



A Sierra Monitor Company

Driver Manual
(Supplement to the FieldServer Instruction Manual)

FS-8707-06

FST OPC Server for FieldServer

APPLICABILITY & EFFECTIVITY

Effective for all systems manufactured after February 2012

Driver Version:	1.01
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1 FST OPC SERVER FOR FIELDSEVERES DESCRIPTION

This OPC Server (I/O Driver) communicates with the FieldServer. The method of data transfer is called Data Array Access (DAA). The Data Arrays are arrays of typed data memory in the FieldServer. The source of the information in the Data Arrays can be any one of the standard FieldServer I/O Drivers. It is incumbent on the user to configure the ports and the Map Descriptors on the FieldServer. The Map Descriptors are FieldServer objects containing polling instructions for an I/O Driver to copy data from the Low level Devices into a Data Array. One of the many advantages of this architecture is that it allows many disparate proprietary devices PLC/DCS's etc. to share common data in a reliable embedded device (FieldServer) while providing access to the SCADA/PC application level via this OPC Server. FST OPC Server supports simultaneous communication to up to 10 OPC Clients.

Please refer to the FieldServer Configuration Manual for instructions on configuration on the FieldServer side, the tools required are not part of this package.

FieldServer Mode	Nodes	Comments
Client	Unspecified	There is no known limit to the number of OPC Servers that can connect to the same FieldServer provided they are on different workstations.
Server	10	FST OPC Server supports simultaneous communication to up to 10 OPC Clients

1.1 OPC Version Supported

The FST OPC Server supports OPC Version 2.05.

1.2 Compatibility Matrix

FieldServer Model	Compatible with this driver
FS-B-OPC-01	Yes
FS-x2010	Yes
FS-x2011	Yes
FS-x25	Yes
FS-x30	Yes
FS-x40	Yes
ProtoCessor FFP-FO2	Yes
ProtoNode LER/RER	Yes
ProtoCessor FFP- FD2	Yes
QuickServer- QS-1010	Yes
QuickServer QS-1011	Yes



2 DRIVER SCOPE OF SUPPLY

2.1 Supplied by FieldServer Technologies for this driver

FieldServer Technologies PART #	Description
FS-8707-06	Driver Manual

2.2 Provided by the Supplier of 3rd Party Equipment

2.2.1 Required 3rd Party Software

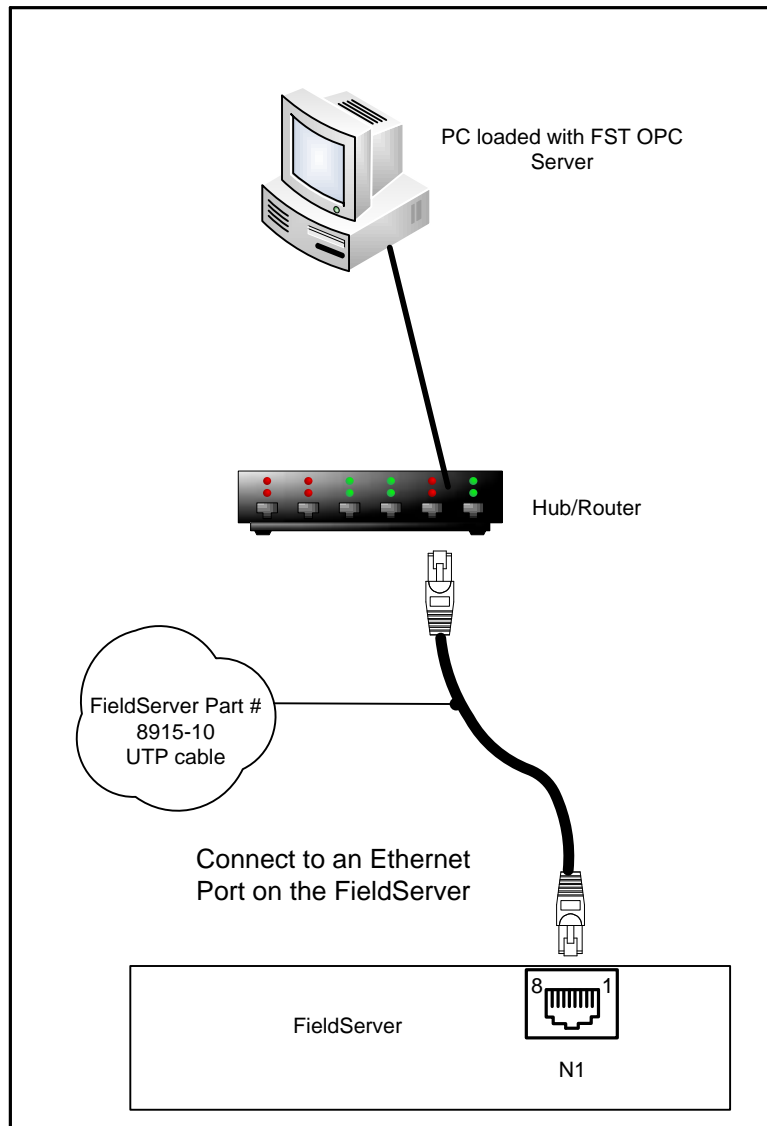
This OPC Server package must be installed on a Customer supplied PC with the following requirements:

- Operating Systems: One of the Windows NT Family - Win NT 4SP4, Windows 2000 or Windows XP. The software does not run on any other version of windows.
- Machine requirements :
 - Pentium 200 MHZ
 - Memory – Minimum requirements of OS is sufficient, 64MB for Win2000 or 128MB for XP
 - Drive Space 2MB
- Other Required Software : Any OPC Client

3 HARDWARE CONNECTIONS

The FST OPC Server communicates with the FieldServers via standard Ethernet & TCP/IP connections. Please refer to the FieldServer Configuration Manual for instructions on setting up the FieldServer side.

Before proceeding to configure the OPC Server it is important to have a proper TCP/IP network setup - verify this by PINGing a FieldServer. Refer to the Microsoft documentation for the setup of the TCP/IP networking on the PC.



4 INSTALLING THE FST OPC SERVER ON A PC

- Connect the supplied Flash Drive to a USB port on the PC.
- Run the file **Setup.exe**
- Follow the series of dialogs to create an Installation directory. When asked whether to install a Client or Server, “Server” is the default & recommended. Only Select Client If it is necessary to run the OPC Server on a different machine from the one where the OPC Client (usually a SCADA System) is running.

5 QUICK START STEPS TO IMPLEMENT A SIMPLE OPC CONFIGURATION (SERVER SIDE)

- Configure a FieldServer with a valid IP address.
- Ensure that at least one Data Array exists. It is recommended that the initial configuration be limited to a single Data Array for simplicity.
- An N1 or N2 connection must be configured with the SMT protocol (SMT is default so the protocol field can be blank). This Nx connection must be used to connect to the OPC Server machine.
- Open a DOS box and “PING” the FieldServer from this machine to confirm that the networking is correctly setup. Take note of the IP address.
- Configure Data Arrays in the FieldServer - note their names and data types (refer to the FieldServer Startup Guide for the hardware being used). Per the OPC standards, Float is the suggested data type
- Run the “FST Configurator” (Located in the Start menu program group selected when installing the OPC Server)
- Add an Ethernet connection to the config tree
- Add a FieldServer to the config tree
- Edit the IP address & change the default name to something meaningful (note for future steps)
 - Add a Data Array to the config tree
- Match the name to the name used in the FieldServer configuration. The name is not case sensitive and will be forced to uppercase.
- The default “offset” is 0, and is applicable in 99% of cases.
- Set the length to the number of elements in the FieldServer/Data Array or less. The maximum length is determined by the datatype of the Data Array. Refer to Section 8.2. To add more, make another poll block with offset > end of first block.
- Set the data storage type to the data type of the Data Array in the FieldServer (this is important, as incorrect values may be returned if set incorrectly). Per the OPC standards, Float is the suggested data type
 - Press the green “Start” button
 - Press the “Stats” button & check that data is being sent and received.
- If not re-check the names of the Data Arrays, the IP address of the FieldServer.



6 CONFIGURING THE OPC CLIENT TO USE THE FST OPC SERVER

The OPC Client refers to the application using the data available in the FieldServer. Normally this is a SCADA system or other third party software.

- From the Client browse the OPC Servers on the network and select the one named “FieldServer.7.16.x”. Note that the “x” is a wild card which references the revision number. If it is not visible, check that the hidden application “OPCENUM.EXE” is running on the Server machine. Refer to Appendix A.1
- Browse the Server. (If the Client does not have a browse facility, enter addresses manually - refer to Appendix A.1 The Browse hierarchy has two levels - FieldServers & Data Arrays. Each entry under Data Arrays is a hint, pointing to the first element of the Data Array. The user needs to delete the hint text and edit the offset number on the end to enter the desired address.
- I/O addresses are in the following format (Analog & Bit Datatypes)
`<FieldServerName>:<Data Array name>:<offset>`
- Address format for packed bits¹ in Integer types
`<FieldServerName>:<Data Array name>:<offset>:<bit>`

6.1 OPC datatypes

This driver only has 2 canonical datatypes : VT_BOOL & VT_R4 (float). The default if no datatype is specified is VT_R4 (floating point)¹. Many OPC Clients do not specify the datatype forcing the default. Float is the only compliant datatype per OPC Standards, and it is therefore recommended that this datatype is used.

¹ For packed bits the OPC datatype MUST be VT_BOOL

7 QUICK START STEPS TO IMPLEMENT A SIMPLE INTELLUTION FIX CONFIGURATION

- Configure a FieldServer with a valid IP address.
- Ensure that at least one Data Array exists. It is recommended that the initial configuration be limited to a single Data Array for simplicity.
- An N1 or N2 connection must be configured with the SMT protocol (SMT is default so the protocol field can be blank). This Nx connection must be used to connect to the OPC Server machine.
- Open a DOS box and “PING” the FieldServer from this machine to confirm that the networking is correctly setup. Take note of the IP address.
- Configure Data Arrays in the FieldServer. Note their names and data types (Read FieldServer Configuration Manual for more information). Per the OPC standards, Float is the suggested data type
- Run the “FST Configurator” (Located in the Start menu program group selected when installing the OPC Server)
- Add an Ethernet connection to the config tree
- Add a FieldServer to the config tree
- Edit the IP address & change the default name to something meaningful (note for future steps)
 - Add a Data Array to the config tree
- Name to that used inside the FieldServer. The name will be forced to uppercase.
- The default “offset” is 0, and is applicable in 99% of cases.
- Set the length to the number of elements in the FieldServer/Data Array or less. The maximum length is determined by the datatype of the Data Array. Refer to Section 8.2. To add more, make another poll block with offset > end of first block.
- Set the data storage type to the data type of the Data Array in the FieldServer (this is important, as incorrect values may be returned if set incorrectly). Per the OPC standards, Float is the suggested data type
 - Press the green “Start” button
 - Press the “Stats” button & check that data is being sent and received.
- If not re-check the names of the Data Arrays, the IP address of the FieldServer.
 - Go to the Options|Setup menu & set the default path to filename - <fix node name> & path = \FIX32\PDB or \Dynamics\PDB
 - Save the configuration to this location, It is not necessary to save after every change, Fix simply requires this file to exist on disk.
 - In the Fix Database Builder add a new block (AI,AO,DI,DO,MDI) and set the I/O Device to “FST”
 - Enter I/O addresses in the following format for AI & AR blocks & DI & DR & MDI blocks to bit datatype addresses.
 - <FieldServerName>:<Data Array name>:<offset>
 - enter I/O addresses in the following format for DI & DR & MDI blocks to packed bit addresses in Integer datatypes.
 - <FieldServerName>:<Data Array name>:<offset>:<bit>



8 EXAMPLE SETUP

8.1 Sample FieldServer Setup

In this example, the low level driver (Modbus) is irrelevant to the operation of the OPC Server, however the user needs to be aware of how field addresses map to Data Array addresses.

```
FieldServer
Title
DAA_TEST

// Client Side Connections
Connections
Port          , Baud          , Parity          , Data_Bits   , Stop_Bits   , Protocol
P1            , 9600          , None           , 8           , 1           , Modbus_RTU

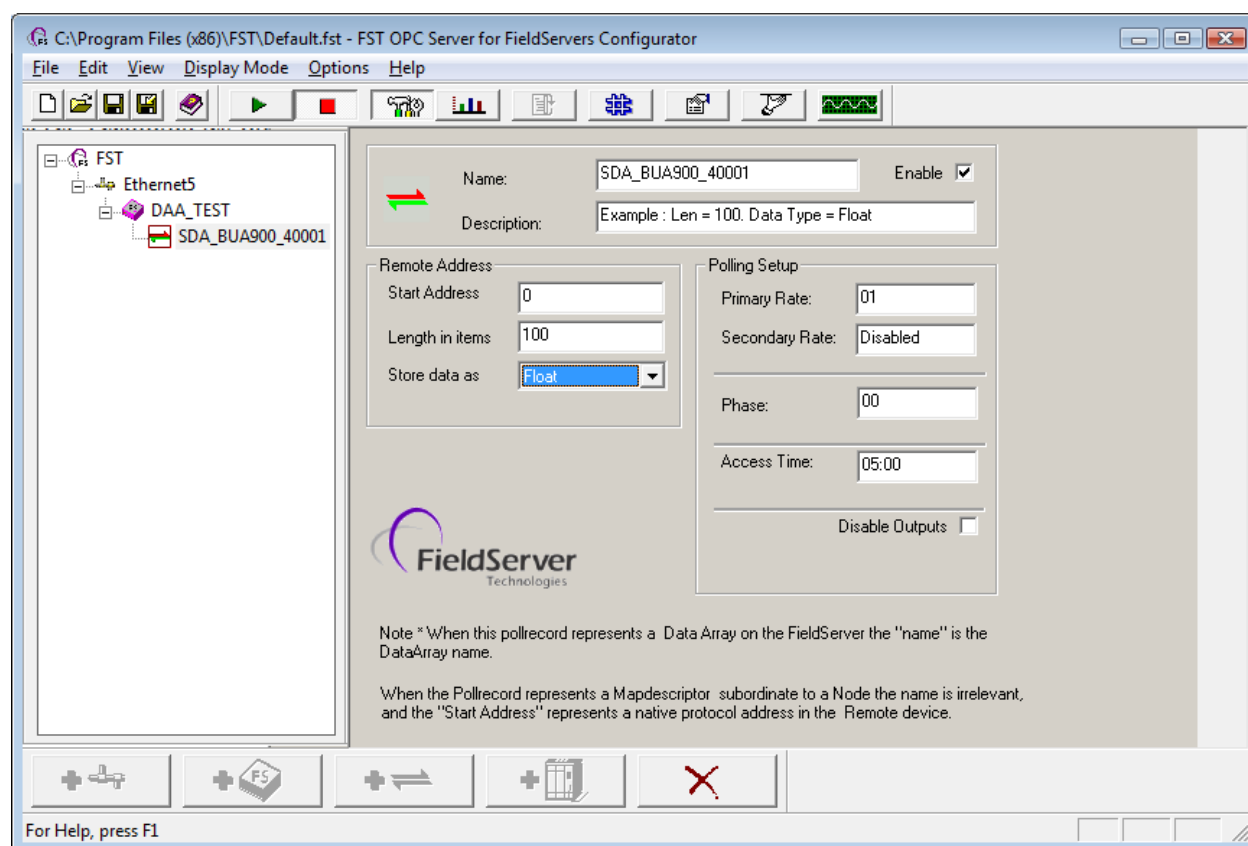
// Server Side Connections
connections
adapter      , protocol
n1           , SMT

Data_Arrays
Data_Array_Name  , Data_Format      , Data_Array_Length
SDA_BUA900_40001 , Float            , 200

Nodes
Node_Name      , Node_ID          , Protocol        , Retries      , Port
BUA900         , 31               , Modbus_RTU      , 8            , R1

Map_Descriptors
Map_Descriptor_Name  , Data_Array_Name  , Data_Array_Offset , Function      , Node_Name  , Address      , Length  , Scan_Interval
CMD_AI_BUA900_1      , SDA_BUA900_40001 , 00               , RDBC         , BUA900     , 40001        , 100    , 5s
CMD_AI_BUA900_2      , SDA_BUA900_40001 , 100              , RDBC         , BUA900     , 40101        , 100    , 5s
```

8.2 Example OPC Server Setup



Remote Data Array	The Data Array set up on the FieldServer
Start Address	Offset into the Data Array where the data will be stored. The default of 0 is applicable in most cases.
Length in items	Set to the number of elements in the FieldServer Data Array or less. The maximum length is determined by the datatype of the Data Array as follows: Float and UInt32 – 325 UInt16 – 650 Byte – 1300 Bit - 2600
Store data as	Datatype for the stored data. Per the OPC standards, Float is the suggested data type
Polling Setup	The rate at which the OPC Server polls the FieldServer.
Primary Rate	The rate at which the OPC Server will poll the FieldServer
Secondary Rate	The rate at which the OPC Server will poll the FieldServer after the access time is expired. If the access time is less than the primary poll rate, the secondary rate will be used.
Phase	Time delay before initial poll takes place
Access Time	Used internally to set the data access expiration time. The FieldServer will be polled at the primary rate until this time expires, after which it will be polled at the secondary rate.

8.3 Run FSTDRV.EXE as a Windows Service

- Install Windows Server 2003 Resource Kit Tools:
<http://www.microsoft.com/download/en/details.aspx?id=17657>
- Run the following command in a command prompt window:
INSTSRV FSTDRV "C:\Program Files\FieldServer\FST\FSTDrv.exe"

Appendix A. Troubleshooting Tips

Appendix A.1. Locating the “FieldServer.7.16.x” file

When Configuring an OPC Client link to the FieldServer OPC, the OPC Client will be browsing for available Servers using the OPC Foundation supplied utility OPCENUM.EXE (Installed with the FST OPC Server for FieldServers)

Appendix A.1.1. When the Client & Server are on the same machine

- Ensure that OPCENUM.EXE is running in the background, it is installed as a service & should start when the Client needs it
- If running NT4 or Windows 2000 with Explorer 6.x and either of the following messages return on installation “IcatInformation interface not supported”; “Incompatible Version of RPC Stub 0x80070725” then uninstall IE6. This is a known issue that needs to be resolved by Microsoft & the OPC foundation.
- Manually type the ProgID and if necessary the CLSID

ProgID “FieldServer”

CLSID {8D3DD5B6-8854-42a0-A376-94DE9676ADD5}

Appendix A.1.2. When the Client & Server are different machines

The same issues apply as above with the following additions

- Ensure that the Server machine is visible in the network neighbourhood
- OPCENUM.EXE needs to run on both machines, on the Server machine it needs to be running at startup which sometimes does not happen – check the services & set the startup mode of the OPCENUM service.

Appendix A.2. The OPC Client returns OPC data quality bad

Open the Configurator, select the Data Array containing the relevant address, then press the “Stats” button



- If the Timeout & retry counters are incrementing then the problem is with the communication to the FieldServer.
- “Ping” the FieldServer and ensure that it can be located.
- Ensure that the Ethernet port on the FieldServer is configured for SMT protocol
 - Check the Text field to the right of the “Last Error Field”
- “Bad DA name” indicates that the Data Array does not exist in the FieldServer - check the FieldServer configuration
- “Bad DA offset” indicates an attempt to poll more data than exists in the Data Array – reduce the length

Appendix A.3. Communication

OPC uses the Windows service DCOM to facilitate communications. DCOM requires port 135 is open on the PC and network. Please ensure that network routers are not blocking this port.

Appendix B. Vendor Information

Appendix A.4. Clients Using Syncio Interface

While the driver does support Cache mode, Device mode is recommended.

Appendix A.5. Fix IO User account

The FieldServer OPC server needs to be running continuously if it is being used in an OPC Client application. Since the OPC Server was created off the Intellution Fix OPC system, it is possible to set it up as a Windows Service that runs continuously in the background. Using this software may install a new user onto the PC, the **username is FIX IO** and the **password is camry**.

Appendix C. Reference

Appendix A.6. The OPC Server – Operating Recommendations and Limitations

There is no limit to the number of FieldServers that the OPC Server can communicate with.

The number of Clients is also unlimited. Note, however, that points memory usage is about 2k/point/Client e.g. 20 Clients with 10000 tags each = 400MB. The Server creates a thread for each Client, thus by default each Client is looping through 10000 tags every 25 ms looking for change of state.

It is possible to have remote Clients, but is not recommended for complexity/reliability reasons. The FieldServers are networked, so it makes sense to run the Server on the Client machine. When running remotely the OPC Server is running under the app "dllhost.exe" in taskman. Because most Clients use OPC in asynchronous mode, the performance is almost indistinguishable for medium amounts of data.

The FieldServer limits the speed to about 50 poll blocks/sec (to test set poll rate to 0). e.g.. with 2 FieldServers the total poll rate is ~100/s, if there are 10000 digitals in one Data Array on each FieldServer that translates to $2 * 50 * 10000 = 1\,000\,000$ digitals per second.

Operating Mode - COM has 3 modes:- inprocess, local & remote. Local & remote have similar performance - the overhead of each COM call is significantly slower than inprocess. The driver supports inprocess, and this mode is recommended.