



396-4216Y1

Spartan Injection Pump Models 115, 125, 135, and 145



ALL SYSTEMS: These flowmeter settings are pulses per ounce, but for some controllers this number will be entered as pulses per gallon. Therefore the controller thinks it is measuring gallons when it is really measuring ounces. This will happen on controllers that only measure gal/acre, and only allow one decimal on the gal/acre rate. Set the Rate using the number of ounces per acre you want. For example, to apply 32 oz/acre, set the rate at 32 gal/acre. The display will read gpa, but it will actually be applying oz/acre.

Operating Caution: Pump will produce up to 290 PSI. Limit operating pressure to 80 PSI. Pressure with water will be less than pressure with a thicker, heavier product.

Specifications

Voltage: 12 VDC

Pump Speed: 0-120 RPM

Current: 16.3 Amps

Spartan Injection Pump Model #	115	125	135	145
Flow Range (oz/min)	1-10	3-20	6-40	10-80
Flow Cal (pul/oz, but some controllers may use this as pul/gal)	1700	890	450	220
Commander II Flow Cal	3400	1780	900	440

Original John Deere Rate Controller Calibration Settings

PWM Settings-Control Valve Calibration—222 or 322 PWM Low Limit—9 (adjust in field-may need lower)

Use Flow Cal number above and Units—Gal For 32 oz/acre, enter Rate as 32 gal/acre.

NEW John Deere Rate Controller 2000 and Raven RCM Calibration Settings

Control Valve Setup: See also 396-3639Y1 SureFire Spartan and JDRC 2000.

PWM CLOSE Valve Response—10-15 Control Deadband—2% Coil Frequency—100 High Limit—100

Low Limit—10 PWM Startup—10-15 Flowmeter Cal—See Flow Cal chart above: **Flowmeter Units: fl.oz.**

Rate Setup: Set Decimal Shift at 2: for 32 oz/acre, set rate at 0.25 gpa

RAVEN RCM - Valve Response = 1. If valve is too aggressive: Advanced Tuning : P = 5, S = 0.9.

Valve Response Rate, Low Limit, and PWM Startup can be adjusted if needed for best operation in the field.

If pump will not get down to the desired rate, lower the PWM Low Limit. If pump oscillates and will not lock on to the rate, decrease the Valve Response Rate. If pump is slow to adjust, increase the Valve Response Rate (on GRC, increase the first Valve Calibration digit). Raven RCM Valve Response may need to be as low as 1 or 2.

To test pump, go to **Diagnostics > Tests > select appropriate Product number > Calibrate PWM Limits.**

This test allows you to run the pump without the controller turning off the pump because it doesn't read flow yet.

Run this test. Observe DC(%) and flow (gal/min) as you speed up the pump. The flow may only be 0.1 or 0.2 gal/min. Be careful not to build more pressure than system will handle.

You can also run a **Nozzle Flow Check** with a Test Speed and Test Rate.

On the Run screen, SureFire recommends putting **DC% (PWM Duty Cycle)** as one of the Display Settings that you can monitor for this product.



Settings for SureFire Spartan injection pump

Typical settings. Adjust as needed for best performance on your system in the field.

SureFire SENTINEL

Control Speed 100 PWM Minimum 5
Flow Cal—see chart above For 32 oz/acre, enter Rate as 32

SureFire Commander II

Valve Control Speed (CAL-Control Speed)— (-3) PWM Minimum (Special CAL 3--Area)—5
Flow Cal—see chart above For 32 oz/acre, enter Rate as 32

Trimble Field-IQ Module for FmX

Allowable Error 2% Lower PWM Limit and Minimum Response 5%
Drive Calibration Proportional --5 All other gains 0 (Newer software uses Proportional instead of Integral)

Ag Leader Control

Checkmark in Close Flow Control valve when rate off PWM Gain 311
Zero Flow Offset and PWM Standby 5 Allowable Error 2%

Pro 700 AccuControl

AccuControl Valve Calibration > Advanced Calibration > Integral Gain—0.2 Breakout—2%
Dead Zone—2% Advanced PWM > PWM Minimum—5

ADJUSTMENTS

Valve Control Speed (Gain) , PWM Low Limit (Minimum), and PWM Startup can be adjusted if needed for best operation in the field.

If pump will not get down to the desired rate, lower the PWM Low Limit. At low output, the pump may run at 5% PWM Duty Cycle or less. At higher outputs, the PWM Low Limit can be raised.

If pump oscillates and will not lock on to the rate, decrease the Valve Control Speed (Gain). If pump is slow to adjust, increase the Valve Control Speed (Gain).

Closely monitor the gallons applied and the acres worked for correct flowmeter adjustment. Adjust the flow cal as needed for best accuracy in the field. (If you need to apply more, increase the flow cal. If you need to apply less, decrease the flow cal.)

IMPORTANT - RINSE AND FLUSH

If using a suspension liquid, use constant agitation and FLUSH when you will be stopped for an hour or more. If it is a product that might set up, it can ruin the pump. Install a rinse tank if needed.

OIL

SureFire uses and recommends Mobil Super 5000 5W-30 oil for the Spartan.

RPM SENSOR, FLOW SWITCH, SIGNAL CONDITIONER

See page 4 for important information on these components of the flow-measuring system. Flow is measured indirectly by using the pump RPM. The positive displacement pump outputs a known amount for each pump revolution. A floating flow switch verifies that liquid is flowing. If the pump is turning, but the float is down, the display will show NO FLOW.



SureFire Ag Systems

Fertilizer Application and Control Experts

John Deere Rate Controller
and
SureFire Spartan Injection Pump

PWM Settings	
Control Valve Calibration	222
Coil Frequency	100
High Limit	255
Low Limit	9

~~Calibrate PWM Limits~~

Control Valve Calibration 222 or 322

If the system is slow getting to the Target Rate, increase the first digit of the Control Valve Calibration. If the system overshoots above and below the Target Rate, decrease the first digit.

Low Limit 9 (Decrease if pump needs to run slower)

This must be set here to “jump-start” the pump. If the pump stalls and won’t get to rate on start-up, increase this setting 1 digit at a time.

PWM High Limit could be set lower to prevent the pump from running at a high speed. (Most systems will be below 160 on the PWM Duty Cycle.)

*Also on System screen, enter the **flow cal** for the pump you are using.*

See the first page of this document for flow cal numbers. Use the number in the chart, set flowmeter units as Gal. This will cause the controller to measure the output in ounces, even though the screen will say gallons.

Implement	System	Alarms	Rates
Alarm?			
Low Tank Level (gal)	20	<input type="checkbox"/>	
High Alarm (% above target rate)	20	<input checked="" type="checkbox"/>	
Low Alarm (% below target rate)	20	<input checked="" type="checkbox"/>	
Pressure Sensor 1 Alarm?			
Minimum (psi)	10	<input type="checkbox"/>	
Maximum (psi)	80	<input checked="" type="checkbox"/>	

Flowmeter Calibration	440
Flowmeter Units	gal

These are suggested settings for **Alarms**.

If using a Pressure Sensor, set the Alarms as shown.

The SureFire Injector Pump is capable of achieving 290 PSI. Operating pressure should be kept at 80 PSI or less.

Operating pressure with water will typically be less than the pressure that will be experienced with thicker, heavier products.

Implement	System	Alarms	Rates
Rate 1	32.0 gal/ac	Minimum Flow Rate	0.0 gal/min
Rate 2	0.0	Enter minimum flow rate required to maintain spray pattern. This is also the flowrate used when manual button is pressed.	
Rate 3	0.0		
Rate Smoothing	<input checked="" type="checkbox"/>	10	%

Rates

Set the desired Rate in **oz/acre** (ignore the gal/ac label on the screen).

With the settings shown on this sheet, the flow will be measured and reported in **ounces** (oz/acre, oz/min, etc.).

After the system is plumbed, and the settings shown above have been entered, SureFire recommends:

1. Run a **Section Test. Diagnostics—Tests—Section Test**. This will verify that you can start the pump and speed it up and slow it down. **Keep the pressure at 80 PSI or less during the Section Test.**
2. Run a **Nozzle Flow Check** with typical operating Rate and Speed to verify that the controller will lock on to the Target Rate. (Enter the Rate in **oz/acre**) You can change the speed to check out various possible operating speeds.
3. Do a **Catch Test** to verify the Flowmeter Calibration. Catch the output from the pump and compare that to what the flowmeter calculated. Adjust the Flowmeter Calibration number as needed. Increase the flow cal if you need to pump more. Decrease the flow cal if you need less.

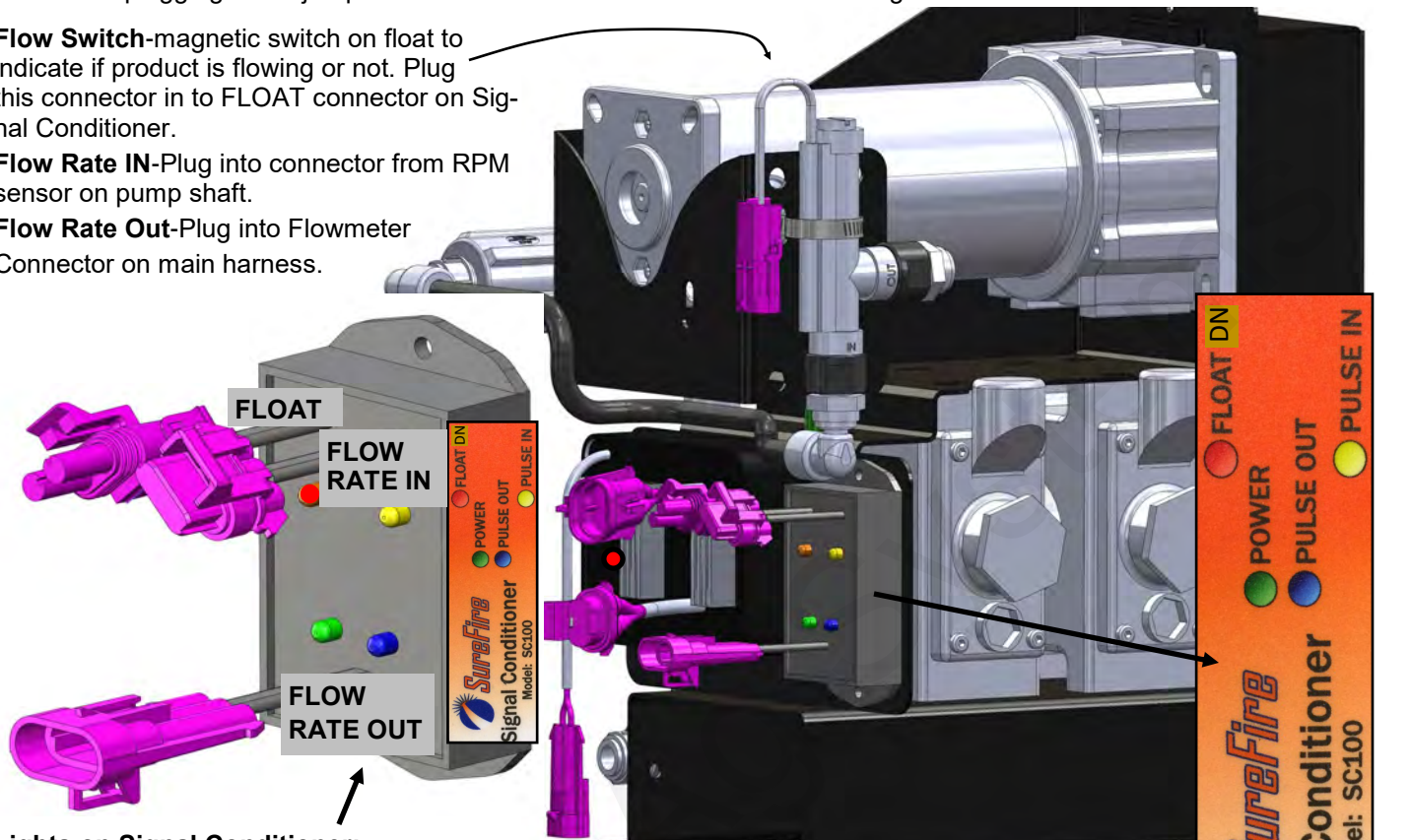


The flowmeter on the Spartan is a pump RPM sensor that is calibrated to convert the pump RPM to flow measured in oz/min. To be certain that liquid is actually flowing, a flow switch with a floating magnetic switch is in the flow line. If the tank is empty, the float will go down, telling the controller that there is no flow. If the flow switch malfunctions and tells the controller there is no flow when there is flow, you can run the system without the flow switch by unplugging the flow switch and plugging in the jumper connector to the Float connection on the Signal Conditioner.

Flow Switch-magnetic switch on float to indicate if product is flowing or not. Plug this connector in to FLOAT connector on Signal Conditioner.

Flow Rate IN-Plug into connector from RPM sensor on pump shaft.

Flow Rate Out-Plug into Flowmeter Connector on main harness.



Lights on Signal Conditioner:

Normal operating mode: Green and Blue steady on. Yellow pulsing quickly.

Green-Steady ON-is receiving power from flowmeter connector on harness.

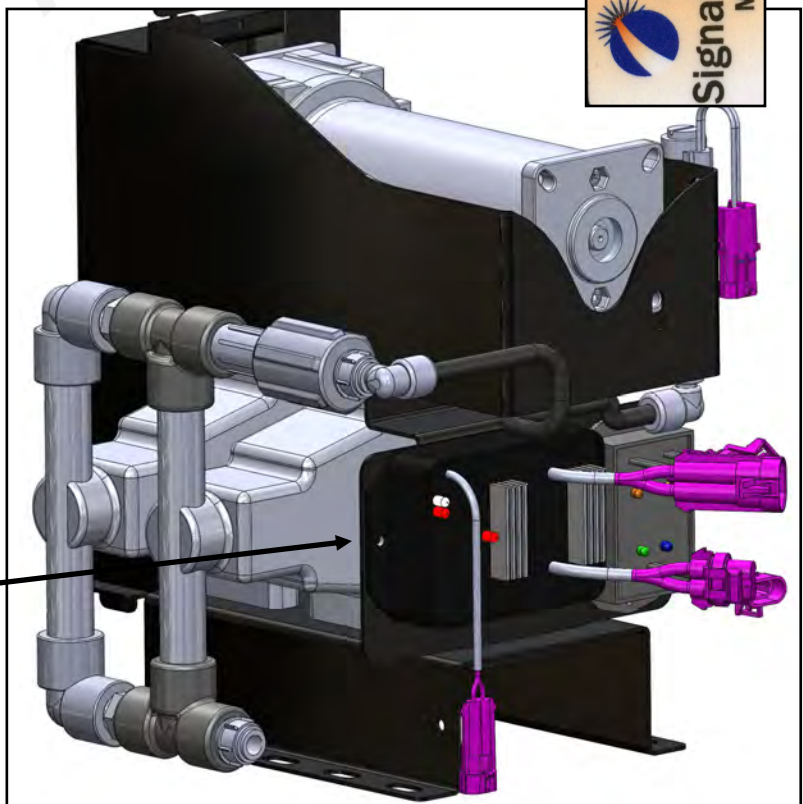
Blue- should be ON when system is running. Indicates Signal Conditioner is sending out pulses to controller.

Yellow—Quick pulses while system is running indicates it is receiving pulses from the RPM sensor on the pump shaft.

Red-should be OFF. Red light ON indicates that float is down or is malfunctioning if fluid is flowing. Red light ON means no pulses are being sent to the controller. (When Red light first comes ON, pulses will be sent for about 10 seconds). To bypass the float (Flow Switch) unplug Flow Switch connector from Float connector on Signal Conditioner, and plug jumper into Float connector. Red light should go out.

Lights on EPD module:

Red light by fins-steady blink (once per second) indicates power from battery. When system is running, this light goes steady red, and red light in corner turns on (maybe not as bright) indicating PWM signal.



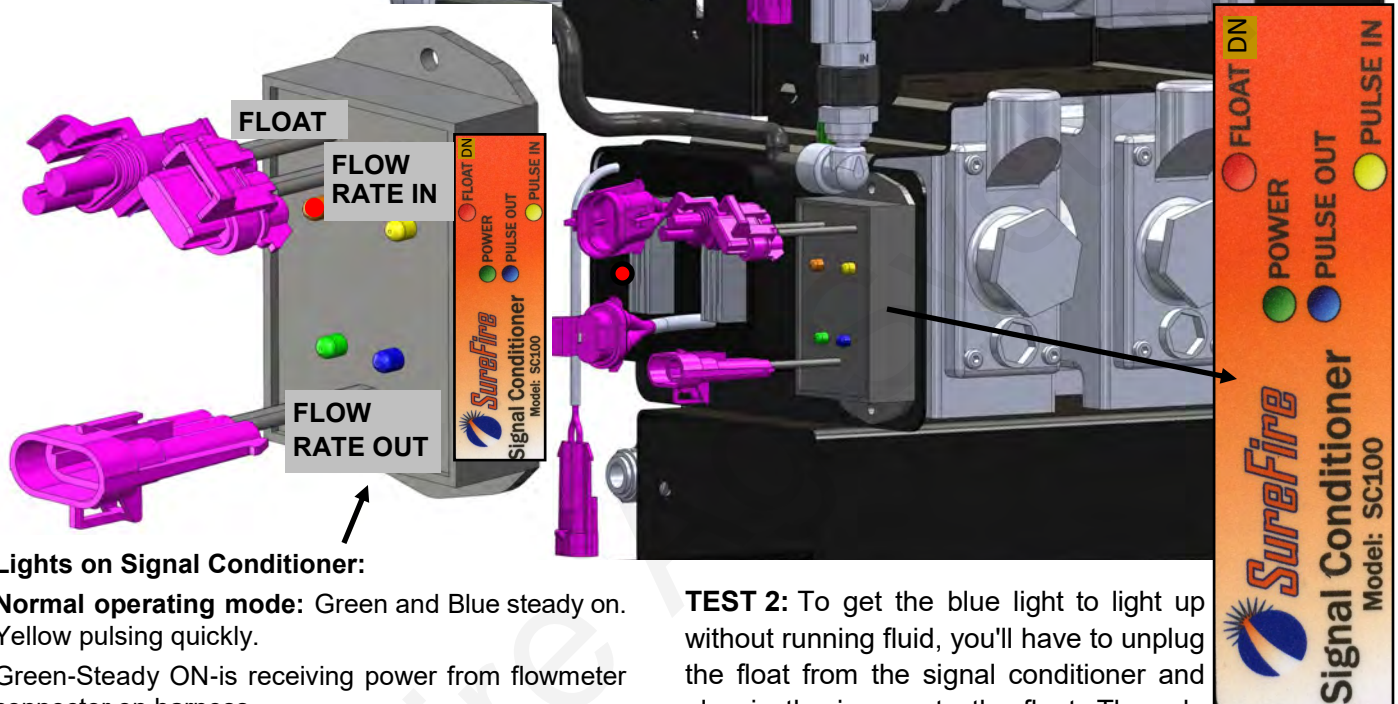
Spartan Tap Test and Signal Conditioner Lights

ISSUE: No yellow or blue lights on Signal Conditioner and No flow reading on display

TEST 1: Unplug the connector where the cable from the shaft sensor plugs into the signal conditioner (Flow rate in). On that Flow Rate In connector take a short wire and tap repeatedly between the two outside pins. You should get the yellow light to light up. If it doesn't, we probably aren't getting pulses from the shaft sensor.

It could also be a problem with the signal conditioner.

See Test 2 and Test 3.



Lights on Signal Conditioner:

Normal operating mode: Green and Blue steady on. Yellow pulsing quickly.

Green-Steady ON-is receiving power from flowmeter connector on harness.

Blue- should be ON when system is running. Indicates Signal Conditioner is sending out pulses to controller.

Yellow—Quick pulses while system is running indicates it is receiving pulses from the RPM sensor on the pump shaft.

Red-should be OFF. Red light ON indicates that float is down or is malfunctioning if fluid is flowing. Red light ON means no pulses are being sent to the controller. (When Red light first comes ON, pulses will be sent for about 10 seconds). To bypass the float (Flow Switch) unplug Flow Switch connector from Float connector on Signal Conditioner, and plug jumper into Float connector. Red light should go out.

Lights on EPD module:

Red light by fins-steady blink (once per second) indicates power from battery. When system is running, this light goes steady red, and red light in corner turns on (maybe not as bright) indicating PWM signal.

TEST 2: To get the blue light to light up without running fluid, you'll have to unplug the float from the signal conditioner and plug in the jumper to the float. Then do that tap test, and it should light up the yellow, showing that the conditioner is receiving pulses, and should light up the blue, to show that the conditioner is sending pulses out.

You should be able to see these pulses in this second test on the display. On Sentinel, look at the Diagnostics Tab for Flowmeter Hz. You have to do quite a bit of tapping to see this. On a Deere display, go to Diagnostics > Readings > Delivery System > Flowmeter Hz. On Trimble and Ag Leader, you can go to Diagnostics and see Flowmeter Pulses.

TEST 3: Plug the flowmeter connector on the pump final harness directly into the connector from the shaft sensor. This bypasses the Signal Conditioner and float. When you run the pump, pulses (flow) should register on the display to verify that the shaft sensor is sending out pulses and that the harnessing can get it to the display.

40 Amp PWM EPD

(Pulse Width Modulated Electric Pump Driver)

D

Wiring & Elec.

The Electric Pump Driver powers the electric pump by providing a pulse width modulated signal to control pump speed. It needs to have a power connection and wiring capable of carrying up to 40 amps of current. **It must be connected directly to the tractor battery.** SureFire recommends 10 gauge wire (or heavier) if extending harnesses in the field.

PWM Connection on pump final harness 207-3461Y2 (or other)

(200-03-18220 if using Commander II or PWM connector on final pump harness on any controller)

Plugs into connector from pump motor

Connector from pump motor

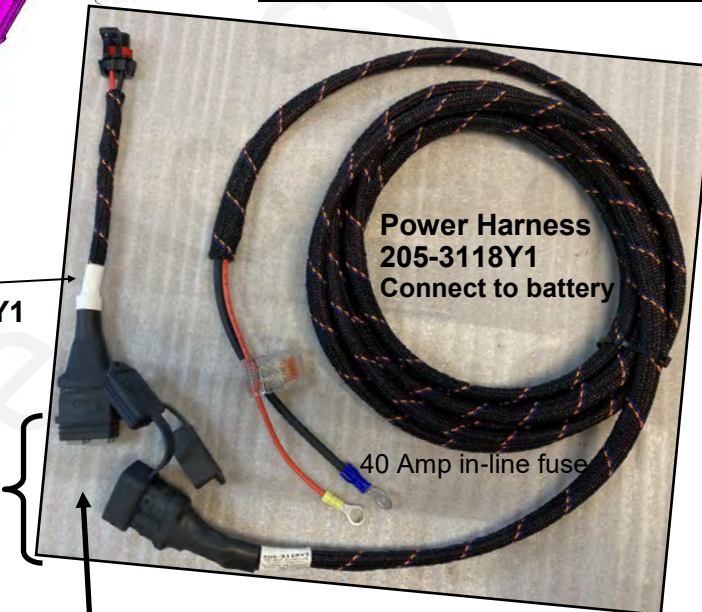
Adapter
201-3130Y1

There may be an extension from the hitch to the pump

Troubleshooting Tip:

The LED in the center above the fins should have a slow steady blink (once per second) when the EPD is receiving power from the battery. When the pump is turned on, this light should go steady red, and there should be a red light (PWM signal) in the corner.

The center light will go off after 5 minutes of inactivity.



Troubleshooting Tip:

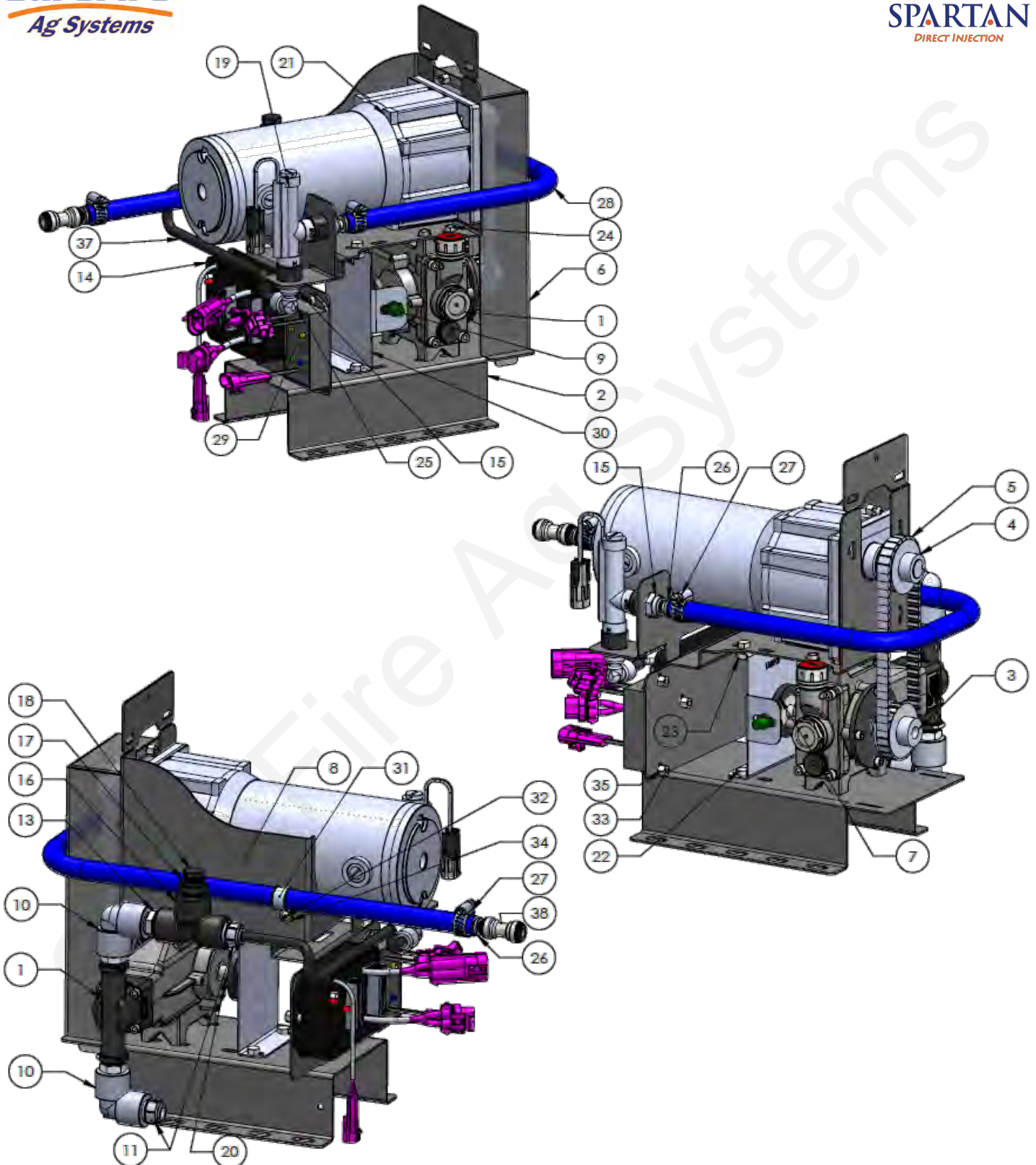
If the pump won't run, connect the power and pump connector directly together to give pump full 12 volts directly from battery. This will tell you if the pump is the problem or if something else is wrong. The pump will be running at full speed, so don't leave them connected this way for long. Disconnect pump outlet hose so high pressure does not cause damage.

Use EPD **Power Harness Extensions** as needed

(These have Anderson Connectors)		Wire Size
206-02-3120Y1	1' Extension	10 gauge
206-02-3121Y1	5' Extension	10 gauge
206-02-3122Y1	10' Extension	8 gauge
206-02-3123Y1	20' Extension	8 gauge
206-02-3124Y1	30' Extension	30' and longer—6 gauge
206-02-3125Y1	40' Extension	
206-02-3126Y1	50' Extension	
206-02-3127Y1	60' Extension	
206-02-3128Y1	2' Anderson Ext w/ Power Switch-8 AWG	

SureFire recommends a single long extension harness as multiple connectors will reduce voltage, increase current and hurt performance of your electric pump system.

Spartan 115 Assembly and Parts Breakdown





Spartan 115 Assembly and Parts Breakdown

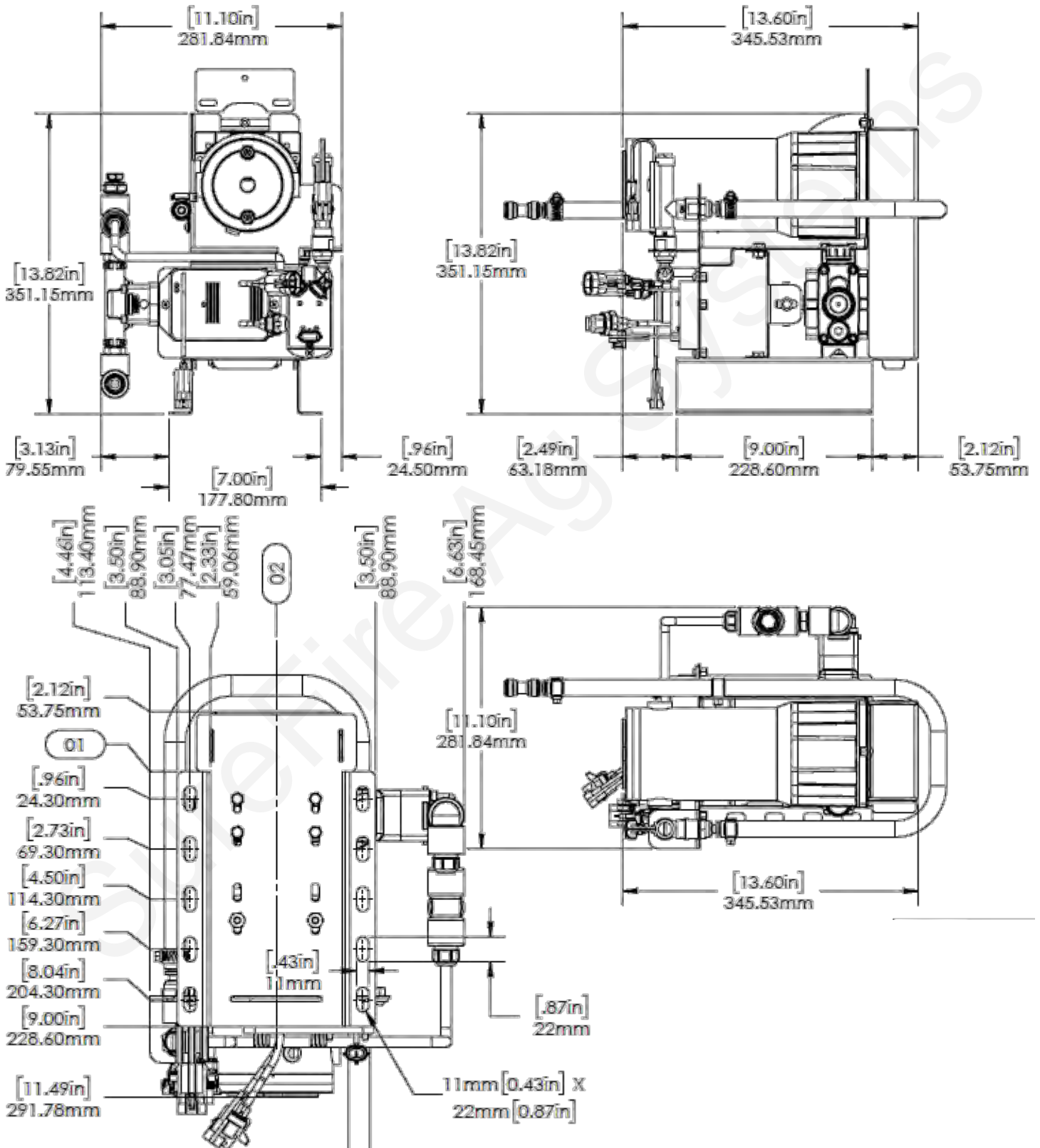


ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	290-10-52.0000.20	Plunger Metering Pump	1
2	470-2065A1	Base Sheet Metal	1
3	367-A 6Z 4M16DF12512	12mm ID Timing Pulley 16 Teeth	1
4	367-A 6Z 4-16DF050020	5/8" ID Timing Pulley 16 Teeth	1
5	367-187L050	187L050 18.5" Timing Belt	1
6	470-2067A1	Belt Sheild Sheet Metal	1
7	204-04-P32B25R32	P32B25R32 Modified with 12mm ID, 32 pulse Target	1
8	470-2066A1	Motor Mount Sheet Metal	1
9	203-01-13096	Hall-effect Flow Sensor Cable 5'	1
10	100-050EL-90	1/2" Pipe Elbow	2
11	113-06-0038050-P	QC to MPT - 3/8" QC x 1/2" MPT	2
12	201-2119Y1	Injection Pump Flow Wiring Harness	1
13	100-050NIP-SH	1/2" Short Nipple	1
14	205-18385	PWM EPD with MP480 Connectors	1
15	113-06-038025-P	QC to MPT - 3/8" QC x 1/4" MPT	2
16	100-050TEE	1/2" TEE	1
17	100-050025RB	1/2" MPT x 1/4" FPT Reducer Bushing	1
18	100-025PLUG	1/4" Pipe Plug	1
19	204-06-3381Y1	Spartan Flow Switch (2-80 oz/min)	1
20	383-1439K411-ONE Pump	Keyway Target Shaft - 12mm	1
21	756-7930-7513	Gear Motor 5/8" Shaft - 76.2 in/lb - 12 VDC - 16.24 Amps	1
22	300-040008-5	1/4" x 1/2" Hex Head Bolt-G5	4
23	323-04	1/4" Flange Nut	4
24	300-M610MM-SS	M6 x 10MM Hex Head Bolt - SS	8
25	113-12-038038-P	Stem Elbow - 3/8" Stem x 3/8" QC	1
26	113-01-038050-P	Stem to HB - 3/8" Stem x 1/2" HB - Polypropylene	2
27	350-0605	SS Hose Clamp - Size 6 - 7/8" Diameter	2
28	284-050-A4086-48in	1/2" Blue Chem Hose - 300PSI - 48"	1
29	204-01-4208Y1	Assembled Signal Conditioner - 16 pulse avg (2 PIN WP Tower - Compac Flow Switch)	1
30	470-4168Y1	RPM Sensor Bracket	1
31	352-11EPDM	EPDM Clamp	1
32	340-100012	Machine Screw - Size 10 x 3/4"	1
33	340-100008-24	Machine Screw - Size 10 x 1/2" - 24 Thread Count	5
34	330-1024	Size 10 Flat Washer	1
35	321-1024	Size 10 Nylock Nut 24 Threads	6
36	470-3359Y1-SS	Cam - 2.1375mm (3-20 oz/min)	1
37	281-038-Spartan115	3/8" Tubing x 12" Long	1
38	113-14-038038	QC to QC - 3/8" QC x 3/8" QC	1

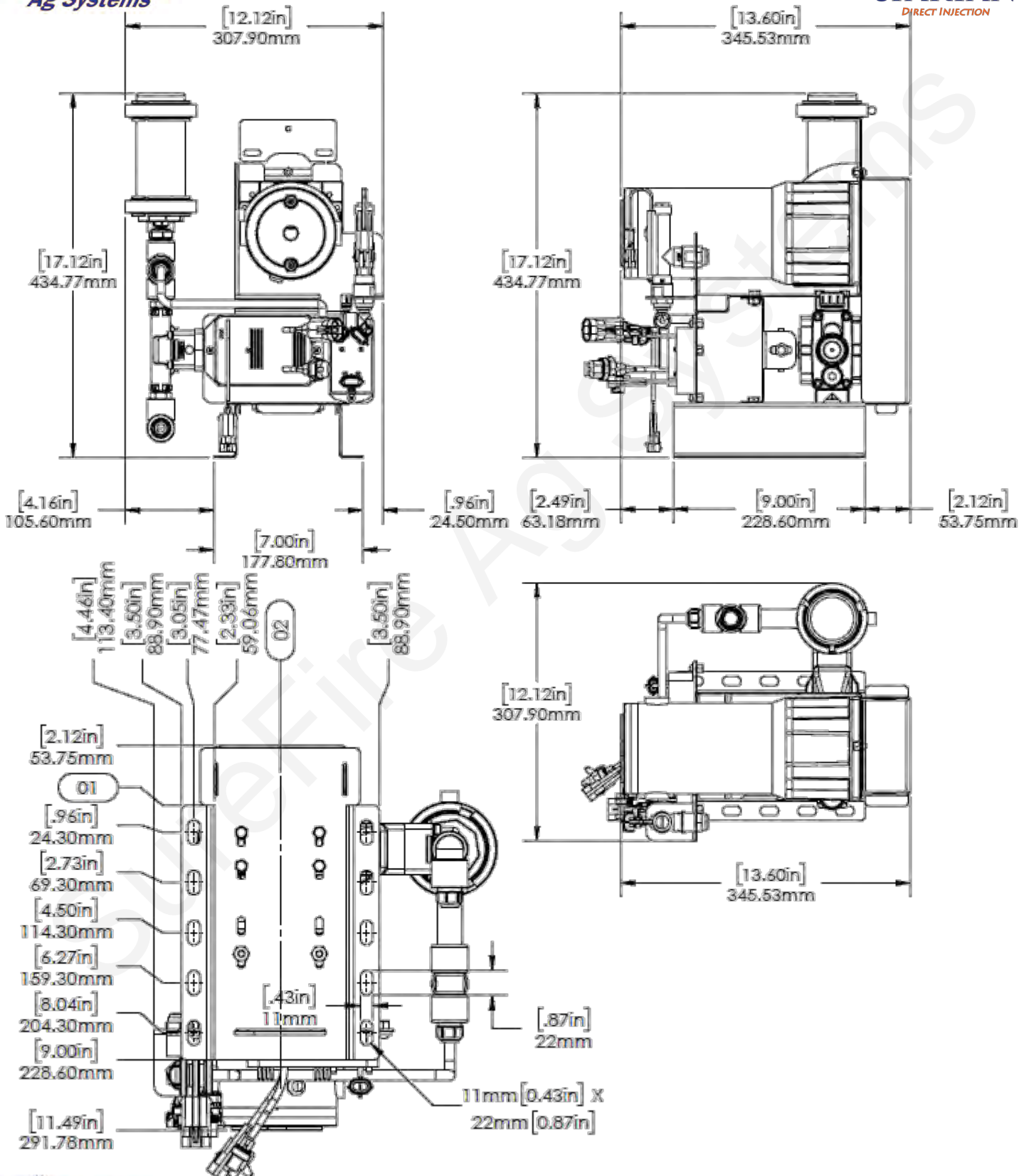


Spartan 115

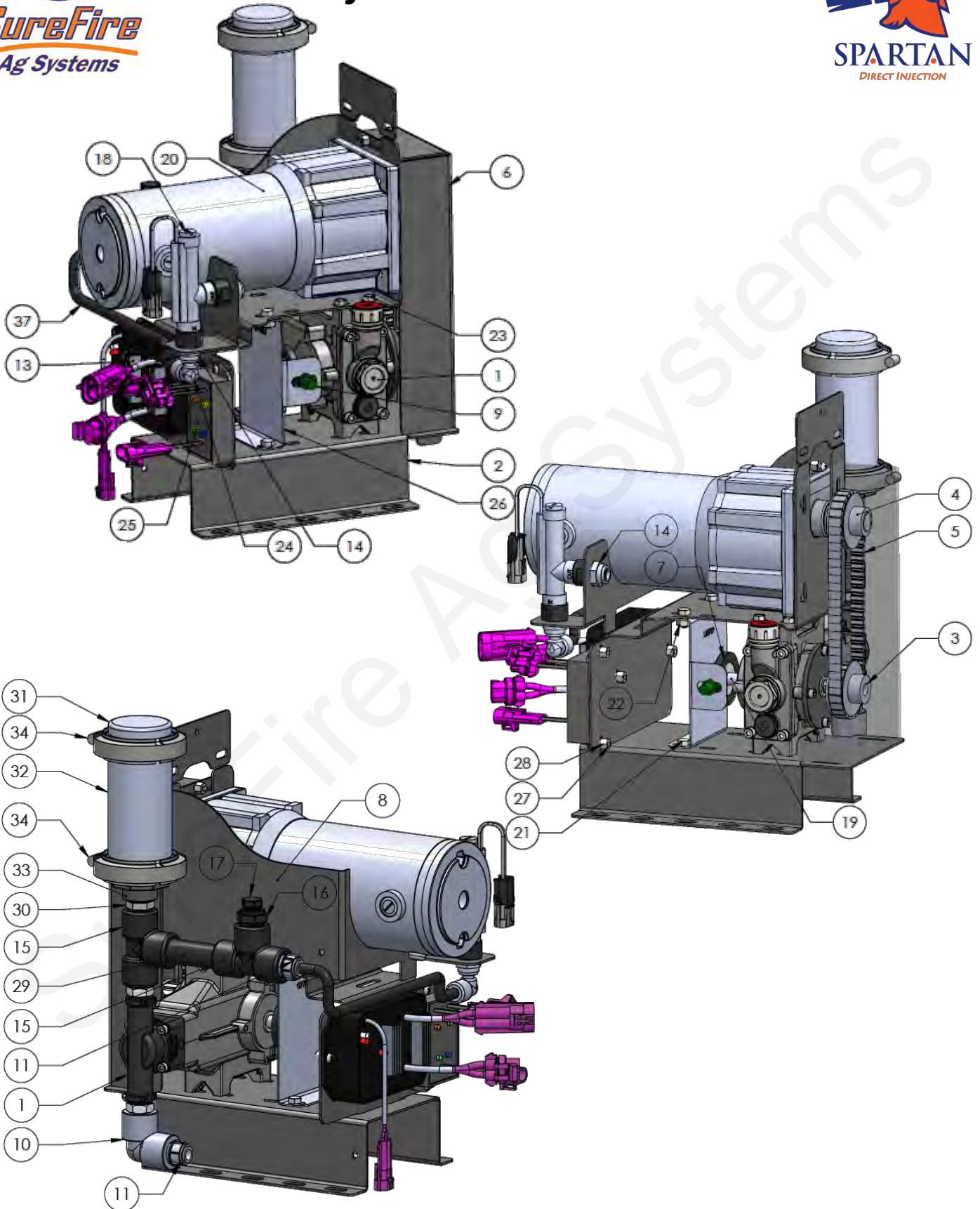
Overall Dimensions



Spartan 125 & 135 Overall Dimensions



Spartan 125 & 135 Assembly and Parts Breakdown





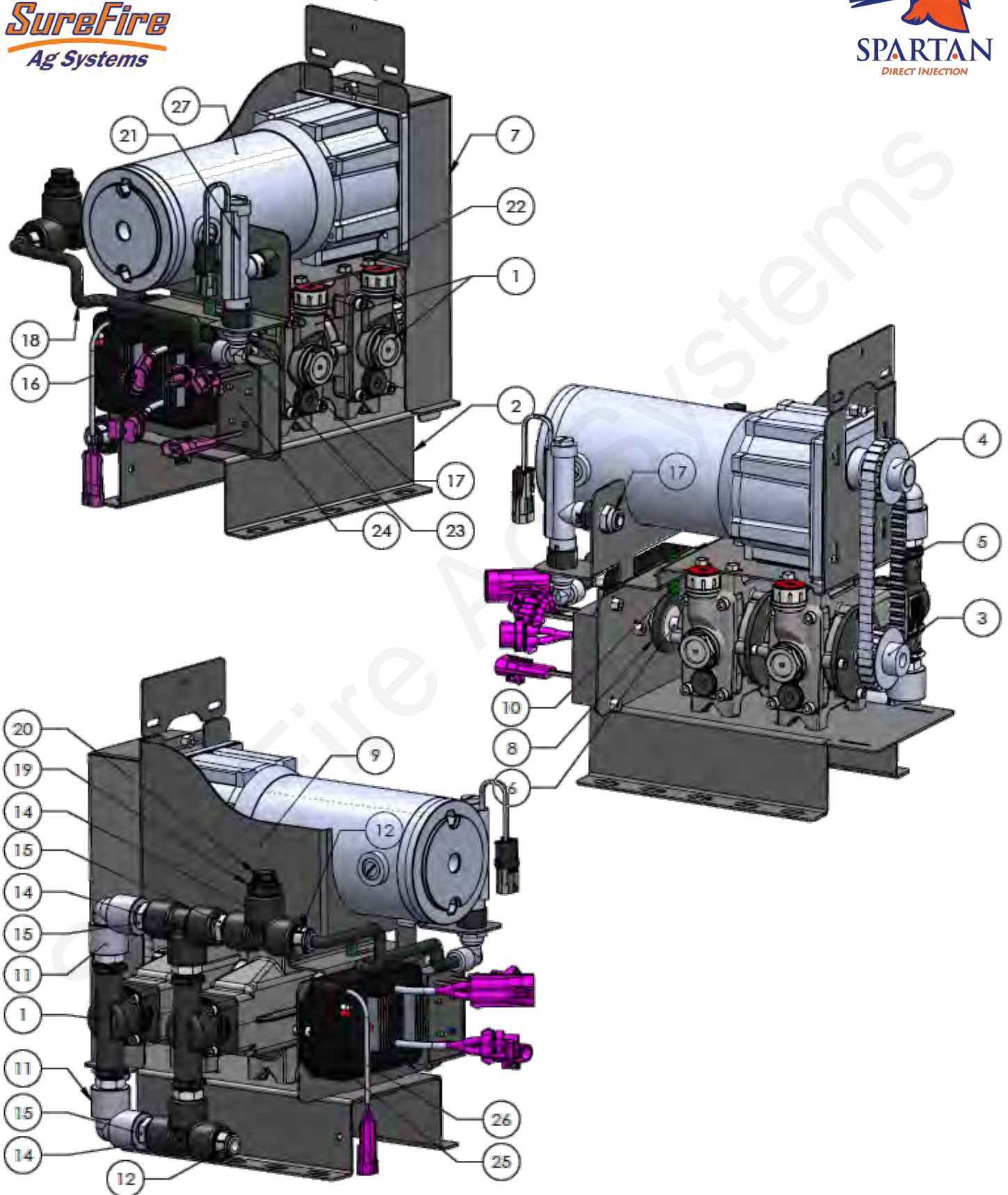
Spartan 125 & 135 Assembly and Parts Breakdown



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	290-10-52.0000.20	Plunger Metering Pump	1
2	470-2065A1	Base Sheet Metal	1
3	367-A 6Z 4M16DF12512	12mm ID Timing Pulley 16 Teeth	1
4	367-A 6Z 4-16DF050020	5/8" ID Timing Pulley 16 Teeth	1
5	367-187L050	187L050 18.5" Timing Belt	1
6	470-2067A1	Belt Sheild Sheet Metal	1
7	204-04-P32B25R32	P32B25R32 Modified with 12mm ID, 32 pulse Target	1
8	470-2066A1	Motor Mount Sheet Metal	1
9	203-01-13096	Hall-effect Flow Sensor Cable 5'	1
10	100-050EL-90	1/2" Pipe Elbow	1
11	113-06-0038050-P	QC to MPT - 3/8" QC x 1/2" MPT	2
12	201-2119Y1	Injection Pump Flow Wiring Harness	1
13	205-18385	PWM EPD with MP480 Connectors	1
14	113-06-038025-P	QC to MPT - 3/8" QC x 1/4" MPT	2
15	100-050TEE	1/2" TEE	2
16	100-050025RB	1/2" MPT x 1/4" FPT Reducer Bushing	1
17	100-025PLUG	1/4" Pipe Plug	1
18	204-06-3381Y1	Spartan Flow Switch (2-80 oz/min)	1
19	383-1439K411-ONE Pump	Keyway Target Shaft - 12mm	1
20	756-7930-7513	Gear Motor 5/8" Shaft - 76.2 in/lb - 12 VDC - 16.24 Amps	1
21	300-040008-5	1/4" x 1/2" Hex Head Bolt-G5	4
22	323-04	1/4" Flange Nut	4
23	300-M610MM-SS	M6 x 10MM Hex Head Bolt - SS	8
24	113-12-038038-P	Stem Elbow - 3/8" Stem x 3/8" QC	1
25	204-01-4208Y1	Assembled Signal Conditioner - 16 pulse avg (2 PIN WP Tower - Compac Flow Switch)	1
26	470-4168Y1	RPM Sensor Bracket	1
27	340-100008-24	Machine Screw - Size 10 x 1/2" - 24 Thread Count	5
28	321-1024	Size 10 Nylock Nut 24 Threads	5
29	100-050NIP-3	1/2"X3" Nipple	1
30	100-050NIP-SH	1/2" Short Nipple	1
31	105-200PLG	2" Manifold Plug	1
32	105-200CPG	2" X 2" STANDARD PORT FLANGE	1
33	105-200PLG050	2" Manifold Plug x 1/2" FPT	1
34	105-FC200	2" Manifold Clamp	2
35	105-150G-V	1 1/2" EPDM Gasket - Viton	2
36	470-2266Y1	Spartan 125 Cam - 4.275mm	1
37	281-038-Spartan125-135	3/8" Tubing x 12" Long	1



Spartan 145 Assembly and Parts Breakdown



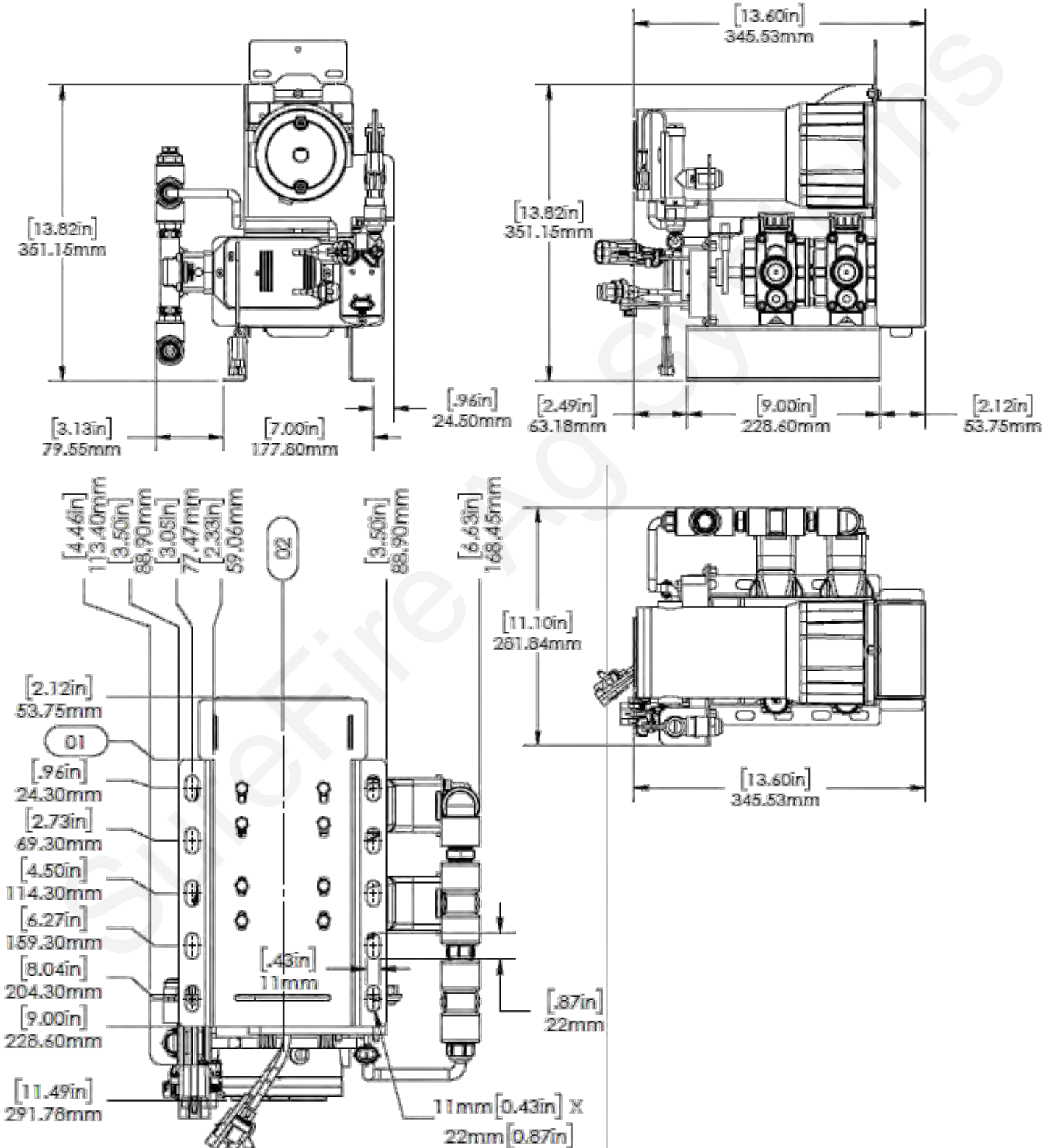


Spartan 145 Assembly and Parts Breakdown



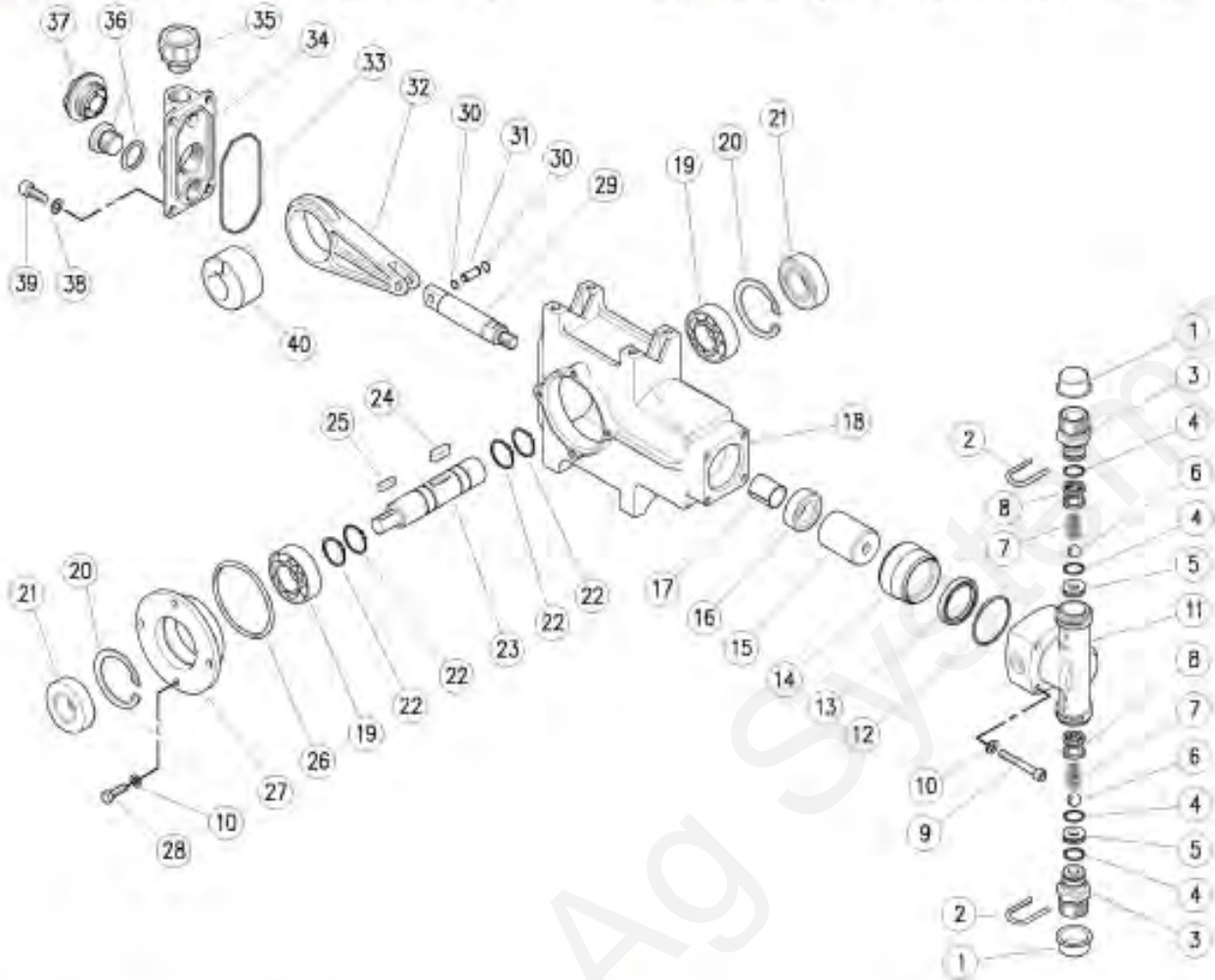
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	290-10-52.0000.20	Plunger Metering Pump	2
2	470-2065A1	Base Sheet Metal	1
3	367-A 6Z 4M16DF12512	12mm ID Timing Pulley 16 Teeth	1
4	367-A 6Z 4-16DF050020	5/8" ID Timing Pulley 16 Teeth	1
5	367-187L050	187L050 18.5" Timing Belt	1
6	383-1439K411	Keyway Target Shaft - 12mm	1
7	470-2067A1	Belt Sheild Sheet Metal	1
8	204-04-P32B25R32	P32B25R32 Modified with 12mm ID, 32 pulse Target	1
9	470-2066A1	Motor Mount Sheet Metal	1
10	203-01-13096	Hall-effect Flow Sensor Cable 5'	1
11	100-050EL-90	1/2" Pipe Elbow	2
12	113-06-0038050-P	QC to MPT - 3/8" QC x 1/2" MPT	2
13	201-2119Y1	Injection Pump Flow Wiring Harness	1
14	100-050TEE	1/2" TEE	3
15	100-050NIP-SH	1/2" Short Nipple	3
16	205-18385	PWM EPD with MP480 Connectors	1
17	113-06-038025-P	QC to MPT - 3/8" QC x 1/4" MPT	2
18	281-038-Spartan	3/8" Tubing x 12" Long	1
19	100-050025RB	1/2" MPT x 1/4" FPT Reducer Bushing	1
20	100-025PLUG	1/4" Pipe Plug	1
21	204-06-3381Y1	Spartan Flow Switch (2-80 oz/min)	1
22	300-M610MM-SS	M6 X 10MM Hex Head Bolt - SS	16
23	113-12-038038-P	Stem Elbow - 3/8" Stem x 3/8" QC	1
24	204-01-4208Y1	Assembled Signal Conditioner - 16 pulse avg (2 PIN WP Tower - Compac Flow Switch)	1
25	321-1024	Size 10 Nylock Nut	5
26	340-100008-24	Machine Screw - Size 10 x 1/2" - 24 Thread Count	5
27	756-7930-7513	Gear Motor 5/8" Shaft - 76.2 in/lb - 12 VDC - 16.24 Amps	1

Spartan 145 Overall Dimensions



52.0000.00 Plunger pump 1,0 l/min -20 bar Phase 1

52.0000.02 Plunger pump 1,0 l/min -20 bar Phase 2



Pos.	PN	Description	Q.ty	K1	K2	K3	K4
1	15.3700.00	Plug, 20,5 mm pvc	2				10
2	29.0087.51	U-bolt, Sst.	2				10
3	52.0016.51	Valve coupl., 1/2M Bsp Sst.	2				1
4	10.3060.18	O-ring, 1,78x12,42 mm EPDM	4	*			5
5	52.0012.51	Seat, 7x15,9x4,5 mm Sst.	2	*			1
6	14.7443.25	Ball, 11/32" Sst. Aisi 316	2	*			5
7	52.0010.51	Spring, 0,3x7,1x7,5 mm Sst.	2	*			1
8	25.1337.84	Ball cage	2	*			1
9	16.1869.35	Screw, DIN912 M5x35 mm z.pl.	4				5
10	14.3560.61	Washer, 5,3x10x1 mm	8				10
11	52.0015.84	Pump head, PA black	1				1
12	10.3079.10	O-ring, 1,78x34,65 mm EPDM	1	*			10
13	10.2028.00	Stem seal, 26x34,2x4,2 mm	1	*			4
14	52.0011.81	Bushing, 26mm POM	1				1
15	52.0008.51	Plunger, 26 mm	1				1
16	10.2016.30	Seal ring, 16x30x7 mm	1	*			3
17	10.4216.18	Bushing, DU 16x16x20 mm	1				5
18	52.0014.44	Pump housing, alum.	1				1
19	11.4320.42	Ball-bearing, 20x42x12 mm	2				2
20	10.1042.00	Snap ring, I 42	2				5
21	10.2020.42	Seal ring, 20x42x7 mm	2	*			3

Pos.	PN	Description	Q.ty	K1	K2	K3	K4
22	10.1020.00	Snap ring, E 20	4				5
23	52.0006.61	Pump shaft	1				1
24	12.3006.18	Feather, 6x6 mm	1				5
25	12.3004.16	Feather, 4x4 mm	1				5
26	10.3080.00	O-ring, 1,78x56,87 mm	1	*			5
27	52.0002.41	Case flange, alum.	1				1
28	16.1871.14	Screw, DIN933 M5x14 mm z.pl.	4				10
29	52.0007.61	Plunger shaft	1				1
30	10.0956.00	Snap ring, E 6	2				5
31	52.0006.61	Plug, 6x20mm	1				1
32	52.0003.34	Pump connecting rod, alum.	1				1
33	10.3081.63	O-ring, 1,78x63,22 mm	1	*			10
34	52.0001.44	Coperchio alum. per carter	1				1
35	15.3726.00	Oil plug 3/8" Bsp-seal	1				5
36	15.3738.10	Oil plug 3/8" Bsp-seal	1				5
37	15.3734.00	See-through oil plug 3/4" Bsp-seal	1				5
38	14.3568.00	Washer, 6,4x11x1 mm	4				10
39	16.1888.00	Screw, DIN912 M5x16 mm z.pl.	4				10
40	52.0004.61	Cam ring	1				1
40	52.0004.61	Cam ring (1)	1				1

Kit	PN	Description	Q.ty
K1	52.0018.24	Pump Seals-Kit, 28mm 7x1pcs.	1
K2	52.0021.24	Spares-kit, suct.+deliv. valves,4x1pcs.	1

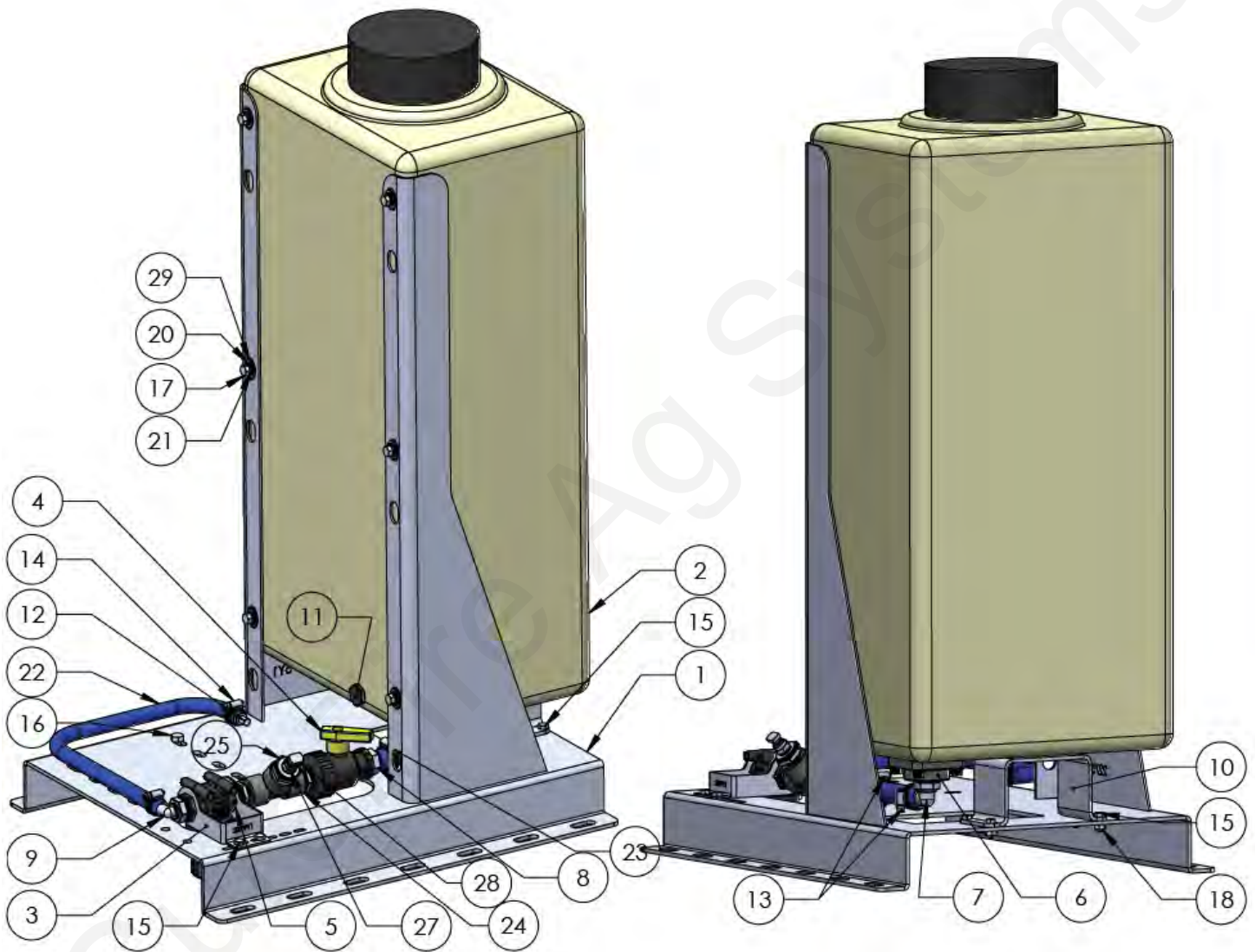
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Spartan Tank Kits

508-02-100100

20 Gallon Tank Kit





Spartan Tank Kits

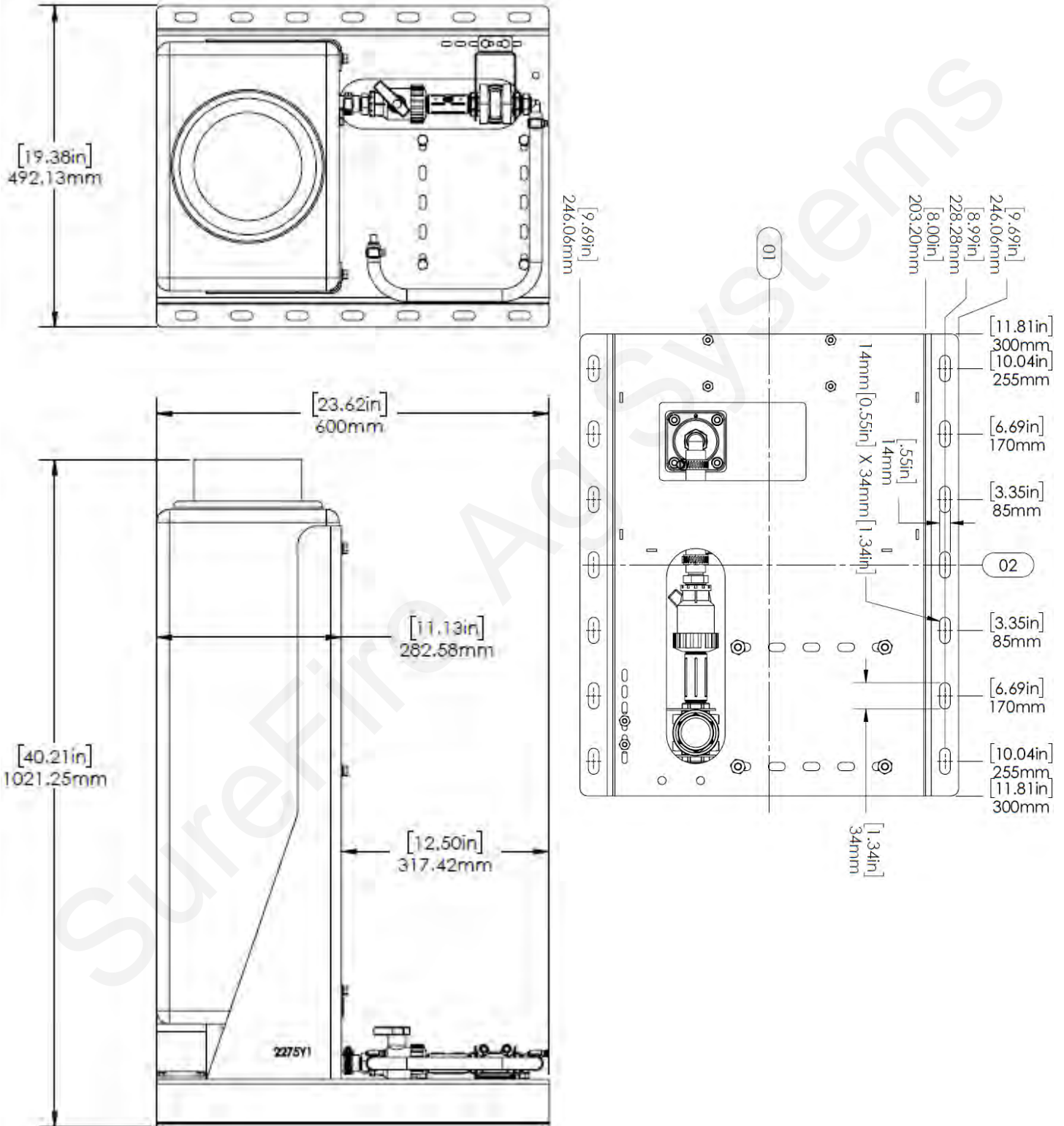
20 Gallon Tank Kit

508-02-100100

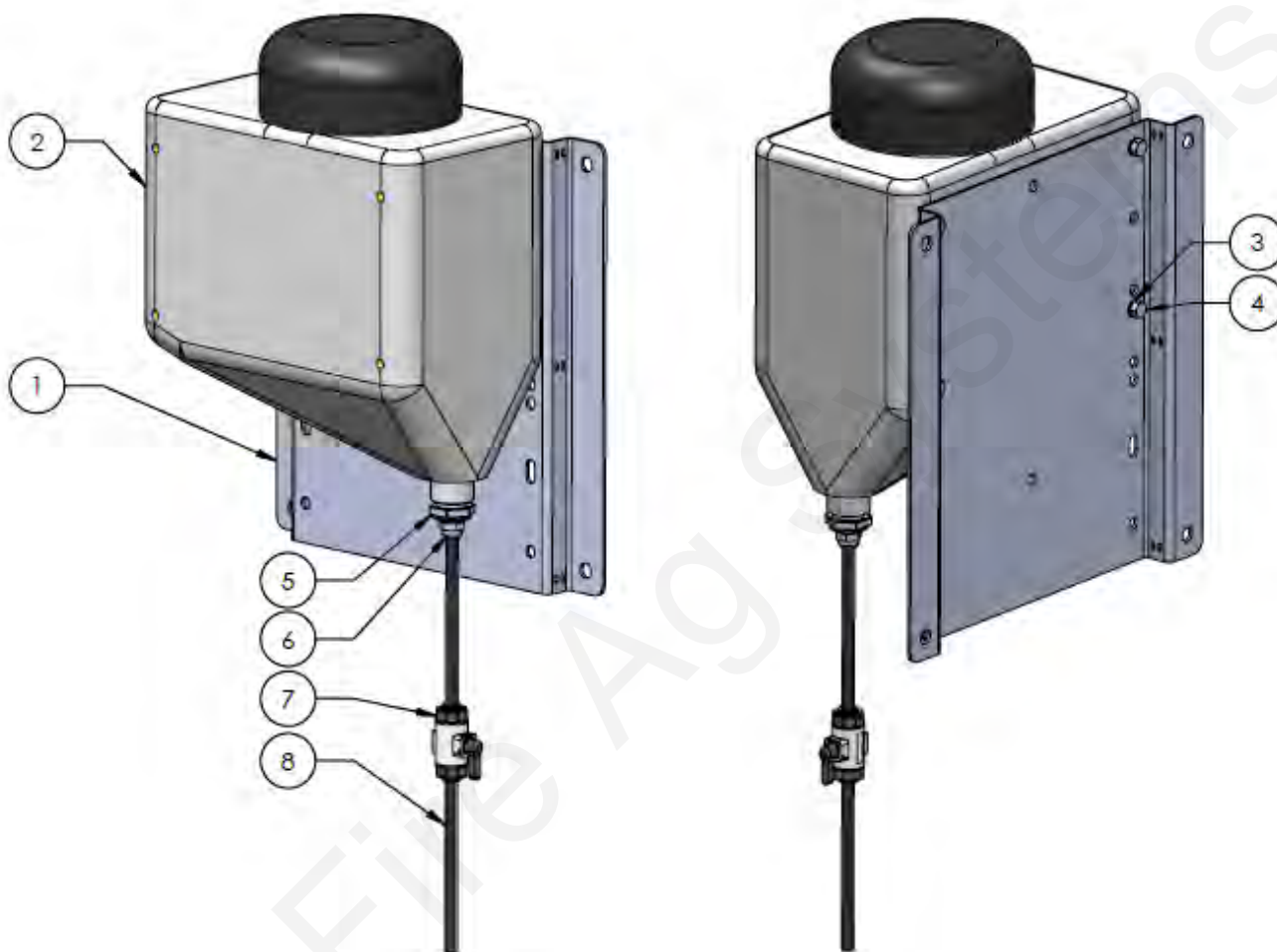


ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	470-2275Y1	20 Gallon Tank-Injection Pump Frame	1
2	727-05-SP0020-0M	20 Gallon White Specialty Rectangular Tank (1/2" fitting)	1
3	470-2279Y1	Strainer Support	1
4	102-075SUBV	3/4" Union Valve 2 Way	1
5	109-075LSTM-50	3/4" Mini Tee Strainer - 50 Mesh	1
6	108-BF075BDV	3/4" X 1" Threaded Bolted Poly Flange With Viton Gasket	1
7	101-075075-90	3/4" MPT x 3/4" HB - 90 degree	1
8	101-075075	3/4" MPT x 3/4" HB	1
9	101-075050-90	3/4" MPT x 1/2" HB - 90 Degree	1
10	470-4170Y1	Bottom Tank Support - 20 Gal Spartan Tank Kit	1
11	100-050PLUG	1/2" Pipe Plug	1
12	113-01-038050	3/8" Stem x 1/2" Hose Barb	1
13	350-1208	SS Hose Clamp - Size 12 - 1-1/4" Diameter	2
14	350-0605	SS Hose Clamp - Size 6 - 7/8" Diameter	2
15	300-040012-5	1/4" x 3/4" Hex Head Bolt-G5	6
16	300-060012-5	3/8" x 3/4" Hex Head Bolt-G5	4
17	300-050012-5	5/16" x 3/4" Hex Head Bolt-G5	6
18	323-04	1/4" Flange Nut	6
19	323-06	3/8" Flange Nut	4
20	330-05	5/16" Flat Washer	6
21	331-05	5/16" Lock Washer	6
22	284-050-A4086	1/2" Chem Hose - 300 PSI	1
23	284-075-A4086	3/4" Chem Hose - 300 PSI	1
24	100-075TEE	3/4" Poly Tee	1
25	100-075038RB	3/4" MPT x 3/8" FPT Reducer Bushing	1
26	100-075NIP-SH	3/4" Short Poly Nipple	2
27	113-06-038038-P	QC to MPT - 3/8" QC x 3/8" MPT	1
28	113-05-038	3/8" QC Plug	1
29	330-07	7/16" Flat Washer	6

20 Gallon Tank Kit 508-02-100100 Overall Dimensions



508-03-100150 3 Gal Rinse Tank Kit for 20 Gallon Tank Kit (508-02-100100)

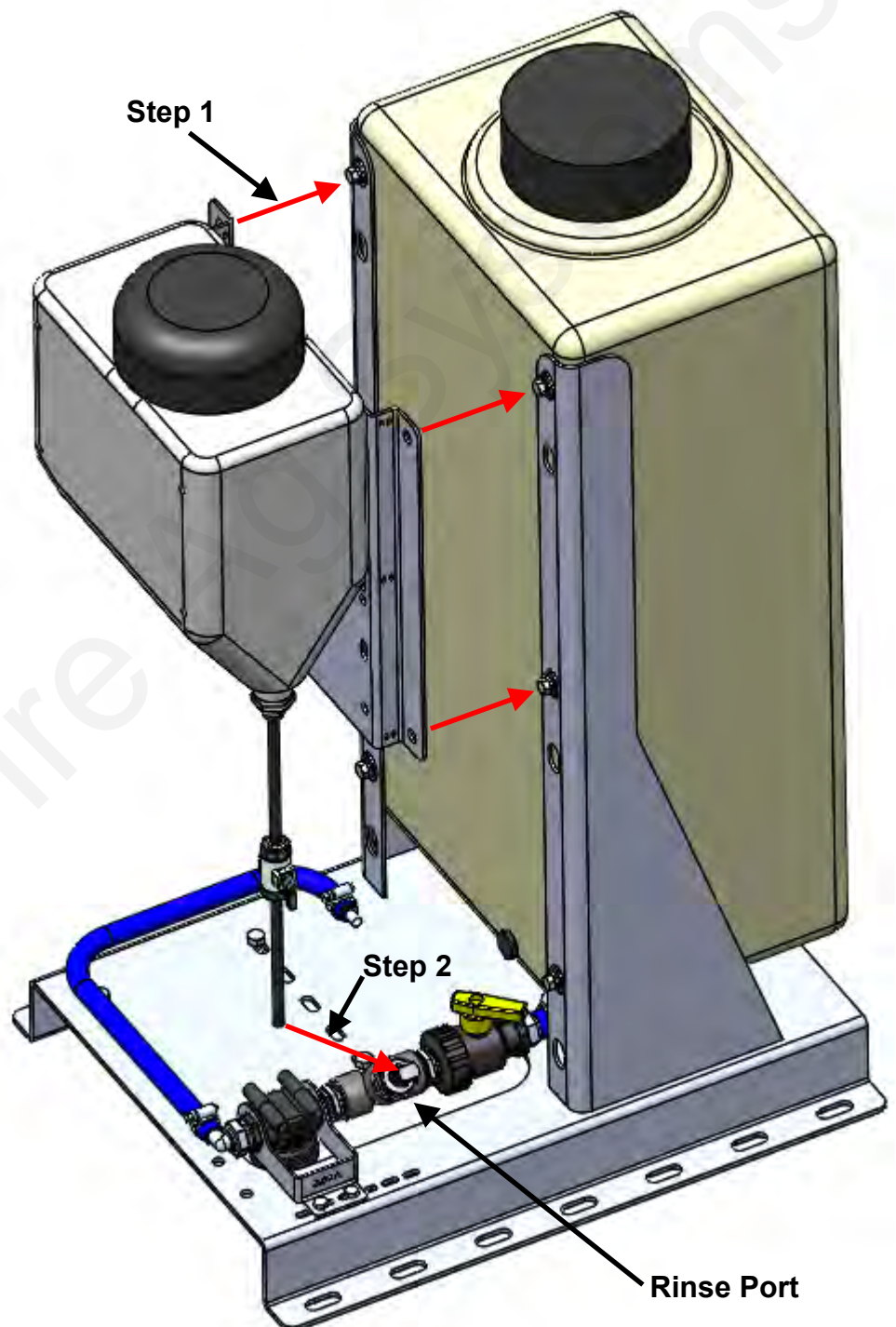


ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	470-3211Y1	Mount Bracket for 3 Gal Rinse Tank and Ace Roto 10 Gal	1
2	727-05-SP0003-RT-BLACK	3 Gallon Square Tank, Black	1
3	331-05	5/16" Lock Washer	4
4	300-050008-5	5/16" x 1/2" Hex Head Bolt-G5	4
5	100-075038RB	3/4" MPT x 3/8" FPT Reducer Bushing	1
6	113-06-038038	QC to MPT - 3/8" QC x 3/8" MPT	1
7	113-50-038038-V	Viton - Valve - 3/8" QC x 3/8" QC	1
8	281-038	3/8" Poly Tube	2'

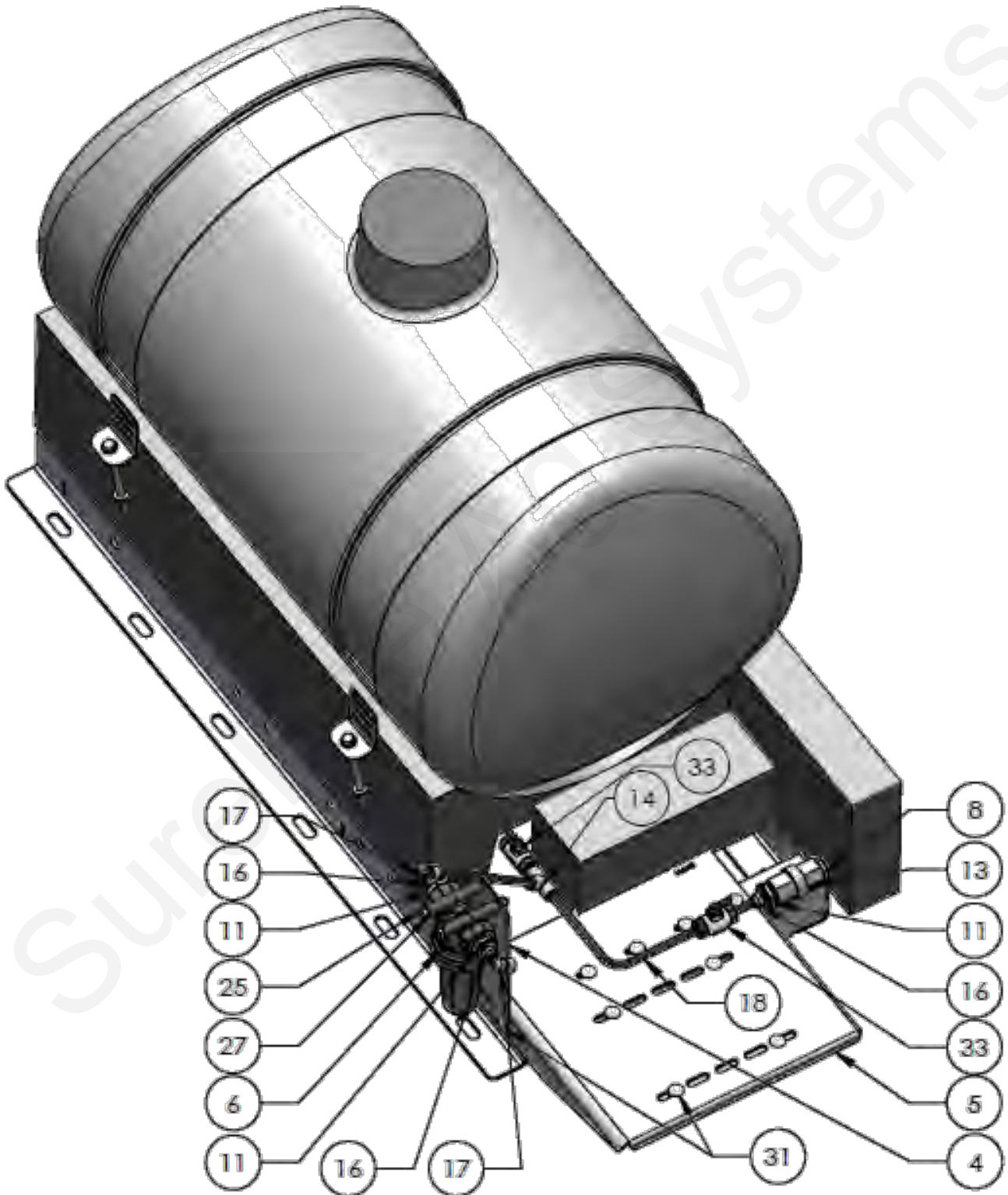
508-03-100150 3 Gal Rinse Tank Kit Mounting Instructions

Step 1: Remove QTY 4, 5/16"x3/4" Bolts and all washers that fasten the 20 gallon tank to the tank frame. Install Rinse Tank Assembly to 20 gallon tank frame as shown with the 5/16"x3/4" bolts. DO NOT reinstall the 7/16" flat washers.

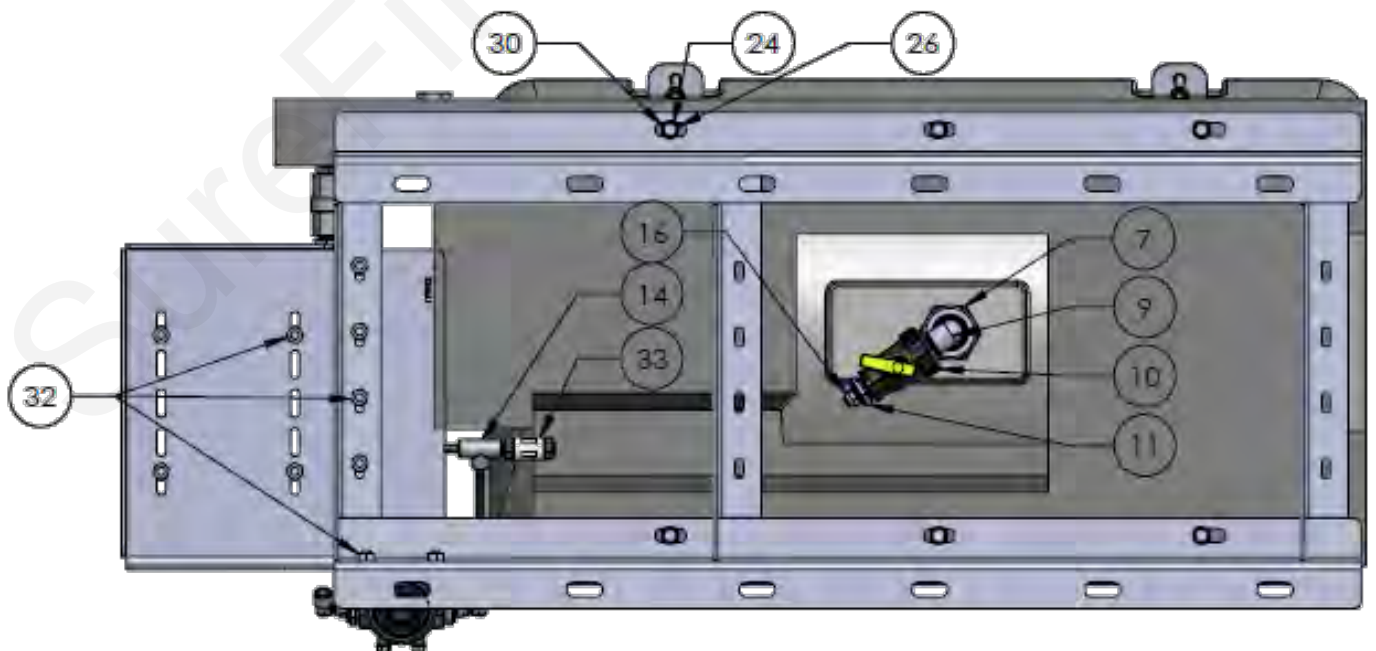
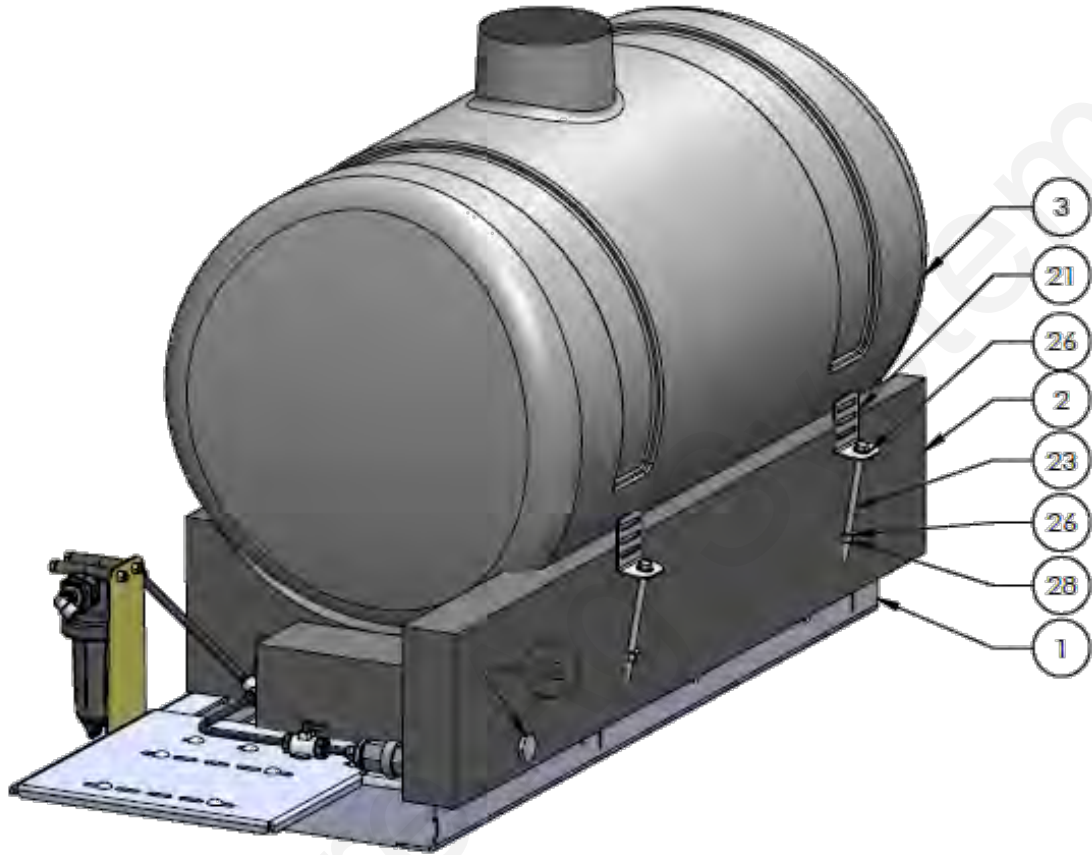
Step 2: Remove 3/8" Quick Connect Plug (113-05-038) and insert the 3/8" poly tube into Quick Connect Fitting Rinse Port.



Spartan Tank Kits 508-02-100200 55 Gallon Tank Kit w/ Rinse Tank Base



Spartan Tank Kits 508-02-100200 55 Gallon Tank Kit w/ Rinse Tank Base





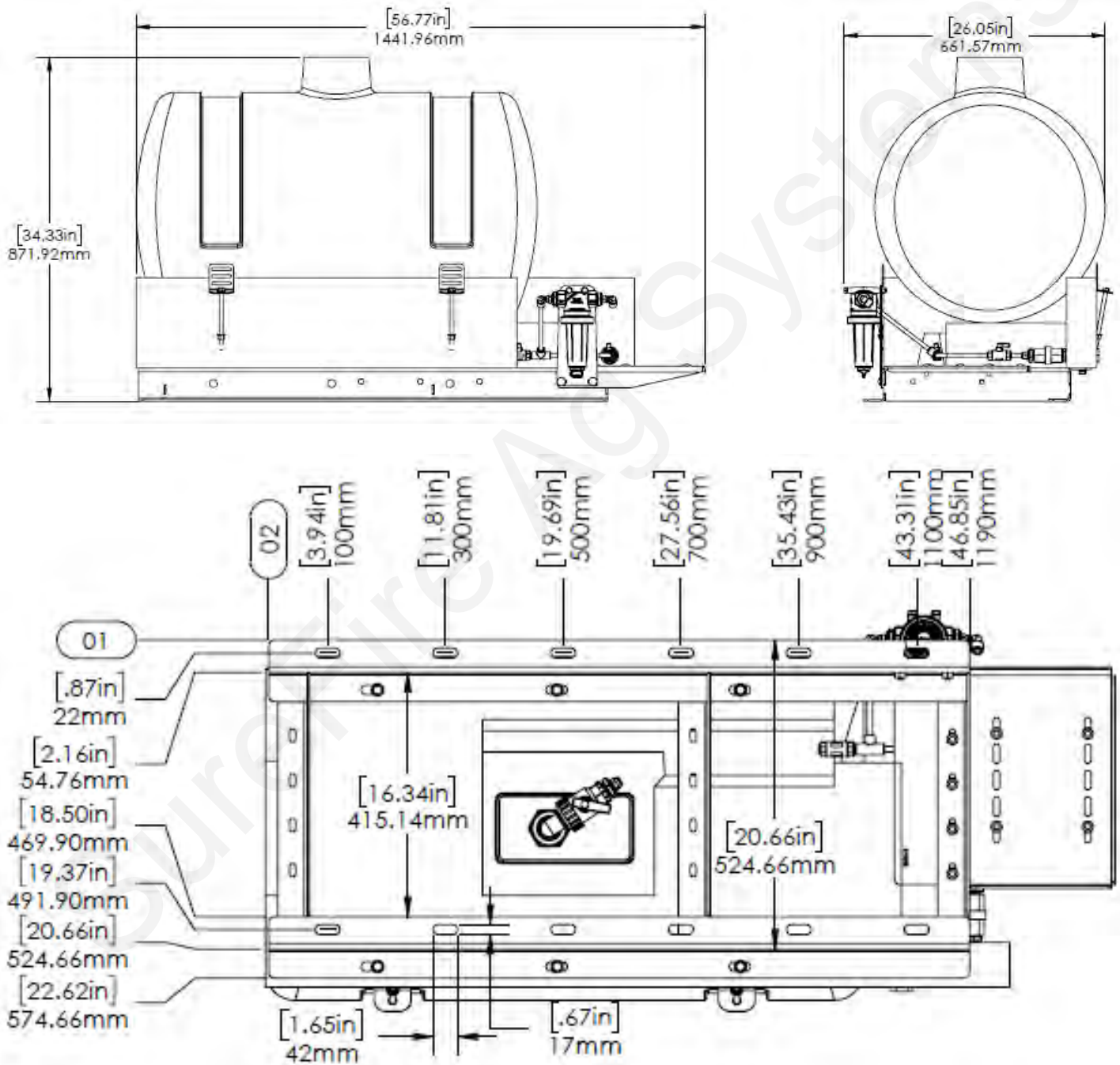
Spartan Tank Kits 508-02-100200 55 Gallon Tank Kit w/ Rinse Tank Base



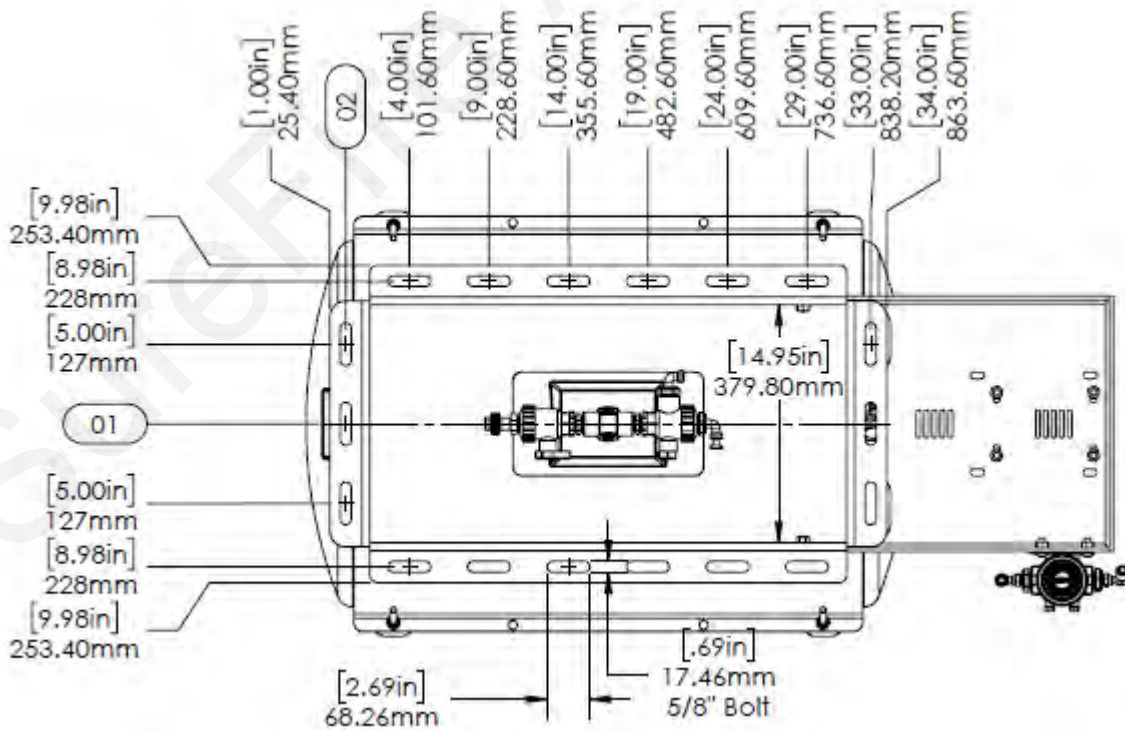
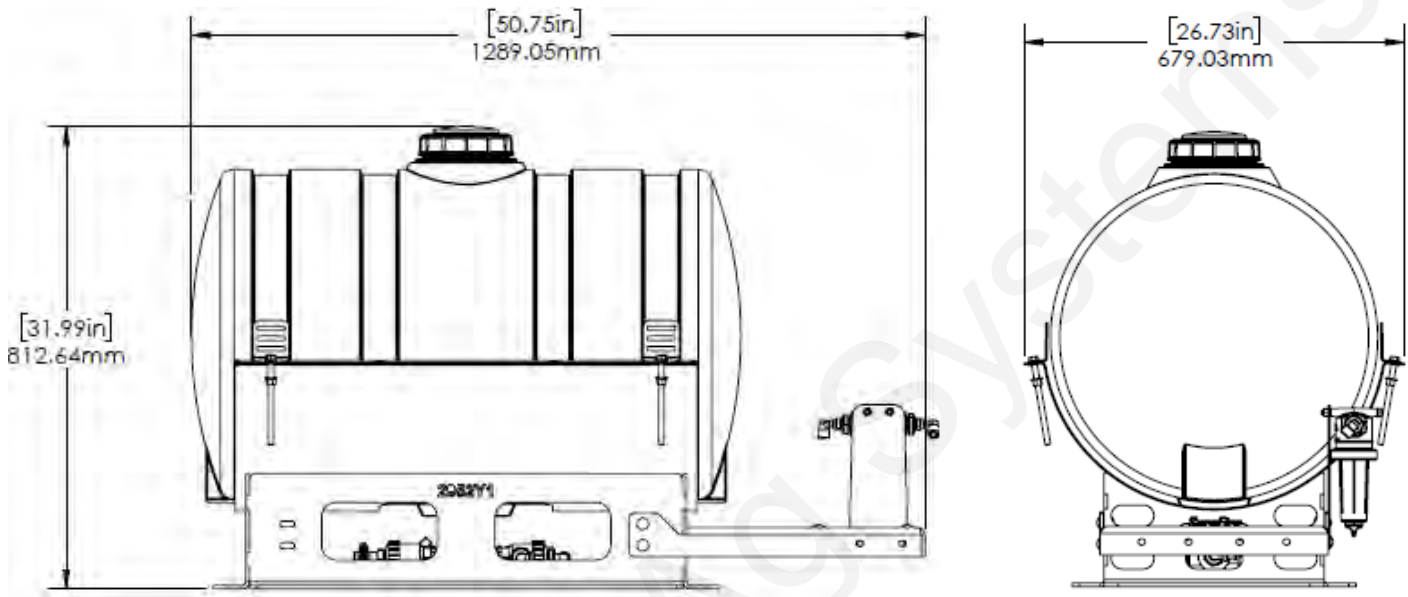
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	420-1327A1	55 Gallon Tank Base Frame WA	1
2	727-28-001998	Tank Base for 55 Gallon Tank	1
3	727-02-0055-U	Horizontal Tank - 55 Gallon - White (fits rinse tank base)	1
4	400-2597Y1	Injection Pump Filter/Strainer Bracket	1
5	470-2197Y1	Injection Pump Mount Plate for Accelerator Tank	1
6	109-075LST-80V	3/4" Tee Strainer -Viton - 80 Mesh	1
7	108-TF075	3/4" Tank Bung	1
8	100-075NIP-SH	3/4" Short Poly Nipple	2
9	100-075075SL-90	3/4" Street Elbow - 90 Degree	1
10	102-075SUBV-H	3/4" Union Valve 2 Way	1
11	100-075038RB	3/4" MPT x 3/8" FPT Reducer Bushing	4
12	100-075PLUG	3/4" Pipe Plug	1
13	136-VIT-075	Poly 1/3 PSI Spring Check Valve with Viton Seals 125 PSI Max Pressure	1
14	113-08-038038038	Equal Tee - 3/8" QC	1
15	105-150G-V	1 1/2" EPDM Gasket - Viton	1
16	113-06-038038	QC to MPT - 3/8" QC x 3/8" MPT	4
17	113-12-038038-P	Stem Elbow - 3/8" Stem x 3/8" QC	2
18	281-038-Spartan 55	3/8" Tube	1
19	281-038-Spartan 55 1	3/8" Tube	1
20	281-038-Spartan 55 6	3/8" Tube	1
21	708-5108112	2" Tank Strap Buckle	4
22	708-5133207	2" Tank Strap	1
23	306-060600-5	3/8" x 6" Tap Bolt-G5	4
24	300-060100-5	3/8" x 1" Hex Head Bolt-G5	6
25	300-050400-5	5/16" x 4" Hex Head Bolt-G5	2
26	330-06	3/8" Flat Washer	14
27	330-04	1/4" Flat Washer	2
28	321-06	3/8" Nylock Nut	4
29	321-05	5/16" Nylock Nut	2
30	331-06	3/8" Lock Washer	6
31	304-060100	Carriage Bolt - 3/8" x 1"	10
32	323-06	3/8" Flange Nut	10
33	113-50-038038-V	Viton - Valve - 3/8" QC x 3/8" QC	2



55 Gallon Tank Kit w/ Rinse Tank Base 508-02-100200 Overall Dimensions



55 Gallon Tank Kit w/ No Rinse Tank 508-02-100250 Overall Dimensions

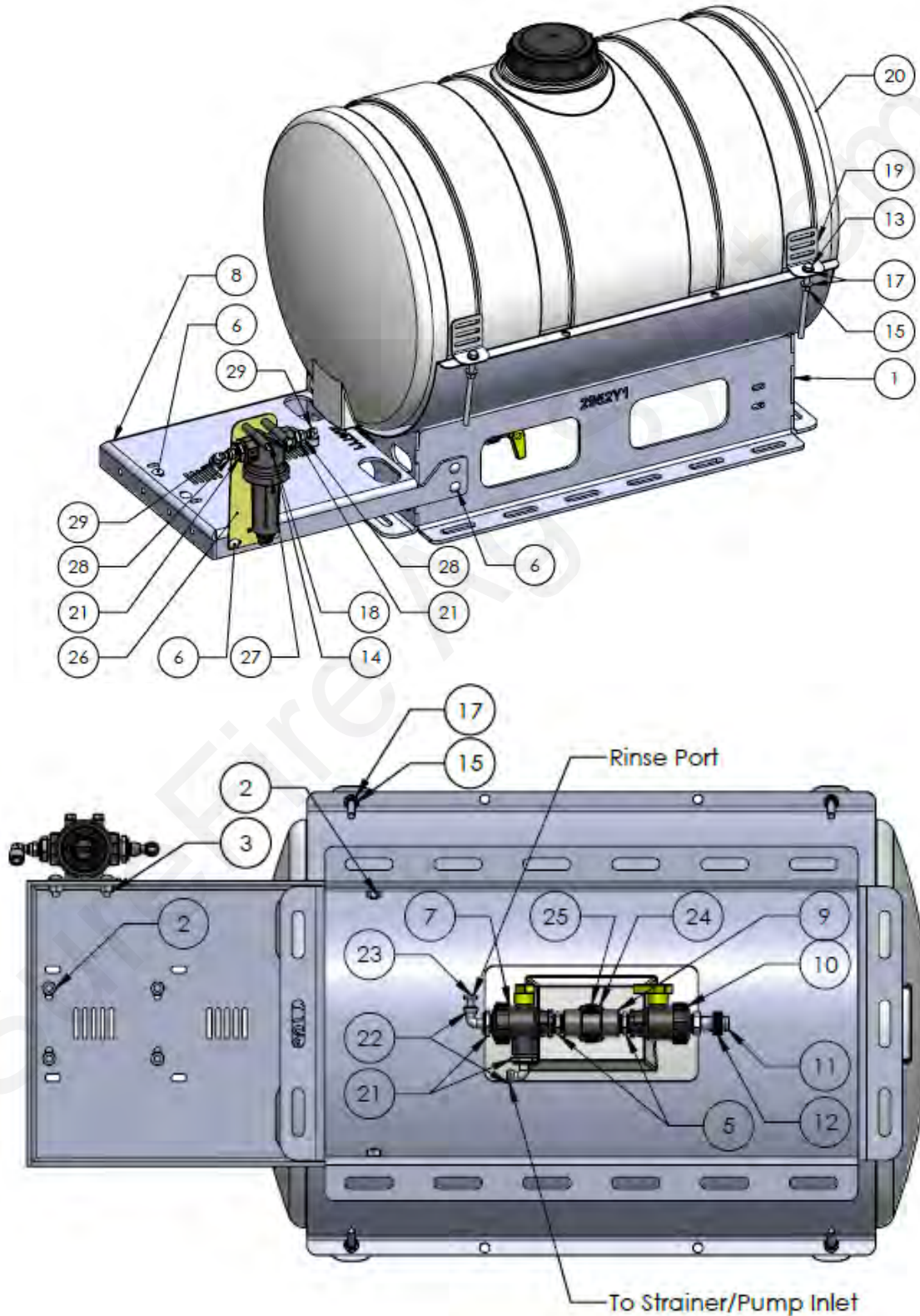


Spartan Tank Kits

508-02-100250

55 Gallon Tank Kit

No Rinse Tank





Spartan Tank Kits

508-02-100250

55 Gallon Tank Kit

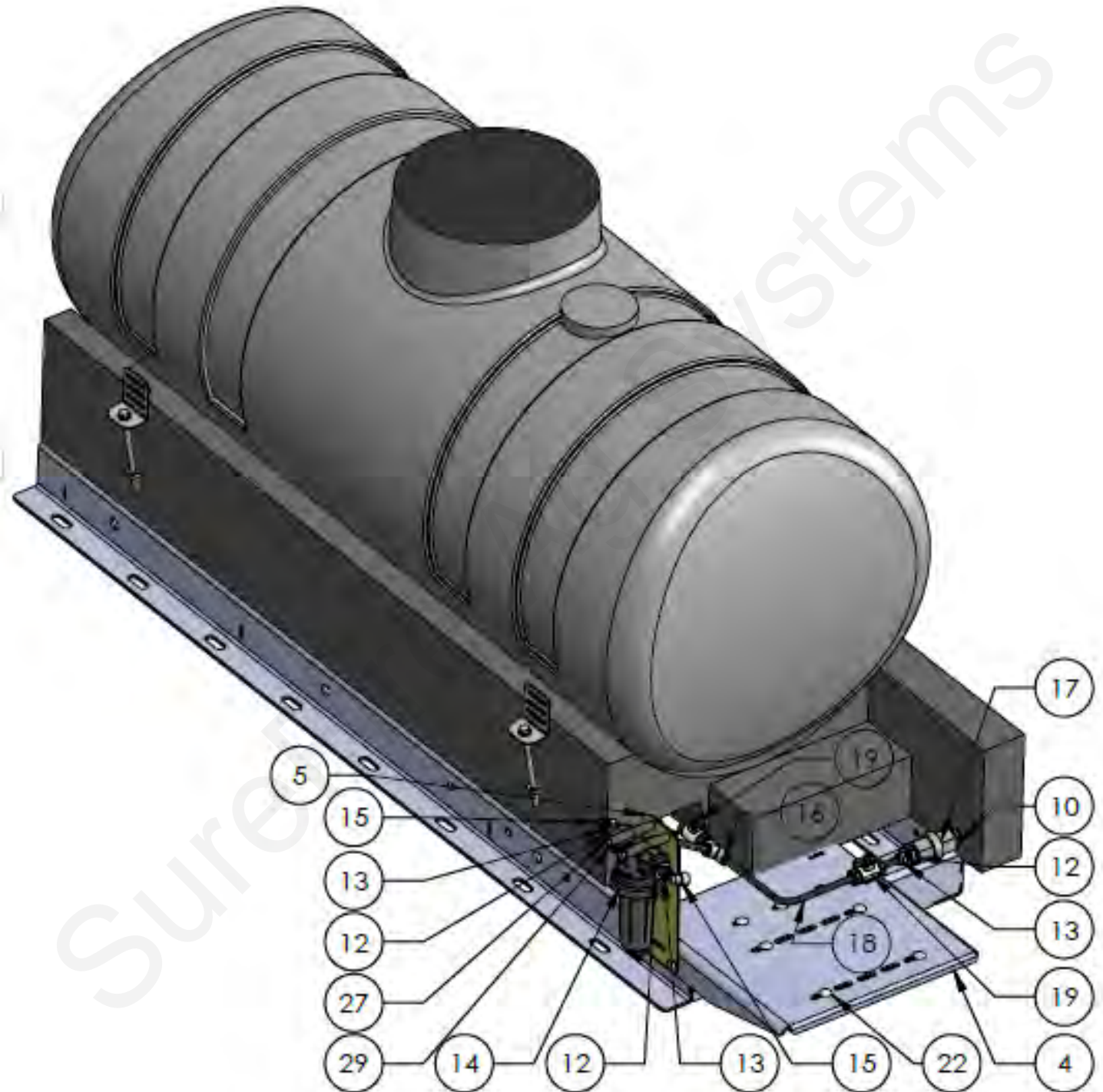
No Rinse Tank



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	421-2952Y1	55 Gallon/24" DIA Tank Cradle	1
2	323-06	3/8" Flange Nut	8
3	323-06	3/8" Flange Nut	2
4	708-5133207	2" Tank Strap	2
5	100-075NIP-SH	3/4" Short Poly Nipple	3
6	304-060100-SS	Carriage Bolt - 3/8" x 1" SS	10
7	102-075SUBV-3BL-H	3/4" Union Valve 3 Way	1
8	420-2957Y1	Tower 100 Mount Bracket	1
9	100-075TEE	3/4" Poly Tee	1
10	102-075SUBV-H	3/4" Union Valve 2 Way	1
11	101-075075	3/4" MPT x 3/4" HB	1
12	350-1208	SS Hose Clamp - Size 12 - 1-1/4" Diameter	1
13	300-060600-5	3/8" x 6" Hex Head Bolt-G5	4
14	300-050400-5	5/16" x 4" Hex Head Bolt-G5	2
15	321-06	3/8" Nylock Nut	4
16	321-05	5/16" Nylock Nut	2
17	330-06	3/8" Flat Washer	8
18	330-04	1/4" Flat Washer	2
19	708-5108112	2" Tank Strap Buckle	4
20	727-02-HZ0055-23-	Horizontal Tank - 55 Gal - White - 23 x 38	1
21	100-075038RB	3/4" MPT x 3/8" FPT Reducer Bushing	4
22	113-13-038038	QC to MPT Elbow - 3/8" QC x 3/8" MPT EL	2
23	113-05-038	Plug - 3/8" QC	1
24	100-125075RB	1-1/4" MPT x 3/4" FPT Reducer Bushing	1
25	105-200G-V	(FOR FC220s) 2" EPDM Manifold Gasket for 220 Series Manifold Fittings	1
26	400-2597Y1	Injection Pump Filter/Strainer Bracket	1
27	109-075LST-80V	3/4" Tee Strainer -Viton - 80 Mesh	1
28	113-06-038038	QC to MPT - 3/8" QC x 3/8" MPT	2
29	113-12-038038-P	Stem Elbow - 3/8" Stem x 3/8" QC	2

Spartan Tank Kits

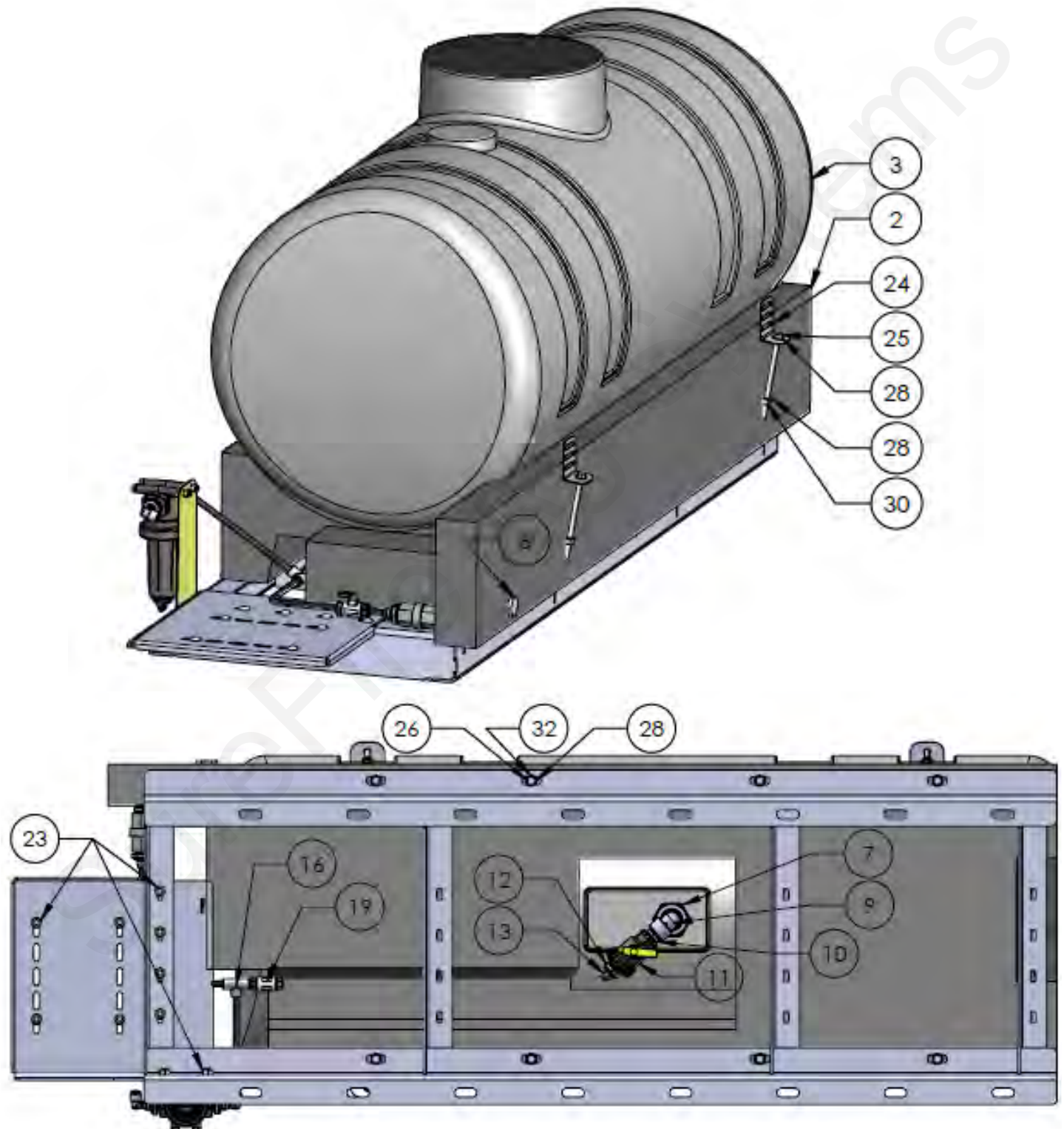
508-02-100300
110 Gallon Tank Kit
w/ Rinse Tank Base



Spartan Tank Kits

508-02-100300

110 Gallon Tank Kit w/ Rinse Tank Base





Spartan Tank Kits

508-02-100300

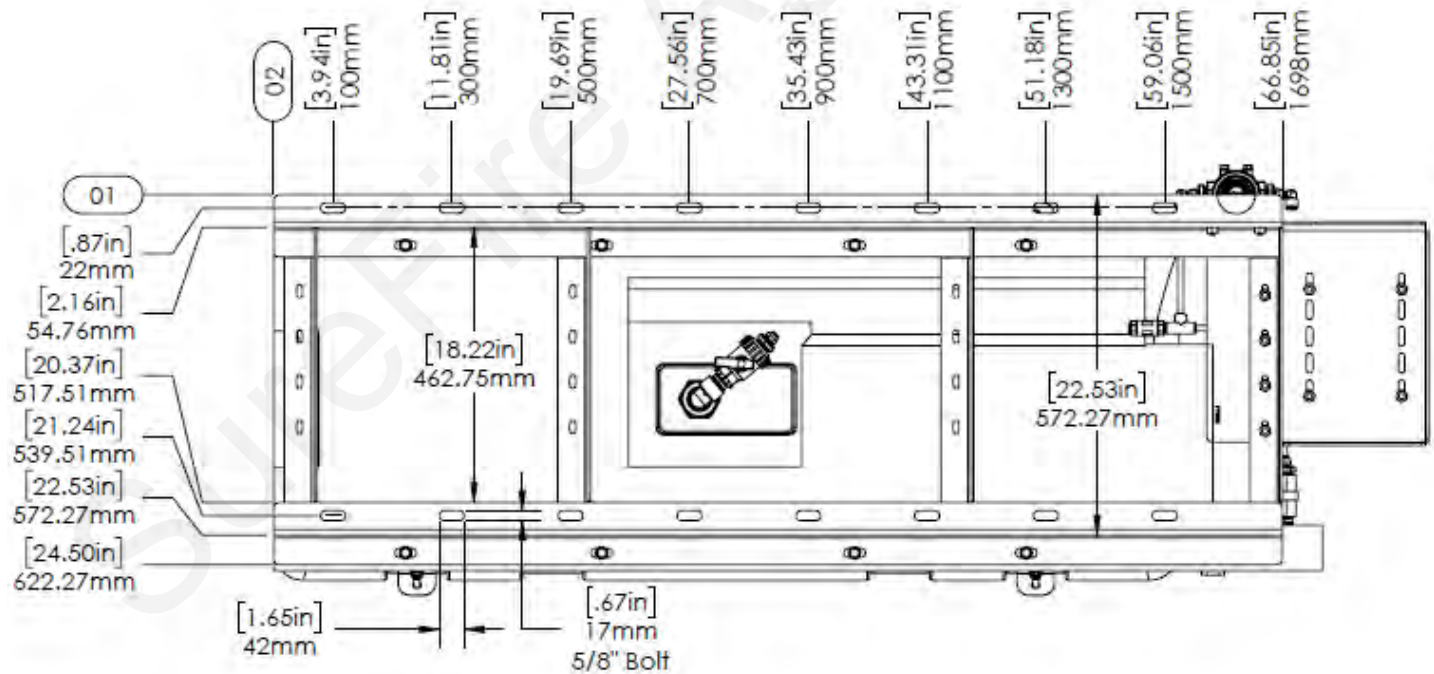
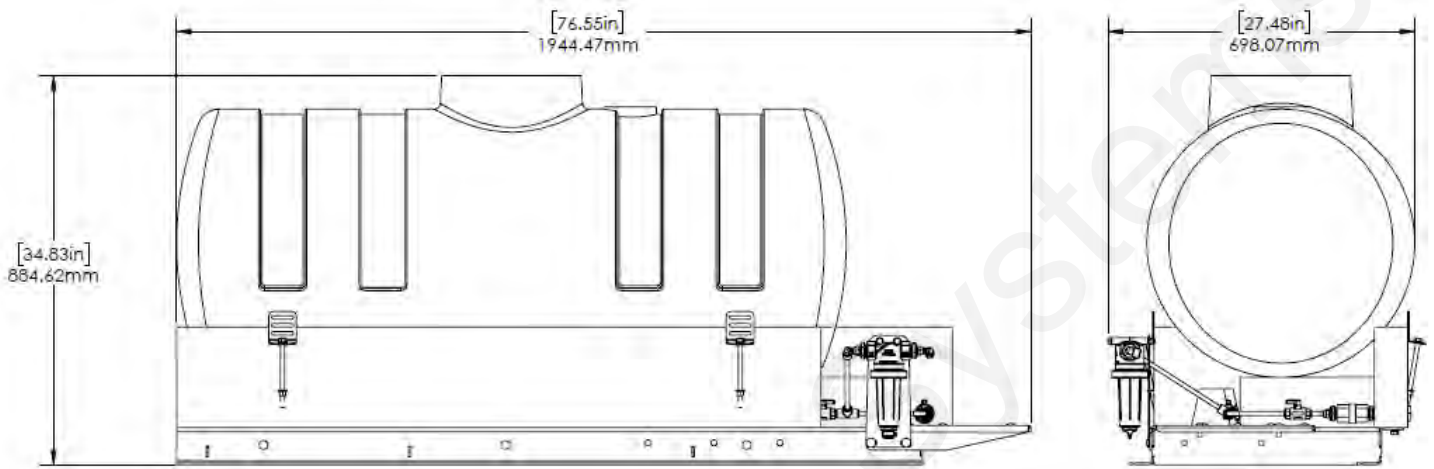
110 Gallon Tank Kit w/ Rinse Tank Base



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	420-1285A1	110 or 155 Gallon Tank Base Frame	1
2	727-28-002004	Tank Rinse Base for 110/155 gallon tank (24" Tank)	1
3	727-02-0110-U	Accelerator Horizontal Tank - 110 Gallon - White - 24"	1
4	470-2197Y1	Injection Pump Mount Plate for Accelerator Tank	1
5	400-2597Y1	Injection Pump Filter/Strainer Bracket	1
6	100-075PLUG	3/4" Pipe Plug	1
7	108-TF075	3/4" Tank Bung	1
8	105-150G-V	1 1/2" EPDM Gasket - Viton	1
9	100-075075SL-90	3/4" Street Elbow - 90 Degree	1
10	100-075NIP-SH	3/4" Short Poly Nipple	2
11	102-075SUBV	3/4" Union Valve 2 Way	1
12	100-075038RB	3/4" MPT x 3/8" FPT Reducer Bushing	4
13	113-06-038038	QC to MPT - 3/8" QC x 3/8" MPT	4
14	109-075LST-80V	3/4" Tee Strainer -Viton - 80 Mesh	1
15	113-12-038038-P	Stem Elbow - 3/8" Stem x 3/8" QC	2
16	113-08-038038038	Equal Tee - 3/8" QC	1
17	136-VIT-075	Poly 1/3 PSI Spring Check Valve with Viton Seals 125 PSI Max Pressure	1
18	281-038-Spartan 55	3/8" Tube	1
19	113-50-038038-V	Viton - Valve - 3/8" QC x 3/8" QC	2
20	281-038-Spartan 55 1	3/8" Tube	1
21	281-038-Spartan 55 9	3/8" Tube	1
22	304-060100-5	Carriage Bolt - 3/8" x 1" - G5	10
23	323-06	3/8" Flange Nut	10
24	708-5108112	2" Tank Strap Buckle	4
25	306-060600-5	3/8" x 6" Hex Head Tap Bolt-G5	4
26	300-060100-5	3/8" x 1" Hex Head Bolt-G5	8
27	300-050400-5	5/16" x 4" Hex Head Bolt-G5	2
28	330-06	3/8" Flat Washer	16
29	330-04	1/4" Flat Washer	2
30	321-06	3/8" Nylock Nut	4
31	321-05	5/16" Nylock Nut	2
32	331-06	3/8" Lock Washer	8
33	708-5133207	2" Tank Strap	1



Spartan Tank Kits 508-02-100300 110 Gallon Tank Kit w/ Rinse Tank Base Overall Dimensions

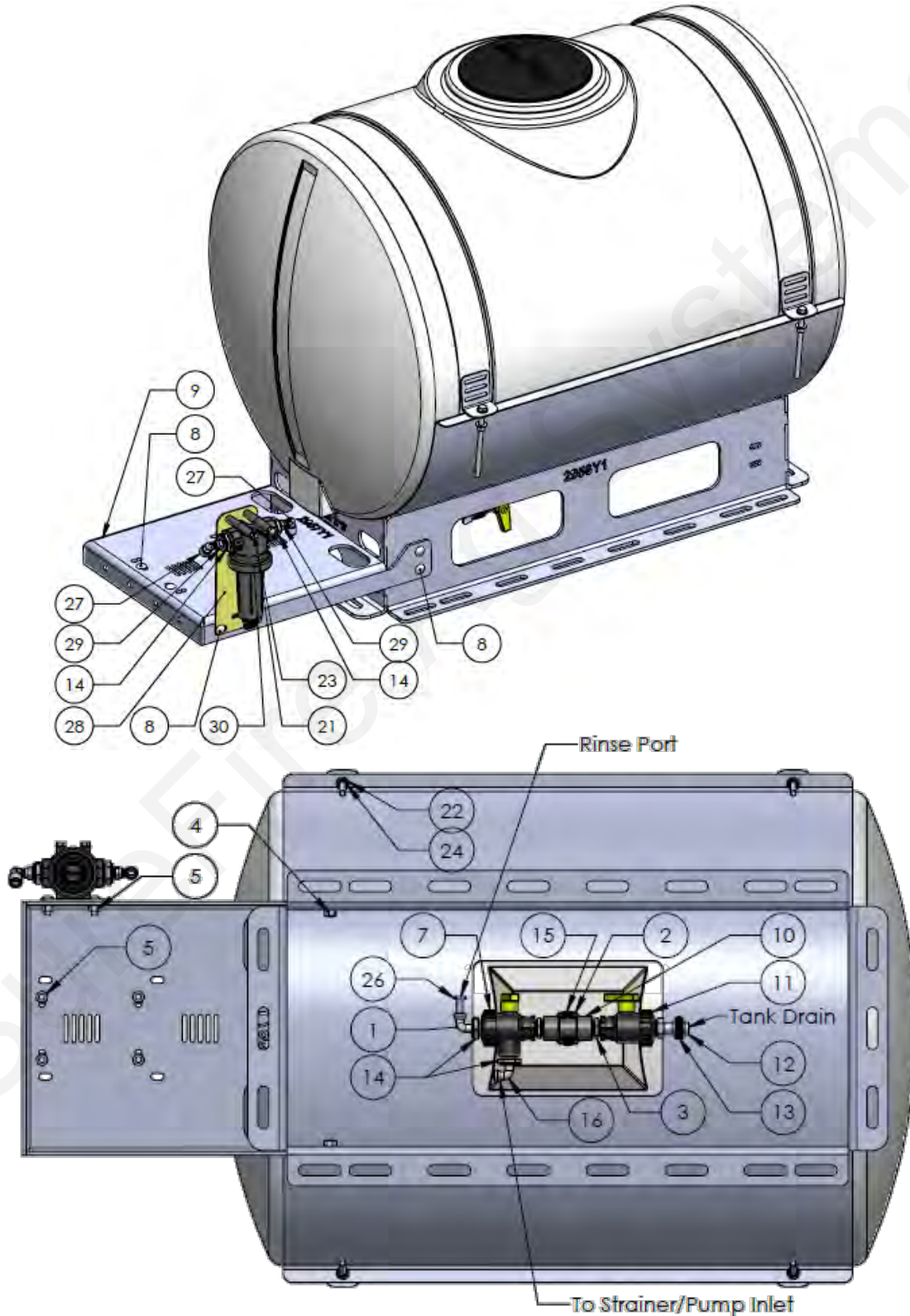


Spartan Tank Kits

508-02-100350

110 Gallon Tank Kit

No Rinse Tank





Spartan Tank Kits

508-02-100350

110 Gallon Tank Kit

No Rinse Tank



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	421-2956Y1	110 Gallon/30" DIA Tank Cradle	1
2	100-125075RB	1-1/4" MPT x 3/4" FPT Reducer Bushing	1
3	100-075NIP-SH	3/4" Short Poly Nipple	3
4	323-06	3/8" Flange Nut	4
5	323-06	3/8" Flange Nut	6
6	525-2055	2" Strap Kit for Tanks under 300 Gallon	2
7	102-075SUBV-3BL-H	3/4" Union Valve 3 Way	1
8	304-060100-SS	Carriage Bolt - 3/8" x 1" SS	10
9	420-2957Y1	Tower 100 Mount Bracket	1
10	100-075TEE	3/4" Poly Tee	1
11	102-075SUBV	3/4" Union Valve 2 Way	1
12	101-075075	3/4" MPT x 3/4" HB	1
13	350-1208	SS Hose Clamp - Size 12 - 1-1/4" Diameter	1
14	100-075038RB	3/4" MPT x 3/8" FPT Reducer Bushing	4
15	105-200G-V	(FOR FC220s) 2" EPDM Manifold Gasket for 220 Series Manifold Fittings	1
16	113-13-038038	QC to MPT Elbow - 3/8" QC x 3/8" MPT EL	2
17	708-5133207	2" Tank Strap	2
18	708-5108112	2" Tank Strap Buckle	4
19	727-02-HZ0110-30-	Horizontal Tank - 110 Gal - White - 30 x 44	1
20	300-060600-5	3/8" x 6" Hex Head Bolt-G5	4
21	300-050400-5	5/16" x 4" Hex Head Bolt-G5	2
22	330-06	3/8" Flat Washer	8
23	330-04	1/4" Flat Washer	2
24	321-06	3/8" Nylock	4
25	321-05	5/16" Nylock Nut	2
26	113-05-038	Plug - 3/8" QC	1
27	113-12-038038-P	Stem Elbow - 3/8" Stem x 3/8" QC	2
28	400-2597Y1	Injection Pump Filter/Strainer Bracket	1
29	113-06-038038	QC to MPT - 3/8" QC x 3/8" MPT	2
30	109-075LST-80V	3/4" Tee Strainer -Viton - 80 Mesh	1

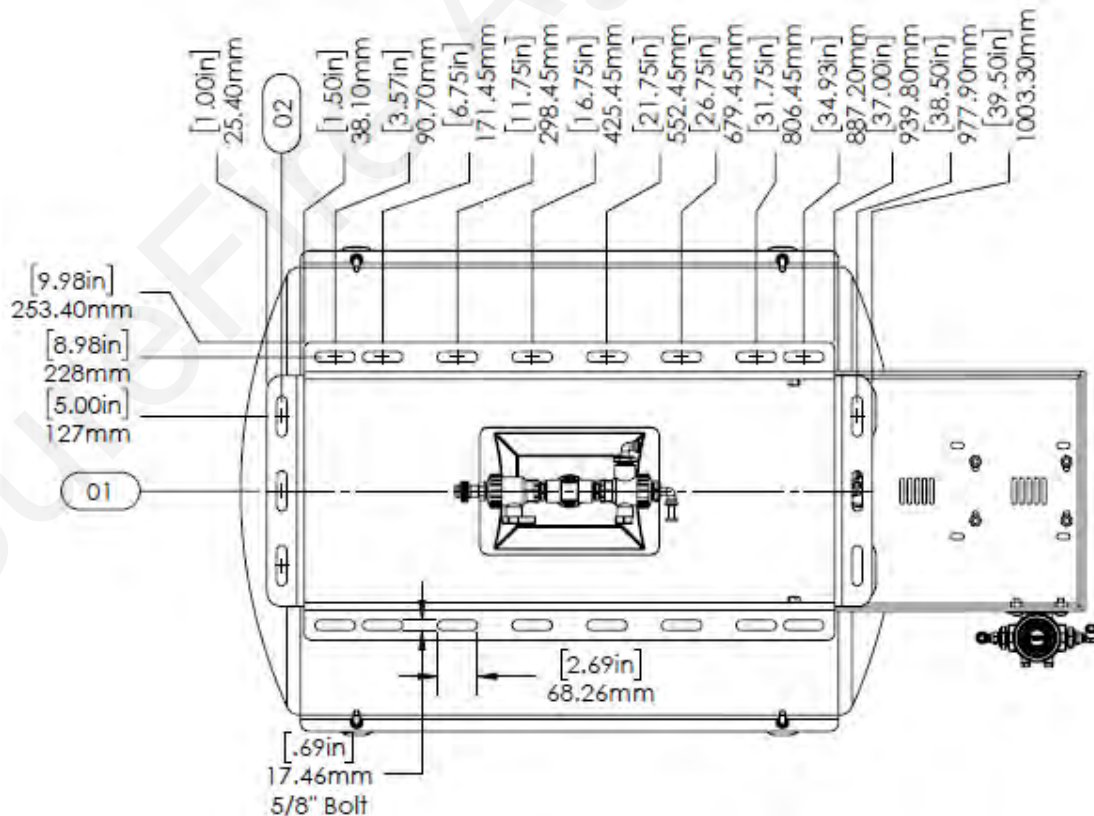
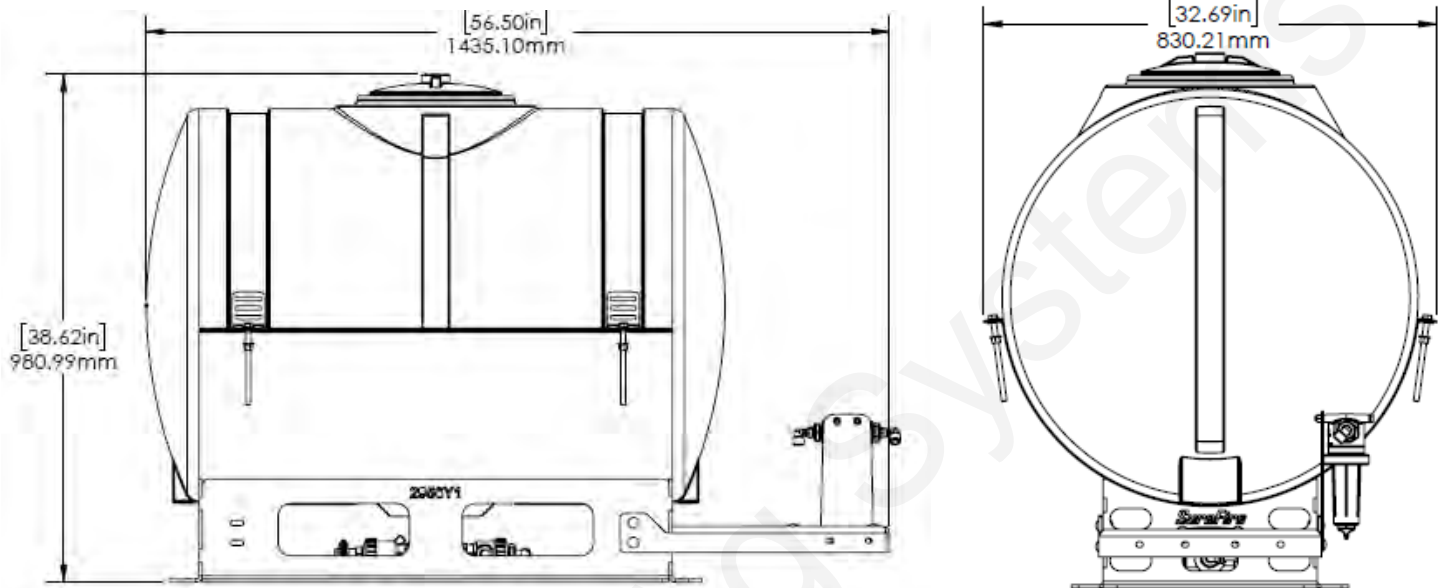
Spartan Tank Kits

508-02-100350

110 Gallon Tank Kit

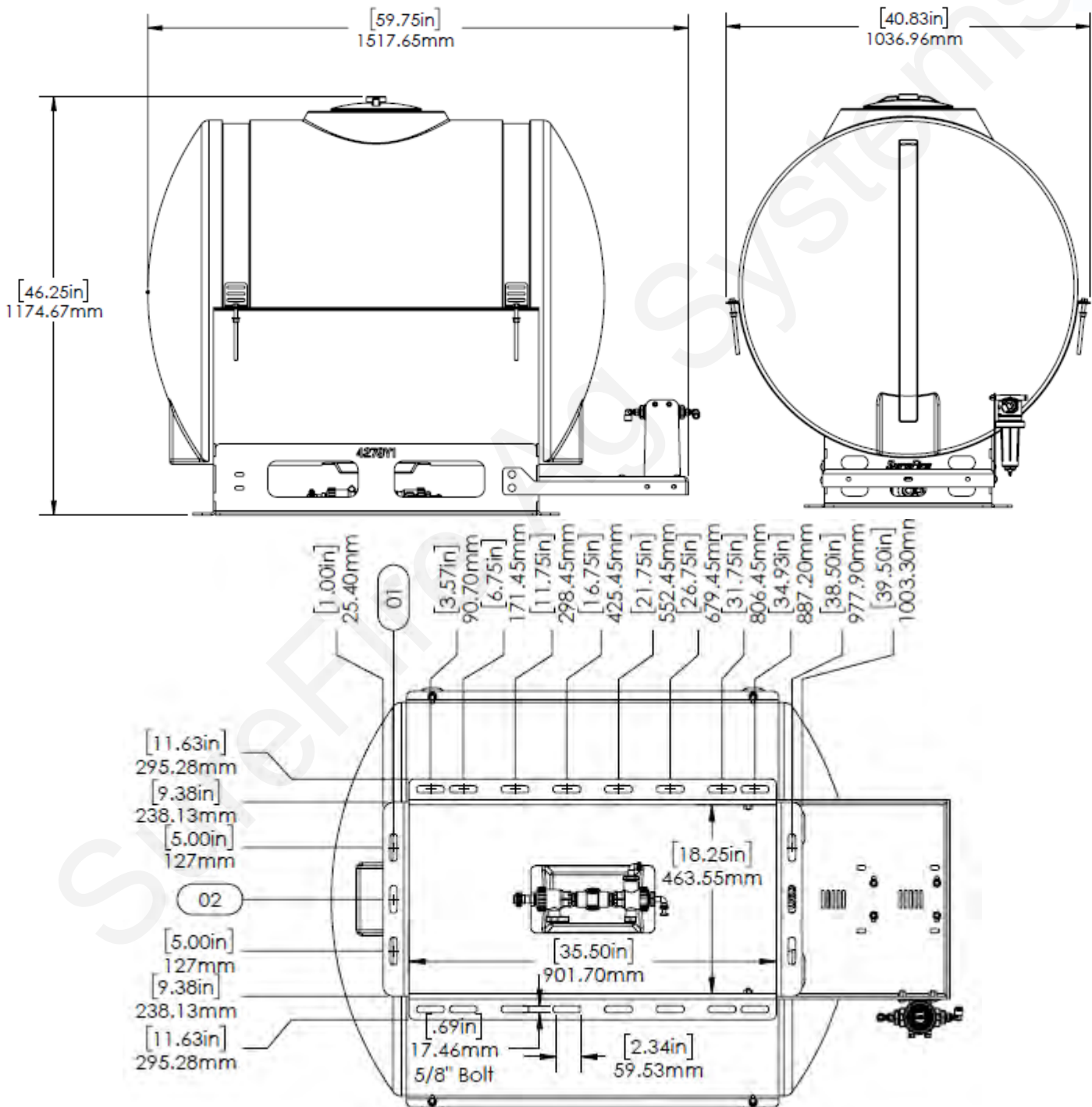
No Rinse Tank

Overall Dimensions





Spartan Tank Kits 508-02-100400 200 Gallon Tank Kit No Rinse Tank Overall Dimensions

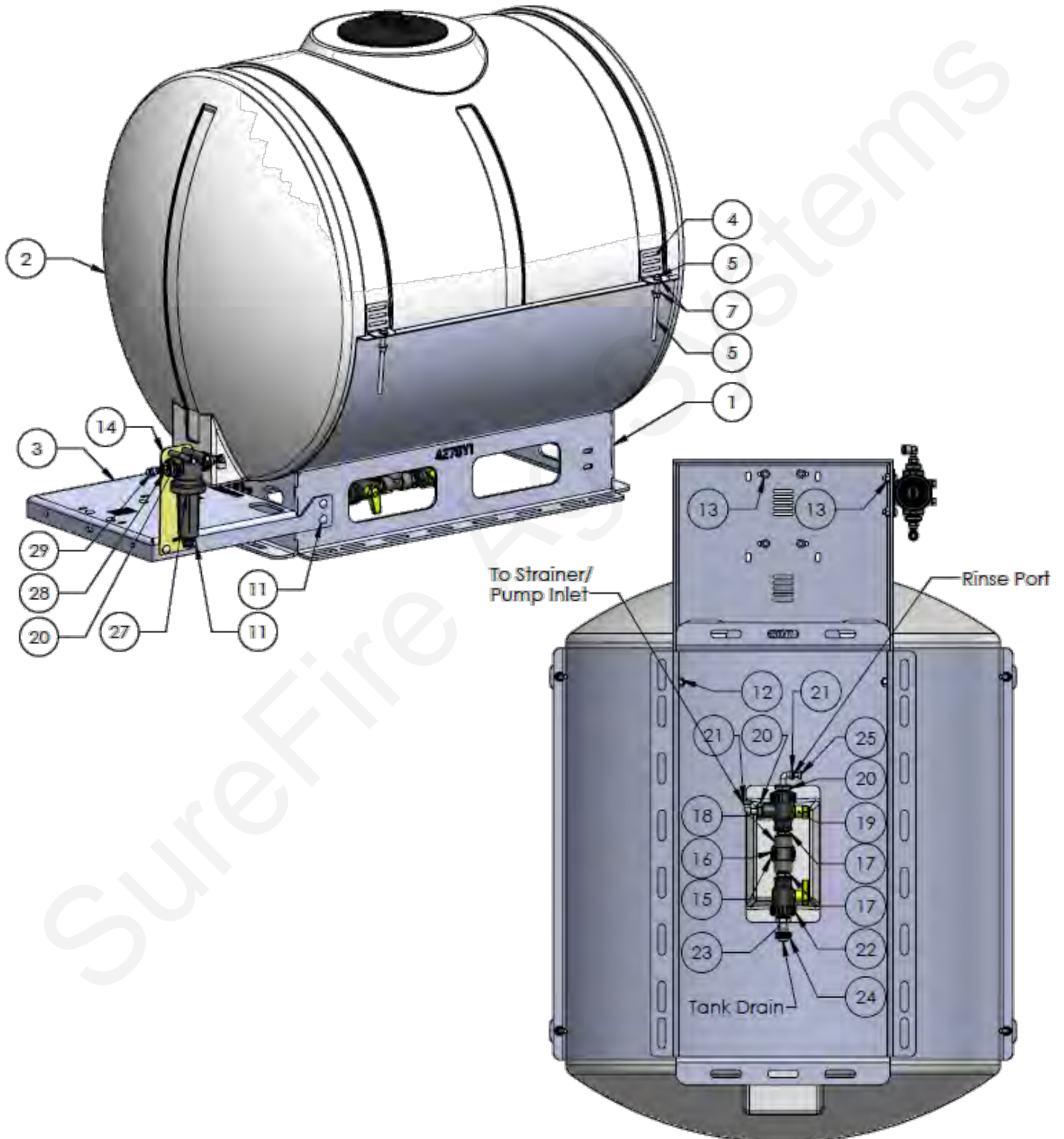


Spartan Tank Kits

508-02-100400

200 Gallon Tank Kit

No Rinse Tank





Spartan Tank Kits 508-02-100400 200 Gallon Tank Kit No Rinse Tank



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	421-4279Y1	200 Gallon/38"Ø Tank Cradle Weldment	1
2	727-02-HZ0200-38-	Horizontal Tank - 200 Gal - White - 38" x 51"	1
3	420-4280Y1	Tower/Spartan Mount Bracket for 200 Gallon Cradle	1
4	708-5108112	2" Tank Strap Buckle	4
5	300-060600-5	3/8" x 6" Hex Head Bolt-G5	4
6	300-050400-5	5/16" x 4" Hex Head Bolt-G5	2
7	330-06	3/8" Flat Washer	8
8	330-04	1/4" Flat Washer	2
9	321-06	3/8" Nylock Nut	4
10	321-05	5/16" Nylock Nut	2
11	304-060100-SS	Carriage Bolt - 3/8" x 1" SS	10
12	323-06	3/8" Flange Nut	4
13	323-06	3/8" Flange Nut	6
14	400-2597Y1	Injection Pump Filter/Strainer Bracket	1
15	105-200G-V	(FOR FC220s) 2" EPDM Manifold Gasket for 220 Series Manifold Fittings	1
16	100-125075RB	1-1/4" MPT x 3/4" FPT Reducer Bushing	1
17	100-075NIP-SH	3/4" Short Poly Nipple	3
18	100-075TEE	3/4" Poly Tee	1
19	102-075SUBV-3BL-H	3/4" Union Valve 3 Way	1
20	100-075038RB	3/4" MPT x 3/8" FPT Reducer Bushing	4
21	113-13-038038	QC to MPT Elbow - 3/8" QC x 3/8" MPT EL	2
22	102-075SUBV	3/4" Union Valve 2 Way	1
23	101-075075	3/4" MPT x 3/4" HB	1
24	350-1208	SS Hose Clamp - Size 12 - 1-1/4" Diameter	1
25	113-05-038	Plug - 3/8" QC	1
26	708-5133207	2" Tank Strap	2
27	109-075LST-80V	3/4" Tee Strainer -Viton - 80 Mesh	1
28	113-06-038038	QC to MPT - 3/8" QC x 3/8" MPT	2
29	113-12-038038-P	Stem Elbow - 3/8" Stem x 3/8" QC	2



396-4315Y1

3 Gal Rinse Tank Kits

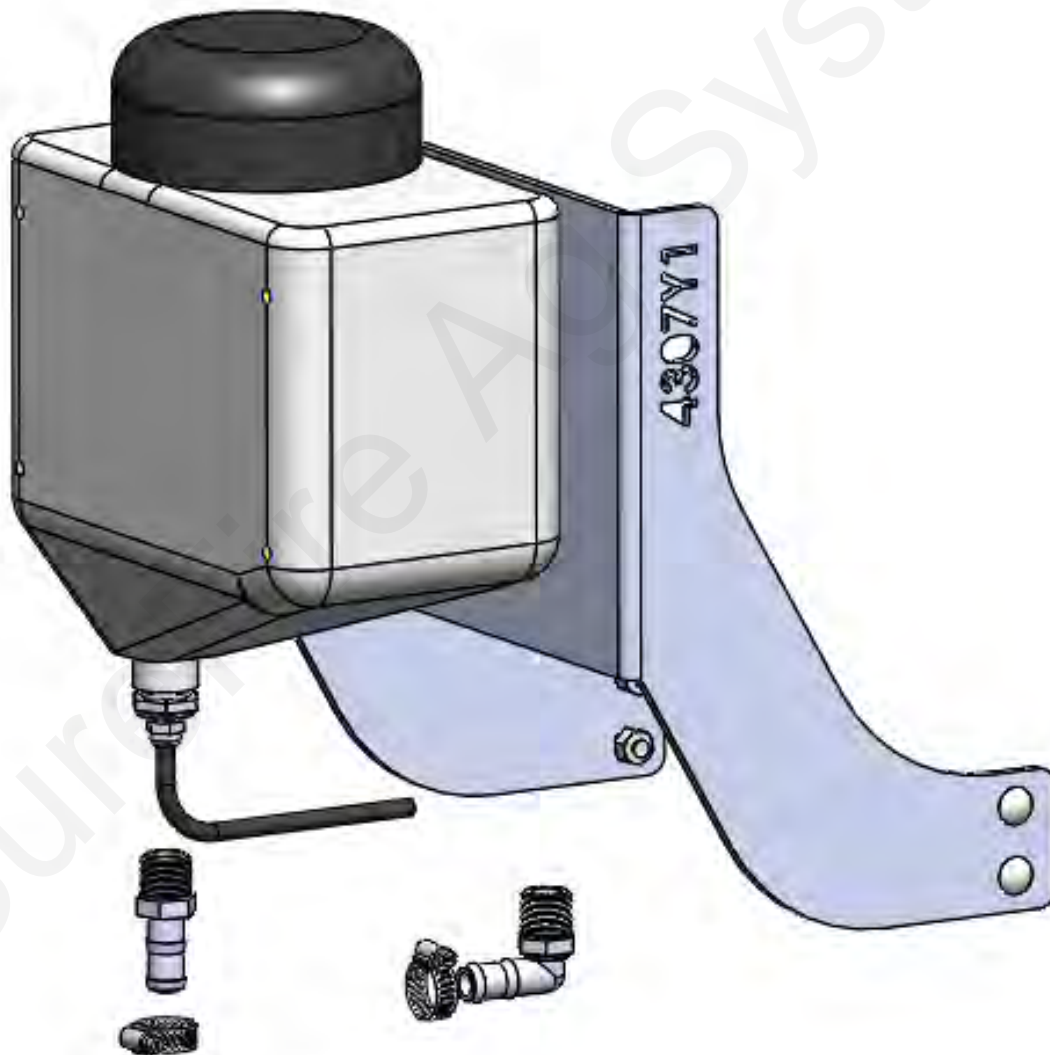


for Horizontal Cradle Tank Kits

Kit Numbers

508-03-100200 : 3 Gallon Rinse Tank Kit—55 and 110 Gallon Horizontal Tank Cradles

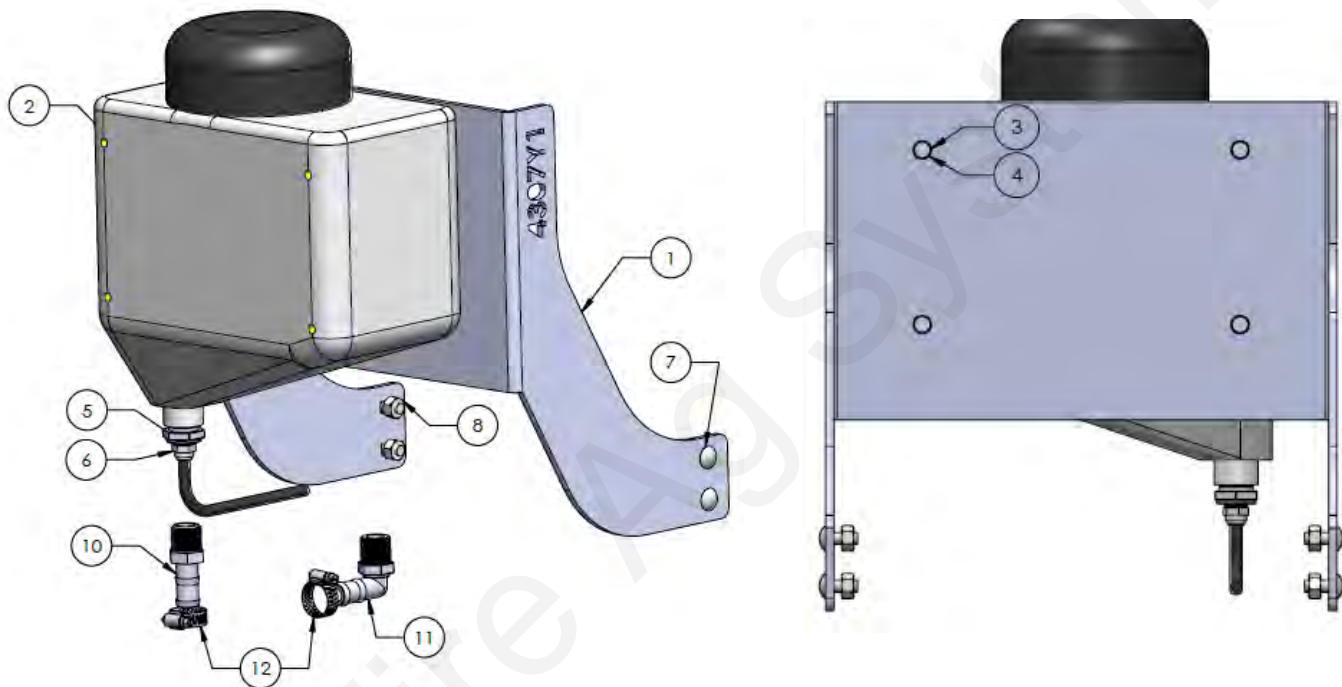
508-03-100250 : 3 Gallon Rinse Tank Kit—200 Gallon Horizontal Tank Cradle



Exploded View and Parts List

Kit Number: 508-03-100200

Description: 3 Gallon Rinse Tank Kit—55 and 110 Gallon Horizontal Tank Cradles

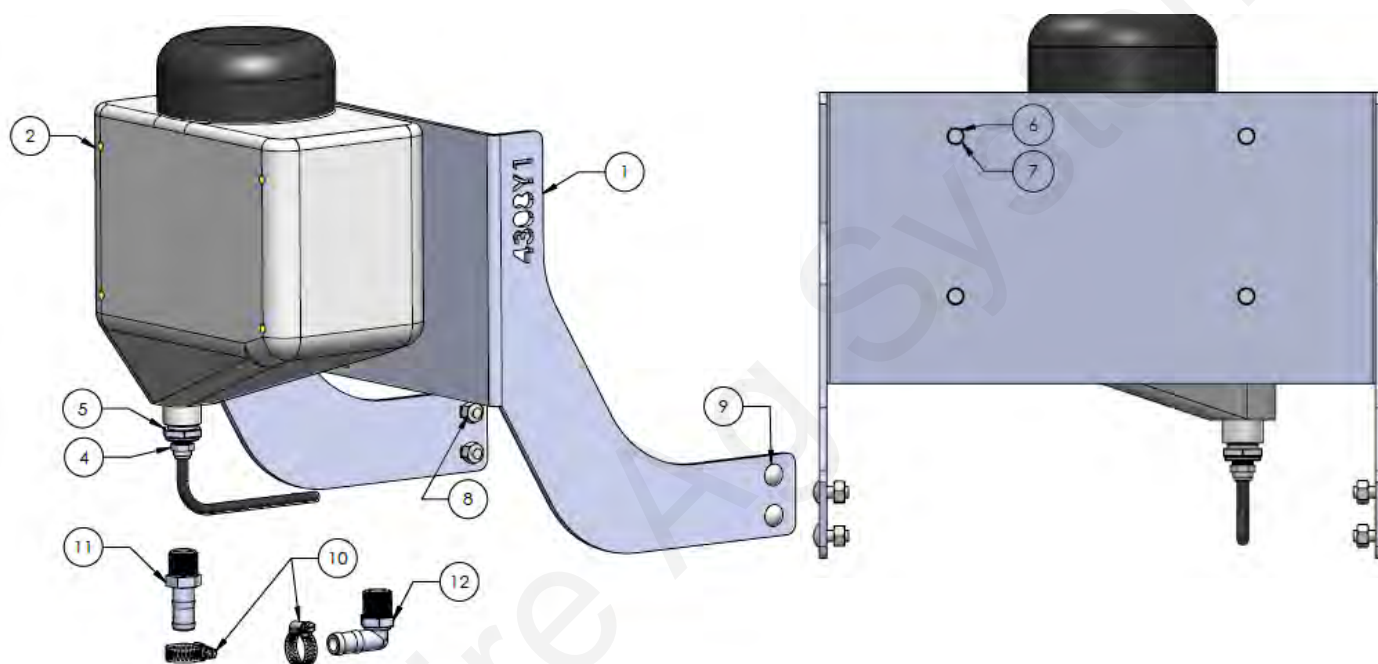


ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	470-4307Y1	3 Gallon Rinse Tank Bracket - 55 and 110 Gal HZ Tank Cradles	1
2	727-05-SP0003-RT-BLACK	3 Gallon Square Tank, Black	1
3	300-050008-5	5/16" x 1/2" Hex Head Bolt-G5	4
4	331-05	5/16" Lock Washer	4
5	100-075038RB	3/4" MPT x 3/8" FPT Reducer Bushing	1
6	113-06-038038	QC to MPT - 3/8" QC x 3/8" MPT	1
7	304-060100-SS	Carriage Bolt - 3/8" x 1" SS	4
8	323-06	3/8" Flange Nut	4
9	281-038	3/8" Poly Tube	4'
10	101-075075	3/4" MPT x 3/4" HB	1
11	101-075075-90	3/4" MPT x 3/4" HB - 90 degree	1
12	350-1208	SS Hose Clamp - Size 12 - 1-1/4" Diameter	2
13	280-075-AG200	3/4" Ag 200 Hose	4'

Exploded View and Parts List

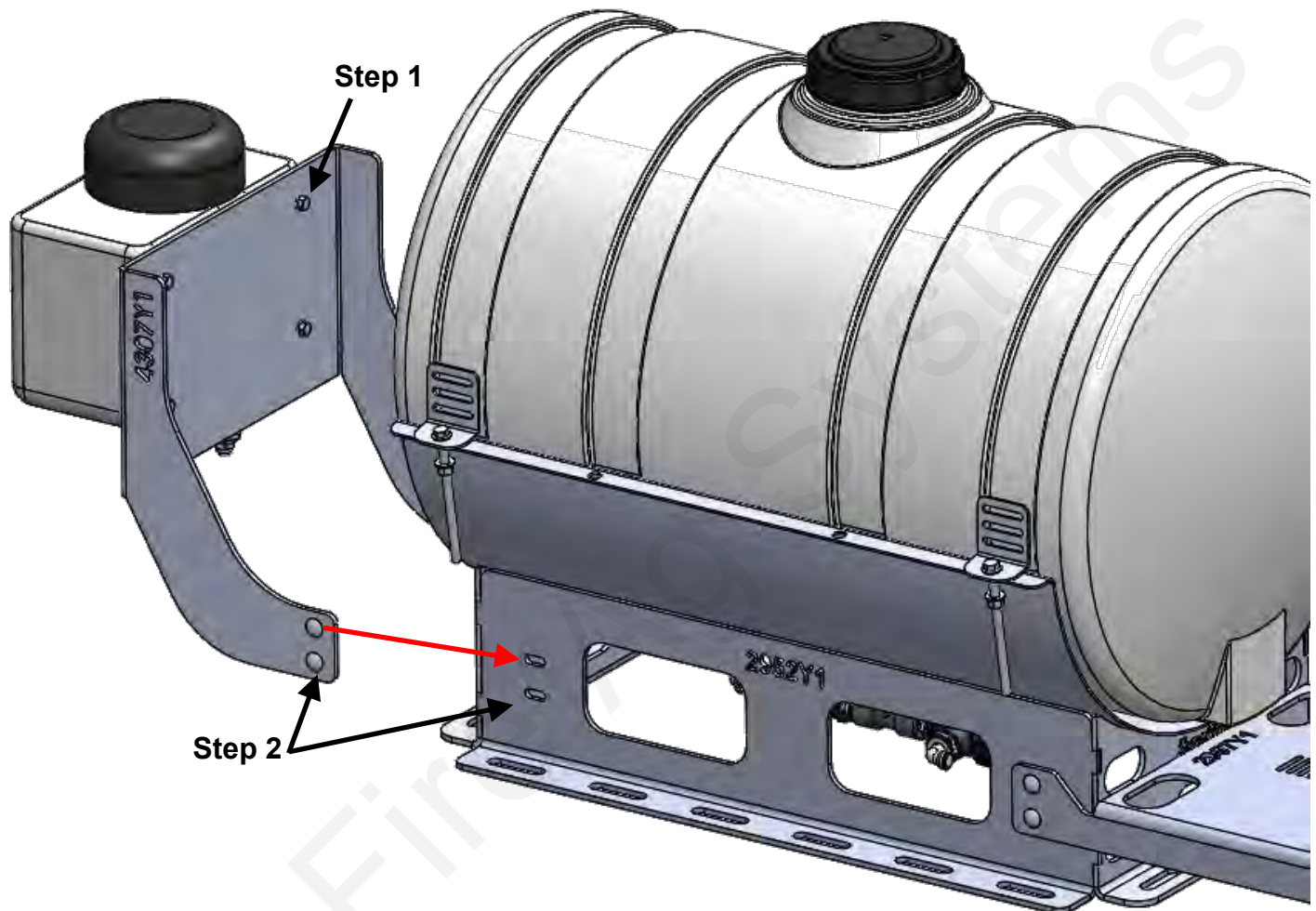
Kit Number: 508-03-100250

Description: 3 Gallon Rinse Tank Kit—200 Gallon Horizontal Tank Cradle



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	470-4307Y1	3 Gallon Rinse Tank Bracket - 55 and 110 Gal HZ Tank Cradles	1
2	727-05-SP0003-RT-BLACK	3 Gallon Square Tank, Black	1
3	300-050008-5	5/16" x 1/2" Hex Head Bolt-G5	4
4	331-05	5/16" Lock Washer	4
5	100-075038RB	3/4" MPT x 3/8" FPT Reducer Bushing	1
6	113-06-038038	QC to MPT - 3/8" QC x 3/8" MPT	1
7	304-060100-SS	Carriage Bolt - 3/8" x 1" SS	4
8	323-06	3/8" Flange Nut	4
9	281-038	3/8" Poly Tube	4'
10	101-075075	3/4" MPT x 3/4" HB	1
11	101-075075-90	3/4" MPT x 3/4" HB - 90 degree	1
12	350-1208	SS Hose Clamp - Size 12 - 1-1/4" Diameter	2
13	280-075-AG200	3/4" Ag 200 Hose	4'

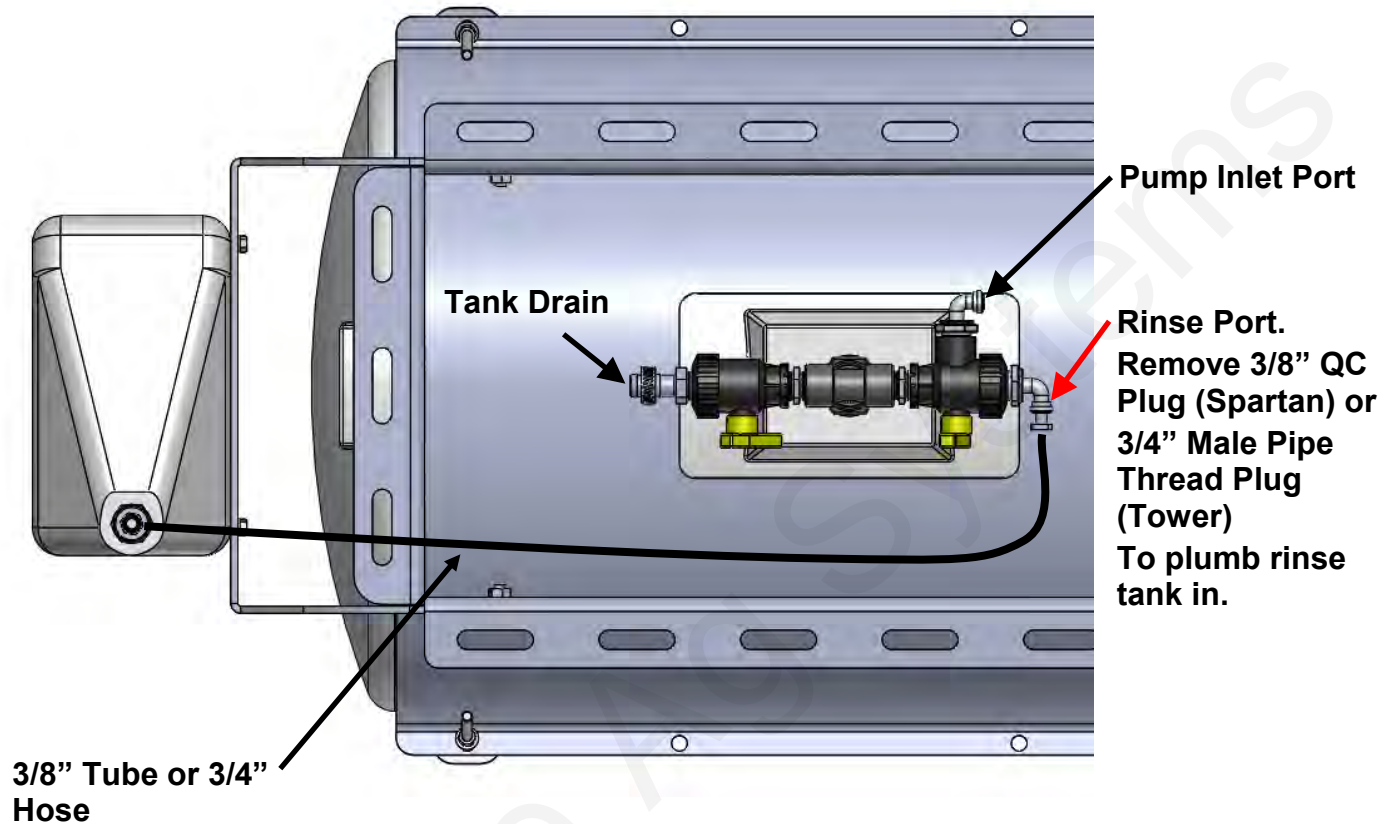
3 Gal Rinse Tank Kit Mounting Instructions



Step 1: Mount 3 Gallon Rinse Tank (727-05-SP0003-RT-Black) to 470-4307Y1 or 470-4308Y1 Rinse Tank Bracket. Use the supplied 5/16"x1/2" Bolts and Lock Washers to fasten.

Step 2: Attach the Rinse Tank Bracket to the Horizontal Tank Cradle, shown above. Use the supplied 3/8"x1" Carriage Bolts and Flange Nuts to fasten.

3 Gal Rinse Tank Kit Plumbing Instructions



Step 1: Remove Rinse Port Plug shown above.

Step 2: For "Spartan" Tank Kits, use the included 3/8" tube and 3/8" Quick Connect fittings to plumb the Rinse Tank into the location shown above. For "Tower" Tank Kits, use the included 3/4" Male Pipe Thread x 3/4" Hose Barb Fittings with Clamps