EtherNet/IP Specification: ACR Series Products

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Introduction

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Introduction

CIP (Control and Information Protocol) is designed for industrial controls devices, which includes DeviceNet, ControlNet, and EtherNet/IP.

This document describes the implementation of EtherNet/IP for the ACR series motion controllers.

This specification applies to the following:

ACR Series Controllers.................. Operating System revision 1.18.15 or greater

Compatible Parker Hannifin Products

Controllers................................. ACR9000

Assumptions of Technical Experience

To install and troubleshoot the ACR9000 Stand-Alone Controller, you should have a fundamental understanding of the following:

• Electronic concepts such as voltage, current, and switches.
• Mechanical motion control concepts such as inertia, torque, velocity, distance, and force.

Before setting up an EtherNet/IP network, you should have a fundamental understanding of the following:

• CIP (Control and Information Protocol) object models for devices.
• CIP object classes for connected and unconnected messaging.
• EtherNet/IP adaptation of CIP.

Reference Documents

The following documents will prove helpful when implementing EtherNet/IP. We assume you are familiar with the following materials. You can download them at the ODVA website (www.odva.org/).

• EtherNet/IP Specification—Volume 1: CIP Common Specification
• EtherNet/IP Specification—Volume 2: EtherNet/IP
• EtherNet/IP Terms

If you are using a ControlLogix System from Rockwell Automation, consider downloading the following reference documents (www.ab.com/)

• Communicating with RA Products Using EtherNet/IP Explicit Messaging
• Establishing I/O Communications with RA ControlLogix Systems on EtherNet/IP
• Logix5000 Data Access Reference Manual
  Publication 1759-RM005A-EN-E (March 2000)
Technical Support

ACR9000
For solutions to your questions about implementing the ACR9000 Stand-Alone Controller, refer to the following documents:

- ACR9000 Hardware Installation Guide (this document)
- ACR User’s Guide (Online Help System in the ACR-View software)

If you cannot find the answer in these documents, contact your local Automation Technology Center (ATC) or distributor for assistance.

If you need to talk to our in-house Application Engineers, please contact us at the numbers listed in “Technical Assistance” on the inside cover, page ii.

Ethernet/IP
For technical questions regarding EtherNet/IP or CIP, contact your local EtherNet/IP user group. You can find information at www.odva.org.
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Overview

CIP is an industrial controls protocol that is structurally designed to allow TCP/IP communication between many different industrial devices.

CIP uses a connection-based design that allows a variety of devices to communicate between each other; a CIP connection provides a communication pathway between multiple end-points.

The CIP specification describes the features available: message protocol, object modeling, messaging protocol, communication objects, general object library, device profiles, electronic data sheets, service, and data management.

As CIP uses object modeling to express data, you can find a library of standard objects in the "CIP Common Specification". In addition, the specification contains a library of device descriptions (or device profiles) for common industrial control devices.

Modes of Communication

The EtherNet/IP network is designed to use standard Ethernet and TCP/IP equipment for the industrial environment. The application layer protocol is an open standard—CIP (Control and Information Protocol). CIP is the same protocol used by DeviceNet and ControlNet networks, allowing interoperability between various industrial devices.

<table>
<thead>
<tr>
<th>Application</th>
<th>CIP Control and Information Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation</td>
<td></td>
</tr>
<tr>
<td>Session</td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td></td>
</tr>
<tr>
<td>Network</td>
<td></td>
</tr>
<tr>
<td>Link</td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td></td>
</tr>
</tbody>
</table>

Class 1 I/O (UDP)

Implicit messaging is a “Class 1” connection type, providing point-to-point or multicast messaging over a UDP connection. Your application uses implicit messaging for I/O data transfer. Data is sent cyclically based on a user-defined duration.
Implicit Message Cycle

Minimum.................................................. 100 milliseconds

Maximum................................................. 3 seconds

With Class 1 I/O communication, the adapter (ACR9000) subscribes to the scanner (ControlLogix). When ControlLogix establishes a connection with the ACR9000 controller, it configures the ACR9000 data for cyclical production and consumption. When configuration is completed, the two devices can share I/O data in both directions.

Class 3 (TCP) CIP Messages (connected and unconnected)

Explicit messaging is a “Class 3” connection type, providing point-to-point, one-time-only messaging over a TCP connection.

With Class 3 communication, the scanner (ControlLogix) initiates the connection. If data needs repeated transmission, this connection can be cached. This reduces the overhead related to establishing and closing connections.

ControlLogix uses read-table and write-table messages to communicate with ACR9000. In addition, it can transmit other generic CIP objects this connection.

Explicit Messaging

The following table shows the general structure of an explicit message.

<table>
<thead>
<tr>
<th>Termination Request Packet Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function</td>
</tr>
<tr>
<td>bService</td>
</tr>
<tr>
<td>iClass</td>
</tr>
<tr>
<td>iInstance</td>
</tr>
<tr>
<td>iAttribute</td>
</tr>
<tr>
<td>iMember</td>
</tr>
<tr>
<td>iTagSize</td>
</tr>
<tr>
<td>RequestData</td>
</tr>
<tr>
<td>iDataSize</td>
</tr>
<tr>
<td>iExplicitMessageTimeout</td>
</tr>
</tbody>
</table>
Object Model

The following Object Classes are supported in the ACR series motion controllers.

<table>
<thead>
<tr>
<th>Description</th>
<th>Service Code</th>
<th>Class Hex</th>
<th>Instance Hex</th>
<th>Attribute Hex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple Attribute</td>
<td>0x0A</td>
<td>FFFF</td>
<td>FFFF</td>
<td>FFFF</td>
</tr>
<tr>
<td>Read Tag</td>
<td>0x4C</td>
<td>FFFF</td>
<td>FFFF</td>
<td>FFFF</td>
</tr>
<tr>
<td>Write Tag</td>
<td>0x4D</td>
<td>FFFF</td>
<td>FFFF</td>
<td>FFFF</td>
</tr>
<tr>
<td>Mask NAND OR</td>
<td>0x4E</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Vendor Move</td>
<td>0x34</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Vendor Float</td>
<td>0x48</td>
<td>Parameter Number</td>
<td>Number of Elements</td>
<td>1</td>
</tr>
</tbody>
</table>

**Multiple Attributes — 0x0A**

The 0x0A service code allows Interact software (from Parker Hannifin) to communicate with an ACR9000. This service wraps around other service codes such as 4C, 4D, and 4E. It allows you to pack multiple service codes inside 0x0A and efficiently send across the network.

**Block Read Table — 0x4C**

The 0x4C service code allows you to read certain 32-bit registers. The object can read any long P-parameter in ACR9000.

You can also use it for multiple-block reads. This is an efficient method to read a contiguous block of P-parameters. You can read 1-16 elements.

**4C Request**

In the following example, EtherNet/IP reads P4105 on the ACR9000. EtherNet/IP sends the following data:

- Source: 172.25.8.29 (672, 0)
- Destination: 172.25.8.23 (672, 0)
- Item Count: 2 (672, 16)
- Item: Connection-based (688, 16)
  - Item Length: 4 (704, 16)
  - Connection Identifier: 0x80020000 (720, 32)
- Item: Connected Transport packet (752, 16)
  - Item Length: 14 (768, 16)
  - Sequence: 40 (784, 16)
  - Request/Reply: Request (800, 1)
  - Service Code: 0x4c (801, 7)
  - Path Size (Words): 4 (808, 8)
The following physical frame is the generated Block Read Request:

```
00 90 55 00 16 41 00 00 bc 03 6a d8 08 00 45 00
00 62 81 c8 00 00 40 06 90 67 ac 19 08 1d ac 19
08 17 af 13 af 12 a6 8b c5 2e 59 2f 12 24 50 18
11 1c e4 2e 00 00 70 00 22 00 00 05 65 b7 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0e 00 28 00 4c 04 91 05 50 34 31 30 35 00 01 00
43 52 43 21
```

The service for ACR9000 is underlined (above), and breaks down as follows:

<table>
<thead>
<tr>
<th>4C</th>
<th>Service code Read Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>Path Length in words</td>
</tr>
<tr>
<td>91</td>
<td>Symbolic Tag= string</td>
</tr>
<tr>
<td>05</td>
<td>Data Length=5</td>
</tr>
<tr>
<td>50</td>
<td>String Data= P4505</td>
</tr>
<tr>
<td>00</td>
<td>Byte Padding</td>
</tr>
<tr>
<td>01</td>
<td>Length= 1</td>
</tr>
<tr>
<td>00</td>
<td>Byte Padding</td>
</tr>
</tbody>
</table>

**4C Response**

In the following example, EtherNet/IP reads P4105 on the ACR9000. EtherNet/IP sends the following data:

- **Source:** 172.25.8.23 (672, 0)
- **Destination:** 172.25.8.29 (672, 0)
- **Item Count:** 2 (672, 16)
- **Item:** Connection-based (688, 16)
  - **Item Length:** 4 (704, 16)
  - **Connection Identifier:** 0x65007404 (720, 32)
- **Item:** Connected Transport packet (752, 16)
  - **Item Length:** 12 (768, 16)
  - **Sequence:** 40 (784, 16)
  - **Request/Reply:** Reply (800, 1)
  - **Service Code:** 0x4c (801, 7)
  - **General Status:** Success (816, 8)
  - **Additional Status Size (Words):** 0 (824, 8)
The following physical frame is the generated Block Read response:

```plaintext
00 00 bc 03 6a d8 00 90 55 00 16 41 08 00 45 00
00 60 00 2d 00 00 40 06 12 05 ac 19 08 17 ac 19
08 1d af 12 af 13 59 2f 12 24 a6 8b c5 68 50 10
3e 80 e3 a8 00 00 70 00 20 00 00 05 65 b7 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 02 00 a1 00 04 00 04 74 00 65 b1 00
0c 00 28 00 cc 00 00 00 c4 00 d9 05 00 00 43 52
43 21
```

The service for ACR9000 is underlined (above), and breaks down as follows:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cc</td>
<td>Service code, Read Table Response</td>
</tr>
<tr>
<td>00</td>
<td>Standard Error Code = Success</td>
</tr>
<tr>
<td>00 c4</td>
<td>Data type Long</td>
</tr>
<tr>
<td>00</td>
<td>Padding</td>
</tr>
<tr>
<td>d9 05 00 00</td>
<td>Long Data Read = 1497</td>
</tr>
</tbody>
</table>

**Block Write Table — 0x4D**

The 0x4D service code allows you to write to any 32-bit Register. The object can write to any P-parameter in ACR9000 with the data type long or float. You can also use it for multiple-block writes. This is an efficient method to write a contiguous block of P-parameters.

You can write 1-16 elements. Make sure that the data type and size of the source and destination elements are the same.

**4D Request**

In the following example, EtherNet/IP writes the value 1862 (0x746) to P4203 on the ACR9000. EtherNet/IP sends the following data:

- **Source**: 172.25.8.29 (672, 0)
- **Destination**: 172.25.8.23 (672, 0)
- **Item Count**: 2 (672, 16)
- **Item**: Connection-based (688, 16)
  - **Item Length**: 4 (704, 16)
  - **Connection Identifier**: 0x80020000 (720, 32)
- **Item**: Connected Transport packet (752, 16)
  - **Item Length**: 20 (768, 16)
  - **Sequence**: 775 (784, 16)
  - **Request/Reply**: Request (800, 1)
  - **Service Code**: 0x4d (801, 7)
  - **Path Size (Words)**: 4 (808, 8)
  - **Path**: 0x 91 05 50 34 32 30 33 00 816 64
    - **Segment**: Symbolic, one byte version (816, 8)
    - **Length**: 5 (824, 8)
Symbolic Data: P4203 (832, 40)
Pad Byte: 0x00 (872, 8)

The following physical frame is the generated Block Write Request:

```
00 90 55 00 16 41 00 00 bc 03 6a d8 08 00 45 00
00 68 88 71 00 00 40 06 89 b8 ac 19 08 1d ac 19
08 17 af 13 af 12 cf 0d 3b 7d 95 83 7c 7b 50 18
11 1c 24 55 00 00 70 00 28 00 00 00 eb 08 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
14 00 07 03 4d 04 05 34 32 30 33 c4 00
01 00 46 07 00 00 43 52 43 21
```

The service for ACR9000 is underlined (above), and breaks down as follows:

<table>
<thead>
<tr>
<th>4d</th>
<th>Service code</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>Path Length in words</td>
</tr>
<tr>
<td>0d</td>
<td>Symbolic Tag, string</td>
</tr>
<tr>
<td>91</td>
<td>Data Length in bytes</td>
</tr>
<tr>
<td>50 34 32 30 33</td>
<td>String Data = P4203</td>
</tr>
<tr>
<td>00</td>
<td>Padding</td>
</tr>
<tr>
<td>04 00</td>
<td>Data Type= long</td>
</tr>
<tr>
<td>01</td>
<td>Length= 1</td>
</tr>
<tr>
<td>00</td>
<td>Padding</td>
</tr>
<tr>
<td>46 07 00 00</td>
<td>Data = parameter data being written = 1862</td>
</tr>
</tbody>
</table>

**4D Response**

In the following example, EtherNet/IP writes the value 1862 (0x746) to P4203 on the ACR9000. EtherNet/IP sends the following data:

- **Source:** 172.25.8.23
- **Destination:** 172.25.8.29
- **Item Count:** 2
- **Item:** Connection-based
  - **Item Length:** 4
    - **Connection Identifier:** 0x49007204
- **Item:** Connected Transport packet
  - **Item Length:** 6
    - **Sequence:** 775
    - **Request/Reply:** Reply
    - **Service Code:** 0x4d
    - **General Status:** Success
    - **Additional Status Size (Words):** 0

---

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The following physical frame is the generated Block Write Response:

```
00 00 bc 03 6a d8 00 90 55 00 16 41 08 00 45 00
00 5a 7c da 00 00 40 06 95 5d ac 19 08 17 ac 19
08 1d af 12 af 13 95 83 7c 7b cf 0d 3b bd 50 10
3e 80 e2 01 00 00 70 00 1a 00 00 00 eb 08 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 02 00 a1 00 04 00 04 72 00 49 b1 00
06 00 07 03 cd 00 00 43 52 43 21
```

The service for ACR9000 is underlined (above), and breaks down as follows:

<table>
<thead>
<tr>
<th>cd 00</th>
<th>Service code, Write Table Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Standard Error Code = Success</td>
</tr>
<tr>
<td>00</td>
<td>Padding</td>
</tr>
</tbody>
</table>

**NAND and OR Masks — 0x4E**

The 0x4E service code allows you to set and clear individual bits. To do this, send CIP Generic messages to the ACR9000.

This mask command consists of three long words: the P-parameter, the NANDmask and the Ormask. The NAND mask clears bits and the OR mask sets bits. The P-parameter is modified as follows:

\[
P = (P \text{ AND } \text{NANDmask}) \text{ OR } \text{ormask}
\]

**4E Request**

In the following example, the value of P4111 is modified as follows:

\[
P4111 = (P4111 \& 0x223D) \mid 0x10D6
\]

Where

- NANDMASK = 8765 =0x223D (bits being cleared)
- ORMASK = 4310 = 0x10D6 (bits being set)

Following packet is by the client to the ACR9000:

Source: 172.25.8.29 (672, 0)
Destination: 172.25.8.23 (672, 0)
Item Count: 2 (672, 16)
Item: Connection-based (688, 16)
  Item Length: 4 (704, 16)
  Connection Identifier: 0x80020000 (720, 32)
Item: Connected Transport packet (752, 16)
  Item Length: 22 (768, 16)
  Sequence: 117 (784, 16)
  Request/Reply: Request (800, 1)
The following physical frame is the generated NAND/OR Mask Request:

```
00 90 55 00 16 41 00 00 bc 03 6a d8 08 00 45 00
00 6a 4d 53 00 00 40 06 c4 d4 ac 19 08 1d ac 19
08 17 af 13 af 12 ac 85 40 35 20 6b b7 21 50 18
11 1c 99 ca 00 00 70 00 2a 00 00 00 15 ff 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
16 00 75 00 4e 03 20 01 24 01 30 05 0f 10 00 00
3d 22 00 00 46 10 00 00 43 52 43 21
```

The service for ACR9000 is underlined (above), and breaks down as follows:

<table>
<thead>
<tr>
<th></th>
<th>Path Length in words</th>
</tr>
</thead>
<tbody>
<tr>
<td>4e</td>
<td>Service code Mask for bit set and clear</td>
</tr>
<tr>
<td>03</td>
<td>Path</td>
</tr>
<tr>
<td>20 01</td>
<td>Class = 1</td>
</tr>
<tr>
<td>24 01</td>
<td>Instance = 1</td>
</tr>
<tr>
<td>30 05</td>
<td>Attribute =5</td>
</tr>
<tr>
<td>0f 10 00 00</td>
<td>Parameter Number = 4111</td>
</tr>
<tr>
<td>3d 22 00 00</td>
<td>NAND MASK = 8765</td>
</tr>
<tr>
<td>d6 10 00 00</td>
<td>OR MASK = 4310</td>
</tr>
</tbody>
</table>

**4E Response**

A success response from ACR9000

- Source: 172.25.8.23 (672, 0)
- Destination: 172.25.8.29 (672, 0)
- Item Count: 2 (672, 16)
- Item: Connection-based (688, 16)
  - Item Length: 4 (704, 16)
  - Connection Identifier: 0x9b007504 (720, 32)
- Item: Connected Transport packet (752, 16)
  - Item Length: 6 (768, 16)
  - Sequence: 117 (784, 16)
  - Request/Reply: Reply (800, 1)
  - Service Code: 0x4e (801, 7)
  - General Status: Success (816, 8)
  - Additional Status Size (Words): 0 (824, 8)
The following physical frame is the generated NAND/OR Mask Response:

00 00 bc 03 6a d8 00 55 00 16 41 08 00 45 00
00 5a 00 91 00 00 40 06 11 a7 ac 19 08 17 ac 19
08 1d af 12 af 21 3e 34 9f 00 00 70 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 02 00 a1 00 04 00 04 75 00 9b b1 00
06 00 75 00 ce 00 00 00 43 52 43 21

The service for ACR9000 is underlined (above), and breaks down as follows:

<table>
<thead>
<tr>
<th>ce 00</th>
<th>Service code, MASK Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Standard Error Code = Success</td>
</tr>
<tr>
<td>00</td>
<td>Padding</td>
</tr>
</tbody>
</table>

**Binary Move Block — 0x34**

The 0x34 service code lets you send binary moves. To do this, send CIP Generic messages to the ACR9000.

**34 Request**

In the following example, EtherNet/IP sends the following moves to the ACR9000.

- binary move header = 04
- code 0 = 0F
- code 1 = 00
- code 2 =07
- code 3 =01
- axis0 = 100
- axis1 = 200
- axis3 = 300

EtherNet/IP sends the following data:

Source: 172.25.8.29 (672, 0)
Destination: 172.25.8.23 (672, 0)
Item Count: 2 (672, 16)
Item: Connection-based (688, 16)
  Item Length: 4 (704, 16)
  Connection Identifier: 0x80020000 (720, 32)
Item: Connected Transport packet (752, 16)
  Item Length: 30 (768, 16)
  Sequence: 4 (784, 16)
  Request/Reply: Request (800, 1)
The following physical frame is the generated Binary Move Request:

```
00 90 55 00 16 41 00 00 bc 03 6a d8 08 00 45 00
00 72 a1 7e 00 00 40 06 70 a1 ac 7e 00 00 40
08 1f af 12 f2 b5 0a 82 59 29 c5 e3 50 18
11 1c 7a 56 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 02 00 a1 00 04 00 00 02 80 b1 00
1e 00 04 00 34 03 20 01 24 01 30 05 04 0f 00 07
01 00 00 00 64 00 00 00 c8 00 00 00 2c 01 00 00
```

The service for ACR9000 is underlined (above), and breaks down as follows:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Path Length in words</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td></td>
<td>Service code move packet</td>
</tr>
<tr>
<td>03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 01</td>
<td></td>
<td>Class = 1</td>
</tr>
<tr>
<td>24 01</td>
<td></td>
<td>Instance = 1</td>
</tr>
<tr>
<td>30 05</td>
<td></td>
<td>Attribute = 5</td>
</tr>
<tr>
<td>04</td>
<td></td>
<td>Binary move header</td>
</tr>
<tr>
<td>0f</td>
<td></td>
<td>Header code 0</td>
</tr>
<tr>
<td>00</td>
<td></td>
<td>Header code 1</td>
</tr>
<tr>
<td>07</td>
<td></td>
<td>Header code 2</td>
</tr>
<tr>
<td>01</td>
<td></td>
<td>Header code 3</td>
</tr>
<tr>
<td>00 00 00</td>
<td></td>
<td>Byte Padding</td>
</tr>
<tr>
<td>64 00 00 00</td>
<td></td>
<td>Axis0 Target Point</td>
</tr>
<tr>
<td>c8 00 00 00</td>
<td></td>
<td>Axis1 Target Point</td>
</tr>
<tr>
<td>2c 01 00 00</td>
<td></td>
<td>Axis2 Target Point</td>
</tr>
</tbody>
</table>

**34 Response**

EtherNet/IP sends the following data:

- **Source:** 172.25.8.23 (672, 0)
- **Destination:** 172.25.8.29 (672, 0)
- **Item Count:** 2 (672, 16)
- **Item:** Connection-based (688, 16)
  - **Item Length:** 4 (704, 16)
  - **Connection Identifier:** 0x3800a604 (720, 32)
- **Item:** Connected Transport packet (752, 16)
  - **Item Length:** 6 (768, 16)
  - **Sequence:** 4 (784, 16)
  - **Request/Reply:** Reply (800, 1)
  - **Service Code:** 0x34 (801, 7)
  - **General Status:** Success (816, 8)
  - **Additional Status Size (Words):** 0 (824, 8)
The following physical frame is the generated Binary Move Response:

```
00 00 bc 03 6a d8 00 90 55 00 16 41 08 00 45 00
00 5a 00 1e 00 00 40 06 12 1a ac 19 08 17 ac 19
08 1d af 12 af 13 59 29 c5 e3 f2 b5 0a cc 50 10
3e 80 cb 8c 00 00 70 00 1a 00 00 00 00 00 00 00 00
00 00 00 02 00 a1 00 04 00 04 a6 00 38 b1 00
06 00 04 00 b4 00 00 00 43 52 43 21
```

The service for ACR9000 is underlined (above), and breaks down as follows:

<table>
<thead>
<tr>
<th>b4 00</th>
<th>Service code move Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Standard Error Code = Success</td>
</tr>
<tr>
<td>00</td>
<td>Padding</td>
</tr>
</tbody>
</table>

**Float Read—0x48**

The 0x48 service codes lets you access 32-bit register with the data type real. This object can read any P-parameter in ACR9000 with the data type float. You can also use it for multiple-block reads. This is an efficient method to read a contiguous block of P-parameters. You can write 1-16 elements.

**48 Request**

In the following example, EtherNet/IP reads P6152 on the ACR9000.

EtherNet/IP sends the following data:

- **Source**: 172.25.8.61
- **Destination**: 172.25.8.23
- **Item Count**: 2
- **Item**: Connection-based
  - **Item Length**: 4
  - **Connection Identifier**: 0x00000002
- **Item**: Connected Transport packet
  - **Item Length**: 14
  - **Sequence**: 3
  - **Request/Reply**: Request
  - **Service Code**: 0x48
  - **Path Size (Words)**: 4
  - **Path**: 0x91 05 50 36 31 35 32 00
  - **Segment**: Symbolic, one byte version
    - **Length**: 5
    - **Symbolic Data**: P6152
    - **Pad Byte**: 0x00

**Data**:

- **Hex**: 0x 01 00
- **ASCII**: I/O Data Connections - 15 -
The following physical frame is the generated Float Read Request:

```
00 90 55 00 16 41 00 20 ab 1b 02 45 08 00 45 00
00 62 01 c5 00 00 40 06 10 4b ac 19 08 3d ac 19
08 17 5c 5e af 12 02 3c b9 93 15 16 58 fa 50 18
16 d0 6e 55 00 00 70 00 22 00 00 45 01 d9 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 02 00 a1 00 04 00 02 00 00 00 b1 00
0e 00 03 00 48 04 91 05 50 36 31 35 32 00 01 00
43 52 43 21
```

The service for ACR9000 is underlined (above), and breaks down as follows:

<table>
<thead>
<tr>
<th>48</th>
<th>Service code Read Float Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>Path Length in words</td>
</tr>
<tr>
<td>91</td>
<td>Symbolic Tag</td>
</tr>
<tr>
<td>05</td>
<td>Tag Length in bytes</td>
</tr>
<tr>
<td>50 36 31 35 32</td>
<td>Float Parameter number p6152</td>
</tr>
<tr>
<td>00</td>
<td>Padding</td>
</tr>
<tr>
<td>01</td>
<td>Length</td>
</tr>
<tr>
<td>00</td>
<td>Padding</td>
</tr>
</tbody>
</table>

**48 Response**

In the following example, EtherNet/IP reads P6152 on the ACR9000. EtherNet/IP sends the following data:

- **Source**: 172.25.8.23
- **Destination**: 172.25.8.61
- **Item Count**: 2
- **Item**: Connection-based
  - **Item Length**: 4
  - **Connection Identifier**: 0x00000001
- **Item**: Connected Transport packet
  - **Item Length**: 10
  - **Sequence**: 3
  - **Request/Reply**: Reply
  - **Service Code**: 0x48
  - **General Status**: Success
  - **Additional Status Size (Words)**: 0

**Data**:

- **Hex**: 0x00 00 00 00
- **ASCII**

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The following physical frame is the generated Float Read Response:

00 20 ab 1b 02 45 00 90 55 00 16 41 08 00 45 00
00 5e 23 a2 00 00 40 06 ee 71 ac 19 08 17 ac 19
08 3d af 12 5c 5e 15 16 58 fa 02 3c b9 cd 50 10
3e 80 14 ec 00 00 70 00 1e 00 00 45 01 d9 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 02 00 a1 00 04 00 01 00 00 00 b1 00
0a 00 03 00 00 00 00 00 00 00 00 00 00 00 00 00

The service for ACR9000 is underlined (above), and breaks down as follows:

<table>
<thead>
<tr>
<th>c8 00</th>
<th>Service code, Read Table Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Standard Error Code = Success</td>
</tr>
<tr>
<td>00</td>
<td>Padding</td>
</tr>
<tr>
<td>00 80 42 45</td>
<td>Float Data Read</td>
</tr>
</tbody>
</table>

### Generic Binary Packets

You can use the standard binary packets, as defined in the ACR User Guide, to communicate. The following standard, ACR binary packets can be encapsulated in the generic Ethernet/IP service code:

- Write
- Set Long
- Set Float
- Mask
- Move
- Set/Clear
- FOV/ROV

For more information about the binary host interface for ACR series controllers, see the ACR Series User’s Guide.