Servo Indexer
Reference Guide

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This document is published as a reference guide only.
A comprehensive "Servo Indexer User Manual" ships with every Indexer

Centricity's Servo Indexers are high precision indexing machines designed to be low cost without sacrificing flexibility. They are ideally suited for applications that require high accuracy and programmability. They are available in multiple sizes, open center and center driven, and come flange - pedestal - or machine base mounted.

System Overview

Centricity's servo indexers and custom rotary tables, when supplied with controls, are shipped from the factory completely assembled, wired, tested, and pre-configured with the customer specific motion profile. Each complete system consists of the following:

The TSP
The Touch Screen Pendant (TSP) is a compact yet powerful handheld analog touch screen. The TSP is the human machine interface between the User and the indexer.

The Drive
The Drive (also called the Controller) is a freestanding digital AC servo controller with multiple fieldbus capability and on-board EMC filter with high precision motion control capabilities.

The Software
The heart of the system is the Indexer and TSP software. All Indexer and TSP functions and features are controlled by this unique and powerful machine code.

The Indexer
The indexer is the physical mechanical hardware of the system. It produces a smooth, high precision, rotary output from an electronic servo motion input.

MECHANICAL

- Fasten the Indexer to an appropriate mounting surface.

  Pedestal mounted Indexers must be secured at the pedestal base with grade 5 or better fasteners.

  Flange mounted and machine base mounted Indexers must be secured to a flat, machined surface with grade 5 or better fasteners.

ELECTRICAL

- Mount Drive/Controller in an appropriate location. See Drive/Controller manual.

- LOCK-OUT incoming power until the entire installation is completed and checked for safety compliance to NEC and any applicable local electrical codes.

- Connect the power side of the Drive/Controller to plant power. Make sure the incoming lines are properly sized and fused and the incoming voltage, frequency, and phase requirements match the drive ratings. See Drive/Controller manual.

- Wire the I/O on the drive in accordance with dwg. C10009.

- Reconnect the power and feedback cables from the Drive/Controller to the Motor if they have been disconnected for shipping. Pay careful attention to the wiring schematic as damage to the unit can occur if improperly wired. MOTOR LEADS ARE NOT SWAPPABLE.

Getting Started

We begin this section with the understanding that installation is complete and in accordance with the safety and installation instructions in the previous sections of this document. For proper operation, a fully loaded dial plate must be mounted to the indexer.

The Indexer should be pre-configured with either the customer specified motion requirements or the default configuration.

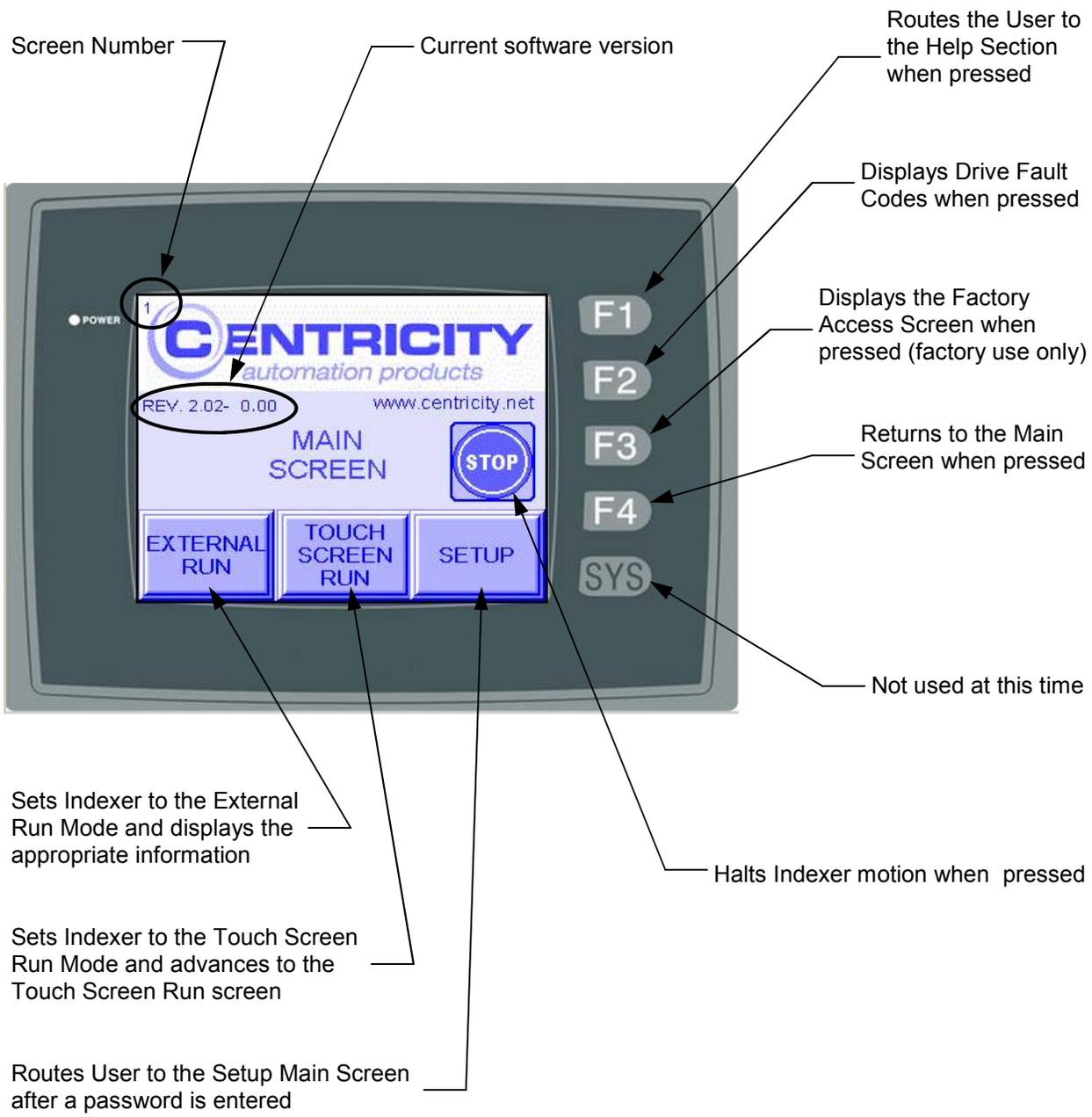Start up is simple and intuitive using the Touch Screen Pendant (also designated TSP).

Every effort has been made to make configuring the indexer as straightforward as possible. Although the term programmable servo indexer is used in describing this product, no programming knowledge is required.

All indexer functions: programming (configuring), drive status, communications, etc. are accessible through the TSP in plain, non-technical English.

TSP quick tips - READ BEFORE START UP

- Begin all Indexer functions from the main screen (#1). See page 13 of this manual.
- F4 returns to the main screen from anywhere on the TSP.
- F1 routes to the help section. The "Exit" button on any help screen will return you to the last screen visited prior to accessing the help section.
- For reference, all screens are labeled. The current screen number is shown in the upper left hand corner of the display. Help screens are designated with letters.
- The stop button on the TSP halts the Indexer motion. It is available on all screens.
- The red Emergency Stop button on the TSP also halts motion and disables the drive. The TSP utilizes the Secure Disable feature on the drive. Consult the Unidrive SP User Guide when using this feature.
- When using this manual "Press" means to push a button on the TSP and "Enter" refers to inputting a value.

Getting Started - Main Screen Review

Screen Number

Current software version

Routes the User to
the Help Section
when pressed

Displays Drive Fault
Codes when pressed

Displays the Factory
Access Screen when
pressed (factory use only)

Returns to the Main
Screen when pressed

Not used at this time

Halts Indexer motion when pressed

Sets Indexer to the External
Run Mode and displays the
appropriate information

Sets Indexer to the Touch Screen
Run Mode and advances to the
Touch Screen Run screen

Routes User to the Setup Main Screen
after a password is entered

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Getting Started   -   Starting up the Indexer

Starting up the indexer with the factory supplied settings

1. Make sure the Indexer is in a **safe state** and is free to move without concern for personnel or any physical obstruction.

2. Apply electrical power to the Drive. After several seconds the TSP will come on and display the Main Screen (screen #1).

3. To start the Indexer moving, select Touch Screen Run.

4. Press "Start Move", The Indexer will make one complete index according to the factory supplied settings and stop.

5. The "STOP" button can be pressed at any time to halt motion.

6. The "Start Loop" button will also initiate an index when pressed and the index will repeat until "Stop Loop" is pressed or the "Stop button is pressed.

7. You can also jog the indexer by pressing the jog screen and selecting the appropriate jog type.

8. Any of the indexer's parameters can be changed by pressing F4 and selecting Setup. You will be prompted to enter a Password factory supplied). This prevents tampering by unauthorized personnel.

9. Make sure to read the appropriate sections of this manual prior to making any changes.

Jog Functions

Jogging is used primarily for manually positioning the indexer. It is generally used during startup and setting the home position. There are 3 Jog types available; Jog Standard, Jog Step and Jog To Position.

Jog Functions - Jog Standard

Jog Standard allows the indexer to be jogged clockwise or counterclockwise as long as the Jog CW or Jog CCW button is pressed. When the button is released indexer motion stops

Jog Functions - Jog Step

Jog Step allows the indexer to be jogged clockwise or counterclockwise in User defined steps. A Step Distance and Step Speed must be entered first. When the Jog Step CW or Jog Step CCW button is pressed the indexer will jog the step distance at the step speed. Motion will continue until the step distance is reached, even if the button is released. To stop motion press the Stop button.

Jog Functions - Jog To Position

Jog To Position allows the indexer to be jogged to a specific User defined angular location. A Jog Position and Jog Speed must be entered first. When the Jog To Position CW or Jog To Position CCW button is pressed the indexer will jog to position at the jog speed. Motion will continue until the position is reached, even if the button is released. To stop motion press the Stop button.

Home Utilities - Move To Home

Move To Home causes the indexer to move to the home position in the direction selected. When the Move To Home CW or CCW button is pressed the indexer will move to the home position at the home speed. Motion will continue until the home position is reached, even if the button is released. To stop motion press the Stop button.

Home Utilities - Home Setup, Capture Position

Home Setup, Capture Position is used to set the home position to the current angular position of the indexer. This is the most common method of setting the home position.

Home Utilities - Home Setup, Home To Sensor

Home Setup, Home To Sensor is used to set the home position to an external switch or sensor. Using a sensor as a drive input, the home position will be set when the drive input goes high. An angular offset feature is also provided for in this setup. This feature is available for Home position #1 only.

Home Utilities - Home Setup, Home To Enc Mark

Home Setup, Home To Enc Mark is used to set the home position to the reference mark on the indexer's feedback device. This feature is available for Home position #1 only.

Home Utilities - Home Setup, Sensor Then Mark

Home Setup, Sensor Then Mark is used to set the home position based first on the sensor input and then to the reference mark on the indexer's feedback device. This feature is available for Home position #1 only.

Home Utilities - Home Setup, Dynamic Home Adjust

The Dynamic Home Adjust function is designed to simplify the fine tuning of the home position on-the-fly. With this feature it is very easy to adjust the home position to coincide with your process requirements while cycling the indexer.

Motion Settings

Motion Settings

Motion Settings are general motion parameters that are necessary for any indexer operation. The motion settings are: In Pos Window, Max Torque, Follow Err Lim, Move Direction, Max Acc/Dec & Jog/Home Acc.

Recovery

Recovery is the process of resetting the indexer to an operational status. Recovery is required whenever the indexer needs to be restarted due to one or more of the following conditions:

- After an Emergency Stop
- After a Drive Fault
- After a loss of power
- If the drive is disabled for any reason

The following routines are available for recovery .

Upon a reset the Indexer will:

- Remain at the current station
- Move to the closest station in the defined (configured) direction
- Move to the closest station in the opposite direction
- Move to the closest station in the shortest path
- Move to the last commanded station in the defined direction
- Move to the last commanded station in the opposite direction
- Move to the last commanded station in the shortest path
- Move to the station before the last commanded station in the opposite direction
- Not move (No motion)

Touch Screen Run and External Run

Touch Screen Run is a function that allows the indexer to be run from the TSP (rather than an external controller such as a PLC). External Run allows the indexer to be controlled externally thru the indexer drive I/O.

Indexer Mode Setup - Best Fit

The Indexer Mode Setup allows the indexer to be configured as a traditional indexer. The User can define the move profile (called User Defined) or select Best Fit. Unless a specific motion is required, Best Fit is the most common choice of operation.

Indexer Mode Setup - User Defined

In the User Defined Mode the User inputs the Acceleration period, Constant Speed period and Deceleration period for the move.

Spin Mode Setup - Continuous Rotation

Continuous Rotation is used when the move profile of the Indexer is required to be a continuous (or constant) rotation rather than a start/stop motion.

Spin Mode Setup - Custom Spin Profile

Custom Spin Profile provides the capability of executing multiple motion segments such that a complete non symmetrical motion sequence can be obtained.

Optional - Consult Factory

Teach Mode Setup

Teach Mode Setup

The Teach Mode feature is useful when a series of positions are required that are not of equal distance or direction.

Optional - Consult Factory

Dwell Torque Setup

Dwell Torque Setup

Dwell Torque allows the User to vary the indexer torque when the indexer is *not* in motion. It is often used when a high holding torque is required during dwell or if the indexer position needs to (float) at station.

Motion Smoother Setup

Motion Smoother Setup

The Motion Smother softens the Indexer motion during acceleration & deceleration transitions. The User can select from no smoothing to full S curve smoothing.

User Output

User Output

The User Output is a 24 VDC output available on the drive. The User can have it turn on or off, based on the position of the indexer.

Drive Fault Codes

Drive Fault Codes

Also called trip indicators. This feature is used to retrieve the drive fault code on the TSP if the drive trips or faults. If a fault or trip occurs, find the drive fault code in the table in this manual to identify the cause of the fault.

Glossary Of Terms

Name	Description	Remarks
# of Stations	Number of stops in one revolution of the Indexer	1-1000
Accel Time	Time to accelerate to a speed	.01 - 300 seconds
Adjustment Distance	Amount the home position changes (at station radius) per keystroke when in Dynamic Home Adjust	.0001 - 1.0000 inch
Alternate Recovery	Optional, Indexer action that occurs when a Drive input is initiated with a system reset	Overrides Std. Rec. Routine
Alternate Recovery Routine #	A number from 1-8 corresponding to the method of recovering from a fault	1 - 8
Alternate Recovery Routines	Optional motion process by the Indexer to return to it's normal state	Drive term. # 7 is high
Best Fit	Computes an efficient motion profile to complete the index in the specified Move Time	–
Capture Position	Sets the current angular pos. of the Indexer as Home when Set Home Pos is used	–
CCW	Counterclockwise Indexer direction	–
Const Spd Time	Constant speed time interval during a trapezoidal move	0 - 300 seconds
Continuous Rotation	Rotating continuously as opposed to indexing	–
Continuous Speed	Final speed when running in continuous rotation	0-3800 rpm
Current Spin Type	Present indexer spin type. Continuous or Custom Spin	–
Current Home Position #	Present home position number being used by the indexer	Home Position 1 thru 9
Current Mode	Mode in which the indexer is operating	–
Current Motion Profile	Present move contour being executed by the indexer	Best Fit or User Defined
Current Motion Smoother	Present setting of the Motion Smoother	See Motion Smoother
Current Output #1 Status	State of the User output	On or Off
Current Station	Closest station achieved by the indexer	–

Glossary Of Terms

Name	Description	Remarks
Custom Spin Mode	Rotational process rather than an indexing process	–
Custom Spin	Spin profile defined by the User	Consult Factory
CW	Clockwise Indexer direction	–
Decel Time	Time to decelerate from a speed	.01 - 300 seconds
Drive Fault Codes	A displayed numeric code that indicates the type of fault	–
Dwell Pos Window	Allowable angular deviation from true position when the indexer is **not** in motion. Used when Dwell Torque is enabled	0 - 10 degrees
Dwell Time	Time between indexes when no motion occurs	0 - 300 seconds
Dwell Torque	Holding torque between indexes. No motion present	0 - 100 %
Dynamic Home Adjust	Function that allows the home position to be altered while running the indexer	–
Exit	Returns to the screen prior to accessing the Help section	–
External Run	Operating the Indexer from an external source i.e. PLC	–
F1	Pressing this key displays the Help Screen	–
F2	Pressing this key displays the Drive Fault Codes	–
F3	Pressing this key displays the Factory Access Screen	–
F4	Pressing this key displays the Main Screen	–
Factory Access Screen	Screen used by factory personnel only	–
Follow Err	Difference between the commanded position & the actual position during motion	–
Follow Err Lim	Max permissible following error	.01 - 360 degrees

Glossary Of Terms

Name	Description	Remarks
Force Output	Toggles the User output on & off from the TSP	–
Home	Zero or starting position of the Indexer	9 Homes available
Home Pos #	One of nine definable starting (Home) positions	1 - 9
Home Speed	Rotational speed when moving to the home position	.1 - 10 rpm
Home Utilities	Functions related to the Indexer's home capabilities	–
Home Position Number	Number assigned to a specific Home Position	1 - 9
Home Setup	Defining the Home Position of the Indexer.	9 Homes available
Home to Encoder Mark	Ability of the Indexer to use the encoder reference to define the Home Position	–
Home to Sensor	Ability of the Indexer to use an external sensor to define the Home Position	Adj. pos. of +/- 180 degrees
Home to Sensor then Mark	Ability of the Indexer to use an external sensor & encoder reference to define the Home Position	–
Homing Type	1 of 4 methods to home the indexer: Capture Position, Home to Sensor, Home to Encoder Mark & Home to Sensor then Mark	–
In Pos Window	Angular window where the indexer is considered to be at it's commanded position. Does not effect the Indexer accuracy	.001 - 10 degrees
In Position	Indexer is considered In Position when it is within the In Position Window	Drive term. #24 goes high
Indexer Mode	Operation of the Indexer in a repeating start-stop manner	–
Indexer State #1	Disabled condition of the Indexer when it is "In Position"	–
Indexer State #2	Disabled condition of the Indexer when it is *not* "In Position"	–
Indexer Position	Angular location of the Indexer	0 - 360 degrees

Glossary Of Terms

Name	Description	Remarks
Jog CCW	Jogs Counterclockwise while the TSP button is pressed	–
Jog CW	Jogs Clockwise while the TSP button is pressed	–
Jog Speed	Rotational speed when jogging	0 - 10 rpm
Jog Standard	Jogs Indexer while direction button is pressed	CW or CCW
Jog Step	Jogs the Indexer in angular increments	–
Jog Step Distance CW	Jogs Indexer one step Clockwise as long as the TSP button is pressed	–
Jog Step Distance CCW	Jogs Indexer one step Counterclockwise as long as the TSP button is pressed	–
Jog to Position	Jogs the Indexer to an angular position	–
Jog to Position CCW	Jogs to the specific position Counterclockwise while the TSP button is pressed	–
Jog to Position CW	Jogs Indexer to the specific position Clockwise while the TSP button is pressed	–
Jog Type	1 of 3 methods of Jogging the Indexer	–
Jog/Home Acc Time	Accel and decel time used for the Jog & Home moves	.1 - 60 seconds
Max Acc/Dec	Maximum Indexer accel and decel value	0 - 100%
Max Torque	Maximum Indexer output torque during a move	0 - 100%
Motion Settings	General motion parameters: In Pos Window, Max Torque, Follow Err Lim, Move Direction, Max Acc/Dec, & Jog/Home Acc	–
Motion Smoother	Softens the Indexer motion during acceleration & deceleration transitions	–
Linear	No motion smoothing	–
1/4 S-Curve	Minor motion smoothing	–
5/8 S-Curve	Intermediate motion smoothing	–

Glossary Of Terms

Name	Description	Remarks
Full S-Curve	Full motion smoothing	–
Move Direction	Indexer direction of rotation during a move	CW or CCW
Move Time	Total time to complete a move	.05 - 300 seconds
Move to Home	Causes the Indexer to move to the home position in the specified direction	CW or CCW
Multiplier	Indexer feature whereby the number of stations can be increased or decreased by the multiplier value. Can be toggled on or off as required	.001-9.999 Typically used to skip stations
Operating Mode	1 of 3 modes of operation: Indexer mode, Spin mode & Teach mode	–
Output #1 Off Pos	Angular position where the User output turns off	0 - 360 degrees
Output #1 On Pos	Angular position where the User output turns on	0 - 360 degrees
Password	A numeric code required for TSP access	Contact Factory
Position	Same as Indexer Position	–
Recovery & Motion Settings	Indexer parameters set by the User	–
Reset	Re-enables the drive & clears drive faults	–
Sensor Offset	Angular offset distance from an external sensor	–
Setup	Defining the operating parameters of the Indexer	–
Speed	Angular velocity of the Indexer	rpm
Spin Mode	Operation of the Indexer in a continuous rotation or motion segment manner	–
Standard Recovery	Indexer action that occurs during a system reset	–
Standard Recovery Routine #	A number from 1-8 corresponding to the method of recovering from a fault	1 - 8
Standard Recovery Routines	Motion process of Indexer to return to it's normal state. 8 Routines are available	–

Glossary Of Terms

Name	Description	Remarks
Start Loop	Begins motion. Motion continues until Stop Loop or Stop is pressed	–
Start Move	Begins motion. Motion continues until move is done or Stop is pressed	–
Station Radius	Distance from center of Indexer to center of Station	0 - 600 inches
Step Distance	Angular distance moved in Step Jog	.000001 - 360 deg
Step Speed	Indexer's rotational speed during a Step jog	0 - 10 rpm
Stop	Halts Indexer motion	–
Stop Loop	Halts Indexer during a Loop	–
Teach Mode	Defining a series of Indexer positions by jogging, entering positional data or manually moving the indexer	1-1000 points Consult Factory
Total Adjusted Distance	Total adjusted difference from the previous Home Position	inches
Total Move Time	Sum of accel, constant speed & decel times in a User Defined move	–
Touch Screen Run	Allows the Indexer to be operated from the TSP	–
User Defined Move	Trapezoidal move profile in which the acceleration, constant speed & deceleration values are specified	1/3,1/3,1/3 is typical
User Output	A 24 VDC drive output configurable from the TSP	0 - 360 degrees