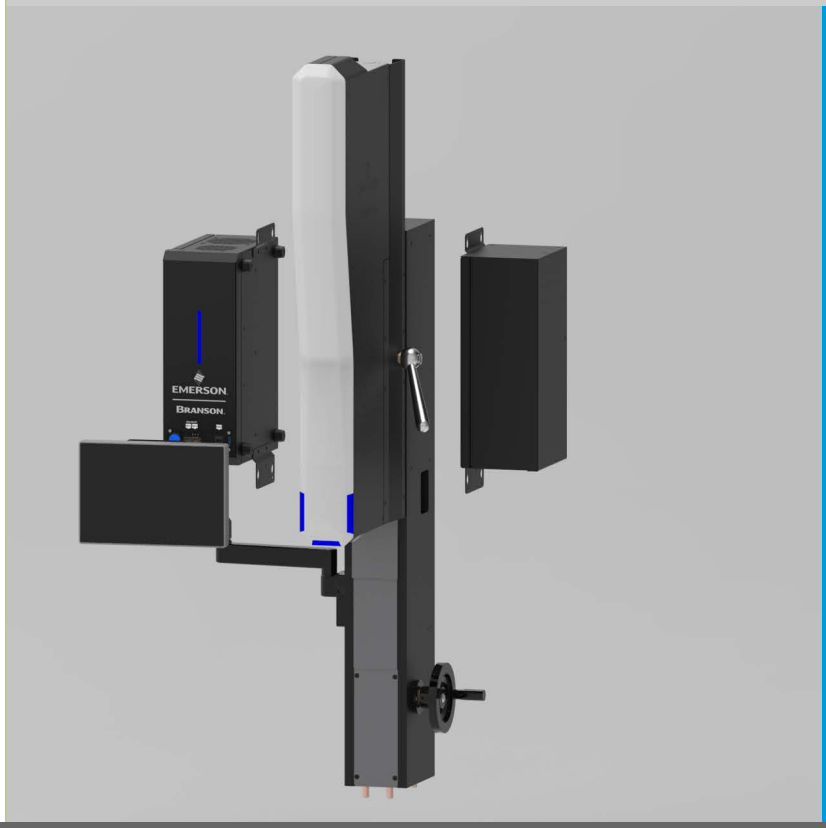
Original Instructions
BU-4001304 - REV. 00

EMERSON



GSX-E1
EtherNet/IP

User Guide

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BRANSON

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Manual Change Information

At Branson, we strive to maintain our position as the leader in ultrasonics plastics joining, metal welding, cleaning and related technologies by continually improving our products. These improvements are incorporated as soon as they are developed and thoroughly tested.

This User Guide is supplemental to and should be used in conjunction with the documentation set for the GSX-E1 system.

Information concerning any improvements will be added to the appropriate technical documentation at its next revision. Therefore, when requesting service assistance for specific units, note the revision information found on this document.

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Chapter 1: EtherNet/IP Overview

1.1 Introduction

This user guide describes the implementation of a GSX-E1 welding system within an EtherNet/IP network. The guide provides an overview of the specifications, EDS installation, I/O and messaging structures, and programming examples with timing charts.

The GSX-E1 provides standard EtherNet/IP communication over an industrial network and is fully ODVA conformant. Both real-time implicit and asynchronous explicit messaging are supported. Control and status updates are communicated cyclically via implicit messaging. Explicit messaging can be used to obtain the end-of-weld-result attributes and to configure the weld recipe parameters.

The examples provided in this guide were developed using Rockwell Automation's Studio 5000 Logix Designer® Version 32 and CompactLogix L16ER®.

1.2 Network Settings

NOTICE	
	This section provides the basic steps for configuring the network settings of the GSX-E1 system for installation on an Ethernet network. The actual process may require additional steps by your network administrator, depending on the requirements of your specific network configuration.

1.2.1 Communication Specifications

The data below applies to the GSX-E1 EtherNet/IP system. The GSX-E1 EtherNet/IP system is ODVA conformant and meets the requirements outlined in the CIP specifications Volumes 1 and 2.

Table 1.1 Default Network Settings

Description		Specification
Default IP Address		192.168.0.100
Connection Topology		Star, Linear, Ring, and Hybrid
Transmission Types		Unicast and Broadcast
Transmission Rate		10 and 100 Mbps Integrated Switch
Transmission Cable		Cat-6 Shielded
Implicit I/O Data	Connection Type	Exclusive Owner
	Cyclical Time	1 ms minimum
	Class 1 Connections	5
Explicit Messaging	Class 3 Connections	10
	UCMM Connections	10

1.3 LED Status Indicator

To get a fast overview about the status of the GSX-E1 EtherNet/IP system, three LEDs are placed on the front of the unit. The subsequent table describes the meaning of the LEDs.

Figure 1.1 LED Status Indicator

Table 1.2 GSX-E1 EtherNet/IP System LED Status Indicator

LED	Color	State	Description
NS	Green	On	**Connected:** If the device has at least one established connection, the network status indicator will be steady green.
	Green	Flashing	**No connection:** If the device has no established connections, but has obtained an IP address, the network status indicator will be flashing green.
	Red	On	**Duplicate IP:** If the device has detected that its IP address is already in use, the network status indicator will be steady red.
	Red	Flashing	**Connection timeout:** If one or more of the connections in which this device is the target has timed out, the network status indicator will be flashing red.
	Green/Red	Flashing	**Self-test:** While the device is performing its power up testing, the network status indicator will be flashing green/ red.
	-	Off	**Not powered, no IP address:** If the device does not have an IP address or is powered off, the network status indicator will be off.

Table 1.2 GSX-E1 EtherNet/IP System LED Status Indicator

LED	Color	State	Description
MS	Green	On	**Device operational:** If the device is operating correctly, the module status indicator will be steady green.
	Green	Flashing	**Standby:** If the device has not been configured, the module status indicator will be flashing green.
	Red	On	**Major fault:** If the device has detected a non-recoverable major fault, the module status indicator will be steady red.
	Red	Flashing	**Minor fault:** If the device has detected a recoverable minor fault, the module status indicator will be flashing red. An incorrect or inconsistent configuration would be considered a minor fault.
	Green/Red	Flashing	**Self-test:** While the device is performing its power up testing, the module status indicator will be flashing green/ red.
	-	Off	**No power:** If no power is supplied to the device, the module status indicator will be steady off.
SYS	Green	On	Operating System running.
	Green/Yellow	Blinking green/ yellow	Bootloader is waiting for firmware.
	Yellow	Static	Bootloader is waiting for software.
	-	Off	Power supply for the device is missing or hardware defect.

1.4 Configuring The GSX-E1 EtherNet/IP Network Settings

The GSX-E1 IP settings for EtherNet/IP is found in the **GSX SYSTEM > DATA > ETHERNET IP Config** screen. The IP Address, Subnet Mask, and Gateway settings can be changed here.

NOTICE	
	An Ethernet cable connection between the GSX-E1 EtherNet/IP system and a PC or PLC is required before the IP Address can be viewed or modified. After making changes to the network settings, the GSX-E1 EtherNet/IP system must be power-cycled for the changes to take effect.

Figure 1.2 Configuring Network Settings

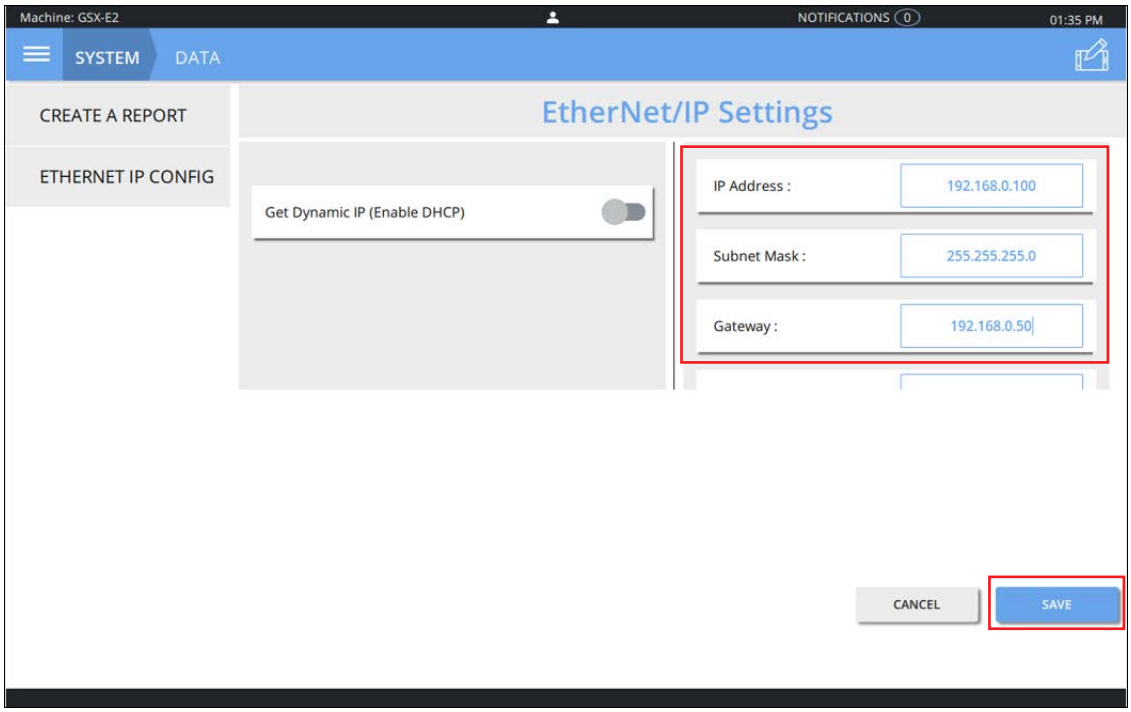


Table 1.3 Configuring The GSX-E1 EtherNet/IP Network Settings

Step	Instructions
1	From the main menu, go to **System > Data > EtherNet/IP Configuration**.
2	Change the network settings as needed for compatibility with your network configuration.
3	Press the **Save** button to save the new settings.
4	Turn off the GSX-E1 EtherNet/IP system, wait a few moments, and then turn power back on.

Table 1.4 Default Network Settings

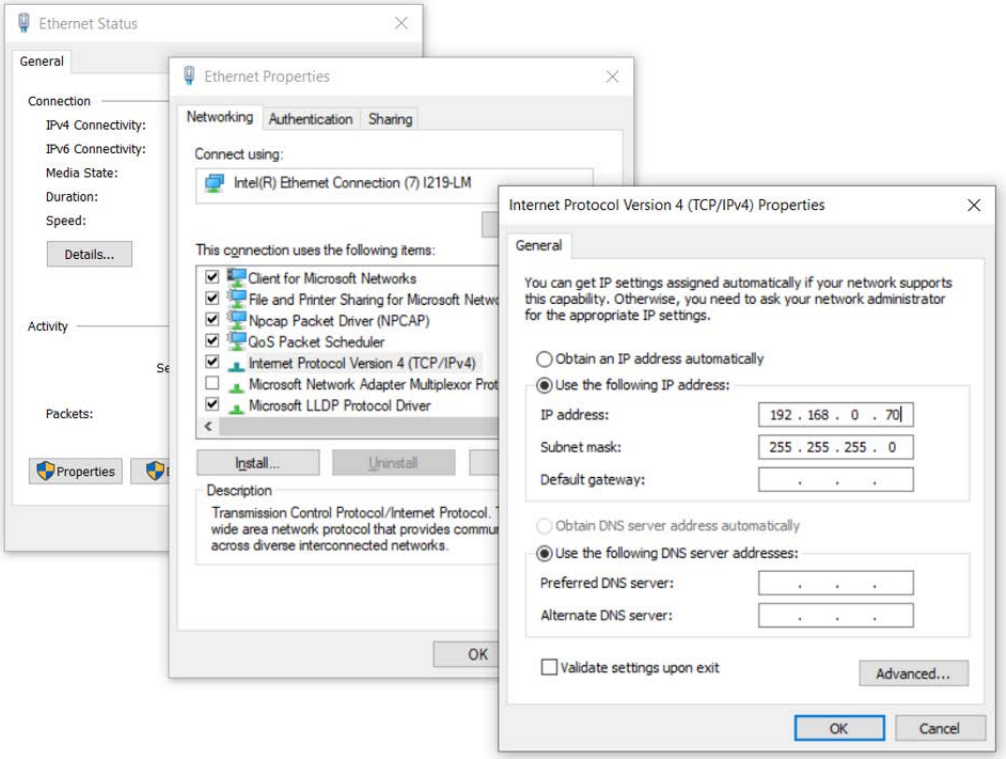
Setting	Default
Get Dynamic IP (Enable DHCP)	Disabled
IP Address	192.168.1.100
Subnet Mask	255.255.255.0
Gateway	0.0.0.0
Name Server	0.0.0.0
Name Server 2	0.0.0.0
Domain Name	-

1.5 GSX-E1 EtherNet/IP Connectivity Testing

After the GSX-E1 EtherNet/IP IP address is set, connectivity can be tested using the PC/Laptop Ping Command Prompt. Before testing, the PC/Laptop's Ethernet IP must be set to the same subnet as the GSX-E1 EtherNet/IP address.

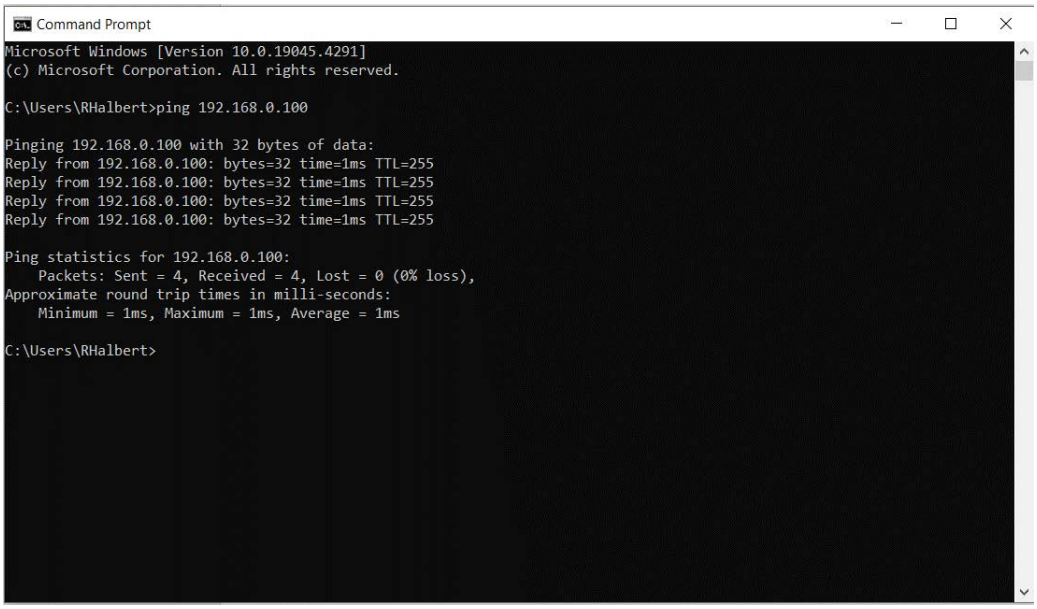
1.5.1 Configuring the PC/Laptop For Testing

Table 1.5 Configuring the PC/Laptop For Testing

Step	Instructions
1	Connect an Ethernet cable between the GSX-E1 EtherNet/IP port and the PC/Laptop RJ45 Ethernet port. A USB to Ethernet Adapter may be required if the PC/Laptop does not provide an RJ45 port.
2	Set the Static IP Address for the PC/Laptop: a. Go to Settings > Network & Internet > Change Adapter Options b. Double click on the Local Area Network icon and select Properties c. Double click on Internet Protocol Version 4 (TCP/IPv4) d. Change the last octet of the IP address to be different than the GSX-E1 setting. For example, if the GSX-E1 is 192.168.0.100, set the PC/Laptop to 192.168.0.70 e. Set the Subnet Mask to 255.255.255.0 f. Select OK and Close **Figure 1.3** Configuring the PC/Laptop For Testing 

1.5.2 Using Ping For Connectivity Testing

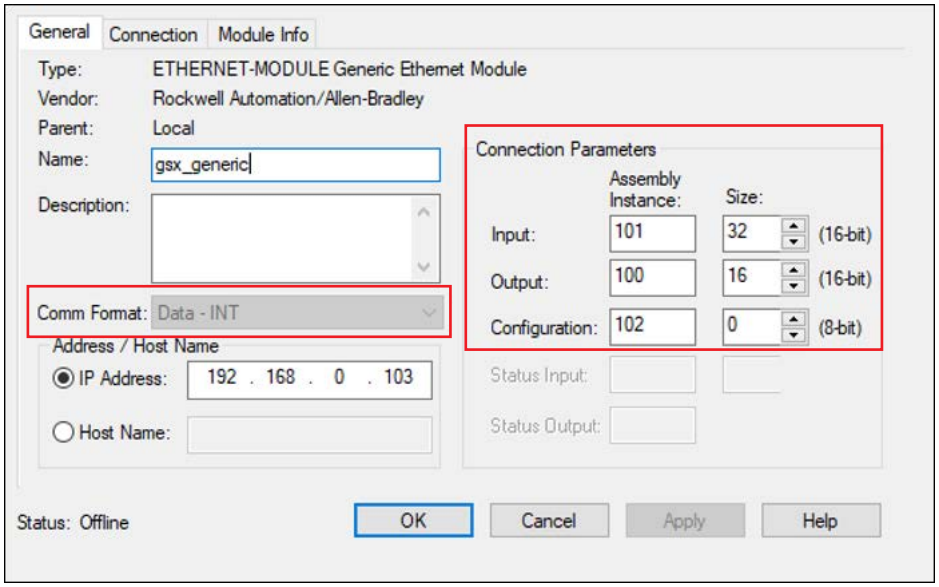
Table 1.6 Using Ping For Connectivity Testing

Step	Instructions
1	In the Windows Start Menu type "cmd" to bring up the Command Prompt and open it.
2	In the Command Prompt type: Ping (IP Address of the GSX-E1 EtherNet/IP), e.g. Ping 192.168.0.100
3	Review the results. a. If "Reply from" is received, the connectivity is good b. If "Request timed out" is received, no connection was made: - Verify GSX-E1 IP setting - Verify the PC/Laptop IP setting - Verify a good cable connection between the GSX-E1 and PC/Laptop - Power cycle the GSX-E1 - Repeat ping command until a "Reply from" is established **Figure 1.4** Using Ping For Connectivity Testing 

1.6 GSX-E1 Generic Ethernet Module

The configuration for using the Generic Ethernet Module is shown below.

Figure 1.5 GSX-E1 Generic Ethernet Module



NOTICE	
	The **Comm Format** must be set for **Data-INT**. REAL formatted data type is not available when using the Generic Ethernet Module.

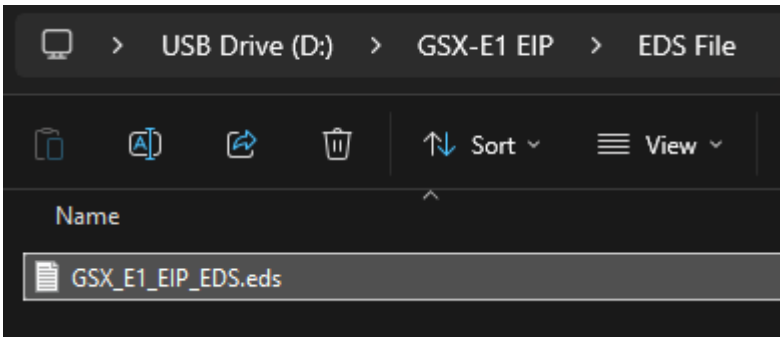
1.7 GSX-E1 Electronic Data Sheet (EDS) File

An EDS file is included in the GSX's USB asset documents (**GSX_E1_EIP_EDS.eds**). The EDS file allows the programmer to quickly identify the GSX-E1 I/O tags.

You can also download the EDS file from the following link:

https://marketplace.odva.org/products/2633-gsx-e1-eip

Figure 1.6 Electronic Data Sheet (EDS) File



NOTICE	
	The instructions for installation apply to Studio 5000 Logix Designer®.

Table 1.7 EDS Installation Instructions

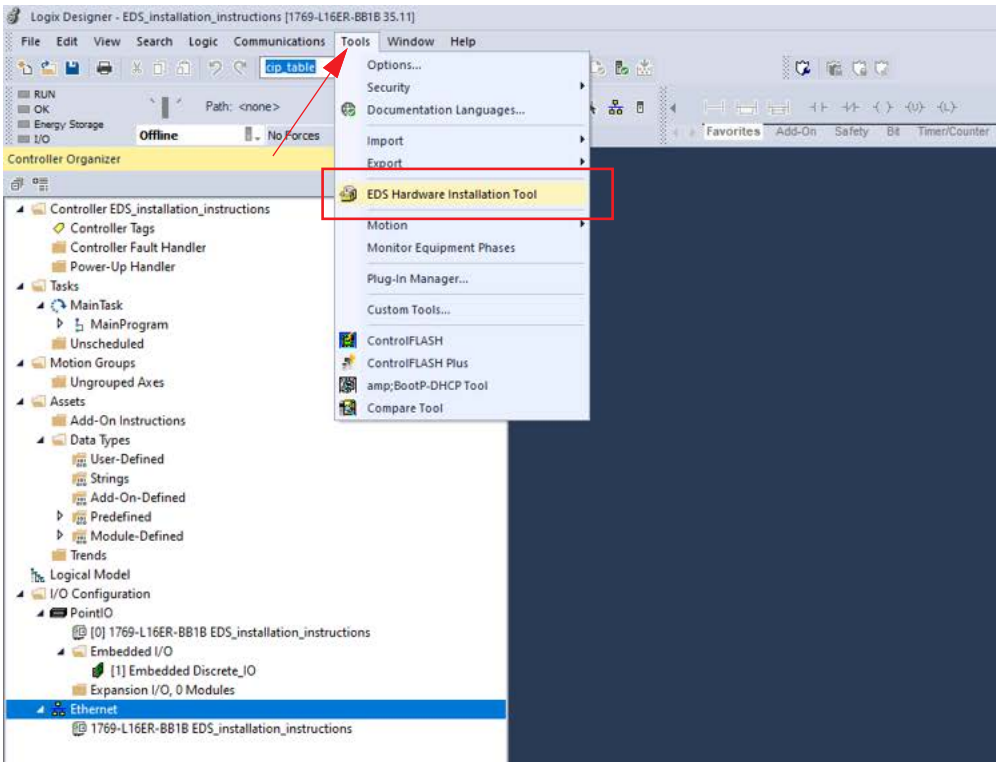
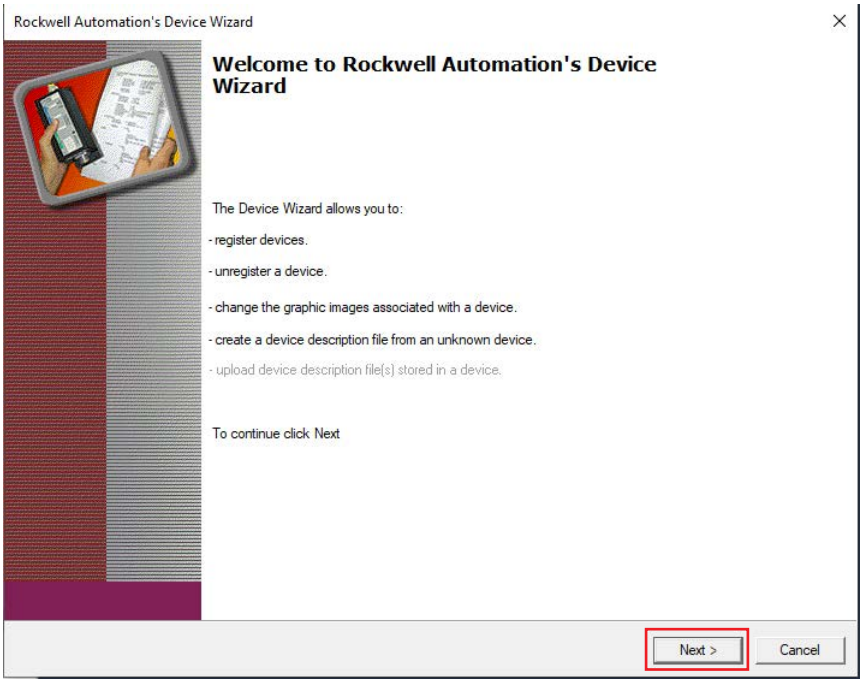
Step	Instructions
1	In the **Tools** pull down menu, select **EDS Hardware Installation Tool**. 
2	Select **Next**. 

Table 1.7 EDS Installation Instructions

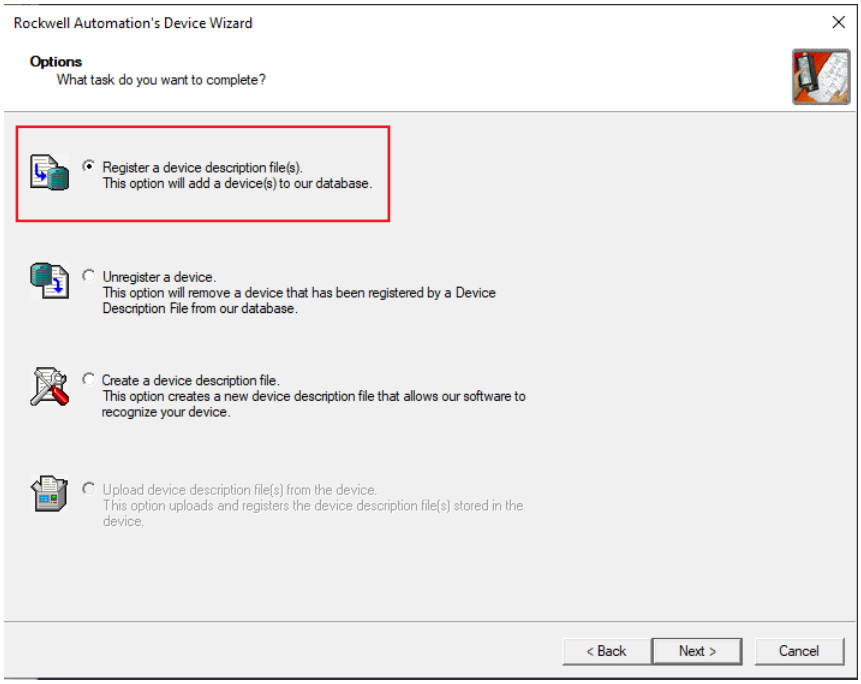
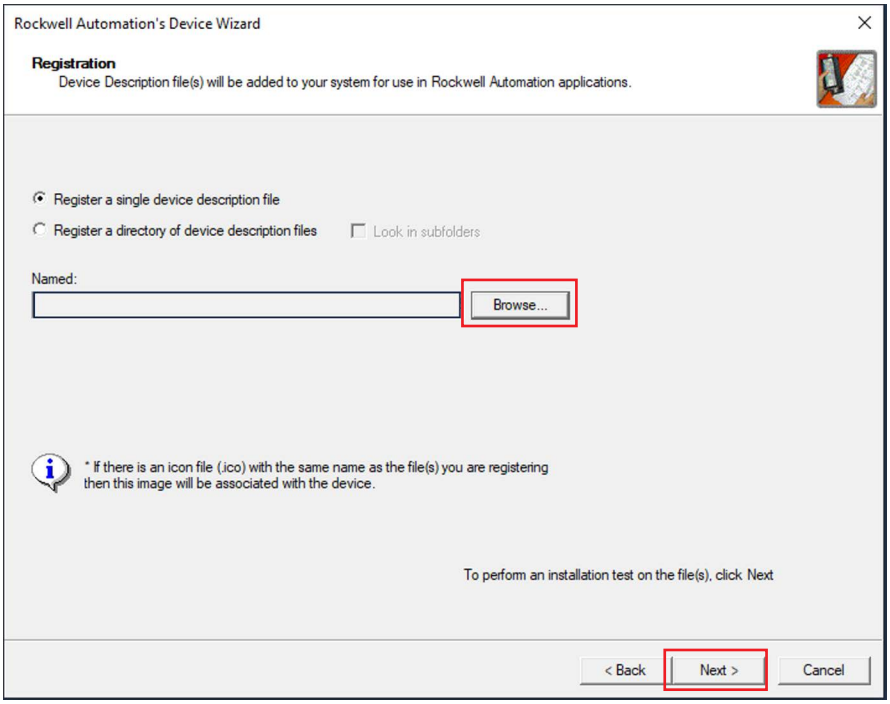
Step	Instructions
3	Select **Register a device description file(s),** then **Next**. 
4	Select **Register a single device description file**. Browse to the location of the EDS file on the computer and select **Next** until the prompts end. 

Table 1.7 EDS Installation Instructions

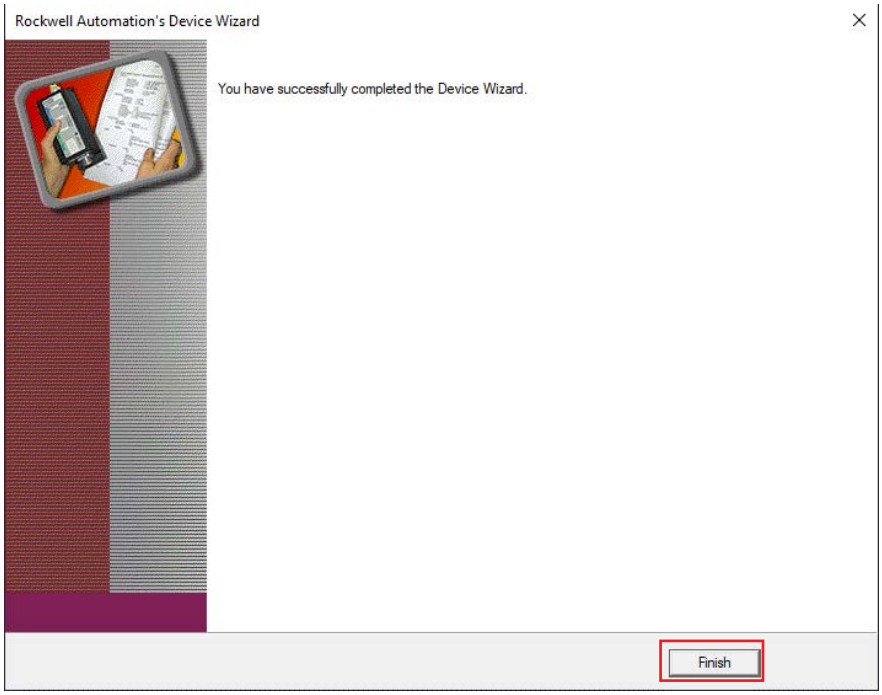
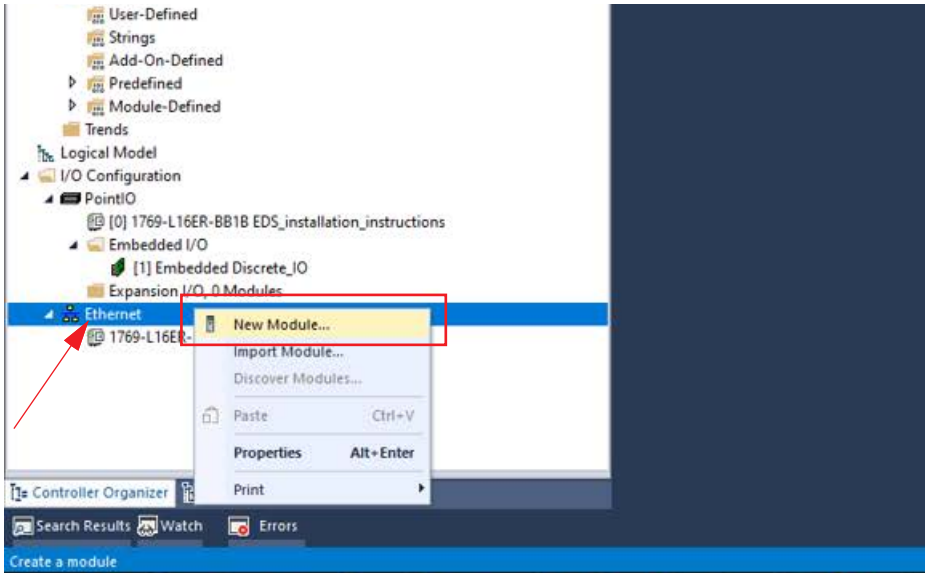
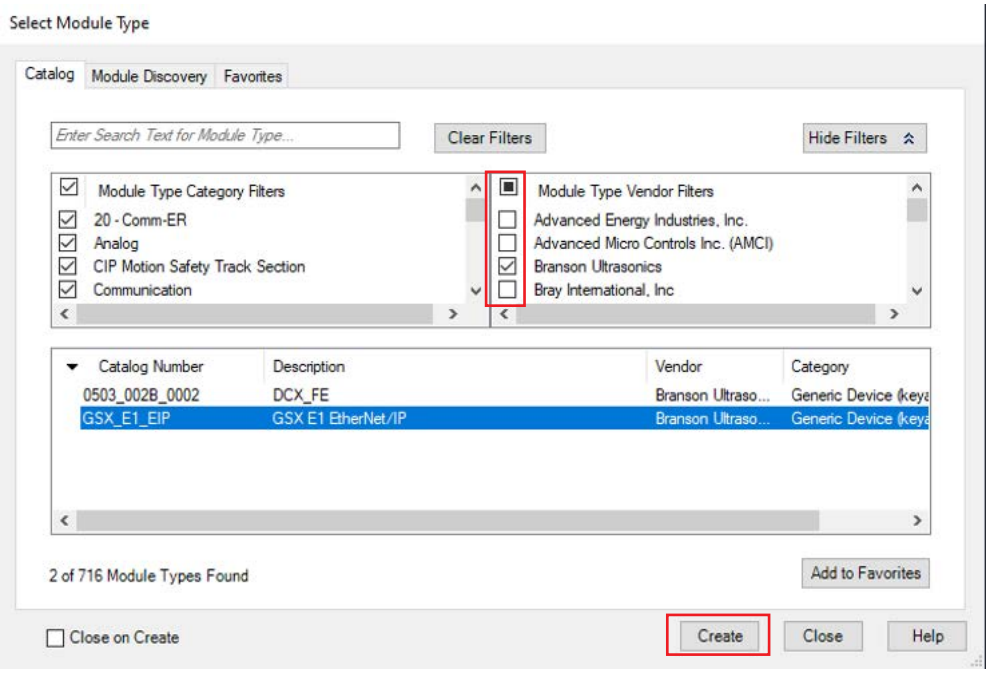
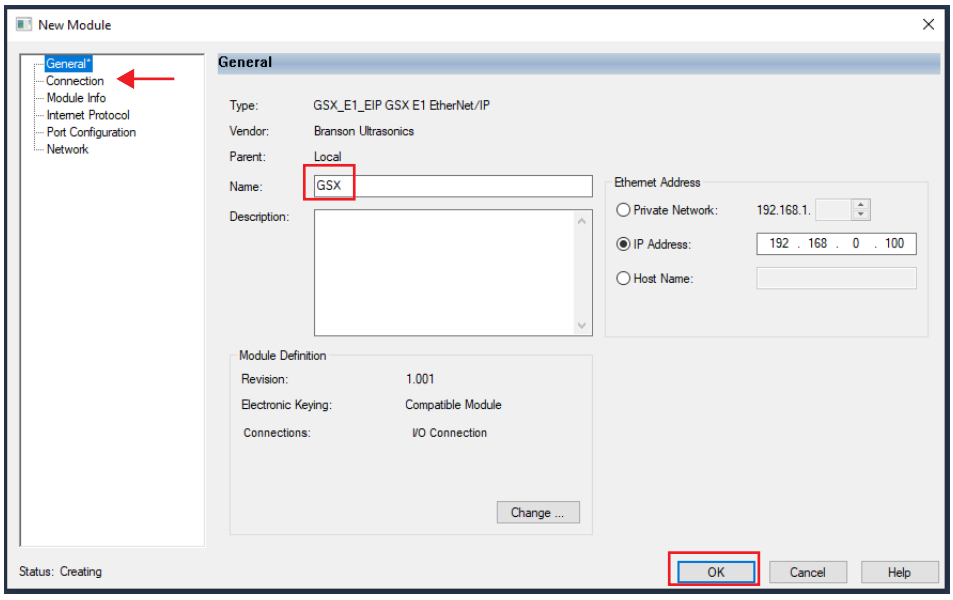
Step	Instructions
5	Select **Finish** to complete. 
6	Right click on the Ethernet icon and select **New Module**. 

Table 1.7 EDS Installation Instructions

Step	Instructions
7	Uncheck **Module Type Vendor Filters** and check **Branson Ultrasonics**. Select **GSX_E1_EIP** from the **Catalog Number** list, then **Create**. 
8	Enter a Name and IP address. The Default IP address is 192.168.0.100. The RPI settings can be changed in the connection menu. Select **OK** and **Close** to complete. The GSX-E1 I/O are now part of the controller tags. 

1.7.1 EDS Module Input and Output Controller Tags

Input and output tags with description and logic or numerical range values.

Table 1.8 EDS Module Input Tags

Tag Name	Data Type	Logic/Value Range
ConnectionFaulted	BOOL	-
Emergency_Stop_Active	BOOL	1 = Emergency Stop active
Ready_State	BOOL	1 = GSX is in ready state
Ultrasonics_Active	BOOL	1 = Ultrasonics active
Cycle_OK	BOOL	1 = No alarms at end of weld cycle
Cycle_Active	BOOL	1 = Weld cycle running
Seek_Active	BOOL	1 = Seek is active
Weld_Active	BOOL	1 = Ultrasonics active in weld cycle
Hold_Active	BOOL	1 = Hold state active in weld cycle
Home_Position	BOOL	1 = Horn at home position
Ready_Position	BOOL	1 = Horn at ready position
PB_Release	BOOL	1 = Start switches can be opened
General_Alarm	BOOL	1 = General alarm active
Setup_Mode	BOOL	1 = Setup mode is active
Validated_Recipe	BOOL	1 = Recipe is validated
Find_Part_Contact_Active	BOOL	1 = Find part contact active
Active_Recipe_Number	INT	Recipe number active
Amplitude_Output	INT	Horn output amplitude: 0 - 100
Current	INT	RF current: 0 - 100
Phase	INT	RF phase: -90 - +90
Frequency	DINT	RF frequency: 19500 - 41000
Time	DINT	Total cycle time: milliseconds
Energy	DINT	Ultrasonic weld energy: millijoules
Force	REAL	Actuator force: Newtons or lbs
Velocity	REAL	Actuator velocity: micrometers/sec or inches/sec
Absolute_Distance	REAL	Absolute actuator travel distance: micrometers or inches
Collapse_Distance	REAL	Weld collapse distance: micrometers or inches
Last_Active_Alarm_ID	DINT	Alarm number: see table

Table 1.9 EDS Module Output Tags

Tag Name	Data Type	Logic
Disable_U_S	BOOL	Set_Active_Recipe
Go_Home_Position	BOOL	1 = Configure to send horn to home position
Go_Ready_Position	BOOL	1 = Configure to send horn to ready position
Enable_Stack_Function	BOOL	See Stack Function table
SFCT0	BOOL	
SFCT1	BOOL	
SFCT2	BOOL	
Reset_Alarm	BOOL	1 = Clear alarms
Cycle_Abort	BOOL	1 = Aborts weld cycle
Ground_Detect	BOOL	1 = Horn to fixture contact is detected
Enable_Actuator_Function	BOOL	See Actuator Function table
ACFT0	BOOL	
ACFT1	BOOL	
ACFT2	BOOL	
Set_Active_Recipe	INT	Recipe number requested

Table 1.10 Stack Function

Tag Name	Frequency Seek
Enable_Stack_Function	1
SFCT0	0
SFCT1	0
SFCT2	0

Table 1.11 Actuator Function

Tag Name	Find Part Contact
Enable_Actuator_Function	1
ACFT0	0
ACFT1	0
ACFT2	0

1.8 Ladder Examples Using Implicit Messaging

1.8.1 Basic Weld Program

The below program runs a weld cycle for the active recipe. The output - Local: 1:O.Data.8 energizes an external DPST relay for the start switches to the GSX-E1 Actuator.

Figure 1.7 Basic Weld Program

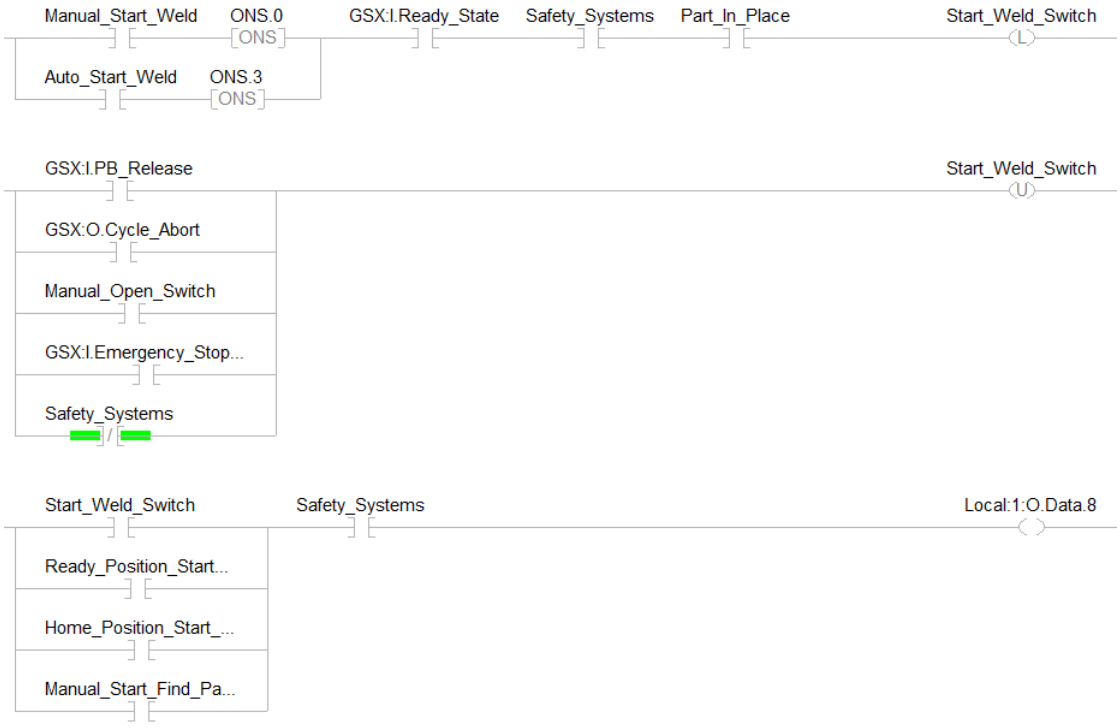


Table 1.12 Basic Weld Program

Controller/Local Tags	Description	Logic
GSX:I.Ready_State	GSX system is in a ready to run state.	1 = GSX is in ready state
GSX:I.PB_Release	Palm Button Release - The start switches can be opened in the weld cycle.	1 = Start switches can be opened
GSX:O.Cycle_Abort	Abort weld cycle.	1 = Aborts weld cycle
GSX:I.Emergency_Stop_Active	Emergency stop is active.	1 = Emergency Stop active
Local:1:O.Data.8	Digital Output of PLC.	1 = 24 VDC
Manual_Start_Weld	Manually initiate a weld cycle.	1 = Start weld cycle
Part_In_Place	The part to be welded is in the nest and ready for welding.	1 = Part is ready
Auto_Start_Weld	Automatic cycle initiates a weld cycle.	1 = Start weld cycle
Manual_Open_Switch	Manual unlatch the Start_Switch bit.	1 = Unlatch Start_Weld_Switch

Table 1.12 Basic Weld Program

Controller/Local Tags	Description	Logic
Safety_Systems	Safety systems around the GSX and machine.	1 = Safe condition to run GSX
Start_Weld_Switch	Latch/Unlatch Start_Weld_Switch bit to close the external start switches.	1 = Start weld switch active
Ready_Position_Start_Switch	Ready_Position_Start_Switch bit to close the external start switches.	1 = Ready start switch active
Home_Position_Start_Switch	Home_Position_Start_Switch bit to close the external start switches.	1 = Home start switch active
Manual_Start	Manual switch to close start switch.	1 = Manual start active

1.8.2 Go To Ready Position Program

The below program moves the carriage to the ready position before welding. The output - Local: 1:O.Data.8 energizes an external DPST relay for the start switches to the GSX-E1 Actuator.

Figure 1.8 Go To Ready Position Program

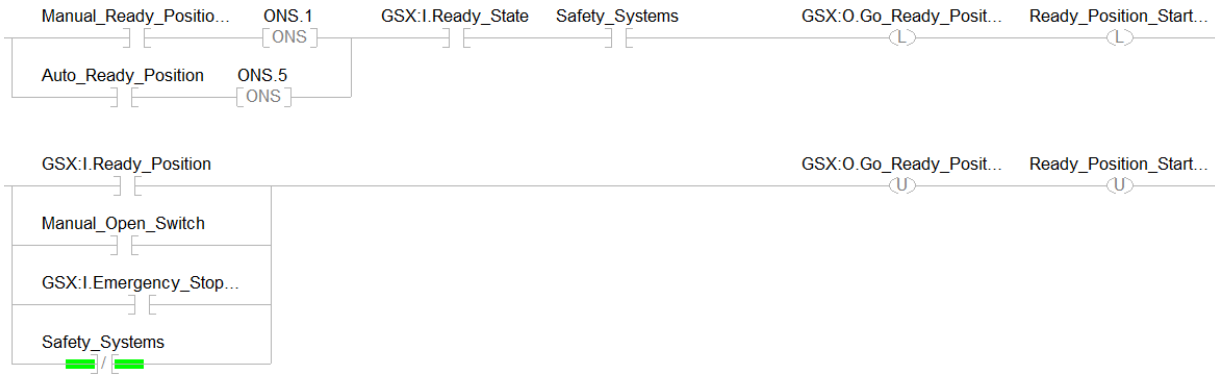


Table 1.13 Go To Ready Position Program

Controller/Local Tags	Description	Logic
GSX:I.Ready_State	GSX system is in a ready to run state.	1 = GSX is in ready state
GSX:O.Go_Ready_Position	Go to Ready Position - Commands to send the horn to ready position when the start switches are closed.	1 = Configure to send horn to ready position
GSX:I.Ready_Position	Ready Position - The horn is at the ready position.	1 = Horn at ready position
GSX:I.Emergency_Stop_Active	Emergency stop is active.	1 = Emergency Stop active
Local:1:O.Data.8	Digital Output of PLC.	1 = 24 VDC
Manual_Ready Position	Manually initiate go to ready position.	1 = Start movement to position
Ready_Position_Start_Switch	Latch/Unlatch Start_Switch bit to close the external start switches.	1 = Start switch active
Auto_Ready_Position	Automatic cycle initiates go to ready position.	1 = Start movement to position
Manual_Open_Switch	Manual unlatch.	1 = Unlatch Go_Ready_Position and Ready_Position_Start_Switch
Safety_Systems	Safety systems around the GSX and machine.	1 = Safe condition to weld

1.8.3 Go To Home Position Program

The below program moves the carriage to the home position for service and tool maintenance. The output - Local: 1:O.Data.8 energizes an external DPST relay for the start switches to the GSX-E1 Actuator.

Figure 1.9 Go To Home Position Program

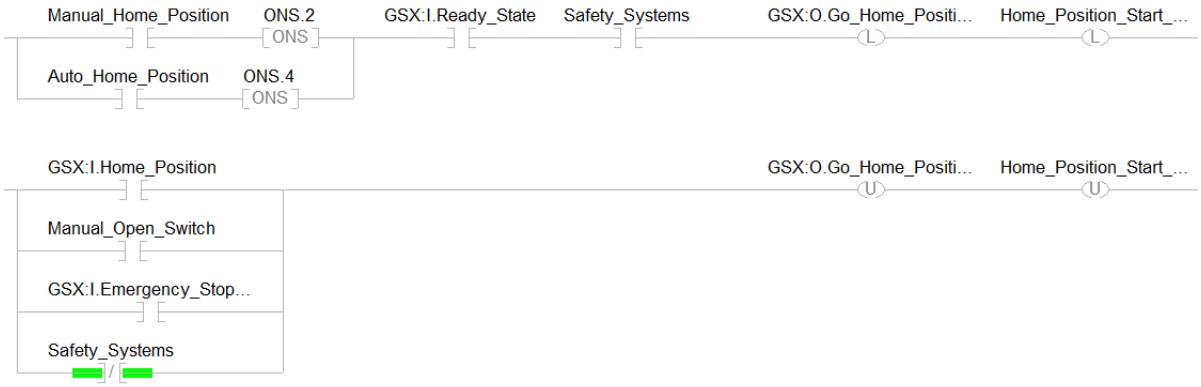


Table 1.14 Go To Home Position Program

Controller/Local Tags	Description	Logic
GSX:I.Ready_State	GSX system is in a ready to run state.	1 = GSX is in ready state
GSX:O.Go_Home_Position	Go to Home Position - Commands to send the horn to home position when the start switches are closed.	1 = Configure to send horn to home position
GSX:I.Home_Position	Ready Position - The horn is at the ready position.	1 = Horn at home position
GSX:I.Emergency_Stop_Active	Emergency stop is active.	1 = Emergency Stop active
Local:1:O.Data.8	Digital Output of PLC.	1 = 24VDC
Manual_Home_Position	Manually initiate go to home position.	1 = Start movement to position
Home_Position_Start_Switch	Latch/Unlatch Start_Switch bit to close the external start switches	1 = Start switch active
Auto_Home_Position	Automatic cycle initiates go to home position.	1 = Start movement to position
Manual_Open_Switch	Manual unlatch.	1 = Unlatch Go_Ready_Position and Ready_Position_Start_Switch
Safety_Systems	Safety systems around the GSX and machine.	1 = Safe condition to weld

1.8.4 Reset, Disable Ultrasonics, Find Part Contact, Frequency Seek Program

The below program example illustrates using implicit messaging for resetting alarms, disabling ultrasonics during a weld (dry weld), activating a frequency seek, and enabling find part contact.

Figure 1.10 Reset, Disable Ultrasonics, Find Part Contact, Frequency Seek Program

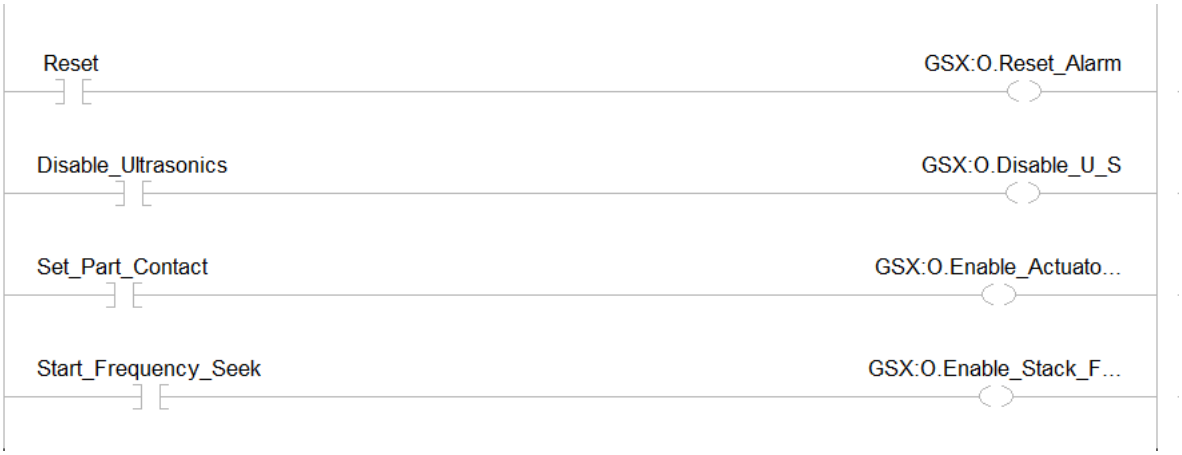


Table 1.15 Reset, Disable Ultrasonics, Find Part Contact, Frequency Seek Program

Controller/Local Tags	Description	Logic
Reset	Clears and resets GSX alarms.	1 = Clear alarms
GSX:O.Reset_Alarm	Clears and resets GSX alarms.	1 = Clear alarms
Disable_Ultrasonics	Disable ultrasonics during the weld cycle.	1 = Disable ultrasonics
GSX:O.Disable_U_S	Disable ultrasonics during the weld cycle.	1 = Disable ultrasonics
Set_Part_Contact	Enable find part contact.	1 = Enable find part contact
GSX:O.Enable_Actuator_Function	Enable find part contact.	1 = Enable find part contact
Start_Frequency_Seek	Active ultrasonic seek.	1 = Active ultrasonic seek
GSX:O.Enable_Stack_Function	Active ultrasonic seek.	1 = Active ultrasonic seek

1.8.5 Using Implicit Messaging for Find Part Contact

When performing find part contact using EtherNet/IP I/O, the PB_Release does not change state and the Ready_State bit goes false.

In the program example, once the Enable_Acuator_Function is true, the Manual_Start bit must be continuously set for the duration of the find part contact cycle. The output Local: 1:O.Data.8 entergizes an external DPST relay, acting as the start switch for the GSX Actuator.

NOTICE	
	When find part contact is complete, the recipe must be saved manually using the HMI or remotely using the save recipe message.

1.9 Explicit Messaging for End of Weld Results

Asynchronous explicit messaging is supported.

1.9.1 Get Messaging for End of Weld Results

The End of Weld Results data can be requested when the Ready Position bit transitions from false to true.

The below example program messages to get the End of Weld Results for weld time and energy.

Object Class = 0x88

Instance = 1

Weld Time Attribute = 0x10

Weld Energy Attribute = 0x11

Figure 1.11

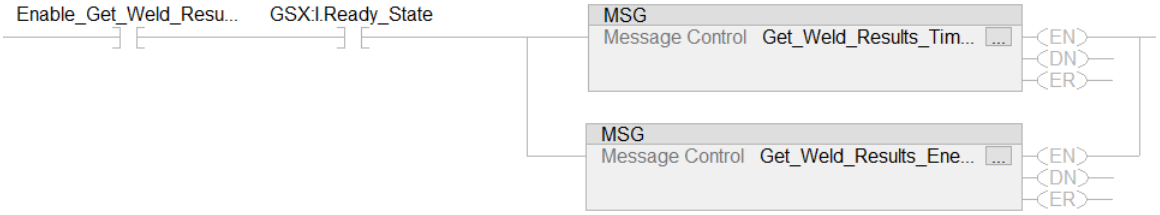
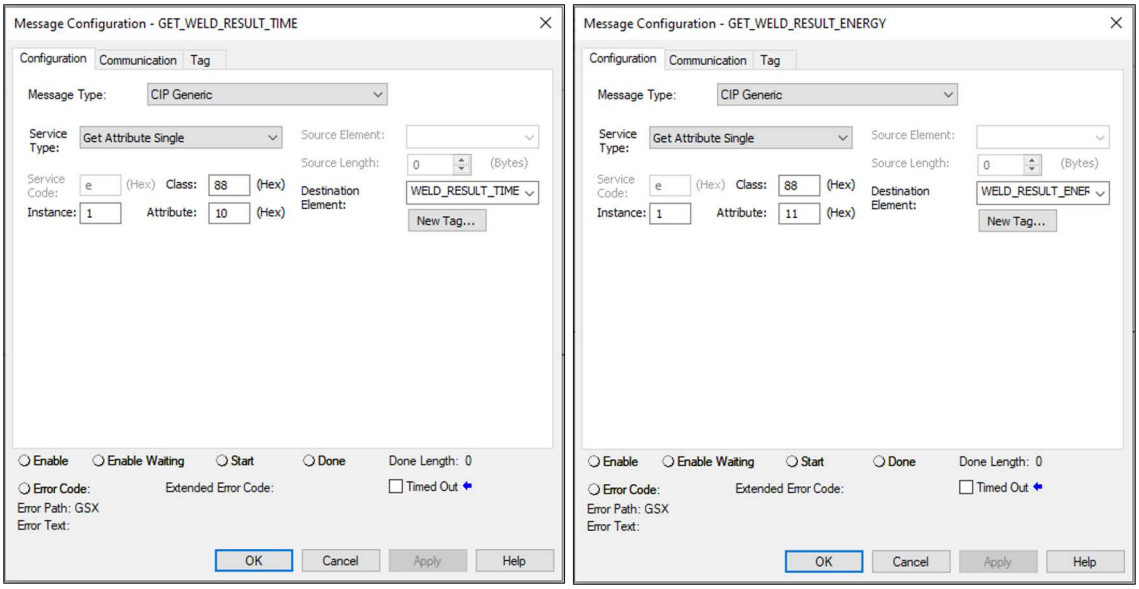
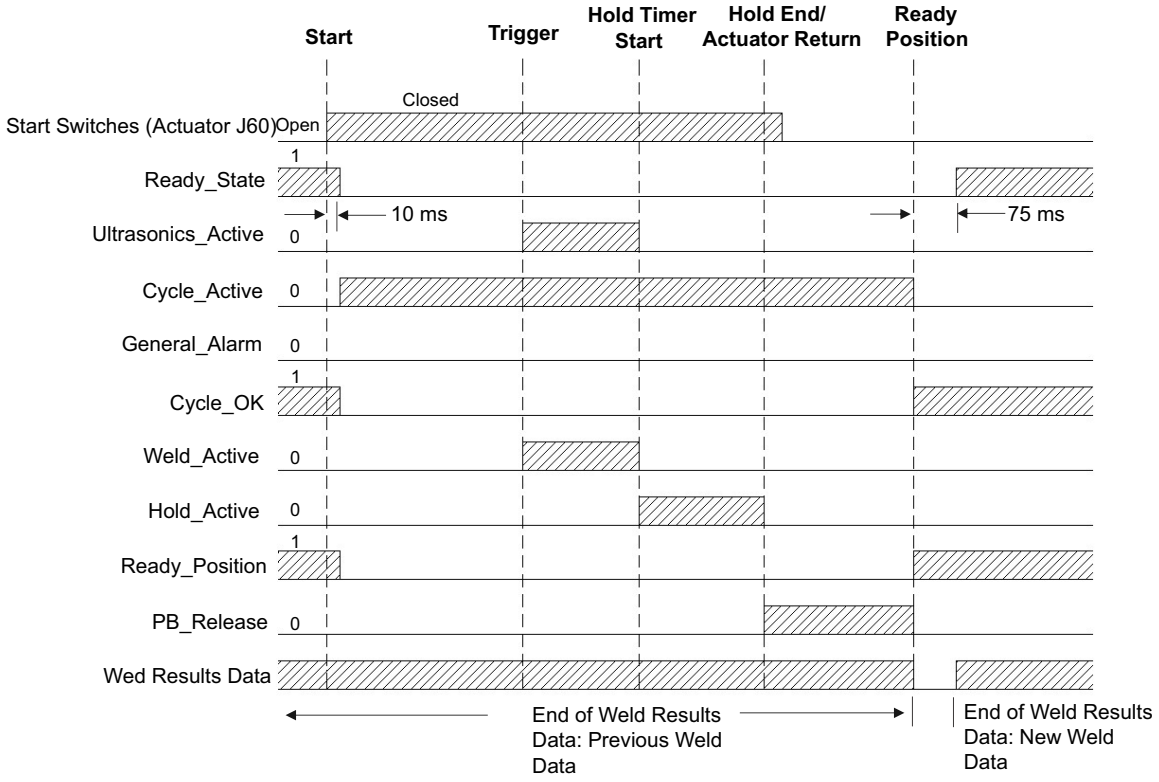


Figure 1.12



The End of Weld Results for the last completed weld are accessible after the Ready_State bit transitions from false to true. The last weld data remains unchanged until the next weld is finished and the horn returns to the Ready Position. At that point, the data for the End of Weld Results updates.

Figure 1.13


Start
Trigger
Hold Timer Start
Hold End/ Actuator Return
Ready Position
Start Switches (Actuator J60)
Closed
Open
Ready_State
1
10 ms
75 ms
Ultrasonics_Active
0
Cycle_Active
0
General_Alarm
0
Cycle_OK
1
Weld_Active
0
Hold_Active
0
Ready_Position
1
PB_Release
0
Wed Results Data
End of Weld Results Data: Previous Weld Data
End of Weld Results Data: New Weld Data

1.10 Explicit Messaging for Setting Weld Recipe Parameters

Weld recipe parameters can be set using Explicit Messaging.

1.10.1 Set Messaging for Control Token

The value of the control token allows for recipe or configuration settings to be made locally at the GSX HMI or remotely via explicit messaging. When the control token is set to zero, the GSX HMI has control over parameter and system settings and remote messages are ignored. When the control token is set to one, remote messaging has control over the settings and GSX's HMI is read only.

The value of the control token is displayed in the upper right corner of the GSX HMI. Green indicates the token value is zero and the HMI has control over the settings.

Figure 1.14 Green Control Token

NOTICE	
	Green control token indicates HMI is read/write.

Red indicates the token value is one and the HMI is read only and remote messaging has control over the settings.

Figure 1.15 Red Control Token

NOTICE	
	Red control token indicates HMI is read only.

Before setting weld recipes using explicit messaging, the control token must be set to one for remote message control.

Object Class = 0x92

Instance = 1

Attribute = 0x1

Source Element = TOKEN_REQUEST (SINT)

Destination Element = TOKEN_RESPONSE (SINT)

TOKEN_REQUEST = 1 (SINT): Remote Messaging Control

TOKEN_REQUEST = 0 (SINT): HMI Local Control

Figure 1.16

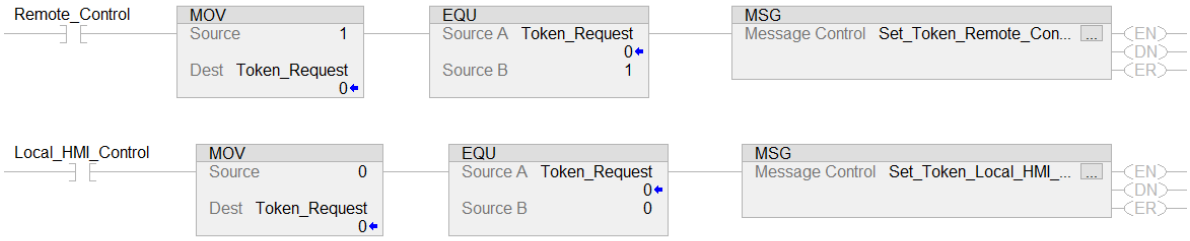
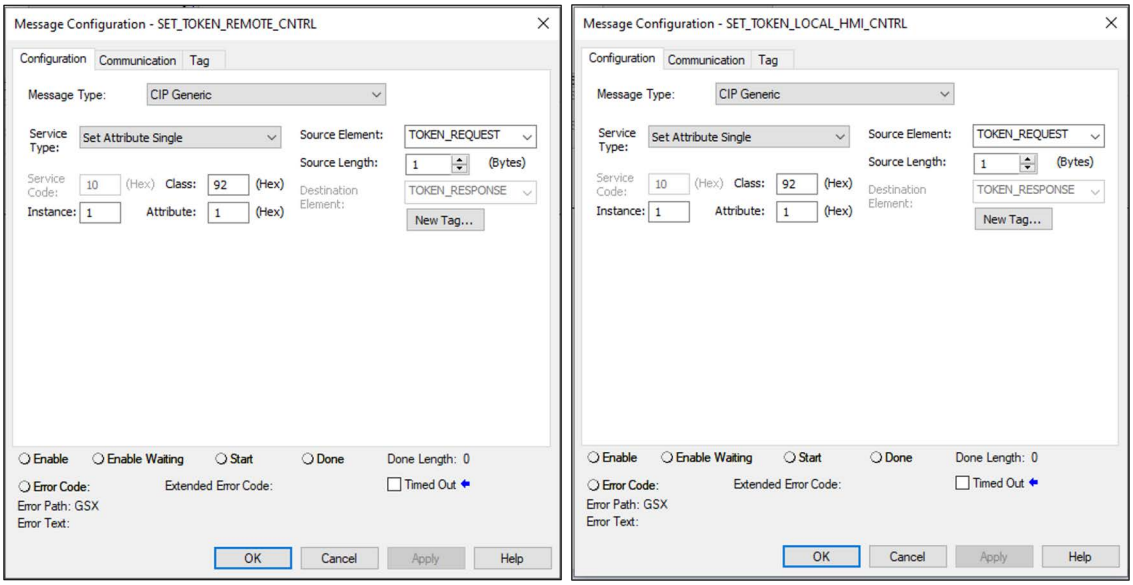


Figure 1.17



1.11 Set Messaging for Weld Mode and Parameters

All weld parameters such as weld time, amplitude, and force can be set using explicit messaging.

If there's a change to the active weld mode (time, energy, collapse...etc.), the new mode must be messaged before messaging mode parameter, such as milliseconds or Joules. Any recipe changes made through set messaging must be saved to the active recipe before welding. Active recipe changes can be saved used set message instructions.

After a recipe is saved, a 200-millisecond time delay before welding should be included to account for GSX CPU housekeeping time.

The below example program messages to set the weld recipe for energy mode, weld for 50J, and save the recipe.

Weld Mode Message:
Object Class = 0x81
Instance = 1
Weld Mode Attribute = 0x4
Source Element = SET_MODE_REQUEST (DINT)
Destination Element = SET_MODE_RESPONSE (DINT)
SET_MODE = 2 (DINT): Energy Mode

Mode Parameter Message:
Object Class = 0x81
Instance = 1
Mode Parameter Attribute = 0x5
Source Element = SET_ENERGY_REQUEST (REAL)
Destination Element = SET_ENERGY_RESPONSE (REAL)
SET_WELD_ENERGY = 50 (Real): 50 Joules

Save Recipe Message:
Object Class = 0x80
Instance = 1
Attribute = 1
Source Element = SAVE_REQUEST (SINT)
Destination Element = SAVE_RESPONSE (SINT)
SAVE_REQUEST = 1 (SINT): Save Recipe

Figure 1.18

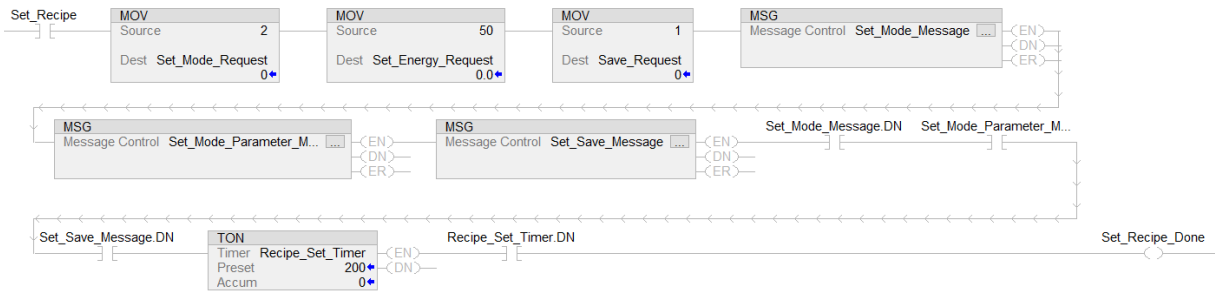
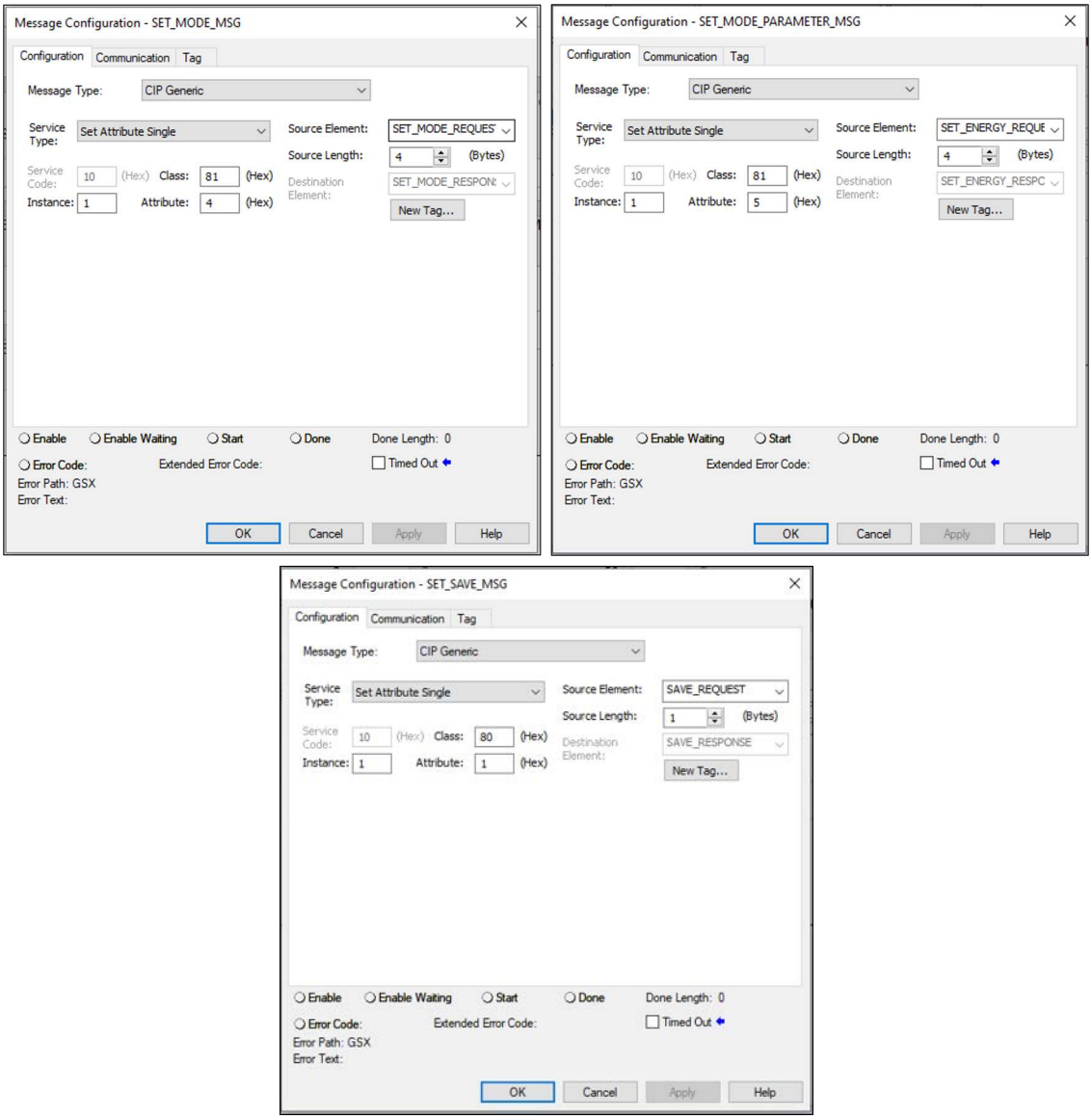


Figure 1.19


Message Configuration - SET_MODE_MSG
Configuration
Communication
Tag
Message Type:
CIP Generic
Service Type:
Set Attribute Single
Source Element:
SET_MODE_REQUES
Source Length:
4
(Bytes)
Service Code:
10
(Hex)
Class:
81
(Hex)
Destination Element:
SET_MODE_RESPON
Instance:
1
Attribute:
4
(Hex)
New Tag...
Enable
Enable Waiting
Start
Done
Done Length: 0
Error Code:
Extended Error Code:
Timed Out
Error Path: GSX
Error Text:
OK
Cancel
Apply
Help
Message Configuration - SET_MODE_PARAMETER_MSG
Configuration
Communication
Tag
Message Type:
CIP Generic
Service Type:
Set Attribute Single
Source Element:
SET_ENERGY_REQUE
Source Length:
4
(Bytes)
Service Code:
10
(Hex)
Class:
81
(Hex)
Destination Element:
SET_ENERGY_RESPC
Instance:
1
Attribute:
5
(Hex)
New Tag...
Enable
Enable Waiting
Start
Done
Done Length: 0
Error Code:
Extended Error Code:
Timed Out
Error Path: GSX
Error Text:
OK
Cancel
Apply
Help
Message Configuration - SET_SAVE_MSG
Configuration
Communication
Tag
Message Type:
CIP Generic
Service Type:
Set Attribute Single
Source Element:
SAVE_REQUEST
Source Length:
1
(Bytes)
Service Code:
10
(Hex)
Class:
80
(Hex)
Destination Element:
SAVE_RESPONSE
Instance:
1
Attribute:
1
(Hex)
New Tag...
Enable
Enable Waiting
Start
Done
Done Length: 0
Error Code:
Extended Error Code:
Timed Out
Error Path: GSX
Error Text:
OK
Cancel
Apply
Help

1.12 I/O Timing Charts

1.12.1 Typical Cycle Timing; No Alarms

Figure 1.20 Typical Cycle Timing; No Alarms

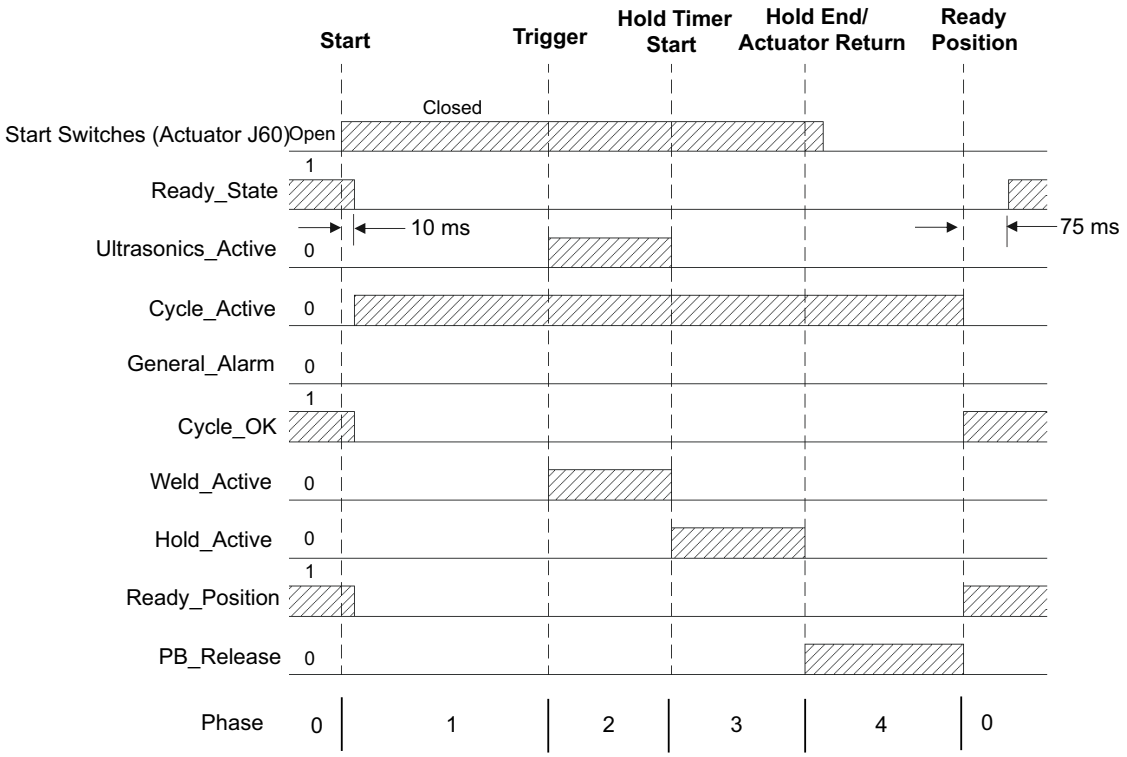


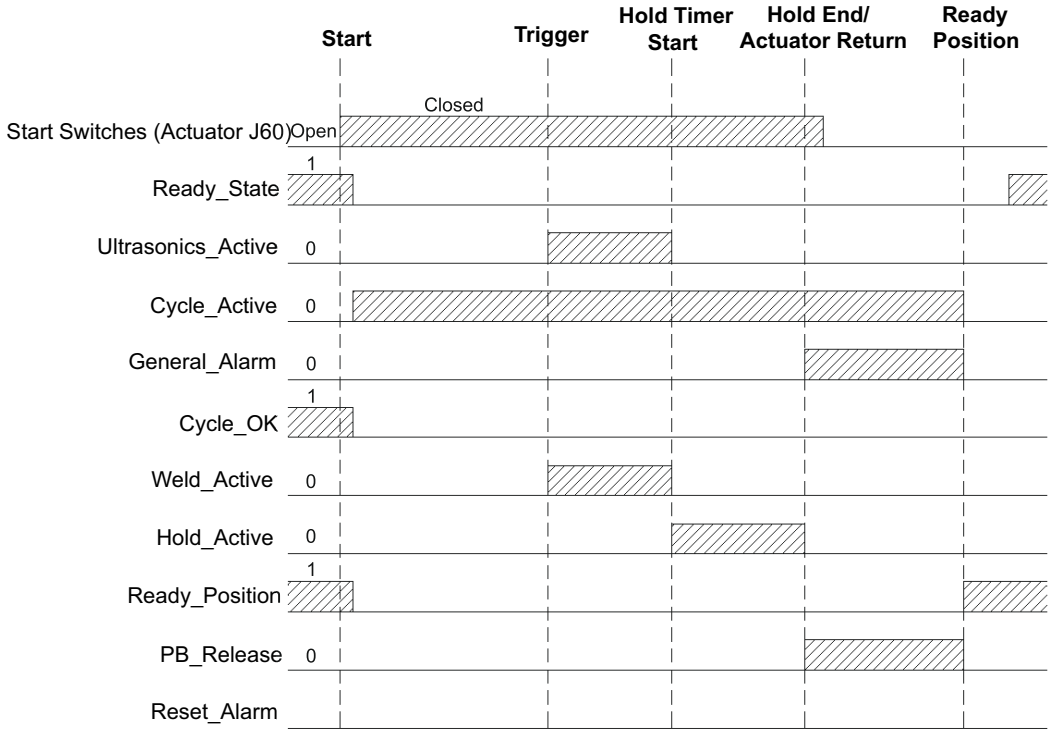
Table 1.16 Typical Cycle Timing; No Alarms

Phase	Event Markers		Definition
	Begin	End	
0	Ready Position	Start	The system is in a ready state. The cycle has not been initiated.
1	Start	Trigger	The cycle has been initiated. The actuator extends the horn down to the part.
2	Trigger	Hold Timer Start	The horn contacts the part and triggers the ultrasonics weld mode. The ultrasonics is on until the weld mode is complete.
3	Hold Timer Start	Hold End/ Actuator Return	The ultrasonic weld mode is complete and the hold timer starts. The horn maintains part contact until the hold time ends.
4	Hold End/ Actuator Return	Ready Position	The hold time has ended and the actuator returns the horn to the ready position. After reaching the ready position, the system returns to the ready state. House keeping time is 75 ms before Ready_State turns true.

1.12.2 Cycle with General Alarm; Alarm Reset Not Required

If the System/Configuration/Alarm Management - Reset Required option is not enabled and an alarm occurs, the system goes to a ready state when the horn returns and reaches its ready position. The General Alarm output transitions from 1 to 0 when the horn reaches the ready position. The Cycle OK output will be at 0.

Figure 1.21 Cycle with General Alarm; Alarm Reset Not Required



NOTICE	
	When Reset Required is set Off in the alarm configuration screen, the Last_Active_Alarm_ID is not available.

1.12.3 Cycle with General Alarm; Alarm Reset Required

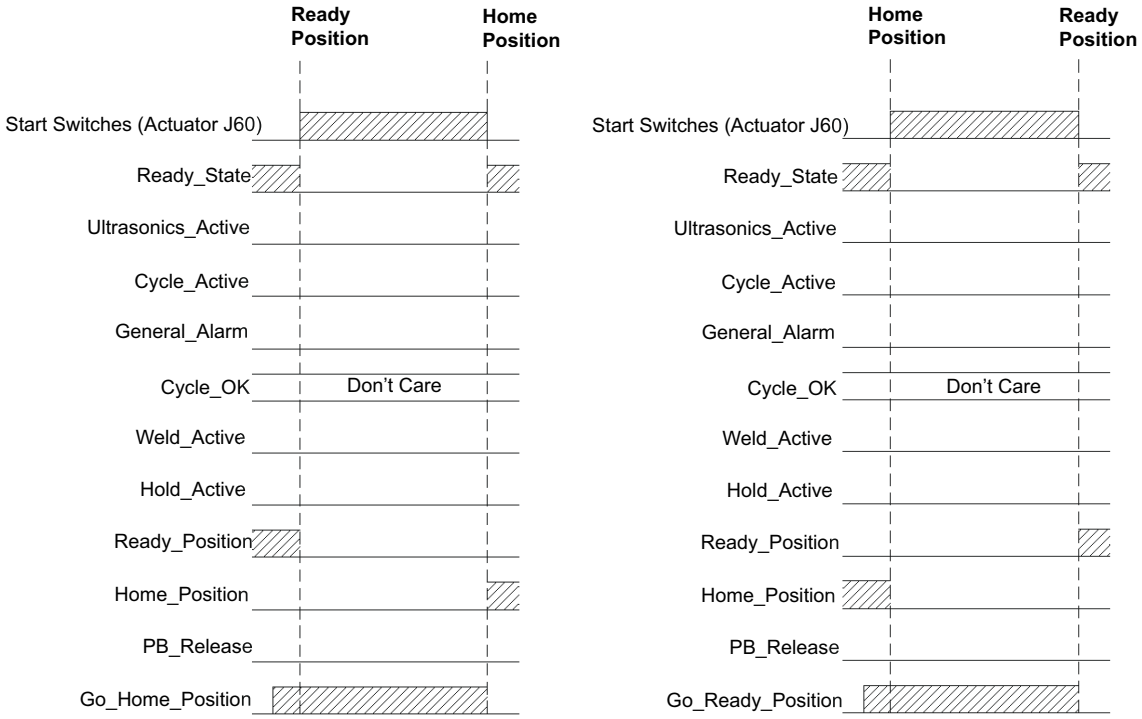
If the System/Configuration/Alarm Management - Reset Required option is enabled and an alarm occurs, the system doesn't return to a ready state until the Reset input is applied. The General Alarm output transitions from 1 to 0 when the Reset is given. The Cycle OK output will be at 0.

Figure 1.22 Cycle with General Alarm; Alarm Reset Required

1.12.4 Home and Ready Horn Positioning

The horn can be commanded to the home or ready position by applying 1 to the Go_Home_Pos or Go_Ready_Pos Inputs. A normal cycle can resume after the horn reaches the home or ready position and the I/O positioning command input is set to 0.

Figure 1.23 Home and Ready Horn Positioning



Chapter 2: Explicit Messaging

2.1 Object Classes and Attributes

Object class and attribute IDs for explicit messaging are listed here.

Table 2.1 Objects Available and Class ID

Object Class ID	Object Class Name	Number of Instances
0x01	Identity Object	1
0x04	Assembly Object	2
0x80	Recipe Management Object	1
0x81	Active Weld Recipe Object	1
0x82	Active Suspect and Reject Recipe Object	1
0x83	Active Stack Recipe Object	1
0x84	Non Active Weld Recipe Object	1000
0x85	Non Active Suspect and Reject Recipe Object	1000
0x86	Non Active Stack Recipe Object	1000
0x87	Weld Results History Object	200000
0x88	Last Weld Results Object	1
0x92	Version, RTC, Counter, Token	1
0x93	Active Setup Limits Recipe Object	1

2.2 Identity Object (0x01)

The Identity Object provides identification and general information about the device.

Table 2.2 Identity Object (0x01)

Attribute ID (Hex)	Attribute Name	Data Type	Size in Bytes	Access	Data Value
1	Vendor ID	UINT	16	R	1283
2	Product Type	UINT	16	R	43
3	Product Code	UINT	16	R	3
4	Revision	USINT	8	R	1.1
7	Product Name	SHORT STRING32	32	R	GSX-E1 EIP

Table 2.3 Common Services

Service Code	Service Name
0x0E	Get_Attribute_Single

2.3 Assembly Object (0x04)

The Assembly Object binds attributes of multiple objects, which allows data to or from each object to be sent or received over a single connection.

Table 2.4 Assembly Object (0x04)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access
64	Control Parameters	INT	16	W
65	Status Output	INT	16	R

Table 2.5 Common Services

Service Code	Service Name
0x0E	Get_Attribute_Single
0x10	Set_Attribute_Single

2.4 Recipe Management Object (0x80)

The Recipe Management Object saves and validates weld recipes.

Table 2.6 Recipe Management Object (0x80)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access
1	Save Recipe	SINT	8	R/W
2	Validate Recipe	SINT	8	R/W

Table 2.7 Common Services

Service Code	Service Name
0x0E	Get_Attribute_Single
0x10	Set_Attribute_Single

2.5 Active Weld Recipe Object (0x81)

The Active Weld Recipe Object contains all the parameters from the current or active recipe.

Table 2.8 Active Weld Recipe Object (0x81)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
1	Recipe Number	INT32	4	R	0	1	1000	
2	Weld Recipe Name	STRING	16	R/W				
3	Weld Recipe Ver Number	INT32	4	R	0	1	1000	
4	Weld Mode	INT32	4	R/W	See Weld Mode Object Table			
5	Mode Value	REAL	4	R/W	See Weld Mode Value Object Table			
6	Hold Time	REAL	4	R/W	0.01	0.01	30	s
7	Trigger Force	REAL	4	R/W	25 (5.6)	5 (1.1)	2500 (562)	N (lbf)
8	Reserved	NA	4	R/W				
9	Amplitude Steps Cnt	UINT8	1	R/W	1	1	10	
A	Amplitude Step At	UINT8	1	R/W	1	1	7	
B	Amplitude Step Value1	REAL	4	R/W	Weld Mode/Value Dependent			
C	Amplitude Step Value2	REAL	4	R/W				
D	Amplitude Step Value3	REAL	4	R/W				
E	Amplitude Step Value4	REAL	4	R/W				
F	Amplitude Step Value5	REAL	4	R/W				
10	Amplitude Step Value6	REAL	4	R/W				
11	Amplitude Step Value7	REAL	4	R/W				
12	Amplitude Step Value8	REAL	4	R/W				
13	Amplitude Step Value9	REAL	4	R/W				
14	Amplitude Step Value10	REAL	4	R/W				

Table 2.8 Active Weld Recipe Object (0x81)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
15	Amplitude Step1	UINT16	2	R/W	100	10	100	%
16	Amplitude Step2	UINT16	2	R/W				
17	Amplitude Step3	UINT16	2	R/W				
18	Amplitude Step4	UINT16	2	R/W				
19	Amplitude Step5	UINT16	2	R/W				
1A	Amplitude Step6	UINT16	2	R/W				
1B	Amplitude Step7	UINT16	2	R/W				
1C	Amplitude Step8	UINT16	2	R/W				
1D	Amplitude Step9	UINT16	2	R/W				
1E	Amplitude Step10	UINT16	2	R/W				
1F	Weld Force	REAL	4	R/W	50 (11.2)	25 (5.6)	2500 (562)	N (lbf)
20	Force Ramp Time	REAL	4	R/W	0.1	0	1	s
21	Reserved	NA	4	R/W				
22	Hold Force	REAL	4	R/W	50 (11.2)	25 (5.6)	2500 (562)	N (lbf)
23	Hold Force Ramp Time	REAL	4	R/W	0	0	1	s
24	Expected Part Contact Position	REAL	4	R/W	0	0	125 (4.9)	mm (inch)
25	Ready Position	REAL	4	R/W	5 (.2)	5 (.2)	120 (4.7)	mm (inch)
26	Down Acceleration	REAL	4	R/W	500 (19.7)	1 (.04)	10000 (39)	mm/s2 (in/s2)
27	Down Max Velocity	REAL	4	R/W	50 (11.2)	5 (.2)	150 (5.9)	mm/s (in/s)
28	Down Deceleration	REAL	4	R/W	500 (19.7)	1 (0.04)	10000 (393)	mm/s2 (in/s2)
29	Return Acceleration	REAL	4	R/W	500 (19.7)	1 (0.04)	10000 (393)	mm/s2 (in/s2)
2A	Return Max Velocity	REAL	4	R/W	50 (11.2)	5 (.2)	150 (5.9)	mm/s (in/s)
2B	Return Deceleration	REAL	4	R/W	500 (19.7)	1 (.04)	10000 (393)	mm/s2 (in/s2)

Table 2.8 Active Weld Recipe Object (0x81)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
2C	Num Force Steps	UINT8	1	R/W	1	1	10	
2D	Force Step At	UINT8	1	R/W	1	1	7	
2E	Force Step Value1	REAL	4	R/W	Weld Mode/Value Dependent			
2F	Force Step Value2	REAL	4	R/W				
30	Force Step Value3	REAL	4	R/W				
31	Force Step Value4	REAL	4	R/W				
32	Force Step Value5	REAL	4	R/W				
33	Force Step Value6	REAL	4	R/W				
34	Force Step Value7	REAL	4	R/W				
35	Force Step Value8	REAL	4	R/W				
36	Force Step Value9	REAL	4	R/W				
37	Force Step Value10	REAL	4	R/W				
38	Force Step Ramp Value1	REAL	4	R/W	0.1	0	1	s
39	Force Step Ramp Value2	REAL	4	R/W				
3A	Force Step Ramp Value3	REAL	4	R/W				
3B	Force Step Ramp Value4	REAL	4	R/W				
3C	Force Step Ramp Value5	REAL	4	R/W				
3D	Force Step Ramp Value6	REAL	4	R/W				
3E	Force Step Ramp Value7	REAL	4	R/W				
3F	Force Step Ramp Value8	REAL	4	R/W				
40	Force Step Ramp Value9	REAL	4	R/W				
41	Force Step Ramp Value10	REAL	4	R/W				

Table 2.8 Active Weld Recipe Object (0x81)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
42	Force Step1	REAL	4	R/W	50 (11.2)	25 (5.6)	2500 (562)	N (lbf)
43	Force Step2	REAL	4	R/W				
44	Force Step3	REAL	4	R/W				
45	Force Step4	REAL	4	R/W				
46	Force Step5	REAL	4	R/W				
47	Force Step6	REAL	4	R/W				
48	Force Step7	REAL	4	R/W				
49	Force Step8	REAL	4	R/W				
4A	Force Step9	REAL	4	R/W				
4B	Force Step10	REAL	4	R/W				
4C	Weld Ramp Time	REAL	4	R/W	0.08	0.01	1	s
4D	After Burst	BOOL	1	R/W	0	0	1	
4E	AB Delay	REAL	4	R/W	0.1	0.05	2	s
4F	AB Time	REAL	4	R/W	0.1	0.1	2	s
50	AB Amplitude	UINT8	1	R/W	100	10	100	%
51	PreTrigger	BOOL	1	R/W	0	0	1	
52	Auto PreTrigger	BOOL	1	R/W	0	0	1	
53	Distance PreTrigger	BOOL	1	R/W	0	0	1	
54	PreTrigger Amplitude	UINT8	1	R/W	100	10	100	%
55	PreTrigger Distance	REAL	4	R/W	3 (.12)	3 (.12)	125 (4.9)	mm (inch)
56	Reserved	NA	1	R/W				
57	Reserved	NA	4	R/W				
58	Reserved	NA	1	R/W				
59	Cooling Valve	BOOL	1	R/W	0	0	1	
5A	Max Weld Time Out	REAL	4	R/W	6	0.05	30	s
5B	Timed Seek	BOOL	1	R/W	0	0	1	
5C	Pre-Weld Seek	BOOL	1	R/W	0	0	1	
5D	Post Weld Seek	BOOL	1	R/W	0	0	1	
5E	Timed Seek Period	INT32	4	R/W	1	1	59	min
5F	Part Contact Window Minus	REAL	4	R/W	2 (.08)	0.01 (.0004)	10 (.39)	mm (inch)
60	Part Contact Window Plus	REAL	4	R/W	2 (.08)	0.01 (.0004)	10 (.39)	mm (inch)

Table 2.8 Active Weld Recipe Object (0x81)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
61	Reserved			R/W				
62	Global Control	BOOL	1	R/W	0	0	1	
63	Peak Power Cutoff	INT32	4	R/W	See P/S Model Object Table			
64	Peak Power Cutoff Enable	BOOL	1	R/W	0	0	1	
65	Frequency Low Cutoff	INT32	4	R/W	See P/S Model Object Table			
66	Frequency Low Cutoff Enable	BOOL	1	R/W	0	0	1	
67	Absolute Cutoff	REAL	4	R/W	125 (4.9)	3 (.12)	125 (4.9)	mm (inch)
68	Absolute Cutoff Enable	BOOL	1	R/W	0	0	1	
69	Frequency High Cutoff	INT32	4	R/W	See P/S Model Object Table			
6A	Frequency High Cutoff Enable	BOOL	1	R/W	0	0	1	
6B	Collapse Cutoff	REAL	4	R/W	25 (.98)	0.01 (.0004)	25 (.98)	mm (inch)
6C	Collapse Cutoff Enable	BOOL	1	R/W	0	0	1	
6D	Energy Cutoff	REAL	4	R/W	See P/S Model Object Table			
6E	Energy Cutoff Enable	BOOL	1	R/W	0	0	1	
6F	Time Cutoff	REAL	4	R/W	30	0.01	30	s
70	Time Cutoff Enable	BOOL	1	R/W	0	0	1	
71	Ground Detect Enable	BOOL	1	R/W	0	0	1	
72	Is Active	BOOL	1	R	0	0	1	
73	Is Locked	BOOL	1	R	0	0	1	
74	Company Name	STRING	32	R				
75	Is Validate	BOOL	1	R	0	0	1	
76	Ready Position Toggle	BOOL	1	R/W	1	0	1	
77	Weld Force Control	INT32	4	R/W	3	1	3	
78	Reactivity	INT32	4	R/W	100	0	100	%
79	Force Level Enable	BOOL	1	R/W	0	0	1	
7A	Force Level	INT32	4	R/W	100	0	100	%
7B	Force Level Time	REAL	4	R/W	0	0	0.3	s

Table 2.8 Active Weld Recipe Object (0x81)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
7C	Scrub Amplitude	INT32	4	R/W	100	10	100	%

Table 2.9 Common Services

Service Code	Service Name
0x0E	Get_Attribute_Single
0x10	Set_Attribute_Single

2.6 Active Suspect and Reject Recipe Object (0x82)

The Active Suspect and Reject Object contains all the suspect and reject parameters from the current or active recipe.

Table 2.10 Active Suspect and Reject Recipe Object (0x82)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
1	SR Recipe Rev Number	UINT32	4	R	0	1	1000	
2	Suspect Limit Enabled	BOOL	1	R/W	0	0	1	
3	Reject Limit Enabled	BOOL	1	R/W	0	0	1	
4	Suspect Limit Time Enabled	BOOL	1	R/W	0	0	1	
5	Suspect Limit Time Low Enabled	BOOL	1	R	0	0	1	
6	Suspect Limit Time High Enabled	BOOL	1	R	0	0	1	
7	Suspect Limit Time Low	REAL	4	R/W	0.01	0.01	30	s
8	Suspect Limit Time High	REAL	4	R/W	30	0.01	30	s
9	Reject Limit Time Enabled	BOOL	1	R/W	0	0	1	
A	Reject Limit Time Low Enabled	BOOL	1	R	0	0	1	
B	Reject Limit Time High Enabled	BOOL	1	R	0	0	1	
C	Reject Limit Time Low	REAL	4	R/W	0.01	0.01	30	s
D	Reject Limit Time High	REAL	4	R/W	30	0.01	30	s
E	Suspect Limit Energy Enabled	BOOL	1	R/W	0	0	1	
F	Suspect Limit Energy Low Enabled	BOOL	1	R	0	0	1	
10	Suspect Limit Energy High Enabled	BOOL	1	R	0	0	1	
11	Suspect Limit Energy Low	REAL	4	R/W	See P/S Model Object Table			
12	Suspect Limit Energy High	REAL	4	R/W				

Table 2.10 Active Suspect and Reject Recipe Object (0x82)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
13	Reject Limit Energy Enabled	BOOL	1	R/W	0	0	1	
14	Reject Limit Energy Low Enabled	BOOL	1	R	0	0	1	
15	Reject Limit Energy High Enabled	BOOL	1	R	0	0	1	
16	Reject Limit Energy Low	REAL	4	R/W	See P/S Model Object Table			
17	Reject Limit Energy High	REAL	4	R/W				
18	Suspect Limit Peak Power Enabled	BOOL	1	R/W	0	0	1	
19	Suspect Limit Peak Power Low Enabled	BOOL	1	R	0	0	1	
1A	Suspect Limit Peak Power High Enabled	BOOL	1	R	0	0	1	
1B	Suspect Limit Peak Power Low	UINT32	4	R/W	See P/S Model Object Table			
1C	Suspect Limit Peak Power High	UINT32	4	R/W				
1D	Reject Limit Peak Power Enabled	BOOL	1	R/W	0	0	1	
1E	Reject Limit Peak Power Low Enabled	BOOL	1	R	0	0	1	
1F	Reject Limit Peak Power High Enabled	BOOL	1	R	0	0	1	
20	Reject Limit Peak Power Low	UINT32	4	R/W	See P/S Model Object Table			
21	Reject Limit Peak Power High	UINT32	4	R/W				
22	Suspect Limit Absolute Distance Enabled	BOOL	1	R/W	0	0	1	

Table 2.10 Active Suspect and Reject Recipe Object (0x82)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
23	Suspect Limit Absolute Distance Low Enabled	BOOL	1	R	0	0	1	
24	Suspect Limit Absolute Distance High Enabled	BOOL	1	R	0	0	1	
25	Suspect Limit Absolute Distance Low	REAL	4	R/W	3 (.12)	3 (.12)	125 (4.9)	mm (inch)
26	Suspect Limit Absolute Distance High	REAL	4	R/W	125 (4.9)	3 (.12)	125 (4.9)	mm (inch)
27	Reject Limit Absolute Distance Enabled	BOOL	1	R/W	0	0	1	
28	Reject Limit Absolute Distance Low Enabled	BOOL	1	R	0	0	1	
29	Reject Limit Absolute Distance High Enabled	BOOL	1	R	0	0	1	
2A	Reject Limit Absolute Distance Low	REAL	4	R/W	3 (.12)	3 (.12)	125 (4.9)	mm (inch)
2B	Reject Limit Absolute Distance High	REAL	4	R/W	125 (4.9)	3 (.12)	125 (4.9)	mm (inch)
2C	Suspect Limit Collapse Distance Enabled	BOOL	1	R/W	0	0	1	
2D	Suspect Limit Collapse Distance Low Enabled	BOOL	1	R	0	0	1	
2E	Suspect Limit Collapse Distance High Enabled	BOOL	1	R	0	0	1	
2F	Suspect Limit Collapse Distance Low	REAL	4	R/W	0.01 (.0004)	0.01 (.0004)	25 (.98)	mm (inch)

Table 2.10 Active Suspect and Reject Recipe Object (0x82)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
30	Suspect Limit Collapse Distance High	REAL	4	R/W	25 (.98)	0.01 (.0004)	25 (.98)	mm (inch)
31	Reject Limit Collapse Distance Enabled	BOOL	1	R/W	0	0	1	
32	Reject Limit Collapse Distance Low Enabled	BOOL	1	R	0	0	1	
33	Reject Limit Collapse Distance High Enabled	BOOL	1	R	0	0	1	
34	Reject Limit Collapse Distance Low	REAL	4	R/W	0.01 (.0004)	0.01 (.0004)	25 (.98)	mm (inch)
35	Reject Limit Collapse Distance High	REAL	4	R/W	25 (.98)	0.01 (.0004)	25 (.98)	mm (inch)
36	Reserved	NA	1	R/W				
37	Reserved	NA	1	R				
38	Reserved	NA	1	R				
39	Reserved	NA	4	R/W				
3A	Reserved	NA	4	R/W				
3B	Reserved	NA	1	R/W				
3C	Reserved	NA	1	R				
3D	Reserved	NA	1	R				
3E	Reserved	NA	4	R/W				
3F	Reserved	NA	4	R/W				
40	Suspect Limit Weld Force Enabled	BOOL	1	R/W	0	0	1	
41	Suspect Limit Weld Force Low Enabled	BOOL	1	R	0	0	1	
42	Suspect Limit Weld Force High Enabled	BOOL	1	R	0	0	1	
43	Suspect Limit Weld Force Low	REAL	4	R/W	50 (11.2)	25 (5.6)	2500 (562)	N (lbf)

Table 2.10 Active Suspect and Reject Recipe Object (0x82)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
44	Suspect Limit Weld Force High	REAL	4	R/W	2500 (562)	25 (5.6)	2500 (562)	N (lbf)
45	Reject Limit Weld Force Enabled	BOOL	1	R/W	0	0	1	
46	Reject Limit Weld Force Low Enabled	BOOL	1	R	0	0	1	
47	Reject Limit Weld Force High Enabled	BOOL	1	R	0	0	1	
48	Reject Limit Weld Force Low	REAL	4	R/W	50 (11.2)	25 (5.6)	2500 (562)	N (lbf)
49	Reject Limit Weld Force High	REAL	4	R/W	2500 (562)	25 (5.6)	2500 (562)	N (lbf)
4A	Suspect Limit Frequency Enabled	BOOL	1	R/W	0	0	1	
4B	Suspect Limit Frequency Low Enabled	BOOL	1	R	0	0	1	
4C	Suspect Limit Frequency High Enabled	BOOL	1	R	0	0	1	
4D	Suspect Limit Frequency Low	UINT32	4	R/W	See P/S Model Object Table			
4E	Suspect Limit Frequency High	UINT32	4	R/W				
4F	Reject Limit Frequency Enabled	BOOL	1	R/W	0	0	1	
50	Reject Limit Frequency Low Enabled	BOOL	1	R	0	0	1	
51	Reject Limit Frequency High Enabled	BOOL	1	R	0	0	1	
52	Reject Limit Frequency Low	UINT32	4	R/W	See P/S Model Object Table			
53	Reject Limit Frequency High	UINT32	4	R/W				

Table 2.11 Common Services

Service Code	Service Name
0x0E	Get_Attribute_Single
0x10	Set_Attribute_Single

2.7 Active Stack Recipe Object (0x83)

The Active Stack Recipe Object contains all the parameters from the current or active stack recipe.

Table 2.12 Active Stack Recipe Object (0x83)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
1	Recipe Number	INT32	4	R/W	0	1	1000	
2	Digital Tune	INT32	4	R/W	See P/S Model Object Table			
3	Internal Offset Flag	BOOL	1	R/W	0	0	1	
4	Frequency Offset	INT32	4	R/W	See P/S Model Object Table			
5	End Of Weld Store	BOOL	1	R/W	0	0	1	

Table 2.13 Common Services

Service Code	Service Name
0x0E	Get_Attribute_Single
0x10	Set_Attribute_Single

2.8 Non-Active Weld Recipe Object (0x84)

The Non-Active Weld Recipe Object contains all the parameters from the saved or non-active recipes.

Table 2.14 Non Active Weld Recipe Object (0x84)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
1	Recipe Number	INT32	4	R	0	1	1000	
2	Weld Recipe Name	STRING	16	R/W				
3	Weld Recipe Ver Number	INT32	4	R	0	1	1000	
4	Weld Mode	INT32	4	R/W	See Weld Mode Table			
5	Mode Value	REAL	4	R/W	See Weld Parameter Table			
6	Hold Time	REAL	4	R/W	0.01	0.01	30	s
7	Trigger Force	REAL	4	R/W	25 (5.6)	5 (1.1)	2500 (562)	N (lbf)
8	Reserved	NA	4	R/W				
9	Amplitude Steps Cnt	UINT8	1	R/W	1	1	10	
A	Amplitude Step At	UINT8	1	R/W	1	1	7	
B	Amplitude Step Value1	REAL	4	R/W	Weld Mode/Value Dependent			
C	Amplitude Step Value2	REAL	4	R/W				
D	Amplitude Step Value3	REAL	4	R/W				
E	Amplitude Step Value4	REAL	4	R/W				
F	Amplitude Step Value5	REAL	4	R/W				
10	Amplitude Step Value6	REAL	4	R/W				
11	Amplitude Step Value7	REAL	4	R/W				
12	Amplitude Step Value8	REAL	4	R/W				
13	Amplitude Step Value9	REAL	4	R/W				
14	Amplitude Step Value10	REAL	4	R/W				

Table 2.14 Non Active Weld Recipe Object (0x84)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
15	Amplitude Step1	UINT16	2	R/W	100	10	100	%
16	Amplitude Step2	UINT16	2	R/W				
17	Amplitude Step3	UINT16	2	R/W				
18	Amplitude Step4	UINT16	2	R/W				
19	Amplitude Step5	UINT16	2	R/W				
1A	Amplitude Step6	UINT16	2	R/W				
1B	Amplitude Step7	UINT16	2	R/W				
1C	Amplitude Step8	UINT16	2	R/W				
1D	Amplitude Step9	UINT16	2	R/W				
1E	Amplitude Step10	UINT16	2	R/W				
1F	Weld Force	REAL	4	R/W	50 (11.2)	25 (5.6)	2500 (562)	N (lbf)
20	Force Ramp Time	REAL	4	R/W	0.1	0	1	s
21	Reserved	NA	4	R/W				
22	Hold Force	REAL	4	R/W	50 (11.2)	25 (5.6)	2500 (562)	N (lbf)
23	Hold Force Ramp Time	REAL	4	R/W	0	0	1	s
24	Expected Part Contact Position	REAL	4	R/W	0	0	125 (4.9)	mm (inch)
25	Ready Position	REAL	4	R/W	5 (.2)	5 (.2)	120 (4.7)	mm (inch)
26	Down Acceleration	REAL	4	R/W	500 (19.7)	1 (.04)	10000 (39)	mm/s2 (in/s2)
27	Down Max Velocity	REAL	4	R/W	50 (11.2)	5 (.2)	150 (5.9)	mm/s (in/s)
28	Down Deceleration	REAL	4	R/W	500 (19.7)	1 (0.04)	10000 (393)	mm/s2 (in/s2)
29	Return Acceleration	REAL	4	R/W	500 (19.7)	1 (0.04)	10000 (393)	mm/s2 (in/s2)
2A	Return Max Velocity	REAL	4	R/W	50 (11.2)	5 (.2)	150 (5.9)	mm/s (in/s)
2B	Return Deceleration	REAL	4	R/W	500 (19.7)	1 (.04)	10000 (393)	mm/s2 (in/s2)

Table 2.14 Non Active Weld Recipe Object (0x84)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
2C	Num Force Steps	UINT8	1	R/W	1	1	10	
2D	Force Step At	UINT8	1	R/W	1	1	7	
2E	Force Step Value1	REAL	4	R/W	Weld Mode/Value Dependent			
2F	Force Step Value2	REAL	4	R/W				
30	Force Step Value3	REAL	4	R/W				
31	Force Step Value4	REAL	4	R/W				
32	Force Step Value5	REAL	4	R/W				
33	Force Step Value6	REAL	4	R/W				
34	Force Step Value7	REAL	4	R/W				
35	Force Step Value8	REAL	4	R/W				
36	Force Step Value9	REAL	4	R/W				
37	Force Step Value10	REAL	4	R/W				
38	Force Step Ramp Value1	REAL	4	R/W	0.1	0	1	s
39	Force Step Ramp Value2	REAL	4	R/W				
3A	Force Step Ramp Value3	REAL	4	R/W				
3B	Force Step Ramp Value4	REAL	4	R/W				
3C	Force Step Ramp Value5	REAL	4	R/W				
3D	Force Step Ramp Value6	REAL	4	R/W				
3E	Force Step Ramp Value7	REAL	4	R/W				
3F	Force Step Ramp Value8	REAL	4	R/W				
40	Force Step Ramp Value9	REAL	4	R/W				
41	Force Step Ramp Value10	REAL	4	R/W				

Table 2.14 Non Active Weld Recipe Object (0x84)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
42	Force Step1	REAL	4	R/W	50 (11.2)	25 (5.6)	2500 (562)	N (lbf)
43	Force Step2	REAL	4	R/W				
44	Force Step3	REAL	4	R/W				
45	Force Step4	REAL	4	R/W				
46	Force Step5	REAL	4	R/W				
47	Force Step6	REAL	4	R/W				
48	Force Step7	REAL	4	R/W				
49	Force Step8	REAL	4	R/W				
4A	Force Step9	REAL	4	R/W				
4B	Force Step10	REAL	4	R/W				
4C	Weld Ramp Time	REAL	4	R/W	0.08	0.01	1	s
4D	After Burst	BOOL	1	R/W	0	0	1	
4E	AB Delay	REAL	4	R/W	0.1	0.05	2	s
4F	AB Time	REAL	4	R/W	0.1	0.1	2	s
50	AB Amplitude	UINT8	1	R/W	100	10	100	%
51	PreTrigger	BOOL	1	R/W	0	0	1	
52	Auto PreTrigger	BOOL	1	R/W	0	0	1	
53	Distance PreTrigger	BOOL	1	R/W	0	0	1	
54	PreTrigger Amplitude	UINT8	1	R/W	100	10	100	%
55	PreTrigger Distance	REAL	4	R/W	3 (.12)	3 (.12)	125 (4.9)	mm (inch)
56	Reserved	NA	1	R/W				
57	Reserved	NA	4	R/W				
58	Reserved	NA	1	R/W				
59	Cooling Valve	BOOL	1	R/W	0	0	1	
5A	Max Weld Time Out	REAL	4	R/W	6	0.05	30	s
5B	Timed Seek	BOOL	1	R/W	0	0	1	
5C	Pre Weld Seek	BOOL	1	R/W	0	0	1	
5D	Post Weld Seek	BOOL	1	R/W	0	0	1	
5E	Timed Seek Period	INT32	4	R/W	1	1	59	min
5F	Part Contact Window Minus	REAL	4	R/W	2 (.08)	0.01 (.0004)	10 (.39)	mm (inch)
60	Part Contact Window Plus	REAL	4	R/W	2 (.08)	0.01 (.0004)	10 (.39)	mm (inch)

Table 2.14 Non Active Weld Recipe Object (0x84)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
61	Reserved	REAL	4	R/W				
62	Global Control	BOOL	1	R/W	0	0	1	
63	Peak Power Cutoff	INT32	4	R/W	See P/S Model Object Table			
64	Peak Power Cutoff Enable	BOOL	1	R/W	0	0	1	
65	Frequency Low Cutoff	INT32	4	R/W	See P/S Model Object Table			
66	Frequency Low Cutoff Enable	BOOL	1	R/W	0	0	1	
67	Absolute Cutoff	REAL	4	R/W	125 (4.9)	3 (.12)	125 (4.9)	mm (inch)
68	Absolute Cutoff Enable	BOOL	1	R/W	0	0	1	
69	Frequency High Cutoff	INT32	4	R/W	See P/S Model Object Table			
6A	Frequency High Cutoff Enable	BOOL	1	R/W	0	0	1	
6B	Collapse Cutoff	REAL	4	R/W	25 (.98)	0.01 (.0004)	25 (.98)	mm (inch)
6C	Collapse Cutoff Enable	BOOL	1	R/W	0	0	1	
6D	Energy Cutoff	REAL	4	R/W	See P/S Model Object Table			
6E	Energy Cutoff Enable	BOOL	1	R/W	0	0	1	
6F	Time Cutoff	REAL	4	R/W	30	0.01	30	s
70	Time Cutoff Enable	BOOL	1	R/W	0	0	1	
71	Ground Detect Enable	BOOL	1	R/W	0	0	1	
72	Is Active	BOOL	1	R	0	0	1	
73	Is Locked	BOOL	1	R	0	0	1	
74	Company Name	STRING	32	R				
75	Is Validate	BOOL	1	R	0	0	1	
76	Ready Position Toggle	BOOL	1	R/W	1	0	1	
77	Weld Force Control	INT32	4	R/W	3	1	3	
78	Reactivity	INT32	4	R/W	100	0	100	%
79	Force Level Enable	BOOL	1	R/W	0	0	1	
7A	Force Level	INT32	4	R/W	100	0	100	%
7B	Force Level Time	REAL	4	R/W	0	0	0.3	s

Table 2.14 Non Active Weld Recipe Object (0x84)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
7C	Scrub Amplitude	INT32	4	R/W	100	10	100	%

Table 2.15 Common Services

Service Code	Service Name
0x0E	Get_Attribute_Single
0x10	Set_Attribute_Single

2.9 Non-Active Suspect and Reject Recipe Object (0x85)

The Non-Active Suspect and Reject Object contains all the suspect and reject parameters from the saved or non-active recipes.

Table 2.16 Non Active Suspect and Reject Recipe Object (0x85)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
1	SR Recipe Rev Number	UINT32	4	R	0	1	1000	
2	Suspect Limit Enabled	BOOL	1	R/W	0	0	1	
3	Reject Limit Enabled	BOOL	1	R/W	0	0	1	
4	Suspect Limit Time Enabled	BOOL	1	R/W	0	0	1	
5	Suspect Limit Time Low Enabled	BOOL	1	R	0	0	1	
6	Suspect Limit Time High Enabled	BOOL	1	R	0	0	1	
7	Suspect Limit Time Low	REAL	4	R/W	0.01	0.01	30	s
8	Suspect Limit Time High	REAL	4	R/W	30	0.01	30	s
9	Reject Limit Time Enabled	BOOL	1	R/W	0	0	1	
A	Reject Limit Time Low Enabled	BOOL	1	R	0	0	1	
B	Reject Limit Time High Enabled	BOOL	1	R	0	0	1	
C	Reject Limit Time Low	REAL	4	R/W	0.01	0.01	30	s
D	Reject Limit Time High	REAL	4	R/W	30	0.01	30	s
E	Suspect Limit Energy Enabled	BOOL	1	R/W	0	0	1	
F	Suspect Limit Energy Low Enabled	BOOL	1	R	0	0	1	
10	Suspect Limit Energy High Enabled	BOOL	1	R	0	0	1	
11	Suspect Limit Energy Low	REAL	4	R/W	See P/S Model Object Table			
12	Suspect Limit Energy High	REAL	4	R/W				

Table 2.16 Non Active Suspect and Reject Recipe Object (0x85)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
13	Reject Limit Energy Enabled	BOOL	1	R/W	0	0	1	
14	Reject Limit Energy Low Enabled	BOOL	1	R	0	0	1	
15	Reject Limit Energy High Enabled	BOOL	1	R	0	0	1	
16	Reject Limit Energy Low	REAL	4	R/W	See P/S Model Object Table			
17	Reject Limit Energy High	REAL	4	R/W				
18	Suspect Limit Peak Power Enabled	BOOL	1	R/W	0	0	1	
19	Suspect Limit Peak Power Low Enabled	BOOL	1	R	0	0	1	
1A	Suspect Limit Peak Power High Enabled	BOOL	1	R	0	0	1	
1B	Suspect Limit Peak Power Low	UINT32	4	R/W	See P/S Model Object Table			
1C	Suspect Limit Peak Power High	UINT32	4	R/W				
1D	Reject Limit Peak Power Enabled	BOOL	1	R/W	0	0	1	
1E	Reject Limit Peak Power Low Enabled	BOOL	1	R	0	0	1	
1F	Reject Limit Peak Power High Enabled	BOOL	1	R	0	0	1	
20	Reject Limit Peak Power Low	UINT32	4	R/W	See P/S Model Object Table			
21	Reject Limit Peak Power High	UINT32	4	R/W				
22	Suspect Limit Absolute Distance Enabled	BOOL	1	R/W	0	0	1	

Table 2.16 Non Active Suspect and Reject Recipe Object (0x85)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
23	Suspect Limit Absolute Distance Low Enabled	BOOL	1	R	0	0	1	
24	Suspect Limit Absolute Distance High Enabled	BOOL	1	R	0	0	1	
25	Suspect Limit Absolute Distance Low	REAL	4	R/W	3 (.12)	3 (.12)	125 (4.9)	mm (inch)
26	Suspect Limit Absolute Distance High	REAL	4	R/W	125 (4.9)	3 (.12)	125 (4.9)	mm (inch)
27	Reject Limit Absolute Distance Enabled	BOOL	1	R/W	0	0	1	
28	Reject Limit Absolute Distance Low Enabled	BOOL	1	R	0	0	1	
29	Reject Limit Absolute Distance High Enabled	BOOL	1	R	0	0	1	
2A	Reject Limit Absolute Distance Low	REAL	4	R/W	3 (.12)	3 (.12)	125 (4.9)	mm (inch)
2B	Reject Limit Absolute Distance High	REAL	4	R/W	125 (4.9)	3 (.12)	125 (4.9)	mm (inch)
2C	Suspect Limit Collapse Distance Enabled	BOOL	1	R/W	0	0	1	
2D	Suspect Limit Collapse Distance Low Enabled	BOOL	1	R	0	0	1	
2E	Suspect Limit Collapse Distance High Enabled	BOOL	1	R	0	0	1	
2F	Suspect Limit Collapse Distance Low	REAL	4	R/W	0.01 (.0004)	0.01 (.0004)	25 (.98)	mm (inch)

Table 2.16 Non Active Suspect and Reject Recipe Object (0x85)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
30	Suspect Limit Collapse Distance High	REAL	4	R/W	25 (.98)	0.01 (.0004)	25 (.98)	mm (inch)
31	Reject Limit Collapse Distance Enabled	BOOL	1	R/W	0	0	1	
32	Reject Limit Collapse Distance Low Enabled	BOOL	1	R	0	0	1	
33	Reject Limit Collapse Distance High Enabled	BOOL	1	R	0	0	1	
34	Reject Limit Collapse Distance Low	REAL	4	R/W	0.01 (.0004)	0.01 (.0004)	25 (.98)	mm (inch)
35	Reject Limit Collapse Distance High	REAL	4	R/W	25 (.98)	0.01 (.0004)	25 (.98)	mm (inch)
36	Reserved	NA	1	R/W				
37	Reserved	NA	1	R				
38	Reserved	NA	1	R				
39	Reserved	NA	4	R/W				
3A	Reserved	NA	4	R/W				
3B	Reserved	NA	1	R/W				
3C	Reserved	NA	1	R				
3D	Reserved	NA	1	R				
3E	Reserved	NA	4	R/W				
3F	Reserved	NA	4	R/W				
40	Suspect Limit Weld Force Enabled	BOOL	1	R/W	0	0	1	
41	Suspect Limit Weld Force Low Enabled	BOOL	1	R	0	0	1	
42	Suspect Limit Weld Force High Enabled	BOOL	1	R	0	0	1	
43	Suspect Limit Weld Force Low	REAL	4	R/W	50 (11.2)	25 (5.6)	2500 (562)	N (lbf)

Table 2.16 Non Active Suspect and Reject Recipe Object (0x85)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
44	Suspect Limit Weld Force High	REAL	4	R/W	2500 (562)	25 (5.6)	2500 (562)	N (lbf)
45	Reject Limit Weld Force Enabled	BOOL	1	R/W	0	0	1	
46	Reject Limit Weld Force Low Enabled	BOOL	1	R	0	0	1	
47	Reject Limit Weld Force High Enabled	BOOL	1	R	0	0	1	
48	Reject Limit Weld Force Low	REAL	4	R/W	50 (11.2)	25 (5.6)	2500 (562)	N (lbf)
49	Reject Limit Weld Force High	REAL	4	R/W	2500 (562)	25 (5.6)	2500 (562)	N (lbf)
4A	Suspect Limit Frequency Enabled	BOOL	1	R/W	0	0	1	
4B	Suspect Limit Frequency Low Enabled	BOOL	1	R	0	0	1	
4C	Suspect Limit Frequency High Enabled	BOOL	1	R	0	0	1	
4D	Suspect Limit Frequency Low	UINT32	4	R/W	See P/S Model Object Table			
4E	Suspect Limit Frequency High	UINT32	4	R/W				
4F	Reject Limit Frequency Enabled	BOOL	1	R/W	0	0	1	
50	Reject Limit Frequency Low Enabled	BOOL	1	R	0	0	1	
51	Reject Limit Frequency High Enabled	BOOL	1	R	0	0	1	
52	Reject Limit Frequency Low	UINT32	4	R/W	See P/S Model Object Table			
53	Reject Limit Frequency High	UINT32	4	R/W				

Table 2.17 Common Services

Service Code	Service Name
0x0E	Get_Attribute_Single
0x10	Set_Attribute_Single

2.10 Non-Active Stack Recipe Object (0x86)

The Non-Active Stack Recipe Object contains all the parameters from the saved or non-active stack recipes.

Table 2.18 Non Active Stack Recipe Object (0x86)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
1	Recipe Number	INT32	4	R	0	1	1000	
2	Digital Tune	INT32	4	R/W	See P/S Model Object Table			
3	Internal Offset Flag	BOOL	1	R/W	0	0	1	
4	Frequency Offset	INT32	4	R/W	See P/S Model Object Table			
5	End Of Weld Store	BOOL	1	R/W	0	0	1	

Table 2.19 Common Services

Service Code	Service Name
0x0E	Get_Attribute_Single
0x10	Set_Attribute_Single

2.11 Weld Results Object (0x87)

The Weld Results Object contains all the weld result characteristics of prior welds.

Table 2.20 Weld Results Object (0x87)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Unit
1	Recipe Number	UINT32	4	R	
2	Weld Recipe Ver Number	UINT32	4	R	
3	Date Time	DATE_AND_TIME	7	R	
4	Reserved	NA	4	R	
5	Cycle Counter	UINT32	4	R	
6	Weld Mode	UINT32	4	R	See Weld Mode Table
7	Max Weld Force	REAL	4	R	N (lbf)
8	End Hold Force	REAL	4	R	N (lbf)
9	Weld Absolute	REAL	4	R	mm (inch)
A	Total Absolute	REAL	4	R	mm (inch)
B	Weld Collapse Distance	REAL	4	R	mm (inch)
C	Hold Collapse Distance	REAL	4	R	mm (inch)
D	Total Collapse Distance	REAL	4	R	mm (inch)
E	Trigger Distance	REAL	4	R	mm (inch)
F	Reserved	NA	4	R	
10	Weld Time	REAL	4	R	s
11	Weld Energy	REAL	4	R	J
12	Weld Peak Power	UINT32	4	R	W
13	Start Frequency	UINT32	4	R	Hz
14	Frequency Change	INT32	4	R	Hz
15	Cycle Time	REAL	4	R	s
16	Username	STRING	16	R	
17	Part ID	STRING	50	R	
18	Batch ID	STRING	50	R	
19	Trigger Point	REAL	4	R	mm (inch)

Table 2.20 Weld Results Object (0x87)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Unit
1A	Weld Sonic Point	REAL	4	R	mm (inch)
1B	Hold Point	REAL	4	R	mm (inch)
1C	Alarm Flag	BOOL	1	R	
1D	Recipe Status	UINT8	1	R	See Table Alarm Table

Table 2.21 Common Services

Service Code	Service Name
0x0E	Get_Attribute_Single

2.12 Last Weld Results Object (0x88)

The Weld Results Object contains all the weld result characteristics of the last completed weld.

Table 2.22 Last Weld Results Object (0x88)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Unit
1	Recipe Number	UINT32	4	R	
2	Weld Recipe Ver Number	UINT32	4	R	
3	Date Time	DATE_AND_TIME	7	R	
4	Reserved	NA	4	R	
5	Cycle Counter	UINT32	4	R	
6	Weld Mode	UINT32	4	R	See Weld Mode Table
7	Max Weld Force	REAL	4	R	N (lbf)
8	End Hold Force	REAL	4	R	N (lbf)
9	Weld Absolute	REAL	4	R	mm (inch)
A	Total Absolute	REAL	4	R	mm (inch)
B	Weld Collapse Distance	REAL	4	R	mm (inch)
C	Hold Collapse Distance	REAL	4	R	mm (inch)
D	Total Collapse Distance	REAL	4	R	mm (inch)
E	Trigger Distance	REAL	4	R	mm (inch)
F	Reserved	NA	4	R	
10	Weld Time	REAL	4	R	s
11	Weld Energy	REAL	4	R	J
12	Weld Peak Power	UINT32	4	R	W
13	Start Frequency	UINT32	4	R	Hz
14	Frequency Change	INT32	4	R	Hz
15	Cycle Time	REAL	4	R	s
16	Username	STRING	16	R	
17	Part ID	STRING	50	R	
18	BatchID	STRING	50	R	

Table 2.22 Last Weld Results Object (0x88)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Unit
19	Trigger Point	REAL	4	R	mm (inch)
1A	Weld Sonic Point	REAL	4	R	mm (inch)
1B	Hold Point	REAL	4	R	mm (inch)
1C	Alarm Flag	BOOL	1	R	
1D	Recipe Status	UINT8	1	R	See Table Alarm Table

Table 2.23 Common Services

Service Code	Service Name
0x0E	Get_Attribute_Single

2.13 Version/RTC/Counters/Access Token Object (0x92)

The Version/RTC/Counters/Access Token Object configures the setting of the control token.

Table 2.24 Version/RTC/Counters/Access Token Object (0x92)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access
1	Access Token Owner	SINT	1	R/W
2	Reserved			
3	Reserved			
4	Reserved			
5	Reserved			
6	Reserved			
7	Reserved			
8	Reserved			
9	Reserved			
A	Reserved			

Table 2.25 Common Services

Service Code	Service Name
0x0E	Get_Attribute_Single
0x10	Set_Attribute_Single

2.14 Active Setup Limits Recipe Object (0x93)

The Active Setup Limits Recipe Object contains all the setup limit parameters of the current or active recipe.

Table 2.26 Active Setup Limits Recipe Object (0x93)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
1	Setup limits global enable	BOOL	1	R/W	0	0	1	
2	Setup limits mode enable	BOOL	1	R/W	0	0	1	
3	Setup limits mode low	REAL	4	R/W	0.01	0.01	30	
4	Setup limits mode high	REAL	4	R/W	30	0.01	30	
5	Setup limits amplitude enable	BOOL	1	R/W	0	0	1	
6	Setup limits amplitude low	UINT32	4	R/W	10	10	100	%
7	Setup limits amplitude high	UINT32	4	R/W	100	10	100	%
8	Setup limits weld force enable	BOOL	1	R/W	0	0	1	
9	Setup limits weld force low	REAL	4	R/W	50	25	2500	N (lbf)
A	Setup limits weld force high	REAL	4	R/W	2500	25	2500	N (lbf)
B	Setup limits trigger force enable	BOOL	1	R/W	0	0	1	
C	Setup limits trigger force low	REAL	4	R/W	25	5	2500	N (lbf)
D	Setup limits trigger force high	REAL	4	R/W	2500	5	2500	N (lbf)
E	Setup limits hold force enable	BOOL	1	R/W	0	0	1	
F	Setup limits hold force low	REAL	4	R/W	25	25	2500	N (lbf)
10	Setup limits hold force high	REAL	4	R/W	2500	25	2500	N (lbf)
11	Setup limits hold time enable	BOOL	1	R/W	0	0	1	
12	Setup limits hold time low	REAL	4	R/W	0.01	0.01	30	s

Table 2.26 Active Setup Limits Recipe Object (0x93)

Attribute ID (Hex)	Attribute Name	Data Type	Size In Bytes	Access	Def.	Min.	Max.	Unit
13	Setup limits hold time high	REAL	4	R/W	30	0.01	30	s
14	Reserved	NA	NA	NA				
15	Reserved	NA	NA	NA				
16	Reserved	NA	NA	NA				
17	Reserved	NA	NA	NA				
18	Reserved	NA	NA	NA				
19	Reserved	NA	NA	NA				
1A	Setup limits reactivity enable	BOOL	1	R/W	0	0	1	
1B	Setup limits reactivity low	UINT32	4	R/W	0	0	100	%
1C	Setup limits reactivity high	UINT32	4	R/W	100	0	100	%
1D	Setup limits force level enable	BOOL	1	R/W	0	0	1	
1E	Setup limits force level low	UINT32	4	R/W	0	0	100	%
1F	Setup limits force level high	UINT32	4	R/W	100	0	100	%

Table 2.27 Common Services

Service Code	Service Name
0x0E	Get_Attribute_Single
0x10	Set_Attribute_Single

2.15 Weld Mode and Weld Mode Parameters

Attribute values and ranges for the Weld Mode and the Weld Mode Parameters.

Table 2.28 Weld Mode

Object ID	Attribute ID	Attribute Name	Data Type	Size in Bytes	Access	Weld Mode Attribute Value					
						Time	Energy	Peak Power	Ground detect	Absolute Distance	Collapse Distance
0x81	4	Weld Mode	INT32	4	R/W	0	1	3	4	5	6

Table 2.29 Weld Mode Parameters (20 kHz)

Object ID	Attribute ID (Hex)	Attribute Name	Data Type	Size in Bytes	Access	Weld Mode Parameter Attribute Value			Units	Weld Mode
						20 kHz				
						Def.	Min.	Max.		
0x81	5	Mode Value	Real	4	R/W	0.01	0.01	30	s	Time
0x81	5	Mode Value	Real	4	R/W	1	1	120000	J	Energy
0x81	5	Mode Value	Real	4	R/W	400	1	4000	W	Peak Power
0x81	5	Mode Value	Real	4	R/W	0 .001	0.001	0.5	s	Ground Detect
0x81	5	Mode Value	Real	4	R/W	3	3	125	mm (inch)	Absolute Distance
0x81	5	Mode Value	Real	4	R/W	.01 (.0004)	.01 (.0004)	25 (.98)	mm (inch)	Collapse Distance

Table 2.30 Weld Mode Parameters (30 kHz)

Object ID	Attribute ID (Hex)	Attribute Name	Data Type	Size in Bytes	Access	Weld Mode Parameter Attribute Value			Units	Weld Mode
						30 kHz				
						Def.	Min.	Max.		
0x81	5	Mode Value	Real	4	R/W	0.01	0.01	30	s	Time
0x81	5	Mode Value	Real	4	R/W	1	1	45000	J	Energy
0x81	5	Mode Value	Real	4	R/W	150	1	1500	W	Peak Power
0x81	5	Mode Value	Real	4	R/W	0.001	0.001	0.5	s	Ground Detect
0x81	5	Mode Value	Real	4	R/W	3	3	125	mm (inch)	Absolute Distance
0x81	5	Mode Value	Real	4	R/W	.01 (.0004)	.01 (.0004)	25 (.98)	mm (inch)	Collapse Distance

Table 2.31 Weld Mode Parameters (40 kHz)

Object ID	Attribute ID (Hex)	Attribute Name	Data Type	Size in Bytes	Access	Weld Mode Parameter Attribute Value			Units	Weld Mode
						40 kHz				
						Def.	Min.	Max.		
0x81	5	Mode Value	Real	4	R/W	0.01	0.01	30	s	Time
0x81	5	Mode Value	Real	4	R/W	1	1	24000	J	Energy
0x81	5	Mode Value	Real	4	R/W	80	1	800	W	Peak Power
0x81	5	Mode Value	Real	4	R/W	0.001	0.001	0.5	s	Ground Detect
0x81	5	Mode Value	Real	4	R/W	3	3	125	mm (inch)	Absolute Distance
0x81	5	Mode Value	Real	4	R/W	.01 (.0004)	.01 (.0004)	25 (.98)	mm (inch)	Collapse Distance

2.16 Power Supply Model Object

Attribute values and ranges specific to a power supply model.

Table 2.32 Power Supply Model Object (20 kHz)

Object ID	Attribute ID (Hex)	Attribute Name	Data Type	Size in Bytes	Access	Weld Mode Parameter Attribute Value			Units
						20 kHz			
						Def.	Min.	Max.	
0x81	63	Peak Power Cutoff	INT32	4	R/W	400	1	4000	W
0x81	65	Frequency Low Cutoff	INT32	4	R/W	500	1	500	Hz
0x81	69	Frequency High Cutoff	INT32	4	R/W	500	1	5000	Hz
0x81	6D	Energy Cutoff	REAL	4	R/W	120000	1	120000	J
0x82	11	Suspect Limit Energy Low	REAL	4	R/W	1	1	120000	J
0x82	12	Suspect Limit Energy High	REAL	4	R/W	120000	1	120000	J
0x82	16	Reject Limit Energy Low	REAL	4	R/W	1	1	120000	J
0x82	17	Reject Limit Energy High	REAL	4	R/W	120000	1	120000	J
0x82	1B	Suspect Limit Peak Power Low	UINT32	4	R/W	1	1	4000	W
0x82	1C	Suspect Limit Peak Power High	UINT32	4	R/W	4000	1	4000	W
0x82	20	Reject Limit Peak Power Low	UINT32	4	R/W	1	1	4000	W
0x82	21	Reject Limit Peak Power High	UINT32	4	R/W	4000	1	4000	W
0x82	4D	Suspect Limit Frequency Low	UINT32	4	R/W	1	1	500	Hz
0x82	4E	Suspect Limit Frequency High	UINT32	4	R/W	500	1	500	Hz
0x82	52	Reject Limit Frequency Low	UINT32	4	R/W	1	1	500	Hz
0x82	53	Reject Limit Frequency High	UINT32	4	R/W	500	1	500	Hz
0x83	2	Digital Tune	INT32	4	R/W	19950	19450	20450	Hz
0x83	4	Frequency Offset	INT32	4	R/W	19950	19450	20450	Hz

Table 2.33 Power Supply Model Object (30 kHz)

Object ID	Attribute ID (Hex)	Attribute Name	Data Type	Size in Bytes	Access	Weld Mode Parameter Attribute Value			Units
						30 kHz			
						Def.	Min.	Max.	
0x81	63	Peak Power Cutoff	INT32	4	R/W	150	1	1500	W
0x81	65	Frequency Low Cutoff	INT32	4	R/W	750	1	750	Hz
0x81	69	Frequency High Cutoff	INT32	4	R/W	750	1	750	Hz
0x81	6D	Energy Cutoff	REAL	4	R/W	45000	1	45000	J
0x82	11	Suspect Limit Energy Low	REAL	4	R/W	1	1	45000	J
0x82	12	Suspect Limit Energy High	REAL	4	R/W	45000	1	45000	J
0x82	16	Reject Limit Energy Low	REAL	4	R/W	1	1	45000	J
0x82	17	Reject Limit Energy High	REAL	4	R/W	45000	1	45000	J
0x82	1B	Suspect Limit Peak Power Low	UINT32	4	R/W	1	1	1500	W
0x82	1C	Suspect Limit Peak Power High	UINT32	4	R/W	1500	1	1500	W
0x82	20	Reject Limit Peak Power Low	UINT32	4	R/W	1	1	1500	W
0x82	21	Reject Limit Peak Power High	UINT32	4	R/W	1500	1	1500	W
0x82	4D	Suspect Limit Frequency Low	UINT32	4	R/W	1	1	750	Hz
0x82	4E	Suspect Limit Frequency High	UINT32	4	R/W	750	1	750	Hz
0x82	52	Reject Limit Frequency Low	UINT32	4	R/W	1	1	750	Hz
0x82	53	Reject Limit Frequency High	UINT32	4	R/W	750	1	750	Hz
0x83	2	Digital Tune	INT32	4	R/W	30000	29250	30750	Hz
0x83	4	Frequency Offset	INT32	4	R/W	30000	29250	30750	Hz

Table 2.34 Power Supply Model Object (40 kHz)

Object ID	Attribute ID (Hex)	Attribute Name	Data Type	Size in Bytes	Access	Weld Mode Parameter Attribute Value			Units
						40 kHz			
						Def.	Min.	Max.	
0x81	63	Peak Power Cutoff	INT32	4	R/W	80	1	800	W
0x81	65	Frequency Low Cutoff	INT32	4	R/W	1000	1	1000	Hz
0x81	69	Frequency High Cutoff	INT32	4	R/W	1000	1	1000	Hz
0x81	6D	Energy Cutoff	REAL	4	R/W	24000	1	24000	J
0x82	11	Suspect Limit Energy Low	REAL	4	R/W	1	1	24000	J
0x82	12	Suspect Limit Energy High	REAL	4	R/W	24000	1	24000	J
0x82	16	Reject Limit Energy Low	REAL	4	R/W	1	1	24000	J
0x82	17	Reject Limit Energy High	REAL	4	R/W	24000	1	24000	J
0x82	1B	Suspect Limit Peak Power Low	UINT32	4	R/W	1	1	800	W
0x82	1C	Suspect Limit Peak Power High	UINT32	4	R/W	800	1	800	W
0x82	20	Reject Limit Peak Power Low	UINT32	4	R/W	1	1	8000	W
0x82	21	Reject Limit Peak Power High	UINT32	4	R/W	8000	1	800	W
0x82	4D	Suspect Limit Frequency Low	UINT32	4	R/W	1	1	1000	Hz
0x82	4E	Suspect Limit Frequency High	UINT32	4	R/W	1000	1	1000	Hz
0x82	52	Reject Limit Frequency Low	UINT32	4	R/W	1	1	1000	Hz
0x82	53	Reject Limit Frequency High	UINT32	4	R/W	1000	1	1000	Hz
0x83	2	Digital Tune	INT32	4	R/W	39900	39100	40700	Hz
0x83	4	Frequency Offset	INT32	4	R/W	39900	39100	40700	Hz

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Chapter 3: I/O Implicit Messaging Data

3.1 I/O Control Words (GSX Inputs/PLC Outputs)

Table 3.1 I/O Control Words (GSX Inputs/PLC Outputs)

Control Words				
Data	**Description**	**Data Type**	**Unit**	**Access**
0	Control Word 0	INT	NA	W
1	Control Word 1			
2	Control Word 2			
3	Set Recipe Number			

3.1.1 Control Word 0

Table 3.2 Control Word 0

Data [0] Control Word 0			
Bit	**Function Name**	**Description**	**Logic**
0	Disable_U_S	Ultrasonic Disable - Disable ultrasonics from during the weld cycle.	1 = Disable ultrasonics
1	Reserved	Not used.	-
2	Go_Home_Position	Go to Home Position - Commands to send the horn to home position when the start switches are closed.	1 = Configure to send horn to home position
3	Go_Ready_Position	Go to Ready Position - Commands to send the horn to ready position when the start switches are closed.	1 = Configure to send horn to ready position
4	Reserved	Not used.	-
5	Reserved	Not used.	-
6	Reserved	Not used.	-
7	Reserved	Not used.	-
8	Reserved	Not used.	-
9	Reserved	Not used.	-
10	Reserved	Not used.	-
11	Reserved	Not used.	-
12	Reserved	Not used.	-
13	Reserved	Not used.	-
14	Reserved	Not used.	-
15	Reserved	Not used.	-

3.1.2 Control Word 1

Table 3.3 Control Word 1

Data [1] Control Word 1			
Bit	**Function Name**	**Description**	**Logic**
0	Reserved	Not used.	-
1	Enable_Stack_Function	See Stack Function table.	
2	SFCT0		
3	SFCT1		
4	SFCT2		
5	Reserved	Not used.	-
6	Reserved	Not used.	-
7	Reserved	Not used.	-
8	Reserved	Clears and resets GSX alarms.	1 = Clear alarms
9	Reserved	Not used.	-
10	Reserved	Abort weld cycle.	1 = Aborts weld cycle
11	Reserved	Not used.	-
12	Reserved	Horn-nest contact is detected.	1 = Horn to fixture contact is detected
13	Reserved	Not used.	-
14	Reserved	Not used.	-
15	Reserved	Not used.	-

Table 3.4 Stack Function

Tag Name	Frequency Seek
Enable_Stack_Function	1
SFCT0	0
SFCT1	0
SFCT2	0

3.1.3 Control Word 2

Table 3.5 Control Word 2

Data [2] Control Word 2			
Bit	**Function Name**	**Description**	**Logic**
0	Enable_Actuator_Function	See Actuator Function table.	
1	ACFT0		
2	ACFT1		
3	ACFT2		
4	Reserved	Not used.	-
5	Reserved	Not used.	-
6	Reserved	Not used.	-
7	Reserved	Not used.	-
8	Reserved	Not used.	-
9	Reserved	Not used.	-
10	Reserved	Not used.	-
11	Reserved	Not used.	-
12	Reserved	Not used.	-
13	Reserved	Not used.	-
14	Reserved	Not used.	-
15	Reserved	Not used.	-

Table 3.6 Actuator Function

Tag Name	Find Part Contact
Enable_Actuator_Function	1
ACFT0	0
ACFT1	0
ACFT2	0

3.2 I/O Status Words (GSX Outputs/PLC Inputs)

Table 3.7 I/O Status Words (GSX Outputs/PLC Inputs)

Status Word						
Data	**Description**	**Data Type**		**Metric Units**	**Imperial Units**	**Access**
0	Status Word 0	INT		N/A	N/A	R
1	Status Word 01	INT				
2	Status Word 02	INT				
3	Active Recipe Number	INT				
4	Amplitude Out	INT		%		
5	Current	INT		%		
6	Power	INT		W		
7	Phase	INT		Deg.		
8	Frequency (Low Word)	INT	DINT	Hz		
9	Frequency (High Word)	INT				
10	Time (Low Word)	INT	DINT	ms		
11	Time (High Word)	INT				
12	Energy (Low Word)	INT	DINT	mJ		
13	Energy (High Word)	INT				
14	Force (Low Word)	INT*	Real	N	lbf	
15	Force (High Word)	INT*				
16	Velocity (Low Word)	INT*	Real	um/s	inch/s	
17	Velocity (High Word)	INT*				
18	Absolute Distance (Low Word)	INT*	Real	um	inch	
19	Absolute Distance (High Word)	INT*				
20	Collapse Distance (Low Word)	INT*	Real	um	inch	
21	Collapse Distance (High Word)	INT*				
22	Last Active Alarm (Low Word)	INT	DINT	See Alarm table.	N/A	
23	Last Active Alarm (High Word)	INT				

NOTICE	
	Imperial or Metric units are set in the system configuration screen. The I/O units automatically configure to match the unit setting in the system configuration screen.

NOTICE	
	High word INT* with Low word INT* follow IEEE-754 standard for floating point numbers.

3.2.1 Status Word 0

Table 3.8 Status Word 0

Data [0] Status Word 0			
Bit	**Function Name**	**Description**	**Logic**
0	Reserved	Not used.	-
1	Emergency_Stop_Active	Emergency stop is active.	1 = Emergency Stop active
2	Reserved	Not used.	-
3	Reserved	Not used.	-
4	Reserved	Not used.	-
5	Reserved	Not used.	-
6	Reserved	Not used.	-
7	Reserved	Not used.	-
8	Reserved	Not used.	-
9	Reserved	Not used.	-
10	Reserved	Not used.	-
11	Reserved	Not used.	-
12	Reserved	Not used.	-
13	Reserved	Not used.	-
14	Reserved	Not used.	-
15	Reserved	Not used.	-

3.2.2 Status Word 1

Table 3.9 Status Word 1

Data [1] Status Word 1			
Bit	**Function Name**	**Description**	**Logic**
0	Reserved	Not used.	-
1	Reserved	Not used.	-
2	Reserved	Not used.	-
3	Reserved	Not used.	-
4	Reserved	Not used.	-
5	Reserved	Not used.	-
6	Reserved	Not used.	-
7	Reserved	Not used.	-
8	Reserved	Not used.	-
9	Reserved	Not used.	-
10	Ready_State	GSX system is in a ready to run state.	1 = GSX is in ready state
11	Ultrasonics_Active	Ultrasonics are active	1 = Ultrasonics active
12	Cycle_OK	No alarm occurred from the last weld cycle.	1 = No alarms at end of weld cycle
13	Reserved	Not used.	-
14	Reserved	Not used.	-
15	Reserved	Not used.	-

3.2.3 Status Word 2

Table 3.10 Status Word 2

Data [2] Status Word 2			
Bit	**Function Name**	**Description**	**Logic**
0	Cycle_Active	Cycle Active - The weld cycle is active.	1 = Weld cycle running
1	Seek_Active	Seek Active - Ultrasonic seek for horn frequency is active.	1 = Seek is active
2	Weld_Active	Weld Active - Ultrasonics are active during the weld cycle.	1 = Ultrasonics active in weld cycle
3	Hold_Active	Hold Active - The hold state is active during the weld cycle.	1 = Hold state active in weld cycle
4	Home_Position	Home Position - The horn is at the home position.	1 = Horn at home position
5	Ready_Position	Ready Position - The horn is at the ready position.	1 = Horn at ready position
6	PB_Release	Palm Button Release - The start switches can be opened in the weld cycle.	1 = Start switches can be opened
7	General_Alarm	An alarm occurred.	1 = General alarm
8	Setup_Mode	The system is in setup mode.	1 = Setup mode is active
9	Validated_Recipe	The active recipe is validated.	1 = Recipe is validated
10	Reserved	Not used.	-
11	Reserved	Not used.	-
12	Reserved	Not used.	-
13	Find_Part_Contact_Active	Find part contact for weld recipe is active.	-1 = Find part contact active
14	Reserved	Not used.	-
15	Reserved	Not used.	-

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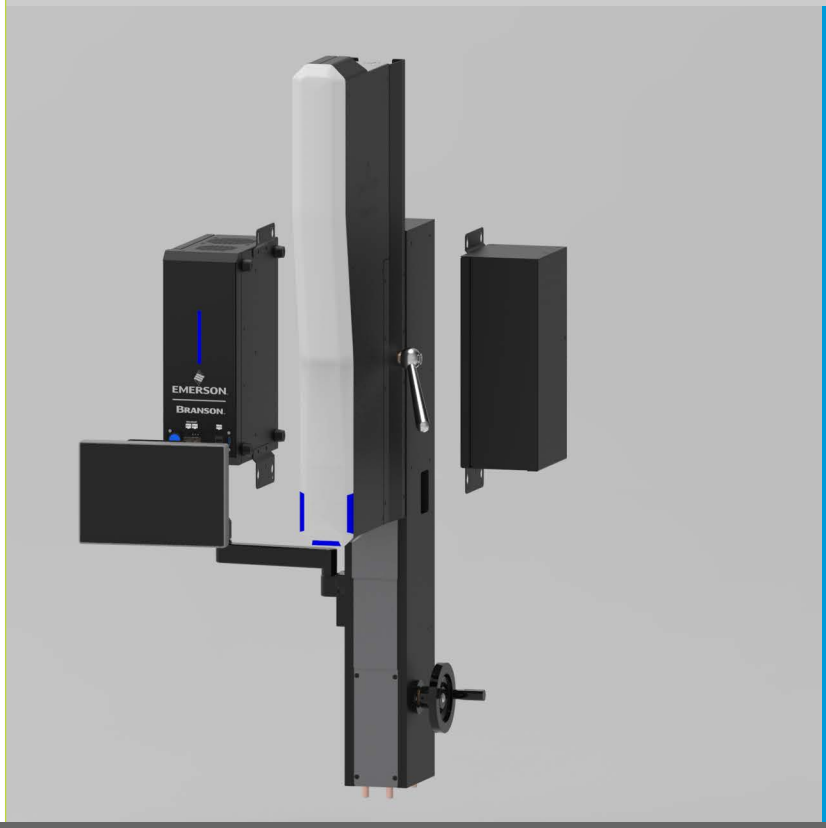
Original Instructions
BU-4001304 - REV. 00

EMERSON



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