

Ransburg

RCS2 Ethernet/IP Explicit Communications Programmer's Manual



Model: A14084-00 RCS2 Interface with Ethernet/IP Card

IMPORTANT: Before using this equipment, carefully read SAFETY PRECAUTIONS and all instructions in this manual. Keep this Service Manual for future reference.

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SAFETY

SAFETY PRECAUTIONS

Before operating, maintaining or servicing any Ransburg electrostatic coating system, read and understand all of the technical and safety literature for your Ransburg products. This manual contains information that is important for you to know and understand. This information relates to **USER SAFETY** and **PREVENTING EQUIPMENT PROBLEMS**. To help you recognize this information, we use the following symbols. Please pay particular attention to these sections.

WARNING

A **WARNING!** states information to alert you to a situation that might cause serious injury if instructions are not followed.

CAUTION

A **CAUTION!** states information that tells how to prevent damage to equipment or how to avoid a situation that might cause minor injury.

NOTE

A **NOTE** is information relevant to the procedure in progress.

While this manual lists standard specifications and service procedures, some minor deviations may be found between this literature and your equipment. Differences in local codes and plant requirements, material delivery requirements, etc., make such variations inevitable. Compare this manual with your system installation drawings and appropriate Ransburg equipment manuals to reconcile such differences.


Careful study and continued use of this manual will provide a better understanding of the equipment and process, resulting in more efficient operation, longer trouble-free service and faster, easier troubleshooting. If you do not have the manuals and safety literature for your Ransburg system, contact your local Ransburg representative or Ransburg.



WARNING

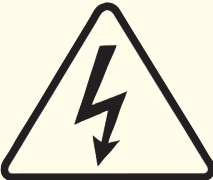
- The user **MUST** read and be familiar with the Safety Section in this manual and the Ransburg safety literature therein identified.
- This equipment is intended to be used by trained personnel **ONLY**.
- This manual **MUST** be read and thoroughly understood by **ALL** personnel who operate, clean or maintain this equipment! Special care should be taken to ensure that the **WARNINGS** and safety requirements for operating and servicing the equipment are followed. The user should be aware of and adhere to **ALL** local building and fire codes and ordinances as well as **NFPA-33 AND EN 50176 SAFETY STANDARDS, LATEST EDITION**, or applicable country safety standards, prior to installing, operating, and/or servicing this equipment.




WARNING

- The hazards shown on the following pages may occur during the normal use of this equipment.

<p>AREA Tells where hazards may occur.</p>	<p>HAZARD Tells what the hazard is.</p>	<p>SAFEGUARDS Tells how to avoid the hazard.</p>
<p>Spray Area</p> 	<p>Fire Hazard</p> <p>Improper or inadequate operation and maintenance procedures will cause a fire hazard.</p> <p>Protection against inadvertent arcing that is capable of causing fire or explosion is lost if any safety interlocks are disabled during operation. Frequent Power Supply or Controller shutdown indicates a problem in the system requiring correction.</p>	<p>Fire extinguishing equipment must be present in the spray area and tested periodically.</p> <p>Spray areas must be kept clean to prevent the accumulation of combustible residues.</p> <p>Smoking must never be allowed in the spray area.</p> <p>The high voltage supplied to the atomizer must be turned off prior to cleaning, flushing or maintenance.</p> <p>Spray booth ventilation must be kept at the rates required by NFPA-33, OSHA, country, and local codes. In addition, ventilation must be maintained during cleaning operations using flammable or combustible solvents.</p> <p>Electrostatic arcing must be prevented. Safe sparking distance must be maintained between the parts being coated and the applicator. A distance of 1 inch for every 10KV of output voltage is required at all times.</p> <p>Test only in areas free of combustible material. Testing may require high voltage to be on, but only as instructed.</p> <p>Non-factory replacement parts or unauthorized equipment modifications may cause fire or injury. If used, the key switch bypass is intended for use only during setup operations. Production should never be done with safety interlocks disabled.</p> <p>The paint process and equipment should be set up and operated in accordance with NFPA-33, NEC, OSHA, local, country, and European Health and Safety Norms.</p>

<p>AREA Tells where hazards may occur.</p>	<p>HAZARD Tells what the hazard is.</p>	<p>SAFEGUARDS Tells how to avoid the hazard.</p>
<p>Spray Area</p> 	<p>Explosion Hazard</p> <p>Improper or inadequate operation and maintenance procedures will cause a fire hazard.</p> <p>Protection against inadvertent arcing that is capable of causing fire or explosion is lost if any safety interlocks are disabled during operation.</p> <p>Frequent Power Supply or Controller shutdown indicates a problem in the system requiring correction.</p>	<p>Electrostatic arcing must be prevented. Safe sparking distance must be maintained between the parts being coated and the applicator. A distance of 1 inch for every 10KV of output voltage is required at all times.</p> <p>Unless specifically approved for use in hazardous locations, all electrical equipment must be located outside Class I or II, Division 1 or 2 hazardous areas, in accordance with NFPA-33.</p> <p>Test only in areas free of flammable or combustible materials.</p> <p>The current overload sensitivity (if equipped) MUST be set as described in the corresponding section of the equipment manual. Protection against inadvertent arcing that is capable of causing fire or explosion is lost if the current overload sensitivity is not properly set. Frequent power supply shutdown indicates a problem in the system which requires correction.</p> <p>Always turn the control panel power off prior to flushing, cleaning, or working on spray system equipment.</p> <p>Before turning high voltage on, make sure no objects are within the safe sparking distance.</p> <p>Ensure that the control panel is interlocked with the ventilation system and conveyor in accordance with NFPA-33, EN 50176.</p> <p>Have fire extinguishing equipment readily available and tested periodically.</p>
<p>General Use and Maintenance</p> 	<p>Improper operation or maintenance may create a hazard.</p> <p>Personnel must be properly trained in the use of this equipment.</p>	<p>Personnel must be given training in accordance with the requirements of NFPA-33, EN 60079-0.</p> <p>Instructions and safety precautions must be read and understood prior to using this equipment.</p> <p>Comply with appropriate local, state, and national codes governing ventilation, fire protection, operation maintenance, and housekeeping. Reference OSHA, NFPA-33, EN Norms and your insurance company requirements.</p>

<p>AREA Tells where hazards may occur.</p>	<p>HAZARD Tells what the hazard is.</p>	<p>SAFEGUARDS Tells how to avoid the hazard.</p>
<p>Spray Area / High Voltage Equipment</p> 	<p>Electrical Discharge</p> <p>There is a high voltage device that can induce an electrical charge on ungrounded objects which is capable of igniting coating materials.</p> <p>Inadequate grounding will cause a spark hazard. A spark can ignite many coating materials and cause a fire or explosion.</p>	<p>Parts being sprayed and operators in the spray area must be properly grounded.</p> <p>Parts being sprayed must be supported on conveyors or hangers that are properly grounded. The resistance between the part and earth ground must not exceed 1 meg ohm. (Refer to NFPA-33.)</p> <p>Operators must be grounded. Rubber soled insulating shoes should not be worn. Grounding straps on wrists or legs may be used to assure adequate ground contact.</p> <p>Operators must not be wearing or carrying any ungrounded metal objects.</p> <p>When using an electrostatic handgun, operators must assure contact with the handle of the applicator via conductive gloves or gloves with the palm section cut out.</p> <p>NOTE: REFER TO NFPA-33 OR SPECIFIC COUNTRY SAFETY CODES REGARDING PROPER OPERATOR GROUNDING.</p> <p>All electrically conductive objects in the spray area, with the exception of those objects required by the process to be at high voltage, must be grounded. Grounded conductive flooring must be provided in the spray area.</p> <p>Always turn off the power supply prior to flushing, cleaning, or working on spray system equipment.</p> <p>Unless specifically approved for use in hazardous locations, all electrical equipment must be located outside Class I or II, Division 1 or 2 hazardous areas, in accordance with NFPA-33.</p> <p>Avoid installing an applicator into a fluid system where the solvent supply is ungrounded.</p> <p>Do not touch the applicator electrode while it is energized.</p>

AREA Tells where hazards may occur.	HAZARD Tells what the hazard is.	SAFEGUARDS Tells how to avoid the hazard.
<p>Electrical Equipment</p> 	<p>Electrical Discharge</p> <p>High voltage equipment is utilized in the process. Arcing in the vicinity of flammable or combustible materials may occur. Personnel are exposed to high voltage during operation and maintenance.</p> <p>Protection against inadvertent arcing that may cause a fire or explosion is lost if safety circuits are disabled during operation.</p> <p>Frequent power supply shut-down indicates a problem in the system which requires correction.</p> <p>An electrical arc can ignite coating materials and cause a fire or explosion.</p>	<p>Unless specifically approved for use in hazardous locations, the power supply, control cabinet, and all other electrical equipment must be located outside Class I or II, Division 1 and 2 hazardous areas in accordance with NFPA-33 and EN 50176.</p> <p>Turn the power supply OFF before working on the equipment.</p> <p>Test only in areas free of flammable or combustible material.</p> <p>Testing may require high voltage to be on, but only as instructed.</p> <p>Production should never be done with the safety circuits disabled.</p> <p>Before turning the high voltage on, make sure no objects are within the sparking distance.</p>
<p>Toxic Substances</p> 	<p>Chemical Hazard</p> <p>Certain materials may be harmful if inhaled, or if there is contact with the skin.</p>	<p>Follow the requirements of the Safety Data Sheet supplied by coating material manufacturer.</p> <p>Adequate exhaust must be provided to keep the air free of accumulations of toxic materials.</p> <p>Use a mask or respirator whenever there is a chance of inhaling sprayed materials. The mask must be compatible with the material being sprayed and its concentration. Equipment must be as prescribed by an industrial hygienist or safety expert, and be NIOSH approved.</p>
<p>Spray Area</p> 	<p>Explosion Hazard — Incompatible Materials</p> <p>Halogenated hydrocarbon solvents for example: methylene chloride and 1,1,1,-Trichloroethane are not chemically compatible with the aluminum that might be used in many system components. The chemical reaction caused by these solvents reacting with aluminum can become violent and lead to an equipment explosion.</p>	<p>Spray applicators require that aluminum inlet fittings be replaced with stainless steel.</p> <p>Aluminum is widely used in other spray application equipment - such as material pumps, regulators, triggering valves, etc. Halogenated hydrocarbon solvents must never be used with aluminum equipment during spraying, flushing, or cleaning. Read the label or data sheet for the material you intend to spray. If in doubt as to whether or not a coating or cleaning material is compatible, contact your coating supplier. Any other type of solvent may be used with aluminum equipment.</p>

ETHERNET/IP EXPLICIT COMMUNICATIONS INTERFACE

This document describes RCS2 Ethernet/IP Explicit protocol packets. Ethernet/IP Implicit data packets are described in a separate document. The Implicit data packets are intended for continuously transporting the command and status data needed as for real-time external control. The Explicit data packets described in this document are implemented for “on-demand” remote access for process monitoring and control actions which may take longer to execute.

General notes for this document:

- When Set access is specified, Get access is automatically supported.
 - When Get access is specified, Set access is not supported.
 - Per ODVA definitions:
 - **“Instance 0 of an Object refers to the Class Level”**
 - “Attribute ID at this level refers to the Class Attributes”
 - **“Instance > 0 of an Object refers to the specified Object Instance”**
 - “Attribute ID at this level refers to the Instance Attributes of the Object”
- For examples showing how Objects are addressed the reader can review the last three pages of this document titled: RCS2 Explicit Message Access Tables
- All Get services are always enabled
 - Some Set services are associated with system flag settings which enables or disables the ability to set these attributes via Ethernet/IP. If disabled, attempts to set attributes will be denied and an error will be returned. The enable/disable settings are retained in non-volatile memory on the Interface–Ethernet/IP board and configured via the RT serial console. Each protocol includes information about any associated Set enable flag.
 - The RCS2 has several possible sources of command inputs. These include the FMS main HMI screen, the physically wired (discrete) input signals and the Ethernet-I/P communications. These different input sources are all concurrently actively scanning.
 - For the discrete digital input signals, an input will be considered “active” if any of the sources of that signal are “active”. To be inactive/off, all sources of that signal must be inactive.
 - For setpoints, there is priority order for “voting” with non-zero values. If enabled, connected and non-zero, the Ethernet/IP setpoint value will be used. The next priority will be given to an FMS “forced” setpoint value. The next priority will be the Analog input reading. Finally, if the Analog input reading is below 250mV, the setpoint will be set to the default value for the Flow Rate Setpoint on the Config. Job Screen.

GUN OPERATIONAL RUNTIME STATUS

Class Code: 64 Hex

The Gun Operational Status Object provides operational data from the selected RCS2 gun.

Gun Status information is maintained for each Gun.

Multiple object instances are used to provide access to the 8 possible Guns.

If Instance Attribute 2 is specified, a single packet with data for all 8 guns will be returned. This single packet transaction facilitates fewer transactions in situations for higher frequency monitoring (e.g. once per second).

Class Attributes

TABLE 1-1: GUN OPERATIONAL STATUS OBJECT CLASS ATTRIBUTES

Attribute ID	Needed in Implementation	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Get	NV	Revision	UINT	Revision of this object	The current value assigned to this attribute is one (1)
2	Required	Get	NV	Max Instance	UINT	Maximum instance number of an object currently created in this class level of the device	The current value assigned to this attribute is eight (8)
3	Required	Get	NV	Number of Instances	UINT	Number of object instances currently created at this class level of the device	The number of object instances at this class hierarchy level. Currently assigned as two times the number of installed Channel Cards (0 – 8)

Instance Attributes

TABLE 1-2: GUN OPERATIONAL STATUS INSTANCE ATTRIBUTES

Attribute ID	Needed in Implementation	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Get	NV	Gun Operational Status	ARRAY of STRUCT 1.3	The current operating values for Gun N (i.e. N = Instance No.)	See Semantics Next Page
2	Required	Get	NV	Gun Operational Status	ARRAY of STRUCT	The current operating values for all Guns	See Semantics Next Page

Semantics

Instances 1 thru 8 return a structured array of operational data for the specified instance, i.e. Gun. These values are arranged as shown in table 1-3.

TABLE 1-3: GUN OPERATIONAL STATUS MEMBER ENTRY FORMAT

Byte Offset	Contains		Value Range	Units	Access
0	Target Flow	Target Flow (Low Byte)	0 – (2 ¹⁶ -1)	mL/min x 10	Get
1		Target Flow (High Byte)			
2	Actual Flow	Actual Flow (Low Byte)	0 – (2 ¹⁶ -1)	mL/min x 10	Get
3		Actual Flow (High Byte)			
4	Hardener Flow Secondary Feedback	Hardener Flow (Low Byte)	0 – 1023	Raw A/D measurement	Get
5		Hardener Flow (High Byte)			
6	Actual Ratio	Actual Ratio (Low Byte)	0 – (2 ¹⁶ -1)	Ratio x 100	Get
7		Actual Ratio (High Byte)			
8	Feather Pressure	Feather Pressure (Low Byte)	0 – (Sensor Limit)	PSIG	Get
9		Feather Pressure (High Byte)			
10	Reserved	Reserved	0*		Get
11	Reserved	Reserved	0*		Get

* indicates the RCS2 default value before user modification

When Attribute 2 is selected, the return value will be an array of 8 consecutive groups of these values, 1 group for each gun.

Target Flow –

The currently active flow setpoint for the gun.

Actual Flow –

The actual flow (sum of all channels) for the gun.

Hardener Flow Secondary Feedback –

This is the flow indication from the optional thermal-shedding flow sensor in the catalyst supply line. (If properly calibrated, 0 = 0mA and 1023 = 20mA with values linearly dispersed between these two values.)

Actual Ratio –

The current mix ratio between Master and Slave channels of the gun.

Feather Pressure –

The current input value from the optional Feather Pressure sensor.

Provided Services

TABLE 1-4: GUN OPERATIONAL STATUS OBJECT COMMON SERVICES

Attribute ID	Needed in Implementation		Service Name	Description of Service
	Class	Instance		
0x0E	Required	Required	Get_Attribute_Single	Returns the contents of the specified attribute Struct.

Service Behavior

“Get_Attribute_Single”

Returns the content of the attribute requested. That is, the “Array of Structure” for the requested instance, i.e. one of the set of [1, 2, 3 ... 8].

NOTE

- All elements of the Structure are returned on a “Get_Attribute_Single” operation.

TABLE 1-4.1.1: GET_ATTRIBUTE_SINGLE SERVICE ERROR CODES

Error Code	Error Name	Description
0x0008	Service Not Supported	The Set service is not supported for this object
0x0014	Attribute unsupported	Attribute not equal to 1 or 2
0x0016	Non-existent object	

“Set_Attribute_Single”

The “Set_Attribute_Single” service shall not be implemented.

TABLE 1-4.1.2: SET_ATTRIBUTE_SINGLE SERVICE ERROR CODES

Error Code	Error Name	Description
0x0008	Service Not Supported	The Set service is not supported for this object

CHANNEL OPERATIONAL STATUS OBJECT

Class Code: 65 Hex

The Channel Operational Status Object provides operational data from the selected RCS2 Channel.

Channel Status information is maintained for each Channel.

Multiple object instances are used to provide access to the 8 possible Channels.

If Attribute 2 is specified, a single packet with data for all 8 Channels will be returned. This single packet transaction facilitates fewer transactions in situations for higher frequency monitoring (e.g. once per second).

Class Attributes

TABLE 2-1: CHANNEL OPERATIONAL STATUS OBJECT CLASS ATTRIBUTES							
Attribute ID	Needed in Implementation	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Get	NV	Revision	UINT	Revision of this object	The current value assigned to this attribute is one (1)
2	Required	Get	NV	Max Instance	UINT	Maximum instance number of an object currently created in this class level of the device	The current value assigned to this attribute is eight (8)
3	Required	Get	NV	Number of Instances	UINT	Number of object instances currently created at this class level of the device	The number of object instances at this class hierarchy level. Currently assigned as two times the number of installed Channel Cards (0 – 8)

Instance Attributes

TABLE 2-2: CHANNEL OPERATIONAL STATUS INSTANCE ATTRIBUTES							
Attribute ID	Needed in Implementation	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Get	NV	Channel Operational Status	ARRAY of STRUCT	The current operating values for Channel N (i.e. N = Instance No.)	See Semantics Next Page
2	Required	Get	NV	Channel Operational Status	ARRAY of STRUCT	The current operating values for all Channels	See Semantics Next Page

Semantics

Instances 1 thru 8 return a structured array of values for the specified instance, i.e. Channel. These values are arranged as shown in table 2-3.

TABLE 2-3: CHANNEL OPERATIONAL STATUS MEMBER ENTRY FORMAT

Byte Offset	Contains		Value Range	Units	Access
0	Target Flow	Target Flow (Low Byte)	0-(2 ¹⁶ -1)	mL/min x 10	Get
1		Target Flow (High Byte)			
2	Actual Flow	Actual Flow (Low Byte)	0-(2 ¹⁶ -1)	mL/min x 10	Get
3		Actual Flow (High Byte)			
4	Pump Inlet Pressure	Inlet Pressure (Low Byte)	0-(Sensor Limit)	PSIG	Get
5		Inlet Pressure (High Byte)			
6	Pump Outlet Pressure	Outlet Pressure (Low Byte)	0-(Sensor Limit)	PSIG	Get
7		Outlet Pressure (High Byte)			
8	Motor Speed	Motor Speed (Low Byte)	0-(2 ¹⁶ -1) (30-1500 Typical)	RPM x 10	Get
9		Motor Speed (High Byte)			
10	Pressure Control	Pressure Control (Low Byte)	0 - 1023	Raw A/D Value	Get
11		Pressure Control (High Byte)			
12	User Analog Input (Spare)	Analog Input (Low Byte)	0 - 1023	Raw A/D Value	Get
13		Analog Input (High Byte)			
14	Reserved				Get
15	Reserved				Get

When Attribute 2 is selected, the return value will be an array of 8 consecutive groups of these values, 1 group for each channel.

Target Flow –

The currently active flow setpoint for the channel.

Actual Flow –

The actual flow for the channel.

Pump Inlet Pressure –

The current pressure being reported by the pressure sensor on the inlet of the pump.

Pump Outlet Pressure –

The current pressure being reported by the pressure sensor on the outlet of the pump.

Motor Speed –

The current RPM of the motor being reported by the motor amplifier.

Pressure Control –

The current command being output by the channel card to the E to P or I to P transducer that is controlling the fluid regulator on the inlet of the pump.

User Analog Input (Spare) –

The amplitude of the analog signal coming into the spare analog input on the breakout board for that channel.

Provided Services

**TABLE 2-4: CHANNEL OPERATIONAL STATUS OBJECT
COMMON SERVICES**

Attribute ID	Needed in Implementation		Service Name	Description of Service
	Class	Instance		
0x0E	Required	Required	Get_Attribute_Single	Returns the contents of the specified attribute.

Service Behavior

“Get_Attribute_Single”

Returns the content of the attribute requested.

**TABLE 2-4.1.1: GET_ATTRIBUTE_SINGLE SERVICE
ERROR CODES**

Error Code	Error Name	Description
0x0008	Service Not Supported	Service is not supported for this object
0x0014	Attribute unsupported	Attribute not equal to 1 or 2
0x0016	Non-existent object	

“Set_Attribute_Single”

The “Set_Attribute_Single” service shall not be implemented.

**TABLE 2-4.1.2: SET_ATTRIBUTE_SINGLE SERVICE
ERROR CODE**

Error Code	Error Name	Description
0x0008	Service Not Supported	Service is not supported for this object
0x0014	Attribute unsupported	Attribute not equal to 1 or 2
0x0016	Non-existent object	

SYSTEM CONFIGURATION OBJECT

Class Code: 66 Hex

The System Configuration Object provides a method to configure operating values from the selected RCS2 System.

There is only one System Configuration Object per RCS2 system.

Class Attributes

TABLE 3-1: SYSTEM OPERATIONAL STATUS OBJECT CLASS ATTRIBUTES

Attribute ID	Needed in Implementation	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Get	NV	Revision	UINT	Revision of this object	The current value assigned to this attribute is one (1)
2	Required	Get	NV	Max Instance	UINT	Maximum instance number of an object currently created in this class level of the device	The current value assigned to this attribute is one (1)
3	Required	Set/Get	NV	Number of Instances	UINT	Number of object instances currently created at this class level of the device	The number of object instances at this class hierarchy level. Currently assigned as one (1)

Instance Attributes

TABLE 3-2: SYSTEM CONFIGURATION INSTANCE ATTRIBUTES

Attribute ID	Needed in Implementation	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Get	NV	System Configuration	ARRAY of STRUCT	The configuration values for the RCS2 system	See Semantics Next Page

Semantics

Instance 1 returns a structured array of values for the instance, i.e. System. These values are arranged as shown in table 3-3 shown below.

TABLE 3-3: SYSTEM CONFIGURATION MEMBER ENTRY FORMAT

Byte Offset	Contains		Value Range	Units	Access
0	Over Pressure Limit	Over Pressure Limit (Low Byte)	0-(Sensor Limit) 190*	PSIG	Set/Get
1		Over Pressure Limit (High Byte)			
2	Foldback Pressure	Foldback Pressure (Low Byte)	0-(Sensor Limit) 140*	PSIG	Set/Get
3		Foldback Pressure (High Byte)			
4	Sensor Limit ¹	Sensor Limit (Low Byte)	0 - 300 200*	PSIG	Set/Get
5		Sensor Limit (High Byte)			
6	Horn Enable	Horn Enable (Low Byte)	0* = Disabled 1 = Enabled	---	Set/Get
7		Horn Enable (High Byte)			
8	Reserved	Reserved (Low Byte)	0*	---	Set/Get
9		Reserved (High Byte)			
10	Reserved	Reserved (Low Byte)	0*	---	Set/Get
11		Reserved (High Byte)			
12	Reserved	Reserved (Low Byte)	0*	---	Set/Get
13		Reserved (High Byte)			
14	Reserved	Reserved (Low Byte)	0*	---	Set/Get
15		Reserved (High Byte)			
16	Reserved	Reserved (Low Byte)	0*	---	Set/Get
17		Reserved (High Byte)			
18	Interface Ethernet/IP Card Software Version	Software Version (Minor Version No.)		---	Get
19		Software Version (Major Version No.)			

* indicates the RCS2 default value before user modification.

1 - Can only change at Setup time, NOT while ANY channel is running. Attempts to change this parameter while running will result in an error and no values will be changed.

Over Pressure Limit –

This is the pressure limit of the entire system. If any pressure sensor in the system reaches or exceeds this pressure, an overpressure fault is issued by the software and the pumps are halted. This fault cannot be disabled.

Foldback Pressure –

When the outbound pressure of the pump exceeds 80% of this setting, the software starts a gradual slowdown of the pumps (while keeping the ratio at its proper setpoint) to prevent the outbound pressure of the pump(s) from exceeding the foldback pressure setpoint.

Sensor Limit –

This is the maximum pressure that the pressure sensors in the system can detect. It is specified by the device manufacturer. This is the pressure that the sensor detects when it outputs 20 mA to the channel card.

Horn Enable –

The horn must be enabled on the CONFIG SYSTEM SCREEN or the horn will not sound for gun faults regardless of whether or not they are configured to do so on the CONFIG GUN screens.

Provided Services

TABLE 3-4: SYSTEM CONFIGURATION OBJECT COMMON SERVICES

Service ID	Needed in Implementation		Service Name	Description of Service
	Class	Instance		
0x0E	Required	Required	Get_Attribute_Single	Returns the contents of the specified attribute Struct
0x10	Required	Required	Set_Attribute_Single	Sets the contents of the specified attribute Struct

Service Behavior

“Get_Attribute_Single”

Returns the content of the attribute requested. That is, the “Array of Structure” for the requested attribute, i.e. attribute one. Note all “Structure element” are returned on a “Get_Attribute_Single” operation, i.e. all 20 bytes.

TABLE 3-4.1.1: GET_ATTRIBUTE_SINGLE SERVICE ERROR CODES

Error Code	Error Name	Description
0x0008	Service Not Supported	Service is not supported for this object
0x0014	Attribute unsupported	Attribute not equal to 1

Set_Attribute_Single

Sets the content of the attribute requested. That is, the “Array of Structure” for the requested attribute, i.e. attribute one. Note only “Structure elements” which support the “Set_Attribute_Single” operation are to be specified, i.e. only the first 18 bytes.

TABLE 3-4.1.2: SET_ATTRIBUTE_SINGLE SERVICE ERROR CODES

Error Code	Error Name	Description
0x000F	Privilege Violation	Enable flag for writing setup configuration data not active
0x0013	Insufficient Data	Parameter data too small
0x0014	Attribute unsupported	Attribute not equal to 1
0x0015	Too much data	Parameter data too large
0x0016	Non-existent object	
0x0020	Invalid Service Parameter	0x0000 000B – Sensor Maximum Limit out of range 0x0000 000C – Overpressure Limit out of range 0x0000 000D – Foldback Limit out of range 0x0000 01nn – Parameter Out of range – Field #nn

GUN CONFIGURATION OBJECT

Class Code: 67 Hex

The Gun Configuration Object provides configuration values for the selected RCS2 gun.

Gun Configuration information is maintained for each Gun.

Multiple object instances are used to provide access to the 8 possible Guns.

Class Attributes

TABLE 4-1: GUN CONFIGURATION OBJECT CLASS ATTRIBUTES

Attribute ID	Needed in Implementation	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Get	NV	Revision	UINT	Revision of this object	The current value assigned to this attribute is one (1)
2	Required	Get	NV	Max Instance	UINT	Maximum instance number of an object currently created in this class level of the device	The current value assigned to this attribute is eight (8)
3	Required	Get	NV	Number of Instances	UINT	Number of object instances currently created at this class level of the device	The number of object instances at this class hierarchy level. Currently assigned as eight (8)

Instance Attributes

TABLE 4-2: GUN CONFIGURATION INSTANCE ATTRIBUTES

Attribute ID	Needed in Implementation	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Set/Get	NV	Gun Configuration may be changed while gun is operating	ARRAY of STRUCT	The current configuration values for Channel N (i.e. N = Instance No.)	See Semantics Next Page
2	Required	Set/Get	NV	Gun Configuration may be changed while gun is operating	ARRAY of STRUCT	The current configuration values for Gun N (i.e. N = Instance No.)	See Semantics Next Page

Semantics

Instances 1 thru 8 return a structured array of configuration settings for the specified instance, i.e. Gun.

Instance Attribute 1 includes a structure of settings that can be modified while the gun is in operation. These settings are arranged as shown in the table below.

TABLE 4-3.1: GUN CONFIGURATION MEMBER ENTRY FORMAT (ADJUSTABLE WHILE GUN OPERATING)

Byte Offset	Contains		Value Range	Units	Access
0	Default Job Number	Default Job for this gun	1 -199	---	Set/Get
1	Number of Applicators	Applicators for this gun	1 - 4	---	Set/Get
2	Mixed Volume	Mixed Volume (Low Byte)	0 - 5000	mL	Set/Get
3		Mixed Volume (High Byte)			
4	Tolerance Percentage (for flow and ratio)	Tolerance Percentage (Low Byte)	0 - 100	Percentage	Set/Get
5		Tolerance Percentage (High Byte)			
6	Tolerance Volume	Tolerance Volume (Low Byte)	0 - 255	mL	Set/Get
7		Tolerance Volume (High Byte)			
8	Alarm Tolerance Time	Alarm Tolerance Time (Low Byte)	0 - 20,000	0.001 sec	Set/Get
9		Alarm Tolerance Time (High Byte)			
10	Horn Code	Horn Code (Low Byte)	(see table below)	---	Set/Get
11		Horn Code (High Byte)			
12	Reserved	Reserved (Low Byte)	0*	---	Set/Get
13		Reserved (High Byte)			
14	Reserved	Reserved (Low Byte)	0*	---	Set/Get
15		Reserved (High Byte)			
16	Reserved	Reserved (Low Byte)	0*	---	Set/Get
17		Reserved (High Byte)			
18	Reserved	Reserved (Low Byte)	0*	---	Set/Get
19		Reserved (High Byte)			

* indicates the RCS2 default value before user modification

POSSIBLE HORN CODES

Horn Code Value	Description
XXXXXXXXXXXXXXXX000	Horn never sounds
XXXXXXXXXXXXXXXX001	Horn only sounds on a Spray Shut Down condition
XXXXXXXXXXXXXXXX010	Horn sounds for All Errors (not including expired pot life)
XXXXXXXXXXXXXXXX100	Horn only sounds if the Pot Life Timer expires
XXXXXXXXXXXXXXXX101	Horn sounds if a Spray Shut Down occurs or if the Pot Life Timer expires
XXXXXXXXXXXXXXXX11X	Horn sounds for Any Error (including an expired Pot Life Timer)

Note: X indicates 'don't care'.

Default Job Number –

This parameter can be any integer from 1 to 199. It indicates which job number an operator wants to automatically load into the gun upon power up of the system.

Number of Applicators –

The range of allowable values for this parameter is any integer from 1 to 4. This parameter indicates how many applicators will be connected to the fluid panel controlled by this gun. It is used by the multiple trigger input capabilities of the system to multiply the target flow rate by the number of triggers being input. For example, if the target flow rate is 100 mL's /min and 1 gun is triggered, the system will deliver 100 mL's to the outlet of the fluid panel, if 3 trigger inputs are energized, the system will deliver 300 mL's/min to the outlet of the fluid panel.

Mixed Volume –

The range of allowable volumes for this parameter is from 0 mL to 5000 mL's. This volume is the amount of material in the fluid lines between the mix-block and the applicator or applicators. It is used by the pot-life timer to keep track of the age of the mixed material. If the material in the applicator (the material that has been mixed the longest) exceeds the programmed pot-life of the material, a flush-request is issued by the system for that gun.

Tolerance Percentage –

Allowable value for this parameter is any integer from 0% to 100%. This parameter indicates how far off from the target flow rate any channel is allowed to be or how far off from the target ratio the actual ratio is allowed to be before a fault is issued by the system controller.

Tolerance Volume –

Allowable volumes for this parameter are from 0 mL's to 255 mL's. This parameter indicates how often the software verifies that the actual ratio being expelled from the fluid panel is within the programmed tolerance limit of the target ratio. Every time this volume of material passes out of the mix tube, the controller calculates the actual ratio based on the actual volume of resin and the actual volume of catalyst that was contained in that sample. It then compares that ratio to the target ratio and checks to see if the actual ratio is within the tolerance limit of the target ratio. If not, a Ratio Out of Tolerance Fault is issued by the controller. Entering a 0 here disables the ratio-by-volume check.

Alarm Tolerance Time –

This parameter is in thousandths of seconds and can be any value from 0 to 20000 thousandths of seconds (20.000 seconds). This parameter allows users to program in how long an error condition can persist before the unit issues a fault for that gun. Users are warned against programming this value too small as nuisance faults may become a problem. This parameter has no effect on ratio checks.

Instance Attribute 2 references a structured array of configuration values for the specified instance, i.e. Gun. These settings can only be modified when the gun is not operating. These values are arranged as shown in the table below.

TABLE 4-3.2: GUN CONFIGURATION MEMBER ENTRY FORMAT (NOT ADJUSTABLE DURING OPERATION)

Byte Offset	Contains		Value Range	Units	Access
0	Active Job Number	Job Number Loaded (Low Byte)	1* -199	---	Set/Get
1		Job Number Loaded (High Byte)			
2	Mode		0 - Off 1 - Automatic 2 - Manual	---	Set/Get
3	Number of Channels	Number of Channels used by this gun	0 - Gun Disabled 1 - Single Channel Gun 2 - Dual Channel Gun	---	Set/Get
4	First Channel (Master)	First/Master Channel Number for this gun	1 - 8	---	Set/Get
5	Reserved			---	Set/Get
6	Auto Reset	Auto Reset (Low Byte)	0 - Disabled 1 - Enabled	---	Set/Get
7		Auto Reset (High Byte)			
8	Solvent Calibration Factor	Solvent Calibration Factor (Lowest Byte)	1000 - 250,000	Pulses/Liter	Set/Get
9		Solvent Calibration Factor			
10		Solvent Calibration Factor			
11		Solvent Calibration Factor (Highest Byte)			

* indicates the RCS2 default value before user modification.

Active Job Number –

This parameter can be any integer from 1 to 199. It indicates which job is actively loaded for this gun.

Mode –

This parameter has three possible settings; OFF, AUTO, and MANUAL.

- OFF – This setting completely disables the gun, removes its data from the main screen, and places the channels tied to this gun available for use by another gun.
- AUTO – This setting is used when the user wishes to control the flow rate of the applicator. If this is to be a 2 channel gun, it also controls the ratio of the two materials.

- MANUAL – This setting is used when the user wishes only to control the ratio of the material. Users can ‘demand’ as much material as they wish and the controller will deliver as much as possible while keeping the ratio on target.

Number of Channels –

This parameter has 3 possible settings; 0, 1, or 2.

- 0 – Gun is disabled.
- 1 – This indicates that the gun is to be a single channel, flow control only gun.
- 2 – This indicates that the gun is to be a dual channel, ratio controlled gun.

First Channel (Master) –

This parameter has 8 possible settings; 1 – 8. For single channel guns, it simply indicates which channel will be controlling the pump for this gun. For dual channel guns it indicates (normally) which channel will be controlling the resin pump. If `Number_of_Channels = 2`, valid settings include 1,3,5,7 and the Slave channel will be automatically assigned to `First_Channel+1`. Attempting to select a Master (or Slave) Channel number that is already assigned to another gun will return an error.

Auto Reset –

This allows the user to enable or disable the fault auto-reset feature. While enabled, any time a gun fault occurs, it can be automatically reset by simply turning off the gun trigger signal and turning it back on. (This allows a handgun operator the ability to reset a fault without returning to a control panel.)

NOTE

- All handguns must have air flow switches in their atomization air lines and all trigger signals for that gun must remain off for at least 0.5 second to cause a reset.

Solvent Calibration Factor –

This parameter can be any integer value from 1000 to 250,000 pulses per liter. This value is used by the totalization software to track the amount of flush solvent used by the gun.

Provided Services**TABLE 4-4: GUN CONFIGURATION OBJECT COMMON SERVICES**

Service ID	Needed in Implementation		Service Name	Description of Service
	Class	Instance		
0x0E	Required	Required	Get_Attribute_Single	Returns the contents of the specified attribute Struct
0x10	Required	Required	Set_Attribute_Single	Sets the contents of the specified attribute Struct

Service Behavior**“Get_Attribute_Single”**

Returns the content of the attribute requested. That is, the “*Array of Structure*” for the requested attribute, i.e. one of the set of [1, 2, 3 ... 8]. Note all elements of the Structure are returned on a “*Get_Attribute_Single*” operation.

TABLE 4-4.1.1: GET_ATTRIBUTE_SINGLE SERVICE ERROR CODES

Error Code	Error Name	Description
0x0008	Service Not Supported	Service is not supported for this object
0x0014	Attribute unsupported	Attribute not equal to 1 or 2

“Set_Attribute_Single”

Sets the content of the attribute requested. That is, the “Array of Structure” for the requested attribute, i.e. one of the set of [1, 2, 3 ... 8]. Note all elements of the Structure are returned on a “Set_Attribute_Single” operation.

TABLE 4-4.1.2: SET_ATTRIBUTE_SINGLE SERVICE ERROR CODE

Error Code	Error Name	Description
0x000F	Privilege Violation	Enable flag for writing data not active. Instance Attribute 1 references the enable flag for runtime setting. Instance Attribute 2 references the setup configuration enable flag.
0x0013	Insufficient Data	Parameter data too small
0x0014	Attribute unsupported	Attribute not equal to 1 or 2
0x0015	Too much data	Parameter data too large
0x0016	Non-existent object	
0x0020	Invalid Service Parameter	0x0000 0008 – Parameter Out of range – Job Number 0x0000 0009 – Parameter Out of range – Channel Number 0x0000 000A – Parameter Out of range (or conflict) – Master Channel 0x0000 0101 – Parameter Out of range – Field #1 0x0000 0102 – Parameter Out of range – Field #2 0x0000 0103 – Parameter Out of range – Field #3 0x0000 0104 – Parameter Out of range – Field #4 0x0000 0105 – Parameter Out of range – Field #5 0x0000 0106 – Parameter Out of range – Field #6

CHANNEL CONFIGURATION OBJECT

Class Code: 68 Hex

The Channel Configuration Object provides configuration values from the selected RCS2 Channel. Channel Configuration information is maintained for each Channel. Multiple object instances are used to provide access to the 8 possible Channels.

Class Attributes

TABLE 5-1: CHANNEL CONFIGURATION OBJECT CLASS ATTRIBUTES

Attribute ID	Needed in Implementation	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Get	NV	Revision	UINT	Revision of this object	The current value assigned to this attribute is one (1)
2	Required	Get	NV	Max Instance	UINT	Maximum instance number of an object currently created in this class level of the device	The current value assigned to this attribute is eight (8)
3	Required	Get	NV	Number of Instances	UINT	Number of object instances currently created at this class level of the device	The number of object instances at this class hierarchy level. Currently assigned as eight (8)

Instance Attributes

TABLE 5-2: GUN CONFIGURATION INSTANCE ATTRIBUTES

Attribute ID	Needed in Implementation	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Get/Set	NV	Gun Configuration may be changed while gun is operating	ARRAY of STRUCT	The current configuration values for Channel N (i.e. N = Instance No.)	See Semantics Next Page
2	Required	Get/Set	NV	Gun Configuration may not be changed while gun is operating	ARRAY of STRUCT	The current configuration values for Gun N (i.e. N = Instance No.)	See Semantics Next Page

Semantics

Instances 1 thru 8 return a structured array of configuration values for the specified instance, i.e. Channel. Instance Attribute 1 includes a structure of settings that can be modified while the channel is in operation. These settings are arranged as shown in table 5-3.1.

TABLE 5-3.1: CHANNEL CONFIGURATION MEMBER ENTRY FORMAT (ADJUSTABLE WHILE CHANNEL OPERATING)

Byte Offset	Contains		Value Range	Units	Access
0	Fill Enable	Fill Enable (Low Byte)	0 - Disabled 1* - Enabled	---	Set/Get
1		Fill Enable (High Byte)			
2	Trigger On Delay (Master)	Trigger On Delay (Low Byte)	0* - 5000	0.001 sec	Set/Get
3		Trigger On Delay (High Byte)			
4	Trigger Off Delay (Master)	Trigger Off Delay (Low Byte)	0* - 5000	0.001 sec	Set/Get
5		Trigger Off Delay (High Byte)			
6	Max Inlet Pressure	Max Inlet Pressure (Low Byte)	0 – (Sensor Limit*)	PSIG	Set/Get
7		Max Inlet Pressure (High Byte)			
8	Min Inlet Pressure	Min Inlet Pressure (Low Byte)	0* – (Sensor Limit)	PSIG	Set/Get
9		Min Inlet Pressure (High Byte)			
10	Max Outlet Pressure	Max Outlet Pressure (Low Byte)	0 – (Sensor Limit*)	PSIG	Set/Get
11		Max Outlet Pressure (High Byte)			
12	Min Outlet Pressure	Min Outlet Pressure (Low Byte)	0* – (Sensor Limit)	PSIG	Set/Get
13		Min Outlet Pressure (High Byte)			
14	Foldback Kp Gain	Foldback Kp Gain (Low Byte)	0-65,535 (5000*)	---	Set/Get
15		Foldback Kp Gain (High Byte)			
16	Foldback Ki Gain	Foldback Ki Gain (Low Byte)	0-65,535 (3000*)	---	Set/Get
17		Foldback Ki Gain (High Byte)			
18	Foldback Kd Gain	Foldback Kd Gain (Low Byte)	0-65,535 (30*)	---	Set/Get
19		Foldback Kd Gain (High Byte)			
20	Foldback Deadband	Foldback Deadband (Low Byte)	0-65,535 (0*)	PSIG	Set/Get
21		Foldback Deadband (High Byte)			
22	Feather Kp Gain	Feather Kp Gain (Low Byte)	65,535 (500*)	---	Set/Get
23		Feather Kp Gain (High Byte)			
24	Feather Ki Gain	Feather Ki Gain (Low Byte)	65,535 (300*)	---	Set/Get
25		Feather Ki Gain (High Byte)			
26	Feather Kd Gain	Feather Kd Gain (Low Byte)	65,535 (30*)	---	Set/Get
27		Feather Kd Gain (High Byte)			
28	Feather Deadband	Feather Deadband (Low Byte)	0-65,635 (0*)	PSIG	Set/Get
29		Feather Deadband (High Byte)			
30	Reserved	Reserved (Low Byte)	0*	---	Set/Get
31		Reserved (High Byte)			
32	Reserved	Reserved (Low Byte)	0*	---	Set/Get
33		Reserved (High Byte)			
34	Reserved	Reserved (Low Byte)	0*	---	Set/Get
35		Reserved (High Byte)			
36	Reserved	Reserved (Low Byte)	0*	---	Set/Get
37		Reserved (High Byte)			
38	Reserved	Reserved (Low Byte)	0*	---	Set/Get
39		Reserved (High Byte)			

* indicates the RCS2 default value before user modification

Fill Enable –

Allowable settings for this parameter are; 0 (Disabled) or 1 (Enabled). This parameter allows the operator to enable or disable the channel fill button on the Main Screen of the user-interface software. This allows a supervisor to prevent a gun from being put into channel fill mode without the operator knowing the password. (This prevents an applicator that is being used in production from applying the wrong flow rate or ratio of material.)

Trigger On Delay –

The allowable range of values for this parameter is from 0.000 seconds to 5.000 seconds. This indicates how long after receiving a trigger signal the controller will wait before it actually starts running the pump(s) for that gun. This allows the operator to compensate for pneumatic delays inherent with some applicators.

Trigger Off Delay –

The allowable range of values for this parameter is from 0.000 seconds to 5.000 seconds. This indicates how long after the trigger signal is removed that the controller will wait before it actually stops the pump(s) for that gun. This allows the operator to compensate for pneumatic delays inherent with some applicators.

Maximum Inlet Pressure –

The allowable range of values for this parameter is any integer from 0 psi to 200 psi. This parameter allows the operator to generate a fault/alarm if the inlet pressure to a pump exceeds a preset limit. If too much pressure is allowed at the inlet of the pump, fluid may 'blow by' the pump without being metered, thus causing inaccurate flow rates or ratios. Exceeding this setpoint will cause the controller to generate an Inlet Overpressure Fault.

Minimum Inlet Pressure –

The allowable range of values for this parameter is any integer from 0 psi to 200 psi. This parameter allows the operator to generate a fault/alarm if the inlet pressure to a pump falls below a preset limit. If too little pressure is allowed at the inlet of the pump, the pump will 'cavitate' or have to pull fluid into it, which could seriously affect its accuracy, thus causing inaccurate flow rates or ratios. Falling below this setpoint will cause the controller to generate an Inlet Underpressure Fault.

Maximum Outlet Pressure –

The allowable range of values for this parameter is any integer from 0 psi to 200 psi. This is the maximum allowable outbound pressure for the pump. Exceeding this setpoint will cause the controller to generate an Outlet Overpressure Fault.

Minimum Outlet Pressure –

The allowable range of values for this parameter is any integer from 0 psi to 200 psi. This is the minimum allowable outbound pressure for the pump. If the outbound pressure from the pump falls below this setpoint while the gun is triggered, an Outlet Underpressure Fault will be generated by the controller.

Foldback Kp Gain–

The allowable range of values for this parameter is any integer from 0 to 65,535. It has no units. This allows the operator to program in the proportional gain for the foldback pressure PID loop.

Foldback Ki Gain –

The allowable range of values for this parameter is any integer from 0 to 65,535. It has no units. This allows the operator to program the integral gain for the foldback pressure PID loop.

Foldback Kd Gain –

The allowable range of values for this parameter is any integer from 0 to 65,535. It has no units. This allows the operator to program the derivative gain for the foldback pressure PID loop.

Foldback Deadband –

The allowable range of values for this parameter is any integer from 0 to 65,535 psi. This allows the operator to program the deadband for the foldback pressure PID loop.

Feather Kp Gain –

The allowable range of values for this parameter is any integer from 0 to 65,535. It has no units. This allows the operator to program the proportional gain for the feather pressure PID loop.

Feather Ki Gain –

The allowable range of values for this parameter is any integer from 0 to 65,535. It has no units. This allows the operator to program the integral gain for the feather pressure PID loop.

Feather Kd Gain –

The allowable range of values for this parameter is any integer from 0 to 65,535. It has no units. This allows the operator to program the derivative gain for the feather pressure PID loop.

Feather Deadband –

The allowable range of values for this parameter is any integer from 0 to 65,535 psi. This allows the operator to program the deadband for the feather pressure PID loop.

Instance Attribute 2 references a structured array of configuration settings for the specified instance, i.e. Channel. These settings can only be modified when the channel is not operating. These values are arranged as shown in table 5-3.2.

TABLE 5-3.2: CHANNEL CONFIGURATION MEMBER ENTRY FORMAT (NOT ADJUSTABLE DURING OPERATION)

Byte Offset	Contains		Value Range	Units	Access
0	Pump Size	Pump Size (Low Byte)	0 – 10,000	mL's/rev x 1000	Set/Get
1		Pump Size (High Byte)			
2	Max Pump Speed	Max Pump Speed (Low Byte)	3 – 300 150*	RPM	Set/Get
3		Max Pump Speed (High Byte)			
4	Min Pump Speed	Min Pump Speed (Low Byte)	3* - 300	RPM	Set/Get
5		Min Pump Speed (High Byte)			
6	Inlet Pressure Sensor Enable	Inlet Pressure Sensor Enable (Low Byte)	0 - Disabled 1* - Enabled 2 - Not CFill	--	Set/Get
7		Inlet Pressure Sensor Enable (High Byte)			
8	Calibration Factor (aka Pump Pulses/Liter)	Calibration Factor (Lowest Byte)	100 – 200,000,000	Pulses/Liter	Set/Get
9		Calibration Factor			
10		Calibration Factor			
11		Calibration Factor (Highest Byte)			
12	Channel Card Software Version	Software Version (Minor Version Number)			Get
13	Software Version	Software Version (Major Version Number)			

* indicates the RCS2 default value before user modification

Pump Size –

The allowable range of values for this parameter is from 0.000 to 10.000 mL's /rev. This is the volume of material that the pump being used on this channel passes with each complete revolution of its gears.

Maximum Pump Speed –

The allowable range of values for this parameter is any integer from 3 RPM to 300 RPM. This is the maximum allowable speed for the pump. It is assumed by the controller that this will be the speed that the pump will run at when a 10 volt DC signal is sent to the motor amplifier.

Minimum Pump Speed –

The allowable range of values for this parameter is any integer from 3 RPM to 300 RPM. This is the minimum speed that the system will allow the pump to run. If the commanded flow rate or ratio would result in a pump running below this setpoint, a Flow Rate Out of Tolerance Fault will be issued by the controller. Gear pumps do not typically function accurately at speeds less than 3 RPM and this is the recommended setting for this parameter.

Inlet Pressure Sensor Enable –

Allowable settings for this parameter are; 0 (Disabled) or 1 (Enabled). The inlet pressure sensor on the catalyst channel is optional since many users use gravity-fed fluid supplies feeding their catalyst pumps. This parameter allows the user to disable monitoring of this sensor. Setting this parameter to 2 causes the software to ignore the inlet pressure during channel fills.

Calibration Factor –

The allowable range of values for this parameter is any integer from 1000 to 200,000,000 pulses/liter. This is the number of pulses received by the channel card from the sensing device (motor amplifier, flowmeter, etc.) for each liter of material that passes through it.

Channel card software version –

This is a read-only (Get) value of the version of the software loaded on the channel card.

Provided Services

TABLE 5-4: CHANNEL CONFIGURATION OBJECT COMMON SERVICES

Service ID	Needed in Implementation		Service Name	Description of Service
	Class	Instance		
0x0E	Required	Required	Get_Attribute_Single	Returns the contents of the specified attribute Struct
0x10	Required	Required	Set_Attribute_Single	Sets the contents of the specified attribute Struct

Service Behavior

“Get_Attribute_Single”

Returns the content of the attribute requested. That is, the “Array of Structure” for the requested attribute, i.e. one of the set of [1, 2, 3... 8]. Note: all Structure elements are returned on a “Get_Attribute_Single” operation.

TABLE 5-4.1.1: GET_ATTRIBUTE_SINGLE SERVICE ERROR CODES

Error Code	Error Name	Description
0x0008	Service Not Supported	Service is not supported for this object
0x0014	Attribute unsupported	Attribute not equal to 1 or 2

“Set_Attribute_Single”

Sets the content of the attribute specified. That is, the “Array of Structure” for the specified attribute, i.e. one of the set of [1, 2, 3... 8]. Note: only the Structure elements which support the “Set_Attribute_Single” Operation are to be specified.

TABLE 5-4.1.2: SET_ATTRIBUTE_SINGLE SERVICE ERROR CODES

Error Code	Error Name	Description
0x000F	Privilege Violation	Enable flag for writing data not active. Instance Attribute 1 references the enable flag for runtime setting. Instance Attribute 2 references the setup configuration enable flag.
0x0010	State conflict	Cannot change data while channel active
0x0013	Insufficient data	Parameter data too small
0x0014	Attribute unsupported	Attribute not equal to 1 or 2
0x0015	Too much data	Parameter data too large
0x0016	Non-existent object	
0x0020	Invalid Service Parameter	0x0000 0004 – Parameter Out of range – Max Pump In 0x0000 0005 – Parameter Out of range – Min Pump In 0x0000 0006 – Parameter Out of range – Max Pump Out 0x0000 0007 – Parameter Out of range – Min Pump Out 0x0000 01nn – Parameter Out of range – Field #nn

JOB CONFIGURATION OBJECT

Class Code: 69 Hex

The Job Configuration Object provides configuration values for RCS2 Jobs. Job configuration values are stored individually for each Gun/Job. Multiple object instances are used to provide access to the 199 available Jobs per Gun.

NOTE
<p>➤ All 199 jobs can be configured using “<i>Set_Attribute_Single</i>” for the desired Gun/Job instance. However, only Loaded Gun/Job instances can be retrieved using “<i>Get_Attribute_Single</i>”. Attempting to access a Gun/Job instance that is not loaded will return an error.</p>

Class Attributes

TABLE 6-1: JOB CONFIGURATION OBJECT CLASS ATTRIBUTES							
Attribute ID	Needed in Implementation	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Get	NV	Revision	UINT	Revision of this object	The current value assigned to this attribute is one (1)
2	Required	Get	NV	Max Instance	UINT	Maximum instance number of an object currently created in this class level of the device	The current value assigned to this attribute is one hundred ninety-nine (199)
3	Required	Get	NV	Number of Instances	UINT	Number of object instances currently created at this class level of the device	The number of object instances at this class hierarchy level. Currently assigned as one hundred ninety-nine (199)

Instance Attributes

TABLE 6-2: GUN CONFIGURATION INSTANCE ATTRIBUTES

Attribute ID	Needed in Implementation	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Set	NV	Gun 1 Job Configuration	ARRAY of STRUCT	Job Configuration values for Gun 1	See Semantics Next Page
2	Required	Set	NV	Gun 2 Job Configuration	ARRAY of STRUCT	Job Configuration values for Gun 2	See Semantics Next Page
3	Required	Set	NV	Gun 3 Job Configuration	ARRAY of STRUCT	Job Configuration values for Gun 3	See Semantics Next Page
4	Required	Set	NV	Gun 4 Job Configuration	ARRAY of STRUCT	Job Configuration values for Gun 4	See Semantics Next Page
5	Required	Set	NV	Gun 5 Job Configuration	ARRAY of STRUCT	Job Configuration values for Gun 5	See Semantics Next Page
6	Required	Set	NV	Gun 6 Job Configuration	ARRAY of STRUCT	Job Configuration values for Gun 6	See Semantics Next Page
7	Required	Set	NV	Gun 7 Job Configuration	ARRAY of STRUCT	Job Configuration values for Gun 7	See Semantics Next Page
8	Required	Set	NV	Gun 8 Job Configuration	ARRAY of STRUCT	Job Configuration values for Gun 8	See Semantics Next Page

Semantics

Instances 1 thru 199 return a structured array of values for the specified instance, i.e. Job (Instance) / Gun (Attribute No.). These values are arranged as shown in table 6-3 shown below.

**TABLE 6-3: CHANNEL CONFIGURATION MEMBER ENTRY FORMAT
(ADJUSTABLE WHILE CHANNEL OPERATING)**

Byte Offset	Contains		Value Range	Units	Access
0	Ratio (Parts Master to 1 part slave)	Ratio (Low Byte)	0.001 - 65.000	Ratio x 1000	Set/Get
1		Ratio (High Byte)			
2	Flow Setpoint	Flow Setpoint (Low Byte)	0 – 10,000	mL/min	Set/Get
3		Flow Setpoint (High Byte)			
4	Maximum Flow	Maximum Flow (Low Byte)	0 – 10,000	mL/min	Set/Get
5		Maximum Flow (High Byte)			
6	Minimum Flow	Minimum Flow (Low Byte)	0 – 10,000	mL/min	Set/Get
7		Minimum Flow (High Byte)			
8	Bar Graph Limit	Bar Graph Limit (Low Byte)	0 – 10,000	mL/min	Set/Get
9		Bar Graph Limit (High Byte)			
10	Potlife Timer	Potlife Timer (Low Byte)	0 – 1,000	Minutes	Set/Get
11		Potlife Timer (High Byte)			
12	Feather Pressure	Feather Pressure (Low Byte)	0 – (Sensor Limit)	PSIG	Set/Get
13		Feather Pressure (High Byte)			
14	Fill Volume	Fill Volume (Low Byte)	0 - 65,535	mL	Set/Get
15		Fill Volume (High Byte)			
16	Pressure Pot Capacity (Master) ¹	P.Pot Capacity (Master) (Low Byte)	0 – 655.35	Liters x 100	Set/Get
17		P.Pot Capacity (Master) (High Byte)			
18	Delta P (Master)	Delta P (Master) (Low Byte)	0 – (Sensor Limit)	PSIG	Set/Get
19		Delta P (Master) (High Byte)			
20	Min. Fluid Pressure (Master)	Min. Fluid Pressure (Master) (Low Byte)	0 – (Sensor Limit)	PSIG	Set/Get
21		Min. Fluid Pressure (Master) (High Byte)			
22	Inlet Pressure Kp (Master)	Inlet Kp (Master) (Low Byte)	0 – 65,535	--	Set/Get
23		Inlet Kp (Master) (High Byte)			
24	Inlet Pressure Ki (Master)	Inlet Ki (Master) (Low Byte)	0 – 65,535	--	Set/Get
25		Inlet Ki (Master) (High Byte)			
26	Inlet Pressure Kd (Master)	Inlet Kd (Master) (Low Byte)	0 – 65,535	--	Set/Get
27		Inlet Kd (Master) (High Byte)			
28	Inlet Pressure Deadband (Master)	Inlet Deadband (Master) (Low Byte)	0 – 65,535	PSIG	Set/Get
29		Inlet Deadband (Master) (High Byte)			
30	Pressure Pot Capacity (Slave) ¹	P.Pot Capacity (Slave) (Low Byte)	0 – 655.35	Liters x 100	Set/Get
31		P.Pot Capacity (Slave) (High Byte)			
32	Delta P (Slave)	Delta P (Slave) (Low Byte)	0 – (Sensor Limit)	PSIG	Set/Get
33		Delta P (Slave) (High Byte)			
34	Min. Fluid Pressure (Slave)	Min. Fluid Pressure (Slave) (Low Byte)	0 – (Sensor Limit)	PSIG	Set/Get
35		Min. Fluid Pressure (Slave) (High Byte)			
36	Inlet Pressure Kp (Slave)	Inlet Kp (Slave) (Low Byte)	0 – 65,535	--	Set/Get
37		Inlet Kp (Slave) (High Byte)			

(Continued on next page)

**TABLE 6-3: CHANNEL CONFIGURATION MEMBER ENTRY FORMAT (Cont.)
(ADJUSTABLE WHILE CHANNEL OPERATING)**

Byte Offset	Contains		Value Range	Units	Access
38	Inlet Pressure Ki (Slave)	Inlet Ki (Slave) (Low Byte)	0 – 65,535	---	Set/Get
39		Inlet Ki (Slave) (High Byte)			
40	Inlet Pressure Kd (Slave)	Inlet Kd (Slave) (Low Byte)	0 – 65,535	---	Set/Get
41		Inlet Kd (Slave) (High Byte)			
42	Inlet Pressure Deadband (Slave)	Inlet Deadband (Slave) (Low Byte)	0 – 65,535	PSIG	Set/Get
43		Inlet Deadband (Slave) (High Byte)			
44	Hardener Sample Time (Slave)	Hardener Sample Time (Slave) (Low Byte)	0– 20	Seconds	Set/Get
45		Hardener Sample Time (Slave) (High Byte)			
46	Hardener No Flow (Slave)	Hardener No Flow (Slave) (Low Byte)	4.0 – 20.0	mA x 10	Set/Get
47		Hardener No Flow (Slave) (High Byte)			
48	Hardener Flow On (Slave)	Hardener Flow On (Slave) (Low Byte)	4.0 – 20.0	mA x 10	Set/Get
49		Hardener Flow On (Slave) (High Byte)			
50	Min. Control Pressure (Master)	Min. Control Pressure (Master) (Low Byte)	0 – 100	PSIG	Set/Get
51		Min. Control Pressure (Master) (High Byte)			
52	Min. Control Pressure (Slave)	Min. Control Pressure (Slave) (Low Byte)	0 – 100	PSIG	Set/Get
53		Min. Control Pressure (Slave) (High Byte)			
54	Reserved	Reserved (Low Byte)	0*	---	Set/Get
55		Reserved (High Byte)			
56	Reserved	Reserved (Low Byte)	0*	---	Set/Get
57		Reserved (High Byte)			
58	Reserved	Reserved (Low Byte)	0*	---	Set/Get
59		Reserved (High Byte)			
60	Reserved	Reserved (Low Byte)	0*	---	Set/Get
61		Reserved (High Byte)			
62	Reserved	Reserved (Low Byte)	0*	---	Set/Get
63		Reserved (High Byte)			

* indicates the RCS2 default value before user modification

1 - Can only change at Setup time, NOT while ANY channel running. Attempts to change this parameter during operation will result in an error and no values will be changed

Ratio –

The allowable range of values for this parameter is any number from 0.000 to 65.000. This is the target ratio (by volume) of resin to catalyst that the controller is going to try to maintain while triggered. The ratio of 1 for the slave channel is assumed. For example, if 12.345 was programmed here, a ratio of 12.345 parts of resin would be metered into 1 part of catalyst. If a value less than 1.000 is programmed here, the flow of the catalyst will be greater than the flow of the resin. For example, if 0.250 was programmed here, a ratio of 4 parts of catalyst (slave channel material) would be metered into 1 part of resin (master channel material). Entering a value of 65.000 transform the gun into a single component gun, delivering only the A-component material at the specified flow rate.

Flow Setpoint –

The allowable range of values for this parameter is any integer from 0 mL's/min to 10,000 mL's/min. This is the target flow rate for the output of the fluid panel associated with this gun.

Maximum Flow –

The allowable range of values for this parameter is any integer from 0 mL's/min to 10,000 mL's/min. When using an analog input to control the target flow rate, this is the flow rate that the controller will try to maintain if the maximum voltage (10 VDC) or current (20 mA) is applied to the analog input. If this is set to 0, the analog input signal is ignored.

Minimum Flow –

The allowable range of values for this parameter is any integer from 0 mL's/min to 10,000 mL's/min. When using an analog input to control the target flow rate, this is the flow rate that the controller will try to maintain if the minimum voltage (0 VDC) or current (4 mA) is applied to the analog input.

Bar Graph Limit –

The allowable range of values for this parameter is any integer from 0 mL's/min to 10,000 mL's/min that is divisible by 4. This is the flow rate indicated by top of the flow rate bar-graphs on the Main Screen.

Potlife Timer –

The allowable range of values for this parameter is any integer from 0 minutes to 1000 minutes. This is the amount of time that mixed plural component material is allowed to remain in the fluid stream after being mixed before a flush-request output and error is issued by the controller.

Feather Pressure –

The allowable range of values for this parameter is any integer value from 0 psi to 300 psi. This value is the pressure that will be maintained at the outlet of the pump (or pumps) when a gun is configured as a manual mode gun and the operator is feathering the spraygun.

Fill Volume –

The allowable range of values for this parameter is 0-65,535 mL. This value is the amount of material that is allowed to flow out of the applicator while in Volume Fill Mode before the gun is halted.

Pressure Pot Capacity (Master / Slave) –

The allowable range of values for this parameter is any value from 0.00 liters to 655.35 liters. This value is simply the volume of material that will be added to the pressure pot each time it is refilled. The pressure pot total should be reset every time a pot is filled. This value cannot be changed while the gun is operational. Attempting to do so, will reject the entire packet.

Delta P (Master / Slave) –

The allowable range of values for this parameter is any integer from 0 psi to 300 psi. This is the target differential pressure that the controller will try to maintain across the pump (inlet to outlet). The system currently only allows a positive differential pressure. That is, if this value is greater than zero (0), the system attempts to maintain the inlet pressure at a higher pressure than the outlet by the amount specified by this parameter. This feature can only

be used if the air lines from the transducers in the motor amplifier panel are connected to the pilot ports on fluid regulators at the inlet of each pump.

Minimum Inlet Fluid Pressure (Master / Slave) –

The allowable range of values for this parameter is any integer value from 0 to 300 psi. This is the target pressure that the controller tries to maintain on the inlet of the pump.

Inlet Control Pressure Kp (Master / Slave) –

The allowable range of values for this parameter is any integer from 0 to 65,535. This value is the proportional gain factor for the PID loop that controls the inlet pressure to the pump.

Inlet Control Pressure Ki (Master / Slave) –

The allowable range of values for this parameter is any integer from 0 to 65,535. This value is the integral gain factor for the PID loop that controls the inlet pressure to the pump.

Inlet Control Pressure Kd (Master / Slave) –

The allowable range of values for this parameter is any integer from 0 to 65,535. This value is the derivative gain factor for the PID loop that controls the inlet pressure to the pump.

Inlet Control Pressure Deadband (Master / Slave) –

The allowable range of values for this parameter is any integer from 0 to 65,535 psig. This value is the deadband for the PID loop that controls the inlet pressure to the pump.

Hardener Sample Time –

The allowable range of values for this parameter is 0 – 20 Seconds. This value allows the operator to program how often (in accumulated seconds) the flow of the slave channel is verified using the optional thermal-shedding flow sensor.

Hardener No Flow –

The allowable range of values for this parameter is 4.0 – 20.0 mA. (times 10). This parameter allows the user to program the current (in milliamps) below which the controller assumes that no catalyst is flowing.

Hardener Flow On –

The allowable range of values for this parameter is 4.0 – 20.0 mA. (times 10). This is the value above which the controller will assume that catalyst is flowing. It must always be greater than the Hardener No Flow Parameter. If the controller sees a value between hardener no flow and hardener flow on, it examines the slope of the

current. As long as the current is increasing while the gun is triggered, the controller assumes catalyst is flowing. If the current is decreasing or remains stable while the gun is triggered, the controller will assume no catalyst flow and it will allow the hardener sample time timer to increment.

to P (or I to P) transducer in the motor amplifier panel will be allowed to go down to. Even if the fluid pressure at the inlet of the pump is above the minimum inlet fluid pressure setpoint, the control (pilot) pressure from the E to P transducer will not go below this setpoint. This can be used as an offset to keep the fluid regulator at its cracking point to allow a more rapid response by the fluid regulator at the trigger on points.

Minimum Inlet Control Pressure (Master / Slave) –
The allowable range of values for this parameter is 0 – 100 psi. This value is the minimum pressure that the E

Provided Services

TABLE 6-4: CHANNEL CONFIGURATION OBJECT COMMON SERVICES				
Service ID	Needed in Implementation		Service Name	Description of Service
	Class	Instance		
0x0E	Required	Required	Get_Attribute_Single	Returns the contents of the specified attribute.

Service Behavior

“Get_Attribute_Single”
Returns the content of the attribute requested.

TABLE 6-4.1.1: GET_ATTRIBUTE_SINGLE SERVICE ERROR CODES		
Error Code	Error Name	Description
0x0008	Service Not Supported	Service is not supported for this object
0x0014	Attribute unsupported	Attribute value out of range (e.g. >8)

“Set_Attribute_Single”
Sets parameter values as specified.

TABLE 6-4.1.2: SET_ATTRIBUTE_SINGLE SERVICE ERROR CODE		
Error Code	Error Name	Description
0x0002	Resource Unavailable	Job/Gun isn't loaded
0x0008	Service Not Supported	The Set service is not supported for this object
0x000F	Privilege Violation	Enable flag for writing runtime data not active
0x0010	State conflict	Cannot change data while gun active
0x0013	Insufficient Data	Parameter data too small
0x0014	Attribute unsupported	Attribute value out of range (e.g. > 8)
0x0015	Too much data	Parameter data too large
0x0016	Non-existent object	
0x0020	Invalid Service Parameter	0x0000 01nn – Parameter Out of range – Field #nn

FLOW TOTALS OBJECT

Class Code: 6A Hex

The Fluid Totals Object provides logging of the fluids dispensed by the RCS2.

Fluid Totals information is stored individually for each Job on each gun. The protocol data structure supports both 1 and 2 channel guns.

Multiple object instances are used to provide access to the 199 available Jobs. However, the 1st request for a Job/Gun instance which is not actively loaded will return

an informational error and will then internally fetch the job totals data. The job totals can then be retrieved by a 2nd request for the same Gun/Job instance using the “*Get_Attribute_Single*” message.

Job totals for any of the 199 jobs can be reset using “*Set_Attribute_Single*” for the desired Job/Channel instance.

Class Attributes

TABLE 7-1: FLUID TOTALS OBJECT CLASS ATTRIBUTES

Attribute ID	Needed in Implementation	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Get	NV	Revision	UINT	Revision of this object	The current value assigned to this attribute is one (1)
2	Required	Get	NV	Max Instance	UINT	Maximum instance number of an object currently created in the device	The current value assigned to this attribute is 199
3	Required	Get	NV	Number of Instances	UINT	Number of object instances currently created at this class level of the device	The number of object instances at this class hierarchy level. Currently assigned as 199

Instance Attributes

TABLE 7-2: FLUID TOTALS INSTANCE ATTRIBUTES

Attribute ID	Needed in Implem	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Get	NV	Gun1 Totals	ARRAY of STRUCT	The totals values for the Job Loaded on Gun 1	See Semantics Next Page
2	Required	Get	NV	Gun 2 Totals	ARRAY of STRUCT	The totals values for the Job Loaded on Gun 2	See Semantics Next Page
3	Required	Get	NV	Gun 3 Totals	ARRAY of STRUCT	The totals values for the Job Loaded on Gun 3	See Semantics Next Page
4	Required	Get	NV	Gun 4 Totals	ARRAY of STRUCT	The totals values for the Job Loaded on Gun 4	See Semantics Next Page
5	Required	Get	NV	Gun 5 Totals	ARRAY of STRUCT	The totals values for the Job Loaded on Gun 5	See Semantics Next Page

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TABLE 7-2: FLUID TOTALS INSTANCE ATTRIBUTES (Cont.)

Attribute ID	Needed in Implem	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
6	Required	Get	NV	Gun 6 Totals	ARRAY of STRUCT	The totals values for the Job Loaded on Gun 6	See Semantics Next Page
7	Required	Get	NV	Gun 7 Totals	ARRAY of STRUCT	The totals values for the Job Loaded on Gun 7	See Semantics Next Page
8	Required	Get	NV	Gun 8 Totals	ARRAY of STRUCT	The totals values for the Job Loaded on Gun 8	See Semantics Next Page
9	Required	Get	NV	Job (Instance) / Gun1 Totals	ARRAY of STRUCT ²	The totals values for Gun 1 and the specified Job (Instance)	See Semantics Next Page
10	Required	Get	NV	Job (Instance) / Gun 2 Totals	ARRAY of STRUCT ²	The totals values for Gun 2 and the specified Job (Instance)	See Semantics Next Page
11	Required	Get	NV	Job (Instance) / Gun 3 Totals	ARRAY of STRUCT ²	The totals values for Gun 3 and the specified Job (Instance)	See Semantics Next Page
12	Required	Get	NV	Job (Instance) / Gun 4 Totals	ARRAY of STRUCT ²	The totals values for Gun 4 and the specified Job (Instance)	See Semantics Next Page
13	Required	Get	NV	Job (Instance) / Gun 5 Totals	ARRAY of STRUCT ²	The totals values for Gun 5 and the specified Job (Instance)	See Semantics Next Page
14	Required	Get	NV	Job (Instance) / Gun 6 Totals	ARRAY of STRUCT ²	The totals values for Gun 6 and the specified Job (Instance)	See Semantics Next Page
15	Required	Get	NV	Job (Instance) / Gun 7 Totals	ARRAY of STRUCT ²	The totals values for Gun 7 and the specified Job (Instance)	See Semantics Next Page
16	Required	Get	NV	Job (Instance) / Gun 8 Totals	ARRAY of STRUCT ²	The totals values for Gun 8 and the specified Job (Instance)	See Semantics Next Page
17	Required	Set	---	Gun 1 Reset Totals Mask	INT	Mask to Selectively reset Totals	See Semantics Next Page
18	Required	Set	---	Gun 2 Reset Totals Mask	INT	Mask to Selectively reset Totals	See Semantics Next Page
19	Required	Set	---	Gun 3 Reset Totals Mask	INT	Mask to Selectively reset Totals	See Semantics Next Page
20	Required	Set	---	Gun 4 Reset Totals Mask	INT	Mask to Selectively reset Totals	See Semantics Next Page
21	Required	Set	---	Gun 5 Reset Totals Mask	INT	Mask to Selectively reset Totals	See Semantics Next Page
22	Required	Set	---	Gun 6 Reset Totals Mask	INT	Mask to Selectively reset Totals	See Semantics Next Page
23	Required	Set	---	Gun 7 Reset Totals Mask	INT	Mask to Selectively reset Totals	See Semantics Next Page
24	Required	Set	---	Gun 8 Reset Totals Mask	INT	Mask to Selectively reset Totals	See Semantics Next Page

1. Attributes 1-8 ignore the instance value since they return the totals for the currently loaded Job on the specified Gun.

2. Attributes 9-16:

- On the 1st request for a Job not actively loaded on the specified Gun, an error will be returned. Then the Gun/Job totals will be retrieved from non-volatile memory thereby allowing retrieval by the next request of this attribute with the same Gun/Job values.
- On the 2nd request for the same Gun/Job, the totals loaded by the 1st request will be returned.

NOTE: This assumes the 1st and 2nd requests are made sequentially, since only one set of Gun/Job Totals is buffered by this message.

Semantics

Instances 1 thru 200 return a structured array of totals values for the specified instance, i.e. Job. These attribute values [1 ... 16] are arranged as shown in table below.

TABLE 7-3.1: CHANNEL TOTALS MEMBER ENTRY FORMAT (ATTRIBUTES 1 - 16)

Byte Offset	Contains		Value Range	Units	Access
0	Gun	Gun (Low Byte)	1 - 8	--	Get
1		Gun (High Byte)			
2	Job	Job (Low Byte)	1 - 199	--	Get
3		Job (High Byte)			
4	Master Channel	Master Channel (Low Byte)	-1, 1 - 8	--	Get
5		Master Channel (High Byte)			
6	Slave Channel	Slave Channel (Low Byte)	--	--	Get
7		Slave Channel (High Byte)			
8	Master – Job - Daily Volume	Daily Volume (Low Byte)	0 - (2 ³² - 1)	mL	Get
9		Daily Volume (2nd byte)			
10		Daily Volume (3rd byte)			
11		Daily Volume (High Byte)			
12	Master – Job - Year to Date Volume	Year to Date Volume (Low Byte)	0 - (2 ³² - 1)	mL	Get
13		Year to Date Volume (2nd byte)			
14		Year to Date Volume (3rd byte)			
15		Year to Date Volume (High Byte)			
16	Master – Job - Solvent Volume	Solvent Volume (Low Byte)	0 - (2 ³² - 1)	mL	Get
17		Solvent Volume (2nd byte)			
18		Solvent Volume (3rd byte)			
19		Solvent Volume (High Byte)			
20	Master – Job - Grand Total Volume	Grand Total Volume (Low Byte)	0 - (2 ³² - 1)	mL	Get
21		Grand Total Volume (2nd byte)			
22		Grand Total Volume (3rd byte)			
23		Grand Total Volume (High Byte)			
24	Master – Job - Clean Volume	Clean Volume (Low Byte)	0 - (2 ³² - 1)	mL	Get
25		Clean Volume (2nd byte)			
26		Clean Volume (3rd byte)			
27		Clean Volume (High Byte)			
28	Master – Sum of All Jobs - Daily Volume	Daily Volume (Low Byte)	0 - (2 ³² - 1)	mL	Get
29		Daily Volume (2nd byte)			
30		Daily Volume (3rd byte)			
31		Daily Volume (High Byte)			
32	Master – Sum of All Jobs - Year to Date Volume	Year to Date Volume (Low Byte)	0 - (2 ³² - 1)	mL	Get
33		Year to Date Volume (2nd byte)			
34		Year to Date Volume (3rd byte)			
35		Year to Date Volume (High Byte)			

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**TABLE 7-3.1: CHANNEL TOTALS MEMBER ENTRY FORMAT (Cont.)
(ATTRIBUTES 1 - 16)**

Byte Offset	Contains	Value Range	Units	Access	
36	Master – Sum of All Jobs - Solvent Volume	0 - (2 ³² - 1)	mL	Get	
37					Solvent Volume (Low Byte)
38					Solvent Volume (2nd byte)
39					Solvent Volume (3rd byte)
40	Master – Totals - Grand Total Volume	0 - (2 ³² - 1)	mL	Get	
41					Solvent Volume (High Byte)
42					Grand Total Volume (Low Byte)
43					Grand Total Volume (2nd byte)
44	Master – Totals - Clean Total Volume	0 - (2 ³² - 1)	mL	Get	
45					Grand Total Volume (3rd byte)
46					Grand Total Volume (High Byte)
47					Clean Volume (Low Byte)
48	Master – Pressure Pot Contents	0 - (2 ³² - 1)	mL	Get	
49					Clean Volume (2nd byte)
50					Clean Volume (3rd byte)
51					Clean Volume (High Byte)
52	Slave – Job - Daily Volume	0 - (2 ³² - 1)	mL	Get	
53					Pressure Pot Contents (Low Byte)
54					Pressure Pot Contents (2nd byte)
55					Pressure Pot Contents (3rd byte)
56	Slave – Job - Year to Date Volume	0 - (2 ³² - 1)	mL	Get	
57					Pressure Pot Contents (High Byte)
58					Year to Date Volume (Low Byte)
59					Year to Date Volume (2nd byte)
60	Slave – Job - Solvent Volume	0 - (2 ³² - 1)	mL	Get	
61					Year to Date Volume (3rd byte)
62					Year to Date Volume (High Byte)
63					Solvent Volume (Low Byte)
64	Slave – Job - Grand Total Volume	0 - (2 ³² - 1)	mL	Get	
65					Solvent Volume (2nd byte)
66					Solvent Volume (3rd byte)
67					Solvent Volume (High Byte)
68	Slave – Job - Clean Total Volume	0 - (2 ³² - 1)	mL	Get	
69					Grand Total Volume (Low Byte)
70					Grand Total Volume (2nd byte)
71					Grand Total Volume (3rd byte)
72	Slave – Sum of All Jobs - Slave Channel Total Daily Volume	0 - (2 ³² - 1)	mL	Get	
73					Grand Total Volume (High Byte)
74					Clean Total Volume (Low Byte)
75					Clean Total Volume (2nd byte)

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**TABLE 7-3.1: CHANNEL TOTALS MEMBER ENTRY FORMAT (Cont.)
(ATTRIBUTES 1 - 16)**

Byte Offset	Contains		Value Range	Units	Access
76	Slave – Sum of All Jobs - Year to Date Volume	Year to Date Volume (Low Byte)	0 - (2 ³² - 1)	mL	Get
77		Year to Date Volume (2nd byte)			
78		Year to Date Volume (3rd byte)			
79		Year to Date Volume (High Byte)			
80	Slave – Sum of All Jobs - Solvent Volume	Solvent Volume (Low Byte)	0 - (2 ³² - 1)	mL	Get
81		Solvent Volume (2nd byte)			
82		Solvent Volume (3rd byte)			
83		Solvent Volume (High Byte)			
84	Slave – Totals - Grand Total Volume	Grand Total Volume (Low Byte)	0 - (2 ³² - 1)	mL	Get
85		Grand Total Volume (2nd byte)			
86		Grand Total Volume (3rd byte)			
87		Grand Total Volume (High Byte)			
88	Slave – Totals - Clean Volume	Clean Volume (Low Byte)	0 - (2 ³² - 1)	mL	Get
89		Clean Volume (2nd byte)			
90		Clean Volume (3rd byte)			
91		Clean Volume (High Byte)			
92	Slave – Pressure Pot Contents	Pressure Pot Contents (Low Byte)	0 - (2 ³² - 1)	mL	Get
93		Pressure Pot Contents (2nd byte)			
94		Pressure Pot Contents (3rd byte)			
95		Pressure Pot Contents (High Byte)			

**TABLE 7-3.2: CHANNEL TOTALS MEMBER ENTRY FORMAT
(ATTRIBUTE 17 - 24)**

Byte Offset	Contains		Value Range	Units	Access
0	Reset Mask ¹	Reset Mask (Low Byte)	0 - 2 ¹¹ -1*	---	Set
1		Reset Mask (High Byte)			

¹ Reset Mask bit functions are defined as follows:

0x0001 : Clear Daily Totals for selected Job and Gun

0x0002 : Clear Year to Date Totals for selected Job and Gun

0x0004 : Clear Solvent Totals for selected Job and Gun

0x0008 : Clear Grand Totals for selected Job and Gun

0x0010 : Clear Clean Totals for selected Job and Gun

0x0020 : Clear selected Gun's Daily Totals on ALL jobs

0x0040 : Clear selected Gun's Year to Date Totals on ALL jobs

0x0080 : Clear selected Gun's Solvent Totals on ALL jobs

0x0100 : Clear selected Gun's Grand Totals on ALL jobs

0x0200 : Clear selected Gun's Clean Totals on ALL jobs

0x0400 : Set selected Gun's Master Pressure Pot Contents (from Job Configuration value)

0x0800 : Set selected Gun's Slave Pressure Pot Contents (from Job Configuration value)

Provided Services

TABLE 7-4: FLUID TOTALS OBJECT COMMON SERVICES

Service ID	Needed in Implementation		Service Name	Description of Service
	Class	Instance		
0x0E	Required	Required	Get_Attribute_Single	Returns the contents of the specified attribute.

Service Behavior

“Get_Attribute_Single”

Returns the content of the attribute requested.

TABLE 7-4.1.1: GET_ATTRIBUTE_SINGLE SERVICE ERROR CODE

Error Code	Error Name	Description
0x0002	Resource Unavailable	The selected resource is currently unavailable. See MSG Extended Error code for details: 0x0000_0002 : Requested Job data not currently available. Will fetch data. 0x0000_0003 : Requested Gun not configured in system.
0x0008	Service Not Supported	The Set service is not supported for this object

“Set_Attribute_Single”

Resets the totals as specified by the mask.

TABLE 7-4.1.2: SET_ATTRIBUTE_SINGLE SERVICE ERROR CODE

Error Code	Error Name	Description
0x0008	Service Not Supported	The Set service is not supported for this object
0x0009	Parameter Error	e.g. : Reset message sent with no reset flags selected
0x0013	Insufficient Data	Parameter data too small
0x0014	Attribute unsupported	Attribute not equal to 1
0x0015	Too much data	Parameter data too large

ERROR LOG OBJECT

Class Code: 6B Hex

The Error Log Object provides logging of errors detected by the RCS2. Information is stored for each error detected and the Channel it occurred on. Ten object instances are used to provide access to the 100 available error entries.

Class Attributes

TABLE 8-1: FLUID TOTALS OBJECT CLASS ATTRIBUTES

Attribute ID	Needed in Implementation	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Get	NV	Revision	UINT	Revision of this object	The current value assigned to this attribute is one (1)
2	Required	Get	NV	Max Instance	UINT	Maximum instance number of an object currently created in the device	The current value assigned to this attribute is ten (10)
3	Required	Get	NV	Number of Instances	UINT	Number of object instances currently created at this class level of the device	The number of object instances at this class hierarchy level. Currently assigned as ten (10)

Instance Attributes

TABLE 8-2: FLUID TOTALS OBJECT CLASS ATTRIBUTES

Attribute ID	Needed in Implementation	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Get	NV	Error Log Entries	ARRAY of STRUCT	Group of 10 error log entries (i.e. Group No. = Instance No.)	See Semantics Next Page
2	Required	Set	---	Error Log Reset	INT	Maximum instance	See Semantics Next Page

Semantics

Instances return a structured array of values for the instance, i.e. 1, 2, .. 10. These values are arranged as shown in table 8-3.1.

TABLE 8-3.1: ERROR LOG MEMBER ENTRY FORMAT (ATTRIBUTE 1)

Byte Offset	Contains		Value Range	Units	Access
0	Timestamp - Year	Year (Low Byte)	e.g. 2017		Get
1		Year (High Byte)			
2	Timestamp - Month	Month	1-12		Get
3	Timestamp - Day	Day of Month	1-31		Get
4	Timestamp - Hour	Hour of Day	0-23		Get
5	Timestamp - Minute	Minute of Hour	0-59		Get
6	Timestamp - Second	Second of Minute	0-59		Get
7	Channel Number	Channel Number	1 – 8, 255		Get
8	Error Number	Error Number (Low Byte)	0 – 99		Get
9		Error Number (High Byte)			
10	Reserved				Get
11	Reserved				Get
12	Timestamp - Year	Year (Low Byte)	e.g. 2017		Get
13		Year (High Byte)			
14	Timestamp - Month	Month	1-12		Get
15	Timestamp - Day	Day of Month	1-31		Get
16	Timestamp - Hour	Hour of Day	0-23		Get
17	Timestamp - Minute	Minute of Hour	0-59		Get
18	Timestamp - Second	Second of Minute	0-59		Get
19	Channel Number	Channel Number	1 – 8, 255		Get
20	Error Number	Error Number (Low Byte)	0 – 99		Get
21		Error Number (High Byte)			
22	Reserved				Get
23	Reserved				Get
Bytes 24 through 107 of the data packet will contain 8 more copies of the data elements shown in bytes 0-23. These 8 copies will contain the data for Error Log records 2 through 9.					
108	Timestamp - Year	Year (Low Byte)	e.g. 2017		Get
109		Year (High Byte)			
110	Timestamp - Month	Month	1-12		Get
111	Timestamp - Day	Day of Month	1-31		Get
112	Timestamp - Hour	Hour of Day	0-23		Get
113	Timestamp - Minute	Minute of Hour	0-59		Get
114	Timestamp - Second	Second of Minute	0-59		Get
115	Channel Number	Channel Number	1 – 8, 255		Get
116	Error Number	Error Number (Low Byte)	0 – 99		Get
117		Error Number (High Byte)			
118	Reserved				Get
119	Reserved				Get

//error log messages

```

[0] = "No Error";
[1] = "";
[2] = "Interface Detected No Slaves ";
[3] = "Interface SPI slot 1";
[4] = "Interface SPI slot 2";
[5] = "Interface SPI slot 3";
[6] = "Interface SPI slot 4";
[7-9] = "";
[10] = "Feather Pressure exceeds Sensor Limit";
[11] = "Delta Pressure exceeds Sensor Limit";
[12] = "Min Fluid Pressure exceeds Sensor Limit";
[13] = "Min Control Pressure exceeds Sensor Limit";
[14] = "Over pressure Limit exceeds Sensor Limit";
[15] = "Fold back Pressure exceeds Sensor Limit";
[16] = "Max Pump In exceeds Sensor Limit";
[17] = "Min Pump In exceeds Sensor Limit";
[18] = "Max Pump Out exceeds Sensor Limit";
[19] = "Min Pump Out exceeds Sensor Limit";
[20-31] = "";
[32] = "Input Under Pressure";           // bit 0 INPUT_UNDER_PRESSURE
[33] = "Input Over Pressure";           // bit 1 INPUT_OVER_PRESSURE
[34] = "Output Under Pressure";         // bit 2 OUTPUT_UNDER_PRESSURE
[35] = "Output Over Pressure";         // bit 3 OUTPUT_OVER_PRESSURE
[36] = "Flow Rate Out Of Tol.";        // bit 4 FLOW_OUT_OF_TOLERANCE
[37] = "Hardener Flow Loss";           // bit 5 HARDENER_FLOW_LOSS
[38] = "Pressure Pot Empty";           // bit 6 PRESSURE_POT_EMPTY
[39] = "Motor Tach Loss";               // bit 7 MOTOR_TACH_LOSS (not used)
[40] = "Delta P Out Of Limits";        // bit 8 DELTA_P_OUT_OF_LIMITS (not used)
[41] = "Inlet Pressure Loss";          // bit 9 INLET_PRESSURE_LOSS
[42] = "Outlet Pressure Loss";         // bit 10 OUTLET_PRESSURE_LOSS
[43] = "Analog Remote Loss";           // bit 11 ANALOG_REMOTE_LOSS
[44] = "Ratio Out Of Tol.";           // bit 12 RATIO_OUT_OF_TOLERANCE
[45] = "External Fault";               // bit 13 EXTERNAL_FAULT (not used)
[46] = "Motor Amp Fault";              // bit 14 MOTOR_AMP_FAULT
[47] = "Analog Feather Loss";          // bit 15 ANALOG_FEATHER_LOSS
[48] = "Analog Spare Loss";            // bit 16 ANALOG_SPARE_LOSS
[49] = "Foldback Press. Reached";      // bit 17 FOLDBACK_PRESSURE_REACHED
[50] = "Pot Life Expired";             // bit 18 POT_LIFE_EXPIRED
[51] = "Chan. Card Param. Range";      // bit 19 PARAMETER_RANGE
[52-58] = "";                          // bits 20-26 (not used)
[59] = "Interface SPI Fault";          // bit 27 Interface SPI chan 1,2,3 or 4 fault
[60] = "System Over Pressure";         // bit 28 SYSTEM_OVER_PRESSURE
[61] = "Chan. Card Param. Fault";      // bit 29 PARAMETER_FAULT
[62] = "Chan. Card SPI Fault";         // bit 30 SPI_COMM_LOST
[63] = "Chan. Card Internal Fault";    // bit 31 INTERNAL_SW_FAULT
[64] = "Trigger 4 On";
[65] = "Trigger 3 On";
[66] = "Trigger 2 On";
[67] = "Trigger 1 On";
[68] = "Motor On";
[69] = "Channel On";
[70-99] = "";

```

TABLE 8-3.2: ERROR LOG MEMBER ENTRY FORMAT (ATTRIBUTE 2)

Byte Offset	Contains		Value Range	Units	Access
0	Reset Mask ¹	Reset Mask (Low Byte)	0 - 1	---	Set
1		Reset Mask (High Byte)			

¹ Reset Mask bit functions are defined as follows:

0x0000 : No Action

0x0001 : Clear the Error Log

Provided Services

TABLE 8-4: CHANNEL CONFIGURATION OBJECT COMMON SERVICES

Service ID	Needed in Implementation		Service Name	Description of Service
	Class	Instance		
0x0E	Required	Required	Get_Attribute_Single	Returns the contents of the specified attribute Struct.
0x10	Required	Required	Set_Attribute_Single	Sets the contents of the specified attribute Struct.

Service Behavior

“Get_Attribute_Single”

Returns the content of the attribute requested. That is, the “Array of Structure” for the requested attribute, i.e. one of the set of [1, 2, 3... 10]. Note all Structure elements are returned on a “Get_Attribute_Single” operation, i.e. all one hundred twenty bytes.

TABLE 8-4.1.1: GET_ATTRIBUTE_SINGLE SERVICE ERROR CODES

Error Code	Error Name	Description
0x0008	Service Not Supported	The Set service is not supported for this object
0x0014	Attribute unsupported	Attribute not equal to 1

“Set_Attribute_Single”

Sets the content of the attribute specified. That is, the “Array of Structure” for the specified attribute, i.e. 1. Note only the Structure elements which support the “Set_Attribute_Single” Operation are to be specified, i.e. two (2) bytes. Specifying a value of zero (0) causes the error log to be cleared.

ALARM CONFIGURATION OBJECT

Class Code: 6C Hex

The Alarm configuration Object provides a means to configure which Alarm events cause the RCS2 system to halt operation. Several flags cannot be disabled. Attempts to disable them will be ignored.

Class Attributes

TABLE 9-1: ALARM CONFIGURATION OBJECT CLASS ATTRIBUTES

Attribute ID	Needed in Implementation	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Get	NV	Revision	UINT	Revision of this object	The current value assigned to this attribute is one (1)
2	Required	Get	NV	Max Instance	UINT	Maximum instance number of an object currently created in the device	The current value assigned to this attribute is one (1)
3	Required	Get	NV	Number of Instances	UINT	Number of object instances currently created at this class level of the device	The number of object instances at this class hierarchy level. Currently assigned as one (1)

Instance Attributes

TABLE 9-2: ALARM CONFIGURATION INSTANCE ATTRIBUTES

Attribute ID	Needed in Implementation	Access Rule	NV	Name	Data Type	Description of Attribute	Semantics of Values
1	Required	Set/Get	NV	Alarm Configuration Bits	ARRAY of STRUCT	Array of Alarm enables bits	See Semantics Next Page

Semantics

Attributes return a structured array of values for the instance, i.e. 1. These values are arranged as shown in the table shown below.

TABLE 9-3: ALARM CONFIGURATION MEMBER ENTRY FORMAT

Byte Offset	Contains	Value Range	Units	Access	
0	Alarm Mask	0 - 2 ³² - 1	---	Set/Get	
1					Alarm Mask (Low Byte)
2					Alarm Mask (Next Byte)
3					Alarm Mask (High Byte)

ALARM CONTROL ENABLE BITS

INPUT_UNDER_PRESSURE*	0x00000001
INPUT_OVER_PRESSURE*	0x00000002
OUTPUT_UNDER_PRESSURE*	0x00000004
OUTPUT_OVER_PRESSURE*	0x00000008
FLOW_OUT_OF_TOLERANCE*	0x00000010
HARDENER_FLOW_LOSS*	0x00000020
PRESSURE_POT_EMPTY	0x00000040
(not used)	0x00000080
(not used)	0x00000100
INLET_PRESSURE_LOSS*	0x00000200
OUTLET_PRESSURE_LOSS*	0x00000400 (always enabled)
ANALOG_REMOTE_LOSS	0x00000800
RATIO_OUT_OF_TOLERANCE*	0x00001000
(not used)	0x00002000
MOTOR_AMP_FAULT*	0x00004000 (always enabled)
ANALOG_FEATHER_LOSS	0x00008000
ANALOG_SPARE_LOSS	0x00010000
FOLDBACK_PRESSURE_REACHED	0x00020000
POT_LIFE_EXPIRED	0x00040000
(not used)	0x00080000
(not used)	0x00100000
(not used)	0x00200000
(not used)	0x00400000
(not used)	0x00800000
(not used)	0x01000000
(not used)	0x02000000
(not used)	0x04000000
INTERFACE_SPI_FAULT	0x08000000
SYSTEM_OVER_PRESSURE*	0x10000000 (always enabled)
PARAMETER_FAULT*	0x20000000 (always enabled)
SPI_COMM_LOST*	0x40000000 (always enabled)
INTERNAL_SW_FAULT*	0x80000000 (always enabled)

Note: * indicates power on default settings

Provided Services

TABLE 9-4: ALARM CONFIGURATION OBJECT COMMON SERVICES

Service ID	Needed in Implementation		Service Name	Description of Service
	Class	Instance		
0x0E	Required	Required	Get_Attribute_Single	Returns the contents of the specified attribute Struct.
0x10	Required	Required	Set_Attribute_Single	Sets the contents of the specified attribute Struct.

Service Behavior

“Get_Attribute_Single”

Returns the content of the attribute requested. That is, the “Array of Structure” for the requested attribute, i.e. one (1).

TABLE 9-4.1.1: GET_ATTRIBUTE_SINGLE SERVICE ERROR CODES

Error Code	Error Name	Description
0x0008	Service Not Supported	The Set service is not supported for this object
0x0014	Attribute unsupported	Attribute not equal to 1

“Set_Attribute_Single”

Sets the content of the attribute specified. That is, the “Array of Structure” for the specified attribute, i.e. one (1).

TABLE 9-4.1.2: GET_ATTRIBUTE_SINGLE SERVICE ERROR CODES

Error Code	Error Name	Description
0x000F	Privilege Violation	Enable flag for writing runtime configuration data not active
0x0013	Insufficient Data	Parameter data too small
0x0014	Attribute unsupported	Attribute not equal to 1
0x0015	Too much data	Parameter data too large
0x0016	Non-existent object	

APPENDIX

Summary of Ethernet/IP Explicit Class Objects

The following series of tables a summary of the supported Ethernet/IP Explicit Classes

CLASS CODE 0x64 - GUN OPERATIONAL STATUS OBJECT

Instance	Level	Attribute No.	Description	Reference	Contents
0	0	1 – 3	Class Attributes		
1	1	1	Instance Attributes (1)	Gun (1)	Status – Gun 1
2	1	1	Instance Attributes (2)	Gun (2)	Status – Gun 2
3	1	1	Instance Attributes (3)	Gun (3)	Status – Gun 3
4	1	1	Instance Attributes (4)	Gun (4)	Status – Gun 4
5	1	1	Instance Attributes (5)	Gun (5)	Status – Gun 5
6	1	1	Instance Attributes (6)	Gun (6)	Status – Gun 6
7	1	1	Instance Attributes (7)	Gun (7)	Status – Gun 7
8	1	1	Instance Attributes (8)	Gun (8)	Status – Gun 8
1-8	1	2	Instance Attributes	Gun (1-8)	Status – Guns 1-8

CLASS CODE 0x65 - CHANNEL OPERATIONAL STATUS OBJECT

Instance	Level	Attribute No.	Description	Reference	Contents
0	0	1 – 3	Class Attributes		
1	1	1	Instance Attributes (1)	Channel (1)	Status – Channel 1
2	1	1	Instance Attributes (2)	Channel (2)	Status – Channel 2
3	1	1	Instance Attributes (3)	Channel (3)	Status – Channel 3
4	1	1	Instance Attributes (4)	Channel (4)	Status – Channel 4
5	1	1	Instance Attributes (5)	Channel (5)	Status – Channel 5
6	1	1	Instance Attributes (6)	Channel (6)	Status – Channel 6
7	1	1	Instance Attributes (7)	Channel (7)	Status – Channel 7
8	1	1	Instance Attributes (8)	Channel (8)	Status – Channel 8
1-8	1	2	Instance Attributes	Channel (1-8)	Status – Channels 1-8

CLASS CODE 0x66 - SYSTEM CONFIGURATION OBJECT

Instance	Level	Attribute No.	Description	Reference	Contents
0	0	1 – 3	Class Attributes		
1	1	1	Instance Attributes	System	Configuration

CLASS CODE 0x67 - GUN CONFIGURATION OBJECT

Instance	Level	Attribute No.	Description	Reference	Contents
0	0	1 – 3	Class Attributes		
1	1	1	Instance Attributes	Gun (1)	Settings – Runtime Adjustable
1	1	2	Instance Attributes	Gun (1)	Configuration settings
2	1	1	Instance Attributes	Gun (2)	Settings – Runtime Adjustable
2	1	2	Instance Attributes	Gun (2)	Configuration settings
3	1	1	Instance Attributes	Gun (3)	Settings – Runtime Adjustable
3	1	2	Instance Attributes	Gun (3)	Configuration settings
4	1	1	Instance Attributes	Gun (4)	Settings – Runtime Adjustable
4	1	2	Instance Attributes	Gun (4)	Configuration settings
5	1	1	Instance Attributes	Gun (5)	Settings – Runtime Adjustable
5	1	2	Instance Attributes	Gun (5)	Configuration settings
6	1	1	Instance Attributes	Gun (6)	Settings – Runtime Adjustable
6	1	2	Instance Attributes	Gun (6)	Configuration settings
7	1	1	Instance Attributes	Gun (7)	Settings – Runtime Adjustable
7	1	2	Instance Attributes	Gun (7)	Configuration settings
8	1	1	Instance Attributes	Gun (8)	Settings – Runtime Adjustable
8	1	2	Instance Attributes	Gun (8)	Configuration settings

CLASS CODE 0x68 - CHANNEL CONFIGURATION OBJECT

Instance	Level	Attribute No.	Description	Reference	Contents
0	0	1 – 3	Class Attributes		
1	1	1	Instance Attributes	Channel (1)	Settings – Runtime Adjustable
1	1	2	Instance Attributes	Channel (1)	Configuration settings
2	1	1	Instance Attributes	Channel (2)	Settings – Runtime Adjustable
2	1	2	Instance Attributes	Channel (2)	Configuration settings
3	1	1	Instance Attributes	Channel (3)	Settings – Runtime Adjustable
3	1	2	Instance Attributes	Channel (3)	Configuration settings
4	1	1	Instance Attributes	Channel (4)	Settings – Runtime Adjustable
4	1	2	Instance Attributes	Channel (4)	Configuration settings
5	1	1	Instance Attributes	Channel (5)	Settings – Runtime Adjustable
5	1	2	Instance Attributes	Channel (5)	Configuration settings
6	1	1	Instance Attributes	Channel (6)	Settings – Runtime Adjustable
6	1	2	Instance Attributes	Channel (6)	Configuration settings
7	1	1	Instance Attributes	Channel (7)	Settings – Runtime Adjustable
7	1	2	Instance Attributes	Channel (7)	Configuration settings
8	1	1	Instance Attributes	Channel (8)	Settings – Runtime Adjustable
8	1	2	Instance Attributes	Channel (8)	Configuration settings

CLASS CODE 0x69 - JOB CONFIGURATION OBJECT

Instance	Level	Attribute No.	Description	Reference	Contents
0	0	1 – 3	Class Attributes		
1	1	1 - 8	Instance Attributes	Job (1)	Configuration for Job/Gun
2	1	1 - 8	Instance Attributes	Job (2)	Configuration for Job/Gun
3	1	1 - 8	Instance Attributes	Job (3)	Configuration for Job/Gun
4	1	1 - 8	Instance Attributes	Job (4)	Configuration for Job/Gun
5	1	1 - 8	Instance Attributes	Job (-)	Configuration for Job/Gun
↓	↓	↓	↓	↓	↓
195	1	1 - 8	Instance Attributes	Job (-)	Configuration for Job/Gun
196	1	1 - 8	Instance Attributes	Job (196)	Configuration for Job/Gun
197	1	1 - 8	Instance Attributes	Job (197)	Configuration for Job/Gun
198	1	1 - 8	Instance Attributes	Job (198)	Configuration for Job/Gun
199	1	1 - 8	Instance Attributes	Job (199)	Configuration for Job/Gun

CLASS CODE 0x6A - FLOW TOTALS OBJECT

Instance	Level	Attribute No.	Description	Reference	Contents
0	0	1 – 3	Class Attributes		
1	1	1 - 8	Instance Attributes	Job (1)	Job/Gun Totals – Active Job
1	1	9 - 16	Instance Attributes	Job (1)	Job/Gun Totals
1	1	17-23	Instance Attributes	Job (1)	Reset Totals for Job/Gun
2	1	1 - 8	Instance Attributes	Job (2)	Job/Gun Totals – Active Job
2	1	9 - 16	Instance Attributes	Job (2)	Job/Gun Totals
2	1	17-23	Instance Attributes	Job (2)	Reset Totals for Job/Gun
3	1	1 - 8	Instance Attributes	Job (3)	Job/Gun Totals – Active Job
3	1	9 - 16	Instance Attributes	Job (3)	Job/Gun Totals
3	1	17-23	Instance Attributes	Job (3)	Reset Totals for Job/Gun
4	1	1 - 8	Instance Attributes	Job (-)	Job/Gun Totals – Active Job
↓	↓	↓	↓	↓	↓
↓	↓	9 - 16	↓	↓	↓
196	1	17-23	Instance Attributes	Job (-)	Reset Totals for Job/Gun
197	1	1 - 8	Instance Attributes	Job (197)	Job/Gun Totals – Active Job
197	1	9 - 16	Instance Attributes	Job (197)	Job/Gun Totals
197	1	17-23	Instance Attributes	Job (197)	Reset Totals for Job/Gun
198	1	1 - 8	Instance Attributes	Job (198)	Job/Gun Totals – Active Job
198	1	9 - 16	Instance Attributes	Job (198)	Job/Gun Totals
198	1	17-23	Instance Attributes	Job (198)	Reset Totals for Job/Gun
199	1	1 - 8	Instance Attributes	Job (199)	Job/Gun Totals – Active Job
199	1	9 - 16	Instance Attributes	Job (199)	Job/Gun Totals
199	1	17-23	Instance Attributes	Job (199)	Reset Totals for Job/Gun

CLASS CODE 0x6B - ERROR LOG OBJECT

Instance	Level	Attribute No.	Description	Reference	Contents
0	0	1 – 3	Class Attributes		
1	1	1	Instance Attributes	Errors (0-9)	Log Entries
2	1	1	Instance Attributes	Errors (10-19)	Log Entries
3	1	1	Instance Attributes	Errors (20-29)	Log Entries
4	1	1	Instance Attributes	Errors (30-39)	Log Entries
5	1	1	Instance Attributes	Errors (40-49)	Log Entries
6	1	1	Instance Attributes	Errors (50-59)	Log Entries
7	1	1	Instance Attributes	Errors (60-69)	Log Entries
8	1	1	Instance Attributes	Errors (70-79)	Log Entries
9	1	1	Instance Attributes	Errors (80-89)	Log Entries
10	1	1	Instance Attributes	Errors (90-99)	Log Entries
1-10	1	2	Clear Error Log	Errors (0-99)	Flag to Clear Log

CLASS CODE 0x6C - ALARM CONFIGURATION OBJECT

Instance	Level	Attribute No.	Description	Reference	Contents
0	0	1 – 3	Class Attributes		
1	1	1	Instance Attributes	Alarms	Configuration Bits

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