise, are expressly EXCLUDED. In no event shall Seller be liable for any costs, expenses or damages, whether direct or indirect, special, incidental, consequential, or other, on any claim of any defective product, in excess of the price paid by Buyer for the product plus return transportation charges prepaid.

No warranty is made by Seller of any Seller product which has been installed, used or operated contrary to Seller's written instruction manual or which has been subjected to misuse, negligence or accident or has been repaired or altered by anyone other than Seller or which has been used in a manner or for a purpose for which the Seller product was not designed nor against any defects due to plans or instructions supplied to Seller by or for Buyer.

NOTE: These instructions do not provide for every contingency that may arise in connection with the installation, operation or maintenance of this equipment. Should you require further assistance, please contact INFICON.

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Chapter 1
Introduction

1.1 Introduction

The CI-100 Crucible Indexer is used to rotate multi-pocket electron beam sources through a rotary vacuum feedthrough. The CI-100 consists of a 3.5 in. half-rack Controller, Motor Drive, Mounting Bracket, and interconnecting cable.

Figure 1-1 CI 100 Crucible Indexer

In addition to the capabilities you expect in a crucible indexer, the CI-100 has these unique features:

- 160 ozf • in torque at all operating speeds
- Direct drive—no pulleys to set or adjust
- Electronic calibration of each pocket—no mechanical adjustments
- Eight pre-defined pocket/banana configurations
- Custom user configuration—program any pocket/banana layout
- Universal 1 in. Bolt and 2 ¾ in. CF mounting bracket included
- Small, cool-running motor drive
- Digital I/O compatible with existing indexers

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1.2 Safety

1.2.1 Definition of Notes, Cautions and Warnings

When using this manual, please pay attention to the Notes, Cautions, and Warnings found throughout. For the purposes of this manual they are defined as follows:

NOTE: Pertinent information that is useful in achieving maximum efficiency when followed.

CAUTION

Failure to heed these messages could result in damage to the instrument.

WARNING

Failure to heed these messages could result in personal injury.

WARNING - Risk Of Electric Shock

Dangerous voltages are present which could result in personal injury.

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1.2.2 General Safety Information

WARNING - Risk Of Electric Shock

Do not open the instrument case! There are no user-serviceable components within the instrument case.

Dangerous voltages may be present whenever the power cord or external input/relay connectors are present.

Refer all maintenance to qualified personnel.

WARNING - Mechanical Hazard

Stay clear of motor output shaft and crucible when indexer is enabled.

Disable indexer before changing materials.

CAUTION

This instrument contains delicate circuitry which is susceptible to transient power line voltages. Disconnect the line cord whenever making any interface connections. Refer all maintenance to qualified personnel.

1.3 How To Contact Customer Support

Worldwide support information regarding:

- Technical Support, to contact an applications engineer with questions regarding INFICON products and applications, or
- Sales and Customer Service, to contact the INFICON Sales office nearest you, or
- Repair Service, to contact the INFICON Service Center nearest you,

is available at www.inficon.com.

If you are experiencing a problem with your instrument, please have the following information readily available:

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- the serial number for your instrument,
- a description of your problem,
- an explanation of any corrective action that you may have already attempted,
- and the exact wording of any error messages that you may have received.

To contact Customer Support, see Support at www.inficon.com.

1.4 Returning Your Instrument to INFICON

Do not return any component of your instrument to INFICON without first speaking with a Customer Support Representative. You must obtain a Return Material Authorization (RMA) number from the Customer Support Representative.

If you deliver a package to INFICON without an RMA number, your package will be held and you will be contacted. This will result in delays in servicing your instrument.

Prior to being given an RMA number, you may be required to complete a Declaration Of Contamination (DOC) form if your instrument has been exposed to process materials. DOC forms must be approved by INFICON before an RMA number is issued. INFICON may require that the instrument be sent to a designated decontamination facility, not to the factory.

1.5 Specifications

1.5.1 Motor Specifications

Motor Type . . . . . two phase, micro-stepper

Motor Drive. . . . . direct drive

Torque . . . . . 160 ozf • in

Speeds . . . . . 20 speed options

Display	Hi Speed (RPM)	Lo Speed (RPM)
1	0.5	0.05
2	0.6	0.06
3	0.8	0.08
4	1.0	0.10
5	1.2	0.12
6	1.5	0.15
7	1.9	0.19
8	2.4	0.24
9	3.0	0.30
0	3.7	0.37

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Resolution	1.8°
Repeatability	0.25°
Size (H x W x D)	3.5 x 3.5 X 4.8 in. (89 x 89 x 122 mm)
Weight	3.2 lbs. (1.5 kg)
Power	12 W (supplied by Controller)

1.5.2 Controller Specifications

Pockets	Up to 8
Inputs/Outpus	Binary or BCD Encoded Low 0 to 2 V (dc), High 4 to 24 V (dc), non-isolated
Communication	RS-232 only
Size (H x W x D)	3.5 x 8.4 x 7.8 in. (88 x 213 x 197 mm)
Weight	6 lbs. (2.7 kg)
Mains Power Supply	100 to 120/200 to 240 v (ac), ±10% nominal, 50/60 Hz, auto detect
Power	20 W
Fuse	250 V, 500 mA, Type T, 5 x 20 mm, time lag
Installation (Overvoltage)	Class 1 Equipment (Grounded Type) Category II for transient overvoltages per IEC 60664
Temporary Overvoltages	Short Term: 1440 V, <5 s Long Term: 490 V, >5 s
Usage	Indoor Only
Operating Temperature	0 to 50°C (32 to 122°F)
Humidity	0 to 80% (RH non-condensing)
Altitude	0 to 2000 m (0 to 6562 ft.)
Pollution Degree	2 per EN 61010
Storage Temperature	-10 to 70°C (14 to 158°F)

NOTE: The CI-100 uses a four rotation full cycle. This means that after four full turns of the motor, it is considered to be back at the home position. Crucible gearing can be adjusted to match this requirement. For example, if you have a four discrete pocket crucible, the gearing should be designed so that one full turn of the CI-100 motor moves one pocket position. For eight pockets, a half turn should move one pocket position.

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1.6 Unpacking and Inspection

1. If the CI-100 has not been removed from its packaging, do so now.
2. Carefully examine the contents for damage that may have occurred during shipping. This is especially important if you notice obvious rough handling on the outside of the container. *Immediately report any damage to the carrier and to INFICON.*
3. Do not discard the packing materials until you have taken inventory and have at least performed successful installation.
4. Take an inventory of your order by referring to your order invoice and the information contained in section 1.7.
5. To set the controller, see Chapter 2, Installation.
6. For additional information or technical assistance, contact INFICON, refer to section 1.3 on page 1-3.

1.7 Parts and Options Overview

1.7.1 Base Configuration

Thin Film Manual CD 074-5000-G1

CI-100 Indexer 782-CI-100

Includes:

CI-100 Controller 782-900-024-G1

Drive Motor. 782-900-025-G1

Power Cord 068-0433

Ethernet Cable 068-0478

DB-25 cable (10 ft.) 068-0483

Adapter (ethernet to RS-232). . . 782-505-078

Spider Coupling 070-1607

Shaft Body Coupling. 070-1606

Motor Bracket. 782-010-101

1.7.2 Accessories

3.5 in. Full Rack Adapter 782-900-008

3.5 in. Half Rack Adapter 782-900-014

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Chapter 2
Installation

2.1 Introduction

The CI-100 controller requires AC mains power, and should be located within 3 m (10 ft.) of the Motor drive unit. The Motor drive typically can be mounted to the E-Beam indexer feedthrough shaft using the mounting bracket and flexible coupling supplied.

NOTE: The CI-100 uses a four rotation full cycle. This means that after four full turns of the motor, it is considered to be back at the home position. Crucible gearing can be adjusted to match this requirement. For example, if you have a four discrete pocket crucible, the gearing should be designed so that one full turn of the CI-100 motor moves one pocket position. For eight pockets, a half turn should move one pocket position.

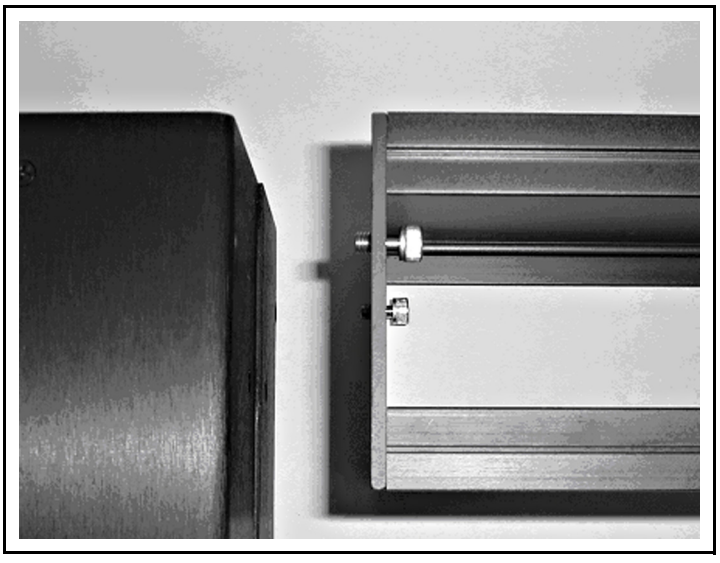
2.2 Mounting the Controller

The CI-100 Controller is a 2U (3.5 in. high) half-rack wide instrument. It can be mounted with a blank space on either side, using the optional Full Rack Extender. Alternatively it can be mounted next to another 2U half-rack instrument, using the optional Half Rack Adapter

2.2.1 Full Rack Extender

Assemble the two extender side panels and the extender front and rear panels into a box configuration using the eight 6-32 flat-head screws.

Figure 2-1 Full rack extender



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Thread the two 10-32 shoulder screws from the inside of one of the box sides until the threads extend fully to the outside.

Attach the Extender Kit to the CI-100 controller by threading the shoulder screws into the matching holes in the instrument covers.

Attach the rack mounting ears with the 10-32 flat-head screws provided.

Mount the assembly in a 19 in. rack with 10-32 screws (not provided).

2.2.2 Half Rack Adapter

Attach one rack mount ear to the CI-100 with the 10-32 flat-head screws provided. Attach the adapter plate with 10-32 flat-head screws to the other side of the CI-100.

Mount the second instrument's rack mount ear to the CI-100 adapter plate with 10-32 rack screws (not provided).

Mount the assembly in a 19 in. rack with 10-32 rack screws (not provided).

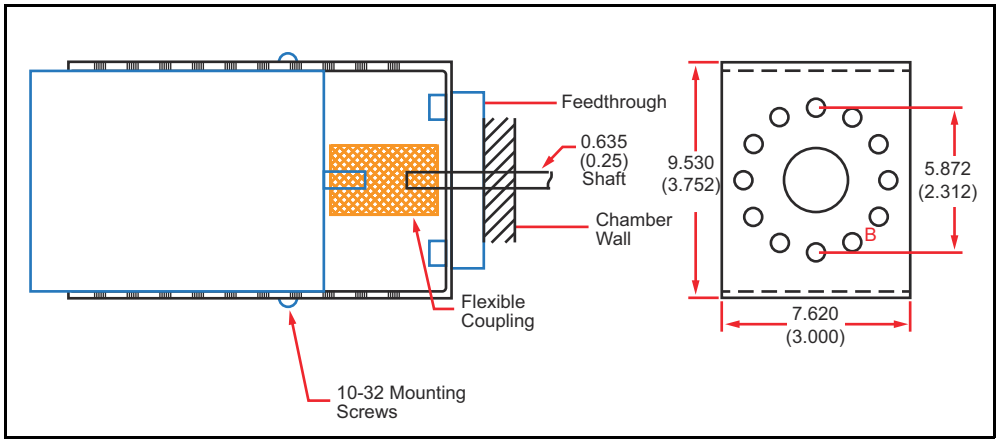
2.3 Mounting the Motor

A bracket and coupling is included to assist in mounting the motor drive to most 1 in. Bolt or 2 ¾ in. Conflat rotary feedthroughs with a 0.25 in. drive shaft.

2.3.1 Drive Mount with Bracket

Attach the mounting bracket to the feedthrough, rotating the bracket into the proper orientation for your vacuum system. Loosen the flexible coupling set screws and slide the coupling onto the feedthrough shaft.

Figure 2-2 Motor drive mounting



Slide the motor into the mounting bracket until the flexible coupling mates with the motor shaft.

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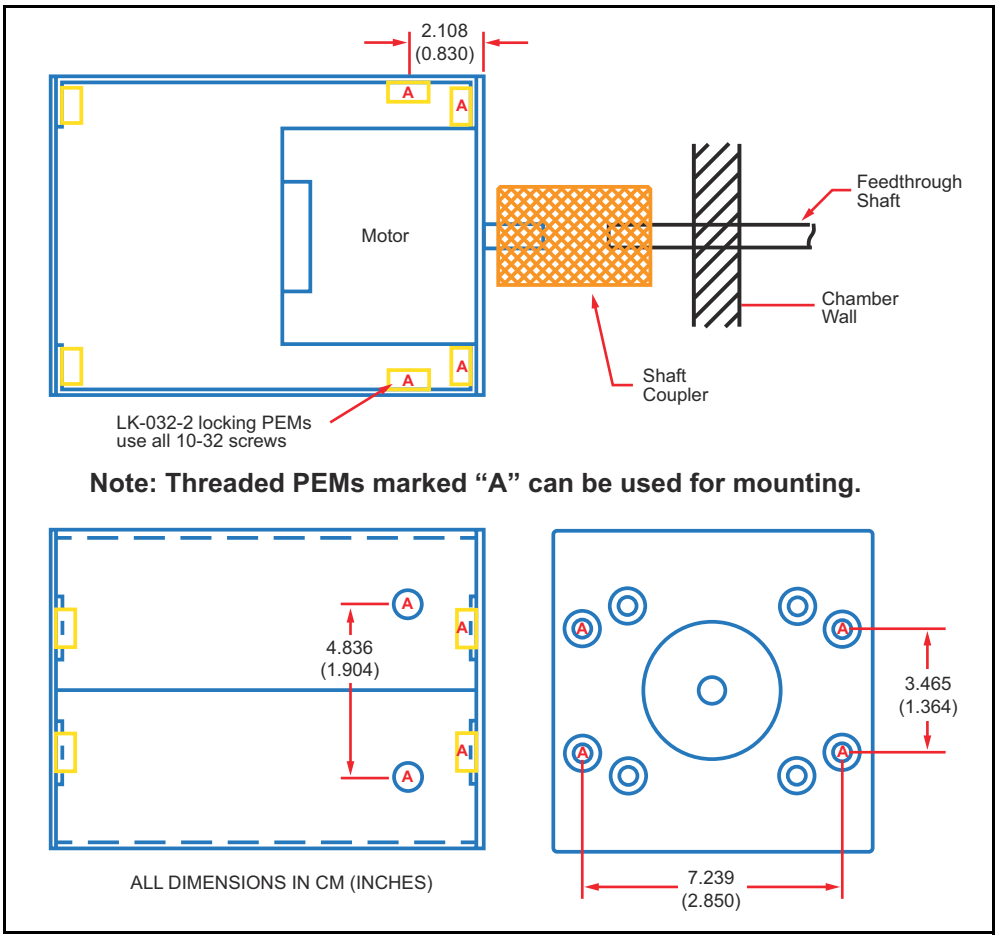
Attach the motor to the mounting bracket with 4 each 10-32 screws so that the set screws on the flexible coupling can secure both the motor and feedthrough shafts. Tighten the coupling set screws.

2.3.2 Drive Mount without Bracket

The motor drive can be mounted in several locations using 10-32 screws. Select screws that protrude no more ¼ in. into the motor housing.

Figure 2-3 Motor mount without bracket



2.4 Electrical Connections

WARNING

Be sure the power switch on the CI-100 controller front panel is OFF.

Plug the power cord into the CI-100 power entry module, then into a 100-120 or 200-240 V (ac), 50/60 Hz mains outlet.

Attach the DB-25 control cable from motor drive to the connector marked Motor on the CI-100 controller.

The I/O and RS-232/LAN connections are covered later in this chapter. They are not needed for initial setup.

2.5 Calibration

NOTE: The display flashes E at power-up until this calibration step is completed.

WARNING

Be sure the power switch on the CI-100 controller front panel is OFF.

CAUTION

Verify that the front panel Manual/Auto switch is set to Manual, and the Pocket/Jog switch is set to Jog.

1. On the rear panel of the CI-100 controller set the Pocket Type and Select dip switches to match your indexer. See the Rear Panel section of the next chapter for a detailed description of the rear panel switches.
2. Push the CI-100 front panel Power switch to the ON position.
3. Press the CW/CCW switch to jog your indexer to Pocket 1. Press and hold the CW/CCW switch for faster movement.
4. Using the CW/CCW switch, jog the indexer to the exact position you want to calibrate as “home” for pocket 1.
5. Press and hold the Calibrate switch until the displays stop blinking (about three seconds). This calibrates pocket one home.

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6 Move the Pocket/Jog switch to Pocket. Press CW/CCW to move to the next pocket.

NOTE: The indexer should stop at a position that is nearly correct. If not, check the rear panel dip switches carefully.

7 If the pocket is not at the desired home position for that pocket, move the Pocket/Jog switch to Jog. Push CW/CCW to jog to home for that pocket.

8 Press and hold the Calibrate switch until the displays stop blinking (about three seconds).

9 Repeat steps 6 through 8 until all pockets are calibrated.

NOTE: When calibrating a continuous (i.e., banana) pocket, calibrate the start position using next pocket number, then the end position as the next pocket number. For example, on a two pocket plus one banana indexer, Pocket 3 is the banana sweep start position, Pocket 4 is the end position.

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2.6 Binary I/O Connector

The binary I/O connector controls pocket selection using a single input per pocket. The pinout and functions match those of the Telemark 376/379 indexers.

NOTE: Select Switch #5 must be off (down) to use this connector.

Table 2-1 Binary I/O connector

Pin	Signal
1	Ground
2	Output: Interlock Contact A
3	Output: Interlock Contact B
4	Input: Pocket 1 Select
5	Output: Pocket 1 Ready
6	Input: Pocket 2 Select
7	Output: Pocket 2 Ready
8	Input: Pocket 3 Select
9	Output: Pocket 3 Ready
10	Input: Pocket 4 Select
11	Output: Pocket 4 Ready
12	Input: Pocket 5 Select
13	Output: Pocket 5 Ready
14	Input: Pocket 6 Select
15	Output: Pocket 6 Ready
16	Ground
17	Unused
18	Unused
19	Unused
20	Unused
21	Unused
22	Unused
23	Unused
24	Unused
25	Unused

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2.7 BCD I/O Connector

The BCD I/O connector controls pocket selection by decoding the pocket select information on three inputs.

NOTE: Select Switch #5 must be on (up) to use this connector.

Table 2-2 BCD I/O connector

Pin	Signal
1	Input: Pocket Select Bit 0
2	Input: Pocket Select Bit 1
3	Input: Interlock (ground to allow movement between pockets)
4	Output: Pocket Ready Contact A
5	Output: Pocket Ready Contact B
6	Ground
7	Input: Pocket Select Bit 2
8	Ground
9	Ground

There are two possible Pocket Select Bit decodings as shown below:

	Switch #7 Off (down)			Switch #7 On (up)		
Pocket	Bit0	Bit1	Bit2	Bit0	Bit1	Bit2
1	Hi	Hi	Hi	Lo	Hi	Hi
2	Lo	Hi	Hi	Hi	Lo	Hi
3	Hi	Lo	Hi	Lo	Lo	Hi
4	Lo	Lo	Hi	Hi	Hi	Lo
5	Hi	Hi	Lo	Lo	Hi	Lo
6	Lo	Hi	Lo	Hi	Lo	Lo
7	Hi	Lo	Lo	Lo	Lo	Lo
8	Lo	Lo	Lo	Hi	Hi	Hi

When the BCD I/O is used to select/operate custom banana configurations, operation of the Bit 0 to Bit 2 inputs and interlock are as follows.

1. Short the Interlock pin to ground to stop movement.
2. Select the desired pocket on BCD bits 0 to 2 to move to a new pocket.
3. Release Interlock to start sweeping at the selected pocket.
4. Short interlock to stop sweeping. Release interlock to start sweeping.

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2.8 Interfacing to INFICON Deposition Controllers

2.8.1 Interfacing to SQC-310 Deposition Controller

2.8.1.1 BCD I/O

BCD wiring between the CI-100 and SQC-310 is preferred over Binary I/O wiring because it uses fewer SQC-310 relays. The cable wiring below interfaces the SQC-310 I/O connector to the CI-100 BCD I/O connector:

SQC-310	CI-100 BCD I/O	
Pin 14---------->	Pin 1	OutX Pocket Bit1
Pin 1 ---------->	Pin 2	OutX Pocket Bit2
Pin 3 ---------->	Pin 7	OutX Pocket Bit3
Pin 16 ----------<	Pin 5	OutX Pocket Ready
Pin 15,2,4----------	Pin 6	Common
	Short Pin 3 to Pin 9	Interlock
	Short Pin 4 to Pin 8	Pocket Ready A

On the CI-100 rear panel, set Select On/Off Switch #5 UP and #7 DOWN. On the SQC-310 System Menu / Sensors & Sources, set up the Source with:

- Number of Positions: 8
- Control Type: BCD
- Feedback Type: In Position
- Indexer Delay: 5 seconds

MDC 991270 and Sycon SRT-400 Indexer compatibility: The pocket select and interlock pins (1, 2, 3, 7) are identical to the MDC and Sycon indexers. For a compatible pocket ready signal (pin 5), ground pin 4 (jumper pin 4 to pin 6, 8, or 9). The pocket position outputs of the MDC/Sycon indexer (pins 4, 8, or 9) are seldom used. Set Select Switch #7 UP.

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2.8.1.2 Binary I/O

To use the CI-100 binary I/O for a four pocket crucible:

SQC-3XX	CI-100 Binary I/O	
Pin 1,3,5,14,24	---------- Pin 1,2	Common
Pin 16	----------<---------- Pin 3	OutX Pocket Ready
Pin 15	----------><---------- Pin 4	OutX Pocket 1
Pin 2	----------><---------- Pin 6	OutX Pocket 2
Pin 4	----------><---------- Pin 8	OutX Pocket 3
Pin 6	----------><---------- Pin 10	OutX Pocket 4

On the CI-100 rear panel, set Select Switch #5 Down. On the SQC-310 System Menu / Sensors & Sources, set up the Source with:

- Number of Positions: 4
- Control Type: Individual
- Feedback Type: In Position
- Indexer Delay: 5 seconds

2.8.2 Interfacing to IC6 Deposition Controller

The INFICON IC6 does not support binary indexer wiring. BCD wiring between the CI-100 and the IC6 is required.

The cable wiring below interfaces the IC6 I/O Board connectors to the CI-100 BCD I/O connector:

IC6 Relay	CI-100 BCD I/O	
Pin 6 (Relay 1, NO)----->----	Pin 1	Pocket Bit1 Select
Pin 8 (Relay 2, NO)----->----	Pin 2	Pocket Bit2 Select
Pin 10 (Relay 3, NO)---->----	Pin 7	Pocket Bit3 Select
Pin 7,9,11(Relay Common)-	Pin 6	Common
IC6 Input	**CI-100 BCD I/O**	
Pin 15 (Input 1)------<--------	Pin 5	Pocket Ready B
Pin 1----------	Pin 6	Common
	Short Pin 3 to 9	Interlock
	Short Pin 4 to 8	Pocket Ready A

On the CI-100 rear panel, set Select On/Off Switch #5 UP and #7 DOWN. Turn the CI-100 Off, then On, to read the switch change.

On the IC6 Source menu select Number of Crucibles=8, Crucible Output = 1, and Crucible Output Type =NO. Set Turret Feedback = Yes and Turret Input = 1.

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2.9 RS-232/LAN Connector

A DB-9 to RJ-45 adapter and standard Ethernet cable are supplied for connecting the CI-100 to the PC for RS-232 communications.

NOTE: CI-100 does not support Ethernet communications.

Table 2-3 RS-232/LAN connector

RJ-45 Pin	Signal	DB-9F Pin
1 *(Wht/Org)*	Unused	
2 *(Org)*	Unused	
3 *(Wht/Grn)*	Unused	
4 *(Blu)*	RS-232 Tx	2 *(Red)*
5 *(Wht/Blu)*	RS-232 Rx	3 *(Grn)*
6 *(Grn)*	Unused	
7 *(Wht/Brn)*	RS-232 Ground	5 *(Brn)*
8 *(Brn)*	Unused	

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2.10 Motor Connector

The controller cable supplied is a DB-25 male to female straight-through 26 AWG, shielded. The standard length is 10 ft. (3 m). For longer lengths, use larger gauge wire to avoid power loss to the motor drive.

Table 2-4 Motor connector

Pin	Signal
1	DAC CSp
2	DAC CLKp
3	DAC DATAp
4	STEPp
5	DIRp
6	Encoder CLKp
7	Encoder CSp
8	Encoder DATAp
9	Ground
10	Ground
11	Ground
12	24 V (dc)
13	24 V (dc)
14	DAC CSn
15	DAC CLKn
16	DAC DATAn
17	STEPn
18	DIRn
19	Encoder CLKn
20	Encoder CSn
21	Encoder DATAn
22	Ground
23	Ground
24	24 V (dc)
25	24 V (dc)

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Chapter 3
Operation

3.1 Introduction

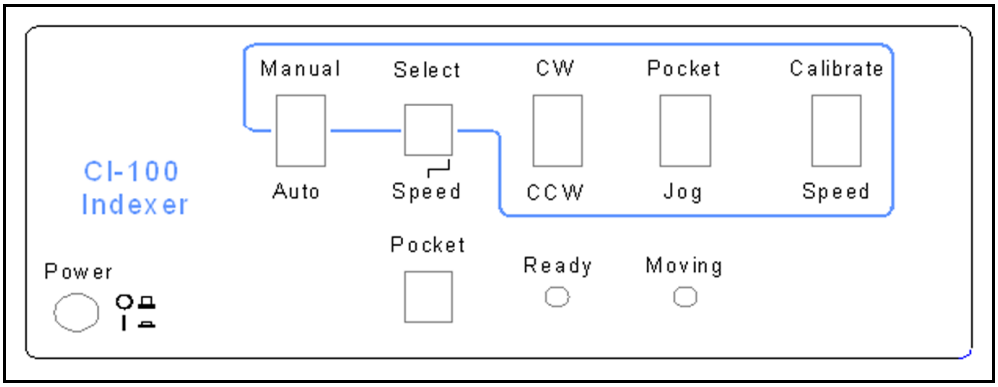
The CI-100 Indexer can be operated using the front panel switches to move to a discrete pocket, or to sweep within a continuous (i.e., banana) pocket. Pocket home for each pocket can also be set from the front panel.

The CI-100 can also be operated remotely (Auto mode) using the rear panel digital I/O or RS-232 communications. The rear panel also provides switches for setting pocket configuration and other movement options.

In addition to pre-defined configurations, the CI-100 can store a custom configuration. This custom configuration allows the user to place discrete and continuous pockets at any point along the 360° rotational arc.

3.2 Controller Front Panel

Figure 3-1 Controller front panel



Power Switch

Controls power to the Controller and Motor.

Manual/Auto Switch

Select Manual to control indexer operation from the front panel. Select Auto to control the indexer from the Communications ports or digital I/O interface. When Auto is selected, the remaining front panel switches are disabled.

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Select/Speed Display

Normally shows the desired pocket in Manual mode. Normally blank in Auto mode.

If the indexer is sweeping in a continuous (i.e. banana) pocket, then the decimal point flashes and the sweep speed is displayed.

CW/CCW Switch

This spring-loaded switch moves the indexer clockwise or counterclockwise. Push and hold for continuous rotation. If Uni-Direction is selected on the rear panel, only moves the indexer in one direction.

The Pocket/Jog switch controls the degree of movement that occurs when CW/CCW is pushed.

Pocket/Jog Switch

Select Pocket to cause moves between pockets. Select Jog to cause moves in 1.8° increments. Use the CW/CCW switch to initiate the move.

Calibrate/Speed Switch

Press and hold to the Calibrate position for 3 seconds to electronically store the selected pocket's home position.

Press to the Speed position to start sweeping a continuous pocket. Press Speed again to stop the sweep. Use the CW/CCW switch to adjust the sweep speed. While sweeping, the Select/Speed display shows the selected speed:

Display	Hi Speed (RPM)	Lo Speed (RPM)
1	0.5	0.05
2	0.6	0.06
3	0.8	0.08
4	1.0	0.10
5	1.2	0.12
6	1.5	0.15
7	1.9	0.19
8	2.4	0.24
9	3.0	0.30
0	3.7	0.37

On discrete pockets, the Speed position has no effect.

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Pocket Display

Shows the pocket that the indexer is on.

Ready LED

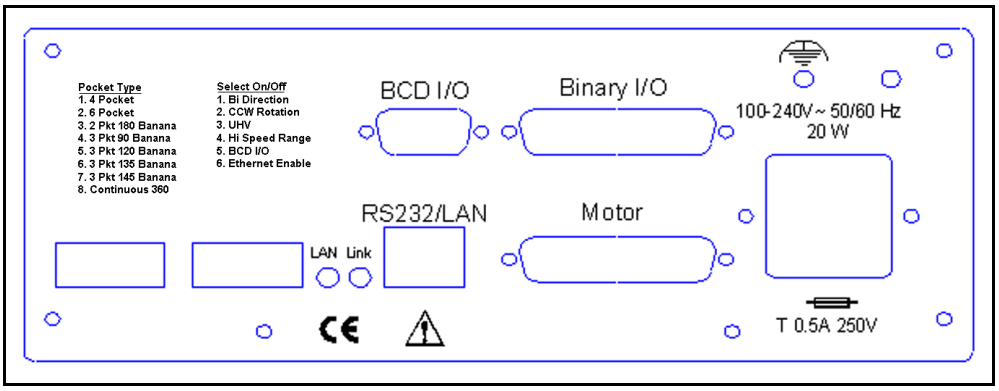
On when the indexer is positioned at a valid pocket, otherwise off.

Moving LED

On when the indexer is moving between pockets, or within a continuous pocket.

3.3 Controller Rear Panel

Figure 3-2 Controller rear panel



NOTE: The rear panel switches are only read at power up. Be sure to power off, then on, after changing the rear panel dip switches.

Pocket Type Switch

1: Selects a four discrete pocket indexer.

2: Selects a six discrete pocket indexer.

3: Two discrete pockets, plus one 180° continuous.

4: Three discrete pockets, plus one 90° continuous.

5: Three discrete pockets, plus one 120° continuous.

6: Three discrete pockets, plus one 135° continuous.

7: Three discrete pockets, plus one 145° continuous.

8: One 360° continuous pocket.

1-8 OFF: Selects the custom configuration.

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Option Select Switch

1: Selects Bi-Direction (on) or Uni-Direction (off) rotation.

2: Selects CCW (on) or CW (off) rotation in Uni-Direction mode.

3: UHV (on) stays within a single 360° arc.

4: High (on) allows speeds >.5 rpm.

5: BCD (on) uses BCD I/O, (off) selects Binary I/O.

6: RS-232 communications (off)

NOTE: CI-100 does not support Ethernet communications.

7: Bit decode selection for BCD I/O Mode – see section 2.7 on page 2-7.

8: Unused.

BCD I/O Connector

The pocket is selected using BCD encoded inputs. Same function and pinout as MDC/Sycon indexers. See Chapter 2 for pinout and compatibility instructions.

NOTE: Option switch 5 must be on (up) to use this connector.

Binary I/O Connector

The pocket is selected by individual inputs. Same function and pinout as Telemark indexers. See Chapter 2 for pinout and compatibility instructions.

NOTE: Option switch 5 must be off (down) to use this connector.

RS-232/LAN Connector

Connector for RS-232 communications. See Chapter 2 for pinout.

NOTE: CI-100 does not support Ethernet communications.

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Motor Connector

Provides power and control signals to the indexer motor. See Chapter 2 for pinout.

Power Input

Connects to mains power. The CI-100 automatically detects mains voltages of 100-120 and 200-240 V (ac), 50/60 Hz.

WARNING

For continued protection, replace fuses with the proper type and rating.

WARNING

Use removable power cords only of the specified type and rating, attached to a properly grounded receptacle.

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3.4 Custom Configuration

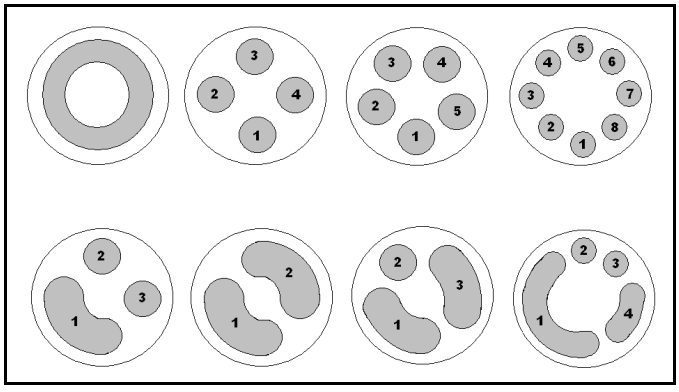
The CI-100 custom configuration allows up to eight pocket positions in a 360° arc. Each position can be designated as discrete, or continuous (i.e., banana). The eight positions can be defined at any point along the 360° arc.

This capability is best illustrated by an example. Assume you have a discrete pocket, then a 120° banana, then another discrete pocket, and finally another 120° banana. The custom configuration might be programmed like this:

Position	Location	Mode	Comments
1	0°	Discrete	First pocket
2	45°	Start Continuous	Start first banana
3	135°	End Continuous	End first banana
4	180°	Discrete	Second pocket
5	225°	Start Continuous	Start second banana
6	315°	End Continuous	End second banana
7			Unused
8			Unused

A Windows™ program for creating custom configurations (see Figure 3-3) and downloading them to the CI-100, is included on the CD-ROM.

Figure 3-3 Indexer pocket combination examples



See Chapter 4, Computer Interface for more information on programming the custom configuration.

NOTE: The CI-100 uses a four rotation full cycle. This means that after four full turns of the motor, it is considered to be back at the home position. Crucible gearing can be adjusted to match this requirement. For example, if you have a four discrete pocket crucible, the gearing should be designed so that one full turn of the CI-100 motor moves one pocket position. For eight pockets, a half turn should move one pocket position.

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Chapter 4
Computer Interface

4.1 Introduction

The CI-100 Controller's front panel controls and rear panel dip switches will provide adequate operation and setup capabilities for most users. The rear panel digital I/O also allows basic operation for system controllers.

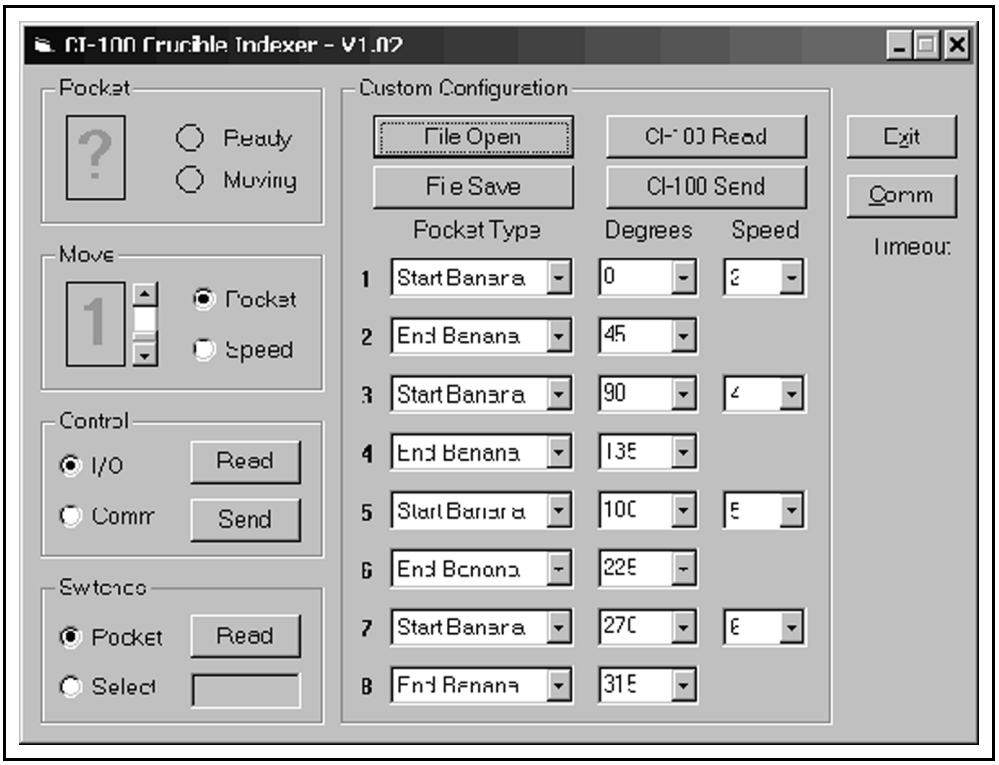
For programming the custom pocket configuration, and computer-controlled operation, use the RS-232 communication interface.

4.2 Control Program

A simple Windows® program is supplied to configure, operate and program the CI-100.

NOTE: The Manual/Auto DIP switch must be in Auto position to communicate using this program. If it is desired to have complete control of the CI-100 through the software, set the Control grid to Comm and hit send.

Figure 4-1 Program main screen



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Main Screen

The CI-100 Crucible Indexer V1.XX software can be used to control the CI-100, send or receive a configuration file, send commands and receive responses, or simply used to monitor the position of the CI-100.

Pocket: The uppermost left grid of the main screen shows the current position and status of the CI-100. A "?" indicates that software is not communicating with the CI-100 at the present time. When "Moving" the position will display a "?" until the desired position is reached at which time the pocket number will be displayed and the CI-100 enters the "Ready" state.

Move: The next grid down is the move grid. From here the desired pocket (1-8) can be chose by clicking on the up and down arrows while the "pocket" option is selected. When the "speed" option is selected you can define the speed (1-20) of the motor.

Control: The next grid down is the control grid. From here the method of controlling the CI-100 is defined. The CI-100 can be controlled manually through the unit itself, through another device via I/O or through PC communications. The "Read" button in this grid reads the current setting on the CI-100 and sets the bullet next to the current control state accordingly. The "Send" command will send the chosen control state to the CI-100.

NOTE: To control the CI-100 from the software it must be in a comm control state. If set to I/O, manual control of the pocket & sending configurations will not be allowed.

Switches: This feature is unavailable.

Custom Configuration: This grid allows for custom configurations to be defined, read or sent to the CI-100. Set the custom configuration as desired for pockets 1 to 8 (refer to section 3.4, Custom Configuration, on page 3-6). Click **CI-100 Send** to send the custom configuration to the CI-100. Click **CI-100 Read** to download the current configuration from the CI-100. Click **File Save** to save the configuration to disk. Click **File Open** to open saved configuration files typically from the default save location.

Exit: choose this option to close the CI-100 software.

Comm: Choose this option to change communication options or for sending commands and receiving responds. The Find button will send a "@" to the unit which should response with a version number. this confirms that communications are established. The port in use can also be defined here.

NOTE: While a ethernet comm option is shown in this screen, ethernet is not available on the CI-100.

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4.3 Command Protocol

The CI-100 communicates with a host computer via an ASCII based protocol. The instrument RS-232 configuration is set to 19200 baud, 8 data bits, and no parity.

The basic protocol is:

<$> <1 to n data characters> <CRLF>

Once a valid command has been transmitted to the CI-100, a response is returned. The structure of the packet is identical in both the command and response. In the response, the character after the $ is a Response Status, as shown in the table:

Table 4-1 Response Characters

Response Character	Meaning
* or #	Command understood, normal response
3 or 4	Instrument in wrong mode for this command
5 or 6	Illegal Data
7 or 8	Illegal Syntax

4.4 Commands

NOTE: In the examples, the sync, response and <CRLF> characters have been eliminated for clarity.

4.4.1 @

Command: @

Parameters: None

Description: Returns the model number and software version number.

Example: @ Response: CT-100 Ver

4.4.2 A

Command: A

Parameters: 0, 1, ?

Description: Read/Set remote control status.

Example: A? Response: 0 (digital I/O control)

A1 Set to RS-232 control

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4.4.3 B

Command: B

Parameters: 1 to 8, ?

Description: Read/Set the current pocket.

Example: B? Response: 2 (on pocket 2)

B3 Go to pocket 3

4.4.4 C

Command: C

Parameters: 0 to 8, ?

Description: Read/Set speed.

Example: C? Response: 0 (speed 0 is selected)

C1 Set to speed 1

The speed RPM value is determined by the setting of the rear panel Hi/Lo speed select switch as shown below:

Speed	Hi Speed (RPM)	Lo Speed (RPM)
1	0.5	0.05
2	0.6	0.06
3	0.8	0.08
4	1.0	0.10
5	1.2	0.12
6	1.5	0.15
7	1.9	0.19
8	2.4	0.24
9	3.0	0.30
0	3.7	0.37

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4.4.5 D

Command: D

Parameters: ?

Description: Read motor status.

Example: D? Response: M (motor is moving)

D? Response: R (motor is stopped)

4.4.6 F

Command: F

Parameters: 1 to 8, ?

Description: Read/Set the number of pockets for the custom configuration.

Example: F? Response: 4 (4 pockets)

F8 Set number of pockets to 8

4.4.7 G

Command: G

Parameters: 1 to 8, ?

Description: Read/Set custom configuration pocket parameters. The first parameter read/set is the pocket type (0=discrete, 1=continuous start, 2=continuous end). The next parameter (separated by a space character) is the position in degrees (0 to 359).

Example: G2? Response: 0 90
(pocket 2 is a discrete pocket at 90°)

G3 1 180 Set pocket 3 to continuous start at 180°

4.4.8 I

Command: I

Parameters: 0?, 1? (0=Pocket, 1= Select)

Description: Reads the rear panel dip switches. Returns an ASCII character representing the hex value of the requested dip switch. Position 1 of the switch is represent by 2^0, position two is 2^1, etc.

Example: I0? Response: @ (pocket switch 7 is up, @=H40=2^6)

I1? Response: A
(select switch 1 & 7 are up, A=H41=$2^6 + 2^0$)

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4.4.9 M

Command:	M	
Parameters:	1 to 9, ?	
Description:	Read/Set custom configuration pocket speed. See the “C” command for speed values.	
Example:	M2?	Response: 1 indicates speed 1 (0.5/0.05 rpm)
	M3 2	Set pocket 3 to speed 2 (0.6/0.06 rpm)

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