

ENGINEERING PUBLICATION
MOTION CONTROL DIVISION

PRODUCT: HMI & JUSP-NS600

SUBJECT: Tips on Using an HMI to Command the Sigma II Indexer

CATEGORY: Application Note

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Summary: An Human Machine Interface (HMI) can be set up to command up to 16 JUSP-NS600 Sigma II Indexers over a dedicated serial network*. Using an HMI for command provides an easy to use interface for the user and allows for quick reconfiguration of the Sigma II Indexers. Over 100 commands for initialization, control, monitoring, and diagnosis are available to the HMI.

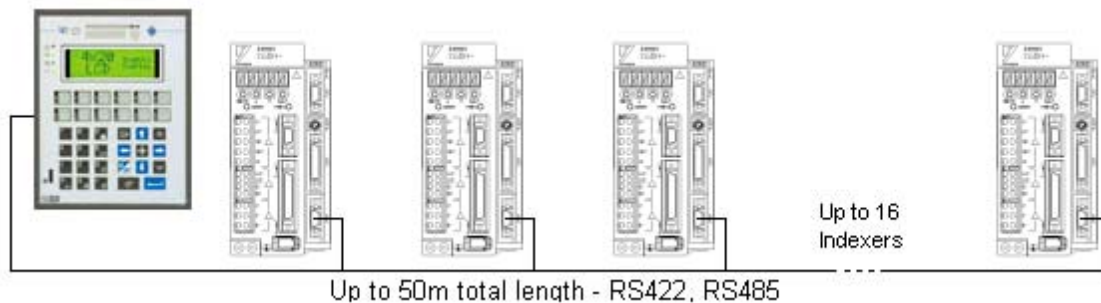


Figure 1. – Typical Control Architecture*

Purpose: The purpose of this document is to explain the functionality of using an HMI to command the Sigma II Indexer (or a network of Indexers) and to provide helpful tips when doing so. This document specifically deals with the Yaskawa Commander (EXOR) series of HMIs, but much of the information is relevant to the use of any HMI. Set up and programming tips for the Sigma II Indexer will not be covered in this document. For a list of supplemental documents, refer to appendix A. A typical bill of materials for using a Yaskawa Commander (EXOR) is available in engineering document “Summary of HMI and Sigma II Indexer Control Systems“ (pub. # eng/01.050/MCD).

Functional Description

An HMI allows the user to start execution of any of the 128 index table commands. By linking the commands in the index table, preset programs can be set up. A menu can be set up allowing the user to select one of these programs from a descriptive job list. In addition, an HMI has the capability to set up recipes of index table commands and parameters allowing the user to quickly rewrite the index table or change the servomotor’s characteristics with the push of a single button. Monitoring capabilities are also included allowing the user to monitor program, motion, alarm status, and more.

* This is NOT a network for real-time control, but works well for limited control, set-up and monitoring.

The Yaskawa Commander (EXOR) series offers an optional HMI-OPLC-30 internal PLC module, which provides internal HMI logic. This internal logic allows for more elaborate command than an HMI alone typically provides. The PLC can have commands sent to the Indexer by requesting them through the HMI. Therefore the PLC can set up a batch routine by starting an index program, polling for completion of the task, and then repeating. The PLC is a completely separate entity from the HMI, but is closely tied to the HMI. The HMI can read/write directly to variables in the PLC letting the user monitor and/or edit them through the panel. The PLC can monitor and have limited control over the HMI through the Reserved Data Area (RDA) and through the Interlock Mailbox. The PLC can monitor the HMI's buttons, request recipe downloads, change the page that is displayed, turn on/off panel LEDs and more.

Hardware Considerations

General considerations for any HMI

- The Indexer will only repeat a single step, not a group of steps. To repeat a group of steps, a batch program must be set up in the PLC.
- This is NOT a control network. The HMI cannot respond in real-time. Because of this reason, emergency stop circuits should be hardwired.
- Limited to 50m serial communication cable for RS422 (and RS485) communication.

Considerations specific to the Yaskawa Commander (EXOR) HMI series

- Serial commands to the Indexer that are requested by the PLC can be made at a maximum frequency of 2/second based on the HMI's read cycle time of the interlock mailbox.
- In general, the HMI will only respond to button presses. Therefore, the HMI will only send a serial command, change the page, etc. when a button is pressed. For example, the HMI can download settings to the Indexer and start an index program, but it CANNOT poll the Indexer for completion and then start a new program. The HMI-OPLC-30 internal PLC will be required for situations such as this.
- The HMI-OPLC-30 has a scan rate of ~3ms per K.
- An optional I/O module for the internal PLC is available on some Commander (EXOR) HMIs, which can be wired to the Indexer's I/O port for quicker control and monitoring. Check with a Yaskawa representative for a complete listing of HMIs that support the I/O modules.

TIPS/TRICKS FOR USING THE YASKAWA COMMANDER HMI WITH THE JUSP-NS600 INDEXER

Setting Up

- To download a Designer program, connect a serial cable to the COM port of your PC and to the PC/Printer port of the HMI. The HMI must be in *Configuration* mode to download a program. Under normal conditions when a valid program is installed, the HMI will boot up in *Operation* mode. To change to *Configuration* mode, hold down on the enter key for 3 seconds and select “CFG” from the menu that appears.
- IndexWorks (used for initial setup of the Indexer’s parameters, program table, etc.) and the HMI require different communications settings on the Indexer. IndexWorks requires that the Indexer be set up for RS422 w/echo back communication (Pn800=1) and the HMI requires that the Indexer be set up for RS422 w/o echo back communication (Pn800=0). To change this parameter, open Terminal in IndexWorks and issue the command <Axis>Prm800=<com> where <Axis> is the axis setting set by the rotary switch on the Indexer and <com> is the desired communications setting – 0,1. Cycle power on the Indexer for this setting to take effect.

Programming Tips

- To set up a new Designer project select Project->Change Controller Driver and then select Yaskawa Indexer from the dialog. If more than one axis is being used, select Project->Controller Setup and set up the axes. Select Project->Panel Setup and set the panel to be used in the project.
- Recipe downloads MUST be allowed to fully complete before new serial commands to the indexer are issued. To prevent users from issuing a command through the HMI before a recipe has completed, a wait timer can be set up when the recipe is downloaded. NOTE: The amount of time required to download a recipe is largely dependant on recipe size, but can also be affected by the load on the HMI (checking the interlock mailbox, refreshing variables on the screen, changing pages, etc.).
- Be careful when programming the enter key on the HMI. Setting up commands on the enter key will prevent the enter key from being used to access the configuration mode. If the enter key has been programmed, hold down on any 3 keys when turning on power to boot the HMI into configuration mode.
- When testing a program, watch for serial command errors. They will not trip the alarm and will only flash the Indexer’s red status LED (STS) for two seconds. Communication errors can sometimes also be spotted on the HMI as a blinking communication light. These errors often result in serial commands being ignored. Because all errors will appear as A.9F on the amplifier display, the easiest way to determine what error has occurred is with a digital operator (JUSP-OP02A). If one is unavailable, the serial command <Axis>ERR can be used to read the last error.

TIPS/TRICKS WHEN USING THE COMMANDER WITH THE INTERNAL SCM03 PLC

Setting up

- The document *MMI-PLC operations.doc* located on the Designer installation CD explains the hardware and software installation. Designer is used for programming the HMI and ISaGRAF Workbench is used for programming the internal PLC.
- EXOR tech note #tn137-0 “Control With UniOP” provides installation and programming information on using the HMI with the internal PLC. The Sigma II Indexer will be set up as the external PLC.
- To compile a Workbench program, the special protection key that comes with the software must be installed on the parallel port. Windows NT users must install an additional program called Sentinel located on the installation CD.
- A Workbench program can be downloaded on either the PC/Printer port or the PLC port. When downloading to the PC/Printer port the HMI must be in *Operation* mode. When downloading to the PLC port the HMI must be in *Configuration* mode. To select the desired port go to *System* mode (hold enter for 3 seconds and select “SYS” from the menu). Scroll down and select “SCM#0 A” on either the PLC or PRINTER selection.

Programming Tips

- To compile a Workbench program for downloading to the PLC, open the project and from the programs window select Make->Compiler Options and select “EXOR: TIC code for EXOR (Intel)” in the dialog box. Then select Make->Make Application. To download it, select Debug->Debug. From the debug window select File->Stop Application to stop any application that might be running. Then select File->Download.
- The PLC CANNOT directly send and receive data through the serial PLC port. The PLC must request that the HMI do that on its behalf.
- There are several ways for the HMI and PLC to communicate with one another.
 - Any variable in the PLC program may be given a network address and referenced in Designer using the Tag Editor.
 - The Reserved Data Area (RDA) sets up a data area on the internal PLC that the HMI reads and writes in. This gives the PLC limited ability to monitor and command the HMI. See Fig 7-2 in the Designer Manual for more information.
 - The Interlock Mailbox also sets up a data area on the internal PLC. The PLC can write commands to the HMI here. The HMI then periodically checks the mailbox receiving the commands. One of the commands that the mailbox allows the PLC to command the HMI to begin is a Data Transfer job. The Data Transfer jobs can then be set up to send various commands/inquiries to the Indexer. This provides an indirect way for the PLC to command the Indexer.
- Just as it is important that users be prevented from issuing serial commands before recipe downloads are complete, it is important that the PLC does not request a serial command through the interlock mailbox before recipe completion. By setting up the Reserved Data Area in the HMI, the PLC can directly monitor whether or not a recipe is being downloaded using *S14* of the *Panel Status Word* and hold its commands until completion.
- A sample application using the Yaskawa Commander (EXOR) HMI-G4X20M-31 with the internal PLC was created. The files can be found at Yaskawa’s ftp site <ftp://ftp.yaskawa.com/public/development/servo/indexer/hmi>. The Designer file, NS600HMI.prj, was used for programming the HMI. The ISaGRAF Workbench folder, NS600HMI, contains the project used for programming the internal PLC. A printout of the PLC code used is provided in figure 2 as an example.

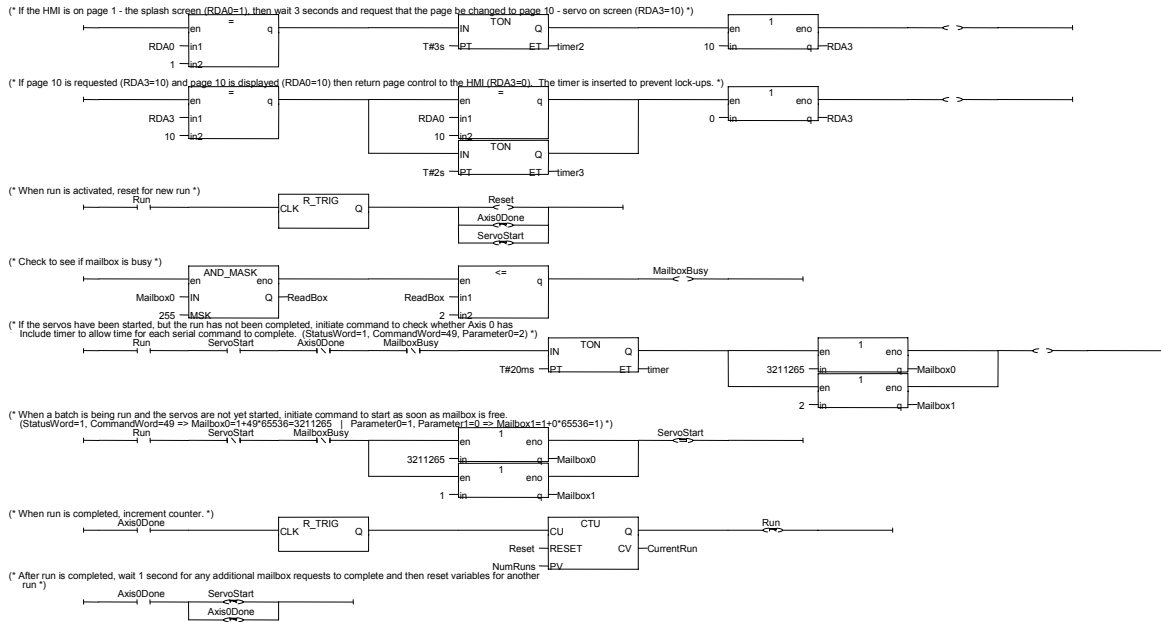


Figure 2. – PLC Ladder Code for HMI for Sigma II Indexer Command Demo

NOTE: Reference Workbench manual for more information on programming the HMI-OPLC-30.

Appendix A – Supplemental Documents

1. Yaskawa Sigma II Indexer User's Manual. YEA-SIA-S800-32.11
2. EXOR Designer for Window's User's Manual
<http://www.exor-rd.com/Support/SoftwareManual/>
3. ISaGRAF Workbench User's Guide. Located on UniWin-CD.
4. MMI+PLC – Operating Instructions. Located on UniWin-CD.
5. EXOR tn137-0, Control with UniOP.
<http://www.exor-rd.com/Support/TechNotes/>