

**SCADAPack E Idec PLC  
Interface Manual**



**Documentation**

# Table of Contents

<b>Part I Idec PLC Interface</b>	<b>3</b>
1 Technical Support.....	3
2 Safety Information.....	4
3 Preface.....	6
4 Overview .....	8
5 ISaGRAF I/O Board Interface.....	9
5.1 Input Boards .....	10
5.2 Output Boards .....	13
6 Communication Interface.....	15
7 Data Communications Protocol.....	16
8 System Points.....	17
8.1 Return Status Values & Data Cache Age .....	19
9 Diagnostics.....	20

---

## I Idec PLC Interface



# Documentation

©2013 Control Microsystems Inc.  
All rights reserved.  
Printed in Canada.

Version: 8.05.4

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

No part of this document may be reproduced in any form or by any means, electronic or mechanical, including photocopying, without express written permission of Schneider Electric.

All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed. Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

## 1 Technical Support

Support related to any part of this documentation can be directed to one of the following support centers.

### Technical Support: The Americas

Available Monday to Friday 8:00am – 6:30pm Eastern Time

Toll free within North America 1-888-226-6876

Direct Worldwide +1-613-591-1943

Email [TechnicalSupport@controlmicrosystems.com](mailto:TechnicalSupport@controlmicrosystems.com)

### Technical Support: Europe

Available Monday to Friday 8:30am – 5:30pm Central European Time

Direct Worldwide +31 (71) 597-1655

Email [euro-support@controlmicrosystems.com](mailto:euro-support@controlmicrosystems.com)

### Technical Support: Asia

Available Monday to Friday 8:00am – 6:30pm Eastern Time (North America)

Direct Worldwide +1-613-591-1943

Email [TechnicalSupport@controlmicrosystems.com](mailto:TechnicalSupport@controlmicrosystems.com)


### Technical Support: Australia


Inside Australia 1300 369 233

Email [au.help@schneider-electric.com](mailto:au.help@schneider-electric.com)

## 2 Safety Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

	The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.
---	--

	This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.
---	--

---

**⚠ DANGER**

**DANGER** indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

**⚠ WARNING**

**WARNING** indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

**⚠ CAUTION**

**CAUTION** indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

**CAUTION**

**CAUTION** used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** equipment damage..

**PLEASE NOTE**

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and the installation, and has received safety training to recognize and avoid the hazards involved.

**BEFORE YOU BEGIN**

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

**⚠ CAUTION****EQUIPMENT OPERATION HAZARD**

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.

- Remove tools, meters, and debris from equipment.

**Failure to follow these instructions can result in injury or equipment damage.**

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and grounds, except those grounds installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove ground from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

## **OPERATION AND ADJUSTMENTS**

The following precautions are from the NEMA Standards Publication ICS 7.1-1995 (English version prevails):

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.
- Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

## **3 Preface**

### **Purpose**

The purpose of this document is to describe the Idec driver implementation for the Schneider Electric SCADAPack E RTU.

---

---

## Assumed Knowledge

Familiarity with the ISaGRAF Workbench recommended.

## Target Audience

- Systems Engineers
- Commissioning Engineers
- Maintenance Technicians

## References

- *SCADAPack E ISaGRAF Technical Reference manual*
  - ICS Triplex ISaGRAF Manuals
  - Idec IZUMI FA-1/FA-1J/FA-2/FA-2J Users Manual
-

## 4 Overview

The Idec FA-2J PLC communicates with the SCADAPack E RTU using an ISaGRAF **idecxxx** I/O board through an RTU serial port configured as a '*PLC Device*'.

The Idec registers are read and the return values cached in the RTU for access through an ISaGRAF input board.

Outputs are written from the RTU's output cache to the Idec PLC.

The SCADAPack E RTU's handling of the communications is the same as other PLC driver communications.

The age and status of the data read from the Idec PLC is present in RTU system points that can be accessed from within ISaGRAF, or external to the RTU.

The Idec Driver supports communications to the following Idec PLC's:

- FA-1 and FA-1J series (These PLCs don't support expansion areas and data registers)
  - FA-2 and FA2J series
-



---

## 5 ISaGRAF I/O Board Interface

The **idecxxx** ISaGRAF I/O boards use a SCADAPack E RTU serial port configured as a '*PLC Device*' to communicate with the Idec PLC.

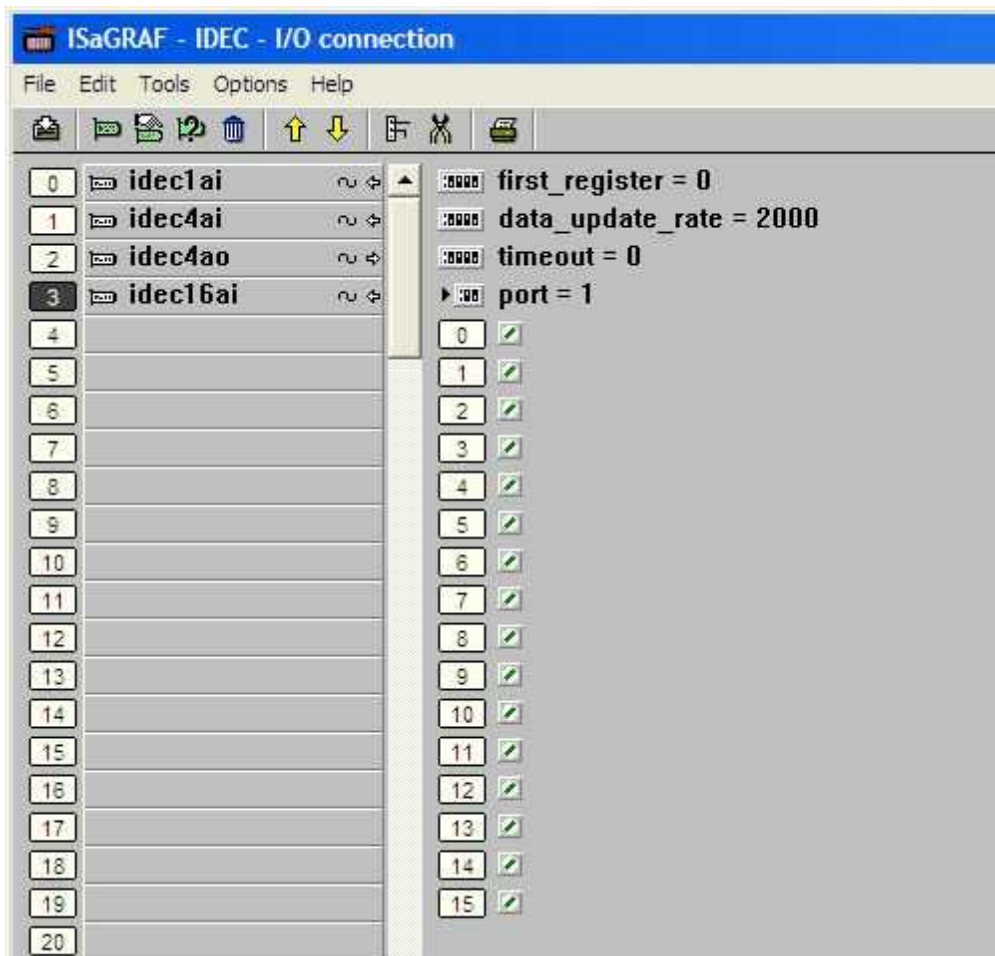
- *Input Boards*
- *Output Boards*

## 5.1 Input Boards

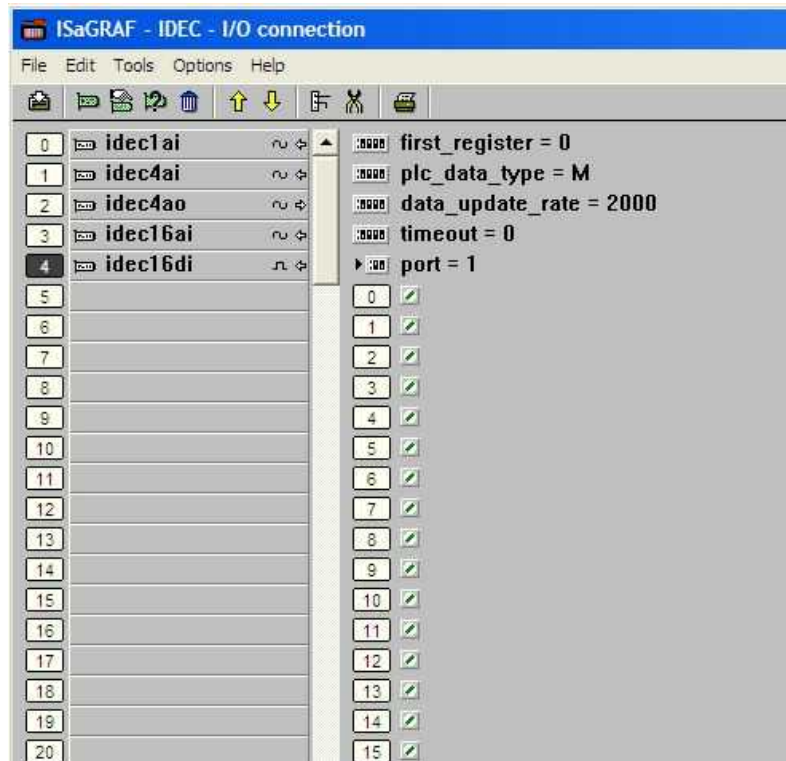
The Input boards supported by the Idec Driver are:

- 1 analog input
- analog input
- 8 analog input
- 16 analog input
- 16 digital input
- 32 digital input

The analog input boards have the same basic layout as shown below.



The digital input boards have the same basic layout as shown below.



The **first\_register** field of the Idec ISaGRAF board (default value of 0) is the configurable register (16-bit) or point (binary) address in the Idec PLC. The allowable values for this address are outlined in the following table:

Board Type	Register Type	PLC Data Type	Standard Address Range	Expansion Address Range
16DI 32DI	Input	I	0-7, 10-17, 20-157	160-317*
	Output	Q	0-7, 10-17, 20-157	160-317*
	Internal	M	0-297, 300-317	320-637*
16DO 32DO	Output	Q	0-7, 10-17, 20-157	160-317*
	Internal	M	0-297, 300-317	320-637*
16AI/AO 8AI/AO 4AI/AO 1AI/AO	Data Register	D (hidden parameter)	0-99*	100-255* Expansion Area 1 256-399* Expansion Area 2

\* Register ranges marked with an asterisk are not accessible with either the FA-1, or the FA-1J.

A 16 channel digital board at start address 0, provides addressing for the following points: 0-7 and 10-

17. Therefore the next consecutive board should be located at address 20 (not 16 or 18). Similarly for the 32 digital point boards

The **data\_type** field is a configurable value that determines what type of registers/points to access in the PLC. As shown in the table above, valid values for digital boards are: I for Input points, Q for Output points, and M for internal points (default). The analog boards only allow access to Data Registers (value of D) and for this reason the **data\_type** field is hidden for these boards.

The **data\_update\_rate** field of the **idecxxx** ISaGRAF board (default 2000) is the configurable number of *seconds* after which the RTU will request element array values from the Idec PLC. The SCADAPack E RTU will also request data from the Idec PLC constantly if the cache data age is greater than the **data\_update\_rate**. I.e. if communications are lost with the PLC, they are retried until the communications are restored.

The **timeout** field of the ISaGRAF board driver provides a parameter for specifying the communications timeout on an individual I/O board (i.e. the timeout applies to communications associated with that board). Where this value is "0", the PLC device driver will use the default timeout (1200ms). Units for this field are in milliseconds.

The **port** field of the ISaGRAF board driver provides a parameter which defines which of the multiple RTU "PLC Device" ports will be used to communicate with the PLC or peripheral device. If only one "PLC Device" port is configured, this field is ignored.

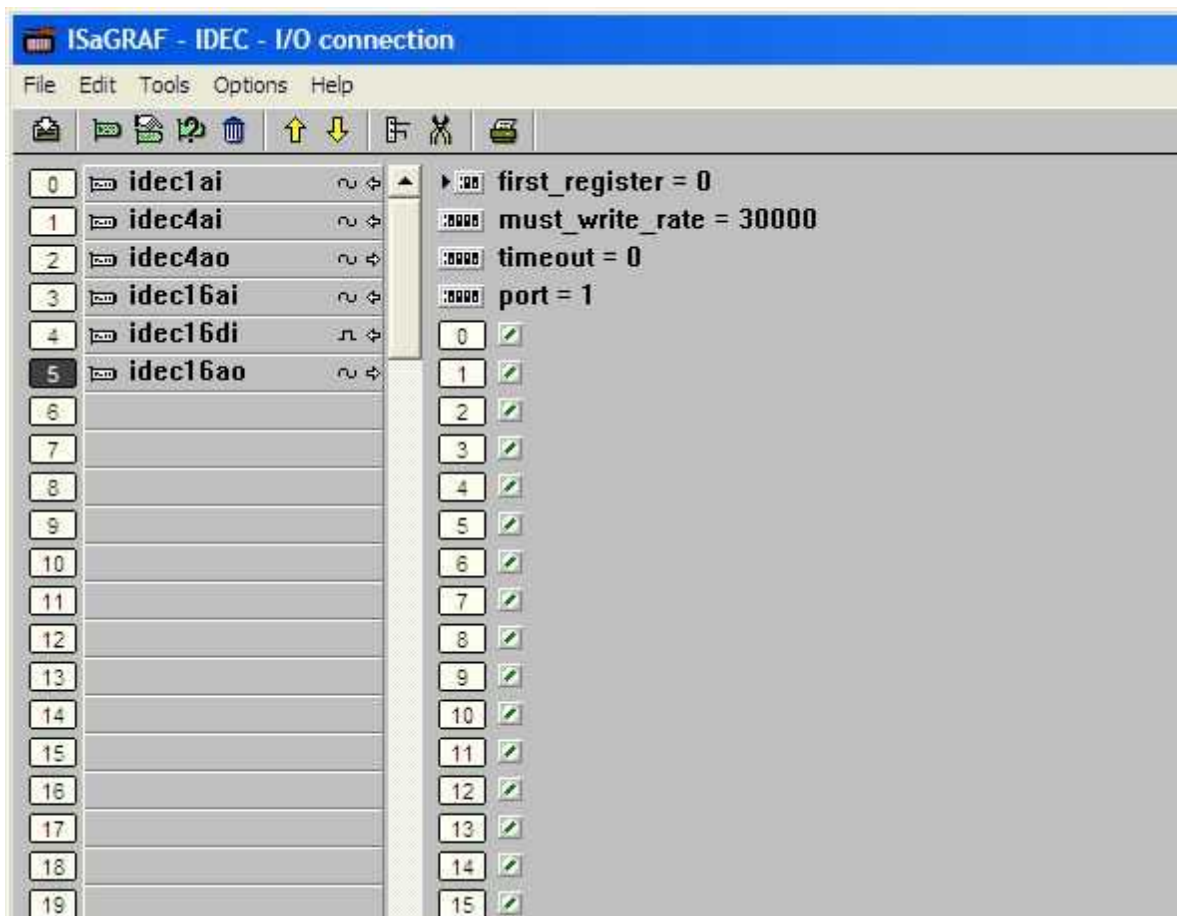
---

## 5.2 Output Boards

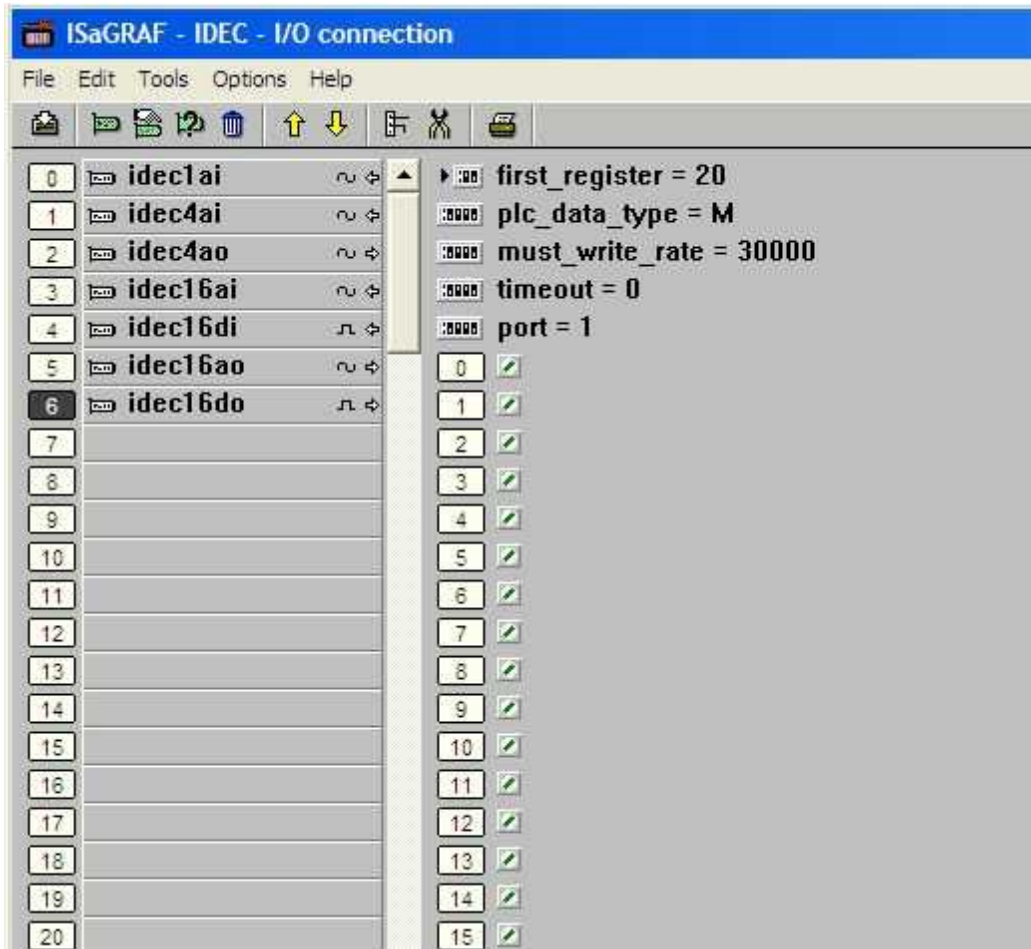
The Input boards supported by the Idec Driver are:

- 1 analog output
- analog output
- 8 analog output
- 16 analog output
- 16 digital output
- 32 digital output

The analog output boards have the same basic layout as shown below.



The digital output boards have the same basic layout as shown below.



These parameters are the same as described for the Input Boards.

The only difference is the **must\_write\_rate**. The unit for this parameter is the milliseconds, and specifies the rate at which the data for the Output board is written to the PLC. Between "must\_write\_rate" periods, data is written to the PLC only when the ISaGRAF output variable values change. Individual I/O boards may have different must write rates allowing prioritization of data sent to a PLC Device.

## 6 Communication Interface

The SCADAPack E RTU communicates with the Idec FA-1/FA-2 PLC using an RTU serial port configured as a 'PLC Device'. This port needs to be configured with the same settings as the serial port on the Idec PLC onto which communications will be established. By default the Idec PLC's communicate at 9600,8,E,1. The RTUs serial port needs to connect to an "Idec RS232C Link Adaptor" to convert the RS232 from the SCADAPack E RTU to the current loop protocol used by the Idec PLC.

A cable configuration for connecting a FA-2J PLC to the RTU port is shown in [Figure 1](#)<sup>[15]</sup>.

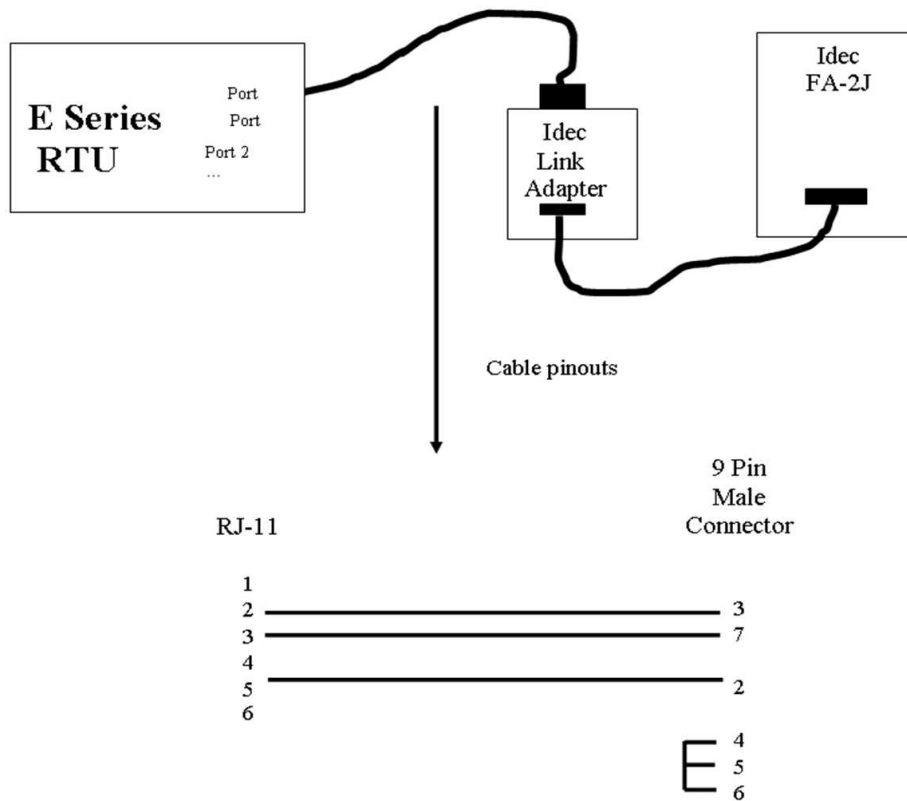


Figure 1: Standard Connection Diagram and SCADAPack ES - SCADAPack ER RTU Cable Pin Out

## 7 Data Communications Protocol

Refer to *Idec IZUMI FA-1/FA-1J/FA-2/FA-2J Users Manual* for a complete description of the Idec protocol as implemented by the driver.

Each of the different Idec PLC types support different Idec commands. The table below outlines the types of commands issued by the Idec driver in the SCADAPack E RTU.

PLC TYPE	Supported Idec Command Code	Supported Idec Type Codes
FA-1/FA-1J	0x42 - Monitor	0x31 – I/O 0x32 – IR
	0x4B – Direct Set/Reset	0x31 – I/O Reset 0x32 – IR Reset 0x39 – I/O Set 0x3A – IR Set
FA-2/FA-2J	0x42 - Monitor	0x31 – I/O 0x32 – IR 0x37 – Data Registers 0x38 – Data Registers (expansion) 0x3E – I/O (expansion) 0x3F – IR (expansion)
	0x4B – Direct Set/Reset	0x31 – I/O Reset 0x32 – IR Reset 0x34 – I/O Reset (expansion) 0x35 – IR Reset (expansion) 0x39 – I/O Set 0x3A – IR Set 0x3C – I/O Set (expansion) 0x3D – IR Set (expansion)
	0x4C – Data Register Write	0x37 – DR (0-99, 100-255) 0x38 – DR (256-399)



## 8 System Points

SCADAPack E RTU system points are provided to indicate the status of the ISaGRAF I/O boards that are used for Slave I/O communications with devices such as PLCs, and the Idec PLC.

Where multiple ISaGRAF Slave I/O boards are present in an ISaGRAF application, consecutive, sequential system point pairs are used for the next Slave I/O board, regardless of what PLC port the boards are connected to. Each ISaGRAF kernel is allocated a separate set of system points for Slave I/O boards. Each ISaGRAF Slave I/O board has two system points associated with it. The communications status and the data cache age.

The communication status indicates the status of the communication with the Idec PLC for data points on the I/O board. For more information see Section [Return Status Values & Data Cache Age \(Return Status Values\)](#)<sup>[19]</sup>.

The age of the cached data is stored in the Slave I/O Board Data Cache Age system point for that I/O board. For more information see Section [Return Status Values & Data Cache Age \(Data Cache Age\)](#)<sup>[19]</sup>.

The RTU Slave I/O board status system points for ISaGRAF Kernel 1 are as follows

System Point Description	Point Number	Point Type
ISaGRAF Kernel 1 Slave I/O board 1 communication status	53300	16-bit unsigned integer (read-only)
ISaGRAF Kernel 1 Slave I/O board 1 data cache time	53301	16-bit unsigned integer (read-only)
ISaGRAF Kernel 1 Slave I/O board 2 communication status	53302	16-bit unsigned integer (read-only)
ISaGRAF Kernel 1 Slave I/O board 2 data cache time	53303	16-bit unsigned integer (read-only)
...		
ISaGRAF Kernel 1 Slave I/O board 60 communication status	53418	16-bit unsigned integer (read-only)
ISaGRAF Kernel 1 Slave I/O board 60 data cache time	53419	16-bit unsigned integer (read-only)

The RTU Slave I/O board status system points for ISaGRAF Kernel 2 are as follows:

System Point Description	Point Number	Point Type
ISaGRAF Kernel 2 Slave I/O board 1 communication status	53422	16-bit unsigned integer (read-only)
ISaGRAF Kernel 2 Slave I/O board 1 data cache time	53423	16-bit unsigned integer (read-only)
ISaGRAF Kernel 2 Slave I/O board 2 communication status	53424	16-bit unsigned

		integer (read-only)
ISaGRAF Kernel 2 Slave I/O board 2 data cache time	53425	16-bit unsigned integer (read-only)
...		
ISaGRAF Kernel 2 Slave I/O board 14 communication status	53448	16-bit unsigned integer (read-only)
ISaGRAF Kernel 2 Slave I/O board 14 data cache time	53449	16-bit unsigned integer (read-only)

---

## 8.1 Return Status Values & Data Cache Age

### Return Status Value

The return status values for the **Idecxxx** board communications status are as follows:

Status	Comment	Value
Success	Normal operation	0
Unknown Error	An undefined error has occurred.	101
Illegal Address	The user has requested a invalid address	103
Timeout	The Idec PLC did not respond	104
Corrupt Message	The message from the Idec PLC was not understood by the SCADAPack E RTU.	106

### Data Cache Age

The age of the data in the RTU cache for the Idec PLC array elements are presented by reading system point for the I/O board (usually Slave I/O board 1 system points). The cache age is initialized to zero when the ISaGRAF application starts and increases until a successful read occurs, after which time the value is reset to zero.

This system point may be used by the ISaGRAF application to determine the suitability of using the input data from the I/O board.

## 9 Diagnostics

The SCADAPack E RTU indicates configuration or communication diagnostics via Diagnostic Display mode from a Command line session.

Configuration diagnostics are indicated via ISaGRAF I/O board messages and are displayed when in Diagnostic Display mode (use DIAG command at command prompt).

Communication diagnostics for the Idec PLC are enabled when the following commands are entered at the SCADAPack E RTU command prompt:

```
PLCDIAG ENABLE *  
DIAG
```

