



2014-2015

Residential/Commercial Irrigation Specification Catalog





Our purpose is to help our customers enrich the beauty, productivity and sustainability of the land

The Toro Company is a leading worldwide provider of innovative turf, landscape, rental and construction equipment, irrigation and outdoor lighting solutions. Toro's global presence extends to more than 90 countries through strong relationships built on integrity and trust, constant innovation, and a commitment to helping customers enrich the beauty, productivity and sustainability of the land. Since 1914, the company has built a tradition of excellence to help customers care for golf courses, sports fields, public green spaces, commercial and residential properties, and agricultural fields.

Building on a Legacy

On July 10th, 2014, The Toro Company celebrates its 100th anniversary. We are deeply honored to achieve this milestone and grateful to the numerous customers that count on Toro for all their turf care and irrigation needs. Though many things have changed over the last century, some things remain the same – Toro's core values of caring relationships market leadership through innovation, and a legacy of excellence. That's why, even though in uncertain times, Toro continued to invest in a portfolio of Precision™ Irrigation products to bring new innovation to the market that upgrade existing systems to the latest, water-saving technology available.

The Toro Precision™ Irrigation Portfolio is:

- Universal – products are designed to fit multiple manufacturers' equipment
- Simple – no digging, trenching or complicated wiring
- Immediate – as soon as you install, you start using less water (no system adjustments)

We have added new products to our portfolio including the multiple award winning Precision™ Soil Sensor and Precision™ Rotating Nozzles, along with the award winning Precision™ Spray Nozzles, that immediately use less water and fit not only Toro threaded, but also competitive threaded, spray bodies. Toro's full suite of Precision™ Irrigation Solutions is perfect for the retrofit market, and many antiquated systems that are ripe for upgrade.

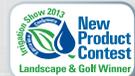


Revolutionary Control Technology

Toro hosted focus groups across the globe asking landscape contractors and homeowners what they liked - and didn't like - about their irrigation control systems. The outcome was an investment in new additions to the Toro controller line:

• **Toro® EVOLUTION®** - This award-winning, menu-based controller is the first of its kind to incorporate an easy-to-understand digital interface, which pushes the technological envelope regarding simple operation, expandability and smart control. **EVOLUTION** provides shortcut menus dedicated to make interaction simpler for the homeowner and an advanced menu system designed for the most demanding of contractor needs. Release of the **Smart Connect™** Add-On accessories also provides the most powerful feature set available for contractors for weather –based or soil moisture smart control, and control of other landscape devices including pumps, water features and low voltage landscape lighting.

• **Toro® SENTINEL®** - a completely redesigned controller interface for easier standalone programming, as well as **Precision™ ET** for ET-based "smart" irrigation. Sentinel controllers can now also operate as a receiver for Turf Guard® wireless soil sensors, communicating directly with up to 16 sensors per controller (1 per program), continually measuring moisture, temperature, and salinity levels in the soil and adjusting irrigation as needed.



Community

The Toro Giving Program has built a legacy of environmental, educational and community support that is deeply rooted in our culture.

- Providing annual financial support to environmental organizations.
- Hosting employee activities to renovate parks and restore lakes, rivers and landscapes to their natural beauty.
- Educating organizations and individuals of all ages on local, state and federal environmental and related legislative issues
- Funding and supporting environmental and turf management research projects to educate and improve the efficiency of the application of water.
- Donating irrigation products and systems to nonprofits to maintain their landscapes and reduce water use.



Customer Care You Can Count On



Toro Technical Support

Our technical support staff is truly extraordinary at what they do. They have over 100 years of combined irrigation experience that you can depend on. For an excellent support experience, call 1-877-345-TORO (8676) or email irrigation.support@toro.com.

There are also many helpful tips on the Toro YouTube site at www.youtube.com/user/toro/featured.



Toro Controller Repair

Did you know that with Toro's Board Exchange Program you can get the replacement controller boards you need immediately? Through your distributor, controller repair provides controller boards ready for immediate board exchange to assure that controller downtime is minimal and your landscape and reputation stay protected. For immediate assistance call 1-877-345-TORO (8676), Monday – Friday, 6:00 AM – 3:30 PM PST. Visit Controller Repair website at www.toro.com/controller-repair



Toro Training

Toro offers its customers training and education on new product technology, water management best practices, and provides world-class business skills training for professional contractors to help them increase productivity and improve their bottom line. For online product training, visit www.torocontractor.com. To learn more about other educational opportunities in your area and nationwide, call 1-877-345-TORO (8676).



Toro NSN®

Toro's National Support Network (NSN) is a team of A+ certified technicians and licensed irrigators dedicated to the daily operations and maintenance of computerized central control systems. Every new Toro computerized central irrigation control system includes Toro NSN support, as well as convenient classroom, web and computer-based training. For assistance call 1-888-676-TORO (8676) or visit www.toronsn.com.



Toro Online Information

We offer a complete listing of all irrigation products at (www.toro.com/irrigation) along with links to Distributor locator, CAD Details, and product literature. Specialty sites for our contractor partners (www.torocontractor.com) and water management highlights (www.torowatersmart.com) are full of great information at your fingertips.

ANATOMY OF A SMART IRRIGATION SYSTEM

All the parts of an irrigation system... controller, valves, sprinklers... work together to ensure your customers' plants get proper watering. Replacing just one portion of their system with efficient products helps save water. Over time, replacing all components of their system (or installing a new system) with efficient irrigation products ensures optimum savings.



RainSensor™ Series
with patented Water Conservation Modes
Page 94



EVOLUTION®
Controller with Smart Connect™
Page 72



Wireless ET Sensor
Page 73



P-220 Scrubber Series Valve
Page 64



TFS Series Flow Sensor
Page 96



TPV Valve Series
Page 56



TPV Drip Zone Kit
Page 128



Precision™ Soil Sensor
Page 90



T5 Series Rotor with optional RapidSet™ Arc Adjustment
Page 36



Fits:
Toro® or Iritrol®, Rain Bird® and Hunter® Spray Bodies

PCD Precision™ Series Spray Nozzles with patented H₂O Chip Technology
Page 16



570ZXF Sprays with patented X-Flow® Valve-In-Stem Shutoff
Page 12



Precision™ Series Rotating Nozzles with Planetary Gear Drive
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DL2000™ Subsurface Dripline with patented ROOTGUARD® Technology
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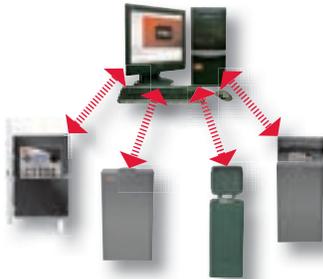


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See EVOLUTION™ Series® Sensors & Remotes on page 73

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Fixed Sprays Overview



Model	570Z	570ZLP	570ZXF	570ZPR	570ZPRX
Page Number	10-11	10-11	12-13	14-15	14-15
Radius	2'-26' (0,6m-7,9m)	2'-26' (0,6m-7,9m)	2'-26' (0,6m-7,9m)	2'-17' (0,6-5,2m)	2'-17' (0,6-5,2m)
Flow Range	0.05-4.50 GPM (0,19-17,0 LPM)	0.05-4.50 GPM (0,19-17,0 LPM)	0.05-4.50 GPM (0,19-17,0 LPM)	0.05-3.45 GPM (0,19-13,0 LPM)	0.05-3.45 GPM (0,19-13,0 LPM)
Operating Pressure Range (inlet)	20-75 PSI (1,4-5,2 Bar)	15-75 PSI (1,0-5,2 Bar)	20-75 PSI (1,4-5,2 Bar)	20-75 PSI (1,4-5,2 Bar)	20-75 PSI (1,4-5,2 Bar)
Turf	X	X	X	X	X
Shrubs/Ground Cover	X	X	X	X	X
Slopes	X	X	X	X	X
High Pressure Systems	X		X	X	X
Low Pressure Systems		X			
Medians			X	X	X
High Traffic Areas			X	X	X
High Wind				X	X
Pop-Up Height to Nozzle	2" (50 mm) 3" (75 mm) 4" (100 mm) 6" (150 mm) 12" (300 mm)	2" (50 mm) 3" (75 mm) 4" (100 mm) 6" (150 mm) 12" (300 mm)	4" (100 mm) 6" (150 mm) 12" (300 mm)	4" (100 mm) 6" (150 mm) 12" (300 mm)	4" (100 mm) 6" (150 mm) 12" (300 mm)
Side Inlet Option	6" (150 mm) 12" (300 mm)	6" (150 mm) 12" (300 mm)	6" (150 mm) 12" (300 mm)	6" (150 mm) 12" (300 mm)	6" (150 mm) 12" (300 mm)
Check Valve Option	X	X	X	X	X
Effluent Water Option	X	X	X	X	X
Shrub Model	X	X	X	X	X
Zero Flush	X	X	X	X	X
X-Flow® Water Shut-off			X		X
Built-In Pressure Regulator				X	X
Serviceable Seal	X	X	X	X	X
Warranty	Two Years	Two Years	Two Years	Five Years	Five Years



 WaterSmart® Feature

Nozzles Overview

Note: All 570 nozzles work in all Toro® sprays.

Precision™ Series also offer additional models to fit Irritrol®, Rain Bird®, and Hunter® sprays.



Model	Radius	Arcs	Flow Range	Recommended Operating Pressure
Pressure-Compensating Precision™ Series spray nozzles Page 16	5'-15' (1,5-4,6m)	60—60° Q—90° T—120°	0.04-2.4 GPM (0,1-9,4 LPM)	50 psi (3,4 Bars)
Precision™ Series Spray Nozzles Page 18-21	5'-15' (1,5-4,6m) 4'x9' (1,2-2,7m) 4'x15' (1,2-4,6m) 4'x18' (1,2-5,5m) 4'x30' (1,2-9,1m)	60°, 90°, 120°, 150°, 180°, 210°, 240°, 270°, 360° and Specialty	.038-2.4 GPM (0,14-9,08 LPM)	30 PSI (2,0 Bar)
Precision™ Series Rotating Nozzle Page 22-23	14'-26' (4,3m-7,9m)	45° to 270°, Full-circle	.38-3.78 GPM (1,43-14,3 LPM)	40-50 PSI (2,8-3,5 Bar)
MPR Plus Page 24-25	5'-15' (1,5m-4,6m) Specialty Patterns 2'-30' (0,6m-9,1m)	1/4, 1/3, 1/2, 2/3, 3/4, Full and Specialty	0.05-4.58 GPM (1,9-17,3 LPM)	30 PSI (2,0 Bar)
TVAN Page 26	8'-17' (2,4m-5,2m)	0°-360°	0.7-5.60 GPM (2,65-21,2 LPM)	30 PSI (2,0 Bar)
Stream Sprays Page 27	13'-22' (4,0m-6,7m)	1/4, 1/2, Full	0.6-2.70 GPM (2,3-10,2 LPM)	30 PSI (2,0 Bar)
Stream Bubblers Page 27	1.5'-18' (0,5m-5,5m)	1/4", 1/2", Full, 2X180, 4x180	0.49-2.02 GPM (1,85-7,64 LPM)	20-30 PSI (1,4-2,0 Bar)
Flood Bubbler PC Page 28	Circle	Flood	0.25-2.0 GPM (0,94-7,6 LPM)	20-30 PSI (1,4-2,0 Bar)
500 Series Bubblers Page 28	6'-17' (2,13m-5,2m)	2/60, 4/60, 6/60, 2/180	1.08-3.70 GPM (4,1-14,0 LPM)	20-30 PSI (1,4-2,0 Bar)



 WaterSmart® Feature

570Z & 570ZLP Series Sprays

- Shrub, 2" (50mm), 3" (75mm), 4" (100mm), 6" (150mm) and 12" (300mm) Pop-Up
- Radius: 2'-26' (0,6m-7,9m)
- Operating Pressure Range (570Z): 20-75 psi (1,4-5,2 Bar)
- Operating Pressure Range (570LP): 15-75 psi (1,0-5,2 Bar)

Versatile. Flexible. Reliable. The Toro® 570Z sprinkler embodies all that is required for residential and service contractors wanting to stock just one sprinkler family.



Effluent
Options
Available



Check
Valve
Options
Available

Water Management Highlight

No Flushing on Pop-Up!

With a pressure-activated wiper seal that flushes only upon retraction, flow-by is eliminated on pop-up reducing water waste and allowing more heads per valve. This zero-flush seal is what makes the 570Z Series a spray head for those serious about effective water management.



Enhanced
zero flush seal

Features & Benefits

Zero Flush Wiper Seal

Prevents flushing on pop-up, allowing more sprinklers on the same line.

One-Piece Check Valve

Easily installed at the factory or in the field. Maintains up to 10' (3m) elevation change.

Low Pressure or Enhanced Retraction Spring

Choose the spring which best meets your site specific needs. New to the family is the low pressure 570ZLP which allows for pop-up and retraction at lower pressures.

Ratcheting Riser

For easy and reliable arc adjustment on pop-up models.

Small 2" (50mm) Diameter Cap

Less visible, reducing damage from exposure or vandals.

Specifications

Dimensions

- Body diameter:
 - 1 3/8" (35mm) on 2P, 3P, 4P, 6P and 6P SI models
 - 1 5/8" (40mm) on 12P
 - 1 3/4" (45mm) on 12P SI
- Cap diameter: 2" (50mm)
- Inlet: 1/2" (12mm) female-threaded
- Side inlet: 4 3/4" (120mm) from top of sprinkler to center of side inlet

Operating Specifications

- Radius: 2'-26' (0,6m-7,9m)
- Operating pressure range (570Z): 20-75 psi (1,4-5,2 Bar)
- Operating pressure range (570ZLP): 15-75 psi (1,0-5,2 Bar)
- Recommended pressure for spray nozzles: 30 psi (2,1 Bar)
- Recommended pressure for rotating nozzles: 40-50 psi (2,8-3,5 Bar)
- Flow rate: 0.05 – 4.5 GPM (0,2-17,0 LPM)

Additional Features

- Stainless steel retraction spring
- Low pressure sealing on LP models at 15 psi (1,0 Bar) for low pressure pumps and well systems
- All bodies shipped with flush plug in place

Options Available

- Check Valve (570CV): maintains up to 10' elevation change (not for side-inlet models; not recommended for use with LP models)
- 570SEAL: Replacement seal for all 570Z models
- Effluent water indicators:
 - Effluent Shrub Adapter (102-0563)
 - Effluent Snap-on Cap Cover (89-9752)
 - Effluent Molded Cap with seal (102-1211)
- 570-6X: 6" (150mm) Riser Extender
- 570-SR-6: 6" (150mm) Stationary Riser
1/2" (12mm) male-threaded inlet
- 570-SR-18: 18" (450mm) Stationary Riser
1/2" (12mm) male-threaded inlet
- Riser Pull-up Tool (89-6395)

Warranty

- Two years



570LP Series Model List

Model	Description
570Z-2LP	570Z, 2" (50mm), Low Pressure
570Z-3LP	570Z, 3" (75mm), Low Pressure
570Z-4LP	570Z, 4" (100mm), Low Pressure
570Z-6LP	570Z, 6" (150mm), Low Pressure
570Z-6LPSI	570Z, 6" (150mm), Low Pressure, Side Inlet
570Z-12LP	570Z, 12" (300mm), Low Pressure
570Z-12LPSI	570Z, 12" (300mm), Low Pressure, Side Inlet

Note: all w/o Nozzle

570Z Series Model List

Model	Description
570Z-2P	2" (50mm) Sprinkler
570Z-3P	3" (75mm) Sprinkler
570Z-4P	4" (100mm) Sprinkler
570Z-4PCOM	4" (100mm) Sprinkler, w/Check Valve
570Z-6P	6" (150mm) Sprinkler
570Z-6PSI	6" (150mm) Sprinkler, Side inlet Body
570Z-6PCOM	6" (150mm) Sprinkler, w/Check Valve
570Z-12P	12" (300mm) Sprinkler
570Z-12PSI	12" (300mm) Sprinkler, Side inlet Body
570Z-12PCOM	12" (300mm) Sprinkler, w/Check Valve
570S	Shrub Adapter

Note: all w/o Nozzle

Specifying Information—570ZLP Series

570X-XXLP-SI-COM-E						
Model	Pop-up Height			Optional	Optional	Optional
570Z	XXLP			SI	COM	E
Z—Lawn Pop-up & High Pop	2LP—2" (50mm) 6LP—6" (150mm)	3LP—3" (75mm) 12LP—12" (300mm)	4LP—4" (100mm)	SI—Side Inlet*	COM—Check- O- Matic™**	E—Effluent
Example: A 570ZLP Series Sprinkler (low pressure) with a pop-up height of 6" (150mm) and a check valve, you would specify: 570Z-6LP COM						

Specifying Information—570Z Series

570X-XXP-SI-COM-E						
Model	Pop-up Height			Optional	Optional	Optional
570X	XXP			SI	COM	E
S—Shrub Z—Lawn Pop-up & High Pop	2—2" (50mm) 6—6" (150mm)	3—3" (75mm) 12—12" (300mm)	4—4" (100mm)	SI—Side Inlet*	COM—Check- O- Matic™**	E—Effluent
Example: A 570Z Series Sprinkler with a pop-up height of 6" (150mm) and a check valve, you would specify: 570Z-6P COM						

*Available for 6" (150mm) and 12" (300mm) models.

**Available with non-side inlet models except 2" (50mm) and 3" (75mm).

570ZXF Series Sprays

- Shrub, 4" (100mm), 6" (150mm) and 12" (300mm) Pop-up
- Radius: 2'-26' (0,6m-7,9m)
- Operating Pressure Range: 20-75 psi (1,4-5,2 Bar)

Convenient and versatile. The Toro® 570ZXF sprinkler has all the versatility and features of the 570Z with the added value of Toro's patented X-Flow® technology.

Features & Benefits

Patented X-flow® Water Shut-off Device

Built into the riser and restricts water loss by 99% if the nozzle is removed or damaged, eliminating potential erosion or safety concerns. Allows for "dry" nozzle and filter-replacement or maintenance, while the system is running.

Zero Flush Wiper Seal

Prevents flushing on pop-up, allowing more sprinklers on the same line.

Enhanced Retraction Spring and Wiper Seal

Robust retraction spring and enhanced seal material ensures positive pop-up and retraction on all 570Z models.

One-Piece Check Valve

Easily installed at the factory or in the field. Maintains up to 10' (3m) elevation change.

Ratcheting Riser

For easy and reliable arc adjustment on pop-up models.

Small 2" (50mm) Diameter Cap

Less visible, reducing damage from exposure or vandals.



Effluent
Options
Available



Check
Valve
Options
Available

Water Management Highlight

X-Flow Technology Shuts Off Water Waste

A missing or damaged spray head nozzle can let up to 40 gallons of water escape per minute. The patented X-Flow technology is a shut-off device built right into the sprinkler. When accidents or vandalism occur the 570ZXF is there to reduce liability and minimize water waste.



Patented X-Flow®
Shut-off Device

Specifications

Dimensions

- Body diameter:
 - 1 3/8" (35mm) on 4P, 6P and 6P SI models
 - 1 5/8" (41mm) on 12P
 - 1 3/4" (44,5mm) on 12P SI
- Cap diameter: 2" (50mm)
- Inlet: 1/2" female-threaded
- Side inlet: 4 3/4" (120,7mm) from top of sprinkler to center of side inlet

Operating Specifications

- Radius: 2'-26' (0,6m-7,4m)
- Operating pressure range: 20-75 psi (1,4-5,2 Bar)
- Recommended pressure for spray nozzles: 30 psi (2,1 Bar)
- Recommended pressure for rotating nozzles: 40-50 psi (2,8-3,5 Bar)
- Flow rate: 0.05 – 4.5 GPM (0,2-17,0 LPM)

Additional Features

- Stainless steel retraction spring
- All bodies shipped with flush plug in place

Options Available

- Check Valve (570CV): maintains up to 10' (3m) elevation change (on non-side-inlet models)
- 570SEAL: Serviceable seal for all 570Z models
- Effluent water indicators:
 - Effluent Snap-on Cap Cover (89-9752)
 - Effluent Molded Cap with seal (102-1211)
- Riser Pull-up Tool (89-6395)
- Adjustment Key (89-7350)

Warranty

- Two years



570ZXF allows for dry nozzle installations and change outs

570ZXF Series Model List

Model	Description
570S-XF	Shrub Sprinkler, w/Shut-off
570Z-4P XF	4" (100mm) Sprinkler, w/Shut-off
570Z-4P XF COM	4" (100mm) Sprinkler, w/Check Valve and Shut-off
570Z-6P XF	6" (150mm) Sprinkler, w/Shut-off
570Z-6P XF SI	6" (150mm) Sprinkler, Side-inlet Body, w/Shut-off
570Z-6P XF COM	6" (150mm) Sprinkler, w/Check Valve and Shut-off
570Z-12P XF	12" (300mm) Sprinkler, w/Shut-off
570Z-12P XF SI	12" (300mm) Sprinkler, Side-inlet Body, w/Shut-off
570Z-12P XF COM	12" (300mm) Sprinkler, w/Check Valve and Shut-off

Note: all w/o Nozzle

Specifying Information—570ZXF Series

570Z- <u>XXP</u> - <u>SI</u> - <u>XF</u> - <u>COM</u> - <u>E</u>				
Model	Pop-up Height	Optional	Optional	Optional
570X	XXP	SI	COM	E
S—Shrub Z—Lawn Pop-up & High-pop	4—4" (100mm) 6—6" (150mm) 12—12" (300mm)	SI—Side Inlet*	COM—Check O-Matic**	E—Effluent
Example: A 570Z XF Series Sprinkler with a pop-up height of 6" (150mm) and a check valve would be specified as: 570Z-6P XF COM				

*Available for 6" (150mm) and 12" (300mm) models.

**Available with non-side inlet models.

570ZPR & 570ZPRX Series Sprays

- Shrub, 4" (100mm), 6" (150mm) and 12" (300mm) Pop-up
- Radius: 2'-17' (0,6-5,2m)
- Operating Pressure Range: 20-75 psi (1,4-5,2 Bar)

Built-in pressure regulation. The Toro® 570ZPR and 570ZPRX feature a patented in-riser pressure regulator, bringing another superior feature to the 570Z series. The 570Z PRX sprinkler also includes the X-Flow® technology combined in a single riser providing unmatched water management.

Features & Benefits

Patented In-riser Pressure Regulator

Maintains constant 30 psi (2,1 Bar) psi outlet pressure, which minimizes misting and fogging caused by pressures above 30 psi (2,1 Bar).

Zero Flush Wiper Seal

Prevents flushing on pop-up, allowing more sprinklers on the same line.

Enhanced Retraction Spring and Wiper Seal

Robust retraction spring and enhanced seal material ensures positive pop-up and retraction on all 570Z models.

Ratcheting Riser

For easy and reliable arc adjustment on pop-up models.

Small 2" (50mm) Diameter Cap

Less visible, reducing damage from exposure or vandals.

AND FOR 570ZPRX MODELS:

Patented X-flow® Water Shut-off Device

- Built into the riser and restricts water loss by 99% if the nozzle is removed or damaged, eliminating potential erosion or safety concerns.
- Allows for "dry" nozzle and filter-replacement or maintenance, while the system is running.



Effluent
Options
Available



Check
Valve
Options
Available

Water Management Highlight

570ZPRX: For Those Serious About Water Management

By combining the patented X-Flow and pressure-regulation technologies into one riser, the 570PRX stabilizes the performance of the system at 30 psi (2,1 Bar) from the first head to the last ensuring optimum nozzle performance.



Without Pressure
Regulation



With Pressure
Regulation



Specifications

Dimensions

- Body diameter:
 - 1 3/8" (35mm) on 4P, 6P and 6P SI models
 - 1 5/8" (40mm) on 12P
 - 1 3/4" (45mm) on 12P SI
- Cap diameter: 2" (50mm)
- Inlet: 1/2" (13mm) female-threaded
- Side inlet: 4 3/4" (120mm) from top of sprinkler to center of side inlet

Operating Specifications

- Radius: 2'-17" (0,6-5,2m)
- Operating pressure range: 20-75 psi (1,4-5,2 Bar)
- Recommended pressure for spray models: 30 psi (2,1 Bar)
- Note: Precision™ Series Rotating Nozzle radius is 17" (5,2m) with 570ZPR and 570ZPRX due to constant 30 psi (2,1 Bar) outlet pressures. For longer distances, use 570Z COM or 570ZXF COM
- Flow rate: 0.05 – 3.45 GPM (0,2-13,0 LPM)

Additional Features

- Stainless steel retraction spring
- All bodies shipped with flush plug in place

Options Available

- Check Valve (570CV): maintains up to 10' (3,0) elevation change (on non-side-inlet models)
- 570SEAL: Serviceable seal for all 570Z models
- Effluent water indicators:
 - Effluent Snap-on Cap Cover (89-9752)
 - Effluent Molded Cap with seal (102-1211)
- 5706X: 6" (150mm) Riser Extender (35-2636)
- Riser Pull-up Tool (89-6395)
- Adjustment Key (89-7350)

Warranty

- Five years

570ZPR Series Model List

Model	Description
All Models Include Patented In-Riser Pressure Regulator	
570Z-4P PR	4" (100mm) Sprinkler
570Z-4P PR COM	4" (100mm) Sprinkler, w/Check Valve
570Z-4P PR COM E	4" (100mm) Sprinkler, w/Check Valve, and Effluent
570Z-6P PR	6" (150mm) Sprinkler
570Z-6P PR COM	6" (150mm) Sprinkler, w/Check Valve
570Z-6P PR COM E	6" (150mm) Sprinkler, w/Check Valve and Effluent
570Z-12P PR	12" (300mm) Sprinkler
570Z-12P PR COM	12" (300mm) Sprinkler, w/Check Valve
570Z-12P PR COM E	12" (300mm) Sprinkler, w/Check Valve and Effluent
570S-PR	Shrub
570S-PRE	Shrub and Effluent

Note: all w/o Nozzle

570ZPRX Series Model List

Model	Description
All Models Include Pressure Regulation and X-Flow® Shut-off	
570S-PRX	Shrub Sprinkler
570Z-4P PRX	4" (100mm) Sprinkler
570Z-6P PRX	6" (150mm) Sprinkler
570Z-6P SI PRX	6" (150mm) Sprinkler, Side-inlet Body
570Z-12P PRX	12" (300mm) Sprinkler
570Z-12P SI PRX	12" (300mm) Sprinkler, Side-inlet Body
With Check Valve added	
570Z-4P PRX COM	4" (100mm) Sprinkler
570Z-6P PRX COM	6" (150mm) Sprinkler
570Z-12P PRX COM	12" (300mm) Sprinkler
With Effluent Molded Cap added	
570Z-4P PRX E	4" (100mm) Sprinkler
570Z-4P PRX COM E	4" (100mm) Sprinkler, w/Check Valve
570Z-6P PRX E	6" (150mm) Sprinkler
570Z-6P PRX COM E	6" (150mm) Sprinkler, w/Check Valve
570Z-12P PRX E	12" (300mm) Sprinkler
570Z-12P PRX COM E	12" (300mm) Sprinkler, w/Check Valve

Note: all w/o Nozzle

Specifying Information—570ZPR & 570ZPRX Series

570X-XXP-SI-PRX-COM-E					
Model	Pop-up Height	Optional	X-flow	Optional	Optional
570X	XXP	SI	PRX	COM	E
S—Shrub Z—Lawn Pop-up & High-pop	4—4" (100mm) 6—6" (150mm) 12—12" (300mm)	SI—Side Inlet*	PR—Pressure Regulation Only PRX—Pressure Regulation With X-flow™	COM—Check Valve**	E—Effluent
<p>Example: A 570Z PR Series Sprinkler with a pop-up height of 6" (150mm) with a side-inlet option, would be specified as: 570Z-6P SI PR</p> <p>Example: A 570Z PRX Series Sprinkler with a pop-up height of 6" (150mm) with a side-inlet option, would be specified as: 570Z-6P SI PRX</p>					

*Available for 6" (150mm) and 12" (300mm) models.

**Available with non-side inlet models.
PRX models not recommended for use with PCD nozzles.

Precision™ Series Spray Nozzles

- Radius: 5'-15' (1,5-4,6m)
- Operating Pressure Range: 20-75 psi (1,4-5,2 Bar)
- Arc Options: 60°, 90°, 120°, 150°, 180°, 210°, 240°, 270°, 360°
- Side & Corner Specialty Patterns
- Fits Toro® or Irritrol®, Rain Bird® and Hunter® Spray Bodies

Toro's Precision™ Series Spray Nozzles are the most complete and efficient spray nozzle line available to help irrigation professionals manage water use, eliminate runoff and reduce customer water bills. The Precision™ Spray nozzles 1"/hr. precipitation rate ensures that water is applied more slowly and evenly without sacrificing landscape health. These nozzles are available in a wide selection of arcs and radii, as well as male and female threads, making them ideal for large scale installations and retrofits. The Precision™ Series Spray Nozzles are now also available in pressure-compensating versions, further enhancing the best-in-class spray nozzle in the industry.



Features & Benefits

Patented H²O Chip Technology

Using patented H²O chip technology – and no moving parts – each Precision Series Spray nozzle creates one or more high frequency oscillating streams to achieve the desired arc and radius with 1/3 less water usage.

Maximize Irrigation Efficiency

Precision Spray nozzles deliver an industry first 1"/hr (25mm/hr) precipitation rate, which better matches soil infiltration rate. This lower precipitation rate, along with high distribution uniformity make this nozzle family the most efficient nozzle from 5'-15' (1,5-4,6m).

Pressure-Compensating Versions Available

Pressure-Compensating Precision™ Series Spray Nozzles maintain 1"/hr (25mm/hr.) precipitation rate and minimizes misting up to inlet pressures to more than 40 PSI, minimizing the need for a regulating head, at fraction of the cost.

Design and Retrofit Effectiveness

The lower flow rate of Precision Series spray nozzles maximizes design efficiency and saves on overall material costs by using fewer valves and less controller stations. In addition, existing systems with low pressure can be fixed with a simple retrofit of the existing high-flow nozzle.

Third-Party Performance Validation

Precision™ Series Spray nozzles (non-Pressure-Compensating versions only) have been tested and validated in the field and at the Center for Irrigation Technology (CIT).



*Based on internal flow rate test data in Riverside, CA.

Precision™ Series Spray Nozzles with Pressure Compensation Device Performs Under Pressure!

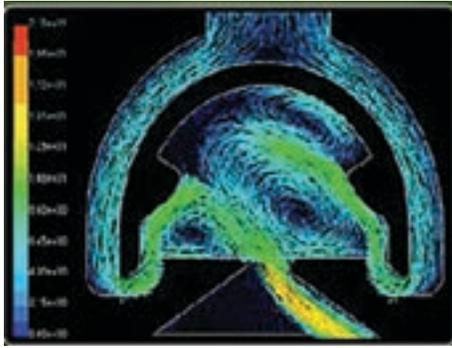


Pressure Compensation Device

The elastomeric PCD disk opens and closes in response to changes in inlet pressure to maintain optimal performance, even when the pressure rises higher than 40 psi. The Pressure-Compensating versions are indicated by the red stamped Toro logo, while the non-Pressure-Compensated versions are indicated by the white stamped Toro logo.



H₂O Chip Technology



Water expands and collapses inside the H₂O Chip created high-frequency oscillating streams which allow for distance of throw using 1/3 less flow.

Specifications

Operating Specifications

- Radius: 5'-15' (1,5-4,6m)
- Operating pressure range: 20-75 psi (1,4-5,2 Bar)
- Recommended Pressure: non-Pressure-Compensating—30 psi (2,1 Bars), Pressure Compensating—50 psi (3,4 Bars)
- Flow Rate: 0.04-2.4 GPM (0,1-9,4 LPM)
- Nozzle trajectory:
 - 5': 5°
 - 8': 10°
 - 10': 15°
 - 12': 20°
 - 15': 27°
 - Corner and Side Strips: 20°

Additional Features

- Specialty Arcs available (60°, 120°, 150°, 210°, 240°)
- Radius reduction 25% maximum
- Color coded for radius on top of the nozzle
- Precipitation rate ≤ 1"/hour (≤ 25mm/hour)
- Maintains precipitation rate as radius is reduced up to max of 25%
- Matched precipitation rate within radius families
- Matched precipitation rates between radius families
- Screen attached to nozzle for easy insertion into the spray body
- Works on all spray bodies

Warranty

- Two years

Precision™ Series Spray Nozzle Model List

5' "O" Nozzle (Red)			8' "O" Nozzle (Green)		
Male	Female	Descrip.	Male	Female	Descrip.
O-T-5-60	O-5-60	60° Arc	O-T-8-60	O-8-60	60° Arc
O-T-5-Q	O-5-Q	90° Arc	O-T-8-Q	O-8-Q	90° Arc
O-T-5-T	O-5-T	120° Arc	O-T-8-T	O-8-T	120° Arc
O-T-5-150	O-5-150	150° Arc	O-T-8-150	O-8-150	150° Arc
O-T-5-H	O-5-H	180° Arc	O-T-8-H	O-8-H	180° Arc
O-T-5-210	O-5-210	210° Arc	O-T-8-210	O-8-210	210° Arc
O-T-5-TT	O-5-TT	240° Arc	O-T-8-TT	O-8-TT	240° Arc
O-T-5-TQ	O-5-TQ	270° Arc	O-T-8-TQ	O-8-TQ	270° Arc
O-T-5-F	O-5-F	360° Arc	O-T-8-F	O-8-F	360° Arc
10' "O" Nozzle (Blue)			12' "O" Nozzle (Brown)		
O-T-10-60	O-10-60	60° Arc	O-T-12-60	O-12-60	60° Arc
O-T-10-Q	O-10-Q	90° Arc	O-T-12-Q	O-12-Q	90° Arc
O-T-10-T	O-10-T	120° Arc	O-T-12-T	O-12-T	120° Arc
O-T-10-150	O-10-150	150° Arc	O-T-12-150	O-12-150	150° Arc
O-T-10-H	O-10-H	180° Arc	O-T-12-H	O-12-H	180° Arc
O-T-10-210	O-10-210	210° Arc	O-T-12-210	O-12-210	210° Arc
O-T-10-TT	O-10-TT	240° Arc	O-T-12-TT	O-12-TT	240° Arc
O-T-10-TQ	O-10-TQ	270° Arc	O-T-12-TQ	O-12-TQ	270° Arc
O-T-10-F	O-10-F	360° Arc	O-T-12-F	O-12-F	360° Arc
15' "O" Nozzle (Black)			Special Patterns (Grey)		
O-T-15-60	O-15-60	60° Arc	Male	Female	
O-T-15-Q	O-15-Q	90° Arc			
O-T-15-T	O-15-T	120° Arc	O-T-4X9-RCS	O-4X9-RCS	Right Corner
O-T-15-150	O-15-150	150° Arc	O-T-4X9-LCS	O-4X9-LCS	Left Corner
O-T-15-H	O-15-H	180° Arc	O-T-4X18-SST	O-4X18-SST	Side Strip
O-T-15-210	O-15-210	210° Arc	O-T-4X15-RCS	O-4X15-RCS	Right Corner
O-T-15-TT	O-15-TT	240° Arc	O-T-4X15-LCS	O-4X15-LCS	Left Corner
O-T-15-TQ	O-15-TQ	270° Arc	O-T-4X30-SST	O-4X30-SST	Side Strip
O-T-15-F	O-15-F	360° Arc			

Pressure-Compensating Precision™ Series Spray Nozzle Model List

5' "O" Nozzle (Red)			8' "O" Nozzle (Green)		
Male	Female	Descrip.	Male	Female	Descrip.
O-T-5-QP	O-5-QP	90° Arc	O-T-8-QP	O-8-QP	90° Arc
O-T-5-TP	O-5-TP	120° Arc	O-T-8-TP	O-8-TP	120° Arc
O-T-5-HP	O-5-HP	180° Arc	O-T-8-HP	O-8-HP	180° Arc
O-T-5-TTP	O-5-TTP	240° Arc	O-T-8-TTP	O-8-TTP	240° Arc
O-T-5-TQP	O-5-TQP	270° Arc	O-T-8-TQP	O-8-TQP	270° Arc
O-T-5-FP	O-5-FP	360° Arc	O-T-8-FP	O-8-FP	360° Arc
10' "O" Nozzle (Blue)			12' "O" Nozzle (Brown)		
O-T-10-QP	O-10-QP	90° Arc	O-T-12-QP	O-12-QP	90° Arc
O-T-10-TP	O-10-TP	120° Arc	O-T-12-TP	O-12-TP	120° Arc
O-T-10-HP	O-10-HP	180° Arc	O-T-12-HP	O-12-HP	180° Arc
O-T-10-TTP	O-10-TTP	240° Arc	O-T-12-TTP	O-12-TTP	240° Arc
O-T-10-TQP	O-10-TQP	270° Arc	O-T-12-TQ	O-12-TQP	270° Arc
O-T-10-FP	O-10-FP	360° Arc	O-T-12-FP	O-12-FP	360° Arc
15' "O" Nozzle (Black)			Special Patterns (Grey)		
O-T-15-QP	O-15-QP	90° Arc	Male	Female	
O-T-15-TP	O-15-TP	120° Arc			
O-T-15-HP	O-15-HP	180° Arc	O-T-4X9-RCSP	O-4X9-RCSP	Right Corner
O-T-15-TTP	O-15-TTP	240° Arc	O-T-4X9-LCSP	O-4X9-LCSP	Left Corner
O-T-15-TQP	O-15-TQP	270° Arc	O-T-4X18-SSTP	O-4X18-SSTP	Side Strip
O-T-15-FP	O-15-FP	360° Arc	O-T-4X15-RCSP	O-4X15-RCSP	Right Corner
			O-T-4X15-LCSP	O-4X15-LCSP	Left Corner
			O-T-4X30-SSTP	O-4X30-SSTP	Side Strip

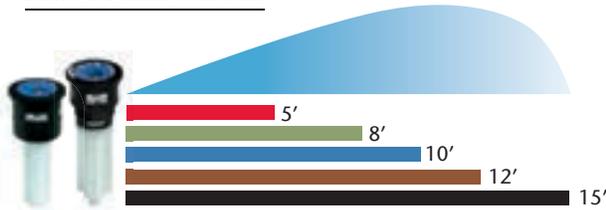
Specifying Information-Precision™ Series Spray Nozzle

O-X-XXXX-XXXXP							
Nozzle	Thread	Radius			Arc	Body	PCD
O	T	XXXX			XXXX		P
O—1" Per Hour	T—Toro Male - Threaded Nozzle Blank—Female-Threaded Nozzle	5—5' (1,5m)	8—8' (2,4m)	10—10' (3,0m)	60—60** Q—90° T—120° 150—150** H—180° 210—210** TT—240° TQ—270° F-360—Full-circle LCS—Left Corner RCS—Right Corner SST—Side Strip	Call out body as required	P—Pressure Compensating
Example: A female threaded Precision™ Series Spray with a spray radius of 12' (3,7m) and a 90° arc would be specified as: O-12-Q Example 2: A male threaded Pressure-Compensating Precision™ Series Spray with a spray radius of 10' (3,0m) and a 180° arc would be specified as O-T-10-HP							

*Not available with Pressure-Compensation.

Precision™ Series Spray Nozzles

5 Radii Available In
Male & Female Threads



9 Arcs Plus Side and Corner Strips Available



60°* 90° 120° 150°* 180° 210°* 240° 270° 360°



LCS
(Left Corner Strip)



SST
(Side Strip)



RCS
(Right Corner Strip)

* Not available with Pressure-Compensation

Performance Data Pressure-Compensating Precision™ Series Spray Nozzles

Arc	PSI	GPM	Radius	Precip. Rate ☒ (in./hr.)	Precip. Rate ▲ (in./hr.)
5Q	40	0.06	4.6	1.0	1.2
	50	0.08	5.1	1.2	1.4
	60	0.09	5.6	1.3	1.5
	70	0.11	6.2	1.5	1.7
5T	40	0.07	4.4	1.0	1.1
	50	0.11	4.9	1.3	1.5
	60	0.15	5.5	1.7	2.0
5H	40	0.10	4.4	1.0	1.2
	50	0.13	4.9	1.1	1.3
	60	0.16	5.4	1.3	1.5
5TT	40	0.14	4.3	1.1	1.3
	50	0.20	4.9	1.3	1.5
	60	0.25	5.4	1.4	1.7
5TQ	40	0.15	4.3	1.0	1.2
	50	0.21	4.9	1.2	1.4
	60	0.26	5.6	1.4	1.6
5F	40	0.17	4.0	1.0	1.2
	50	0.24	4.8	1.1	1.3
	60	0.31	5.5	1.2	1.4
	70	0.38	6.3	1.3	1.5

Arc	PSI	GPM	Radius	Precip. Rate ☒ (in./hr.)	Precip. Rate ▲ (in./hr.)
8Q	40	0.14	7.0	1.1	1.3
	50	0.17	7.7	1.2	1.3
	60	0.20	8.4	1.2	1.4
	70	0.23	9.1	1.3	1.4
8T	40	0.20	7.6	1.0	1.2
	50	0.24	8.0	1.1	1.3
	60	0.27	8.5	1.2	1.4
	70	0.31	8.9	1.3	1.5
8H	40	0.26	7.0	1.0	1.2
	50	0.33	7.6	1.1	1.3
	60	0.39	8.1	1.2	1.4
	70	0.46	8.7	1.3	1.4
8TT	40	0.34	7.0	1.0	1.1
	50	0.43	7.8	1.1	1.2
	60	0.52	8.5	1.2	1.4
	70	0.61	9.3	1.3	1.5
8TQ	40	0.41	7.2	1.0	1.1
	50	0.48	7.9	1.1	1.2
	60	0.55	8.6	1.1	1.3
	70	0.62	9.3	1.2	1.4
8F	40	0.55	7.0	1.1	1.2
	50	0.65	7.5	1.1	1.2
	60	0.74	8.0	1.1	1.3
	70	0.84	8.5	1.1	1.3

Arc	PSI	GPM	Radius	Precip. Rate ☒ (in./hr.)	Precip. Rate ▲ (in./hr.)
10Q	40	0.26	9.5	1.0	1.1
	50	0.28	10.0	1.1	1.2
	60	0.29	10.5	1.1	1.3
	70	0.31	11.1	1.2	1.4
10T	40	0.31	9.5	1.0	1.1
	50	0.36	10.0	1.1	1.2
	60	0.41	10.5	1.2	1.4
	70	0.46	11.0	1.3	1.5
10H	40	0.48	9.7	1.0	1.1
	50	0.53	10.1	1.1	1.2
	60	0.57	10.4	1.1	1.3
	70	0.62	10.8	1.2	1.4
10TT	40	0.63	9.6	1.0	1.1
	50	0.70	9.9	1.1	1.2
	60	0.77	10.3	1.1	1.3
	70	0.84	10.6	1.2	1.4
10TQ	40	0.71	9.5	1.0	1.1
	50	0.77	9.9	1.0	1.2
	60	0.82	10.3	1.1	1.2
	70	0.88	10.7	1.1	1.3
10F	40	0.95	9.6	1.0	1.1
	50	1.06	10.0	1.1	1.2
	60	1.16	10.5	1.1	1.3
	70	1.27	10.9	1.2	1.4

Arc	PSI	GPM	Radius	Precip. Rate ☒ (in./hr.)	Precip. Rate ▲ (in./hr.)
12Q	40	0.34	12.0	1.0	1.2
	50	0.39	12.2	1.1	1.3
	60	0.43	12.5	1.2	1.3
	70	0.48	12.7	1.2	1.4
12T	40	0.46	11.5	1.0	1.2
	50	0.50	11.8	1.0	1.2
	60	0.54	12.0	1.1	1.3
	70	0.58	12.3	1.1	1.3
12H	40	0.70	11.5	1.0	1.2
	50	0.75	11.8	1.0	1.2
	60	0.80	12.2	1.1	1.2
12TT	40	0.90	11.4	1.0	1.2
	50	1.03	11.5	1.1	1.3
	60	1.16	11.5	1.2	1.3
	70	1.29	11.6	1.2	1.4
12TQ	40	1.05	11.4	1.0	1.2
	50	1.14	11.7	1.0	1.2
	60	1.23	12.0	1.1	1.3
	70	1.32	12.3	1.1	1.3
12F	40	1.35	11.5	1.0	1.1
	50	1.49	11.8	1.0	1.2
	60	1.63	12.2	1.1	1.3
	70	1.77	12.5	1.1	1.3

Arc	PSI	GPM	Radius	Precip. Rate ☒ (in./hr.)	Precip. Rate ▲ (in./hr.)
15Q	40	0.53	14.2	1.0	1.2
	50	0.59	14.5	1.1	1.2
	60	0.64	14.8	1.1	1.3
	70	0.70	15.1	1.2	1.3
15T	40	0.72	14.3	1.0	1.2
	50	0.77	14.8	1.0	1.2
	60	0.82	15.2	1.1	1.2
	70	0.87	15.7	1.1	1.2
15H	40	1.10	14.5	1.0	1.2
	50	1.20	14.3	1.1	1.2
	60	1.29	14.0	1.1	1.3
	70	1.39	13.8	1.2	1.3
15TT	40	1.45	14.5	1.0	1.2
	50	1.57	14.8	1.0	1.2
	60	1.68	15.0	1.1	1.2
	70	1.80	15.3	1.1	1.3
15TQ	40	1.60	14.0	0.9	1.0
	50	1.70	14.4	1.0	1.1
	60	1.80	14.8	1.0	1.2
	70	1.90	15.1	1.1	1.2
15F	40	2.20	14.5	1.0	1.2
	50	2.36	14.8	1.0	1.2
	60	2.52	15.1	1.1	1.2
	70	2.68	15.4	1.1	1.3

Arc	PSI	GPM	Radius	Precip. Rate ☒ (in./hr.)	Precip. Rate ▲ (in./hr.)
4X30 SST	40	0.62	4x30	1.0	1.1
	50	0.65	4x30	1.0	1.2
	60	0.67	4x30	1.1	1.3
	70	0.70	4x30	1.1	1.3
4X15 LCS	40	0.32	4x15	1.0	1.2
	50	0.33	4x15	1.1	1.2
	60	0.34	4x15	1.1	1.3
	70	0.35	4x15	1.2	1.3
4X15 RCS	40	0.32	4x15	1.0	1.2
	50	0.33	4x15	1.1	1.2
	60	0.34	4x15	1.1	1.3
	70	0.35	4x15	1.2	1.3
4X18 SST	40	0.36	4X18	1.0	1.1
	50	0.37	4X18	1.0	1.2
	60	0.38	4X18	1.0	1.2
	70	0.39	4X18	1.0	1.2
4X9 LCS	40	0.18	4X9	1.0	1.1
	50	0.19	4X9	1.1	1.2
	60	0.20	4X9	1.1	1.2
	70	0.21	4X9	1.2	1.3
4X9 RCS	40	0.18	4X9	1.0	1.2
	50	0.19	4X9	1.1	1.2
	60	0.20	4X9	1.1	1.2
	70	0.21	4X9	1.2	1.3

Performance Data Precision™ Series Spray Nozzles

Arc	PSI	GPM	Radius	Precip.Rate ☒ (in./hr.)	Precip. Rate ▲ (in./hr.)	Arc	PSI	GPM	Radius	Precip.Rate ☒ (in./hr.)	Precip. Rate ▲ (in./hr.)	Arc	PSI	GPM	Radius	Precip.Rate ☒ (in./hr.)	Precip. Rate ▲ (in./hr.)
5-60° ▲	20	0.04	4.7	1.0	1.15	8-60° ▲	20	0.10	7.6	1.0	1.2	10-60° ▲	20	0.16	9.5	1.0	1.2
	30	0.04	5.0	1.0	1.15		30	0.11	8.0	1.0	1.1		30	0.17	10.0	1.0	1.1
	40	0.04	5.0	1.0	1.15		40	0.12	8.1	1.1	1.2		40	0.18	10.0	1.0	1.2
	50	0.05	5.3	1.0	1.14		50	0.13	8.3	1.1	1.3		50	0.19	10.0	1.1	1.3
5Q ■	20	0.06	4.6	1.0	1.18	8Q ■	20	0.14	7.0	1.1	1.3	10Q ■	20	0.26	9.5	1.0	1.1
	30	0.06	5.0	1.0	1.14		30	0.17	8.0	1.0	1.1		30	0.23	10.0	1.0	1.2
	40	0.07	5.0	1.0	1.16		40	0.18	8.2	1.0	1.2		40	0.28	10.2	1.0	1.2
	50	0.07	5.0	1.0	1.17		50	0.18	8.4	1.0	1.1		50	0.28	10.3	1.0	1.2
5T ■	20	0.07	4.4	1.0	1.17	8T ■	20	0.20	7.6	1.0	1.2	10T ■	20	0.31	9.5	1.0	1.1
	30	0.09	5.0	1.0	1.20		30	0.22	8.0	1.0	1.1		30	0.34	10.0	1.0	1.1
	40	0.09	5.2	1.0	1.15		40	0.23	8.2	1.0	1.1		40	0.36	10.0	1.0	1.2
	50	0.10	5.4	1.0	1.13		50	0.24	8.3	1.0	1.1		50	0.37	10.0	1.1	1.2
5-150° ■	20	0.07	4.0	1.0	1.18	8-150° ■	20	0.25	7.5	1.0	1.2	10-150° ■	20	0.41	9.8	1.0	1.1
	30	0.11	5.0	1.0	1.19		30	0.27	8.0	1.0	1.1		30	0.43	10.0	1.0	1.1
	40	0.12	5.2	1.0	1.20		40	0.28	8.1	1.0	1.1		40	0.44	10.2	1.0	1.1
	50	0.13	5.4	1.0	1.20		50	0.29	8.2	1.0	1.2		50	0.46	10.4	1.0	1.1
5H ■	20	0.10	4.4	1.0	1.15	8H ■	20	0.26	7.0	1.0	1.2	10H ■	20	0.48	9.7	1.0	1.1
	30	0.13	5.0	1.0	1.16		30	0.33	8.0	1.0	1.1		30	0.51	10.0	1.0	1.1
	40	0.14	5.1	1.0	1.15		40	0.34	8.0	1.0	1.2		40	0.55	10.3	1.0	1.2
	50	0.14	5.2	1.0	1.14		50	0.34	8.0	1.0	1.2		50	0.56	10.4	1.0	1.2
5-210° ■	20	0.10	4.4	1.0	1.15	8-210° ■	20	0.33	7.6	1.1	1.3	10-210° ■	20	0.56	9.8	1.1	1.3
	30	0.15	5.2	1.1	1.23		30	0.36	8.0	1.1	1.3		30	0.58	10.0	1.1	1.3
	40	0.16	5.3	1.1	1.27		40	0.37	8.1	1.1	1.3		40	0.60	10.4	1.1	1.2
	50	0.17	5.5	1.1	1.25		50	0.38	8.2	1.1	1.3		50	0.62	10.5	1.1	1.3
5TT ■	20	0.14	4.3	1.1	1.26	8TT ■	20	0.34	7.0	1.0	1.2	10TT ■	20	0.63	9.6	1.0	1.1
	30	0.17	5.0	1.0	1.13		30	0.44	8.0	1.0	1.1		30	0.69	10.0	1.0	1.2
	40	0.19	5.0	1.1	1.23		40	0.46	8.0	1.0	1.2		40	0.73	10.3	1.0	1.1
	50	0.19	5.0	1.1	1.25		50	0.46	8.0	1.0	1.2		50	0.74	10.4	1.0	1.1
5TQ ■	20	0.15	4.3	1.0	1.17	8TQ ■	20	0.41	7.2	1.0	1.1	10TQ ■	20	0.71	9.5	1.0	1.1
	30	0.20	5.0	1.0	1.16		30	0.49	8.0	1.1	1.1		30	0.79	10.0	1.0	1.1
	40	0.21	5.0	1.1	1.21		40	0.54	8.0	1.1	1.2		40	0.84	10.3	1.0	1.1
	50	0.22	5.0	1.1	1.27		50	0.55	8.0	1.1	1.2		50	0.86	10.4	1.0	1.1
5F ●	20	0.17	4.0	1.0	1.18	8F ●	20	0.55	7.0	1.1	1.2	10F ●	20	0.95	9.6	1.0	1.1
	30	0.26	5.0	1.0	1.16		30	0.66	8.0	1.0	1.1		30	1.03	10.0	1.0	1.1
	40	0.26	5.0	1.0	1.16		40	0.68	8.0	1.0	1.2		40	1.08	10.3	1.0	1.1
	50	0.26	5.0	1.0	1.16		50	0.71	8.0	1.1	1.2		50	1.12	10.4	1.0	1.2
Arc	PSI	GPM	Radius	Precip.Rate ☒ (in./hr.)	Precip. Rate ▲ (in./hr.)	Arc	PSI	GPM	Radius	Precip.Rate ☒ (in./hr.)	Precip. Rate ▲ (in./hr.)	Arc	PSI	GPM	Radius	Precip.Rate ☒ (in./hr.)	Precip. Rate ▲ (in./hr.)
12-60° ▲	20	0.24	11.5	1.0	1.2	15-60° ▲	20	0.35	14.0	1.0	1.2	4X30 SST	20	0.62	4x28	1.0	1.1
	30	0.25	12.0	1.0	1.2		30	0.39	15.0	1.0	1.2		30	0.66	4x30	1.1	1.2
	40	0.26	12.1	1.0	1.2		40	0.40	15.1	1.0	1.2		40	0.67	4x30	1.1	1.2
	50	0.28	12.2	1.1	1.3		50	0.42	15.3	1.0	1.2		50	0.68	4x30	1.1	1.3
12Q ■	20	0.34	12.0	1.0	1.2	15Q ■	20	0.53	14.2	1.0	1.2	4X15 LCS	20	0.32	4x15	1.0	1.2
	30	0.37	12.1	1.0	1.1		30	0.58	15.0	1.0	1.1		30	0.33	4x15	1.1	1.2
	40	0.39	11.4	1.0	1.2		40	0.60	15.1	1.0	1.2		40	0.34	4x15	1.1	1.3
	50	0.39	12.0	1.0	1.1		50	0.61	15.3	1.0	1.2		50	0.34	4x15	1.1	1.3
12T ■	20	0.46	11.5	1.0	1.2	15T ■	20	0.72	14.3	1.0	1.2	4X15 RCS	20	0.32	4x15	1.0	1.2
	30	0.49	12.0	1.0	1.1		30	0.77	15.0	1.0	1.1		30	0.33	4x15	1.1	1.2
	40	0.51	12.2	1.0	1.1		40	0.81	15.3	1.0	1.2		40	0.34	4x15	1.1	1.3
	50	0.52	12.3	1.0	1.1		50	0.82	15.4	1.0	1.2		50	0.34	4x15	1.1	1.3
12-150° ■	20	0.60	11.6	1.0	1.2	15-150° ■	20	0.92	14.7	1.0	1.2	4X18 SST	20	0.36	4X18	1.0	1.1
	30	0.62	12.0	1.0	1.2		30	0.96	15.0	1.0	1.2		30	0.37	4X18	1.0	1.1
	40	0.63	12.2	1.0	1.1		40	1.00	15.2	1.0	1.2		40	0.38	4X18	1.0	1.2
	50	0.64	12.3	1.0	1.1		50	1.10	15.3	1.1	1.3		50	0.38	4X18	1.0	1.2
12H ■	20	0.70	11.5	1.0	1.2	15H ■	20	1.10	14.5	1.0	1.2	4X9 LCS	20	0.18	4X9	1.0	1.1
	30	0.74	12.0	1.0	1.1		30	1.16	15.0	1.0	1.1		30	0.19	4X9	1.0	1.2
	40	0.79	12.3	1.0	1.2		40	1.25	15.4	1.0	1.2		40	0.20	4X9	1.1	1.2
	50	0.80	12.4	1.0	1.2		50	1.28	15.5	1.0	1.2		50	0.20	4X9	1.1	1.1
12-210° ■	20	0.76	11.6	1.1	1.3	15-210° ■	20	1.15	14.5	1.1	1.2	4X9 RCS	20	0.18	4X9	1.0	1.2
	30	0.82	12.0	1.1	1.3		30	1.20	15.0	1.0	1.2		30	0.19	4X9	1.0	1.2
	40	0.84	12.3	1.1	1.2		40	1.30	15.5	1.0	1.2		40	0.20	4X9	1.1	1.2
	50	0.85	12.4	1.1	1.2		50	1.40	15.6	1.1	1.3		50	0.20	4X9	1.1	1.2
12TT ■	20	0.90	11.4	1.0	1.2	15TT ■	20	1.45	14.5	1.0	1.2						
	30	0.99	12.0	1.0	1.1		30	1.54	15.0	1.0	1.1						
	40	1.04	12.3	1.0	1.1		40	1.58	15.2	1.0	1.1						
	50	1.05	12.4	1.0	1.1		50	1.61	15.3	1.0	1.1						
12TQ ■	20	1.05	11.4	1.0	1.2	15TQ ■	20	1.72	14.5	1.0	1.2						
	30	1.15	12.0	1.0	1.2		30	1.78	15.0	1.0	1.1						
	40	1.19	12.2	1.0	1.2		40	1.82	15.0	1.0	1.2						
	50	1.22	12.3	1.0	1.2		50	1.90	15.3	1.0	1.2						
12F ●	20	1.35	11.5	1.0	1.1	15F ●	20	2.20	14.5	1.0	1.2						
	30	1.48	12.0	1.0	1.1		30	2.31	15.0	1.0	1.1						
	40	1.59	12.4	1.0	1.1		40	2.35	15.2	1.0	1.1						
	50	1.60	12.5	1.0	1.1		50	2.40	15.3	1.0	1.1						

Precision™ Series Rotating Nozzles

- Radius: 14'-26' (4,3-8,0m)
- Operating Pressure Range: 20-75 psi (1,4-5,2 Bar)
- 45°-360° Arc Settings
- Fit Toro® or Irritrol®, Rain Bird® and Hunter® Spray Bodies

Based off the design of the world's leading gear-driven rotor for golf applications, the Precision Series Rotating Nozzle is powered by a proven gear drive and delivers wind resistant, multi-stream, multi-trajectory patterns.

Female-threaded
PRN-A



Male-threaded
PRN-TA



Female-threaded
PRN-F



Male-threaded
PRN-TF



Adjustment
Tool

Water Management Highlight



Precision Series Rotating Nozzles supply matched precipitation with any arc and any radius from 14 to 26 feet (4,3m-8,0m). Water is applied slowly and evenly to reduce runoff and wasted water.

Features & Benefits

Gear-Driven

Utilizes a proven planetary gear drive, variable stator and turbine to rotate the nozzle.

Fewer Models

Only two male-threaded nozzles and two female-threaded nozzles are required to cover radius range from 14-26 feet (4,3m-8,0m) and arc range from 45-360°.

Matched Precipitation Rate of 0.55"/hr. (14 mm/hr.)

These nozzles deliver water more slowly and evenly than standard spray nozzles. The precipitation rate of 0.55"/hr. (14 mm/hr.) helps prevent excess run times often set to stay within watering windows.

Consistent Speed of Rotation

The gear drive mechanism delivers a consistent speed of rotation regardless of system pressure and prevents product stalling at low pressure.

Step-Up™ Technology



Step-Up™ Technology is designed to deliver high uniformity with matched precipitation for in-close watering all the way out to the furthest radius point. The unique "steps" create 15 streams, each designed to cover an area of the pattern.

Specifications

Operating Specifications

- Radius: 14'-26' (4,3-7,9m)
- Operating pressure range: 20-75 psi (1,4-5,2 Bar)
- Recommended Pressure: 40-50 psi (2,8-3,5 Bar)
- Flow Rate: 0.17-3.68 GPM (1,4-14 LPM)

Additional Features

- 15 unique streams with different trajectories
- Maximum height of 20° trajectory to fight through wind
- Threads onto nearly all sprayheads and shrub adapters (male or female)
- Pre-attached screen for easy installation
- Radius reduction up to 25% by turning set screw 90°
- Color coded to identify adjustable or full circle
- Precipitation rate = 0.55"/hr. (14 mm/hr.) on square spacing plans
- Maintains precipitation rate as radius is reduced
- Matched precipitation from 14-26 feet (4,3-7,9m)
- Matched precipitation from 20-75 psi (1,4-5,2 Bar)
- Adjustable by hand or with included tool
- Consistent speed of rotation not affected by pressure

Warranty

- Five years

Precision Series Rotating Nozzle Model List

Male Threaded	Description
• PRN-TA	Toro Threaded, 14-26 feet (4,3-7,9m), Adjustable from 45°-270°
• PRN-TF	Toro Threaded, 14-26 feet (4,3-7,9m), Full-Circle
Female Threaded	Description
• PRN-A	Threaded, 14-26 feet (4,3-7,9m), Adjustable from 45°-270°
• PRN-F	Threaded, 14-26 feet (4,3-7,9m), Full-Circle

Precision™ Series Rotating Nozzle Visual Arc Adjustment



The unique adjustment method allows for pre-setting of arc by hand or tool before the nozzle is installed. Visual indicators allow the user to quickly adjust the arc pattern to the desired arc from 45-270°. The adjustment band can be adjusted by hand or with the pre-included tool.

Performance Data—Precision™ Series Rotating Nozzles—US

Arc	PSI	GPM	Radius	Precip. Rate ☒ (in./hr.)	Precip. Rate ▲ (in./hr.)
45°	20	0.17	14.0	0.67	0.77
	30	0.19	15.0	0.65	0.75
	40	0.25	17.0	0.67	0.77
	50	0.31	18.5	0.70	0.81
	60	0.35	19.5	0.71	0.82
	75	0.43	22.0	0.68	0.79
90°	20	0.43	16.0	0.65	0.75
	30	0.49	17.5	0.62	0.71
	40	0.62	20.5	0.57	0.66
	50	0.75	22.5	0.57	0.66
	60	0.82	23.5	0.57	0.66
	75	0.92	25.0	0.57	0.65
120°	20	0.48	16.4	0.69	0.79
	30	0.57	17.5	0.72	0.83
	40	0.78	20.2	0.55	0.64
	50	0.97	22.5	0.55	0.64
	60	1.07	23.5	0.56	0.65
	75	1.18	25.0	0.55	0.63
180°	20	0.83	15.0	0.71	0.82
	30	0.94	17.0	0.63	0.72
	40	1.22	20.5	0.56	0.65
	50	1.46	22.5	0.56	0.64
	60	1.61	24.0	0.54	0.62
	75	1.81	26.0	0.52	0.60
240°	20	1.12	15.0	0.72	0.83
	30	1.27	17.0	0.63	0.73
	40	1.56	20.0	0.56	0.65
	50	1.80	21.5	0.56	0.65
	60	1.95	22.5	0.56	0.64
	75	2.20	24.0	0.55	0.64
270°	20	1.08	14.0	0.71	0.81
	30	1.23	16.0	0.62	0.71
	40	1.62	19.0	0.57	0.66
	50	2.00	21.5	0.55	0.64
	60	2.26	23.0	0.55	0.63
	75	2.60	25.0	0.53	0.61
360°	20	1.81	15.0	0.77	0.89
	30	2.00	17.2	0.65	0.75
	40	2.56	20.9	0.56	0.65
	50	3.09	22.9	0.57	0.65
	60	3.34	23.8	0.57	0.66
	75	3.68	25.6	0.54	0.62

Nozzle data subject to change.

Specifying Information—Precision Series Rotating Nozzle

PRN-XX		
Model	Thread	Model
PRN	X	X
PRN—Precision Rotating Nozzle	T—Male Thread Blank—Female Thread	A—Adjustable arc F— Full-circle
Example: A male threaded Precision Series Rotating nozzle with a 24' (7,31m) radius and a 180° arc would be specified as: PRN-TA A female threaded Precision Series Rotating nozzle with a 20' (6,1)radius and 360° arc would be specified as: PRN-F		

Note: For optimal performance in dirty water applications, a minimum of 120 mesh primary filtration is recommended.

MPR Plus Spray Nozzles

- Radius: 5'-15' (1,5-4,6m)
- Operating Pressure Range: 20-75 psi (1,4-5,2 Bar)
- Matched Precipitation

MPR Nozzles make design and installation easier than ever. Just pick your spacing and choose your arc - the nozzle does everything else.



- Side & Corner Specialty Patterns
- Arc Options: 90°, 120°, 180°, 240°, 270°, 360°
- Fit Toro® Spray Bodies

Features & Benefits

Matched Precipitation Rates

Ensure all nozzles (every arc within a family) apply water at approximately the same rate.

Low Flow Rates

Allow for more sprinklers to be placed on the same zone.

Pre-installed Pressure Compensation Device (PCD)

Eliminate fogging, conserve water and provide precise flow rates (also available without PC Devices).

Complete Selection Of Arcs

Arcs for all radius options – full, 3/4, 2/3, 1/2, 1/3 and 1/4.

Specifications

Operating Specifications

- Operating pressure range: 20-75 psi (1,4-5,2 Bar)
- Recommended pressure: 30 psi (2,1 Bar)
- Flow Rate: 0.05 – 4.58 GPM (0,2-17,3 LPM)
- Nozzle trajectory:
 - 5': 5° - 8': 10° - 10': 17° - 12': 24° - 15': 28°
 - Corner and Side Strips: 17°
 - 8' Flat Spray: 0°

Additional Features

- Standard and special spray patterns
- Customized screens for each nozzle
- Patterns for small areas: full set of arcs for 10', 8' and 5' (3,0m, 2,4m, and 1,5m) radius nozzles
- 4' x 18' (1,2-5,2m) side strip ideal for medians
- 2' x 6' (0,6-1,8m) for small planter beds and other narrow areas
- Fine-mesh snap-in filter screens for lower flow nozzles
- Five levels of trajectory
- Convenient nozzle packaging – nozzles and screens packed separately
- Adjustment screw allows up to 25% reduction in radius and complete shutoff

Warranty

- Two years

Specifying Information—MPR Plus

XX-XXX-PC		
Radius	Arc	Optional
XX	XXX	PC
5—5' (1,5m) 8—8' (2,4m) 10—10' (3,0m) 12—12' (3,7m) 15—15' (4,6m)	Q—90° T—120° H—180° TT—240° Q—270° F—360° EST—End Strip CST—Center Strip SST—Side Strip	PC—Pressure Compensation
Example: A 570 MPR Plus Nozzle with a spray of 10' (3,0m), 180° arc and pressure compensation, would be specified as: 10-H-PC		

Note: To specify a MPR Plus nozzle with a 570Z sprinkler body, attach the body specification before the above nozzle specification.

Note: Do not use PCDs with 570Z PR & 570Z PRX models

MPR Plus Spray Nozzle Series Model List

Model	Description	Model	Description
5' (1,5m) MPR Plus Nozzle Red		8' (2,4m) MPR Plus Nozzle Green	
5Q	90° Arc	8Q	90° Arc
5T	120° Arc	8T	120° Arc
5H	180° Arc	8H	180° Arc
5TT	240° Arc	8TT	240° Arc
5TQ	270° Arc	8TQ	270° Arc
5F	360° Arc	8F	360° Arc
8' (2,4m) Flat Spray Black		10' (3,0m) MPR Plus Nozzle Blue	
FSQ	90° Arc	10Q	90° Arc
FSH	180° Arc	10T	120° Arc
FSF	360° Arc	10H	180° Arc
FSQ-LG	90° Arc, Low GPM	10TT	240° Arc
FSH-LG	180° Arc, Low GPM	10TQ	270° Arc
FSF-LG	360° Arc, Low GPM	10F	360° Arc
12' (3,7m) MPR Plus Nozzle Brown		Special Patterns Orange	
12Q	90° Arc	4SST	Side Strip 4'x30' (1,2-9,1m)
12T	120° Arc	4EST	End Strip 4'x15' (1,2-4,3m)
12H	180° Arc	4CST	Center Strip 4'x30' (1,2-6,1m)
12TT	240° Arc	9SST	Side Strip 9'x18' (2,7-5,2m)
12TQ	270° Arc	4SSST	Side Strip 4'x18' (1,2-5,2m)
12F	360° Arc	2SST	Side Strip 2' x 6' (0,6-1,8m)
15' (4,6m) MPR Plus Nozzle Black			
15Q	90° Arc		
15T	120° Arc		
15H	180° Arc		
15TT	240° Arc		
15TQ	270° Arc		
15F	360° Arc		

(Note: All above also available in Pressure Compensating (PC) Models)

Performance Data-MPR Plus Spray Nozzles—US

5' Series with 5° Trajectory—Red

Arc	Desc.	psi	GPM	Radius	Prec. Rate	
					▲	▣
90°	5-Q	20	0.05	4	1.40	1.21
		30	0.09	5	1.61	1.40
		40	0.12	6	1.78	1.54
		50	0.15	6	1.86	1.62
5-Q-PC	30-40	0.09	5	1.61	1.40	
	40-75	0.10	5	1.79	1.55	
120°	5-T	20	0.07	4	1.47	1.27
		30	0.12	5	1.61	1.40
		40	0.16	6	1.78	1.54
		50	0.20	6	1.86	1.62
5-T-PC	30-40	0.12	5	1.61	1.40	
	40-75	0.13	5	1.79	1.55	
180°	5-H	20	0.10	4	1.40	1.21
		30	0.19	5	1.70	1.47
		40	0.23	6	1.70	1.47
		50	0.27	6	1.68	1.45
5-H-PC	30-40	0.18	5	1.61	1.40	
	40-75	0.20	5	1.79	1.55	
240°	5-TT	20	0.15	4	1.57	1.36
		30	0.25	5	1.68	1.45
		40	0.30	6	1.66	1.44
		50	0.35	6	1.63	1.41
5-TT-PC	30-40	0.23	5	1.54	1.34	
	40-75	0.27	5	1.81	1.57	
270°	5-TQ	20	0.20	4	1.86	1.61
		30	0.29	5	1.73	1.50
		40	0.34	6	1.68	1.45
		50	0.40	6	1.66	1.44
5-TQ-PC	30-40	0.26	5	1.55	1.34	
	40-75	0.29	5	1.73	1.50	
360°	5-F	20	0.25	4	1.75	1.51
		30	0.38	5	1.70	1.47
		40	0.45	6	1.66	1.44
		50	0.53	6	1.65	1.43
5-F-PC	30-40	0.35	5	1.57	1.36	
	40-75	0.39	5	1.75	1.51	

8' Series with 10° Trajectory—Green

Arc	Desc.	psi	GPM	Radius	Prec. Rate	
					▲	▣
90°	8-Q	20	0.17	7	1.55	1.34
		30	0.24	8	1.68	1.45
		40	0.26	9	1.61	1.39
		50	0.29	9	1.60	1.39
8-Q-PC	30-40	0.22	8	1.54	1.33	
	40-75	0.25	8	1.75	1.51	
120°	8-T	20	0.23	7	1.58	1.36
		30	0.30	8	1.57	1.36
		40	0.36	9	1.67	1.45
		50	0.40	9	1.66	1.44
8-T-PC	30-40	0.29	8	1.52	1.32	
	40-75	0.35	8	1.84	1.59	
180°	8-H	20	0.37	8	1.47	1.27
		30	0.50	8	1.75	1.51
		40	0.58	9	1.80	1.56
		50	0.65	9	1.80	1.56
8-H-PC	30-40	0.44	8	1.54	1.33	
	40-75	0.50	8	1.75	1.51	
240°	8-TT	20	0.56	7	1.92	1.66
		30	0.70	8	1.84	1.59
		40	0.80	9	1.86	1.61
		50	0.88	9	1.82	1.58
8-TT-PC	30-40	0.59	8	1.55	1.34	
	40-75	0.70	8	1.84	1.59	
270°	8-TQ	20	0.63	7	1.92	1.66
		30	0.76	8	1.77	1.53
		40	0.86	9	1.78	1.54
		50	0.93	9	1.71	1.48
8-TQ-PC	30-40	0.64	8	1.49	1.29	
	40-75	0.70	8	1.63	1.41	
360°	8-F	20	0.74	7	1.69	1.46
		30	1.00	8	1.75	1.51
		40	1.16	9	1.80	1.56
		50	1.30	9	1.80	1.56
8-F-PC	30-40	0.85	8	1.49	1.29	
	40-75	1.00	8	1.75	1.51	

10' Series with 17° Trajectory—Blue

Arc	Desc.	psi	GPM	Radius	Prec. Rate	
					▲	▣
90°	10-Q	20	0.30	9	1.66	1.44
		30	0.40	10	1.79	1.55
		40	0.50	11	1.85	1.60
		50	0.60	12	1.86	1.62
10-Q-PC	30-40	0.33	10	1.48	1.28	
	40-75	0.37	10	1.66	1.43	
120°	10-T	20	0.42	9	1.74	1.51
		30	0.52	10	1.75	1.51
		40	0.65	11	1.80	1.56
		50	0.75	12	1.75	1.51
10-T-PC	30-40	0.44	10	1.48	1.28	
	40-75	0.50	10	1.68	1.45	
180°	10-H	20	0.60	9	1.66	1.44
		30	0.71	10	1.59	1.38
		40	0.85	11	1.57	1.36
		50	0.99	12	1.65	1.43
10-H-PC	30-40	0.66	10	1.48	1.28	
	40-75	0.75	10	1.68	1.45	
240°	10-TT	20	0.71	9	1.47	1.27
		30	0.97	10	1.63	1.41
		40	1.10	11	1.67	1.45
		50	1.19	11	1.65	1.43
10-TT-PC	30-40	0.89	10	1.49	1.29	
	40-75	1.00	10	1.68	1.45	
270°	10-TQ	20	0.82	9	1.51	1.31
		30	1.04	10	1.55	1.34
		40	1.20	11	1.62	1.41
		50	1.35	11	1.66	1.44
10-TQ-PC	30-40	0.99	10	1.48	1.28	
	40-75	1.09	10	1.63	1.41	
360°	10-F	20	1.11	9	1.72	1.49
		30	1.49	10	1.67	1.44
		40	1.61	11	1.63	1.42
		50	1.85	11	1.71	1.48
10-F-PC	30-40	1.33	10	1.49	1.29	
	40-75	1.51	10	1.69	1.46	

12' Series with 24° Trajectory—Brown

Arc	Desc.	psi	GPM	Radius	Prec. Rate	
					▲	▣
90°	12-Q	20	0.40	11	1.48	1.28
		30	0.50	12	1.55	1.35
		40	0.60	13	1.64	1.42
		50	0.63	13	1.67	1.44
12-Q-PC	30-40	0.48	12	1.49	1.29	
	40-75	0.53	12	1.65	1.43	
120°	12-T	20	0.57	11	1.58	1.37
		30	0.72	12	1.68	1.45
		40	0.87	13	1.87	1.62
		50	0.97	13	1.93	1.67
12-T-PC	30-40	0.64	12	1.49	1.29	
	40-75	0.70	12	1.63	1.41	
180°	12-H	20	0.95	11	1.76	1.52
		30	1.09	12	1.69	1.47
		40	1.30	13	1.72	1.49
		50	1.55	14	1.77	1.53
12-H-PC	30-40	0.96	12	1.49	1.29	
	40-75	1.05	12	1.63	1.41	
240°	12-TT	20	1.12	11	1.55	1.35
		30	1.45	12	1.69	1.46
		40	1.63	13	1.75	1.52
		50	1.80	13	1.79	1.55
12-TT-PC	30-40	1.28	12	1.49	1.29	
	40-75	1.40	12	1.63	1.41	
270°	12-TQ	20	1.05	11	1.42	1.23
		30	1.55	12	1.61	1.39
		40	1.65	13	1.58	1.36
		50	1.80	13	1.59	1.38
12-TQ-PC	30-40	1.44	12	1.49	1.29	
	40-75	1.60	12	1.66	1.44	
360°	12-F	20	1.67	11	1.54	1.34
		30	2.19	12	1.70	1.47
		40	2.35	13	1.68	1.46
		50	2.70	13	1.79	1.55
12-F-PC	30-40	1.92	12	1.49	1.29	
	40-75	2.10	12	1.63	1.41	

15' Series with 28° Trajectory—Black

Arc	Desc.	psi	GPM	Radius	Prec. Rate	
					▲	▣
90°	15-Q	20	0.68	14	1.55	1.34
		30	0.85	15	1.69	1.46
		40	1.04	16	1.82	1.57
		50	1.23	16	2.15	1.86
15-Q-PC	30-40	0.75	15	1.49	1.29	
	40-75	0.81	15	1.61	1.40	
120°	15-T	20	0.95	14	1.75	1.52
		30	1.10	15	1.64	1.42
		40	1.30	16	1.82	1.57
		50	1.45	16	2.03	1.75
15-T-PC	30-40	1.00	15	1.49	1.29	
	40-75	1.10	15	1.64	1.42	
180°	15-H	20	1.37	13	1.79	1.55
		30	1.65	15	1.66	1.44
		40	2.02	16	1.77	1.53
		50	2.14	16	1.87	1.62
15-H-PC	30-40	1.50	15	1.49	1.29	
	40-75	1.65	15	1.64	1.42	
240°	15-TT	20	1.78	14	1.59	1.38
		30	2.20	15	1.64	1.42
		40	2.66	16	1.74	1.51
		50	2.84	16	1.86	1.61
15-TT-PC	30-40	2.00	15	1.49	1.29	
	40-75	2.20	15	1.64	1.42	
270°	15-TQ	20	2.10	13	1.85	1.61
		30	2.60	15	1.72	1.49
		40	3.00	16	1.86	1.61
		50	3.40	16	1.98	1.72
15-TQ-PC	30-40	2.30	15	1.53	1.32	
	40-75	2.50	15	1.66	1.44	
360°	15-F	20	2.85	13	1.89	1.63
		30	3.60	15	1.79	1.55
		40	4.20	16	1.84	1.59
		50	4.58	16	2.00	1.73
15-F-PC	30-40	3.00	15	1.49	1.29	
	40-75	3.30	15	1.64	1.42	

Special Patterns—Orange

Pattern	Desc.	psi	GPM	Special Patterns		Prec. Rate*
				Width	Length	
4-EST	4-EST	20	0.38	3'	x 12'	2.03
		30	0.45	4'	x 15'	1.44
		40	0.53	5'	x 18'	1.13
		50	0.60	6'	x 20'	0.96
4-EST-PC	4-EST-PC	30-40	0.43	4'	x 15'	1.38
		40-75	0.50	4'	x 15'	1.61

TVAN Variable Arc Nozzles

- Radius: 8'-17' (2,4-5,2m)
- Operating Pressure Range: 20-50 psi (1,4-3,5 Bar)
- Arc Options: 0°-360° (infinitely adjustable)

Quick, easy and infinitely adjustable!

Toro® Variable Arc Nozzles (TVAN) are designed to deliver excellent irrigation efficiency with maximum product versatility.



Easy Grip Top

The easy grip top makes arc adjustment from 0°-360° a snap

Features & Benefits

Matched Precipitation Rates

Within a given radius family (MPR) ensures all nozzles apply water at approximately the same rate.

Unique Grip And Turn Adjustment

Requires no tools and makes arc setting fast and simple. Adjust from the top of the nozzle – wet or dry.

Infinitely Adjustable From 0° - 360°

The TVAN provides a variety of arc settings to precisely match any terrain and reduces inventory by meeting the needs of any size or shape landscape.

Five Color-coded Nozzles

Allow for quick and easy identification even when retracted.

Specifications

Operating Specifications

- Radius: 8' to 17' (2,4-5,2m)
- Operating pressure range: 20-50 psi (1,4-3,5 Bar)
- Recommended pressure: 30 psi (2,1 Bar)

Additional Features

- Stainless steel adjustment screw allows up to 25% radius reduction
- Nozzle arc adjustment opens from a fixed left stop position indicated by an arrow on the top
- Compatibility with any female threaded riser made, means one nozzle family can meet all your needs

Warranty

- Two years

TVAN Variable Arc Nozzles Model List

Model	Description
TVAN8	8' (2,4m) Variable Arc Pattern
TVAN10	10' (3,0m) Variable Arc Pattern
TVAN12	12' (3,7m) Variable Arc Pattern
TVAN15	15' (4,6m) Variable Arc Pattern
TVAN17	17' (5,2m) Variable Arc Pattern

Specifying Information—TVAN

TVANXX	
Model	Radius
TVAN	XX
TVAN—Toro Variable Arc Nozzle	8—8' (2,4m) Variable Arc Pattern 10—10' (3,0m) Variable Arc Pattern 12—12' (3,7m) Variable Arc Pattern 15—15' (4,6m) Variable Arc Pattern 17—17' (5,2m) Variable Arc Pattern

Example: A TVAN8 nozzle, would be specified as:TVAN8

TVAN Variable Arc Nozzle Performance Data—US

Pattern	PSI	8 Series-Green				10 Series-Blue				12 Series-Brown				15' Series-Black				17' Series-Gray			
		GPM	Rad	Precip. Rate ▲	■	GPM	Rad	Precip. Rate ▲	■	GPM	Rad	Precip. Rate ▲	■	GPM	Rad	Precip. Rate ▲	■	GPM	Rad	Precip. Rate ▲	■
90°	20	0.58	7	5.26	4.56	0.59	9	3.24	2.81	0.76	10	3.38	2.93	1.06	15	2.09	1.81	1.25	16	2.17	1.88
	30	0.71	8	4.93	4.27	0.72	10	3.20	2.77	0.93	12	2.87	2.49	1.29	15	2.55	2.21	1.46	17	2.25	1.95
	40	0.82	9	4.50	3.90	0.84	10	3.73	3.24	1.07	12	3.30	2.86	1.49	16	2.59	2.24	1.68	18	2.31	2.00
	50	0.92	9	5.05	4.38	0.94	10	4.18	3.62	1.21	13	3.18	2.76	1.66	16	2.88	2.50	1.87	18	2.57	2.22
180°	20	0.81	7	3.67	3.18	0.94	9	2.58	2.24	1.35	10	3.00	2.60	1.71	14	1.94	1.68	1.95	15	1.93	1.67
	30	0.99	8	3.44	2.98	1.15	10	2.56	2.21	1.65	12	2.55	2.21	2.08	15	2.05	1.78	2.38	17	1.83	1.59
	40	1.15	8	3.99	3.46	1.33	10	2.96	2.56	1.91	12	2.95	2.55	2.40	15	2.37	2.05	2.74	17	2.11	1.83
270°	50	1.28	9	3.51	3.04	1.49	10	3.31	2.87	2.13	13	2.80	2.43	2.68	15	2.65	2.29	3.06	18	2.10	1.82
	20	1.08	7	3.27	2.83	1.37	9	2.51	2.17	1.90	11	2.33	2.02	2.41	14	1.82	1.58	2.69	14	2.03	1.76
	30	1.33	8	3.08	2.67	1.67	10	2.47	2.14	2.32	12	2.39	2.07	2.94	15	1.94	1.68	3.28	17	1.68	1.46
	40	1.53	8	3.54	3.07	1.92	10	2.85	2.47	2.68	12	2.76	2.39	3.38	15	2.23	1.93	3.76	17	1.93	1.67
360°	50	1.70	9	3.11	2.69	2.15	10	3.19	2.76	2.99	12	3.08	2.67	3.77	16	2.18	1.89	4.19	18	1.92	1.66
	20	1.25	7	2.84	2.46	1.73	9	2.37	2.06	2.27	10	2.52	2.19	2.69	13	1.77	1.53	3.05	17	1.17	1.02
	30	1.52	8	2.64	2.29	2.11	10	2.35	2.03	2.77	12	2.14	1.85	3.26	15	1.61	1.40	3.73	17	1.43	1.24
	40	1.75	9	2.40	2.08	2.42	10	2.69	2.33	3.12	12	2.41	2.09	3.79	15	1.87	1.62	4.26	18	1.46	1.27
	50	1.96	9	2.69	2.33	2.69	10	2.99	2.59	3.47	12	2.68	2.32	4.33	16	1.88	1.63	4.71	18	1.62	1.40

Shaded data indicates optimal operating pressure. Radius shown in feet. Data based on 360°.

Stream Spray Nozzles

- Radius: 13'-22' (4,0-6,7m)



Specifications

Operating Specifications and Features

- Recommended operating pressure range: 20-75 psi (1,4-5,2 Bar)
- Flow Rate: 0.60 – 2.70 GPM (2,3-10,2 LPM)
- Radius adjusts up to 50%
- 10° or 35° Angle
- Non-Rotating

Warranty

Two years

Performance Data 10° Stream Spray—US

Pattern	Desc.	psi	GPM	Radius	Prec. Rate*	
					▲	☒
90°	10-SSQ	20	0.60	14	1.36	1.18
		30	0.80	16	1.39	1.20
		40	0.92	17	1.42	1.23
		50	1.03	18	1.41	1.22
		60-70	0.70	13	1.84	1.60
180°	10-SSH	20	1.00	14	1.13	.98
		30	1.20	16	1.04	.90
		40	1.38	17	1.06	.92
		50	1.55	18	1.06	.92
		60-70	1.40	15	1.38	1.20
360°	10-SSF	20	1.80	14	1.02	.88
		30	2.10	16	.91	.79
		40	2.42	17	.93	.81
		50	2.70	18	.93	.80
		60-70	1.80	13	1.18	1.03

Performance Data 35° Stream Spray—US

Pattern	Desc.	psi	GPM	Radius	Prec. Rate*	
					▲	☒
90°	35-SSQ	20	0.60	18	.82	.71
		30	0.80	20	.89	.77
		40	0.92	21	.93	.80
		50	1.03	22	.95	.82
		60-70	0.70	17	1.08	.93
180°	35-SSH	20	1.00	18	.69	.59
		30	1.20	20	.67	.58
		40	1.38	21	.70	.60
		50	1.55	22	.71	.62
		60-70	1.40	17	1.08	.93
360°	35-SSF	20	1.80	18	.62	.54
		30	2.10	20	.58	.51
		40	2.42	21	.61	.53
		50	2.70	22	.62	.54
		60-70	1.80	17	.69	.60

Note: Stream sprays are not recommended for turf applications. Radius shown in feet. Data based on 360°.

Stream Spray Nozzles Model List

Non-Pressure Compensating	
Model	Description
10-SSQ	90° Arc
10-SSH	180° Arc
10-SSF	360° Arc
35-SSQ	90° Arc
35-SSH	180° Arc
35-SSF	360° Arc
Pressure Compensating	
10-SSQ-PC	90° Arc
10-SSH-PC	180° Arc
10-SSF-PC	360° Arc
35-SSQ-PC	90° Arc
35-SSH-PC	180° Arc
35-SSF-PC	360° Arc

Stream Bubbler Nozzles

- Radius: 1.5'-18' (0,5-5,5m)



Specifications

Operating Specifications and Features

- Recommended operating pressure range: 10-75 psi (0,7-5,2 Bar)
- Flow Rate: 0.49 – 2.02 GPM (1,9-9,0 LPM)
- Fits all Toro spray bodies, shrub adapters, risers and riser extenders

Warranty

Two years

Stream Bubbler Nozzle Performance Data

Pattern	Description	10 psi		20 psi		30 psi		40 psi		50 psi		60 psi	
		GPM	Rad										
2/60°	SB-90	0.49	7	0.70	11	0.86	13	1.00	15	1.12	16	1.23	18
2/60°	SB-90-PC2					0.21	1.5	0.22	1.5	0.23	1.5	0.24	1.5
4/60°	SB-180	0.84	5	1.18	9	1.43	12	1.66	14	1.86	16	2.02	17
4/60°	SB-180-PC2					0.46	2.5	0.49	2.5	0.50	2.5	0.51	2.5
6/60°	SB-360	1.18	3	1.63	6	2.00	8	2.29	9	2.55	10	2.82	11
6/60°	SB-360-PC2					0.74	1.5	0.75	1.5	0.76	1.5	0.77	1.5
2/180°	SB-2-180	0.49	7	0.70	11	0.86	13	1.00	15	1.12	16	1.23	18
2/180°	SB-2-180-PC2					0.21	1.5	0.22	1.5	0.23	1.5	0.24	1.5
2/60x2/60°	SB-4-180	0.84	5	1.18	9	1.43	12	1.66	14	1.86	16	2.02	17
2/60x2/60°	SB-4-180-PC2					0.46	2.5	0.49	2.5	0.50	2.5	0.51	2.5

Radius shown in feet. Data based on 360°.

Stream Bubbler Nozzles Model List

Model	Description
Pressure Compensating	
• SB-90-PC2	90° Arc, 2' Radius
• SB-180-PC2	180° Arc, 2' Radius
• SB-360-PC2	360° Arc, 2' Radius
• SB-2-180-PC2	180° Arc, 2 Stream, 2' Radius
• SB-4-180-PC2	180° Arc, 4 Stream, 2' Radius,

Pressure-Compensating Flood Bubblers



Specifications

Operating Specifications and Features

- Recommended operating pressure range: 20-75 psi (1,4-5,2 Bar)
Maximum pressure: 75 psi (5,2 Bar)
- Flow Rate: Adjustable: 0 – 2.0 GPM (0-7,6 LPM);
Fixed Flow: 0.25, 0.50 and 1.0 GPM (0,9; 1,9; 3,8 LPM)
- Adjustment screw allows up to 25% reduction in radius
- Compatible with shrub adapter, 570Z Series sprinklers, risers and riser extenders

Warranty

Two years

Flood Bubbler Performance Data

Pattern	Model No.	GPM @ 40 psi	GPM @ 50 psi	GPM @ 60 psi
Flood ●	FB25PC	0.25	0.25	0.25
	FB50PC	0.45	0.50	0.50
	FB100PC	0.95	1.00	1.00
	FB200ADJPC	1.90	2.00	2.00

Pressure-compensating Flood Bubblers Model List

Model	Description
FB-25-PC	.25 GPM (0,9 LPM)
FB-50-PC	.50 GPM (1,9 LPM)
FB-100-PC	1.00 GPM (3,8 LPM)
FB-200-ADJ-PC2.00	Adjustable GPM (LPM)

500 Series Bubblers



Specifications

Operating Specifications and Features

- Recommended operating pressure range:
 - Flood: 15-75 psi (1,0-5,2 Bar)
 - Stream: 10-75 psi (0,7-5,2 Bar)
 Maximum pressure: 75 psi (5,2 Bar)
- Flow Rate:
 - Flood: 1.7 – 2.7 GPM (6,4-10,2 LPM)
 - Stream: 1.08 – 3.70 GPM (4,1-14,0 LPM)
- Inlet: ½" (12mm) female thread
- Attaches directly to risers
- Radius adjusts up to 50%

Warranty

Two years

Adjustable Flood Bubbler Nozzle Performance Data—US

Pattern	Model No.	15 psi		20 psi		25 psi		30 psi		35 psi		40 psi	
Universal Flood ●	514-20												
		1.70		2.00		2.20		2.40		2.50		2.70	

500 Series Adjustable Stream Bubbler Nozzle Performance Data—US

Pattern	Model No.	10 psi		20 psi		30 psi		40 psi	
		GPM	Rad	GPM	Rad	GPM	Rad	GPM	Rad
2/60° ☉	511-30	1.08	10	1.52	14	1.87	16	2.10	17
4/60° ☼	512-30	1.50	7	2.11	10	2.58	11	2.98	13
6/60° ☽	514-30	1.89	6	2.61	8	3.20	10	3.70	11
2/180° ☾	516-30	1.08	10	1.52	14	1.87	16	2.10	17

Radius shown in feet. Data based on 360°.

500 Series Bubblers Model List

Model	Description
511-30	90° Arc, Stream Bubbler
512-30	180° Arc, Stream Bubbler
514-30	360° Arc, Stream Bubbler
516-30	180° Arc, 2-stream Bubbler
514-20	Universal Flood Bubbler

Effluent Water Indicators



89-9752

- Lavender snap-on cover for use on 570Z Series pop-up models



102-1211

- Lavender molded cap for use on 570Z Series pop-up models
- Includes wiper seal



102-0563

- (Nozzle not included)
- Lavender molded 570Z Series shrub adapter
- Installs onto a 1/2" (12mm) NPT riser

Serviceable Parts



570SEAL

- Serviceable seal for all 570Z models
- Recommended for upgrades



Check Valve

570CV

- Check valve for all the 570Z models
- Install in field to prevent low head drainage

Risers and Extenders

570-6X



- 570Z Extender
- Male-inlet threads install onto any 570Z pop-up sprinkler or shrub adapter to provide a 6" (15cm) extension
- Maximum pressure: 75 psi (5,2 Bar)

570SR-6 and 570SR-18



- 570Z stationary riser
- 1/2" (12mm) male-threaded inlet for installation on pipe fittings
- Maximum pressure: 75 psi (5,2 Bar)
- Height: 6" (15cm), 18" (45cm)

Tools



89-6395

- Riser pull-up and screen removal tool for all 570Z Series models



102-1777

- X-tool for 570Z XF/PRX Series models for easy nozzle removal and assembly



89-7350

- Adjustment tool for all 570Z Series models



PRNTOOL

- PRN Adjustment Tool for Precision™ Series Rotating Nozzles
- Adjusts arc and radius.



PNOZZTOOL

- Riser Pull Up Tool
- Used on all 570Z Sprays

Super Funny Pipe®

- 20' (6m), 50' (16m), 100' (30,5m) Coils
- Up to 120 psi (8,3 Bar)

Toro® Super Funny Pipe is practical and saves time. Whether you are installing a new system or replacing an old sprinkler, Super Funny Pipe makes the job easier.



Features & Benefits

Flexible, Thick-walled Polyethylene Pipe
Super Funny Pipe is a high-strength poly tubing that solves tough sprinkler installation and replacement problems. It acts as an extension cord between the water line and the sprinkler.

Easy Installation For Problem Areas
One of the most useful and time-saving sprinkler installation aids whether you are installing a new system or replacing an old sprinkler. Also comes pre-assembled as the Super Funny Pipe Swing Joints in 8" (20,3cm) and 12" (30,5cm) lengths or just get the individual fittings as needed.

Specifications

Dimensions

- Wall thickness: .10" ± .01 (2,5mm ± 0,25)
- Inside diameter: .49" ± 0.005 (12,4mm ± 0,13)
- Outside diameter: .70" (17.8mm)

Operating Specifications and Features

- Maximum pressure: 120 psi (8,3 Bar)
- Cushions sprinklers from external impact
- Connects to sprinklers and Toro fittings

Warranty

Two years

Super Funny Pipe Friction Loss Data

	GPM Flow						
GPM	1	2	3	4	5	6	7
PSI Loss	0.01	0.02	0.06	0.09	0.15	0.21	0.27

This chart indicates the amount of pressure loss (psi) per foot of Super Funny Pipe at stated flow rates (GPM).

Super Funny Pipe Model List

Model	Description
850-23	20' (6,1m) Length, 3/8" (9,5mm) Polyethylene Pipe
850-24	50' (15,2m) Coil, 3/8" (9,5mm) Polyethylene Pipe
850-25	100' (30,4m) Coil, 3/8" (9,5mm) Polyethylene Pipe

Super Funny Pipe® Swing Joints

Super Funny Pipe Swing Joints Model List

Model	Description
SPFA-585	8" x 1/2" (200 x 13mm)
SPFA-5875	8" x 3/4" (200 x 20mm)
SPFA-5125	12" x 1/2" (300 x 13mm)
SPFA-51275	12" x 3/4" (300 x 20mm)

Warranty

Two years

Top pair:
12" and 8" Long X 1/2"
(30,5cm and 20,3cm X 13mm)



Bottom pair:
12" and 8" Long X 3/4"
(30,5cm and 20,3cm X 20mm)

Super Funny Pipe® Fittings

Super Funny Pipe Fittings Friction Loss Data

Model No.	Description	GPM Flow						
		1	2	3	4	5	6	7
850-36	3/4" Male Adapter	0.04	0.10	0.23	0.43	0.80	1.37	1.86
850-35	1/2" Male Adapter	0.03	0.06	0.18	0.31	0.60	1.00	1.41
850-31	1/2" Male Elbow	0.05	0.15	0.36	0.62	1.13	1.62	2.37
850-34	1/2" Female Elbow	0.05	0.15	0.36	0.62	1.13	1.62	2.37
850-32	3/4" Male Elbow	0.06	0.18	0.41	0.80	1.42	2.20	3.05

This chart indicates the amount of pressure loss (psi) per foot of Super Funny Pipe at stated flow rates (GPM).

Super Funny Pipe Fittings Model List

Model	Description
850-20	Coupling
850-31	Male Elbow, 1/2" (13mm)
850-32	Male Elbow, 3/4" (20mm)
850-33	Female Adapter, 1/2" - 3/4" (13-20mm)
850-34	Female Elbow, 1/2" (13mm)
850-35	Male Adapter, 1/2" (13mm)
850-36	Male Coupling, 3/4" (20mm)
850-37	Tee, Barbed Inserts
850-60	Saddle Tee, 3/4" (20mm)
850-61	Saddle Tee, 1" (25mm)



Warranty

Two years

Rotors Overview



Model	Mini-8	300 Multi-Stream	T5	TR50XT	T7
Page Number	32-33	34-35	36-37	38-39	40-41
Inlet size	1/2" (13mm)	3/4" (20mm)	3/4" (20mm)	3/4" (20mm)	1" (25mm)
Radius	20'-35' (6,1-10,7m)	15'-33' (4,6-10,1m)	25'-50' (7,6-15,2m)	28'-48' (8,5-14,6m)	40'-75' (12,2 - 22,9m)
Flow Range	0.8-3.40 GPM (3,0-12,9 LPM)	0.57-7.54 GPM (2,0-28,0 LPM)	0.76-9.63 GPM (2,8-36,5 LPM)	1.0-9.8 GPM (3,8-37,0 LPM)	6.7 - 30.6 GPM (25,4-116 LPM)
Operating Pressure Range	30-50 PSI (2,0-3,5 Bar)	35-50 PSI (2,4-3,5 Bar)	25-70 PSI (1,7-4,8 Bar)	30-70 PSI (2,0-4,8 Bar)	40-100 psi (2,8 - 7,0 Bar)
Shrubs/Ground Cover		X	X	X	
Slopes		X	X	X	
Low Pressure	X		X	X	
High Traffic/Vandal Prone Areas				X	
Rubber Cover for Sports Fields			X	X	X
High Wind			X	X	
Full Circle	X	X	X	X	X
Part-circle Adjustable	X		X	X	X
Part-circle Fixed		X			
Part/Full Circle in One	X	X	X	X	X
Stainless Steel Riser				X	X
Check Valve	Optional	Optional	Optional	Standard	Standard
Effluent Water Option		X	X	X	X
Shrub Model		X	X	X	
High Pop Model		X	X	X	
Smart-Arc Memory				X	X
Below Grade				X	X
No Tools Arc Adjustment			X		
Trajectory Adjustment				5°-25°	
X-Flow Water Shut-Off				X	
Standard Pop-Up Height	4" (100mm)	2 3/4" (70)	5" (127mm)	5" (127mm)	5" (127mm)
Warranty	Two Years	Two Years	Five Years	Five Years	Five Years



WaterSmart® Feature



Model	640	TS90	TG101	690
Page Number	43-45	46-47	48-49	50
Inlet size	1" (25mm)	1" (25mm)	2" (50mm)	1½" (37mm)
Radius	47'-67' (14-20m)	53' - 95' (16-29m)	91'-178' (27-54m)	87'-108' (26,5-33m)
Flow Range	6.0-25.0 GPM (23-95 LPM)	14.0-61.5 GPM (53-233 LPM)	42-248 GPM (158-938 LPM)	51.0-82.2 GPM (193-311 LPM)
Operating Pressure Range	40-90 PSI (2,8-6,2 Bar)	40-100 PSI (2,8-7,0 Bar)	50-95 PSI (3,5-6,5 Bar)	80-100 PSI (5,5-7,0 Bar)
Artificial turf		X	X	X
High Traffic/Vandal Prone Areas	X			
Rubber Cover for Sports Fields	X	X		
High Wind		X		X
Normally Open Hydraulic System	X			X
Full Circle	X			1 and 2 Speed
Part-circle Fixed	X			90° and 180°
Part/Full Circle in One		X	X	
Stainless Steel Riser	X			
Check Valve	Standard	Standard		X
Effluent Water Option	X	X		X
Smart-Arc Memory		X		
Below Grade	X	X		
No Tools Arc Adjustment				
Trajectory Adjustment		7°-30°		
Standard Pop-Up Height	2 ¾" (60mm)	4" (100mm)		2¼" (57mm)
Warranty	Five Years	Five Years	Two Years	Three Years



 **WaterSmart® Feature**



Mini 8 Series

- Inlet Size: 1/2" (13mm)
- Radius: 20'-35' (6,1-10,7m)
- Operating Pressure Range: 30-50 psi (2,0-3,4 Bar)

When spray heads won't do the job and a full size rotor is just too much, you need the Mini 8 from Toro®. Designed to fill in that hard to cover area between 20' (6,1m) and 35'(10,7m), the Mini 8 provides great value and water efficiency for your landscapes.



Check
Valve
Options
Available



Nozzle Tree—
Five interchangeable nozzles
– comes pre-installed with a
1.5 nozzle

Features & Benefits

Top Arc Indication

Ensures easy adjustments from 40° to 360° with visual feedback of arc change by reading the scale.

Stainless Steel Radius Adjustment Screw

Allows up to 25% reduction.

Pressure Activated Seal

The seal and robust trip mechanism offer enhanced reliability.

Ratcheting Riser

Easily shift the riser and fixed left stop to the desired position.

Five Interchangeable Nozzles

To cover varying flow and radius requirements (comes pre-installed with a 1.5 nozzle).

Part And Full Circle In One

Offers convenience and reduces inventory requirements.

Water Management Highlight

Not Too Big and Not Too Small - the Mini 8 is Just Right



With the smaller nozzle set you get lower flows on smaller spaces providing more efficient application and water savings. And compared to sprays, it saves on the number of heads which in turn reduces the number of valves and stations required. No matter how you look at it, the Mini 8 brings together money savings with better water management.



Arc setting is visible from the top of sprinkler

Arc Scale

Use a slotted screwdriver to turn. Read arc change on the arc scale as the screwdriver is turned. The arrow points to the arc degrees.

Specifications

Dimensions

- Body height: 6" (150mm)
- Pop-up to nozzle height: 3 3/4" (95mm)
- Exposed diameter: 1 3/4" (45mm)
- Cap diameter: 2 1/4" (57mm)
- Inlet: 1/2" (13mm) female-threaded

Operating Specifications

- Radius: 20'–35' (6,1–10,7m)
- Operating pressure range: 30-60 psi (2,0-4,1 Bar)
- Flow Rate: 0.80 – 3.40 GPM (3,0-12,9 LPM)
- Trajectory: 25°

Options Available

- MINI8-CV - Check Valve – maintains up to 8' elevation change (Bag of 25)
- 102-2024 – Adjustment Tool

Warranty

- Two years



Optional Check Valve

Prevents low head drainage and puddling at the sprinkler.

Mini 8 Performance Data—US

Nozzle	psi	GPM	Radius	Prec. Rate	
				▲	■
.75	30	0.8	20	0.42	0.36
	40	0.9	21	0.44	0.38
	50	1.0	22	0.46	0.40
1.0	30	1.0	26	0.30	0.26
	40	1.1	27	0.34	0.30
	50	1.3	28	0.36	0.32
1.5*	30	1.3	29	0.24	0.30
	40	1.5	30	0.38	0.32
	50	1.7	31	0.40	0.34
2.0	30	1.7	30	0.42	0.36
	40	2.0	31	0.46	0.40
	50	2.3	31	0.54	0.46
3.0	30	2.6	34	0.50	0.44
	40	3.0	35	0.54	0.48
	50	3.4	35	0.62	0.54

Radius shown in feet. Data based on 180°.

*▲ Precipitation rates are for triangular spacing, shown in inches per hour, calculated at 50% of diameter.

*■ Precipitation rates are for square spacing, shown in inches per hour, calculated at 50% of diameter.

All performance specifications are based on the stated working pressure available at the base of the sprinkler.

* Pre-installed nozzle.

Mini 8 Model List

Model	Description
MINI8-4P	Mini 8 Rotor, 4" (100mm) Lawn Pop-up

Specifying Information-Mini 8

MINI8-4P-XX-CV				
Description	Body	Nozzle		Optional
MINI8	4P	XX		CV
MINI8—Mini 8 Rotor	4P—Lawn Pop-up	75—.75 10—1.0 15—1.5	20—2.0 30—3.0	CV—Check Valve
<p>Example: A Mini 8 Series sprinkler with a 3.0 nozzle, would be specified as: MINI8-4P-30</p>				

Note: MINI8-CV available in bags of 25.

300 Series Multi-Stream Rotor®

- Inlet Size: ¾" (20mm) for Lawn and High-pop; ½"-¾" (13-20mm) for Shrub model
- Radius: 15'-30' (4,6-9,2m)
- Operating Pressure Range: 35-50 psi (2,4-3,5 Bar)

The 300 Series Multi-Stream Rotor from Toro® combines a highly distinctive way to irrigate with the reliability you've come to expect. Uniquely designed, Multi-Stream Rotors feature multiple rotating streams, a slower precipitation rate and excellent wind resistance.



Effluent
Options
Available



Check
Valve
Options
Available

Features & Benefits

Unique Multiple Rotating Streams

Provide slow, effective watering, plus you can zone your arcs together, saving time and water.

Matched Precipitation Rate Arc Discs

Ensures uniform delivery of water across each square foot of an irrigated area, resulting in high-precision water application.

Choice Of Six Nozzles And Nine Interchangeable Arc Discs

For maximum versatility covering varying landscape needs (4 separate nozzles for high-pops).

Selection Of Pop-Up Heights

3" (76,2mm) Lawn Pop-up, shrub and high-pop – to satisfy varying installation requirements.

Water Management Highlight

A Winning Combination of Watering Efficiency and Visual Appeal

The exclusive "fingers of water" application takes a flow of water and divides it into smaller streams at different trajectories for a stronger performance all across the landscape. Shorter radii get the coverage needed with enough water still in the main stream to reach longer distances. This also creates a heavier watering stream at the tail end of the spray allowing for greater wind resistance.



Specifications

Dimensions

- Body Diameter: 2 3/8" (60mm)
- Cap Diameter: 3" (75mm)
- Height:
 - Lawn Pop-up: 6 1/8" (155mm)
 - High-Pop: 16" (405mm)
- Shrub Base Diameter: 1 3/4" (45mm)

Operating Specifications

- Radius: 15'-30' (4,6-9,2m)
- Flow Rate:
 - Lawn Pop-up and High-pop: 0.57-7.51 GPM (2,1-28,4 LPM)
 - Shrub (COM): 2.07-6.36 GPM (7,8-24,0 LPM)
- Operating Pressure Range: 35-50 psi (2,4-3,5 Bar)
- Trajectory: 3 angles to cover short, medium & large radius
- Pop-up to nozzle:
 - Lawn Pop-up: 2 3/4" (70mm)
 - High-Pop: 11 3/4" (298mm)
- Inlet (Female-threaded):
 - Lawn Pop-up and High-pop: 3/4" (20mm)
 - Shrub: 1/2" to 3/4" (13-20mm)
- Large basket filter screen

Options Available

- Recycled Water Indicators:
 - 89-7853 — Omni Nozzle Cover (Use with Part No. 300-15)
 - 89-7854 — High-pop Omni Nozzle Cover (Use w/Part No. 300-25)
 - 89-7889 — Rotor Plug
- Check Valve - maintains up to 8' elevation change (shrub com only)
- 35-1344 — Locking cap for Lawn Pop-up models (standard on high-pop models)

Warranty

- Two years

300 Series arc discs come in 9 different selections



300 Series: Shrub w/COM (360° Arc Disc) (Model Nos. 300-10-00COM)—US

Nozzle	psi	300 Series GPM	Radius
01	50	2.07	14
01	75	2.95	16
02	50	2.48	23
02	75	3.69	25
03	50	4.55	27
03	75	6.24	29
63	50	2.66	28
63	75	3.82	30
93	50	3.64	29
93	75	5.29	31
Omni (Min)	50	2.67	16
Omni (Min)	75	3.95	18
Omni (Max)	50	5.08	30
Omni (Max)	75	6.36	33

300 Series Lawn Pop-up Apex @ 50 psi—US

Nozzle	27°
	Max. Ht. of Spray
01	4' 10"
02	5' 1"
03	5' 11"
63	7' 0"
93	6' 3"

300 Series: 300-15 and 300-25 Omni™ Adjustable-radius Nozzle Performance Chart

psi	Radius	Precipitation Rate*		GPM										
		▲	■	90°	112°	135°	157.7°	180°	202.5°	225°	270°	360°		
		35	15	1.69	1.46	0.85	1.06	1.28	1.49	1.70	1.91	2.13	2.55	3.41
35	18	1.37	1.19	1.00	1.24	1.50	1.75	2.00	2.25	2.50	3.00	4.00		
35	21	1.15	1.00	1.15	1.42	1.72	2.01	2.29	2.58	2.86	3.44	4.58		
35	24	0.99	0.86	1.29	1.60	1.94	2.26	2.58	2.91	3.23	3.88	5.17		
35	26	0.95	0.82	1.44	1.79	2.16	2.52	2.88	3.24	3.60	4.32	5.76		
50	18	1.60	1.38	1.16	1.44	1.74	2.04	2.33	2.62	2.91	3.49	4.65		
50	21	1.35	1.17	1.34	1.66	2.01	2.35	2.68	3.02	3.35	4.02	5.36		
50	24	1.17	1.02	1.52	1.88	2.28	2.66	3.04	3.42	3.80	4.56	6.08		
50	27	1.04	0.90	1.70	2.10	2.55	2.97	3.40	3.82	4.24	5.09	6.79		
50	30	0.93	0.80	1.88	2.33	2.82	3.29	3.75	4.23	4.69	5.63	7.51		

300 Series: Fixed-radius Nozzle Performance Chart

Nozzle	psi	Radius	Precip. Rate*		GPM										
			▲	■	90°	112°	135°	157.7°	180°	202.5°	225°	270°	360°		
			01	35	16	0.99	0.86	0.57	0.71	0.86	1.00	1.14	1.28	1.43	1.71
	50	18	0.99	0.86	0.72	0.90	1.08	1.26	1.44	1.62	1.80	2.16	2.88		
02	35	21	0.73	0.63	0.72	0.90	1.08	1.26	1.44	1.62	1.80	2.16	2.88		
	50	24	0.66	0.57	0.85	1.06	1.28	1.49	1.71	1.92	2.13	2.56	3.41		
03	35	28	0.77	0.67	1.36	1.69	2.04	2.38	2.72	3.05	3.39	4.07	5.43		
	50	30	0.80	0.69	1.61	2.01	2.42	2.82	3.23	3.63	4.03	4.84	6.45		
63§	35	28	0.39	0.33	0.68	0.85	1.02	1.19	1.36	1.53	1.70	2.04	2.72		
	50	30	0.40	0.35	0.81	1.00	1.21	1.41	1.62	1.82	2.02	2.42	3.23		
93§	35	28	0.58	0.50	1.02	1.27	1.53	1.78	2.04	2.29	2.54	3.05	4.07		
	50	30	0.60	0.52	1.21	1.51	1.82	2.12	2.42	2.72	3.03	3.63	4.84		

*▲ Precipitation rates are for triangular spacing, shown in inches per hour, calculated at 50% of diameter.
 ■ Precipitation rates are for square spacing, shown in inches per hour, calculated at 50% of diameter.
 All performance specifications are based on the stated working pressure available at the base of the sprinkler.
 Radius shown in feet. Data based on 360°.
 § Low gallonage.

300 Series Multi-Stream Rotor Model List	
Model	Description
300-00-00	Lawn Pop-up w/o Nozzle
300-10-00	Shrub w/o Nozzle
300-10-00-COM	Shrub w/o Nozzle with Check Valve
300-12-00	12" (300mm) Pop-up w/o Nozzle

Specifying Information— 300 Series Multi-Stream Rotor

3XX-XX-XX-COM-E				
Arc	Body	Nozzle	Optional	
3XX	XX	XX	COM	E
04—90° 05—112° 06—135° 07—157.5° 08—180° 09—202.5° 10—225° 12—270° 16—360°	00—Lawn Pop-up 10—Shrub 12—High-pop	01—Small Radius, 12 Ports 02—Medium Radius, 12 Ports 03—Large Radius, 12 Ports 15—Adjustable Shrub & Lawn Pop-up 63—Large Radius, 6 Ports, Low GPM* 93—Large Radius, 9 Ports, Low GPM*	COM—Check-O-Matic (COM available on shrub model only)	E—Effluent

Example: A 300 Series Shrub Sprinkler with a 90° arc and an adjustable nozzle, would be specified as: 304-10-15

* Available on Lawn Pop-up and Shrub only
 ** Must be used on High-pop body

T5 Series

The Toro® T5 Series Rotor has the features to satisfy all your basic irrigation needs and a few extras. The T5 offers an extra inch of pop-up height compared to most competitive units. All lawn models are now available with the optional RapidSet™ feature, a quick and easy way to make arc adjustments—with NO TOOLS. For those day-in and day-out installations, the T5 is the only rotor you'll need.



RapidSet™ Option



Effluent Options Available



Check Valve Options Available



Extensive testing for T5 nozzle efficiency was performed using SPACE™ calculations

- Inlet Size: ¾" (20mm)
- Radius: 25'-50' (7,6-15,2m)
- Operating Pressure Range: 25-70 psi (1,7-4,8 Bar)

Features & Benefits

NEW RapidSet™ Arc Adjustment (optional)

All arc adjustments can be made quickly, with a few twists of the nozzle turret, using no tools. The feature also provides protection against gear damage from vandalism or abuse.

5" Pop-Up

Easily replaces many competitive units in the same footprint but delivers an extra inch of pop-up.

Standard Rubber Cover

Heavy-duty rubber cover minimizes injuries and reduces liability (black indicates standard; gray indicates RapidSet).

Airfoil™ Technology Nozzles

The T5 comes with a full set of 8 standard nozzles (25°) and 4 low angle nozzles (10°) that utilize patent-pending Airfoil technology which creates a zone of low pressure just below the main stream to gently guide water downward for unmatched uniformity, without forcefully washing out seeds.

Optional Check Valve

An optional check valve is available with a hold back strength of 7' of elevation change.



Note: See Page 51 For Kits:

102-6527—T5 Tool Kit

102-7712—T5 Nozzle Tree Kit

102-7714—T5 Check Valve Kit



Stream straighteners align the water flow behind the nozzle.

Nozzles

Geometry on the face of the nozzle creates breakup.



Specifications

Dimensions

	Lawn Pop	Shrub	HP
Body Diameter:	2 1/4" (57mm)	2 1/4" (57mm)	2 1/4" (57mm)
Cap Diameter:	2 5/8" (67mm)	N/A	2 5/8" (67mm)
Height:	7 1/2" (190mm)	7 3/4" (196mm)	16 7/8" (200mm)

Operating Specifications

- Radius: 25'-50' (7,6-15,2m)
- Flow Rate: .76 – 9.63 GPM (2,8-36,5 LPM)
- Operating Pressure Range: 25-70 PSI (1,7-4,8 Bar)
- Trajectory: 25° standard, 10° low angle
- Pop-up to nozzle: 5" (127mm)
- Inlet: 3/4" (20mm)
- Factory installed with a #3.0 nozzle

Options Available

- Check valve

Warranty

- Five years

T-5 Nozzle Performance Data—US

Nozzle	PSI	Radius	GPM	Precipitation Rate	
				(in/hr)▲	(in/hr)■
1.5	25	33	1.15	0.23	0.20
	35	34	1.38	0.27	0.23
	45	35	1.59	0.29	0.25
	55	35	1.74	0.32	0.27
	65	36	1.88	0.32	0.28
2.0	25	35	1.45	0.26	0.23
	35	36	1.80	0.31	0.27
	45	37	2.12	0.34	0.30
	55	37	2.30	0.37	0.32
	65	37	2.58	0.42	0.36
2.5	25	35	1.75	0.32	0.28
	35	36	2.20	0.38	0.33
	45	37	2.55	0.41	0.36
	55	37	2.80	0.45	0.39
	65	37	3.05	0.50	0.43
3.0*	25	36	2.20	0.38	0.33
	35	38	2.60	0.40	0.35
	45	40	3.05	0.42	0.37
	55	40	3.52	0.49	0.42
	65	40	3.80	0.53	0.46
4.0	25	37	2.95	0.48	0.41
	35	40	3.55	0.49	0.43
	45	42	4.10	0.52	0.45
	55	42	4.45	0.56	0.49
	65	43	4.85	0.58	0.50
5.0	25	39	3.75	0.55	0.47
	35	41	4.50	0.60	0.52
	45	43	5.10	0.61	0.53
	55	45	5.75	0.63	0.55
	65	45	6.10	0.67	0.58
6.0	25	39	4.20	0.61	0.53
	35	43	5.20	0.63	0.54
	45	46	6.05	0.64	0.55
	55	47	6.65	0.67	0.58
	65	48	7.25	0.70	0.61
8.0	25	36	5.75	0.99	0.85
	35	43	7.10	0.85	0.74
	45	47	8.05	0.81	0.70
	55	48	8.95	0.86	0.75
	65	50	9.70	0.86	0.75

* Pre-installed nozzle

T5 Series Model List	
Model	Description
• T5P	5" (127mm) Lawn Pop-up w/o check valve
• T5PCK	5" (127mm) Lawn Pop-up w/ check valve
• T5PE	5" (127mm) Lawn Pop-up w/o check valve-effluent
• T5S	Shrub
• T5HP	High-Pop
• T5SE	Shrub, Effluent
• T5HPE	High-Pop, Effluent
• T5P-RS	5" Pop-up, Lawn, RapidSet
• T5PCK-RS	5" Pop-up, Lawn, w/check valve, RapidSet

Nozzle	PSI	Radius	GPM	Precipitation Rate	
				(in/hr)▲	(in/hr)■
1.0LA	25	25	0.74	0.26	0.23
	35	28	0.94	0.27	0.23
	45	28	1.02	0.29	0.25
	55	29	1.14	0.30	0.26
	65	29	1.25	0.33	0.29
1.5LA	25	27	1.10	0.34	0.29
	35	30	1.35	0.33	0.29
	45	31	1.52	0.35	0.30
	55	31	1.75	0.40	0.35
	65	31	1.90	0.44	0.38
2.0LA	25	29	1.40	0.37	0.32
	35	31	1.72	0.40	0.34
	45	32	2.05	0.45	0.39
	55	33	2.25	0.46	0.40
	65	33	2.45	0.50	0.43
3.0LA	25	29	2.20	0.58	0.50
	35	33	2.60	0.53	0.46
	45	34	3.05	0.59	0.51
	55	36	3.40	0.58	0.51
	65	36	3.70	0.63	0.55

Radius shown in feet.
Data based on 180°.

Specifying Information—T5 Sprinkler

T5XX-XXXX-CK-E						
Description	Body	Nozzle		Optional	Optional	
T5	XX	XXXX		XX	E	
T5-T5 Series Rotor	P—Lawn Pop-up S—Shrub HP—High Pop	1.5—1.5 GPM 2.0—2.0 GPM 2.5—2.5 GPM 3.0—3.0 GPM	4.0—4.0 GPM 5.0—5.0 GPM 6.0—6.0 GPM 8.0—8.0 GPM	Low Angle Nozzle 10LA—1.0 GPM 15LA—1.5 GPM 20LA—2.0 GPM 30LA—3.0 GPM	CK— Check-O-Matic* RS— RapidSet™ (optional for lawn models only)	E—Effluent

Example: A T5 Lawn Pop-up sprinkler with a 2.5 nozzle, would be specified as: **T5P-25**

TR50XT Series

- Inlet Size: 3/4" (20mm)
- Radius: 28'-48' (8,5-14,6m)
- Operating Pressure Range: 30-70 psi (2,0-4,8 Bar)

The Toro® TR50XT Series Rotor is the ultimate sprinkler upgrade! No 3/4" (20mm) rotor can match the feature set of TruArc™ adjustments, Smart Arc™ memory return in addition to Toro's patented X-Flow® and Trjectory™ technologies.

Features & Benefits

X-Flow® Water Shutoff Device

Allows one or more sprinklers to be shut-off while all the others on the same line are still running.

Exclusive Trjectory™ Adjustment

Allows fine-tuning of nozzle spray trajectory - make adjustments from 5° to 25° to compensate for wind, low-hanging branches or throwing water from the top of slopes.

TruArc™ For Easy Arc Set

Eliminates "palming" of a sprinkler to check the final arc setting—visual arc set from arrow on cap to arrow on riser.

Smart Arc™ Memory

Safely returns sprinkler to previously set arc if vandalized, and slip clutch assures no damage to gears.

Standard Reversible Check Valve

Prevents low-head drainage, keeping laterals charged with water (maintains up to 8' (2.4m) elevation change).

Below Grade Installation

Allows for maximum safety helping to eliminate the potential for tripping accidents or damage caused by mowers.



Effluent Options Available



Check Valve Options Available



SST Riser Options Available

Water Management Highlight

Trjectory™: Accurate Arc Adjustment without Switching the Nozzle Set



With Toro's Trjectory technology you can adjust anywhere between 5 and 25 degrees without having to change out the nozzle. The easy-to-use design combines the fine-tuning capability that you really want with what your installation requires. Overthrows onto hardscapes are eliminated and the integrity of the stream remains intact since there is no need for a diffuser screw.



High



Low

Specifications

Dimensions

- Body Diameter:
 - Lawn Pop-up: 2 3/8" (59mm)
 - High-pop: 2 1/2" (64mm)
- Cap Diameter: 3" (75mm)
- Height:
 - Lawn Pop-up: 8" (200mm)
 - High-Pop: 15 7/8" (403mm)

Operating Specifications

- Radius: 28-48' (8,5-14,6m)
- Flow Rate: 1.0– 9.80 GPM (3,8-37,1 LPM)
- Operating Pressure Range: 30-70 psi (2,1-4,8 Bar)
- Trajectory: Adjustable from 5°-25°
- Pop-up to nozzle: 4 3/4" (120mm)
- Inlet: 3/4" (20mm) female-threaded
 - 1/2" to 3/4" (13-20mm) female-threaded on shrub
- 1/2" (13mm) below grade installation (except shrub model)

Additional Features

- Cluster, water-lubricated, gear-drive design
- Standard rubber cover
- Large filter screen to prevent clogging
- Factory installed with a #3.0 nozzle
- Left arc indicator on cap (arrow) and on body (hash mark), and right trip indicator on black adjusting band
- Dry mode pull-up slot for convenience
- Arc adjustment from 30°-360°
- Continuous, unidirectional rotation provides uniform water coverage when set at full circle
- Color-coded nozzle tree with 8 interchangeable nozzles
- Stainless steel radius adjustment screw allows up to 25% radius reduction

Warranty

- Five years

TR50XT Performance Data

Nozzle Size	PSI	Flow	25°				15°				5°			
			Radius		Precip. Rate*		Radius		Precip. Rate*		Radius		Precip. Rate*	
			▲	■	▲	■	▲	■	▲	■				
1.0 Yellow	30	1.0	33	0.10	0.09	31	0.12	0.10	28	0.28	0.24			
	40	1.1	34	0.11	0.09	31	0.13	0.11	29	0.30	0.26			
	50	1.3	35	0.12	0.10	32	0.14	0.12	30	0.32	0.28			
	60	1.4	36	0.12	0.10	32	0.15	0.13	31	0.32	0.28			
	70	1.5	37	0.12	0.11	33	0.15	0.13	31	0.34	0.30			
1.5 Orange	30	1.1	34	0.11	0.09	32	0.12	0.10	30	0.28	0.24			
	40	1.4	35	0.13	0.11	32	0.15	0.13	31	0.32	0.28			
	50	1.6	36	0.14	0.12	33	0.16	0.14	32	0.34	0.30			
	60	1.7	37	0.14	0.12	33	0.17	0.15	32	0.36	0.32			
	70	1.9	38	0.15	0.13	34	0.18	0.16	33	0.38	0.34			
2.0 Red	30	1.6	36	0.14	0.12	34	0.15	0.13	32	0.34	0.30			
	40	1.9	37	0.15	0.13	34	0.18	0.16	33	0.38	0.34			
	50	2.2	38	0.17	0.15	35	0.20	0.17	34	0.42	0.36			
	60	2.4	39	0.18	0.15	36	0.21	0.18	35	0.44	0.38			
	70	2.6	40	0.18	0.16	37	0.21	0.18	36	0.44	0.38			
3.0* Black	30	2.3	37	0.19	0.16	35	0.21	0.18	33	0.46	0.40			
	40	2.7	38	0.21	0.18	36	0.23	0.20	34	0.52	0.44			
	50	3.1	39	0.23	0.20	37	0.25	0.22	35	0.56	0.48			
	60	3.4	40	0.24	0.20	38	0.26	0.23	36	0.58	0.50			
	70	3.6	42	0.23	0.20	39	0.26	0.23	38	0.56	0.48			
4.5 Blue	30	3.4	38	0.26	0.23	35	0.31	0.27	33	0.70	0.60			
	40	4.0	39	0.29	0.25	36	0.34	0.30	34	0.76	0.66			
	50	4.6	40	0.32	0.28	38	0.35	0.31	36	0.78	0.68			
	60	5.1	41	0.34	0.29	39	0.37	0.32	37	0.82	0.72			
	70	5.6	43	0.34	0.29	40	0.39	0.34	39	0.82	0.70			
6.0 Green	30	4.4	39	0.32	0.28	36	0.38	0.33	33	0.90	0.78			
	40	5.1	40	0.35	0.31	37	0.41	0.36	34	0.98	0.84			
	50	5.8	41	0.38	0.33	39	0.42	0.37	36	1.00	0.86			
	60	6.5	42	0.41	0.35	40	0.45	0.39	38	1.00	0.86			
	70	7.1	44	0.41	0.35	42	0.45	0.39	40	0.49	0.86			
7.5 Brown	30	5.2	40	0.36	0.31	36	0.45	0.39	33	1.06	0.92			
	40	6.2	41	0.41	0.35	38	0.48	0.41	35	1.12	0.98			
	50	7.1	43	0.43	0.37	40	0.49	0.43	37	1.16	1.00			
	60	7.8	44	0.45	0.39	41	0.52	0.45	39	1.14	0.98			
	70	8.5	45	0.47	0.40	43	0.51	0.44	41	1.12	0.98			
9.0 Gray	30	6.1	40	0.42	0.37	36	0.52	0.45	33	1.24	1.08			
	40	7.1	42	0.45	0.39	39	0.52	0.45	36	1.22	1.06			
	50	8.0	45	0.44	0.38	41	0.53	0.46	38	1.24	1.06			
	60	8.9	46	0.47	0.40	42	0.56	0.49	40	1.24	1.08			
	70	9.8	48	0.47	0.41	44	0.56	0.49	42	1.24	1.06			

Shaded areas represent optimum operating pressure for that nozzle size.
 *Pre-installed nozzle.
 Radius shown in feet.
 Data based on 180°.

TR50XTP Series Model List

Model	Description
• TR50XTP	5" (127mm) Lawn pop-up
• TR50XTPE	5" (127mm) Lawn pop-up, Effluent
• TR50XTS	Shrub
• TR50XTSE	Shrub, Effluent
• TR50XTHP	12" (300mm) High-pop
• TR50XTHPE	12" (300mm) High-pop, Effluent
• TR50XTPSS	5" (127mm) Lawn pop-up w/Stainless Steel Riser
• TR50XTPSSE	5" (127mm) Lawn pop-up w/ Stainless Steel Riser, Effluent

Specifying Information—TR50XT

TR50XT <u>XXX-XX-E</u>			
Description	Body	Nozzle	Optional
TR50XT	XXX	XX	E
TR50XT—TR50XT Series Rotor	P—Lawn Pop-up S—Shrub HP—High-pop PSS—Stainless Steel Riser	10—1.0 45—4.5 15—1.5 60—6.0 20—2.0 75—7.5 30—3.0 90—9.0	E—Effluent
Example: A TR50XT Series sprinkler with High-pop and a 6.0 nozzle, would be specified as: TR50XT-HP-60			

T7 Series

- Inlet Size: 1" (25mm) NPT or BSP
- Radius: 40-75' (12,2-22,9m)
- Operating Pressure Range: 40-100 psi (2,8 - 7,0 Bar)

The Toro® T7 Rotor is built rugged to withstand the harsh conditions and vandalism present in municipal/government, sports fields and commercial rotor applications.

Features & Benefits

Top Arc Indication

Arc setting indicator on top of the rotor allows for easy wet or dry adjustments from 40°-360°.

High Efficiency Nozzles

Single port design ensures water is evenly distributed across the pattern without putting too much water near the head, which prevents seed from washing away.

Vandal and Abuse Resistance

Smart Arc™ memory safely returns sprinkler to previously set arc if vandalized.

Design Solutions and Safety

Standard check valve to prevent low head drainage. Small exposed diameter reduces possibility of injury on play areas.

Durability

Heavy duty retract spring and water-lubricated gear drive. Wiper seal reduces stick-ups and wiper seal leaks.

Versatility

Also available in low-flow versions for short radius (<50') applications such as baseball infields.



Effluent
Options
Available



SST Riser
Options
Available



Standard rubber
cover with arc
indicator from
45°-360° simplifies
installation
and service

Specifications

Dimensions

- Pop-up height to nozzle: 5" (127mm)
- Body height: 8.8" (223.5mm)
- Rubber cover diameter: 2.2" (55.9mm)
- Body diameter: 2.7" (68.6mm)

Operating Specifications

- Precipitation rate: .30 -.55 (7.6 - 14.0mm) inches per hour
- Radius: Low-flow models: 38'-56' (11,6 - 17,1m)
High-flow models: 46'-75' (14,0 - 22,9m);
- Flow rate: Low-flow models: 1.7-13.0 gpm (6,4-49,2 lpm)
High-flow models: 6.8-30.5 gpm (25,4-116 lpm);
- Operating pressure range: 40-100 psi (2,8-7,0 Bar)
- Inlet size: 1" (25mm) threaded NPT or 1" (25mm) BSP
- Nozzle trajectory: 25°
- Arc adjustment: 50°-360° (unidirectional at 360°)†

Nozzle Performance Data-Low Flow Models

Nozzle	Press. (PSI)	Radius (FT)	Flow Rate (GPM)	Precip Rate (in/hr) ▲	Precip Rate (in/hr) ■
2.0	40	40	1.73	0.25	0.22
	50	42	1.96	0.29	0.25
	60	42	2.17	0.30	0.26
	70	41	2.36	0.33	0.28
	80	42	2.54	0.35	0.31
	90	41	2.71	0.36	0.31
	100	41	2.88	0.38	0.33
3.0*	40	41	2.43	0.36	0.31
	50	42	2.77	0.39	0.33
	60	41	3.10	0.41	0.36
	70	41	3.38	0.45	0.39
	80	42	3.64	0.46	0.40
	90	41	3.89	0.47	0.41
	100	43	4.06	0.49	0.42
4.5	40	38	4.07	0.63	0.54
	50	41	4.65	0.62	0.53
	60	41	5.17	0.68	0.59
	70	42	5.64	0.71	0.62
	80	42	6.08	0.77	0.66
	90	43	6.49	0.78	0.68
	100	43	6.88	0.83	0.72
6.0	40	43	4.92	0.59	0.51
	50	46	5.63	0.59	0.51
	60	48	6.27	0.61	0.52
	70	50	7.05	0.65	0.57
	80	49	7.37	0.68	0.59
	90	50	7.87	0.70	0.61
	100	50	8.37	0.74	0.64
7.5	40	44	5.78	0.66	0.58
	50	46	6.63	0.70	0.60
	60	48	7.37	0.71	0.62
	70	50	8.05	0.75	0.65
	80	51	8.73	0.78	0.67
	90	52	9.46	0.84	0.73
	100	52	9.89	0.81	0.70
9.0	40	45	7.33	0.81	0.70
	50	49	8.44	0.78	0.68
	60	51	9.39	0.80	0.70
	70	54	10.43	0.83	0.72
	80	55	11.27	0.83	0.72
	90	55	12.05	0.89	0.77
	100	56	12.74	0.90	0.78

† When the sprinkler is adjusted to 360°, it will be uni-directional in that direction of rotation (clockwise or counterclockwise) at the moment when the sprinkler was changed to 360°

* Pre-installed nozzle
Data based on 180°

Additional Features

- Standard check valve
- Threaded cap-retained riser assembly
- Variable reversing stator
- Two nozzle trees: Low flow-6 nozzles (2, 3, 4.5, 6, 7.5 and 9)
High flow-7 nozzles (7, 9, 12, 16, 20, 24 and 27)
- Slip clutch
- Nozzle support/breakup screw
- Riser pull-up feature on top of nozzle base
- Adjustment/pull up tool supplied
- Locking cap screw

Options Available

- Stainless steel riser
- Effluent indicator

Warranty

- Five years

Nozzle Performance Data-High Flow Models

Nozzle	Press. (PSI)	Radius (FT)	Flow Rate (GPM)	Precip Rate (in/hr) ▲	Precip Rate (in/hr) ■
7.0	40	46.3	6.81	0.715	0.620
	50	48.7	7.41	0.746	0.646
	60	49.0	8.10	0.782	0.677
	70	50.3	8.90	0.824	0.714
	80	52.0	9.67	0.827	0.716
	90	52.0	10.27	0.845	0.732
	100	53.3	10.85	0.827	0.716
9.0	40	47.3	7.54	0.759	0.657
	50	50.7	8.25	0.734	0.635
	60	50.3	8.91	0.762	0.660
	70	52.0	9.81	0.807	0.699
	80	53.7	10.49	0.800	0.693
	90	53.3	11.20	0.823	0.713
	100	54.0	11.83	0.839	0.727
12.0*	40	50.3	9.95	0.885	0.767
	50	53.3	10.55	0.902	0.781
	60	56.7	11.53	0.913	0.791
	70	59.0	12.54	0.956	0.828
	80	59.7	13.51	0.993	0.860
	90	60.7	14.38	1.020	0.883
	100	63.0	15.18	1.039	0.900
16.0	40	52.3	13.42	1.062	0.920
	50	57.0	14.96	1.061	0.919
	60	60.0	15.79	1.044	0.904
	70	61.0	17.13	1.094	0.948
	80	63.7	18.41	1.100	0.953
	90	64.3	19.64	1.136	0.984
	100	65.7	20.80	1.166	1.009
20.0	40	52.0	16.10	1.275	1.104
	50	57.3	18.40	1.216	1.053
	60	61.0	19.56	1.209	1.047
	70	63.7	21.01	1.256	1.087
	80	66.3	22.58	1.188	1.029
	90	68.0	23.99	1.225	1.061
	100	70.3	25.29	1.253	1.085
24.0	40	53.7	15.46	1.272	1.101
	50	60.3	17.69	1.093	0.946
	60	63.7	19.76	1.107	0.959
	70	66.3	21.61	1.138	0.985
	80	68.3	23.29	1.154	0.999
	90	70.0	24.87	1.196	1.036
	100	72.3	26.30	1.160	1.005
27.0	40	55.0	19.37	1.424	1.233
	50	64.3	21.98	1.157	1.002
	60	71.0	23.82	1.051	0.910
	70	72.3	25.67	1.101	0.954
	80	73.0	27.34	1.141	0.988
	90	74.3	29.03	1.179	1.021
	100	75.0	30.52	1.207	1.045

T7 Rotor Model List

Model	Description
• T7P-02	1" (25mm) Rotor
• T7P-02E	1" (25mm) Rotor, Effluent Indicator
• T7P-02L	1" (25mm) Rotor, Low Flow
• T7P-02LE	1" (25mm) Rotor, Low Flow, Effluent Indicator
• T7PSS-02	1" (25mm) Stainless Steel Rotor
• T7PSS-02E	1" (25mm) Stainless Steel Rotor, Effluent Indicator
• T7PSS-02L	1" (25mm) Stainless Steel Rotor, Low Flow
• T7PSS-02LE	1" (25mm) Stainless Steel Rotor, Low Flow, Effluent Indicator

Specifying Information—T7 Sprinkler

T7PXX-02XX			
Descrip.	Optional	Thread	Optional
T7P	SS	O2	XX
T7P—Sports Rotor	SS—Stainless Steel Riser	NPT Thread	E—Effluent L—Low Flow

Example: A low flow T7P sprinkler with a stainless steel riser and effluent rubber cover would be specified as **T7PSS-02LE**

Sports Field Solutions

Challenges of Sports Turf Maintenance:

As a sports field manager, you face unique challenges and goals in landscape maintenance:

Appearance – Making sure your turf looks its best on game day, especially if it will be on national TV.

Playability – Ensuring peak team performance and maximizing player safety, while also minimizing potential liability.

Turf Health – Maintaining your turf in high-usage, short-recovery-window environments.

Water Use – Keeping the field in good condition while keeping your water costs down.

If your fields are surfaced with artificial grass, your irrigation needs are balanced with the goal of no infield disruption of the playing surface:

Wash Down – Ensuring sufficient coverage to clean the entire field.

Cool Down – Minimizing playing surface temperatures, especially in summer.

Toro offers a complete line of professional products from control systems to sprinklers and in-field monitoring systems that work together to provide optimal water-management solutions for all your sports field needs. We want to help you make your turf the best it can be – that's why Toro is committed to developing advanced and improved products that water more accurately, more efficiently, more dependably, and more affordably. Our efforts don't stop at irrigation, though... from mowers to grooming equipment to aerators, Toro provides a complete sports field maintenance solution. And, through continued industry efforts like sponsorship of the Sports Turf Managers Association, we look forward to answering your needs as a sports field manager with innovative solutions for

Sports Field And Artificial Turf Sprinklers:



T7 Series
Radius: 40'-75'
(12,2-22,9m)



640 Series
Radius: 47'-67'
(14,0-20,0m)



TS90 Series
Radius: 53'-95'
(16,2-29,0m)



690 Series
Radius: 87'-108'
(26,5-33,0m)



TG101 Series
Radius: 91'-178'
(27-54m)

Sports Field Management Solutions:

Sentinel® Central Control (Page #: 104-107)

- PC-based Water Management System
- Weather-based Runtime Adjustment
- Advanced Reporting including Water Use & ET
- Flow Monitoring with Automatic E-mail Alert
- Sophisticated Scheduler/Optimizer Program
- Radio, Ethernet, Internet, & Cellular Communications



Turf Guard® Soil Monitoring System (Page #: 92-93)

- Turf Guard® Soil Monitoring System
- Wireless Soil Monitoring
- Soil Moisture, Temperature, & Salinity
- Web-based Reporting & Analysis
- Monitor up to 500 Sensors per System
- Ideal for Managing Playability of Sports Fields

For more information and sports field designs using Toro Products visit www.toro.com

640 Series

- Inlet Size: 1" (25mm) NPT or BSP
- Radius: 47'-67' (14,0-20,0m)
- Operating Pressure Range: 40-90 psi (2,8-6,2 Bar)

Considered the most durable, heavy-duty commercial sprinkler available, the Toro® 640 Series is the proven veteran for athletic fields, parks, campuses and commercial sites.



Effluent
Options
Available



Check
Valve
Options
Available

Features & Benefits

35 Years of Reliability

Once the 640 Series sprinkler goes in the ground, it stays there. With a stainless steel-encased nozzle assembly and gear drive design.

Normally Open Valve-In-Head Body

Allows individual head control - the only commercial grade Toro rotor available with this feature.

Stainless Steel, Engineering Plastic and Brass Construction

Provide dependable performance in the most demanding environments.

Standard Check Valve

Prevents low-head drainage and keeps laterals charged with water.



The 640 installs below grade for increased player safety.



640 Series

Specifications

Dimensions

- Body diameter: 2 1/2" (65mm)
- Cap diameter: 3 1/4" (83mm)
- Body height: Check-O-Matic – 9" (230mm);
Valve-In-head – 10 1/2" (267mm)
- Exposed surface diameter when buried 1/2" below grade: 1 3/4" (65mm)

Operating Specifications

- Radius: 47' – 67' (14-20m)
- Flow Rate: 6.0 – 25.0 GPM (23-95 LPM)
- Operating Pressure Range: 40-90 psi (2,8-6,2 Bar)
- Trajectory: 27°
- Pop-up to nozzle: 2 3/8" (60mm)
- Inlet: 1" female-threaded (25mm)
- Below-grade installation: up to 1/2" (13mm)
- Check-O-Matic maintains up to 15' (4,6m) elevation change
- Selection of five nozzles and 12 arcs
- Adjustment screw allows up to 25% radius reduction

Additional Features

- Standard rubber cover
- Vandal-resistant cap with locking set screw
- Small exposed surface diameter
- Gear-drive design
- Basket filter screen
- Stainless steel retraction spring

Options Available

- 995-100 - Valve-In-Head Snap Ring Pliers
- 995-08 - Valve Removal Tool
- 995-35 - Valve Insertion Tool
- 995-37 - Seal Installation Tool
- 995-42 - Canister Removal Tool
- 996-51 - Cap Removal Tool
- 35-0579 - #41 Fast Rotating Stator
- 35-1011 - #42/43 Fast Rotating Stator
- Effluent options available

Warranty

- Five years

640 Series Model List Standard Arcs with Check-O-Matic

Model	Description
Body Package	
• 640-02	Check-O-Matic, NPT
• 640-52	Check-O-Matic, BSP
Nozzle/Stator Set	
• 641-40	#40 Nozzle & Stator
• 641-41	#41 Nozzle & Stator
• 641-42	#42 Nozzle & Stator
• 641-43	#43 Nozzle & Stator
• 641-44	#44 Nozzle & Stator
• 642-40E	#40 Nozzle & Stator
• 642-41E	#41 Nozzle & Stator
• 642-42E	#42 Nozzle & Stator
• 642-43E	#43 Nozzle & Stator
• 642-44E	#44 Nozzle & Stator
Drive Assemblies	
• 640-090	Drive Assembly, 90 Degrees
• 640-180	Drive Assembly, 180 Degrees
• 640-270	Drive Assembly, 270 Degrees

640 Series Model List

Model	Description
• 640-0XXX	Drive Assembly
• 640-10	Body Package, Valve-In-Head
• 640-20	Body Package, Check-O-Matic
• 640-XX	Nozzle and Stator
• 640-XXX	Nozzle and Stator, Effluent
Standard Arcs w/Check-O-Matic	
• 641-02-40	90° Arc, #40 Nozzle
• 641-02-41	90° Arc, #41 Nozzle
• 641-02-42	90° Arc, #42 Nozzle
• 641-02-43	90° Arc, #43 Nozzle
• 641-02-44	90° Arc, #44 Nozzle
• 642-02-40	180° Arc, #40 Nozzle
• 642-02-41	180° Arc, #41 Nozzle
• 642-02-42	180° Arc, #42 Nozzle
• 642-02-43	180° Arc, #43 Nozzle
• 642-02-44	180° Arc, #44 Nozzle
• 644-02-40	360° Arc, #40 Nozzle
• 644-02-41	360° Arc, #41 Nozzle
• 644-02-42	360° Arc, #42 Nozzle
• 644-02-43	360° Arc, #43 Nozzle
• 644-02-44	360° Arc, #44 Nozzle

Specifying Information—640

64X X-X-4X-XXX-E							
Arc		Thread	Valve Type	Nozzle	Special Arc		Optional
X		X	X	X	XXX		E
0—Special Arc	1—90°	0—NPT Thread	1—Normally Open Valve-In-Head	0	045°	148°	E—Effluent Model
2—180°	3—270°	5—BSP Thread	2—Check-O-Matic	1	060°	173°	
	4—360°			2	108°	192°	
				3	127°	238°	
				4			

Example: A 640 Series Sprinkler with a 90° arc, 40 nozzle and a check valve, would be specified as: **641-02-40**

Most 640 sprinklers are available in component parts only. Consult Res/Com Finished Goods Price List for a complete list of sprinklers available as finished goods.

640 Series Performance Data

Nozzle	psi	GPM	Radius	360°		270°		238°		192°		180°		173°	
				▲	■	▲	■	▲	■	▲	■	▲	■	▲	■
40	40	6.0	47	0.30	0.26	0.40	0.35	0.46	0.39	0.57	0.49	0.60	0.52	0.63	0.54
	50	6.7	50	0.30	0.26	0.40	0.34	0.45	0.39	0.56	0.49	0.60	0.52	0.62	0.54
	60	7.3	52	0.30	0.26	0.40	0.35	0.45	0.39	0.56	0.49	0.60	0.52	0.62	0.54
	70	8.0	53	0.32	0.27	0.42	0.36	0.48	0.41	0.60	0.52	0.63	0.55	0.66	0.57
	80	8.6	54	0.33	0.28	0.44	0.38	0.50	0.43	0.62	0.53	0.66	0.57	0.68	0.59
90	9.2	55	0.34	0.29	0.45	0.39	0.51	0.44	0.64	0.55	0.68	0.59	0.70	0.61	
41	40	9.5	48	0.46	0.40	0.61	0.53	0.69	0.60	0.86	0.75	0.92	0.79	0.95	0.83
	50	10.2	53	0.40	0.35	0.54	0.47	0.61	0.58	0.76	0.60	0.81	0.70	0.84	0.73
	60	11.0	54	0.42	0.36	0.56	0.48	0.63	0.55	0.79	0.68	0.84	0.73	0.87	0.76
	70	11.9	55	0.44	0.38	0.58	0.50	0.66	0.57	0.82	0.71	0.87	0.76	0.91	0.79
	80	12.7	56	0.45	0.39	0.60	0.52	0.68	0.59	0.85	0.73	0.90	0.78	0.94	0.81
90	13.4	57	0.46	0.40	0.61	0.53	0.69	0.60	0.86	0.74	0.92	0.79	0.95	0.83	
42	40	12.0	52	0.49	0.43	0.66	0.57	0.75	0.65	0.93	0.80	0.99	0.85	1.03	0.89
	50	12.9	55	0.47	0.41	0.63	0.55	0.72	0.62	0.89	0.77	0.95	0.82	0.99	0.85
	60	14.0	56	0.50	0.43	0.66	0.57	0.75	0.65	0.93	0.81	0.99	0.86	1.03	0.89
	70	14.7	57	0.50	0.44	0.67	0.58	0.76	0.66	0.95	0.82	1.01	0.87	1.05	0.91
	80	15.8	58	0.52	0.45	0.69	0.60	0.79	0.68	0.98	0.85	1.04	0.90	1.09	0.94
90	16.8	58	0.56	0.48	0.74	0.64	0.84	0.73	1.04	0.90	1.11	0.96	1.16	1.00	
43	40	13.2	56	0.47	0.41	0.62	0.54	0.71	0.61	0.88	0.76	0.94	0.81	0.97	0.84
	50	14.5	59	0.46	0.40	0.62	0.53	0.70	0.61	0.87	0.75	0.93	0.80	0.96	0.83
	60	15.7	59	0.50	0.43	0.67	0.58	0.76	0.66	0.94	0.82	1.00	0.87	1.04	0.83
	70	17.0	61	0.51	0.44	0.68	0.59	0.77	0.67	0.96	0.83	1.02	0.88	1.06	0.92
	80	18.3	63	0.51	0.44	0.68	0.59	0.77	0.67	0.96	0.83	1.03	0.89	1.07	0.92
90	19.4	64	0.53	0.46	0.70	0.61	0.80	0.69	0.99	0.86	1.05	0.91	1.10	0.95	
44	40	16.7	55	0.61	0.53	0.82	0.71	0.93	0.80	1.15	1.00	1.23	1.06	1.28	1.11
	50	18.6	60	0.57	0.50	0.76	0.66	0.87	0.75	1.08	0.94	1.15	1.00	1.20	1.03
	60	19.9	61	0.59	0.52	0.79	0.68	0.90	0.78	1.12	0.97	1.19	1.03	1.24	1.07
	70	21.9	63	0.61	0.53	0.82	0.71	0.93	0.80	1.15	1.00	1.23	1.06	1.28	1.11
	80	23.4	65	0.62	0.53	0.82	0.71	0.93	0.81	1.16	1.00	1.23	1.07	1.28	1.11
90	25.0	67	0.62	0.54	0.82	0.71	0.94	0.81	1.16	1.01	1.24	1.07	1.29	1.12	

Nozzle	psi	GPM	Radius	148°		127°		108°		90°		60°		45°	
				▲	■	▲	■	▲	■	▲	■	▲	■	▲	■
40	40	6.0	47	0.73	0.64	0.85	0.74	1.01	0.87	1.21	1.05	1.81	1.57	2.42	2.09
	50	6.7	50	0.72	0.63	0.84	0.73	0.99	0.86	1.19	1.03	1.79	1.55	2.38	2.06
	60	7.3	52	0.73	0.63	0.85	0.74	1.00	0.75	1.20	1.04	1.80	1.56	2.40	2.08
	70	8.0	53	0.77	0.67	0.90	0.78	1.05	0.91	1.27	1.10	1.90	1.65	2.53	2.19
	80	8.6	54	0.80	0.69	0.93	0.80	1.09	0.95	1.31	1.14	1.97	1.70	2.62	2.27
90	9.2	55	0.82	0.71	0.96	0.83	1.13	0.98	1.35	1.17	2.03	1.76	2.71	2.34	
41	40	9.5	48	1.11	0.96	1.30	1.12	1.53	1.32	1.83	1.59	2.75	2.38	3.67	3.18
	50	10.2	53	0.98	0.85	1.14	0.99	1.34	1.16	1.62	1.40	2.42	2.10	3.23	2.80
	60	11.0	54	1.02	0.88	1.19	1.03	1.40	1.21	1.68	1.45	2.52	2.18	3.36	2.91
	70	11.9	55	1.06	0.92	1.24	1.07	1.46	1.26	1.75	1.52	2.62	2.27	3.50	3.03
	80	12.7	56	1.09	0.95	1.27	1.10	1.50	1.30	1.80	1.56	2.70	2.34	3.60	3.12
90	13.4	57	1.11	0.97	1.30	1.12	1.53	1.32	1.83	1.59	2.75	2.38	3.67	3.18	
42	40	12.0	52	1.20	1.04	1.40	1.21	1.64	1.42	1.97	1.71	2.96	2.56	3.95	3.42
	50	12.9	55	1.15	1.00	1.34	1.16	1.58	1.37	1.90	1.64	2.85	2.46	3.79	3.29
	60	14.0	56	1.21	1.05	1.40	1.22	1.65	1.43	1.99	1.72	2.98	2.58	3.97	3.44
	70	14.7	57	1.22	1.06	1.42	1.23	1.68	1.445	2.01	1.74	3.02	2.61	4.03	3.49
	80	15.8	58	1.27	1.10	1.48	1.28	1.74	1.51	2.09	1.81	3.13	2.71	4.18	3.62
90	16.8	58	1.35	1.17	1.57	1.36	1.85	1.60	2.22	1.92	3.33	2.89	4.44	3.85	
43	40	13.2	56	1.14	0.98	1.32	1.15	1.56	1.35	1.87	1.62	2.81	2.43	3.74	3.24
	50	14.5	59	1.13	0.97	1.31	1.14	1.54	1.34	1.85	1.60	2.78	2.41	3.71	3.21
	60	15.7	59	1.22	1.06	1.42	1.23	1.67	1.45	2.01	1.74	3.01	2.61	4.01	3.47
	70	17.0	61	1.23	1.07	1.44	1.25	1.69	1.47	2.03	1.76	3.05	2.64	4.06	3.52
	80	18.3	63	1.25	1.08	1.45	1.25	1.71	1.48	2.05	1.78	3.08	2.66	4.10	3.55
90	19.4	64	1.28	1.11	1.49	1.29	1.75	1.52	2.11	1.82	3.16	2.74	4.21	3.65	
44	40	16.7	55	1.49	1.29	1.74	1.50	2.04	1.77	2.46	2.13	3.68	3.19	4.91	4.25
	50	18.6	60	1.40	1.21	1.63	1.41	1.91	1.66	2.30	1.99	3.45	2.99	4.60	3.98
	60	19.9	61	1.45	1.25	1.68	1.46	1.98	1.71	2.38	2.06	3.57	3.09	4.76	4.12
	70	21.9	63	1.49	1.29	1.74	1.53	2.04	1.84	2.45	2.13	3.68	3.19	4.91	4.25
	80	23.4	65	1.50	1.30	1.74	1.51	2.05	1.78	2.46	2.13	3.70	3.20	4.93	4.27
90	25.0	67	1.50	1.30	1.75	1.52	2.06	1.79	2.48	2.15	3.72	3.22	4.95	4.29	

*▲ Precipitation rates are for triangular spacing, shown in inches per hour, calculated at 50% of diameter.
 *■ Precipitation rates are for square spacing, shown in inches per hour, calculated at 50% of diameter.
 All performance specifications are based on the stated working pressure available at the base of the sprinkler.
 Radius shown in feet.
 Note: For the 640, differing arcs cannot be valved together.

TS90 Series

- Inlet Size: 1" (25mm) NPT or BSP
- Radius: 53'-95' (16,2-29,0m)
- Operating Pressure Range: 40-100 psi (2,8-7,0 Bar)

For big open spaces, the Toro TS90 provides unparalleled features and performance into a single fully adjustable rotor.



Effluent
Options
Available

Features & Benefits

Trajectory Adjustment from 7° to 30°

Fine tunes nozzle spray height, helps provide true head-to-head coverage, and compensates for windy conditions.

Part- And Full-Circle In One Sprinkler

No need to inventory multiple models or service parts

Back Nozzle Capable

Perfect for perimeter of sports fields. Provides the flexibility for fine-tuning any watering requirement.

Ratcheting Riser

Allows you to adjust the riser position in the body with no disassembly. Simply pull up the riser and ratchet it to the precise position you want to water.

Three Nozzle Configuration

Provides better distribution uniformity, nozzle flexibility and system efficiency.

Constant-Velocity Drive

Provides reliable rotation speed – from sprinkler to sprinkler.

TurfCup™ for Sports Fields

The optional TurfCup version seamlessly integrates into either natural grass or artificial turf sports fields, enhancing player safety, surface playability and field aesthetics.



Specifications

Dimensions

- Body Height: 10" (254mm)
- Overall Height: 12.5" (317mm)
- Retracted Height: 8.5" (216mm)
- Pop-Up Height: 4" (100mm)
- Exposed Cap Diameter: 2.2" (56mm)

Operating Specifications

- Radius: 53'-95' (16,2-29,0m) at 25° trajectory
- Flow Rate: 14.0-61.5 GPM (53-233 LPM)
- Precipitation Rate: .56-.60"/hr (14,2-15,2mm/hr)
- Arc: Full- & Part-circle in one
 - Full-circle: 360° unidirectional clockwise rotation
 - Part-circle: 40°-330°
- Rotation Speed: 3 minutes ± 30 seconds
- Inlet: 1" (25mm) female-threaded (NPT or BSP)
- Operating pressure range: 40-100 psi (2,8-7,0 Bar)

Additional Features

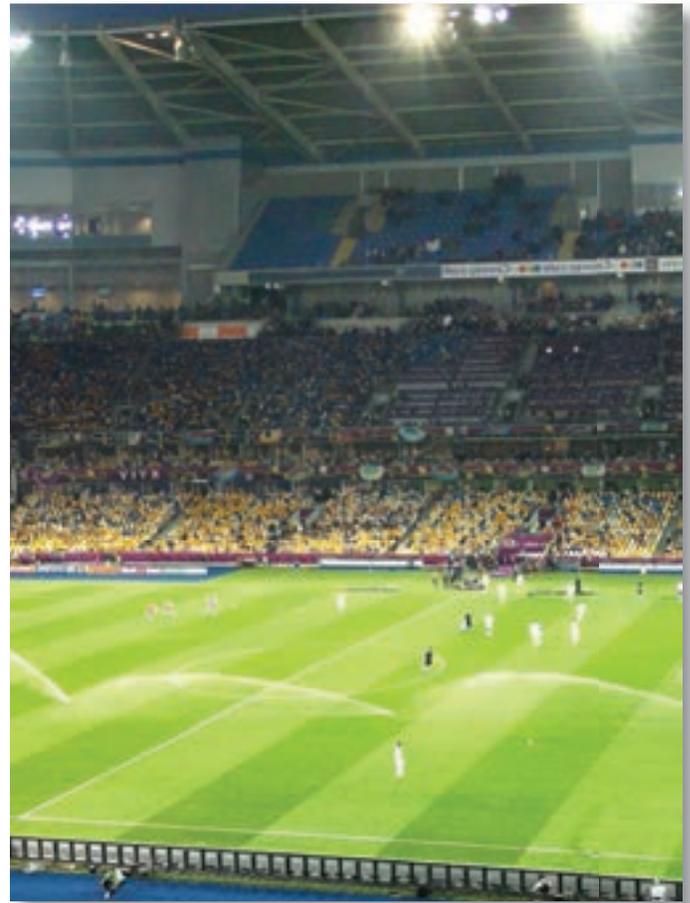
- Full set of color-coded nozzles that thread directly into the front.
- Rubber cover and below grade installation
- Check Valve standard – maintains up to 10' (3m) elevation
- Nozzle options: 9 main, 3 intermediate, 1 inner

Options Available

- Effluent Indicator available: part number 118-0063
- Main Nozzle Tool: 5/8" (16mm) hex socket or Toro Part 995-99
- Intermediate and Trajectory tool: 5/16" (8mm) hex socket or Toro Part 995-105

Warranty

5 years



TS90TP Nozzle Performance Data—US

Nozzle Set			50 PSI		60 PSI		70 PSI		80 PSI		90 PSI		100 PSI	
Number	Main/Intermediate	Stator	Radius (Ft.)	Flow (GPM)										
1	Yellow/Blue	102-1939 Yellow	53	14.0	54	15.2	55	16.4	55	17.4	54	18.5	56	19.4
2	Blue/Red		55	18.8	59	20.5	61	22.1	59	23.6	59	25.0	62	26.3
3	Brown/Orange		-	-	57	22.7	60	24.5	61	26.1	63	27.6	68	29.1
4	Orange/Orange		-	-	-	-	74	32.7	80	35.1	81	37.0	82	38.9
5	Green/Blue	102-1940 White	-	-	-	-	-	-	79	37.7	82	39.9	84	41.8
6	Gray/Blue		-	-	-	-	-	-	82	39.6	86	41.9	87	44.1
7	Black/Orange		-	-	-	-	-	-	80	43.6	87	46.2	84	48.6
8	Red/Blue		-	-	-	-	-	-	86	48.5	88	51.4	88	54.1
9	Beige/Blue	102-1941 White	-	-	-	-	-	-	85	55.1	91	58.3	95	61.6

TS90 Series Model List

Model	Description
• TS90TP-02-14	#3 nozzle pre-installed (comes with #1,#2 and #4 nozzles)
• TS90TP-02-58	#6 nozzle pre-installed (comes with #7,#5 and #8 nozzles)
• TS90TP-02TC	TS90TP with TurfCup, #8 nozzle installed (comes with #5, #6 and #7 nozzles)

Specifying Information—TS90TP

TS90TP-02 TC-X-E				
Arc	Threads	TurfCup™	Nozzle	Optional
TS90TP	02	TC	X	E
TS90TP—TS90TP 1" (25mm) Rotor with Trajectory	02—NPT	TC—TurfCup option	1, 2, 3, 4, 5, 6, 7, 8, 9	E—Effluent Model
Example: A TS90 Series sprinkler with Trajectory, NPT threads, and with an 82' (25m) radius would be specified as: TS90TP-02-58				

TG101 Series

- Inlet Size: 2" (50mm) NPT or BSP
- Radius: 91'-178' (27-54m)
- Operating Pressure Range: 40-95 psi (2,8-6,5 Bar)

The Toro® TG101-NPT large-radius, gun-style sprinkler is ideal for applications that require long distance throw, such as irrigation solely from the perimeter of sports fields, or for cleaning and cooling artificial turf.



Energy Savings

The great versatility of the gun is further increased with the dynamic intermittent jet-breaker. It allows energy savings and reduction of system operating costs by running an irrigation system at lower pressures.



Features & Benefits

Innovative Drive System

Adjusts automatically, ensuring steady rotation and uniform coverage at varying pressures.

Excellent Uniformity

Using a single nozzle design (spreader nozzles not required).

Dispersed Jet Upon Start-up

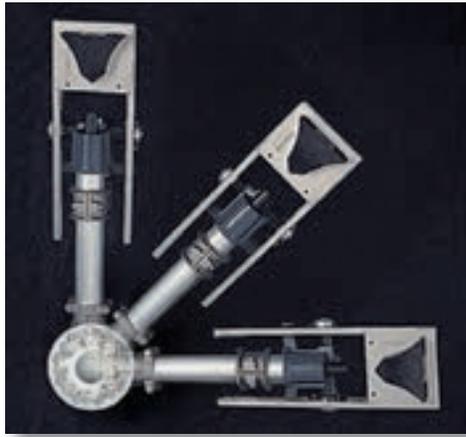
Reduces run-off and over-watering.

Self-adjusting Jet Breaker Device

To vary distribution at lower pressures or to increase close-in watering.

Low Maintenance

The TG101 is a very low maintenance gun-style sprinkler.



Distribution

The unique drive system allows a better stream diffusion. This greatly reduces furrows and run-off.

Adjustable Brake Force

The self-adjusting system adapts its brake force to the existing system pressure. This is essential for uniform water application.

TG101-NPT Performance Data — 24° Trajectory

Pressure PSI	Nozzle 0.47" (12mm)		Nozzle 0.55" (14mm)		Nozzle 0.63" (16mm)		Nozzle 0.71" (18mm)		Nozzle 0.79" (20mm)		Nozzle 0.87" (22mm)		Nozzle 0.94" (24mm)	
	Flow GPM	Radius Feet												
30			46.7	85.3	61.2	91.5	77.5	97.4	95.5	103.3	115.8	108.6	137.8	113.8
35			52.4	92.8	68.2	99.7	86.7	106.3	107.0	112.5	129.4	118.4	154.1	124.0
40	42.3	91.5	57.2	99.4	74.8	107.0	95.1	113.8	112.3	120.4	141.8	127.0	168.6	132.9
50	45.8	96.8	62.1	105.3	81.0	113.2	102.6	120.7	126.3	127.6	153.2	134.5	182.3	141.1
60	48.9	102.0	66.5	110.9	86.7	119.1	109.6	127.0	135.1	134.5	163.8	141.4	195.0	148.3
65	51.5	106.6	70.4	115.8	92.0	124.7	116.2	132.9	143.5	140.4	171.4	148.0	206.5	155.2
70	54.6	110.9	74.0	120.7	96.8	129.6	122.4	138.1	151.9	146.3	183.1	186.7	217.9	161.4
80	57.2	115.2	77.9	125.0	101.7	134.5	128.5	143.4	158.5	151.6	191.9	159.8	228.5	167.3
90	59.9	119.1	81.0	129.3	106.1	139.1	134.3	148.0	168.5	156.8	200.3	165.0	238.6	172.9
95	62.1	122.7	84.5	133.2	110.5	143.0	139.5	152.6	172.6	161.7	208.7	170.3	248.3	178.5

Note: Products may not be available in all regions. Please consult your Toro regional manager for availability.

Specifications

Operating Specifications

- Radius: 91-178 feet (27-54m)
- Flow Rate: 42-248 GPM (190-1127 LPM)
- Operating Pressure Range: 40-95 PSI (2,5-6,5 Bar)
- Trajectory: 24°
- Two standard nozzle options: 0.63" (16mm) and .87" (22mm) (additional range of nozzles available for specialty applications)

Additional Features

- Powerful and efficient stream diffusion
- Standard 2" (51mm) NPT thread connection
- High-quality, durable construction
- Full or part-circle operation in one unit
- Adjustable rotation speed

Warranty

- Two years

Specifying Information—TG101

TG101-NPT-XX	
Description	Nozzle
TG101-NPT	XX
TG101-NPT—TG101 Sprinkler	16—16.0 24—24.0 20—20.0 26—26.0 22—22.0 28—28.0
Example: A TG101 sprinkler, part circle with a 16.0 nozzle, would be specified as: TG101-NPT-16	



Low maintenance

The TG101 gun is lowmaintenance. The modern design avoids the use of ball bearings, which can seize at contact with moisture, cause failure.

TG101 Model List

Model	Description
• TG101-NPT	Large Radius Gun-Style Sprinkler, NPT
• TG101-D912	12 mm Nozzle
• TG101-D914	14 mm Nozzle
• TG101-D916	16 mm Nozzle
• TG101-D918	18 mm Nozzle
• TG101-D920	20 mm Nozzle
• TG101-D922	22 mm Nozzle
• TG101-D924	24 mm Nozzle

690 Series

- Inlet Size: 1½" (37mm)
- Radius: 87'-108' (26,5-33,0m)
- Operating Pressure Range: 80-150 PSI (5,5-10,3 Bar)

For nearly 40 years the 690 Series has set the standard for durability and reliability in commercial applications. Extremely rugged, the 690 Series is constructed of brass, stainless steel and engineering plastics for unmatched performance in the most demanding environments.



Features & Benefits

Artificial Playing Surfaces

Radius and flow capabilities are perfect for cooling and rinsing artificial playing surfaces such as football fields.

Electric Valve In Head Models

Provide individual head control that ensures run times can match differing soil, turf and terrain watering requirements, pressure regulation to ensure all nozzles perform at the same pressure and manual ON-OFF-auto control at the head.

Fixed Arc Drives

Nine fixed arc drive assemblies ensure positive retention of the coverage area with no arc drift

Balanced Application Rate

Used in single or double row applications these sprinklers operate at a slower speed over the non-overlap area and a faster speed over the overlapped areas to provide a balanced application rate.

Dimensions

- Body diameter: 10" (254mm)
- Body height: 16" (405mm)
- Weight: 5.6 lbs. (2,54 kg)

Operating Specifications

- Radius: 87' – 108' (26,5-33,0m)
- Flow Rate: 51.0 – 82.2 GPM (193-311 LPM)
- Operating Pressure Range: 80-150 psi (5,5-10,3 Bar)
- Pop-up height to nozzle: ¾" (20mm)
- Inlet: 1 ½" NPT (38mm)
- Check-O-Matic: Maintains 37' (11,2m) of elevation
- Electric Valve-in-head Solenoid: 24V ac, 50/60 Hz
 - Inrush: 60 Hz, 0.30 amps
 - Holding: 60 Hz, 0.20 amps
- All internal components serviceable from the top

Warranty

- Three years

690 Series Performance Chart

Base Pressure	Nozzle Set 90		Nozzle Set 91		Nozzle Set 92	
	Radius	GPM	Radius	GPM	Radius	GPM
80	87	51.0	96	61.2	100	74.0
100	90	57.1	100	73.5	108	82.2

Radius shown in feet.
Sprinkler radius of throw per ASAE standard S398.1.

690 Series Model List

Model	Description
• 691	90° Part-circle sprinkler
• 692	180° Part-circle sprinkler
• 694	Full-circle sprinkler
• 696	2-speed (60°-120°) sprinkler
• 698	2-speed (180°-180°) sprinkler

Specifying Information—690

69X-0X-XXX			
Arc	Valve-In-Head Type	Nozzle	Pressure Regulation*
69X	0X	XX	X
1—90° 2—180° 4—Full-circle 6—Full-circle, 2-speed (60°-120°) 8—Full-circle, 2-speed (180°-180°)	1—Normally Open Hydraulic 2—Check-O-Matic 6—Electric	90 91 92	8—80 psi 1—100 psi

Example: When specifying a 690 Series Sprinkler with a 180° arc, electric valve-in-head, #91 nozzle, and pressure regulation at 80 psi (5,5 Bars), you would specify: **692-06-918**

*Electric models only.

Rotor Accessories

Effluent Water Indicators



300 & 340 Series

89-7853

- Lavender cover for 300 and 340 Series Omni nozzle
- Use with part no. 300-15 (Omni Nozzle)



89-7854

- Lavender cover for 300 and 340 Series Omni nozzle high-pop models
- Use with part no. 300-25 (Omni Nozzle)



89-7889

- Lavender plug for 300 Series with fixed-radius nozzles

Nozzles



T7

102-2633

- Nozzle tree



T5 Nozzle Tree Kit

102-7712

- 20 nozzle trees per bag

Installation/Adjustment Tools



Mini 8 & S800 Series

102-2024

- Adjustment tool for Mini 8 and Super 800 Series models



T5 Rotor Check Valve Kit

102-7714

- 20 valve seals per bag



T5/T7/TR50 XT Rotor Adjustment Tool

102-6527



For 640 Series

995-07

- VIH pliers



995-08

- Valve removal tool
- Designed for quick removal of valve assembly from body



995-42

- Canister removal tool



996-51

- Cap removal tool



995-37

- Seal installation tool



995-35

- Valve insertion tool for
- Designed for accurate one-step insertion of valve assembly and snap ring



Valves Overview



Model		EZ-Flo® Plus	TPV Series	250/260 Series 254/264 Series
Page Number		54-55	56-57	58-59
Flow Range		.025-30 GPM (1-114 LPM)	0.1- 40 GPM (1-151 LPM)	0.25-30 GPM (1-114 LPM)
Operating Pressure		10-150 PSI Max (0,7-10 Bar)	10-175 PSI Max (0,7-12 Bar)	10-150 PSI Max (0,7-10 Bar)
Conditions	Electrically-Activated Systems	X	X	X
	Hydraulically-Activated Systems			250/260 only
	Pin-Type Systems			250/260 only
Sizes	Effluent Water	X	X	X
	3/4" (20mm)	X		254/264 only
	1" (25mm)	X	X	X
	1 ¼" (32mm)			
	1 ½" (40mm)			
	2" (50mm)			
	2 ½" (65mm)			
	3" (80mm)			
Configurations	Angle	X		
	Anti-Siphon	X		
	Inline/Globe	X	X	X
Inlet/Outlet	Threaded (Female)	X	X	250/260 only
	Slip	X	X	
	Male X Male	X	X	254/264 only
	Male X Barb	X	X	254/264 only
Features	Manual Flow Control	X	X	X
	Pressure Regulation			
	Internal Bleed	X	X	
	External Bleed (Flush)	X	X	X
	Optional DC Latching Solenoid	X	X	
Body Construction	ABS			X
	PVC	X	X	
	Glass-filled Nylon			X
	Glass-filled Polypropylene	X		
	Brass			
Warranty		Five Years	Five Years	Two Years

 **WaterSmart® Feature**



Model		252 Series	P-220 Series	P-220 Scrubber	220 Brass Series	Quick Coupler Series
Page Number		60-61	62-63	64-65	66-67	68
Flow Range		5.0-90.0 GPM (19-340 LPM)	5.0-300 GPM (19-1136 LPM)	80-300 GPM (302-1136 LPM)	5.0-350 GPM (19-1325 LPM)	
Operating Pressure		10-150 PSI Max (0,7-10 Bar)	10-220 PSI Max (0,7-15,2 Bar)	10-220 PSI Max (0,7-15,2 Bar)	10-220 Psi Max (0,7-15,2 Bar)	
Conditions	Electrically-Activated Systems	X	X	X	X	
	Hydraulically-Activated Systems	X				
	Pin-Type Systems					
Sizes	Effluent Water	X	X	X	X	X
	3/4" (20mm)					X
	1" (25mm)	X	X	X	X	X
	1 1/4" (32mm)				X	
	1 1/2" (40mm)	X	X	X	X	
	2" (50mm)	X	X	X	X	
	2 1/2" (65mm)				X	
Configurations	3" (80mm)		X	X	X	
	Angle	X	X	X	X	
	Anti-Siphon					
Inlet/Outlet	Inline/Globe	X	X	X	X	
	Threaded (Female)	X	X	X	X	
	Slip					
	Male X Male					
Features	Male X Barb					
	Manual Flow Control	X	X	X	X	
	Pressure Regulation		X	X	X	
	Internal Bleed		X	X		
	External Bleed (Flush)	X	X	X	X	
Body Construction	Optional DC Latching Solenoid		X	X	X	
	ABS	X				
	PVC					
	Glass-filled Nylon	X	X	X		
	Glass-filled Polypropylene					
Brass				X	X	
Warranty		Two Years	Five Years	Five Years	Five Years	Two Years

 WaterSmart® Feature

EZ-Flo® Plus Jar-Top Series

- 3/4" (20mm), 1" (25mm)
- Electric

The name says it all – EZ. Easy to install and easy to service, these Toro® valves are easy to choose. Perfect for residential applications, EZ-Flo Plus valves are available in various configurations providing the flexibility you need.



Effluent
Options
Available



DC Latching
Solenoid
Option

Features & Benefits

Jar-Top Design

Requires no screws and provides fast and easy servicing.

PVC, Glass-Filled Nylon and Stainless Steel Construction

Provides longer life span and leak protection in nearly any environment.

Double-beaded, Chloramine and Ozone-Resistant Santoprene® Diaphragm

Ensures a consistent, leak-proof seal all the way up to 150 psi (10,3 Bar).

In-Line or Anti-Siphon Models

Ample selection for new and retrofit installations.

Optional Flow Control

Adjusts the flow of each zone on a system.

Water Management Highlight



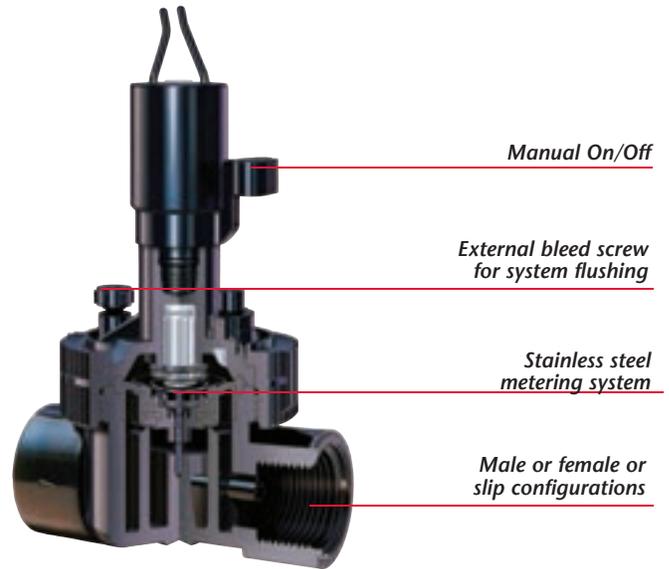
Jar-Top for Ease of Use

No screws mean less time flushing out the system on start-up. Cleaning the diaphragm area is uncomplicated as it requires no tools. EZ-Flo Plus valves are simple to service – it's that easy.



EZ-Flo® Plus with DC Latching Solenoid

EZ-Flo valves can be ordered with pre-installed DC Latching solenoids providing cost and labor savings. Perfect for use with Toro controllers, especially DDCWP and TDC.



Specifications

Dimensions

- Female Globe: 5 1/8" H x 3" W x 4" L (130 x 75 x 101mm)
- Male Globe: 5 1/8" H x 3" W x 5 1/2" L (130 x 75 x 140mm)
- Anti-Siphon: 6" H x 3" W x 6 7/8" L (152 x 75 x 175mm)

Operating Specifications and Additional Features

- Flow Range:
 - 3/4" (20mm): 0.25 – 20 GPM (0,9-76 LPM)
 - 1" (25mm): 0.25 – 30 GPM (0,9-114 LPM)
- Operating Pressure: 10-150 psi (0,68-10,32 Bar)
- Encapsulated solenoid (102-7053) with captured hex plunger, spring and O-ring (24 VAC):
 - Inrush current, 0.4 amps
 - Holding current, 0.2 amps
- Available with or without flow control

Options Available

- DCLS-P — Potted DC Latching Solenoid
- EFF-KIT-60Hz— Effluent Solenoid Assembly and Tag

Warranty

- Five years

Friction Loss Data—US

Size	Model	GPM Flow					
		0.25	5	10	15	20	30
1"	Inline	2.0	3.5	4.0	3.0	3.3	6.2
	Anti-siphon	2.0	2.1	3.1	2.3	3.8	8.1
3/4"	Anti-siphon	2.0	4.2	4.2	4.8	7.6	—

EZ-Flo Plus Series Model List

AC Solenoids

Model	Description
• EZF-29-03	3/4" (20mm) Electric, NPT, Anti-siphon
• EZF-29-04	1" (25mm) Electric, NPT, Anti-siphon
• EZF-20-04	1" (25mm) Electric, Slip
• EZF-26-04	1" (25mm) Electric, Female NPT
• EZF-21-04	1" (25mm) Electric, Male x Male NPT
• EZF-25-04	1" (25mm) Electric, Male x Barb NPT
• EZF-00-04	1" (25mm) Electric, Slip without flow control
• EZF-06-04	1" (25mm) Electric, Female NPT without flow control
• EZF-01-04	1" (25mm) Electric, Male x Male NPT without flow control
• EZF-05-04	1" (25mm) Electric, Male x Barb NPT without flow control

DC Solenoids

Model	Description
• EZF-20-94	1" (25mm) Electric, Slip, with DC Latching Solenoid
• EZF-26-94	1" (25mm) Electric, Female, NPT, with DC Latching Solenoid
• EZF-21-94	1" (25mm) Electric, Male x Male NPT with DC Latching Solenoid
• EZF-25-94	1" (25mm) Electric, Male x Barb NPT with DC Latching Solenoid

Specifying Information—EZ-Flo® Plus

EZ-Flo Plus Series Model List			
Model	Flow Control	Body Style	Size
EZF	X	X	XX
EZF—EZ-Flo Plus Valve	0—Without 2—With	0—1" Slip x Slip 1—1" Male x Male NPT 5—Male NPT x Barb 6—1" Female NPT 9—Anti-siphon	03—3/4" (20mm) 04—1" (25mm) 94—1" (25mm) with DCLS-P (flow control models only)

Example: A 1" (25mm) EZ-Flo Plus Valve with slip configuration and flow control would be specified as: **EZF-20-04**

TPV Series

- 1" (25mm)
- 0.1—40 GPM (0,38-151 LPM)
- Electric

The search for a full-featured yet economically priced, residential and commercial valve is over thanks to Toro's newest 1" (25mm) valve offering—the TPV Series. These full-featured, rugged, debris-resistant valves feature flow ranges from 0.1 to 40 GPM (0,38-151 LPM), making them ideal for everything from drip to high-flow residential and light-commercial applications.



Effluent
Options
Available



DC Latching
Solenoid
Option

Features & Benefits

Tough Double-Beaded, Chloramine and Ozone-Resistant Santoprene® Diaphragm

Ensures a consistent, leak-proof seal all the way up to 175 psi (12,0 Bar).

Multiple Body Styles

Choose from various styles to meet any installation requirement.

Wide Range of Flows and Pressure

One valve for all site specific needs.

Robust Solenoid Design

Ensures reliable opening and closing.

Water Management Highlight

Flow Control

The precise flow control with ergonomic handle allows fine tuning of the downstream pressure to prevent pressure spikes that damage sprinklers and moderate high pressures that cause misting and poor nozzle performance.



Specifications

Dimensions

- 5 1/8" H x 2 3/4" W x 5" L (130 x 70 x 127mm)

Operating Specifications

- Flow Range: 0.1 to 40 GPM (0,38-151 LPM)
- Operating Pressure: Electric – 10 to 175 psi (0,7-12,0 Bar)
- Burst pressure safety rating: 1000 psi (68,9 Bar)
- Solenoid: 24 VAC (50/60 Hz) Standard (102-7053)
 - Inrush: 0.4 amps
 - Holding: 0.2 amps

Additional Features

- Rugged, Double-Beaded Santoprene diaphragm
- Patented DBS™ (Debris Bypass System) technology
- Operates in low-flow and landscape drip applications when a filter is installed upstream (see page 145)
- Built with either AC or DC Latching Solenoids
- Manual Operation without the use of a controller—Internal and External Bleed
- Captured hex/Phillips screws
- Optional flow control allows precise zone adjustment and manual shutoff
- Encapsulated injection-molded solenoid with a captured plunger
- Removable flow control handle to ensure vandal-resistance
- Slip models feature patented Glue Stop™
- Self-aligning bonnet permits fast and easy servicing
- Large directional flow arrows

Options Available

- EFF-Kit-60Hz - Recycled Water Solenoid Assembly and Watering Tag
- DCLS-P - Potted DC Latching Solenoid Assembly

Warranty

- Five years



Glue Stop™

TPV Slip-by-Slip models include this patented feature which ensures that the installer cannot block the downstream port of the valve during installation with primer and cement.

TPV Series Model List

AC Solenoids	
Model	Description
• TPV100	1" (25mm) Female NPT, In-Line, w/o FlowControl
• TPVF100	1" (25mm) Female NPT, In-Line, w/Flow Control
• TPV100MM	1" (25mm) Male Thread x Male Thread, In-Line, w/o Flow Control
• TPVF100MM	1" (25mm) Male Thread x Male Thread, In-Line, w/Flow Control
• TPV100S	1" (25mm) Slip x Slip, In-Line, w/o Flow Control
• TPVF100S	1" (25mm) Slip x Slip, In-Line, w/Flow Control
• TPV100MB	1" (25mm) Male Thread x Barb, In-Line, w/o Flow Control
• TPVF100MB	1" (25mm) Male Thread x Barb, In-Line, w/Flow Control
DC Solenoids	
Model	Description
• TPVF100DC	1" (25mm) Female NPT, In-Line, w/ Flow Control, DCLS-P
• TPVF100MMDC	1" (25mm) Male Thread x Male Thread, In-Line, w/ Flow Control, DCLS-P
• TPVF100SDC	1" (25mm) Slip x Slip, In-Line, w/Flow Control, DCLS-P
• TPVF100MBDC	1" (25mm) Male Thread x Barb, In-Line, w/Flow Control, DCLS-P

TPV Friction Loss data—US

GPM Flow	.10	.25	5	10	15	20	30	40
PSI Loss	2.0	2.0	3.5	3.9	3.0	3.3	7.0	13

Specifying Information—TPV

TPVF100XXXX				
Model	Flow Control	Size	Body Style	Optional
TPV	E	100	XX	XX
TPV—TPV Valve	F—With Flow Control	100—1" (25mm)	MM—Male X Male S—Slip MB—Male X Barb	DC—DCLS-P Latching Solenoid
Example: A 1" (25mm) TPV Valve with slip configuration and flow control would be specified as: TPVF100S				

250/260 & 254/264 Series

- 3/4" (20mm) and 1" (25mm)
- Electric/Hydraulic

Heavy duty. Hardworking. The Toro® 250/260 and 254/264 Series Valves are made to withstand whatever a large residential or light commercial application can dish out.

Features & Benefits

Heavy-Duty Toro Solenoid

Provides dependable operation and long life.

Optional Flow Control

Adjust the flow of each zone.

Various Inlet and Outlet Choices

Ample selection for new and retrofit installations.

Single-Piece Robust Rubber Diaphragm

For reliable, leak-free closing.

Tough, Glass-Filled Zytel Cap And Body

Durable materials which provide years of reliable operation.

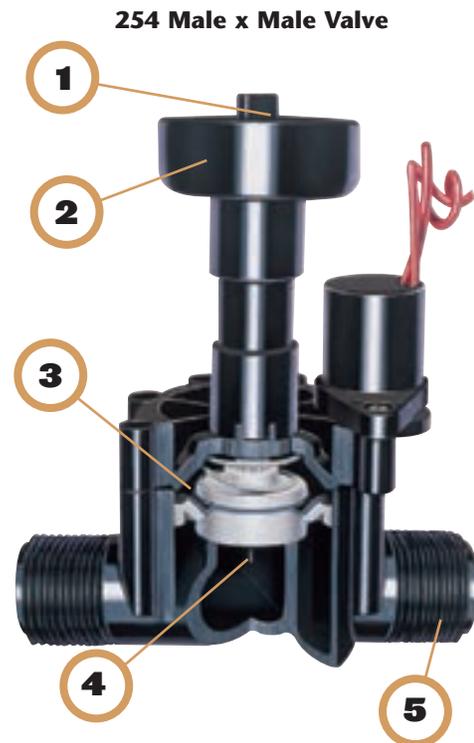


Water Management Highlight



Effluent Flow Control Handle

Ideal for systems using reclaimed water, this flow control handle is easily viewable from the top of the valve.



1. Manual bleed screw
2. Optional flow control
3. Single-piece rubber diaphragm
4. Stainless-steel metering pin
5. Tough, glass-filled cap and body

Specifications

Dimensions

- 3/4" (20mm): 3" H x 4" W (75 x 101mm)
- 1" (25mm) 250 & 254 (with flow control): 6" H x 4 1/2" W (152 x 114mm)
- 1" (25mm) 260 & 264 (w/o flow control): 4 1/2" H x 4 1/2" W (114 x 114mm)

Operating Specifications

- Recommended flow range:
 - 3/4" (20mm): 0.25 to 15.0 GPM (.95-56 LPM)
 - 1" (25mm): 5.0 to 30.0 GPM (19-114 LPM)
- Operating Pressure
 - 3/4" (20mm): 10 to 150 psi (0,7-10,3 Bar)
 - 1" (25mm): 20 to 150 psi (1,4-10,3 Bar)
- Solenoid: 24 VAC
 - 3/4" (20mm): Inrush: 0.25 amps, 6.00 VA; Holding: 0.19 amps, 4.56 VA
 - 1" (25mm): Inrush: 0.30 amps, 7.20 VA; Holding: 0.20 amps, 4.80 VA
- Burst Pressure safety rating: 750 psi (51,7 Bar)

Additional Features

- Manual flow control adjustable to zero flow
- Self-cleaning, stainless steel metering pin
- External manual bleed
- 18" (5,5m) lead wires (electric)
- Single-piece rubber diaphragm
- Recycled water flow-control knob available
- Available with or without flow control
- Low in-rush solenoid

Options Available

- 89-7855 - Effluent Water Indicator Valve Flow Control Knob

Warranty

- Two years

250/260 Series Model List

Female Thread

Model	Description
• 250-06-04	1" (25mm) Female NPT, In-line, w/ Flow Control
• 260-06-04	1" (25mm) Female NPT, In-line, w/o Flow Control
• 250-00-04	1" (25mm) Female NPT, In-line, Pin-type Hydraulic, w/Flow Control
• 250-01-04	1" (25mm) Female NPT, In-line, Normally Open Hydraulic, w/Flow Control

Male Thread

• 264-06-03	3/4" (20mm) Male Thread x Male Thread, In-Line, w/o Flow Control
• 254-06-04	1" (25mm) Male Thread x Male Thread, In-Line, w/ Flow Control
• 264-06-04	1" (25mm) Male Thread x Male Thread, In-Line, w/o Flow Control
• 254-16-04	1" (25mm) Male Thread x Insert, In-Line, w/ Flow Control
• 264-16-04	1" (25mm) Male Thread x Insert, In-Line, w/o Flow Control

254/264 Series Friction Loss Data—US

Size	Model	GPM Flow												
		.5	1	2	5	10	15	20	25	30	35	40	45	
3/4"	Electric	<1.0	<1.0	<1.0	1.5	3.0	6.5							
1"	Electric				2.0	2.0	2.3	3.1	4.0	5.4	7.0	8.7	10.5	

Note: For optimum sprinkler performance when designing a system, calculate total friction loss to ensure sufficient downstream pressure. Flow rates are recommended not to exceed 5 psi loss. Values are listed in psi.

250/260 Series Friction Loss Data—US

Size	Model	GPM Flow						
		0.5	10	15	20	25	30	40
1"	Hydraulic	<1.0	1.0	2.0	3.0	4.0	6.0	9.5
1"	Electric		4.4	4.5	5.0	5.0	7.0	9.5

Specifying Information—250/260

2X0-0X-04		
Flow Control	Activation Type	Size
2X0	0X	04
5—w/Flow Control 6—w/o Flow Control	0—Pin-type Hydraulic 1—Normally Open Hydraulic 6—Electric	04—1" (25mm)

Example: A 1" (25mm) 250 Series Valve with flow control and electric activation would be specified as: **250-06-04**

Note: DC Latching Solenoid not available.

Specifying Information—254/264

2X4-X6-0X		
Flow Control	Body Style	Size
2X4	X6	0X
5—w/Flow Control 6—w/o Flow Control	0—Male Thread x Male Thread 1—Male Thread x Barb	3—3/4" (20mm) 4—1" (25mm)

Example: A 1" (25mm) electric 264 Series Valve without flow control with a barb would be specified as: **264-16-04**

Note: DC Latching Solenoid not available.

252 Series

- 1" (25mm), 1½" (40mm), 2" (50mm)
- Electric/Hydraulic
- Globe, Angle

Toro® 252 Series valves are built tough and ready to withstand the harshest conditions in any commercial application. With several configurations to choose from, 252 Series valves are available in electric or hydraulic, 1" (25mm), 1.5" (40mm) and 2" (50mm)globe/angle models with flow control.



Effluent
Options
Available

Features & Benefits

Heavy-Duty Toro Solenoid

Provides dependable operation and long life.

High-Grade Construction

Made of durable materials to resist wear.

Globe and Angle Configurations

Easy to use in any application.

Fabric-Reinforced Rubber Diaphragm

Provides long-term tear and stretch tolerance.

Water Flow Control Handle

Adjusts the flow of each zone on a system.

Robust ABS Material

Ensures the valve will resist heavy pressure and high flows without damage.

Water Management Highlight



External Bleed

The external bleed allows perfect manual operation of the valve without electrically charging the solenoid. System flushing can also be accomplished using the external bleed with debris and other material being flushed out of the port.

Specifications

Dimensions

- 1" (25mm): 6 ¾" H x 4 ½" W (171 x 114mm)
- 1½" (40mm): 7 ¾" H x 6" W (197 x 152mm)
- 2" (50mm): 9 ½" H x 7" W (241 x 178mm)

Operating Specifications

- Recommended Flow Range:
 - 1" (25mm): 5.0 to 25 GPM (19-95 LPM)
 - 1½" (40mm): 25 to 70 GPM (95-265 LPM)
 - 2" (50mm): 60 to 150 GPM (227-568 LPM)
- Operating Pressure: 20 to 150 psi (1,3-10,3 Bar)
- Solenoid: 24 VAC, 50/60 Hz
 - Inrush: 0.30 amps, 7.20 VA
 - Holding: 0.20 amps, 4.80 VA
- Burst pressure safety rating: 750 psi (51,7 Bar)

Additional Features

- Globe and globe/angle built into one valve
- Manual flow control
- External manual bleed
- 24" (60cm) lead wires 1 ½" (40mm) and 2" (50mm) electric or 18" (45cm) lead wires 1" (25mm) electric
- Self-cleaning, stainless steel metering pin (electric)
- Tough, glass-filled bonnet
- Single-piece diaphragm

Options Available

- 89-7855 – Effluent Water Indicator Valve Flow Control Knob

Warranty

- Two years



Globe and Angle In One Valve

The all-in-one globe and angle configuration allows flexibility in design and installation. Angle installations allow for less friction loss across the piping system while globe configurations are standard in many irrigation systems.

252 Series Model List

Female NPT In-line/Angle w/Flow Control

Model	Description
• 252-06-04	1" (25mm)
• 252-26-06	1½" (38mm)
• 252-26-08	2" (50mm)
• 252-21-06	1 ½" (38mm) Normally Open
• 252-21-08	2" (50mm) Normally Open

252 Series Friction Loss Data—US

Size	Type	Config.	GPM Flow												
			5	10	20	25	30	40	50	60	70	80	100	120	150
1½"	Hydraulic	Globe				1.0	1.0	2.0	3.0	4.0	5.5	6.5			
		Angle				1.0	1.0	1.5	1.5	3.0	4.0	5.0			
2"	Hydraulic	Globe								1.5	2.0	2.0	3.5	5.0	8.0
		Angle								1.0	1.0	1.5	2.0	3.0	5.0
1"	Electric	Globe	3.0	4.0	5.0	6.0	7.0	9.5							
		Angle	2.0	3.5	4.5	4.5	5.0	7.5							
1½"	Electric	Globe				1.5	1.0	2.0	3.0	4.0	5.0	7.0			
		Angle				1.5	1.0	1.5	2.0	3.0	3.0	5.0			
2"	Electric	Globe								2.0	2.0	2.5	3.5	5.5	8.0
		Angle								1.0	1.0	2.0	3.0	4.0	5.0

Note: For optimum performance when designing a system, be sure to calculate total friction loss to ensure sufficient downstream pressure. For optimum regulation performance, size regulating valves toward the higher flow ranges. Flow rates are recommended not to exceed 5 psi (0,3 bar) loss. ■ = Debris-resistant models

Specifying Information—252

252-XX-0X		
Model	Activation Type	Size
252	XX	0X
252—252 Series Valve	06—1" Electric 21—Normally Open Hydraulic 26—1½" or 2" Electric	4—1" (25mm) 6—1½" (40mm) 8—2" (50mm)
Example: A 1½" (40mm) electric 252 Series Valve, would be specified as: 252-26-06		

Note: DC Latching Solenoid not available.

P-220 Series

- 1" (25mm), 1½" (40mm), 2" (50mm), 3" (80mm)
- Electric
- Pressure-regulating
- Globe, Angle

For proven reliability in the field, the Toro® P-220 Series valves deliver. Constructed of heavy-duty, glass-filled nylon material, these valves are ready to consistently withstand pressures up to 220 PSI (15 Bar).



Features & Benefits

Durable Glass-Filled Nylon

Ensures the P-220 can operate at pressures up to 220 psi (15 Bar).

Precise Pressure Control Option

Compact EZReg® dial-design technology (factory or field installed - no need to remove solenoid).

Internal And External Manual Bleed

Keeps valve box dry and easy to use.

Schrader Valve Pre-Installed

Simple verification of downstream pressure.

Optional Spike-Guard™ Solenoid

Reduces wire size requirements, allows twice as many valves to run simultaneously on a transformer, and lowers power costs with a lightning rating exceeding 20,000 volts.

Filter Screen On 2" (50mm) & 3" Models (75 mm)

Allows for upstream filtration of water to ensure no clogging occurs inside the valve.

Water Management Highlight



Pressure Regulator



The EZReg® module can regulate with flows of only 5 GPM (0,3 Bar) with a 1" (25mm) valve and it only requires 10 psi (0,7 Bar) differential to operate. The pressure regulator can be easily and quickly installed—even under pressure, with no danger of water geysers.



Effluent
Options
Available



Pressure
Regulation



DC Latching
Solenoid
Option

Specifications

Dimensions

- 1" (25mm): 6 3/4" H x 3 5/8" W (171 x 92mm)
- 1 1/2" (40mm): 7 1/4" H x 3 5/8" W (184 x 92mm)
- 2" (50mm): 9 1/2" H x 6 1/8" W (241 x 156mm)
- 3" (80mm): 10 3/4" H x 6 1/8" W (273 x 156mm)

Operating Specifications

- Flow Range:
 - 1" (25mm): 5 to 40 GPM (19 - 151 LPM)
 - 1 1/2" (40mm): 30 to 100 GPM (114 - 416 LPM)
 - 2" (50mm): 80 to 180 GPM (303 - 681 LPM)
 - 3" (80mm): 150 to 300 GPM (568 - 1,135 LPM)
- Operating Pressure
 - 1" & 1 1/2" Models: 10 to 220 psi (0,7 to 15,2 Bar)
 - 2" & 3" Models: 20 to 220 psi (1,4 to 15,2 Bar)
- Pressure regulating:
 - Outlet (EZR-30): 5 to 30 psi ± 3 (0,3 to 2,1 Bar)
 - Outlet (EZR-100): 5 to 100 psi ± 3 (0,3 to 7,0 Bar)
- Minimum pressure differential (between inlet and outlet) for pressure regulation: 10 psi (0,7 Bar)
- Body styles:
 - Globe/Angle – 1", 1 1/2", 2" & 3" (25, 40, 50 & 80mm) female threads
- 118-5982 Solenoid: 24 VAC (50/60 Hz) Standard
 - Inrush: 60 Hz: 0.4 amps
 - Holding: 60 Hz: 0.2 amps

Additional features

- Tough glass-filled nylon and stainless steel construction
- Internal and External bleed
- Pressure regulates in electric or pressure-regulating models
- No external tubing for either pressure-regulating model
- Standard, built-in Schrader-type valve for downstream pressure verification
- Flow control independent of solenoid
- Self-aligning bonnet to ensure correct installation
- Self-cleaning, stainless steel metering rod
- Low-flow capability down to 5 GPM (18,9 LPM) with EZReg®
- Low-power requirement for longer wire runs

Options Available

- EZR-30 - EZReg®, 5–30 psi (0,3-2,1 Bar) Regulator Module
- EZR-100 - EZReg®, 5–100 psi (0,3-7,0 Bar) Regulator Module
- EFF-KIT-60Hz - Effluent Water (Lavender) Solenoid Assembly (24 VAC, 60 Hz) and Warning Tag
- 118-5982 Solenoid: 24 VAC (50/60 Hz) Standard
- DCLS-P - Potted DC Latching Solenoid Assembly
- SGS-12 - Spike Guard™ Solenoid: 24 VAC (50/60 Hz)

Warranty

- Five years

P-220 Series Model List

Model	Description	With Pre-Installed Latching Solenoids
<ul style="list-style-type: none"> • P220-26-04 • P220-26-06 • P220-26-08 • P220-26-00 	1"(25mm) In-line, Angle 1 1/2"(40mm) In-line, Angle 2"(50mm) In-line, Angle 3"(80mm) In-line, Angle	<ul style="list-style-type: none"> • P220-26-94 • P220-26-96 • P220-26-98 • P220-26-90
Pressure-Regulated With EZ Reg®		With Pre-Installed Latching Solenoids
Model	Description	
<ul style="list-style-type: none"> • P220-27-04 • P220-27-06 • P220-27-08 • P220-27-00 	1"(25mm) In-line, Angle 1 1/2"(40mm) In-line, Angle 2"(50mm) In-line, Angle 3"(80mm) In-line, Angle	<ul style="list-style-type: none"> • P220-27-94 • P220-27-96 • P220-27-98 • P220-27-90

P-220 Series Friction Loss Data—US

Size	Config.	GPM Flow																						
		5	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	180	200	225	250	275	300	
1"	Globe	4.00	4.20	3.20	4.10	7.20																		
	Angle	4.00	4.20	3.10	2.70	4.80																		
1 1/2"	Globe				1.60	2.30	3.60	5.20	7.00	9.20	11.20	13.60	16.40											
	Angle				1.30	1.60	2.80	4.00	5.50	7.10	8.90	10.90	13.50											
2"	Globe									2.10	2.70	3.30	4.00	4.80	5.60	6.50	7.50	8.70						
	Angle									1.20	1.60	2.00	2.40	2.80	3.30	3.90	4.40	5.20						
3"	Globe															2.50	3.00	4.10	5.30	6.70	8.30	10.10		
	Angle															1.90	2.40	3.30	4.30	5.50	6.90	8.50		

Note: For optimum performance when designing a system, be sure to calculate total friction loss to ensure sufficient downstream pressure. For optimum regulation performance, size regulating valves toward the higher flow ranges. Flow rates are recommended not to exceed 5 psi loss.

Specifying Information—P220

P220-2X-X-X			
Model	Activation Type	Solenoid	Size
P220	2X	X	X
P220—P-220 Series Plastic Valve	26—NPT, Electric 27—NPT, Pressure-regulated EZR-100 (Standard)	0—Standard Solenoid 9—DC Latching Solenoid	4—1" (25mm) 6—1 1/2" (40mm) 8—2" (50mm) 0—3" (80mm)

Example: A 1" (25mm) P-220 Series plastic electric, pressure-regulating valve would be specified as: **P220-27-04**

P-220S Scrubber Series

- 1" (25mm), 1½" (40mm), 2" (50mm), 3" (80mm)
- Electric
- Pressure-regulating
- Globe, Angle

A true dirty water irrigation valve, able to handle chlorine and other chemicals found in reclaimed and other non-potable water systems.



Features & Benefits

Durable Glass-Filled Nylon

Ensures the P-220 can operate at pressures up to 220 psi (15 Bar).

Active Cleansing Technology (ACT™)

Industry's first active scrubber valve cleans continuously whereas competitive valves only clean on opening and closing.

Fabric-reinforced EPDM Diaphragm and EPDM Seat

Designed to work in virtually all water applications.

Rugged Internal Plastic And Stainless Steel Parts

Turbine, nut and metering system are designed with marine and aerospace plastics and metals which make them resistant to water treated with chloramines or ozones.

Precise Pressure Regulation Option

Compact EZReg® dial-design technology ensures precise downstream pressure for optimizing sprinkler head performance.

Completely Serviceable and Retrofittable

"Scrubber" diaphragm assembly is replaceable and can also retrofit previously installed P220 models.



Effluent
Options
Available



Pressure
Regulation



DC Latching
Solenoid
Option

"Scrubber"
Turbine

Filter Surface



ACT™ System

Toro's patented technology employs a constantly rotating turbine to clean the metering/filtration area. This ensures that dirt, algae and particulates do not impede valve performance.

Specifications

Dimensions

- 1" (25mm): 6 3/4" H x 3 5/8" W (171 x 92mm)
- 1 1/2" (40mm): 7 1/4" H x 3 5/8" W (184 x 92mm)
- 2" (50mm): 9 1/2" H x 6 1/8" W (241 x 156mm)
- 3" (80mm): 10 3/4" H x 6 1/8" W (273 x 156mm)

Operating Specifications

- Flow Range:
 - 1" (25mm): 5 to 40 GPM (19 - 151 LPM)
 - 1 1/2" (40mm): 30 to 100 GPM (114 - 416 LPM)
 - 2" (50mm): 80 to 180 GPM (303 - 681 LPM)
 - 3" (80mm): 150 to 300 GPM (568 - 1,135 LPM)
- Operating Pressure
 - 1" & 1 1/2" Models: 10 to 220 psi (0,7 to 15,2 Bar)
 - 2" & 3" Models: 20 to 220 psi (1,4 to 15,2 Bar)
- Pressure regulating:
 - Outlet (EZR-30): 5 to 30 psi ± 3 (0,3 to 2,1 Bar)
 - Outlet (EZR-100): 5 to 100 psi ± 3 (0,3 to 7,0 Bar)
- Minimum pressure differential (between inlet and outlet) for pressure regulation: 10 psi (0,7 Bar)
- Body styles:
 - Globe/Angle – 1", 1 1/2", 2" & 3" (25, 40, 50 & 80mm) female threads
- 118-5982 Solenoid: 24 VAC (50/60 Hz) Standard
- Inrush: 60 Hz: 0.4 amps

Additional features

- Tough glass-filled nylon and stainless steel construction
- Internal and External bleed
- Pressure regulates in electric or pressure-regulating models
- No external tubing for either pressure-regulating model
- Standard, built-in Schrader-type valve for downstream pressure verification
- Flow control independent of solenoid
- Self-aligning bonnet to ensure correct installation
- Self-cleaning, stainless steel metering rod
- Low-flow capability down to 5 GPM (18,9 LPM) with EZReg
- 316 nuclear-grade stainless-steel stem for maximum corrosion resistance

Options Available

- EZR-30 - EZReg®, 5–30 psi (0,3-2,1 Bar) Regulator Module
- EZR-100 - EZReg®, 5–100 psi (0,3-7,0 Bar) Regulator Module
- EFF-KIT-60Hz - Effluent Water (Lavender) Solenoid Assembly (24 VAC, 60 Hz) and Warning Tag
- 118-5982 Solenoid: 24 VAC (50/60 Hz) Standard
- DCLS-P - Potted DC Latching Solenoid Assembly
- SGS-12 - Spike Guard™ Solenoid: 24 VAC (50/60 Hz)

Warranty

- Five years

P-220S Series Friction Loss Data—US

Size	Config.	GPM Flow				
		5	10	20	30	40
1"	Globe	4.63	4.74	3.10	6.05	10.75
	Angle	4.14	4.64	2.54	5.53	9.46

Size	Config.	GPM Flow									
		20	30	40	50	60	70	80	90	100	110
1.5"	Globe	1.14	1.73	2.80	4.21	6.33	8.65	11.20	14.04	17.20	20.46
	Angle	0.95	1.56	2.61	3.82	5.29	6.97	9.26	11.79	14.36	17.40

Size	Config.	GPM Flow													
		80	90	100	110	120	130	140	150	180	200	225	250	275	300
2"	Globe	3.87	4.29	4.41	6.50	7.78	9.30	9.94	12.15						
	Angle	2.79	3.58	5.69	5.62	6.4	7.35	8.95	9.94						
3"	Globe								2.65	3.40	5.10	5.98	6.70	7.73	11.05
	Angle								2.10	2.65	4.65	4.30	5.54	6.98	9.95

Note: For optimum performance when designing a system, be sure to calculate total friction loss to ensure sufficient downstream pressure. For optimum regulation performance, size regulating valves toward the higher flow ranges. Flow rates are recommended not to exceed 5 psi loss.

Specifying Information—P220S

P220S-2X-X-X			
Model	Activation Type	Solenoid	Size
P220S	2X	X	X
P220S—P-220S Scrubber Series Plastic Valve	6—NPT, Electric 7—NPT, Pressure-regulated EZR-100 (Standard)	0—Standard 24 VAC Solenoid 9—DC Latching Solenoid	4—1" (25mm) 6—1 1/2" (40mm) 8—2" (50mm) 0—3" (80mm)

220 Brass Series

- 1" (25mm), 1¼" (32mm), 1½" (40mm), 2" (50mm), 2½" (65mm), 3" (80mm)
- Electric
- Pressure-regulating
- Globe, Angle

Built for superior performance under pressure, these Toro® heavy-duty brass and stainless steel valves are rugged and reliable. The debris-resistant design is tested and proven under the harshest conditions.



Features & Benefits

Nearly Three Times the Lightning Protection of Competitive Product

With a lightning rating exceeding 20,000 volts.

Precise Pressure Control Option

Compact EZReg® dial-design technology (factory or field installed - no need to remove solenoid).

Dirty Water Resistance

120-mesh, stainless steel filter screen is constantly flushed by the flow, enabling the use of very dirty water without clogging and valve closure failure.

External Downstream Manual Bleed

Keeps valve box dry and allows for manually setting pressure regulation.

Spike-Guard™ Solenoid

Reduces wire size requirements, allows twice as many valves to run simultaneously on a transformer and lowers power costs.

Water Management Highlight



Dirty Water Resistance

The 120-mesh, stainless steel filter screen is positioned on the supply side of the water stream. It is constantly flushed by the flow, enabling the use of very dirty water without clogging. Stainless steel construction of both the filter screen and the valve solenoid seat ensure long component life in all types of water and pressures.



Effluent Options Available



Spike-Guard Standard



Pressure Regulation



DC Latching Solenoid Option

Notes: All come with Effluent Sticker and Label.
Compatible with DC Latching Solenoid.

Specifications

Dimensions

- 1" (25mm): 5 1/4" H x 5" W (133 x 127mm)
- 1 1/4" (32mm): 6 1/2" H x 6" W (165 x 152mm)
- 1 1/2" (40mm): 6 1/2" H x 6" W (165 x 152mm)
- 2" (50mm): 7 1/2" H x 7" W (191 x 178mm)
- 2 1/2" (65mm): 8 3/4" H x 8 1/2" W (223 x 216mm)
- 3" (80mm): 8 3/4" H x 8 1/2" W (223 x 216mm)

Operating Specifications

- Flow Range:
 - 1" (25mm): 5 to 40 GPM (19 to 151 LPM)
 - 1 1/4" (32mm): 20 to 100 GPM (75 to 378 LPM)
 - 1 1/2" (40mm): 20 to 130 GPM (75 to 492 LPM)
 - 2" (50mm): 30 to 180 GPM (114 to 681 LPM)
 - 2 1/2" (65mm): 60 to 250 GPM (227 to 946 LPM)
 - 3" (80mm): 80 to 350 GPM (303 to 1324 LPM)
- Operating Pressure:
 - Electric – 10 to 220 psi 1,4 to 15,2 Bar
 - Pressure regulating:
 - Outlet (EZR-30): 5 to 30 psi ± 3 (0,3 to 2,1 Bar)
 - Outlet (EZR-100): 5 to 100 psi ± 3 (0,3 to 7,0 Bar)
- Inlet: 10 to 220 psi (1,4 to 15,2 Bar)
- Minimum pressure differential (between inlet and outlet) for pressure regulation: 10 psi (1,4 Bar) 2" & 3" – 20 PSI (1,38 Bar)
- Burst pressure safety rating: 750 psi (51,7 Bar)
- Body styles:
 - Globe valve – 1" (25mm), 1 1/4" (32mm), 1 1/2" (40mm), 2" (50mm) female threads
 - Angle valve – 2 1/2" (65mm), 3" (80mm) female threads
- Spike Guard™ Solenoid: 24 VAC (50/60 Hz) Standard
 - Inrush: 60 Hz: 0.12 amps
 - Holding: 60 Hz: 0.1 amps

Additional features

- Diaphragm stem guide
- 316 nuclear-grade stainless-steel stem for maximum corrosion resistance
- Pressure regulator can be installed as a service kit without draining the main line
- Pressure regulates in electric and manual modes, serviceable under pressure
- Forward-flow design for more precise regulation
- Standard, built-in Schrader-type valve for downstream pressure verification
- Anti-vandal dust cap on pressure-regulating models
- No external tubing for either electric or pressure regulating models
- Manual flow control: adjustable to zero flow
- Tough, double-beaded, fabric-reinforced rubber diaphragm

Options Available

- EZR-30 - EZReg, 5-30 psi (0,3-2,1 Bar) Regulator Module
- EZR-100 - EZReg, 5-100 psi (0,3-7,0 Bar) Regulator Module
- EFF-KIT-60 Hz - Effluent Water (Lavender) Solenoid Assembly (24 VAC, 60 Hz) and Warning Tag
- 118-5982 - 24 VAC Solenoid Assembly, 60 Hz, 18" (45,7cm) Leads, Captive Plunger
- DCLS-P - Potted DC Latching Solenoid Assembly

Warranty

- Five years

220 Brass Series Friction Loss Data

Model	Type	GPM Flow																			
		5	10	15	20	30	40	50	60	70	80	100	120	150	170	180	200	250	300	350	
1"	Electric	1.75	2.0	2.2	3.10	5.05	7.80														
1 1/4"	Electric				1.85	2.50	2.70	3.50	4.10	5.6											
1 1/2"	Electric				2.15	2.45	2.80	3.05	3.80	5.0	6.55										
2"	Electric					3.05	3.20	2.90	2.95	3.25	3.40	4.50	6.55	10.10	13.45	14.85					
2 1/2"	Electric								2.0	2.2	2.3	2.4	2.5	3.0	4.0	4.5	5.5				
3"	Electric										2.2	2.4	2.5	3.0	4.0	4.5	5.5	6.5	7.0	7.5	

Notes: For optimum performance when designing a system, calculate total friction loss to ensure sufficient downstream pressure.
 For optimum regulation performance, size regulating valves toward the higher flow ranges.
 Flow rates are recommended not to exceed 5 psi loss.

Specifying Information—220 Brass

220-2X-X-X			
Model	Activation Type	Solenoid	Size
220	2X	X	X
220—220 Series Brass Valve	6—NPT, Electric 7—NPT, Pressure regulated (5—100)	0—Spike Guard Solenoid 6—Less Solenoid 9 - DC Latching Solenoid	4—1" (25mm) 5—1 1/4" (32mm) 6—1 1/2" (40mm) 8—2" (50mm) 9—2 1/2" (65mm) 0—3" (80mm)
Example: A 1" (25mm) NPT pressure-regulated, 220 Series Brass Valve with Spike Guard solenoid, would be specified as: 220-27-04			

Note: 1", 1 1/2" and 2" —globe configuration.
 2 1/2" and 3" —angle configuration.

220 Brass Series Model List

Model	Description
• 220-26-04	1" (25mm) In-line
• 220-26-05	1 1/4" (32mm) In-line
• 220-26-06	1 1/2" (40mm) In-line
• 220-26-08	2" (50mm) In-line
• 220-26-09	2 1/2" (65mm) Angle
• 220-26-00	3" (80mm) Angle
Pressure Regulated With EZREG®	
• 220-27-04	1" (25mm) In-line
• 220-27-05	1 1/4" (32mm) In-line
• 220-27-06	1 1/2" (40mm) In-line
• 220-27-08	2" (50mm) In-line
• 220-27-09	2 1/2" (65mm) Angle
• 220-27-00	3" (80mm) Angle
With Latching Solenoid	
• 220-26-94	1" (25mm) In-line
• 220-26-95	1 1/4" (32mm) In-line
• 220-26-96	1 1/2" (40mm) In-line
• 220-26-98	2" (50mm) In-line
• 220-26-99	2 1/2" (65mm) Angle
• 220-26-90	3" (80mm) Angle
Electric Valves Less Solenoid	
• 220-26-64	1" (25mm) In-line
• 220-26-66	1 1/2" (40mm) In-line
• 220-26-68	2" (50mm) In-line
• 220-26-60	3" (80mm) Angle

Quick Coupler Series

- 3/4" (20mm) and 1" (25mm)
- Standard, Vinyl, Effluent

Toro® Quick Coupler valves are designed for durable everyday use in projects requiring quick remote water access to the mainline water supply.



Features & Benefits

Stainless Steel And Brass Construction

Quick Couplers are also available with metal or vinyl covers in locking or non-locking options.

Multiple Models To Choose From

There are a variety of one-piece and two-piece models in 3/4" (20mm) and 1" (25mm) sizes, including ACME thread key connections.

Eliminate Tangled Hoses

The 360-degree hose swivel provides movement without hose tangling.

3/4" (20mm) Quick Coupling Valves and Accessories Model List	
Model	Description
• 075-SLSC	3/4" (20mm) Single Lug Key, with 1/2" (12mm) Top Pipe Thread Outlet
• 075-SLK	3/4" (20mm) Single Lug Key, with 1/2" Male (12mm) and 3/4" Female (20mm) Top Pipe Thread Outlet
• 075-75-MHS	3/4" (20mm) NPT x 3/4" (20mm) MHT Hose Swivel

1" Quick Coupling Valves and Accessories Model List	
Model	Description
• 100-SLSC	One-piece, 1" (25mm) Single Lug, Quick Coupler w/Metal Cover
• 100-SLVC	One-piece, 1" Single Lug, Quick Coupler w/Vinyl Cover
• 100-SLVLC	One-piece, 1" (25mm) Single Lug, Quick Coupler w/Vinyl Locking Cover
• 100-2SLVC	Two-piece, 1" (25mm) Single Lug, Quick Coupler w/Vinyl Cover
• 100-ATLVC	One-piece, 1" (25mm) Quick Coupler w/Acme Thread and Lavender Locking Vinyl Cover
• 100-2SLLVC	Two-piece, 1" (25mm) Single Lug Quick Coupler w/Lavender Vinyl Locking Cover
• 100-AK	1" (25mm) Acme Thread, 1" (25mm) Top Pipe Thread Outlet
• 100-SLK	Single Lug Key, 1" (25mm) Top Pipe Thread Outlet w/Internal 3/4" (20mm) NPT Threads
• 075-MHS	3/4" (20mm) NPT x 1" (25mm) MHT Hose Swivel
• 100-MHS	1" (25mm) NPT x 1" (25mm) MHT Hose Swivel
• LK	Key for Locking Cap

Quick Coupler Series Friction Loss Data—US

Model Number	GPM Flow												
	10	15	20	25	30	35	40	50	60	70	85	100	
075-SLSC	1.5	3.1	5.3	8.5									
100-2SLLC			1.1	2.2	3.6	5.7	8.0						

Note: For optimum sprinkler performance when designing a system, be sure to calculate total friction loss to ensure sufficient downstream pressure. Values listed in psi. Flow rates are recommended not to exceed 5 psi loss.

Specifying Information—Quick Couplers

XXX-XXX-XXX		
Size	Nozzle	Optional
XXX	XXX	XXX
075—3/4" (20mm) 100—1" (25mm)	SL—One-piece, Single Lug 2SL—Two-piece, Single Lug AT—ACME Thread	SC—Standard Cover VC—Vinyl Cover LVC—Effluent Vinyl Cover VLC—Vinyl Locking Cover

Example: A 1" (25mm) one-piece, single lug Quick Coupler Valve with a vinyl locking cover, would be specified as: 100-SLVLC

Valve Accessories

Solenoids

DCLS-P

- Potted DC latching solenoid for Toro valves used with EZ-Flo® Plus, TPV, P-220 or 220 Series brass valves



102-7053

- Solenoid assembly for EZ-Flo Plus, TPV, P-220 or 220 Series brass valves
- Captive hex plunger features
- 24 VAC
- 60 Hz, 18" (0,5m) leads



SGS-12

- Spike Guard™ Solenoid compatible with EZ-Flo Plus, TPV, P-220 or 220 Series brass valves
- Inrush 0.2A
- Holding: 0.1A
- 20,000 volts lightning rating



LWS

- Low Wattage Solenoid compatible with EZ-Flo Plus, TPV, P-220 or 220 Series brass valves
- Inrush 0.2A
- Holding: 0.1A



Effluent Water Indicators

89-7855

- Effluent flow-control knob for 254/264, 250/260 and 252 Series valves



EFF-Kit-60Hz

- Effluent solenoid with warning tag for EZ-Flo Plus, TPV, P-220 or 220 Series brass valves



- Captive hex plunger features
- 24 VAC, 0.40 amp inrush, 0.20-amp-holding

RWSG-Kit

- Effluent sticker and tag for P-220 valves with Spike Guard solenoids



1088501

- Effluent tag for use with Toro or competitive valves



EZReg® Pressure-regulation Options



EZR-30 and EZR-100

- Pressure-regulator module for use with P-220 and 220 Series valves
- Precise pressure control with dial design
- EZR-30: 5–30 psi (0,3–2,0 Bar)
- EZR-100: 5–100 psi (0,3–7,0 Bar)

Electric-Hydraulic Converters

Toro® Electric-Hydraulic Converters (EHC) provide the ability to bring together electrical outputs from sophisticated electric controllers and the pressure-based signals in hydraulic irrigation systems.



Electric-Hydraulic Converters Model List

Model	Description
• EHC-01-01	1-Station, Normally Open
• EHC-01-04	4-Station, Normally Open
• EHC-08-04	4-Station, Normally Closed
• EHC-01-12	12-Station, Normally Open
• EHC-08-12	12-Station, Normally Closed
• EHC-01-16	16-Station, Normally Open
• EHC-08-16	16-Station, Normally Closed

Specifications

Dimensions

- 4-Station: 8 3/4" W x 4 1/2" H x 2 1/2" D (222 x 114 x 64mm)
- 12-Station: 8 3/4" W x 12 1/2" H x 2 1/2" D (222 x 318 x 64mm)
- 16-Station: 8 3/4" W x 16 1/2" H x 2 1/2" D (222 x 419 x 64mm)

Electrical Specifications

- Input power:
 - 24 VAC (60 Hz)
 - Holding - .225A @ 24 VAC
 - Inrush - .400A @ 24 VAC

Specifications and Features

- Pressure: 40-150 psi (2,8-10,3 Bar)
- Wiring: 18 AWG x 4' (1,2m) wire leads
 - Maximum distance from converter to valve:
 - 3/16" (4,7mm) – 500' (152m)
 - 1/4" (6,4mm) – 1000' (304m)
- Normally open: Valve elevation should not exceed 25' (7,6m) above or 70' (21,3m) below controller elevation
- Normally closed: Valve elevation should not exceed 0' (0m) above or 70' (21,3m) below controller elevation
- Direct manual control activates any sprinkler from the converter
- Optional plastic pedestal (89-8342)

Warranty

- Two years

Controller Overview



Model	EVOLUTION®	DDC™W/P	TMC-212
Page Number	72-77	78-79	80-81
Number of Stations	4 to 16	2, 4, 6, 8	2 to 12
Modular	X		X
ET-Adjust	With Smart Connect™		
Flow-Sensing			
TMR-1-Compatible	X		X
Two-Wire Decoder			
RainSensor - Compatible	X	X	X
Soil Sensor - Compatible	X		X
Number of Programs	3 Irrigation 3 Auxillary	3	3
Simultaneous Program Operation	X		
Number of Start Times	4 Per Program	3 Per Program	4 Per Program
Maximum Station Runtime	12 Hours	4 Hours	4 Hours
Days of the Week Programming	X	X	X
Odd/Even Programming	X	X	X
Interval Programming	X	X	X
Valves Per Station	2	1	2
Battery-Powered		X	
Armchair™ Programming	X	X	
Enclosure	Indoor/Outdoor	Waterproof Indoor/ Outdoor	Indoor
Warranty	Five Years	Three Years	Three Years

 WaterSmart® Feature

Model	TMC-424E	Custom Command™	TDC Series
Page Number	82-83	84-85	86-87
Number of Stations	4 to 24	9, 12, 15, 18, 24, 36, 48	100-200
Modular	X		X
ET-Adjust			
Flow-Sensing	X		
TMR-1-Compatible	X	X	X
Two-Wire Decoder			X
RainSensor - Compatible	X	X	X
Soil Sensor - Compatible	X	X	X
Number of Programs	4	4	10
Simultaneous Program Operation	X	X	X
Number of Start Times	16	16	60
Maximum Station Runtime	8 Hours	10 Hours	24 Hours
Days of the Week Programming	X	X	X
Odd/Even Programming	X	X	X
Interval Programming	X	X	X
Valves Per Station	2	2	2
Armchair™ Programming	X	X	
Enclosure	Indoor/Outdoor	Outdoor	Outdoor
Pedestal Option	X	X	X
Warranty	Five Years	Five Years	Five Years



 WaterSmart® Feature



EVOLUTION® Series

- 4- to 16-Stations
- Modular
- Indoors and Outdoor

Introducing the next generation in controllers!
With an intuitive interface and exclusive features for “smart” control, the new Toro® EVOLUTION is an easy choice for residential and light-commercial applications.



Features & Benefits

Revolutionary Interface

The EVOLUTION controller's user interface was designed with the customer in mind. Shortcut buttons provide quick access to basic functions while the advanced menu leverages the experience and knowledge of the irrigation professional, all shown on a graphics display that navigates similar to many modern consumer electronic devices.

Easy Upgrade to Integrated Smart Control

An optional Smart Connect™ plugs into the timing mechanism, enabling it to wirelessly communicate directly with a number of add-on devices—including a weather sensor, handheld remote, multiple soil sensors, and up to two wireless relays.

Computer-programmable with USB Drive

Simple-to-use software allows you to program everything at a computer. Use a standard USB drive to transfer programming to one or more controllers in a matter of seconds. The USB drive also provides controller logging functionality to save an operation log for diagnostic



12-station configuration with (2) 4-station modules



16-station configuration with (1) 12-station module



Smart Connect™ Add-On Devices

Simply plugging the Smart Connect™ into the EVOLUTION controller allows it to communicate wirelessly with a number of add-on devices, providing a great opportunity to upgrade with a number of different water-saving and time-saving options.



Wireless ET Sensor

Uses live temperature and solar measurements as well as historical weather data for your location to calculate the amount of water needed from the irrigation system.



Handheld Remote

Makes maintenance checks a snap, allowing you to run sprinklers or schedules from up to 1000 feet (305 m) away.

Toro® Smart Connect™ Plug-In Receiver

Installs easily on the backside of the EVOLUTION® controller's Front panel. No wires, No externally mounted receiver. One Smart Connect™ Receiver is all that is required to communicate to all Add-On Devices.



Toro® Smart Connect™ INTERNAL VIEW



Toro® Precision™ Soil Sensor

Up to three soil sensors can be used (one per schedule) to monitor the moisture level in the soil and prevent over- and underwatering. With up to a 500 feet (152,4 m) wireless range, there's no digging required to install.



Wireless Auxiliary Relay

Up to two wireless relays can be used to turn on lighting, pumps, or fountains, just to name a few possibilities.



EVOLUTION® Series

Controller Interface

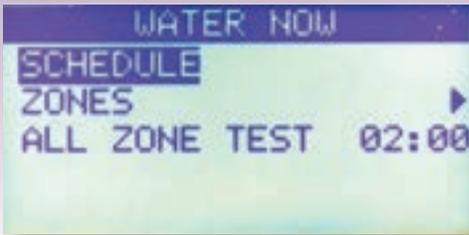
The EVOLUTION controller's interface is a system of informative yet easy-to-understand screens that are quickly accessible using the controller's shortcut buttons.



Standard Functions



The **Standard** menu gives the homeowner access to the most fundamental functions of the controller, such as manual watering, setting watering days and start times for a *single* schedule, and adjusting the amount of irrigation, all directly accessible through dedicated shortcut buttons.



For example, the **Water Now Screen** allows the user to begin watering with as few as just two button presses, with the option of starting a specific schedule, specific zone, or watering all zones in series.

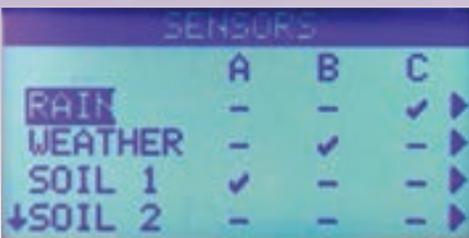


Another example is the **Review Screen**, which is an at-a-glance summary showing which days the controller is going to water in the next seven days for the schedule you select.

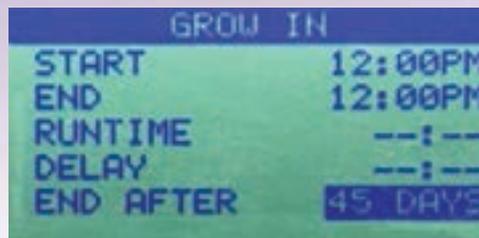
Advanced Functions



The **Advanced** menu gives the contractor access to the full power of the EVOLUTION controller, including the ability to set up *multiple* irrigation and auxiliary schedules, create custom grow-in schedules, and configure any "smart" add-on devices - all operations that may otherwise overwhelm a homeowner.



For example, the **Apply Sensors** screen allows the user to easily view and configure all the sensors available to the controller, including rain, ET, and soil.



The **Grow In Screen** allows the user to set up a grow-in schedule for a user-defined period of time (up to 90 days), after which the controller will default back to its normal irrigation schedule(s).

Other Examples



The **Home Screen** displays the current time and date, what zones are scheduled to water next, or if currently watering, what zone(s) are currently watering and how much time is remaining, as well as any alerts – in the absence of any alerts, the screen will display



The **Contractor Message Screen** allows the contractor to input a custom message with their name and contact information into the controller from the software via a USB drive so it is visible to the homeowner when they press the "Help" button.

Dimensions

- 11.25" W x 7.75" H x 4.5" D (286 x 197 x 114 mm)
- Weight: 4.5 lbs. (2 kg)

Electrical Specifications

- Electrical input power:
 - 120 VAC
 - 30 VA maximum
 - UL, CUL Listed
- Station output power:
 - 24 VAC
 - 0.75 amps per station maximum
 - 0.75 amps pump/master valve
 - 1.0 amps total load
- Surge Protection:
 - 6.0 KV common mode; 1.0 KV normal mode
- Operation of two solenoids per station (up to 0.75 amps per station max)

Programming

- One schedule in the default "standard" mode
- Up to six schedules in "advanced" mode:
 - Three irrigation schedules, four start times per schedule
 - One fixed auxiliary schedule, plus two virtual
- Three scheduling choices:
 - Seven-day calendar
 - 1- to 30-day interval with up to seven day exclusions
 - Odd/even days with up to seven day exclusions
- Monthly season adjust by schedule
- Schedule stacking, with automatic split cycle when season adjust is greater than 100%
- Grow-in schedule settable up to 90 days automatically reverts to regular irrigation schedule
- Station runtimes from one minute to twelve hours
- Allows 30, 60, or 90 second manual runtimes for things such as winterization/blowouts
- Programmable well-recovery/station-delay from 1 to 60 seconds or 1 to 60 minutes
- Pump start delay from 1 to 60 seconds
- Master valve on/off by zone
- Timed water off from one to fourteen days
- Compatible with normally-closed rain sensors
- Automatic short detection for circuit protection and faster troubleshooting
- Non-volatile memory doesn't require batteries and holds programming for up to five years

Hardware

- 4 to 16 stations with 4- and 12-station hot-swappable modules
- Cabinet easily mounts to the wall through two easily-accessible screw holes on the upper left-hand and right-hand sides of the controller
- Red LED next to display lights in the event of an alert
- 128 x 64 pixel graphical display
- Battery on the timing mechanism for "armchair" programming
- Outdoor key-lock cabinet manufactured out of durable UV-resistant plastic and includes standardized key used on many of the most popular controllers

Optional Add-Ons and Accessories

- EVO-SC – Smart Connect™
- PSS-SEN – Precision™ Soil Sensor Probe
- EVO-WS – ET/Weather Sensor
- EVO-HH – Maintenance Remote

Warranty

- Five years

Evolution Series Model List

Model	Description
• EVO-4ID	4-station Indoor Controller
• EVO-4OD	4-station Outdoor Controller

Add-ons and Accessories

Model	Description
• EMOD-4	4-station Expansion Module
• EMOD-12	12-station Expansion Module
• EVO-SC	Smart Connect™ Plug-In Receiver
• PSS-SEN	Wireless Precision™ Soil Sensor Probe Only
• EVO-WS	Wireless Weather Sensor
• EVO-HH	Wireless Handheld Maintenance Remote
• EVO-AR	Wireless Auxiliary Relay

Specifying Information- EVOLUTION®

EVO-4-XX-XX-SC			
Description	Cabinet Type	Module	Connector Options
EVO-4	XX	XX	SC
EVO-4 – Evolution Controller	ID – Indoor OD – Outdoor	4 – 4-station 12 – 12-station	SC – Smart Connect™
Example: A 16-station Evolution controller in an indoor cabinet with the Smart Connector would be specified as EVO-4ID-12-SC			

EVOLUTION® Series Software

Simple programming made even easier!

The EVOLUTION programming software makes the already easy-to-program EVOLUTION series controller even easier to program by allowing you to set up irrigation and auxiliary schedules at your computer and transfer everything to the controller in seconds using a standard USB drive. Managing multiple controllers for different installation locations is a much more manageable task with this powerful tool, allowing you to create a “homeowner” database of schedules for an unlimited number

Features & Benefits

An Even Easier Way to Program

Whether you’re at your desk or in your truck on a laptop, the optional EVOLUTION software allows you to program the EVOLUTION controller using the power of a PC on most Windows-based operating systems (XP, or Windows® 7 or 8).

Quick Uploading with USB

Once you’re done programming on the computer, transferring the information to the controller is easy with a USB drive – making it simple to create, save, and load different schedules for multiple controllers – there’s no limit!

Standard and Advanced Modes

Just like the EVOLUTION controller itself, the EVOLUTION software can tailor itself to your needs and be only as advanced as you want it to be. Standard mode covers the basics for a single schedule while advanced mode provides additional scheduling options, such as ET-based programming and creating more than one schedule.

Backup & Troubleshooting

The EVOLUTION software gives you the ability to store programming for multiple controllers on your computer, making field changes as easy as emailing updated programming to your customer. The EVOLUTION system also provides controller logging functionality that saves an operation log to the USB drive for later analysis and troubleshooting via the software.





Expanded Customization

The software also allows you to enter custom names for schedules and zones (such as “Shrubs” or “Front Yard” instead of “Zone 1”), as well as contact information that the homeowner can access in the “contractor message screen” any time they press the “Help” button on the controller.



Zones Screen

In advanced mode, this screen is where you enter the characteristics of each of the zones on the system, including the type of plant, soil, sprinkler, slope, and amount of sun exposure, to create the most efficient irrigation schedule possible. You also have the option of loading custom photos to represent each zone.



Review Screen

Similar to the review screen in the controller itself, this “at-a-glance” view of upcoming irrigation events graphically displays on a calendar when watering is scheduled to occur and for how long. You can zoom in and out on any section of the calendar and click on a segment of any schedule to see details of which zone is scheduled to water at that time.



Simple Setup

A simple wizard walks you through the schedule setup process step-by-step, allowing you to select the different features specific to each zone on the system. This data is then used to create a fully customized and optimized irrigation schedule for the controller.



DDC™ WP Series

- 2-, 4-, 6- and 8-Stations
- Battery-powered
- Indoor and Outdoor

Looking for a rugged waterproof controller ideal for remote or isolated installations? Toro's DDC-WP Series controller provides all that and more. Using the new potted DC latching solenoid, the DDCWP is battery-operated using two 9V batteries.

Features & Benefits

Fully Waterproof and Submersible

Submersible up to 6.5' (2m) per IP-68 standards, allowing contractors to mount up to an 8-station controller in a valve box.

Operates DC Latching Solenoids

Controller is compatible with most manufacturers' DC Latching solenoids.

Exclusive "Digital Dial" Technology

Simple programming functions.

Unique Power Feature

Verifies sufficient voltage level for turning stations off before turning any stations on.

Monthly Watering Schedule

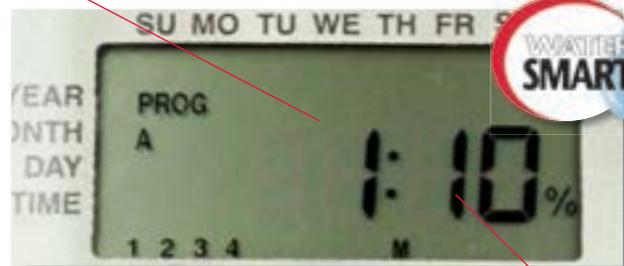
Monthly preset option – ideal for automatic runtime adjustments.



 Wired Rain Sensor Compatible

Water Management Highlight

1 = The first month, January



10 = 100%. 140% would be designated as 14.

Monthly % Adjust

DDCWP adjusts annual irrigation run time during initial controller set up. Options include from 0-200% and January to December scheduling. With easy adjusting for seasonal watering, water savings is enhanced for all-around intelligent programming.

Specifications

Dimensions

- 5 3/4" W x 5" H x 1 15/16" D (145 x 126 x 4,9mm)
- Weight: 23.3 oz. (672 grams) without 9V battery

Operating Specifications and Additional Features

- Operating temperature: 0° - 60° C
- Operates using two x 9V alkaline batteries (not supplied)
- Operates one latching solenoid per station and one latching solenoid-equipped master valve
- Controller is compatible with all Toro valves accepting latching solenoids (model DCLS-P or equivalent) and competitive valve models/latching solenoids
- Accepts Toro TRS Wired RainSensor™, Wired Rain/Freeze and other normally-closed sensors
- Low-battery indicator visible on LCD screen
- Three independent programs and three start times per program
- Three scheduling choices by program:
 - Seven-day calendar
 - 1 to 7-day interval
 - Odd/even with 365-day calendar and 31st day exclusion
- Station run times from one minute to four hours in one-minute increments
- Seasonal adjust by month from 0-200% in 10% increments
- Manual operation by station or program
- Self-diagnostic circuit breaker skips shorted stations
- Up to five-year program retention with on-board coin battery saves time of day and all programming features

Warranty

- Three years



EZ-Flo® Plus and P-220 valves shown with the DCLS-P Latching solenoid which provide cost and labor savings.

Battery Cap



Easy installation of two 9V batteries with the simple screw on/off lid. The battery cap provides a dependable leak-proof seal allowing submersion up to 6.5' (2m) per IP-68.

DDCWP Series Model List

Model	Description
• DDCWP-2-9V	2-station
• DDCWP-4-9V	4-station
• DDCWP-6-9V	6-station
• DDCWP-8-9V	8-station

Wire Run Lengths for DDCWP

With battery voltage at 9 VDC, maximum recommended wire runs for an 8-station DDCWP are:

Multi-strand Wire	Distance	
	Feet	(meters)
18 AWG (1,0mm ²)	197	(60m)
16 AWG (1,5mm ²)	305	(93m)
14 AWG (2,5mm ²)	493	(150m)
12 AWG (4,0mm ²)	820	(250m)

Specifying Information—DDCWP

DDCWP- <u>X</u> -9V			
Description	Stations		Voltage
DDCWP	XX		9V
DDCWP—Digital Dial Waterproof Controller	2—2 Stations 4—4 Stations	6—6 Stations 8—8 Stations	9V—9 Volt
Example: An 8 station DDCWP controller would be specified as: DDCWP-8-9V			

TMC-212 Series

- 2- to 12-Stations
- Indoor
- Modular

Designed for flexibility, the Toro® TMC-212 is the ideal controller choice for residential applications. With station count modularity from 2 -12 stations.



Rain
Sensor
Compatible



TMR-1
Compatible



PSS-KIT
Compatible



EPA WaterSense®
approved when used with
Irritrol® Climate Logic®

Features & Benefits

Station Count Modularity

For flexibility and reduced inventory— modular from 2 to 12 stations in 2-station increments.

Automatic Short Detection

For circuit protection and faster troubleshooting.

Non-Volatile Memory

Requires no batteries and holds programming for up to five years.

Scheduling Flexibility

Three independent programs and four start times per program.

Pump Start Compatibility

Pump Delay and Well Recovery/Station Delay with Pump-enabled Option.

Water Management Highlight

Auto-split on Season Adjust > 100%

The TMC-212 is designed to help minimize the potential for runoff. When Season Adjust is set > 100%, the TMC-212 will automatically split station runtimes in half and run two cycles of the program to minimize the effects of extended runtimes and allow for absorption.



Two-station Modules

Two-station modules provide station count flexibility and cost-effectiveness.



TSM-02
Standard

Specifications

Dimensions

- 8" W x 8 1/2" H x 2" D (203 x 216 x 51mm)
- Weight: 3 lbs. 4 oz. (1,5 kg)

Electrical Specifications

- Electrical input power:
 - 120 VAC
 - 18 VA maximum (indoor models)
 - 20 VA maximum (outdoor models)
 - UL, CUL Listed
- Station output power:
 - 24 VAC
 - 0.50 amps per station maximum
 - 0.50 amps pump/master valve
 - 0.70 amps total load
- Surge Protection:
 - 6.0 KV common mode; 600 V normal mode

Operating Specifications

- Three programs, four start times per program
- Station run times from one minute to four hours
- Three Scheduling choices
 - Seven-day calendar
 - 1- to 7-day interval with day exclusion
 - Odd/even days with day exclusion
- Programmable well recovery/station delay from 1 to 60 seconds or 1 to 60 minutes
- Pump start delay from 1 to 60 seconds
- Master valve on/off by program
- Automatic split cycle when season adjust is greater than 100%
- Program stacking
- Rain delay from one to seven days
- Hot-swappable station modules
- Compatible with normally open or normally closed rain sensors
- Operation of two solenoids per station (up to 0.50 amps per station max)

Optional Accessories

- PSS-KIT - Precision™ Soil Sensor Kit
- TRS – Wired RainSensor
- 53853 – Wired Rain/Freeze Sensor
- TWRS/TWRFS – Wireless RainSensor or Wireless Rain/Freeze Sensor

Warranty

- Three years

Advanced Features



Pump Start Delay provides settable time delay between activation of MV/PS and first valve to allow for main pressurization. Well Recovery/Station Delay provides settable time delay between stations to allow for slow-closing valves or well refill with selectable MV/PS Energized during delay.

TMC-212 Series Model List

Model	Description
• TMC-212-ID	4-station, Indoor
Station Modules - Base model includes 4 stations (2 modules)	
Model	Description
• TSM-02	2-station Expansion Module

Specifying Information—TMC-212

TMC-212-XX	
Model	Cabinet Type
TMC-212	XX
TMC-212—Toro Controller	ID—Indoor

Specifying Information—TSM Module

TSM-02	
Model	Module Description
TSM	02
TSM—Toro Station Module	02—2-station Expansion Module

Example: A 6-station indoor TMC-212 Controller, would be specified as: **TMC-212-ID and TSM-02**

Note: Base model includes four stations (two modules)

TMC-424E Series

- 4- to 24-Stations
- Indoor and Outdoor
- Modular
- Flow-Sensing

The TMC-424E Series takes modularity to a whole new level. Toro's advanced modular technology combines sophisticated features with simple operation to provide a customizable



Rain
Sensor
Compatible



PSS-KIT
Compatible



Flow
Sensor
Compatible



TMR-1
Compatible

Features & Benefits

Station Count Modularity

Station count modularity from 4 to 24 stations using 4- or 8-station modules for flexibility.

Two Levels of Surge Protection

Standard or High Surge modules provide options to meet regional lightning protection needs.

Flow-Sensing

Monitor and react to system leaks or breaks.

Up to 4 Master Valve or Pump Start Connections

Options for connection of up to four Master Valve or Pump Start Relays utilizing TSM-4F or TSM-8F modules.

Run Times In Minutes or Seconds

Ability to set run times for less than a minute provides efficient watering for planter box, misting cycle, nursery, or syringe cycle needs.

Armchair Programming

Removable Timing Mechanism can be powered by 9V battery allowing for easy and comfortable programming.

Water Management Highlight

Flow-Sensing for Greater Water Savings

With flow-sensing capability that monitors up to three independent flow sensors, the controller consistently monitors for problems and takes action as needed to isolate breaks or system issues.



Specifications

Dimensions

- 10¾" W x 10¼" H x 4 5/8" D (273 x 260 x 117mm)
- Weight: Indoor—7.5 lbs. (3,4 kg); Outdoor—7.1 lbs. (3,2 kg)

Electrical Specifications

- Input power:
 - 120 VAC
 - 30 VA (internal and external plug-in type transformer)
 - UL, CUL-listed
- Station output power:
 - 24 VAC
 - 0.50 amps per station maximum
 - 0.50 amps pump/master valve
 - 1.20 amps total load
- Surge Protection:
 - Standard – 6.0 KV common mode; 600 V normal mode
 - High Surge – 6.0 KV common mode; 6.0 KV normal mode

Specifications and Features

- Four programs with 16 total start times
- Three Scheduling choices
 - Seven-day calendar
 - 1- to 31-day interval with day exclusion
 - Odd/even days with day exclusion
- Station run times in minutes or seconds
- Programmable well recovery/station delay from 1 to 60 seconds or 1 to 60 minutes
- Pump start/master valve settable by program and station
- Operate up to three programs simultaneously
- Rain delay from one to 14 days and water budgeting from 0-200% in 10% increments
- Hot-swappable station modules
- Review feature quickly recaps all program information
- Short detection for faster troubleshooting
- Valve Test mode for quick system checks
- Multi-language capability (English, Spanish, French, Italian, German and Portuguese)
- Program erase
- 12/24-hour real-time clock
- Non-volatile memory

Optional Accessories

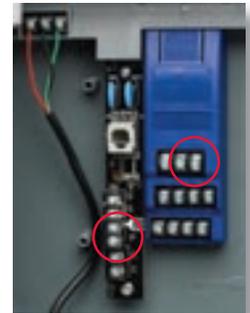
- PSS-KIT - Precision™ Soil Sensor Kit
- TRS – Wired RainSensor
- 53853 – Wired Rain/Freeze Sensor
- TWRS/TWRFS – Wireless RainSensor or Wireless Rain/Freeze Sensor
- TMR-1 – Maintenance Remote
- TFS-Flow Sensor

Warranty

- Five years

Up to 4 Master Valve/PS Connections

One on controller terminal block and 3 flow-sensing modules. Any station can be assigned to any MV. Options for a single station to activate both a controller and flow module MV/PS connection (e.g., MV and Booster Pump activation).



TMC-424E Series Model List	
Model	Description
• TMC-424E-ID*	Modular, Indoor
• TMC-424E-OD*	Modular, Outdoor
<i>* Base models include TSM-4 (4-station Module)</i>	
Station Modules - Base model includes 4 stations	
Model	Description
• TSM-4	4-station Expansion Module
• TSM-4H	4-station Expansion Module, High-Surge
• TSM-4F	4-station Expansion Module, Flow-Sensing
• TSM-8	8-station Expansion Module
• TSM-8H	8-station Expansion Module, High-Surge
• TSM-8F	8-station Expansion Module, Flow-Sensing

Specifying Information—TMC-424

TMC-424E-XX-XX-XX-XX		
Model	Type	Module Description
TMC-424E	XX	XX-XX-XX
TMC-424E—Toro Controller	ID—Indoor OD—Outdoor	4—4-station, Standard-Surge 8—8-station, Standard-Surge 4H—4-station, High-Surge 8H—8-station, High-Surge 4F—4-station, High-Surge and Flow-Sensing 8F—8-station, High-Surge and Flow-Sensing

Example: A 16-station TMC-424E controller in an indoor cabinet with one flow monitor would be specified as: **TMC-424E-ID-8F-8**

* Note: Base model comes with one TSM-4 (4-station) included.

Custom Command™ Series

- 9-, 12-, 15-, 18-, 24-, 36-, 48-Stations
- Wall- or Pedestal-Mount

With the highest surge protection in its price range, the Toro® Custom Command offers durability and performance in one rugged commercial-grade controller.

Features & Benefits

Versatile Runtimes

Runtimes from one minute to ten hours in one-minute increments meet the needs of standard or drip applications.

Independent Programs

Four fully independent programs and 16 start times that can run concurrently with start time overlap protection within each program.

High Surge Protection

Highest surge protection in its price range for lightning-prone areas.

Metal or Plastic Enclosures

Available in wall-mount metal cabinet with optional metal pedestal, or wall-mount plastic cabinet.

Hand-Held Remote Compatible

Compatible with the Toro TMR-1 Maintenance Remote for ease of use, troubleshooting, and field maintenance operation.



TMR-1
Compatible



Rain
Sensor
Compatible



PSS-KIT
Compatible



EPA WaterSense®
approved when used with
Irritrol® Climate Logic®

Water Management Highlight

Wired RainSensor or Wireless Rain/Freeze sensors will stop irrigation when it rains or when temperature drops below a user-defined point.



Specifications

Dimensions

- Plastic: 11½" W x 5⅞" H x 8⅝" D (292 x 149 x 219mm)
- Metal (12-, 15-, 18- and 24-stations):
10¾" W x 9¾" H x 5¾" D (273 x 247 x 146mm)
- Metal (36- and 48-stations):
10¾" W x 15¾" H x 5¾" D (273 x 400 x 146mm)
- Pedestal (CC-PED):
10¾" W x 27⅞" H x 3⅜" D (273 x 708 x 86mm)
- Weight
 - Plastic: 8 lbs (3,6 kg)
 - Metal (12-, 15-, 18-, and 24-station): 14 lbs (6,4 kg)
 - Metal (36- and 48-station): 18 lbs (8,2 kg)

Electrical Specifications

- Input Power
 - 120 VAC ± 10%, (60 Hz)
 - 0.50 amps (24 W) maximum
- Station output power
 - 24 VAC (60 Hz)
 - 0.50 amps (12 VA) per station maximum
 - 0.50 amps (12 VA) pump/master valve
 - 1.25 amps (30 VA) total load
- UL, CUL Listed

Operating Specifications

- Three selectable watering schedules:
 - Seven-day calendar
 - Odd/even days with day exclusion
 - 31-day interval
- 365-day calendar with automatic compensation for leap year
- Rain delay from one to seven days
- Program stacking for simultaneous operation of one to four programs (four program stacking only in 36- and 48-station models)
- Season % adjust by month
- Individual station manual start and manual start by program
- Independent program erase for each program
- Master valve/pump start operation selectable by program
- Available in 9-, 12-, 15-, 18-, 24-, 36- and 48-station models
- Non-volatile memory retains programmed information in event of power failure
- Time and date retention for up to 90 days using 9-volt battery
- Self-diagnostic circuit breaker that identifies and overrides faulty stations

Optional Accessories

- PSS-KIT - Precision™ Soil Sensor Kit
- TRS - Wired RainSensor
- 53853 - Wired Rain/Freeze Sensor
- TWRS/TWRFS - Wireless RainSensor or Rain/Freeze Sensor
- TMR-1 - Maintenance Remote

Warranty

- Five years

Multiple Enclosure Options

Metal or plastic cabinets and optional metal pedestals meet a variety of installation needs.



High-Surge Protection

With the highest surge protection in its competitive price range, a self-diagnostic circuit breaker and a five-year warranty, this controller withstands the test of time.



Custom Command Series Model List

Wall-Mount Metal Cabinet		Wall-Mount Plastic Cabinet	
Model	Description	Model	Description
• CC-M12	12-station	• CC-P9	9-station
• CC-M15	15-station	• CC-P12	12-station
• CC-M18	18-station	• CC-P15	15-station
• CC-M24	24-station	• CC-P18	18-station
• CC-M36	36-station	• CC-P24	24-station
• CC-M48	48-station		
Metal Pedestal Mount (optional)			
Model	Description		
• CC-PED	Compatible with CC-M12 to CC-M24 models only		
• TIS-PED	Compatible with CC-M36 and CC-M48 models only		

Specifying Information—Custom Command

CC-X-XX-PED				
Model	Cabinet	Description		Optional
CC	X	XX		PED
CC—Custom Command	M—Metal P—Plastic	9—9-stations 15—15-stations 24—24-stations 48—48-stations	12—12-stations 18—18-stations 36—36-stations	PED—Optional Pedestal Mount

Example: A 12-station Custom Command Controller with an internal transformer and metal cabinet would be specified as: CC-M12

TDC Series 2-Wire System

- 50—200 Stations
- 1-, 2- or 4-Station Decoders

For an energy efficient, highly cost-effective way to irrigate large commercial installations, you'll want the TDC Series from Toro®. Using a two-wire path to communicate to buried decoders, the TDC system eliminates high costs associated with traditional valve wiring, trenching and trouble-shooting.



Features & Benefits

New ISP Decoders

Industry leading surge protections up to 20 KV means less grounding in the field than competitive products.

Advanced Diagnostics

The TDC provides true two-way communication with each decoder in the field, thus providing communication verification to decoders in the field, as well as shorted or open solenoid conditions, making troubleshooting a breeze.

Low-Power Operating Costs

The TDC Decoders operate DC Latching Solenoids which utilize no power when valves are in operation.

Water Budget

Water budget by controller, by program and by station (Season Adjust) 0 to 250% in 1% increments.

Simple, Intuitive Programming

Installation and future servicing are quick and simple thanks to the large LCD display and the industry's most intuitive interface.



Rain
Sensor
Compatible



TMR-1
Compatible



PSS-KIT
Compatible

Key-locking, Front-Entry, Metal Cabinet



TDC offers a key-locking cabinet in both the outdoor and indoor model controllers. Constructed from heavy-duty powder-coated metal, this is a wall-mount cabinet that provides superior weather and vandalism resistance.

Stainless Steel Pedestal Option



With Toro's EICON Special Build division, TDC units may be ordered with a stainless steel pedestal. To order please specify CDEC-PED-100 or CDEC-PED-200.

Specifications

Dimensions

- Cabinet: 14" W x 13" H x 6" D (356 x 330 x 152mm)

Electrical Specifications

- Input Power: 120 VAC or 220/240 VAC (50/60 Hz)
- Station Output Power: Up to 38 VAC maximum; 3 amps maximum output
- Wiring-two wire path: Jacketed, twisted pair 14 AWG to 15,000 ft.
- Wiring-two wire path: Jacketed, twisted pair 16 AWG to 8,450 ft.
- Wiring-decoder to solenoid: Standard pair 14 AWG to 400 ft.

Operating Specifications

- 20 KV surge protection with proper grounding of 10 Ohms or less at the controller
- 10 independent irrigation programs
- Six start times per program
- Day of the week programming, odd/even, interval (1-31 days)
- 0-255% adjust by controller, by program, by station
- Day Exclusion (remove a day from standard program)
- Programmable master valve and pump start, by station
- Manual start of each station or entire program
- Non-volatile memory retains programming
- Self-diagnostics circuit breaker skips shorted/open stations
- Two-way confirmation of decoder activation
- Activate up to 20 solenoids at up to 2.8 miles away
- Programmable rain delay up to 31 days
- Water window calculator
- 10-digit alpha-numeric zone identification
- Remote-Ready and RainSensor-compatible
- Upgradeable to Sentinel® Central Control
- Utilizes DC latching solenoids for valve control

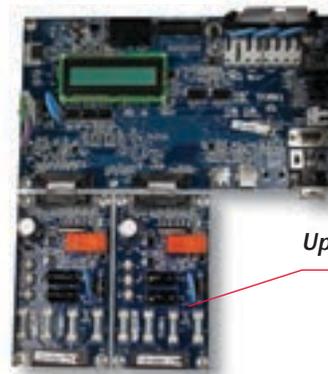
Optional Accessories

- PSS-KIT Precision™ Soil Sensor Kit
- DEG-SG-LINE Decoder, Line Surge Protector
- TRS Wired RainSensor
- 53853 Wired Rain/Freeze Sensor
- TWRS/TWRFS Wireless RainSensor or Wireless Rain/Freeze Sensor
- TMR-1-KIT Toro Maintenance Remote

Warranty

- Five years

Modular Design



Upgrade Module

The base model of the TDC offers 50 stations with capability to easily add another module allowing up to 200-station control. This is ideal for phased projects. Independently fused wire paths (4 per 100 stations = 8 for 200 stations) provide protection to the controller in the event of a short in field wiring.

TDC Series Model List

Metal Pedestal Mount	
Model	Description
• CDEC-SA-100	100-station, w/remote connection
• CDEC-SA-200	200-station, w/remote connection
• CDEC-PED-100	100-station, Two-wire controller on stainless steel pedestal*
• CDEC-PED-200	200-station, Two-wire controller on stainless steel pedestal*
* Order through EICON Special Build	
Two-Wire Station Decoders	
Model	Description
• CDEC-ISP-1	1-station w/ integrated surge protection (Operates up to two solenoids)
• CDEC-ISP-2	2-station w/ integrated surge protection (Operates up to four solenoids)
• CDEC-ISP-4	4-station w/ integrated surge protection (Operates up to eight solenoids)

Specifying Information—Decoders

Model	Description
CDEC-ISP-1	Single Station Decoder w/ integrated surge protection
CDEC-ISP-2	Two Station Decoder w/ integrated surge protection
CDEC-ISP-4	Four Station Decoder w/ integrated surge protection

Specifying Information—DEC

Model	Description
DEC-SG-LINE	Decoder, line surge protector*

*One per 1500 Feet

Specifying Information-TDC

CDEC-XXX-XXX		
Model	Cabinet	Description
CDEC	XXX	XXX
CDEC—2-wire Controller w/remote hook up	SA—Wall Mount Metal Cabinet PED—Stainless Steel Pedestal*	100—100 Stations 200—200 stations
Example: A TDC Controller with 200 stations would be specified as: CDEC-SA-200		

*Order through EICON

Sensors Overview



Model	PSS-KIT	Turf Guard®	TWRFS	TWRS	TRS	TFS
Page Number	90-91	92-93	94	94	95	96
Transmission Range (Line-Of-Sight)	Up To 500'	Up To 500', Unlimited w/ Repeaters	Up To 500'	Up To 500'		
Rain Sensing			X	X	X	
Soil Moisture Sensing	X	X				
Temperature Sensing	Freeze	Soil	Freeze			
Salinity Sensing		X				
Flow Sensing						X
Dual-Level Sensing		X				
Works With all 24V Controllers	X		X	X	X	
Communicates with Multiple Receivers	X	X	X	X		
Adjusts Irrigation Based On Amount of Water Needed	X	w/Sentinel®				
Replaceable Battery	X	X	X	X		
Automatic Resetting Bypass	X		X	X		
Cycle Delay Feature	X	w/Sentinel®				
Power Failure Protection	X	X	X	X		
Signal Strength Indicator on Receiver	X		X	X		
Signal Strength Indicator on Sensor	X					
Multiple Mounting Options	X	X	X	X	X	
Flow Range						1.2-500 GPM

Remotes Overview



Model	Evo-HH	TMR-KIT	EICON Remote
Page Number	73	97	98
Transmission Range (Line-of-Sight)	Up to 1000'	Up to 1.5 Miles	Up to 5 Miles
# of Programmable Addresses/Pins	Up to 999	Up to 999	Up to 999
Maximum Stations to Control	99	99	96
Independent Control of Master Valve or Pump			X
Turn Transmitter On or Off		X	X
Turn Station On or Off	X	X	X
Manual Station Advance		X	X
Pause or Un-Pause Current Station		X	
Minute Test Run	X	X	X
Turn on Specific Program	X		X
Compatible with all 24V Controllers			MRC Version
Connector Harnesses Available for Permanent Mount		X	X
Individual Receivers Available for Permanent Mount		X	X
Two-Way Voice Transmission			X
Carrying Case Included		X	X
Battery Requirement for Transmitter	9V	4 Each, AA	
Warranty	5 Years	2 Years	2 Years

Note: See page 73 for more information on the Evo-HH

Precision™ Soil Sensor

- Works with Nearly All Irrigation Controllers
- Up to 500' (152,4m) Range

Leveraging Toro sensing technology used on high-end commercial sites and world-class golf courses around the globe, the Toro Precision Soil Sensor reduces water waste by continuously measuring moisture levels in the soil and determining when to allow your controller to water, maximizing the efficiency of your irrigation system. Communication between the sensor probe and receiver is completely wireless, so installation is quick and easy with no digging required.

Features & Benefits

Works with Nearly All Irrigation Controller

Can be installed on any irrigation controller, including competitive models.

Prevents Overwatering

Continuously measures soil moisture levels and determines when to allow your irrigation controller to water, making sure just the right amount of water is applied.

No Digging Required

Communication between the sensor probe and the receiver is completely wireless, with up to a 500' range (line of sight). Installation doesn't disturb the soil, giving you accurate moisture readings starting as soon as the sensor is put in the ground.

Automatic Calibration

The sensor will automatically detect the soil type and adjust all calculations accordingly.

Freeze Detection

The only soil sensor to offer freeze detection that prevents irrigation when temperatures approach freezing.



How It Works

- There are two components to the system - a battery-powered wireless sensor probe and a receiver that wires into any irrigation controller's sensor port.
- Once installed, the sensor calculates field capacity for your soil (or the maximum amount of water the soil can hold after excess water has drained away) and sets that as "100%".
- Any time the moisture level in the soil exceeds field capacity, the irrigation controller is prevented from watering until the moisture level falls below the level set in the receiver (default is 50% of field capacity, adjustable by the user).

Dimensions

- Probe body: 5" x 3 3/4" x 3/4"
- Probe spikes: 4 3/4"
- Receiver body: 3" x 3 3/4" x 1 1/2"

Electrical Specifications

- Receiver input power: 24 VAC
- Probe: Three AA batteries

Temperature Specifications

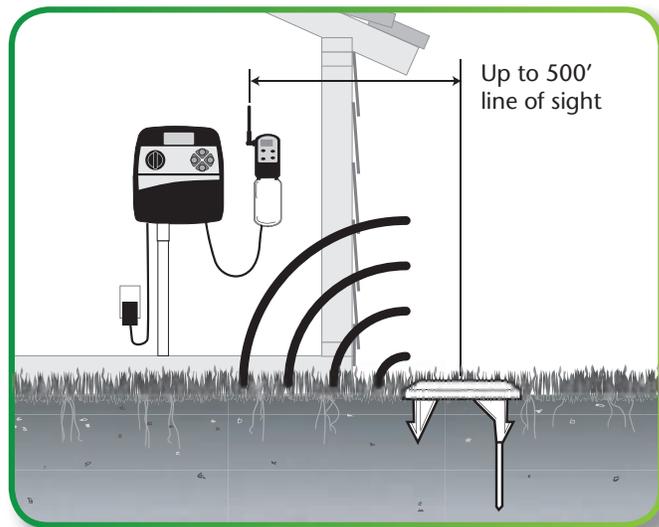
- Operating (Probe): 14°F to 170°F (-10°C to 77°C)
- Operating (Receiver): 14°F to 140°F (-10°C to 60°C)
- Storage: -22°F to +149°F (-30°C to 65°C)

Operating Specifications and Additional Features

- Sensor receiver hooks up to irrigation controller's sensor port (if available) or is wired into common wire
- Up to 500' (152m) range, line of sight
- One sensor per receiver
- Adjustable moisture threshold in 1% increments allows the user to set the desired moisture level
- Sensor automatically determines soil type and adjusts calculations accordingly
- Freeze detection prevents irrigation when temperatures approach freezing
- Smart bypass overrides the sensor for a user-defined length of time (especially useful during system winterization)
- If the sensor is tripped while the irrigation controller is in the middle of a watering program, the optional "Cycle Delay" feature ensures all subsequent zones in the irrigation program have a chance to get watered before the sensor halts watering
- Multi-color LED on the sensor probe indicates radio signal strength
- Sensor probe's ultra-slim 3/4" profile allows it to avoid being damaged by mowing equipment
- Extra long stainless-steel electrodes measure over 4 inches down into the soil profile
- Sensor probe's support stakes hold sensor firmly in place when installed
- Easily replaceable batteries last up to 2 years with alkaline batteries (longer with lithium)

Warranty

- Two years



Easy Installation



1. Hook up the receiver to your irrigation controller

2. Install the batteries to power up the sensor probe



3. Place the probe in the ground

Visit www.toroevolution.com to download free software to help optimize your irrigation controller's schedule for the Precision Soil Sensor.

Specifying Information— Toro Precision Soil Sensor

Model	Description
PSS-KIT	Precision Soil Sensor (Probe + Receiver)

Turf Guard® Soil Monitoring System

- Soil Moisture
- Salinity
- Temperature
- Web-based Interface

The Toro® Turf Guard Wireless Soil Monitoring system helps you improve your turf, soil and water efficiency. The system is a revolutionary technology that lets you know what's going on beneath the surface of your turf, so you can make timely, more-informed adjustments.



Features & Benefits

Monitor Moisture Levels And Adjust Irrigation

Reduce water usage and improve playability without risking turf quality. Promote root growth by avoiding over watering. Detect dry areas before it impacts the turf's health.

Track Salt Build-up And Schedule Flushing

Take the guesswork out of monitoring and managing salinity levels. Get positive confirmation that your flushing reduced soil salts. Know when and how much water to flush with.

Monitor Daily Soil Temperatures

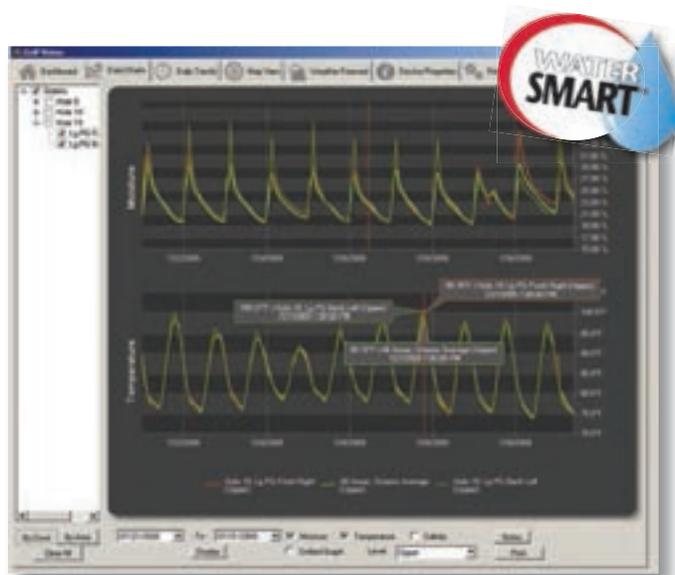
Predict peak soil temperatures early in the day to start remediation activities before an emergency. Schedule fungicide applications and pesticides for optimal effectiveness. Understand evaporation rates and syringing needs.

Wireless Network

No wires between the repeaters and the sensors, or the sensor and the probes means that sensors can be installed anywhere on your turf without disrupting play. Install sensors in other areas without having to trench or pull wires.

Water Management Highlight

No need to guess at how much water to apply for flushing an area, let Turf Guard tell you when enough water has been applied to push the salts out of the root zone. Don't wonder if you need to irrigate an area tonight, let Turf Guard tell you if the area is in an acceptable moisture level range.



Specifications

Dimensions

- Body: 2" x 3 5/8" x 6 1/8" (50 x 92 x 156mm)
- Spikes: 1 3/4" x 3/16" (44 x 5mm)
- Installation Hole Diameter: 4.25" (108mm)

Electrical Specifications

- Input Power:
 - Repeater: <.02A @ 6 VDC
 - Base Station: <.1A @ 120 VAC, 50/60 Hz

Temperature Specifications

- Operating: 32°F to 140°F (0°C - 60°C)
- Storage: -22°F to 180°F (-30°C - 82°C)

Sensing

- 0.1°F Temperature resolution
- 0.1 % Volumetric soil moisture content resolution
- 0.1 dS/m Soil conductivity resolution (Salinity)

Communication

- Repeater Range: Up to 5,000' (1524m) line-of-sight
- Buried Sensor Range: Up to 500' (152m) line-of-sight
- 900 MHz ISM Band FHSS Communication
- Additional licensing not required

Operating Specifications and Additional Features

- Immediately ready for operation after installation
- Advanced MESH routing technology overcomes obstacles
- Repeater can plug into standard 120V outlet
- Durable sensor housing is resistant to aeration damage
- Supports up to 500 sensors per system
- Expected sensor battery life of 3 years, field replaceable
- Sensor reading sent every 5 minutes
- Measures two distinct depths in the soil profile
- Automatic network configuration and failure recovery
- Graphical system overview displays sensor data at a glance
- Plots trends and compares historical and current readings
- Move quickly from system-wide averages to individual sensor readings

Warranty

- Comes with 1 year of NSN support (extended support plans available)

How it works:

- Multiple sensors buried in a site at critical root zone levels.
- Above-ground relays installed on or in existing irrigation controller enclosures.
- Wireless MESH networking links all sensors to central computer
- Moisture, Temperature and Salinity readings displayed in your office



Sensor

- Measures soil moisture, temperature, and salinity.
- Two distinct depths in the soil profile— Critical root zone level and a second 4.5 (11,5cm) inches lower
- Independent measurements from each depth.

Repeater

- Can run off of a standard 120V outlet
- Multiple sensors can be run through just one repeater, no configuration required.



Base Station

Connects to Internet in the office.

Web-based Interface

View current sensor readings and historical data remotely from any Web-connected computer or Web-enabled Mobile Phone or PDA.



Specifying Information—Turf Guard

Model	Description
TG-S2-R	Turf Guard Sensor With Replaceable Battery
TG-R-INT	Repeater-Internal Mount
TG-R-EXT	Repeater-External Mount
TG-B	Base Station
TG-S2-BAT	Battery Kit

Wireless RainSensor™

- Rain or Rain/Freeze Sensor
- 500' (152,4m) Range

No wires. No hassle. Just reliable rain sensing that provides optimum water savings. Toro® innovative wireless technology provides easy to use, advanced features for prompt reaction when it starts to rain.



Specifications

Dimensions

- Transmitter: 1 3/4" W x 3 1/2" H x 1 3/4" D (44 x 89 x 44mm)
- Receiver: 2" W x 4" H x 1 3/4" D (51 x 102 x 44mm)
- Weight: 0.78 lbs. (0,4 kg) product and carton

Electrical Specifications

- Transmitter Power: Two replaceable lithium cells (CR2032-3V)
- Receiver Power Source: 22-28 VAC/VDC, 100mA (from existing timer or optional transformer)
- Relay contacts output: Normally-opened or normally-closed; 3A @ 24VAC
- FCC, IC, AVA, UL, CUL, CE and C-tick approved

Specifications and Features

- Operating temperature: -20° F to 120° F (-28°C– 49°C)
- Housing material: Weather and UV resistant engineered polymer
- Transmitting range: up to 500' (152m) (line-of-sight) with adjustable antenna
- Sensor: maintenance free hygroscopic disks; adjustable rain sensitivity: 1/8" to 3/4" (3,2-20mm)
- Low battery indicator
- Signal strength indicator/scale
- Rain delay feature that works intelligently with the rain sensor (unlike most controller-based rain delays)
- Fail-safe modes in the event of loss of communications or failed sensor
- Real-time outside temperature displayed on the LCD (TWRS only)
- Five year easy to replace, standard coin batteries
- Versatile mounting options – one-piece Quick-Clip™ gutter bracket or 1/2" (13mm) conduit adapter
- Can control multiple receivers/controllers with one sensor transmitter

Warranty

- Five years

Features & Benefits

Smart Bypass™

Allows for system override at any time and resets automatically.

Rain/Freeze Combination

Features digital programmable accuracy – a first in the industry – The Freeze shutoff can be set from 35°–45°F (2°C–7°C) in 2° (0,5°C) increments.

Water Management Highlight



Water Conservation Modes

Selectable water conservation modes delay resumption of irrigation by intelligently extending beyond mechanical reset time and can save you up to 30%* more water.

* Savings vary based on sensor setting, watering schedule and other conditions.

First LCD In A Wireless Rainsensor



Provides informative system feedback including outside temperature, and transmitter signal strength and battery life.

Specifying Information-Wireless

Model	Description
TWRS	Toro Wireless RainSensor
TWRFS	Toro Wireless Rain/Freeze Sensor

Wired RainSensor™

- Wired Rain and Rain/Freeze Sensor
- Normally-Open or Normally-Closed

When it rains sometimes all you need is a simple sensor that ensures the job gets done. With multiple set-points for adjustable rain sensitivity and maintenance-free sensing disks, Toro's TRS provides the reliability required.



Wired Rain/Freeze Sensor

New Wired Rain/Freeze Sensor automatically suspends irrigation when the temperature drops below 37° F (2,8°C) saving piping networks and irrigation components.

Features & Benefits

Compatible With All Toro And Other Manufacturers' Controllers

Universal Normally Open and Normally Closed operation for compatibility with all controllers that are designed to accept a sensor device.

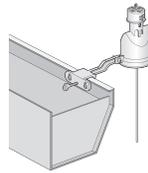
Maintenance Free Hygroscopic Discs

Industry standard sensing discs with adjustable rain shut-off indexes at 1/8" (3,2mm), 1/4" (6,4mm), 1/2" (12mm) and 3/4" (17mm) of rain.

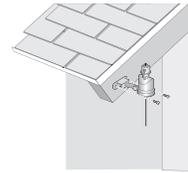
25 Feet Of UV-Resistant Cable

Includes 25 feet (7.6m) of white outdoor-rated, UV-resistant cable.

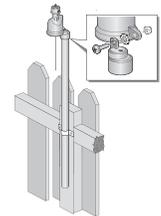
Three Mounting Options:



Quick Clip gutter bracket



Wall mount



Conduit adapter

Specifications

Dimensions

- Transmitter: 1 3/4" W x 3 1/2" H x 1 3/4" D (44 x 89 x 44mm)
- Weight: 0.80 lbs (0,4 kg) product and carton

Specifications and Features

- Relay contacts output, normally open or normally closed: 3A, 24 VAC
- Operating temperature: -20° F to 120° F (-28°C– 49°C)
- Low profile design and UV-resistant housing for sensor
- No special tools required for installation

Warranty

- Two years

Specifying Information-Wired

Model	Description
TRS	Toro Wired RainSensor
53853	Toro Wired Rain/Freeze Sensor

TFS (Flow Sensors)

- 1/2", 3/4", 1", 1 1/2", 2", 3", 4" Plastic Tee Sizes (12mm, 20mm, 25mm, 37mm, 50mm, 75mm, 100mm)
- 1.2 GPM to 500 GPM (4,5-1892 LPM)



Features & Benefits

Effective Flow Monitoring Even In Flows Less Than 5 GPM (19 LPM)

Effective in ranges from 1.2 GPM to 500 GPM (4,5-1892 LPM). Teamed with the Toro TMC-424, 1/2", 3/4" and 1" (12mm, 20mm, 25mm) sensors provide a cost-effective flow monitoring and alarm system.

Compatible With Competitive Controllers

In addition to the TORO compatible controllers – TDC+, TMC-424E, TIS-PRO and Sentinel® – these flow sensors work with any controller or control system compatible with frequency output flow sensors (pulses per second proportional to flow velocity).

Specifications

Specifications and Features

- Simple impeller-based design
- Potted electronics designed for valve box or underground applications
- Sensor pre-installed in tee
- Removable sensor design for easy replacement without removal of tee
- Socket end tee
- Output: 2-wire, unscaled pulse – pulse width 5msec +/- 25%
- Frequency: 3.2 to 200 Hz
- Pressure Rating:
 - 1/2", 3/4" and 1" (13, 20 and 25mm): up to 150 psi (10,3 Bar)
 - 1 1/2", 2", 3" and 4" (37, 50, 75, and 100mm): up to 100 psi (6,8 Bar)
- Temperature Rating: Up to 140° F (60° C)
- Flow Range (Velocity):
 - 1/2", 3/4" and 1" (13, 20 and 25mm): 2'-20' (0,6-6,0m) per second
 - 1 1/2", 2", 3" and 4" (37, 50, 75, and 100mm): 0.5'-30' (0,1-9,1m) per second
- Tee:
 - 1/2", 3/4" and 1" (13, 20 and 25mm): Schedule 40 PVC
 - 1 1/2", 2", 3" and 4" (37, 50, 75, and 100mm): Schedule 80 PVC
- Sensor Housing: Potted, PPS
- Impeller:
 - 1/2", 3/4" and 1" (13, 20 and 25mm): 300SST
 - 1 1/2", 2", 3" and 4" (37, 50, 75, and 100mm): Glass-filled nylon
- Shaft: Tungsten Carbide
- Bearing: UHMWPE
- Wires: 18AWG direct burial shielded cable

Warranty

- Two years

TFS Series Flow Sensor Performance Data

Sensor Model	TFS-050	TFS-075	TFS-100	TFS-150	TFS-200	TFS-300	TFS-400
Size	1/2" (13mm)	3/4" (19mm)	1.0" (25mm)	1.5" (38mm)	2.0" (51mm)	3.0" (76mm)	4.0" (102mm)
K Value	00.78	0.1563	0.26112	1.699	2.8249	8.309	13.74283
Offset	0.9	0.9	1.2	-3.016	0.1435	0.227	0.23707

TFS Series Model List		
Model	Description	Suggested Operating Range:
• TFS-050	1/2" (13mm) Flow Sensor	1.2-12 GPM (4,5-45 LPM)
• TFS-075	3/4" (20mm) Flow Sensor	2.7-28 GPM (10,2-65 LPM)
• TFS-100	1" (25mm) Flow Sensor	5-50 GPM (18,9-189 LPM)
• TFS-150	1 1/2" (37mm) Flow Sensor	5-100 GPM (18,9-379 LPM)
• TFS-200	2" (50mm) Flow Sensor	10-200 GPM (38-757 LPM)
• TFS-300	3" (75mm) Flow Sensor	20-300 GPM (76-1135 LPM)
• TFS-400	4" (100mm) Flow Sensor	40-500 GPM (151-1892 LPM)

Specifying Information—TFS

TFS-XXX	
Model	Configuration
TFS	XXX
TFS—Flow Sensor	050—1/2" (13mm) Plastic Tee 075—3/4" (20mm) Plastic Tee 100—1" (25mm) Plastic Tee 150—1 1/2" (37mm) Plastic Tee 200—2" (50mm) Plastic Tee 300—3" (75mm) Plastic Tee 400—4" (100mm) Plastic Tee

TMR-1 (Maintenance Remote)

1.5 Mile (2,41km) Range
Large LCD



This is irrigation maintenance at its easiest!

The Toro® TMR-1 is a maintenance remote system that allows a single operator to perform irrigation checks and fully operate the system from up to 1.5 miles (2,4 km) away.

Features & Benefits

Operates on Unlicensed MURS Frequencies
Up to 1.5 mile (2,4km) line-of-sight range without the hassles of FCC licensing.

Toro Exclusive All Stations Cycle (ASC) Function
Provides one-start system operation for walk-throughs, maximizing productivity – 2-minute runtimes per station.

Quick-Connect System (For Toro Controllers)
Allows receiver to easily be moved from one controller to another; circular connector can be bracket-mounted or mounted using 1/2" conduit.

Multi-Controller/Multi-Site Capability
Programmable address allowing selection of up to 999 different remote receivers at controllers.

Specifications

Dimensions

- Receiver size: 12" x 3" (305 x 76mm) with antenna
- Transmitter size: 12" x 3" (305 x 76mm) with antenna

Electrical Specifications

- Receiver input voltage: 22-26 VAC input
- Transmitter DC Operating voltage: 4-6V DC (AA Batteries included)
- Transmitter operates on 4 AA NiMH rechargeable batteries or 4 AA standard alkaline batteries
- Battery charger: Dual rate 12-hour charger
- Receiver operates off of the 24 VAC power from the controller
- FCC, UL-listed

Controller Compatibility

- Toro: TMC-212, TMC-424E, Custom Command, TIS-PRO, TDC

Operating Specifications

- Frequency: MURS designated channels – U.S. USE ONLY (151.82, 151.88, 151.94, 154.57, 154.6 MHz)
- Automatic detection and avoidance of busy channels
- Operating temperature range: -10° to 60° C
- Up to 1.5 miles (2,4 km) line-of-sight range and typically 1/2 mile (0,8 km) in obstructed areas
- Intuitive, easy-to-use keypad
- Large, easy-to-read LCD display
- Remotely controls up to 500 stations
- Battery life indicator
- Circular connector comes standard with 5' (1,5m) cable
- Simple, intuitive command set
- Default run time is 10 minutes
- Display shows countdown of time left to run
- Ergonomic design and removable belt clip

Warranty

- Two years

Specifying Information—TMR-1

TMR-1-XXX	
Model	Description
TMR-1	XXX
TMR-1—Toro Maintenance Remote	KIT—Complete Kit: Transmitter, Receiver, Circular Connector/Cable Assembly, Batteries, Carrying Case

Example: A complete TMR-1 Maintenance Remote Kit would be specified as: TMR-1-KIT

EICON Remote

5-Mile (8,04km) Range
Universal Wiring



For powerful, long-range, multi-site control, EICON maintenance remotes have been the irrigation industry for over 40 years.

Features & Benefits

Up to 5-Mile (8km) Line-of-Sight Range
Plus powerful UHF FM signal is the best available tool for communicating with receivers behind walls or in other hard-to-reach locations.

Universal Wiring

Receivers connect to any controller with 24 VAC outputs.

Two-way Voice Communication

Hand-held transmitter is capable of two-way voice communication as well as data transmission.

All Maintenance Remotes are ordered through and available from the EICON Division of Toro:

EICON
5825 Jasmine Street
Riverside, CA 92504
www.toro.com

Specifications

Dimensions

- MRC Receiver: 6.25" D x 8" W x 2.5" H (159 x 203 x 64mm)
- Omnitrol Receiver: 1.75" D x 3.25" W x 5.25" H (45 x 83 x 133mm)

Specifications and Features

- Hand-held radios feature rechargeable batteries
- Low battery indicators
- Hand-held transceivers are locally serviceable at radio service centers
- All components comply with FCC rules and regulations
- Receivers available in 12, 24, 36 or 48 station configurations
- Omnitrol receivers may be upgraded to as many as 96 stations
- MRC units are compatible with any controller that controls solenoids, relays etc., utilizing 24 VAC
- Any of the outputs in the host controller maybe turned on or off in any order
- A run time can be entered from the hand-held transceiver (from 1 to 20 minutes) for multiple valve syringe or sequential operations
- Ability to individually address and control up to 1000 controllers with a single hand held transceiver
- Receiver address codes may be changed by the operator
- An indicator light illuminates and begins blinking when the receiver unit is properly installed
- External antenna connectors are standard. For special applications where reception may become a problem such as deep underground or extreme ranges, special application antennas are available

Optional Accessories

- TRX-5U UHF Hand Held Transceiver with DTMF Keypad – includes charger
- P-30 30" (76cm), 12-station wiring harness for wiring to individual station outputs
- P-48 48" (122cm), 12-station wiring harness for wiring to individual station outputs
- E-36: 36" (91cm) pigtail extension

Warranty

- Two years

Specifying Information—EICON Special Build

ESB -XXX-XX-XX			
Description	Model	Type	Options
ESB	XXX	XX	XX
ESB—EICON SpecialBuild	MRC—Maintenance Remote Complete Kit MRX—Maintenance Remote Receiver OTL —Omnitrol Maintenance Remote Complete Kit OTX —Omnitrol Maintenance Remote Receiver RLM—Permanent mount receiver card	12—12 stations Universal 24—24 stations Universal 36—36 stations Universal 48—48 stations Universal	IR—Irritrol® MC-E Remote Connector RB—Rain Bird® (ESP-MC) Remote Connector*

*Only available in RLM Version

Central Control Overview



Model	Small Metal Wall Mount (24 VAC Terminals)	Stainless Steel Wall Mount (24 VAC Terminals)	Stainless Steel Pedestal (24 VAC Terminals)	Plastic Pedestal (24 VAC Terminals)	Two-Wire Satellite (Multiple Enclosures)
Number of Stations	12, 24, 36, 48, 96 with MapTo or Wireless Output Boards	12, 24, 36, 48, 96 with MapTo or Wireless Output Boards	12, 24, 36, 48, 96 with MapTo or Wireless Output Boards	12, 24, 36, 48, 60, 72, 84, 96	204
Turf Guard	Optional	Optional	Optional	Optional	Optional
ET-Adjust	X	X	X	X	X
Flow Sensing Compatible	X	X	X	X	X
Remote (SHHR) Compatible	X	X	X	X	X
RainSensor Compatible	X	X	X	X	X
Number of Programs	16	16	16	16	16
Simultaneous Program Operation	Up to 2 Amps	Up to 2 Amps	Up to 2 Amps	Up to 2 Amps	16
Number of Start Times	8 per Program	8 per Program	8 per Program	8 per Program	8 per Program
Max Station Runtime	4 Hours 15 Minutes	4 Hours 15 Minutes	4 Hours 15 Minutes	4 Hours 15 Minutes	4 Hours 15 Minutes
Days of the Week Programming	X	X	X	X	X
Odd/Even Programming	X	X	X	X	X
Interval Programming	X	X	X	X	X
Flow Monitoring	X	X	X	X	X
Water Use Logging	X	X	X	X	X
Valves per Station	2	2	2	2	2
Warranty	Five Years	Five Years	Five Years	Five Years	Five Years

 WaterSmart® Feature

Sentinel[®] Central Control

- Central Control Software
- PC-based
- ET-based Watering

Sentinel Central Control from Toro[®] is a powerful system that literally “stands guard” over large irrigation sites. With the ability to control up to 999 field satellites from one location, users have a water management tool that provides reliability, accuracy and water savings.



iPhone[®] and iPad[®] Connectivity



Turf
Guard[®]
Option



ET Adjust

Water Management Highlight

Water savings – ET-based (multiple weather station options)

Effective ET-based system management can lead to water savings of 25% to 30% per year. As an additional source of savings, pipeline breaks, malfunctioning valves, and missing heads are automatically detected and shut down, preventing excessive water loss.

Features & Benefits

Simple To Use

Microsoft[®] Windows-based software – daily operations and scheduling are made quick and easy.

Features For Water Management

ET-based watering, flow sensing and optimization, water usage report with historical comparison.

Smartphone and Tablet Connectivity

The new Sentinel WMS software package also includes iPhone[®] and iPad[®] connectivity for remote programming and alerts on ALL new systems.

Multiple Communication Options

Communication options like radio, telephone, fiber optics cellular, and Ethernet can be mixed and matched to meet system requirements.

Distributed Programming

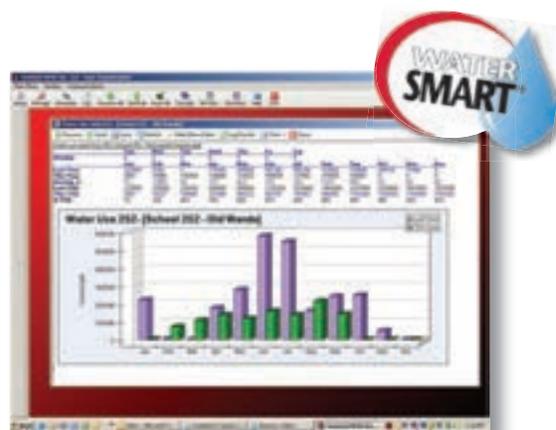
Stores irrigation programs in the computer while allowing irrigation control at the satellite level, ensuring the loss of a component does not result in the loss of irrigation across the system.

Toro NSN[®] Support

All centrals come with a minimum of two years of NSN support – unlimited 24-hour toll-free support with 24/7/365 emergency paging

Three Choices Of Central Packages

1) Software only; 2) Software and radio communication interface; 3) Central computer, software and radio communication interface.



Specifications

Specifications and Features

- Control up to 999 field satellites
- Group controllers into “systems” for system-wide adjustments:
 - Rain Days
 - Percent Adjust
 - ET-Adjustment from shared weather source
- Field changes to controller programs can be uploaded to computer
- Support for the System Administration
 - Set system, program and satellite descriptions
 - Map valve positions on site maps
 - Mark special dates on on-screen calendar
- Alarm reporting of any system component failure, including communications, over/under-flow conditions, electrical problems or power failure
- Extensive reporting features:
 - Run time reports
 - Water usage
 - Alarms
 - Logging of system changes
- Water use, rain and ET accumulation
- Flow optimizing to maintain optimum flow and shorten water window
- Ability to redefine valve sequence without physically changing wire terminations in field satellite
- Information overview by group and satellite
- System status indications for individual field satellite
- On-line help screens
- Map-based feedback on system status
- Standard telephone modem or internet connection allows for remote access to central software via pcAnywhere™

Warranty

- Two year extendable by continuous NSN subscription

Distributed Intelligence



Each Sentinel® controller is a fully intelligent unit with program data stored at both the field satellite and within the central computer. In the event a computer or master controller goes off line, there will be no loss of irrigation. True two-way communication allows programming changes to occur at the on-site field controller and uploaded to the central computer. Protection from unauthorized changes is ensured as the controller program can be easily compared to the program saved in the central computer.

Sentinel Central Model List

Central Software/Computer Models

Model	Description
• SGIS-1-T	Software Only w/2 years of NSN Support
• SGIS-0-1	Software, Peripheral Hardware w/2 years of NSN Support
• SGIS-1-0	Software, Computer Equip, Peripheral Hardware w/2 years of NSN Support

NSN Support Extension Models

Model	Description
• SSE-T-1	1-year Extension for SGIS-0-1 of SGIS-1-T
• SSE-T-3	3-year Extension for SGIS-0-1 of SGIS-1-T
• SSE-C-1	1-year Extension for SGIS-1-0 (w/computer warranty)
• SSE-C-3	3-year Extension for SGIS-1-0 (w/computer warranty)

Specifying Information— Sentinel Central

SGIS-X-X	
Description	Optional
SGIS	-X-X
SGIS—Sentinel Central Control Irrigation System	1-T—Software Only w/2 Years of NSN Telephone Support for Software 0-1—Software, Peripheral Hardware w/2 Years of NSN Telephone Support 1-0—Software, Computer Equipment, Peripheral Hardware w/2 Years of NSN Telephone Support (with computer warranty)

Sentinel® Controllers

- Modular
- Remote Ready
- ET-based Run Times
- Flow Sensor Ready

Toro® Sentinel field satellites are commercial grade, modular units that do the irrigation control work in the field. Designed to operate in both stand-alone and central mode.



The newly-redesigned satellite controller offers a number of new features and enhancements, including a completely-redesigned interface for easier standalone programming that incorporates a large backlit graphical display, new shortcut buttons for frequently-used functions, as well as a number of other additions.



Remote Ready



Flow Sensor Compatible



Turf Guard® Option

Cabinet choices



WS1
Powder-coated, wall-mount enclosure



WS5
16-gauge stainless steel, front-entry, wall-mount enclosure with backplate and junction box



PP1
Double-sided, plastic, top-entry pedestal-mount enclosure with dual backplates and junction box



PS1
16-gauge stainless steel, top-entry, pedestal-mount enclosure with backplate and junction box

Features & Benefits

Flow Sensing

Reads, displays and reacts to under and over flow situations and track water usage. No additional circuit boards are required.

Expanded Wireless Connectivity

Sentinel offers true two-way communication via several different connectivity options that can be mixed and matched to meet system requirements.

Firmware Updating

Firmware is now easier than ever to update or upgrade by simply inserting a USB thumb drive.

Weather-Based Irrigation

Sentinel waters according to ET values by using one or a number of onsite weather stations.

Advanced Troubleshooting

The new satellite controller has significantly more internal memory, allowing for extensive event logging and data storage, making it easier to diagnose issues in the field.

Water Management Highlight



The new satellite controller can easily be upgraded to operate with Turf Guard® wireless soil sensors, communicating directly with up to 16 sensors per controller (1 per program), continually measuring moisture, temperature and salinity levels in the soil, and adjusting irrigation as needed.

Specifications

Dimensions

- Small wall-mount:
10 1/4" W x 15 1/4" H x 5 1/4" D (260 x 387 x 133mm)
- Stainless steel wall-mount:
17 1/8" W x 30 3/4" H x 8 5/8" D (435 x 781 x 219mm)
- Stainless steel pedestal-mount:
17 1/8" W x 34 1/2" H x 8 5/8" D (435 x 876 x 219mm)
- Plastic Pedestal-mount:
17" W x 40" H x 16" D (432 x 1016 x 406mm)
- Weight:
 - Small Metal Wall-mount: 21 lbs (9,5 kg)
 - Stainless steel wall-mount: 47 lbs (21,3 kg)
 - Stainless steel pedestal-mount: 64 lbs (29,0 kg)
 - Plastic Pedestal: 60 lbs (27,2 kg)

Electrical Specifications

- Input power:
 - 120 VAC, 60 Hz
- Station output power:
 - 24 VAC
 - 1.0 amps per station maximum
 - 2.0 amps total load
- Surge protection: 24 V output boards, 20 KV @ 10 KVA
- UL Listed

Specifications and Features

- 16 programs
- Eight start times per program
- 6-week scheduling calendar
- Station runtimes from one minute to 4 hours and 15 minutes
- Global adjustment from 0-255%
- Flow sensor ready
- Handheld remote ready
- Turf Guard ready
- Two sensor inputs included for rain sensors or other switch sensors

Specifications and Features (cont.)

- Ability to connect to a laptop to download large station count programs
- Upgrade to a central computer system without additional field satellite hardware or costs
- Program single or multiple stations to operate sequentially or start a program or multiple programs with just a few keystrokes
- Ability to read open- or closed-contact switches in any station count configuration
- Current monitor will disable a station if excessive amp draw is detected
- Non-volatile memory will retain all programming and real-time data for 10 years
- Multi-language display: English, Spanish, French, and Italian
- Operating temperature: 14° to 140°F (-10° to 60°C)
- Surge rated to 20 KV @ 10 KVA

Optional Accessories

- TRS – Wired RainSensor
- TWRS/TWRFS – Wireless RainSensor or Wireless Rain/Freeze Sensor
- TFS – Flow Sensors
- SHHR - Hand Held Remote
- TS-TGB - Turf Guard Base Station Module for Sentinel Satellite Connectivity
- TG-S2-R - Turf Guard Soil Sensor
- TS-U2 - Toro Sentinel UHF Radio for Two-Way Communication with Central

Warranty

- Five years

Sentinel Satellite Model List

Model	Description
• TS	Toro Sentinel Satellite Assembly
• TSW	Toro Sentinel Satellite Assembly, Wireless Output

Specifying Information—Sentinel

TS-X-XX-XXX-U2			
Configuration	Station Count	Enclosure	Communication
TS-X	XX	XXX	U2
TS—Toro Sentinel Satellite Assembly	12—12-station	WS1—Powder-coated Wall Mount (Small)	U2-UHF 2-way radio
TSW—Toro Sentinel Satellite Assembly, Wireless Output	24—24-station	WSS—Stainless Steel Wall Mount (Large)	
	36—36-station	PP1—Plastic Pedestal Mount (Large)	
	48—48-station	PS1—Stainless Steel Pedestal Mount (Large)	
Example: A 24-station Sentinel satellite in a powder-coated wall-mount cabinet would be specified as: TS24WSIU2			

Sentinel® Two-Wire Controllers

- Up to 204 Stations
- Remote Ready
- Flow Sensor Ready
- 1-, 2- or 4-station Decoders

Easy to install and expand – a highly cost-effective field controller for large central control installations. Using a two-wire path to communicate to decoders, the Sentinel Two-Wire controller eliminates high costs associated with traditional valve wiring.



Remote Ready



Flow Sensor Compatible



Turf Guard® Option

Specifications

Dimensions

- Small wall-mount: 14" W x 13" H x 6" D (355 x 330 x 152mm)
- Stainless steel wall-mount: 17 1/8" W x 30 3/4" H x 8 5/8" D (435 x 781 x 219mm)
- Stainless steel pedestal-mount: 17 1/8" W x 34 1/2" H x 8 5/8" D (435 x 876 x 219mm)
- Plastic Pedestal-mount: 17" W x 40" H x 16" D (432 x 106 x 406mm)
- Weight:
 - Small Metal Wall-mount: 21 lbs (9,5 kg)
 - Stainless steel wall-mount: 47 lbs (21,3 kg)
 - Stainless steel pedestal-mount: 64 lbs (29,0 kg)
 - Plastic Pedestal: 60 lbs (27,2 kg)

Electrical Specifications

- Input power: 120 VAC or 220/240 VAC (50/60 Hz)
- Station output power: Up to 38 VAC maximum; 3 amps maximum output
- Wiring two-wire path: Jacketed, twisted pair 14 AWG to 15,000 ft (4572 m)
- Wiring two-wire path: Jacketed, twisted pair 16 AWG to 8,450 ft (2575 m)
- Wiring decoder to solenoid: Jacketed, twisted pair 14 AWG to 400 ft (122 m)

Specifications and Features

- 100 Station base model expandable to 204 stations
- Operates Valves with DC-Latching Solenoids
- 16 programs, eight start times per program
- 6-week or 365-day scheduling calendar
- Station runtimes from one minute to 4 hours and 15 minutes
- Global adjustment from 0-255%
- Handheld remote ready
- Two sensor inputs included for rain sensors or other switch sensors
- Multi-language display: English, Spanish, French and Italian
- Operating Temperature: 14° to 140° F (-10°C to 60°C)

Optional Accessories

- TRS – Wired RainSensor
- TWRS/TWRFS – Wireless RainSensor or Wireless Rain/Freeze Sensor
- TFS – Flow Sensors
- SHHR - Hand Held Remote
- TS-TGB - Turf Guard Base Station Module for Sentinel Satellite Connectivity
- TG-S2-R - Turf Guard Soil Sensor
- TS-U2 - Toro Sentinel UHF Radio for Two-Way Communication with Central

Warranty

- Five years

Sentinel 2-Wire Controller Model List

Model	Description
•TSD	Toro Sentinel Satellite Assembly, Two-Wire (Decoder)
Two-Wire Station Decoders	
Model	Description
• ESB-DDC-1	1-station w/ integrated surge protection (Operates up to two solenoids)
• ESB-DDC-2	2-station w/ integrated surge protection (Operates up to four solenoids)
• ESB-DDC-4	4-station w/ integrated surge protection (Operates up to eight solenoids)
• ESB-TWD-ISP	Sentinel two wire DC inline surge protection

Specifying Information-Sentinel 2-Wire

TSD-XXX-U2		
Station Count	Enclosure	Communication
TSD	XXX	U2
TSD—Toro Sentinel Satellite Assembly, Two-Wire (Decoder)	WS2—Small Painted Cabinet WS4—Medium SS Cabinet WS5—SS Wall Mount PS1—SS Pedestal	U2-UHF 2-way radio
Example: A two-wire Sentinel satellite in a stainless steel wall-mount cabinet would be specified as: TSDWS2U2		

Sentinel® Wireless Output Boards

Sentinel Wireless Output Boards utilize spread spectrum radio communication between the control module and the output boards, allowing virtually unlimited installation flexibility while eliminating surge damage to the control module. Solar powered output boards provide the perfect solution for medians and islands. Retrofits and remote flow sensing are a snap since hardscape crossing issues are eliminated.

• 12-stations



Specifications

Specifications & Features

- Wireless Output Controllers are expandable in 12-station increments from 12 to 96-stations
- Ability to mount outputs remote from Sentinel® Control Module - No cabling between output boards and control module
- Improved sensing includes real-time current draw per station
- Manual Station Activation Switches
- High Surge Protection

Options

- Flow Monitoring Only units available (no stations) for water supply flow monitoring
- Multiple Enclosure Options
- Standard or Solar-powered
- AC or DC-Latching

Warranty

- Two years

Sentinel® Custom Control Series

Sentinel Custom Control satellites are built to fit your needs and to eliminate controller overkill on small sites. These satellites ship without manual interface keypad or display, minimizing expense without sacrificing capabilities. All the features expected of a Sentinel controller, but cost-effective for your small site needs.

• 9-, 12- or 18-station



Remote Ready



Flow Sensor Compatible

Specifications

Specifications & Features

- All the capabilities of a Sentinel Controller, including 16 programs and eight start times per program.
- 9, 12, and 18 station models
- 6-week scheduling calendar
- Station runtimes from one minute to four hours and 15 minutes.
- Global adjustment from 0-255%.
- Percent adjust by program from 0-255%.
- Two sensor inputs included for rain sensors or other switch sensors.
- Flow Monitoring Only units available (no stations) for water supply flow monitoring.

Options

- Multiple Enclosure Options
- Standard or Solar-powered
- AC or DC-Latching

Warranty

- Two years

Hand Held Remote

The *Sentinel remote* allows users to conduct irrigation checks, and fully operate the system without opening a field satellite enclosure or needing a second person. This remote also serves as a two-way voice radio, allowing easy communication with other crew members.

Specifications

Dimensions

- Transmitter size (with antenna):
2 3/8" W x 1 3/4" D x 11" H (60 x 44 x 279mm)

Specifications and Features

- Simple command set
- Accesses controller and satellite features from the field
- Direct access to controllers (central control software not required)
- Two-way voice communication capability
- System On and Off command activation
- Five-watt radio
- 120 selectable and programmable channels
- Range: 2 to 3 miles (3,2 to 4,8 km)

Warranty

- Two year



Specifying Information

Model No.	Description
SHHR	Sentinel Hand Held Radio

Retro Link

The *Sentinel Retro-Link assembly unit* allows an existing Irritrol® MC-E or Rain Bird® ESP-MC controller to be upgraded to a Sentinel field satellite. Retro-Link is 100% compatible with the Sentinel central control software.

Specifications

Dimensions

- 5 1/2" W x 5 1/2" L x 1 1/2" H (140 x 140 x 279mm)

Specifications and Features

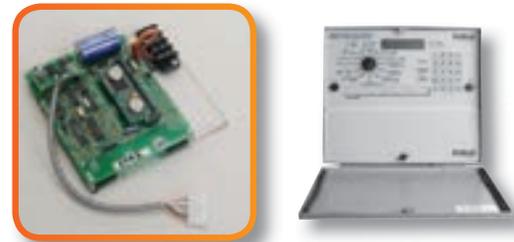
- Flow sensor, ET gauge or rain sensor capabilities
- Non-volatile memory in case of a power outage
- 100% compatibility with the Sentinel central control software
- Optional hand-held control with a Sentinel hand-held unit
- Provides the convenience of remote manual control
- Multiple hand-helds can be used on one-site

Accessories

- SHHR - Sentinel Hand Held Remote

Warranty

- Two year



Sentinel Retro Link Model List

Model	Description
• RLS-IR	Sentinel Retro-Link Assembly (Irritrol® MC-E)
• RLS-RB	Sentinel Retro-Link Assembly (Rain Bird ESP-MC)

Specifying Information

Model		Description		
ESB - RLS - U - 2 - XX				
ESB—Eicon Special Build	RLS—Sentinel Retro-Link	U—UHF	2—2-way	IR—Irritrol RB—Rain Bird

For information, ordering, or quotes, contact:
EICON Division • The Toro Company
 5825 Jasmine Street • Riverside, CA • 92504-1183
 www.toro.com • 877-345-8676

Maximize efficiency on your Sentinel system by using ET-Based watering. ET-Based watering automatically schedules irrigation based on individual landscape needs and local weather conditions. The result is higher property values, lower water bills and a healthier environment. Unlike competitive systems, Sentinel works in conjunction with multiple weather sources including on-site weather stations and the new wireless, web-based Precision™ ET.

Features & Benefits

Precision-ET

Precision-ET is a web-based ET source that users subscribe to through the Toro National Support Network. Virtual Weather Stations are assigned based on Latitude and Longitude coordinates. Each "location" will require a yearly fee, however, unlimited controllers may be assigned to any latitude and longitude.

On-Site Weather Stations*

Choose from a number of manufacturer's weather stations to meet your customer's needs. Choose wired or wireless versions to best suit the installation method needed.

*CIMIS (CA Only)

Freely access a network of over 120 automated weather stations in the State of California managed by the California Department of Water Resources (DWR).



Specifications

Recommendation On-Site Weather Station

- Davis Vantage Pro 2 Plus™
 - Cabled (6162C)
- Less Expensive
- 100' (30,5m) feet of cable provided
- 1000' (305m) possible
 - Wireless (6162)
- No cable necessary
- Repeaters can be used
 - Wireless Repeaters (7654)
- AC powered
- Solar
- Used with 6162 Davis Station
- WeatherLink® Software (6510 SER)

Supported Weather Sources:

- Precision-ET (Virtual)
- CIMIS (Free CA only)
- Davis Instruments®
 - Vantage Pro 2 Plus™
 - Grow Weather™
- Campbell Scientific®
 - ET 106
 - Turf Weather
- Irrisoft™
 - Weather Reach™

Isn't it nice to know someone's got you covered?
Available day or night, you can count on the Toro® National Support Network (NSN) team for total operational confidence.



Features & Benefits

24-Hour, Seven-Day, 365 Support

Worldwide, Toro NSN is always available to answer your questions, troubleshoot your system and solve your problems. And if needed, our 24-hour central computer and component replacement service ensures minimal disruption to the operation of your irrigation system (U.S.).

Industry-Best Training – Classroom And Internet- Based

Classroom instruction is available at regional locations and at the NSN Training Center—where classes feature hands-on computer training and the operation of Toro hardware. NSN's new internet-based Training In Ten™ features critical instruction that can be learned in ten minutes or less and quickly applied right on-the-job!

The Confidence Of Working With The Best In The Business

Toro NSN is a Microsoft® Certified Partner. Our support technicians are licensed irrigators. NSN has a diagnostic lab on-site for each irrigation platform, all field hardware, plus ancillary products. The lab is used to duplicate field issues and investigate causes and solutions as part of Toro's commitment to continuous improvement. NSN is dedicated to irrigation—we know your business and expectations.

New System Support, Flexible Options To Renew

Every new Sentinel offering includes Toro NSN support. To protect your Toro investment long-term, choose a renewal option that gives you exactly what you need for continued reliable, cost-effective support and extended warranty, including equipment upgrades to keep your technology current and powerful.

Note: NSN Features vary based on the Sentinel product offering purchased. Contact Toro Sales for details.

Specifications

Support for the Sentinel® Central Control

- Every Sentinel central package comes standard with 2-years NSN support
- Unlimited 24-hour toll-free support with 24/7/365 emergency paging
- Technical assistance by email with next business day response
- Remote PC assistance where connectivity is available
- Support of Microsoft® operating system software when purchased from NSN
- NSN lab for field issue duplication and diagnostics
- Technical bulletins
- Remote data storage for duration of subscription period
- Extended warranty on central hardware components with continuous subscription
- User training both hardware and software
- For more information on products, services or training, contact:

Toro NSN
P.O. Box 3339,
Abilene, TX 79604
Phone: 888-676-8676
Website: toronsn.com



Specifying Information—NSN/Sentinel Support Extensions

SSE-X-X	
Description	Optional
SSE	-X-X
SSE—Toro NSN Support for Sentinel Subscription Extensions*	T-1— 1-year Extension for SGIS-0-1 or SGIS-1-T T-3— 3-year Extension for SGIS-0-1 or SGIS-1-T C-1— 1-year Extension for SGIS-1-0 (w/computer warranty) C-3— 3-year Extension for SGIS-1-0 (w/computer warranty)

*1- and 3-year NSN extensions can be purchased up-front in conjunction with SGIS packages to provide the end-user with an additional one or three years of NSN support. For example, a customer can order the SGIS-1-0 and the SSE-C-3 which would equal five years of NSN support. These extensions are for original purchases only; existing plan renewals are still purchased through Toro NSN.

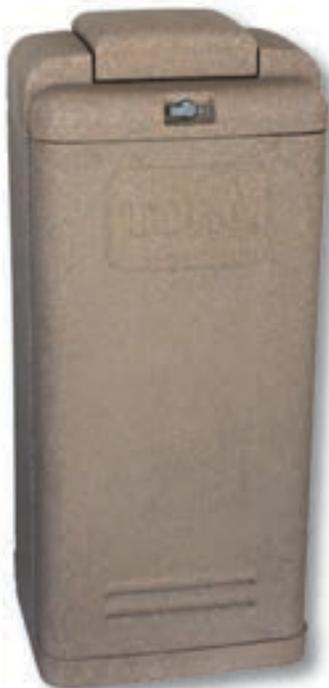
EICON Special Build

No matter what your central control system requires, from controller enclosures to communications type, Toro's Sentinel® can meet the demand. With EICON Special Build (ESB) we can custom-produce exactly what your system needs.



Solar-powered Controller

Retrofit or areas like highway medians where standard 120 VAC can't be run to.



Sandstone Plastic Pedestal
For desert / arid locations

Features & Benefits

Communication Options

Not only has Sentinel been at the forefront of narrowband radio technology as an irrigation control and data transmission method, but we also have extensive experience in systems utilizing Ethernet, Internet, Spread Spectrum Radio, Cellular Phone, Landline Phone, Fiber Optics, Radio Repeaters, or a combination of the above. So, if narrowband radios don't work, tell us what will.

Enclosures To Meet Your Needs

If you prefer sandstone-colored plastic, because your landscape is in a semi-arid environment where green plastic just does not work, or if you need painted metal enclosures, or enclosures with 9 or 96 stations, let us know.

Retro-Link Options

Many existing controllers, like the Irritrol® MC-E or a Rain Bird® ESP-MC can be upgraded with a Sentinel Retro-Link to turn them into a Sentinel Satellite without needing to replace the controller.

Tell Us What You Need

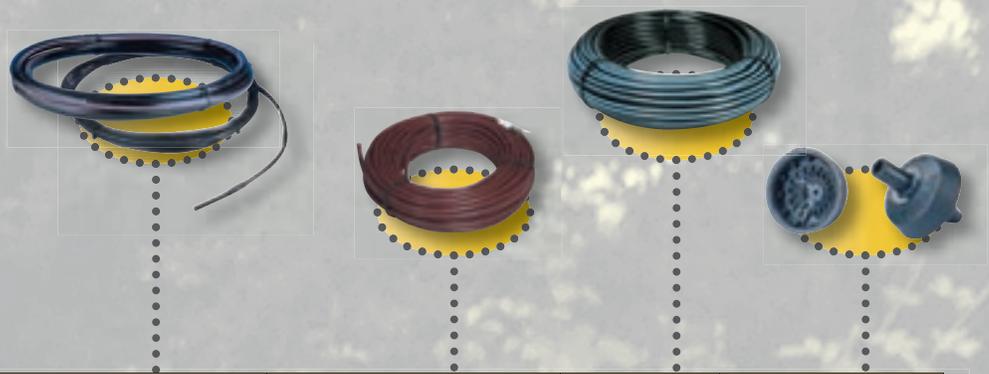
Whether it is solar-powered controllers, a non-standard voltage supply, or other issues you need solved, tell us what you need. We'll tell you if it's possible.

For information, ordering, or quotes, contact:

EICON Division

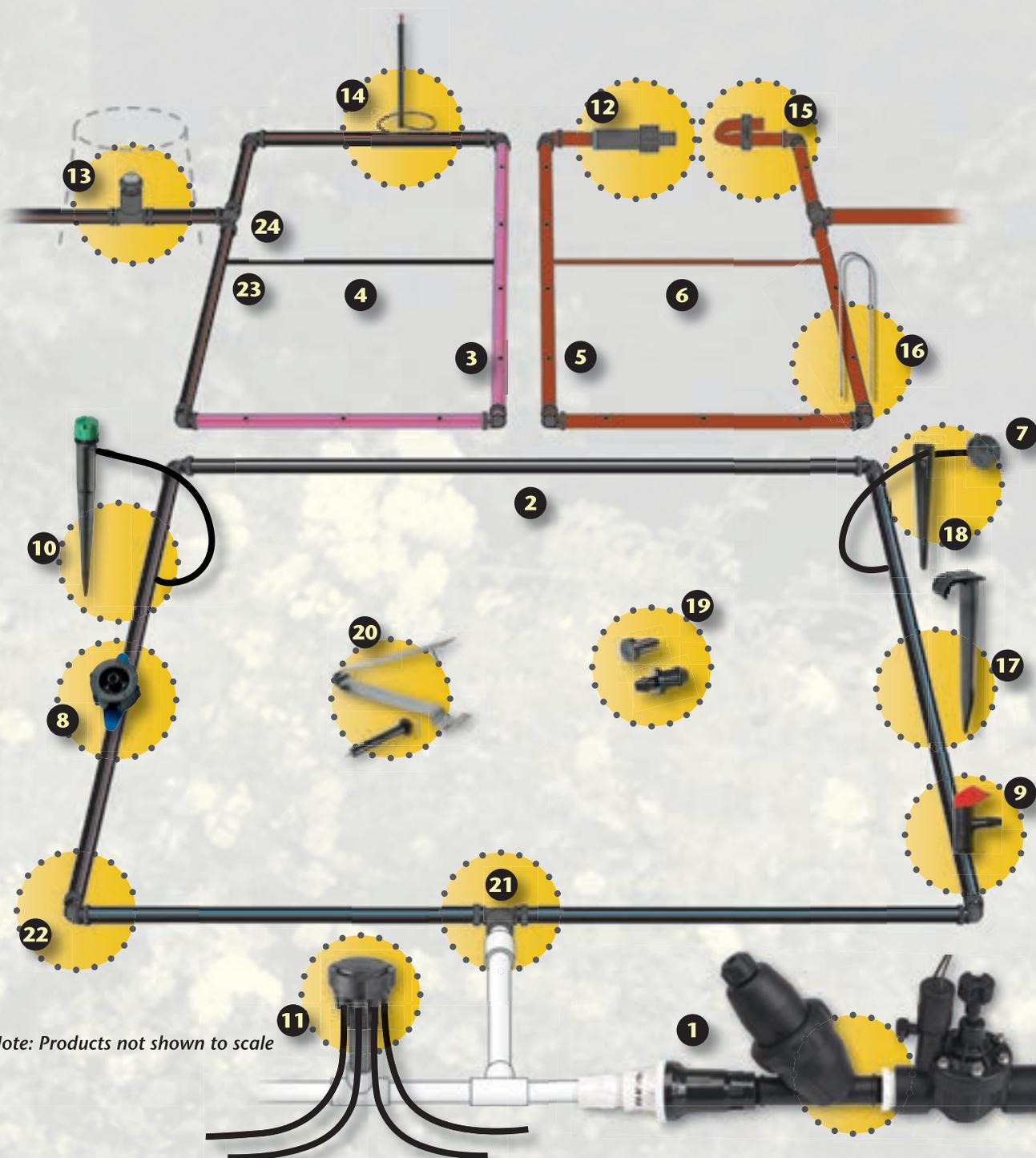
*The Toro Company
5825 Jasmine Street
Riverside, CA 92504-1183
877-345-8676 • www.toro.com*

Landscape Drip Overview



	DL2000™ & Microline w/ROOTGUARD®	Drip In® Dripline* & Soakerline™*	Blue Stripe® Hose	Emitters
Page Number	112-113 and 116	114-116	118-119	120-122
Sizes	.710"(18mm) OD DL2000 1/4" (6,4mm) Microline	.710"(18mm) OD Drip In 1/4" (6,4mm) Soakerline	1/4" to 1" (6,4-25mm)	
Emitter Spacing	12"; 18" (31cm; 46cm) DL2000 6"; 12" (15cm; 31cm) Microline	12"; 18" (31cm; 46cm) Drip In 6"; 12" (15cm; 31cm) Soakerline		
Flow Range	0.5-1.0 GPH (1,9-3,8 LPH)	0.5-1.0 GPH (1,9-3,8 LPH)		0.5-4.0 GPH (1,9-15,1 LPH)
Operating Pressure	15-60 PSI (1,0-4,1 Bar)	15-60 PSI (1,0-4,1 Bar)		8-60 PSI (0,5-4,1 Bar)
Pressure Compensating	DL2000	Drip In PC		NGE®, Drip Bubblers Turbo-SC™ Plus
Non-Pressure Compensating	Microline	Soakerline		E-2™ Classic Take-apart
Turf/Subsurface	X			
Shrubs/Ground Cover	X	X	X	X
Sloped Areas			X	X
High Traffic Areas	X		X	
Nursery		X		
Median Strips/ Parking Islands	X		X	
High Wind Conditions	X	X	X	X





Note: Products not shown to scale

- | | | | |
|--|------------------------------------|------------------------------------|---|
| 1. Drip Zone Kit (p. 128) | 7. NGE Emitter (p. 120) | 13. Vacuum Relief Valve (p. 117) | 19. Goof Plugs & Bug Caps (p. 117) |
| 2. Blue Stripe Hose (p. 118) | 8. Turbo-SC Emitter (p. 122) | 14. Operation Indicator (p. 117) | 20. Hole Punchers (p. 117) |
| 3. DL2000 Subsurface Dripline (p. 112) | 9. E2 Emitter (p. 123) | 15. End Clamp (p. 117) | 21. FPT to Loc-Eze Adapter (p. 117) |
| 4. DL2000 Micro-Line (p. 116) | 10. Varistake Emitter (p. 126) | 16. Steel Staple (p. 117) | 22. Loc-Eze Elbow (p. 117) |
| 5. PC Brown Drip-In Dripline (p. 114) | 11. Multi-Outlet Manifold (p. 124) | 17. Plastic Locator Stake (p. 117) | 23. 1/4" (6,4mm) Barbed Coupling (p. 117) |
| 6. 1/4" Soakerline Dripline (p. 116) | 12. Flush Valve (p. 117) | 18. 1/4" Locator Stake (p. 117) | 24. Loc-Eze Tee (p. 117) |

DL2000™ Series PC Dripline

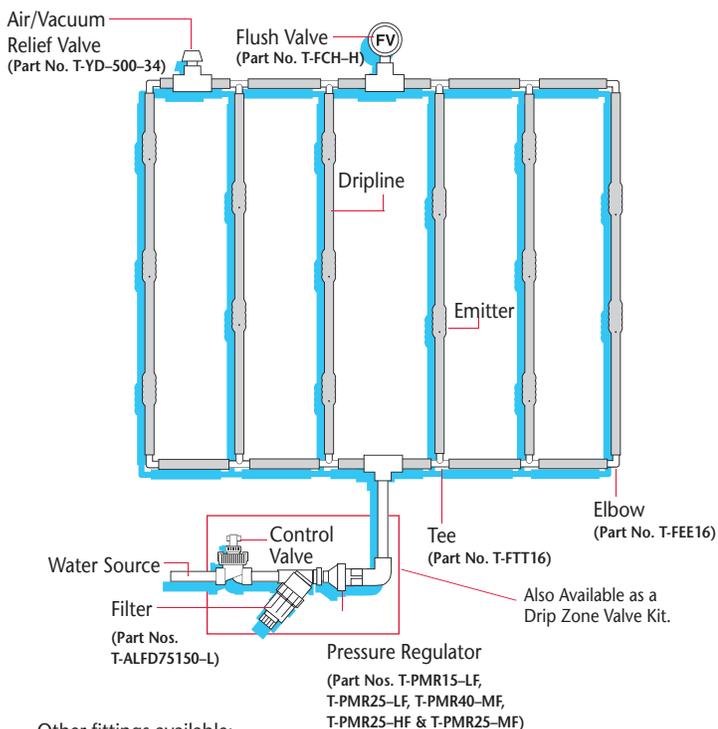
- 12" (31cm) and 18" (46cm) Emitter Spacing
- 0.5 (1,9 LPH) or 1.0 GPH (3.8 LPH)
- 5/8" (16mm)—0.710" x 0.620" (18,03 x 15,75mm)
- US Gov. Approved ROOTGUARD® Protection

Toro® DL2000 Dripline is the most technologically advanced subsurface irrigation system available.

Through its non-toxic ROOTGUARD® technology, only DL2000 delivers optimal water application directly to the root zone while safely inhibiting root intrusion.



Effluent Options Available



Other fittings available:

- Coupling (Part No. T-FCC16)
- Adapter (Part No. T-FAM16)
- Compression Adapter (Part No. T-CA-710)

Features & Benefits

U.S. Government-approved ROOTGUARD Protection

The pre-emergent, TREFLAN®, is impregnated into the emitter during the molding process and creates a "force field" effect around the emitter outlet, diverting root growth and assuring long term reliability.

At Grade Or Buried Options

Can be installed at grade or buried 4" – 8" (10,2-20,4cm) underground, delivering irrigation directly to the plant's root zone.

Pressure Compensating PC Self-cleaning Emitters

Provide precise, trouble-free water application. TREFLAN® impregnated emitters are inseparably welded to the inside wall of durable polyethylene dripline tubing during manufacturing.

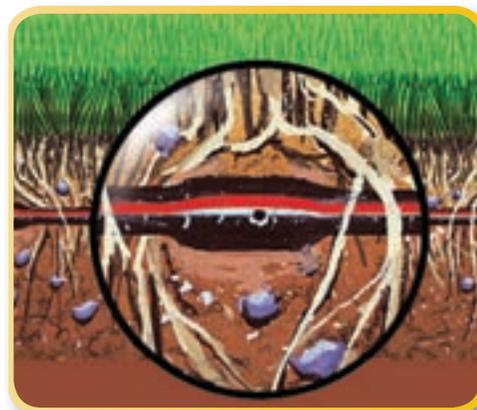
Environmentally Friendly

Irrigation takes place at or below grade so there is minimal water loss due to mist, evaporation, run-off or wind. Fertigation needs are reduced because water is applied only at the root zone.

Safety and Liability

When DL2000 is installed below ground, the landscape surface is free from irrigation equipment that may disrupt activities or cause injury. Sub-surface performance also avoids slippery walkways and roadways as well as wet walls, fences and windows.

Distinctive red stripe on tubing signifies DL2000 with ROOTGUARD



Precipitation Rate for Evenly Spaced Laterals and Emitters

Precipitation Rate for Drip Laterals (inches/hour)							
Emitter Flow (gph)	Emitter Spacing (in)	Spacing Between Drip Laterals					
		6 in	12 in	18 in	24 in	30 in	36 in
0.53	12	1.7	0.85	0.57	0.43	0.34	0.28
0.53	18	1.13	0.57	0.38	0.28	0.23	0.19
1.02	12	3.27	1.64	1.09	0.82	0.65	0.55
1.02	18	2.18	1.09	0.73	0.55	0.44	0.36

Precipitation Rate Formula:

$$\text{Precipitation Rate (in./hr.)} = \frac{231.1 \times \text{Emitter Flow (gph)}}{\text{Lateral Spacing (in.)} \times \text{Emitter Spacing (in.)}}$$

Note: This formula applies to evenly spaced drip irrigation laterals and emitters.

5/8" (18mm) OD		Inlet Pressure VS Maximum Length of Run In Feet				
Part No.	Flow Rate (GPH)	Emitter Spacing	15 psi	25 psi	30 psi	40 psi
RGP-212	.53	12"	250'	360'	400'	460'
RGP-218	.53	18"	350'	515'	565'	650'
RGP-412	1.0	12"	160'	240'	260'	300'
RGP-418	1.0	18"	240'	340'	375'	430'

DL2000 Performance Table—US

Flow Rate	.53/1.06 GPH
Inside Diameter	0.620"
Outside Diameter	0.710"
Wall	0.045"
Operating pressure (P)	15–60 psi
Minimum filtration requirement	120 Mesh
Hazen-Williams C factor	140
Barb loss factor (Kd)	.98

Performance Table

Flow Rate	.53/1.06 GPH
Flow Exponent (x)	0.05
Inside Diameter	0.620"
Outside Diameter	0.710"
Wall	0.045"
Operating pressure (P)	15–60 psi
Minimum filtration requirement	120 Mesh
Hazen-Williams C factor	140
Barb loss factor (Kd)	.98

Other Features

- Design flexibility for narrow, odd-shaped landscape areas
- Precise watering puts water where it's needed; avoids water marks on expensive hardscapes, glass or signage
- Distinctive red strip on tubing signifies DL2000 w/ROOTGUARD®

Warranty

Against Root Intrusion: Seven years

Hose: Five years pro-rated

DL2000 Model List

5/8" (18mm) DL 2000 PC DRIPLINE with ROOTGUARD

Model	Description
• RGP-212-01	0.5 GPH (1,9 LPH), 12" (31cm) emitter spacing, 100 ft. (31m) coil
• RGP-412-01	1.0 GPH (3,8 LPH), 12" (31cm) emitter spacing, 100 ft. (31m) coil
• RGP-218-01	0.5 GPH (1,9 LPH), 18" (46cm) emitter spacing, 100 ft. (31m) coil
• RGP-418-01	1.0 GPH (3,8 LPH), 18" (46cm) emitter spacing, 100 ft. (31m) coil
• RGP-212-05	0.5 GPH (1,9 LPH), 12" (31cm) emitter spacing, 500 ft. coil (152m)
• RGP-412-05	1.0 GPH (3,8 LPH), 12" (31cm) emitter spacing, 500 ft. coil (152m)
• RGP-218-05	0.5 GPH (1,9 LPH), 18" (46cm) emitter spacing, 500 ft. coil (152m)
• RGP-418-05	1.0 GPH (3,8 LPH), 18" (46cm) emitter spacing, 500 ft. coil (152m)
• RGP-212-10	0.5 GPH (1,9 LPH), 12" (31cm) emitter spacing, 1000 ft. coil (304m)
• RGP-412-10	1.0 GPH (3,8 LPH), 12" (31cm) emitter spacing, 1000 ft. coil (304m)
• RGP-218-10	0.5 GPH (1,9 LPH), 18" (46cm) emitter spacing, 1000 ft. coil (304m)
• RGP-418-10	1.0 GPH (3,8 LPH), 18" (46cm) emitter spacing, 1000 ft. coil (304m)

5/8" DL2000 PC PURPLE DRIPLINE with ROOTGUARD

Model	Description
• RGP-212-05-E	0.5 GPH (1,9 LPH), 12" (31cm) emitter spacing, 500 ft. coil (152m)
• RGP-412-05-E	1.0 GPH (3,8 LPH), 12" (31cm) emitter spacing, 500 ft. coil (152m)
• RGP-218-05-E	0.5 GPH (1,9 LPH), 18" (46cm) emitter spacing, 500 ft. coil (152m)
• RGP-418-05-E	1.0 GPH (3,8 LPH), 18" (46cm) emitter spacing, 500 ft. coil (152m)

Specifying Information—DL2000

RGP X-XX-XX-E			
Emitter Flow	Emitter Spacing	Coil Length	Optional
X	XX	XX	E
2—.50 GPH (1,9 LPH) 4—1.0 GPH (3,8 LPH)	12—12" (30,5 cm) 18—18" (45,7 cm)	01—100' (30,5 m) 05—500' (152,4 m) 10—1000' (305 m)	E—Purple Tubing for Non-potable Water

Example: A 500' (152,4m) coil of Pressure-compensating Dripline with ROOTGUARD, 12" (30,5cm) emitter spacing and 0.5 GPH (2.0 LPH), would be specified as: **RGP-212-05**

Note: Specify/use Loc-Eze Fittings or .710 Compression Fittings

Drip In® PC Brown Dripline

- 12" (31cm) and 18" (46cm) Emitter Spacing
- 0.5 (1,9 LPH) or 1.0 GPH (3.8 LPH)
- Pressure Compensating
- 100' (30,5m), 250' (76,2m) & 500' (152m) Coils

With higher water costs in our future, it makes more sense than ever to use inline tubing in suitable landscape applications. Drip In PC is both an effective and economical choice for at-grade installations.



Features & Benefits

Built-in Emitters

Deliver precise water application directly to the root zone.

Fully Pressure-compensating from 15 – 60 PSI (1,03-4,13 Bar)

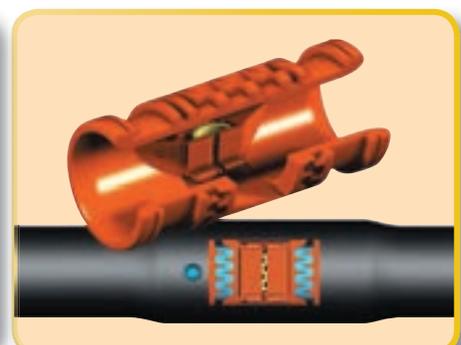
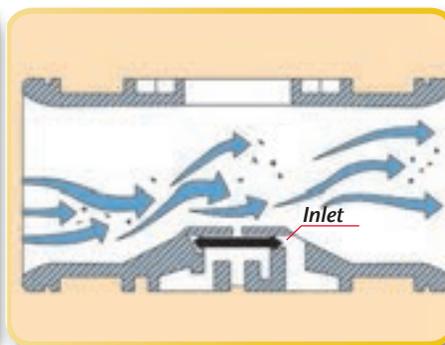
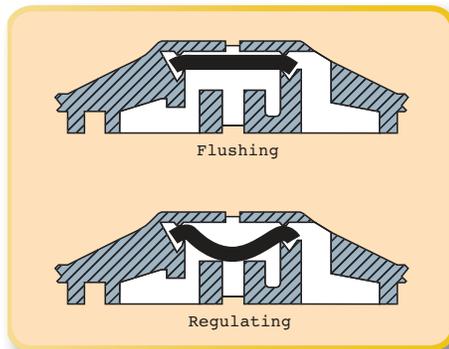
The pressure compensating design makes it ideal for slopes, high wind areas and areas with limited water supply or low pressure.

High Uniformity

Proven, dependable pressure compensating Drip In emitters deliver uniform, precise emitter discharge rates with exceptionally low variability.

Keeps Water Off Hardscapes

Preventing unsightly water stains.



UNIQUE, CONTINUOUS FLUSHING

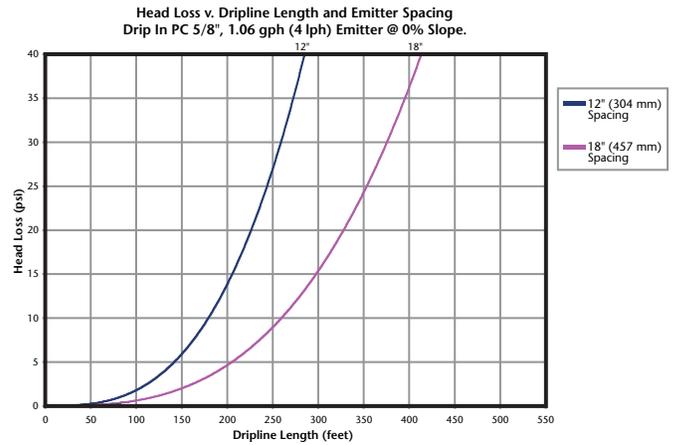
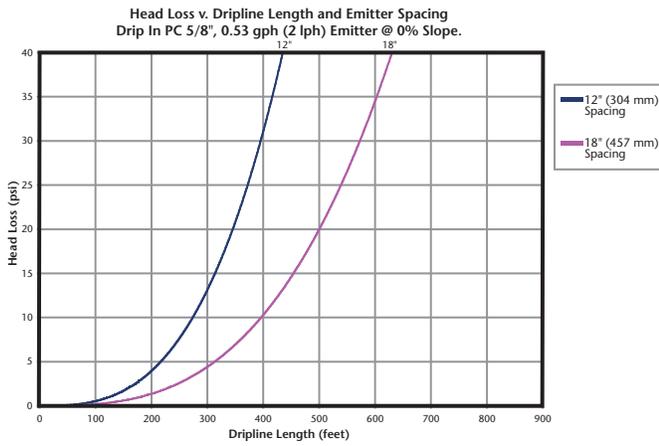
Flushing occurs at low pressure at start up, during the irrigation cycle if the emitter begins to clog and there is a reduction in flow, and as pressure drops during shut-down.

HIGHLY CLOG RESISTANT

Unique, raised internal filtration design deflects debris upward and away from the emitter's inlet. Because the inlet is also raised, sediment won't collect at the inlet while the system is off.

DUAL OPPOSED OUTLETS

In above ground installations, dual opposing ports in every emitter assure that at least one outlet provides air relief, which prevents back-siphonage of contamination into the emitter.



Length of Run Chart

5/8" (0.620" ID / 0.710" OD)				Inlet pressure vs. Max length of run in Feet			
Part Number	Tubing Size	Flow Rate	Emitter Spacing	15 psi	25 psi	30 psi	40 psi
T-PCB1853-12	.620" ID	.53 gph	12"	250'	360'	400'	460'
T-PCB1853-18	.620" ID	.53 gph	18"	350'	515'	565'	650'
T-PCB1810-12	.620" ID	1.0 gph	12"	160'	240'	260'	300'
T-PCB1810-18	.620" ID	1.0 gph	18"	240'	340'	375'	430'

Flow Rate	.53/1.06 GPH
Inside Diameter	0.620"
Outside Diameter	0.710"
Wall	0.045"
Operating Pressure (P)	15–60 psi
Minimum Filtration Requirement	120 Mesh
Hazen-Williams C Factor	140
Barb Loss Factor (Kd)	.98

DripIn PC Model List	
5/8" (16mm) Brown PC Dripline 0.620" ID x 0.710" OD x 0.045" Wall (15,7mm ID x 18,0mm OD x 1,1mm Wall)	
Model	Description
• T-PCB1853-12-100	0.53 GPH (2,0 LPH), 12" (31cm) emitter spacing, 100' (31m) coil
• T-PCB1810-12-100	1.0 GPH (3,8 LPH), 12" (31cm) emitter spacing, 100' (31m) coil
• T-PCB1853-18-100	0.53 GPH (2,0 LPH), 18" (46cm) emitter spacing, 100' (31m) coil
• T-PCB1810-18-100	1.0 GPH (3,8 LPH), 18" (46cm) emitter spacing, 100' (31m) coil
• T-PCB1853-12-250	0.53 GPH (2,0 LPH), 12" (31cm) emitter spacing, 250' (76m) coil
• T-PCB1810-12-250	1.0 GPH (3,8 LPH), 12" (31cm) emitter spacing, 250' (76m) coil
• T-PCB1853-18-250	0.53 GPH (2,0 LPH), 18" (46cm) emitter spacing, 250' (76m) coil
• T-PCB1810-18-250	1.0 GPH (3,8 LPH), 18" (46cm) emitter spacing, 250' (76m) coil
• T-PCB1853-12-500	0.53 GPH (2,0 LPH), 12" (31cm) emitter spacing, 500' (152m) coil
• T-PCB1810-12-500	1.0 GPH (3,8 LPH), 12" (31cm) emitter spacing, 500' (152m) coil
• T-PCB1853-18-500	0.53 GPH (2,0 LPH), 18" emitter spacing, 500' (152m) coil
• T-PCB1810-18-500	1.0 GPH (3,8 LPH), 18" emitter spacing, 500' (152m) coil
5/8" (18mm) Purple PC Dripline (Effluent)	
• T-PCE1810-12-500	1.0 GPH (3,8 LPH), 12" (31cm) emitter spacing, 500' (152m) coil

Specifying Information—DripIn PC

T-PCX-X-18-XX-XX-XXX					
Tubing Type	Skin	Tubing Size	Emitter Flow (@ 30 psi)	Emitter Spacing	Coil Length
T-PC	X	18	XX	XX	XXX
T-PC—Drip In Tubing	B—Brown Drip In Tubing E—Purple Drip In Tubing (Effluent)	18–5/8" (.720 OD X 0.620" ID) (18mm OD X 16mm ID)	53–0.53 GPH (2,0 LPH) 10–1.00 GPH (4,0 LPH)	12–12" (30,5cm) 18–18" (45,7cm)	100–100' (30,5m) 250–250' (75,2m) 500–500' (152,4m)

Example: A coil of 5/8" (16mm ID) pressure compensating .53 GPH (2,0 LPH) emitters spaced at 12" (45,7cm) on a 500' (152,3m) coil would be specified as: T-PCB1853-12-500

DL2000™ Series Microline with ROOTGUARD®

- 1/4" (6,4mm) Tubing
- 0.5 GPH (1,9 LPH)
- 6" (16cm) and 12" (31cm) Emitter Spacing



Inside Diameter	0.170"
Outside Diameter	0.250"
Wall	0.040"
Operating Pressure	15–60 psi
Minimum Filtration Requirement	140 Mesh
Nominal Flow Rate (Q)	0.53 GPH

NOTE: For information about the effects of temperature on polyethylene drip hose/tubing, please see bottom of pg. 164.

Features & Benefits

ROOTGUARD® Protection

Uses the non-toxic Treflan® creating a force-field effect guarding against root intrusion into the emitters.

1/4" (6,4mm) Tubing With Built-in Emitters

Allows for ease of installation even to the smallest of areas.

Length of Run Chart

Part Number	Tubing Size	Flow Rate	Emitter Spacing	Inlet Pressure	Maximum Length of Run
T-MCRG-206	1/4" (6,4mm)	.53 GPH (2,0 LPH)	6" (15,2mm)	15 psi (1,03 bar)	19' (5,8m)
T-MCRG-212	1/4" (6,4mm)	.53 GPH (2,0 LPH)	12" (30,5mm)	15 psi (1,03 bar)	33' (10m)

Specifying Information—Microline

Part Number	Description
T-MCRG-206	DL2000 100' (30,5m) Roll, 1/4" (6,4mm) Non-pressure-compensating Microline Dripline w/ROOTGUARD, 6" (15,2mm) Emitter Spacing, 0.50 GPH (1,9 LPH)
T-MCRG-212	DL2000 100' (30,5m) Roll, 1/4" (6,4mm) Non-pressure-compensating Microline Dripline w/ROOTGUARD, 12" (30,5mm) Emitter Spacing, 0.50 GPH (1,9 LPH)

Soakerline™ 1/4" (6,4mm) Classic Dripline

- 100' (30,5m) Coils
- 0.53 GPH (2.0 LPH)
- 6" (15cm) and 12" (31cm) Emitter Spacing



NOTE: For information about the effects of temperature on polyethylene drip hose/tubing, please see bottom of pg. 164.

Features & Benefits

Flexible And Sturdy Design

Soakerline 1/4" (6,4mm)dripline has a flexible and sturdy design making it ideal for young trees, shrubs, planter boxes and small landscape applications.

Built-in Emitters

Allow for ease of installation.

Brown Color

To blend into landscape areas.

Inside Diameter	0.170"
Outside Diameter	0.250"
Wall	0.040"
Operating Pressure	15–60 psi
Minimum Filtration Requirement	140 Mesh
Nominal Flow Rate (Q)	0.53 GPH

Length of Run Chart

Part Number	Tubing Size	Flow Rate	Emitter Spacing	Inlet Pressure	Max Length of Run
T-SDB252-6-100	1/4" (6,4mm)	.53 GPH (2,0 LPH)	6" (15,2mm)	15 psi (1,03 bar)	19' (5,8m)
T-SDB252-12-100	1/4" (6,4mm)	.53 GPH (2,0 LPH)	12" (30,5mm)	15 psi (1,03 bar)	33' (10m)

Loc-Eze™ Fittings and Accessories

Specifying Information— 5/8" (16mm) Loc-Eze Fittings

Part Number	Description
T-FTT16	Loc-Eze Tee
T-FEE16	Loc-Eze Elbow
T-FCC16	Loc-Eze Coupling
T-FAM16	Loc-Eze x 1/2" (13mm) MPT Male Adapter
T-FTV16	Loc-Eze x 1/2" (13mm) Slip Adapter Tee
T-FTF16	Loc-Eze x 1/2" (13mm) FPT Tee
T-FJA16	Loc-Eze x 3/4" (20mm) MHT without Cap
T-FJJ16	Loc-Eze x 3/4" (20mm) MHT with Cap
T-FAS16-1	Loc Eze x 3/4" (20mm) FHT Swivel with Washer
T-FTS16	Loc Eze x 3/4" (20mm) FHT Swivel with Screen
T-FTS16-1	Loc-Eze x 3/4" (20mm) FHT Swivel Tee with Washer
T-FAS16	Loc-Eze x 3/4" (20mm) FHT Swivel Tee with Screen

Note: 5/8" (16mm) EHW1645 is an equivalent hose size to DL2000 Dripline.



T-FTT16

T-FEE16

T-FCC16

T-FAM16

T-FTV16

T-FTF16

T-FJA16

T-FJJ16

T-FAS16-1

T-FTS16

T-FTS16-1

T-FAS16



T-YD-500-34

T-FCH-H-FIPT

T-FPG02

T-FCH-H-FHT

T-FJQ16

T-BC-025

T-DL-MP9

T-IPS1500

T-SS6-50

T-FMP16

Specifying Information Accessories

Part Number	Description
T-YD-500-34	Air Vent—1/2" (13mm) MIPT Air Release & Vacuum Relief Valve
T-FCH-H-FIPT	Flush Valve—3/4" (20mm) FPT (Pipe Thread), 0.8 GPM, 2 psi Sealing Pressure
T-FCH-H-FHT	Flush Valve—3/4" (20mm) FHT (Hose Thread), 0.8 GPM, 2 psi Sealing Pressure
T-DL-MP9	DL2000 Pop-up Operation Indicator
T-FJQ16	5/8" (16mm) Figure-eight End Clamp
T-SS6-50	3/4" (20mm) Steel Soil Staple to Hold Tubing in Place
T-IPS1500	5/8" (16mm) Plastic Locator Stake to Hold Tubing in Place
T-FPG02	Double-sided Goof Plug
T-BC-025	Bug Cap for 1/4" (6,4mm) Tubing
T-FMP16	Stainless Steel Insertion Tool for 1/4" (6,4mm) Barbed Fittings and Emitters

Specifying Information— Microline 1/4" (6,4mm) Fittings

Part Number	Description
T-FTT0400	Tee (Barb x Barb)
T-FEE0400	Elbow (Barb x Barb)
T-FCC0400	Coupling (Barb x Barb)
T-FCV-BB	Microflow Valve (Barb x Barb)
T-FMP08	Hose Punch for 1/4" (6,4mm) barbed fittings and emitter
T-IPS0104	1/4" (6,4mm) plastic locator stake to hold tubing in place



T-FCC0400

T-FTT0400

T-FEE0400

T-FCV-BB

T-FMP08

T-IPS0104



T-CA-710

T-CEFCH-H

Specifying Information— 0.710 (18mm) OD Compression Fittings

Part No.	Description
T-CA-710	OD Compression Adapter 1/2" (13mm) Spigot
T-CEFCH-H	OD Compression Adapter with Flush Valve, 0.8 GPM (3,03 LPM), 2 psi (9,76k/m²) Sealing

Blue Stripe™ Polyethylene Hose

- 5/8" (16mm), 3/4" (20mm), 1" (25mm) ID
- 7 Year Warranty

Central to any point-source drip installation, is the water delivery system. It needs to be reliable, trouble-free and cost effective. Providing the solution for over 30 years, Toro® Blue Stripe® hose leads the industry as the highest requested hose on the market.



Effluent
Options
Available

NOTE: For information about the effects of temperature on polyethylene drip hose/tubing, please see bottom of pg. 152.

Features & Benefits

Manufactured From Premium Grade Linear Low Density Polyethylene

For the most dependable long-lasting operation.

Minimum 2% Carbon Black Added

To provide optimum protection against ultraviolet (UV) deterioration.

Available With Blue, White Or Lavender Stripe

For easy on-site identification of drip zones or applications during installation and operation.

Wide Range Of Choices

Available in a wide range of diameters, wall thicknesses, coil lengths and working pressures.

Loc-eze Fittings Recommended

5/8" (16mm) Loc-Eze Fittings are designed to work with 5/8" (16mm) hose.

Blue Stripe® Micro-Distribution Hose

ID Controlled Hose

Part Number	Hose Size	Nominal Hose Size			Coil Length	Coil Ship Weight	Pressure Rating
	ID Inch	ID Inch	OD Inch	Wall Inch	Ft.	Lbs.	psi

Blue Stripe Round Hose - Coil Stretch Wrapped

T-EHW0437-100	1/4" (6,4mm)	0.170 (4,31mm)	0.250 (6,4mm)	0.040 (1,02mm)	1,000 (305m)	9.64 (4,37k)	161 (,078bar)
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Blue Stripe Round Hose - Coil Banded

T-EHD0437-010	1/4" (6,4mm)	0.170 (4,31mm)	0.250 (6,4mm)	0.040 (1,02mm)	100 (30,5m)	1.1 (,5k)	161 (,078bar)
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Blue Stripe® Polyethylene Hose

ID Controlled Hose

Part Number	Hose Size	Nominal Hose Size			Coil Length	Coil Ship Weight	Pressure Rating
	ID Inch	ID Inch	OD Inch	Wall Inch	Ft.	Min. Lbs.	psi

Blue Stripe® Round Hose – Coil Stretch Wrapped

T-EHW1645-010	5/8" (16mm)	0.615 (15,49mm)	0.705 (17,91mm)	0.045 (1,143mm)	100 (30,5m)	4.0 (1,81k)	61 (,029bar)
T-EHW1645-050	5/8" (16mm)	0.615 (15,49mm)	0.705 (17,91mm)	0.045 (1,143mm)	500 (152,4m)	19.8 (8,98k)	61 (,029bar)

Blue Stripe® Round Hose - Coil Banded

T-EHD1554-050A (palletized)	-	0.570 (14,48mm)	0.680 (17,27mm)	0.055 (1,397mm)	500 (152,4m)	21.5 (9,75k)	77 (,037bar)
P,X T-EHD1645-050A (palletized)	5/8" (16mm)	0.615 (15,49mm)	0.705 (17,91mm)	0.045 (1,143mm)	500 (152,4m)	18.9 (8,57k)	61 (,029bar)
P,X T-EHD2057-050A (palletized)	3/4" (20mm)	0.805 (20,45mm)	0.920 (23,34mm)	0.057 (1,448mm)	500 (152,4m)	31.2 (14,15k)	59 (,028bar)
T-EHD2667-066A (palletized)	1" (25mm)	1.060 (26,92mm)	1.195 (30,35mm)	0.067 (1,702mm)	660 (201m)	63.3 (28,7k)	53 (,025bar)

Note: For the two designated part numbers above, replace "D" with "P" in the part number to specify Purple Hose for reclaimed water. For the same two designated part numbers above, replace "D" with "X" in the part number to specify White Stripe Hose.



Blue Stripe® Polyethylene Hose Model List

Micro-Distribution Hose - Coil Stretch Wrapped	
Model	Description
• T-EHW0437-100	LLDPE; 1/4"; ID: 0.170"; OD: 0.250"; Wall: 0.040"; 1,000' coil (LLDPE; 6mm; ID: 0,4mm; OD: 0,6mm; Wall: 0,1mm; 304m coil)
Micro-Distribution Hose - Coil Banded	
Model	Description
• T-EHD0437-010	LLDPE, 1/4", ID-0.170", OD-0.250", Wall-0.040", 100' coil (LLDPE; 6mm; ID: 0,4mm; OD: 0,6mm; Wall: 0,1mm; 31m coil)
Inside Diameter (ID) controlled - Coil Stretch Wrapped	
Model	Description
• T-EHW1645-010	5/8"; ID: 0.615"; OD: 0.705"; Wall: 0.045"; 100' coil (16mm; ID: 1,6mm; OD: 1,8mm; Wall: 0,1mm; 31m coil)
• T-EHW1645-050	5/8"; ID: 0.615"; OD: 0.705"; Wall: 0.045"; 500' coil (16mm; ID: 1,6mm; OD: 1,8mm; Wall: 0,1mm; 152m coil)
Inside Diameter (ID) Controlled - Coil Banded	
Model	Description
• T-EHD1554-050A	ID: 0.570"; OD: 0.680"; Wall: 0.055"; 500' coil (palletized) (ID: 14,5mm; OD: 17,3mm; Wall: 1,4mm; 152m coil palletized)
• T-EHD1645-050A	5/8"; ID: 0.615"; OD: 0.705"; Wall: 0.045"; 500' coil (palletized) (16mm; ID: 15,6mm; OD: 17,9mm; Wall: 0,1mm; 152m coil palletized)
• T-EHD2057-050A	3/4"; ID: 0.805"; OD: 0.920"; Wall: 0.057"; 500' coil (palletized) (20mm; ID: 20,4mm; OD: 23,4mm; Wall: 1,5mm; 152m coil palletized)
• T-EHD2667-066A	1"; ID: 1.060"; OD: 1.195"; Wall: 0.067"; 660' coil (25mm; ID: 26,9mm; OD: 30,4mm; Wall: 1,7mm; 201m coil)
Lavender Stripe Round Hose	
Inside Diameter (ID) Controlled - Coil Banded	
Model	Description
• T-EHP1645-050A	5/8", ID-0.615", OD-0.705", Wall-0.045", 500' coil (palletized) (16mm; ID: 15,6mm; OD: 17,9mm; Wall: 0,1mm; 152m coil palletized)
• T-EHP2057-050A	3/4", ID-0.805", OD-0.920", Wall-0.057", 500' coil (palletized) (20mm; ID: 20,4mm; OD: 23,4mm; Wall: 1,5mm; 152m coil palletized)
White Stripe™ Round Hose	
Inside Diameter (ID) Controlled - Coil Banded	
Model	Description
• T-EHX1645-050A	5/8", ID-0.615", OD-0.705", Wall-0.045", 500' coil (palletized) (16mm; ID: 15,6mm; OD: 17,9mm; Wall: 0,1mm; 152m coil palletized)
• T-EHX2057-050A	3/4", ID-0.805", OD-0.920", Wall-0.057", 500' coil (palletized) (20mm; ID: 20,4mm; OD: 23,4mm; Wall: 1,5mm; 152m coil palletized)

Specifying Information—Blue Stripe Polyethylene Hose

T-EH-X-XX-XX-XXX-A					
Model	Stripe Color / Packaging	Tubing Size (ID)	Wall Thickness	Coil Length	Optional
T-EH	X	XX	XX	XXX	A
T-EH - Blue Stripe Hose	D - Blue Stripe / Coil Banded W - Blue Stripe / Stretch Wrapped P - Lavender Stripe / Coil Banded X - White Stripe / Coil Banded	04 - 4mm (.16") 15 - 15mm (.59") 16 - 16mm (.63") 20 - 20mm (.79") 26 - 26mm (1.02")	37 - .037" (0,94mm) 45 - .045" (1,14mm) 54 - .054" (1,37mm) 57 - .057" (1,44mm) 67 - .067" (1,70mm)	010 - 100' (30,5m) 050 - 500' (153m) 066 - 660' (201m) 100 - 1000' (305m)	A - Palletized

NGE® New Generation Emitters

- 0.5 (1,9 LPH), 1.0 (3,8 LPH) and 2.0 GPH (7,6 LPH)
- 8-60 psi (0,6-4,14 Bar)
- Pressure-Compensating

Designed for demanding drip irrigation installations, the Toro® New Generation Emitter (NGE) has what it takes to keep your system flowing.



Features & Benefits

Uniform Flow Rates

Make the NGE ideal for use in difficult topographical conditions.

Unique Emitter Design And Pressure Compensating Diaphragm

Allows the emitter to self-flush during operation and shut-down to facilitate cleaning. This ensures the emitter is free of debris at start-up and during the emitter operation.

Stops the emitter from draining below 2-3 psi (0,14-0,20 Bar) preventing complete drainage of the system. This reduces the time required to refill the system at start-up improving the overall operation.

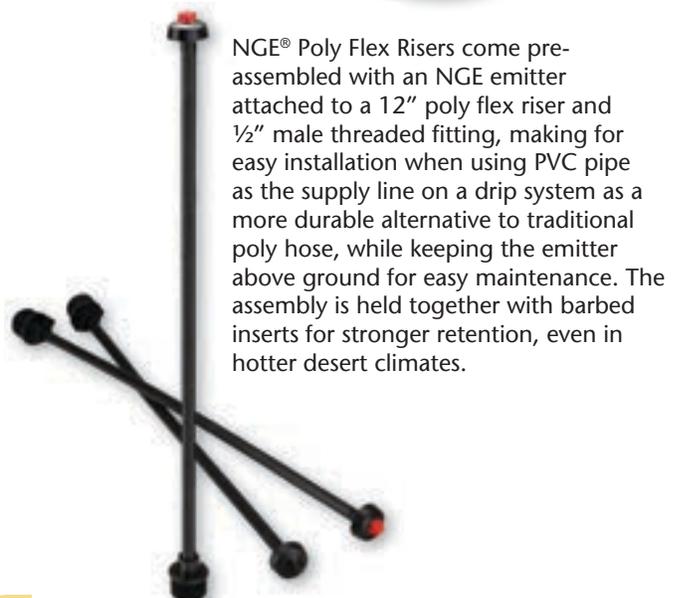
Allows the emitter to close inhibiting back siphoning and preventing the emitter from being contaminated with debris

Coefficient Of Variation (CV) Of 3% Or Less

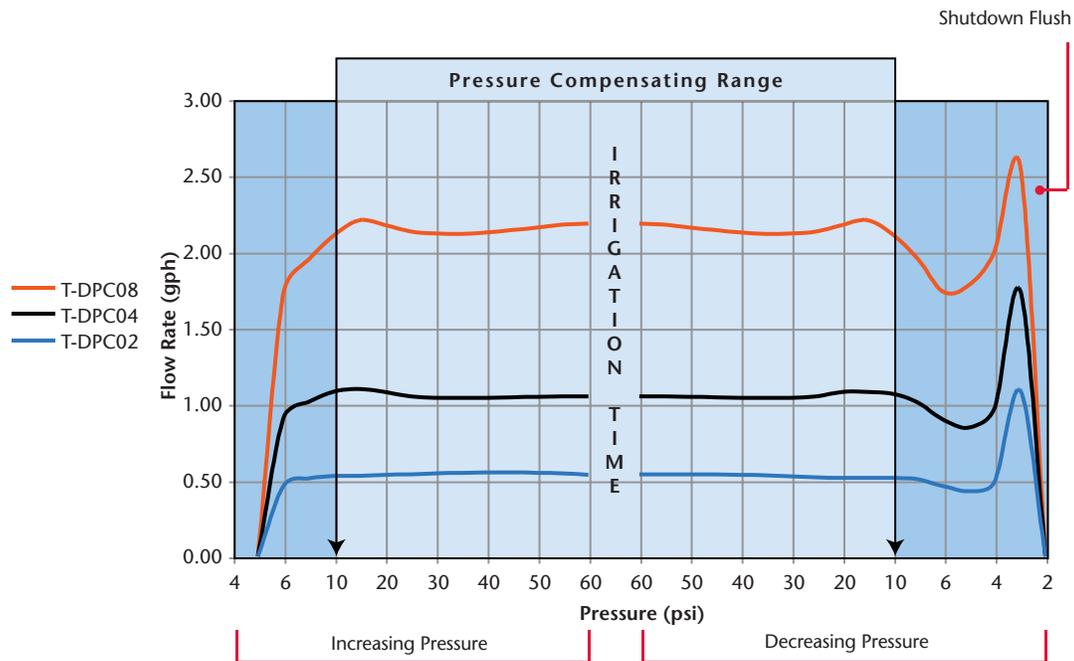
As tested by Toro and independent labs, the NGE is one of the best performing pressure-compensating emitters available.



Poly Risers **NEW!**



NGE® Poly Flex Risers come pre-assembled with an NGE emitter attached to a 12" poly flex riser and 1/2" male threaded fitting, making for easy installation when using PVC pipe as the supply line on a drip system as a more durable alternative to traditional poly hose, while keeping the emitter above ground for easy maintenance. The assembly is held together with barbed inserts for stronger retention, even in hotter desert climates.



Specifications

Specifications

- Recommended operating pressure: 8-60 psi (0,5-4,1 Bar)
- Flow Rates:
 - T-DPC02 – 0.5 GPH (1,9 LPH)
 - T-DPC04 – 1.0 GPH (3,8 LPH)
 - T-DPC08 – 2.0 GPH (7,6 LPH)
- Color-coded snap-on dust cap (0.5 Blue; 1.0 Black; 2.0 Red) deters dust and insects from entering the emitter
- Barbed inlet allows emitters to be installed directly onto hose or used with 1/4" (6mm) tubing

Warranty

- Two years

NGE Flow Rates—US

Pressure	DPC02	DPC04	DPC08
psi	GPH	GPH	GPH
6	0.46	0.91	1.73
8	0.51	1.01	1.95
10	0.53	1.08	2.11
15	0.53	1.10	2.21
20	0.53	1.08	2.17
25	0.54	1.05	2.13
30*	0.54	1.04	2.12
35	0.55	1.04	2.12
40	0.55	1.04	2.12
45	0.55	1.04	2.14
50	0.55	1.05	2.16
55	0.54	1.05	2.18
60	0.54	1.05	2.18

* Recommended operating pressure

NGE Performance Table—US

Nominal Flow Rate (Q)	GPH	T-DPC02	T-DPC04	T-DPC08
		0.5 GPH	1.0 GPH	2.0 GPH
Recom. Pressure Range (P)	psi	8–60 psi		
Emitter Exponent (x)		0.000	0.000	0.002
Coefficient of Variation (Cv)		3%		
Min. Filtration Requirement		140 Mesh (105 Micron)		
Optional Outlet		-MA (Male Adapter)	-DC (Snap-on Dust Cap)	
Color (Cap)		Blue	Black	Red

Specifying Information—NGE Emitter

Part Number	Description
T-DPC02-MA	NGE SF (Self-flushing) Pressure-compensating Turbulent Flow Emitter with Male Adapter
T-DPC04-MA	
T-DPC08-MA	
T-DPC02-DC-BLUE	NGE SF (Self-flushing) Pressure-compensating Turbulent Flow Emitter with Dust Cap
T-DPC04-DC	
T-DPC08-DC-RED	
T-DPC04-PR12	NGE SF (Self-flushing) Pressure-compensating Turbulent Flow Emitter with Dust Cap on Poly Riser
T-DPC08-PR12	

Turbo-SC™ Plus

Pressure-compensating Emitter

- 0.5 (1,9 LPH), 1.0 (3,8 LPH) and 2.0 GPH (7,6 LPH)
- Self-Flushing
- Pressure-Compensating

From the company that has pioneered so many drip irrigation innovations, the Toro® Turbo SC Plus has an industry track record for proven performance and affordability. Known as the DPJ emitter, Turbo SC Plus offers the two features liked by so many users. Pressure-compensation for system uniformity and “take-apart” for simple on site inspection.



Flow Rate

PSI	T-DPJ02-A	T-DPJ04-A	T-DPJ08-A
5	0.42	0.73	1.41
10	0.44	0.97	1.80
15	0.47	0.96	2.00
20	0.49	0.97	2.12
25	0.50	1.00	2.15
*30	0.51	1.01	2.15
35	0.51	1.01	2.11
40	0.50	1.00	2.04
45	0.49	0.98	1.95
50	0.47	0.95	1.84
55	0.45	0.91	

* Recommended operating pressure
Values listed in gallons per hour.

Features & Benefits

Take-apart Feature

Permits fast, easy on-site inspection and cleaning.

Large Self-flushing, Turbulent Flow Path

For higher resistance to plugging where water conditions may be a problem.

Male Adapter With Bug Shield

Deters the entry of insects, but also can be used with ¼" (6,4mm) exit tubing for precision water placement.

Color-coded Base For Easy On-site Identification

Blue – 0.5 GPH (1,9 LPH); Black – 1.0 GPH (3,8 LPH); Red – 2.0 GPH (7,6 LPH).

Specifications

Specifications

- Proven PC (pressure-compensating) emitter design
- Barbed inlet allows emitters to be installed directly onto hose or used with ¼" (6,4mm) tubing
- High quality diaphragm for improved pressure compensation and uniformity over a wide range of pressure

Warranty

- One year

Turbo-SC Performance Table—US

		T-DPJ02-A	T-DPJ04-A	T-DPJ08-A
Nominal Flow Rate (Q)	GPH	0.5 GPH	1.0 GPH	2.0 GPH
Recom. Pressure Range (P)	psi	10–50 psi		
Emitter Exponent (x)		0.02	-0.04	0.01
Min. Filtration Requirement		140 Mesh (105 Micron)		
Color (Base)		Blue	Black	Red

Specifying Information—Turbo-SC Plus

Part Number	Description
T-DPJ02-A-BLUE	0.5 GPH (2 LPH) Pressure-compensating Emitter w/Male Adapter (Blue)
T-DPJ04-A	1.0 GPH (4 LPH) Pressure-compensating Emitter w/Male Adapter (Black)
T-DPJ08-A-RED	2.0 GPH (8 LPH) Pressure-compensating Emitter w/Male Adapter (Red)

E-2™ Classic Take Apart Emitter

- 1.0 (3,8 LPH), 2.0 (7,6 LPH) and 4.0 GPH (15,1 LPH)
- Barbed Inlet
- Non-Pressure-Compensating
- Color-coded

First introduced in 1972, the E-2 is considered the take-apart emitter by which all others are measured. While there have been a few improvements over the years, the E-2 emitter still provides accurate watering at an economical price.



Specifications

Specifications

- Flow Rates:
 - T-DBK04-100 – 1.0 GPH (3,8 LPH)
 - T-DBK08-RED-100 – 2.0 GPH (7,6 LPH)
 - T-DBK16-MB-100 – 4.0 GPH (15,1 LPH)
- Proven Classic hydraulic design
- Economic emitter for trouble-free applications
- Barbed inlet allows emitters to be installed directly onto hose or used with 1/4" (6,4mm) leader tubing (T-EHD0437)
- Exit barb may be used with 1/4" (6,4mm) exit tubing for precision water placement

Warranty

- One year

		T-DBK04	T-DBK08	T-DBK16
Nominal Flow Rate (Q)	GPH @ 15 psi	1.06 GPH	2.11 GPH	4.23 GPH
Flow Coefficient (K)	U.S. Units	0.22	0.41	0.85
Operating Pressure Range (P)	psi	0–50 psi		
	Bar	0–3,5 Bar		
Flow Exponent (X)		0.60	0.57	0.56
Coefficient of Variation (Cv)		≤ 5%	≤ 6%	≤ 6.5%
Minimum Filtration Requirement		140 Mesh (105 Micron)		

Features & Benefits

Fast Single Barb Installation

Install directly onto hose.

Large Open Flow Path

For resistance to plugging.

Take-apart Feature

Allows fast simple field inspection.



E-2 Emitter Flow Rate—US

psi	T-DBK04	T-DBK08	T-DBK16
5	0.58	1.03	2.09
10	0.88	1.53	3.08
15	1.12	1.93	3.87
20	1.33	2.27	4.55
25	1.52	2.58	5.15
30	1.70	2.87	5.71
35	1.87	3.13	6.23
40	2.03	3.38	6.71
45	2.17	3.62	7.17
50	2.32	3.84	7.61

* Recommended operating pressure
Values listed in gallons per hour.

Specifying Information E-2 Classic Emitter

Model No.	Description
T-DBK04-100	1.06 GPH (4,0 LPH) E-2 Emitter (Black)
T-DBK08-RED-100	2.11 GPH (7,9 LPH) E-2 Emitter (Red)
T-DBK16-MB-100	4.23 GPH (16,0 LPH) E-2 Emitter (Maroon)

Pressure Regulating Multi-Outlet Drip Manifold

- 9 Barbed Outlets
- Pressure-Regulating

The T-PR25-9 can be installed on any 1/2" (12mm) riser or fitting and easily converts traditional spray systems to drip, micro spray, or micro stream bubblers.



Features & Benefits

- Built-in 25 psi (1,7 Bar) pressure regulator delivers consistent, reliable, low-volume irrigation
- Barbed outlets (9) accept 1/4" (6,4mm) micro-tube & emitters, micro-bubblers or micro-sprays – ideal for mixed planting areas.
- Small shut-off caps provided with unit seal unused outlets.
- When system is off, cover unthreads for access to screen without disturbing 1/4" (6,4mm) micro-tube connected to outlets.

Specifications

Specifications

- 1/2" (13mm) FPT Inlet
- Operating Pressure: 20 – 100 psi (1,4-6,9 bar)
- Manifold Outlet Pressure: 21 – 28 psi (1,5-1,9 bar)
- Manifold Flow Range: 1 – 210 GPH (0.06-13.2 lpm)
- Individual Outlet Flow Range: 1 -20 GPH (0.06-1.3 lpm)
- Barbed outlets accept 1/4" (6,4mm) tubing: ID: .170 - .188

Warranty

- One year

Specifying Information— Pressure Regulating Drip Manifold

Model No.	Description
T-PR25-9	Pressure Regulating 9-outlet Drip Manifold

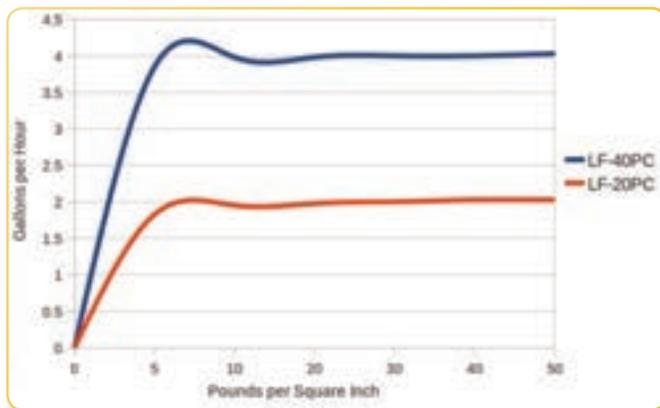
Drip Bubblers (Pressure Compensating)

- 2.0 (7,6 LPH) and 4.0 GPH (15,1 LPH)
- Pressure-Compensating
- Effluent models

Toro's new pressure-compensating 1/2" threaded Drip Bubblers are built to perform in tough environments. Bringing commercial-grade ruggedness to drip irrigation, they're easy to install, virtually maintenance-free, and are a more robust alternative to traditional drip emitters connected to 1/4" tubing. The innovative design of these Drip Bubblers combines the low flow rates of drip emitters with the ease of 1/2" PVC riser installation. A self-sealing screen eliminates the need for plumber's tape and the chloramine-stabilized silicone diaphragms assure long-term reliability with potable or reclaimed water. Toro continues to set the standard for performance and durability in the world of drip irrigation.



Effluent Model



Features & Benefits

Easy to Install

Easily threads on to a 1/2" threaded riser. The self-sealing screen eliminates the cost and labor of having to use plumber's tape on every riser.

Easy to Maintain

Self-cleaning mechanism flushes at every startup, ensuring reliable operation and fewer maintenance headaches.

Durable Construction

Commercial-grade plastic and chloramine-stabilized silicone diaphragm provide dependable UV- and chemical-resistant performance in the least forgiving of environments.

Pressure Compensating

Pressure compensating to 2 (7,6 LPH) and 4 GPH (15,1 LPH) over a range of 5-50 PSI.

Specifications

Operating Range

- Flow Rates: 2.0 GPH & 4.0 GPH
- Pressure Compensation: 5 – 50 PSI
- Minimum Filtration Requirement: 80 Mesh

Operating Specifications

- 1/2" FIPT inlet; diffuser cap outlet
- Self-sealing screen eliminates need for plumber's tape
- Self-cleaning flush at startup minimizes clogging and maintenance
- Flow rate molded into the identification
- Commercial-grade plastic and chloramine-stabilized silicone diaphragm provide dependable UV- and chemical-resistant performance
- Effluent and non-effluent models

Warranty

- Two years

Specifying Information — Drip Bubblers

Model Number	Description
LF20-PC	2.0 GPH PC Bubbler
LF40-PC	4.0 GPH PC Bubbler
LF20-PCE	2.0 GPH PC Bubbler, Effluent
LF40-PCE	4.0 GPH PC Bubbler, Effluent

Varis™ and Varistake™ Adjustable Emitters

- 0—14 GPH (53,0 LPH)
- Adjustable
- Maximum working pressure: 45 psi (3,1 Bar)



Varis and Varistake Adjustable Emitters Model List

Diameter of throw (maximum opening at 30 clicks):		
PSI (Bar)	At 1" (2,5cm) Height	At 2.5" (6,3cm) Height
20 (1,4)	6" (15,2cm)	8" (20,3cm)
30 (2,1)	13.5" (34,3cm)	15.5" (39,4cm)
40 (2,8)	21" (53,3cm)	27" (68,6cm)

Varis and Varistake Flows:	
PSI	Flow Range
10 (0,6)	0-7 GPH (0-26,5 LPH)
20 (1,4)	0-10 GPH (0-37,9 LPH)
30 (2,1)	0-11 GPH (0-41,6 LPH)
40 (2,8)	0-14 GPH (0-53,0 LPH)

Features & Benefits

Available As Stake Assembly or As Barbed Emitter
Varistake connects to 1/4" (6,4mm) micro-tube (T-EHD0437) for precise placement at plant. Varis emitter installs directly onto drip lateral.

Adjustable Flow Rate

Adjustable from 0 to 14 GPH (53 LPH) – makes this emitter ideal for potted and container plants.

Easy To Maintain

Green top unthreads completely to permit easy inspection and cleaning.

Specifying Information— Varis and Varistake Emitters

Model No.	Description
T-DAK05	Varis Adjustable Emitter with 1/4" (6,4mm) Barbed Inlet
T-DAK15	Varistake Adjustable Emitter with 4-3/4" (12cm) Stake and 1/4" (4mm) Barbed Inlet

Pressure Regulators



Specifying Information—PC Regulators

Model Number	Description
T-PMR15-LF	3/4" (20mm), 15 psi (73,2 kg/m ²), 1/10-8 GPM (0,38-30,3 LPH) Low Flow Pressure Regulator
T-PMR25-LF	3/4" (20mm), 25 psi (122,0 kg/m ²), 1/10-8 GPM (0,38-30,3 LPH) Low Flow Pressure Regulator
T-PMR40-MF	3/4" (20mm), 40 psi (195,0 kg/m ²), 2-20 GPM (7,6-75,7 LPH) Medium Flow Pressure Regulator
T-PR25-HF	1-1/4" (31,8mm) x 1" (25mm), 25 psi (122,0 LPH), 10 – 32 GPM (38,0-121,0 LPH), High Flow Pressure Regulator
T-PMR25-MF	3/4" (20mm), 25 psi (122,0 kg/m ²), 2 – 20 GPM (7,6-75,7 LPH), Medium Flow Pressure Regulator

Plastic Y-Filters

- 3/4" (20mm), 1" (25mm), 1 1/2" (40mm)
- 150 Mesh

Filtration for your drip system doesn't have to be difficult. Since low volume systems require filtration for effective and efficient watering, Toro® F-Series filters are designed to perform.



Features & Benefits

1/2" (13mm) Male Thread Outlet
With cap for quick flush cleaning.

Easy Element Access
For trouble free maintenance.

Constructed Of Highest Quality Plastics
For durability and corrosion resistance.

Specifications

Specifications

- Recommended pressure range: 5 – 142 psi (0,3-9,8 Bar)
- Flow Rate: 5 – 80 GPM (19-303 LPM)
- 3/4" and 1" (20mm & 25mm) screen filters are available in small- and large-size bodies
- Body and cap constructed of nylon
- Locking ring constructed of glass reinforced nylon
- O-ring constructed of Buna-N

Warranty

- One year

Plastic Y-Filters (Disc) Specifying Information

Model	Size	Maximum Flow	Element	Mesh	Body	Head Loss Curve
T-ALFD75150-L	3/4" (20mm)	25 GPM (94,6 LPH)	Disc	150	Large	B
T-ALFD10150-L	1" (25mm)	35 GPM (132,5 LPH)	Disc	150	Large	C
T-ALFD15150-L	1-1/2" (40mm)	80 GPM (302,8 LPH)	Disc	150	Large	D

Plastic Y-Filters (SS Screen) Specifying Information

Model	Size	Maximum Flow	Element	Mesh	Body	Head Loss Curve
T-ALFS75150-S	3/4" (20mm)	18 GPM (68,1 LPH)	Screen	150	Small	A
T-ALFS75150-L	3/4" (20mm)	25 GPM (94,6 LPH)	Screen	150	Large	B
T-ALFS10150-S	1" (25mm)	25 GPM (94,6 LPH)	Screen	150	Small	B
T-ALFS10150-L	1" (25mm)	35 GPM (132,5 LPH)	Screen	150	Large	C
T-ALFS15150-L	1-1/2" (40mm)	80 GPM (302,8 LPH)	Screen	150	Large	D

Replacement SS Screen/Disc Filter Elements Specifying Information

Model	Size	Element	Mesh	Body
T-AMP-0004-4F	3/4" (20mm), 1" (25mm) and 1-1/2" (37mm)	Disc	150	Large Body Size Filters
T-AMP0004-15	1/4" (6,4mm) and 1" (25mm)	Screen	150	Small Body Size Filters
T-AMP0004-2F	3/4" (20mm), 1" (25mm) and 1-1/2" (37mm)	Screen	150	Large Body Size Filters

When installing the disc filters, the flow direction is opposite to the screen filter.

Drip Zone Valve Kits

- 3/4" (20mm) with AVB or 1" (25mm) inline
- Residential and Commercial
- Low Volume

Pre-packaged and ready for installation – Toro® Drip Zone Valve Kits provide everything you need for drip zone automation. No need to specify or purchase separate parts.

Features & Benefits

Everything You Need Is In The Kit

- Toro Y-Filter – protects against contamination.
- Control Valve – controls the flow of water
- Pressure Regulator – reduces system pressure to levels suitable for drip irrigation

Specially Designed For Low-volume Drip Applications

- These kits are a simple, one-stop package available in 3/4" (20mm) and 1" (25mm) sizes
- Less valve kits also available

Reliable Valve Options

- TPV Series, 1" (25mm) Inline
- EZ-Flo® Plus, 3/4" (20mm) AVB and 1" (25mm) Inline
- Irritrol® 700 UltraFlow® Valve, 1" (25mm) Inline



Low Flow TPV Series Drip Zone Kits



Specifications	Toro EZ-Flo Plus AVB*		Toro TPV		Irritrol® 700 UltraFlow In-line	
Part Number	DZK-EZF-075-LF	DZK-EZF-075-MF	DZK-TPV-1-LF	DZK-TPV-1-MF	DZK-700-1-LF	DZK-700-1-MF
Description	Drip Zone Valve Kit, 3/4" (20mm) EZ-Flo Plus, AVB, Low-flow	Drip Zone Valve Kit, 3/4" (20mm) EZ-Flo Plus, AVB, Medium-flow	Drip Zone Valve Kit, 1" (25mm), Low-flow	Drip Zone Valve Kit, 1" (25mm), Medium-flow	Drip Zone Valve Kit, 1" (25mm) 700 UltraFlow, In-line, Low-flow	Drip Zone Valve Kit, 1" (25mm) 700 UltraFlow, In-line, Medium-flow
Connection Size	3/4" (20mm)	3/4" (20mm)	1" (25mm)	1" (25mm)	1" (25mm)	1" (25mm)
Control Valve Solenoid	24VAC, Inrush: 0.4 amps, 11.5 VA, Holding 0.20 amps, 5.75 VA					
Minimum Flow Rate	0.25 GPM (0,9 LPM)	2 GPM (7,6 LPM)	0.10 GPM (0,4 LPM)	2 GPM (7,6 LPM)	0.10 GPM (0,4 LPM)	2 GPM (7,6 LPM)
Maximum Flow Rate	8 GPM (30 LPM)	20 GPM (76 LPM)	8 GPM (30 LPM)	20 GPM (76 LPM)	8 GPM (30 LPM)	20 GPM (76 LPM)
Maximum Pressure	150 psi (10 Bar)	150 psi (10 Bar)	150 psi (10 Bar)	150 psi (10 Bar)	150 psi (10 Bar)	150 psi (10 Bar)
Y-Filter Degree of Filtration	150 mesh/100 Microns	150 mesh/100 Microns	150 mesh/100 Microns	150 mesh/100 Microns	150 mesh/100 Microns	150 mesh/100 Microns
Regulator-Preset Pressure	25 psi (1,7 Bar)	25 psi (1,7 Bar)	25 psi (1,7 Bar)	25 psi (1,7 Bar)	25 psi (1,7 Bar)	25 psi (1,7 Bar)
Thread Connection-Upstream	Female NPT	Female NPT	Female NPT	Female NPT	Female NPT	Female NPT
Thread Connection-Downstream	Female NPT	Female NPT	Male NPT	Female NPT	Male NPT	Female NPT
Minimum Number of Emitters:						
0.5 GPH (1,9 LPM)	30	240	12	240	12	240
1 GPH (3,8 LPM)	15	120	6	120	6	120
2 GPH (7,6 LPM)	8	60	3	60	3	60
Maximum Number of Emitters:						
0.5 GPH (1,9 LPM)	960	2400	960	2400	960	2400
1 GPH (3,8 LPM)	490	1200	490	1200	490	1200
2 GPH (7,6 LPM)	240	600	240	600	240	600

Note: Consult your local plumbing code for backflow prevention requirements.

* AVB = Atmospheric Vacuum Breaker (Anti-siphon Valve)

Toro Drip Zone Valve Kits Model List

Model	Description
• DZK-EZF-075-LF	Drip Zone Kit: 3/4" (20mm) EZ-Flo Plus Valve, AVB, Filter, Low-flow Regulator & Fittings
• DZK-EZF-075-MF	Drip Zone Kit: 3/4" (20mm) EZ-Flo Plus Valve, AVB, Filter, Medium-flow Regulator & Fittings
• DZK-EZF-1-LF	Drip Zone Kit: 1" EZ-Flo Plus, Filter, Low-flow Regulator & Fittings
• DZK-EZF-1-MF	Drip Zone Kit: 1" EZ-Flo Plus, Filter, Medium Flow Regulator & Fittings
• DZK-TPV-1-LF	Drip Zone Kit: 1" (25mm) TPV, Filter, Low-flow Regulator & Fittings
• DZK-TPV-1-MF	Drip Zone Kit: 1" (25mm) TPV, Filter, Medium-flow Regulator & Fittings
• DZK-700-1-LF	Drip Zone Kit: 1" (25mm) 700 UltraFlow Inline Valve, Filter, Low-flow Regulator & Fittings
• DZK-700-1-MF	Drip Zone Kit: 1" (25mm) 700 UltraFlow Inline Valve, Filter, Medium-flow Regulator & Fittings
• DZK-X-075-LF	Drip Zone Kit less valve with Filter, Low-flow Regulator & Fittings
• DZK-X-075-MF	Drip Zone Kit less valve with Filter, Medium-flow Regulator & Fittings

Flow vs. Friction Loss

Part Number	GPM (Flow)	0.25	5	8	15	20
DZK-EZF-075-LF	Friction Loss (psi)	3	5	5	n/a	n/a
	Min. Inlet Press. (psi)	30	32	32	34	39
DZK-EZF-075-MF	Friction Loss (psi)	3	5	5	7	13
	Min. Inlet Press. (psi)	30	32	32	34	39
DZK-TPV-1-LF	Friction Loss (psi)	2	3.5	3.7	3	3.3
	Min. Inlet Press. (psi)	30	32	32	34	39
DZK-TPV-1-MF	Friction Loss (psi)	2	3.5	3.7	3	3.3
	Min. Inlet Press. (psi)	30	32	32	32	35
DZK-700-1-LF	Friction Loss (psi)	3	3	3	n/a	n/a
	Min. Inlet Press. (psi)	30	30	30	32	34
DZK-700-1-MF	Friction Loss (psi)	3	3	3	4.5	7
	Min. Inlet Press. (psi)	30	30	30	32	34

Specifying Information—Drip Zone Valve Kits

DZK-XXXXXX-XX		
Kit	Valve Type	Flow Rate
DZK	XXXXXX	XX
DZK—Drip Zone Kit	EZF-075—3/4" (20mm) EZ-Flo Plus AVB EZF-1—1" (25mm) EZ-Flo Plus AVB TPV-1—1" (25mm) TPV 700-1—1" (25mm) In-line X-075—3/4", No Valve	LF—Low Flow MF—Medium Flow

Example: A Drip Zone Kit with a 700 Series UltraFlow, 1" (25mm) commercial valve would be specified as: DZK-700-1-LF

Customer Support



Toro Technical Support
1-877-345-8676



Toro NSN®
1-888-676-8676/www.toronsn.com



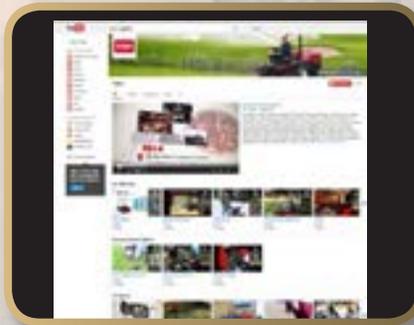
Toro Controller Repair
1-877-345-8676



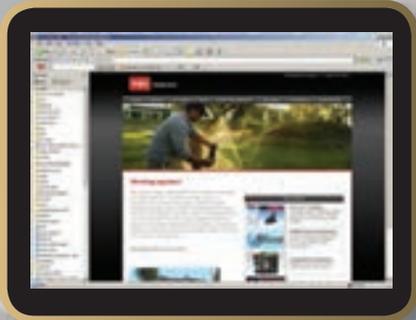
Order Services
1-800-654-1882



www.toro.com/irrigation



www.youtube.com/user/toro/featured



www.torocontractor.com



www.torowatersmart.com

Formulas and Conversion Factors

Precipitation Rates		
U.S. (Spacing in feet)		Metric (Spacing in meters)
Equilateral Triangular Spacing		
P.R. = (in/hr)	$\frac{(\text{GPM of } 360) \times 96.25}{(\text{Head Spacing})^2 \times .866}$	P.R. = (mm/hr) $\frac{\text{m}^3/\text{hr of } 360 \times 1000}{(\text{Head Spacing})^2 \times .866}$
Square/Rectangular Spacing		
P.R. = (in/hr)	$\frac{(\text{GPM of } 360) \times 96.25}{\text{Head Spacing} \times \text{Row Spacing}}$	P.R. = (mm/hr) $\frac{\text{m}^3/\text{hr of } 360 \times 1000}{\text{Head Spacing} \times \text{Row Spacing}}$
Square/Rectangular Spacing for Specific Arc		
P.R. = (in/hr)	$\frac{34650 \times \text{GPM (for any arc)}}{\text{Degrees of Arc} \times \text{Head Spacing} \times \text{Row Spacing}}$	P.R. = (mm/hr) $\frac{\text{m}^3/\text{hr (for any arc)} \times 1000}{\text{Degrees of Arc} \times \text{Head Spacing} \times \text{Row Spacing}}$
Horsepower		
H.P. =	$\frac{\text{GPM} \times \text{Ft of Head}}{3,960 \times \text{Pump Efficiency (expressed as a decimal)}}$	H.P. = $\frac{\text{LPM} \times \text{Meters of Head}}{3,433 \times \text{Pump Efficiency (expressed as a decimal)}}$
Station Run Time		
S.R.T. = (min/wk)	$\frac{\text{Total Weekly Req'd (inch/wk)} \times 60 \text{ (min/hr)}}{\text{Precipitation Rate (in/hr)}}$	S.R.T. = (min/wk) $\frac{\text{Total Weekly Req'd (mm/wk)} \times 60 \text{ (min/hr)}}{\text{Precipitation Rate (mm/hr)}}$
Pipe Velocity		
V = (ft/sec)	$\frac{0.4085 \times \text{Flow (GPM)}}{(\text{Inside Pipe Diameter in Inches})^2}$	V = (m/sec) $\frac{1273.24 \times \text{Flow (l/sec)}}{(\text{Inside Pipe Diameter in Millimeters})^2}$
Slope		
S =	$\frac{\text{Rise (Measure of Length)}}{\text{Run (Measure of Length)}}$	

To Convert	From	To	Multiply By
Area	acres	feet ²	43560
	acres	meters ²	4046.8
	meters ²	feet ²	10.764
	feet ²	inches ²	144
	inches ²	centimeters ²	6.452
	hectares	meters ²	10,000
	hectares	acres	2.471
Power	kilowatts	horsepower	1.3410
Flow	feet ³ /minutes	meters ³ /second	0.0004719
	feet ³ /second	meters ³ /second	.02832
	yards ³ /minute	meters ³ /second	.01274
	gallons/minute	meters ³ /hour	.22716
	gallons/minute	liters/minute	3.7854
	gallons/minutes	liters/second	.06309
	meters ³ /hour	liters/minute	16.645
	meters ³ /hour	liters/second	.2774
	liters/minute	liters/second	60
	Length	feet	inches
inches		centimeters	2.540
feet		meters	.30481
kilometers		miles	.6214
miles		feet	5280
miles		meters	1609.34
millimeters		inch	.03937

To Convert	From	To	Multiply By
Pressure	psi	kilopascals	6.89476
	psi	bars	.068948
	bars	kilopascals	100
	psi	feet of head	2.31
Velocity	feet/second	meters/second	.3048
Volume	feet ³	gallons	7.481
	feet ³	liters	28.32
	meters ³	feet ³	35.31
	meters ³	yard ³	1.3087
	yards ³	feet ³	27
	yards ³	gallons	202
	acres/feet	feet ³	43,560
	gallons	meters ³	.003785
gallons	liters	3.785	
imperial gallons	gallons	1.833	

Sprinkler Spacing and Winterization Specifications

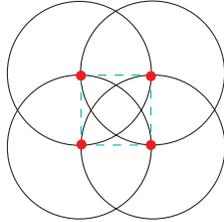
Sprinkler Spacing

- The Toro Company does not recommend designing for 0 mph wind conditions. Design in consideration of the worst wind conditions.

Precipitation Rate Formulas

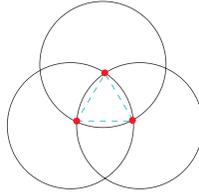
- Square-spaced sprinklers in pattern:

$$\frac{\text{GPM of full circle} \times 96.3}{(\text{Spacing})^2}$$



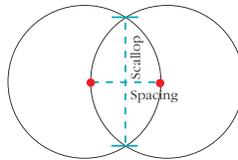
- Triangular-spaced sprinklers in pattern:

$$\frac{\text{GPM of full circle} \times 96.3}{(\text{Spacing})^2 (0.866)}$$



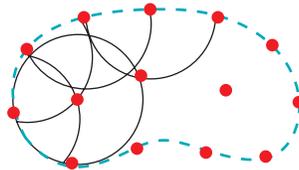
- Single row:

$$\frac{\text{GPM of full circle} \times 96.3}{(\text{Spacing}) (\text{Scallop})}$$



- Area and flow:

$$\frac{\text{Total GPM of zone} \times 96.3}{\text{Total irrigated square feet of zone}}$$



Winterization Specifications

In freezing climates, sprinklers and valves should be properly winterized to prevent freeze-related damage.



FRICION LOSS FORMULAS

Hazen-Williams Equation:

$$H_f = (0.2083) (100 / C)^{1.852} (Q^{1.852} / D^{4.866})$$

(The result is multiplied by .433 to give psi loss for 100 feet of pipe)

The velocity values were derived using the following:

$$V = (0.408 \times Q_{\text{gpm}}) / d^2$$

(The average inside diameter of OD controlled pipe was based upon subtracting two times the minimum wall thickness plus one-half of the wall thickness tolerance from the outside diameter.)

- Pressure ratings for plastic pipes are based on 23° C or 73.4° F
- Head loss decreases (increases) approximately 1% for every 3 degrees F above (below) the reference temperature (73.4° F)

Friction Loss Characteristics

Losses in psi per 100 feet of hose (psi/100 ft.) for hose sizes: .509" (13mm) ID through .627" (16mm) ID

Part No.	EHD1335		EHD1348		EHD1350		EHD1443		EHD1554		EHD1635		EHD1642		EHD1645		
Nom. ID	0.509"		0.510"		0.520"		0.550"		0.572"		0.616"		0.627"		0.616"		
Min. ID	0.506"		0.510"		0.516"		0.547"		0.569"		0.613"		0.624"		0.613"		
Min. Wall	0.035"		0.048"		0.050"		0.043"		0.054"		0.035"		0.042"		0.045"		
Flow	Velocity		Loss														
	GPM	GPH	FPS	PSI	FPS	PSI	FPS	PSI	FPS	PSI	FPS	PSI	FPS	PSI	FPS	PSI	
0.5	30	0.80	0.37	0.79	0.35	0.77	0.34	0.68	0.25	0.63	0.21	0.54	0.14	0.52	0.13	0.54	0.14
1.0	60	1.60	1.33	1.57	1.28	1.53	1.21	1.37	0.91	1.26	0.75	1.09	0.52	1.05	0.48	1.09	0.52
1.5	90	2.39	2.82	2.36	2.71	2.30	2.56	2.05	1.93	1.89	1.59	1.63	1.11	1.57	1.02	1.63	1.11
2.0	120	3.19	4.80	3.14	4.62	3.07	4.37	2.73	3.29	2.52	2.71	2.17	1.89	2.10	1.73	2.17	1.89
2.5	150	3.99	7.26	3.93	6.99	3.84	6.60	3.41	4.97	3.15	4.10	2.72	2.85	2.62	2.62	2.72	2.85
3.0	180	4.79	10.18	4.71	9.80	4.60	9.26	4.10	6.97	3.79	5.75	3.26	4.00	3.15	3.67	3.26	4.00
3.5	210	5.58	13.55	5.50	13.04	5.37	12.31	4.78	9.27	4.42	7.65	3.80	5.32	3.67	4.88	3.80	5.32
4.0	240	6.38	17.35	6.28	16.69	6.14	15.77	5.46	11.87	5.05	9.79	4.35	6.81	4.20	6.25	4.35	6.81
4.5	270	7.18	21.57	7.07	20.76	6.90	19.61	6.14	14.76	5.68	12.18	4.89	8.48	4.72	7.77	4.89	8.48
5.0	300	7.98	26.22	7.85	25.24	7.67	23.84	6.83	17.94	6.31	14.81	5.44	10.30	5.25	9.45	5.44	10.30
6.0	360	9.57	36.75	9.42	35.37	9.21	33.41	8.19	25.15	7.57	20.75	6.52	14.44	6.29	13.24	6.52	14.44
7.0	420	11.17	48.90	10.99	47.06	10.74	44.45	9.56	33.46	8.83	27.61	7.61	19.21	7.34	17.62	7.61	19.21
8.0	480			12.56	60.26	12.27	56.92	10.92	42.85	10.09	35.36	8.70	24.60	8.39	22.56	8.70	24.60
9.0	540			14.13	74.95	13.81	70.80	12.29	53.29	11.36	43.98	9.78	30.60	9.44	28.06	9.78	30.60
10.0	600							13.65	64.77	12.62	53.45	10.87	37.19	10.49	34.11	10.87	37.19
11.0	660									13.88	63.77	11.96	44.37	11.54	40.69	11.96	44.37
ID120	720									15.14	74.93			12.59	47.81	13.05	52.13

Losses in psi per 100 feet of hose (psi/100 ft.) for hose sizes: .726" (18mm) ID through 1.360" (35mm) ID

Part No.	EHD1845		EHD1847		EHD1850		EHD2052		EHD2057		EHD2662		EHD2667		EHD3580		
Nom. ID	0.710"		0.729"		0.729"		0.807"		0.807"		1.060"		1.060"		1.365"		
Min. ID	0.707"		0.726"		0.726"		0.804"		0.804"		1.056"		1.056"		1.360"		
Min. Wall	0.045"		0.047"		0.050"		0.052"		0.057"		0.062"		0.067"		0.084"		
Flow	Velocity		Loss														
	GPM	GPH	FPS	PSI	FPS	PSI	FPS	PSI	FPS	PSI	FPS	PSI	FPS	PSI	FPS	PSI	
1	60	0.82	0.26	0.78	0.23	0.78	0.23	0.63	0.14	0.63	0.14	0.37	0.04	0.37	0.04	0.22	0.01
2	120	1.63	0.94	1.55	0.83	1.55	0.83	1.26	0.50	1.26	0.50	0.73	0.13	0.73	0.13	0.44	0.04
3	180	2.45	2.00	2.33	1.75	2.33	1.75	1.90	1.07	1.90	1.07	1.10	0.28	1.10	0.28	0.66	0.08
4	240	3.27	3.40	3.10	2.99	3.10	2.99	2.53	1.82	2.53	1.82	1.47	0.48	1.47	0.48	0.88	0.14
5	300	4.09	5.14	3.88	4.52	3.88	4.52	3.16	2.75	3.16	2.75	1.83	0.73	1.83	0.73	1.10	0.21
6	360	4.90	7.21	4.65	6.34	4.65	6.34	3.79	3.85	3.79	3.85	2.20	1.02	2.20	1.02	1.33	0.30
7	420	5.72	9.59	5.43	8.43	5.43	8.43	4.42	5.13	4.42	5.13	2.56	1.36	2.56	1.36	1.55	0.40
8	480	6.54	12.28	6.20	10.79	6.20	10.79	5.06	6.57	5.06	6.57	2.93	1.74	2.93	1.74	1.77	0.51
9	540	7.36	15.27	6.98	13.42	6.98	13.42	5.69	8.17	5.69	8.17	3.30	2.16	3.30	2.16	1.99	0.63
10	600	8.17	18.57	7.75	16.32	7.75	16.32	6.32	9.93	6.32	9.93	3.66	2.63	3.66	2.63	2.21	0.77
11	660	8.99	22.15	8.53	19.47	8.53	19.47	6.95	11.84	6.95	11.84	4.03	3.14	4.03	3.14	2.43	0.92
12	720	9.81	26.02	9.30	22.87	9.30	22.87	7.58	13.91	7.58	13.91	4.40	3.69	4.40	3.69	2.65	1.08
13	780	10.62	30.18	10.08	26.52	10.08	26.52	8.22	16.14	8.22	16.14	4.76	4.28	4.76	4.28	2.87	1.25
14	858	11.69	36.04	11.09	31.68	11.09	31.68	9.04	19.27	9.04	19.27	5.24	5.11	5.24	5.11	3.16	1.49
15	920	12.54	41.01	11.89	36.04	11.98	36.04	9.69	21.93	9.69	21.93	5.62	5.81	5.62	5.81	3.39	1.70
16	982	13.38	46.27	12.69	40.66	12.69	40.66	10.35	24.74	10.35	24.74	6.00	6.56	6.00	6.56	3.62	1.91
17	1,044	14.23	51.82	13.49	45.54	13.49	45.54	11.00	27.71	11.00	27.71	6.38	7.34	6.38	7.34	3.84	2.14
18	1,080			13.95	48.46	13.95	48.46	11.38	29.48	11.38	29.48	6.59	7.81	6.59	7.81	3.98	2.28
19	1,140			14.73	53.56	14.73	53.56	12.01	32.59	12.01	32.59	6.96	8.64	6.96	8.64	4.20	2.52
20	1,200							12.64	35.83	12.64	35.83	7.33	9.50	7.33	9.50	4.42	2.77
22	1,320							13.90	42.75	13.90	42.75	8.06	11.33	8.06	11.33	4.86	3.31
24	1,440							15.17	50.23	15.17	50.23	8.79	13.31	8.79	13.31	5.30	3.88
26	1,560							16.43	58.25	16.43	58.25	9.52	15.44	9.52	15.44	5.74	4.50
28	1,680							17.69	66.82	17.69	66.82	10.26	17.71	10.26	17.71	6.18	5.17
30	1,800							18.96	75.93	18.96	75.93	10.99	20.13	10.99	20.13	6.63	5.87
32	1,920									20.22	85.57	11.72	22.68	11.72	22.68	7.07	6.62
34	2,040											12.45	25.38	12.45	25.38	7.51	7.40
36	2,160											13.19	28.21	13.19	28.21	7.95	8.23
38	2,280											13.92	31.18	13.92	31.18	8.39	9.10
40	2,400											14.65	34.29	14.65	34.29	8.83	10.00
45	2,700											16.48	42.65	16.48	42.65	9.94	12.44
50	3,000											18.32	51.84	18.32	51.84	11.04	15.12
55	3,300											20.15	61.84	20.15	61.84	12.15	18.04
60	3,600											21.98	72.66	21.98	72.66	13.25	21.19
65	3,900													23.81	84.27	14.36	24.58
70	4,200															15.46	28.19
75	4,500															16.56	32.04
80	4,800															17.67	36.11
85	5,100															18.77	40.40
90	5,400															19.88	44.91
95	5,700															20.98	49.64

Shaded area represents velocities over 5 fps. Use with caution.

Friction losses are calculated using Hazen-Williams equation (C = 140) and minimum inside diameter. See pg 148 for friction loss formulas.

Friction Loss Characteristics

Losses in psi per 100 feet of hose (psi/100 ft.) for hose sizes: .596" (16mm) ID through .870" (22mm) ID

Part No.		EHO1650		EHO2055		EHO2060		HDO2255	
Nom. ID		0.600"		0.830"		0.820"		0.870"	
Min. ID		0.596"		0.821"		0.811"		0.870"	
Nom. Wall		0.050"		0.055"		0.060"		0.055"	
Flow		Velocity		Velocity		Velocity		Velocity	
GPM	GPH	FPS	PSI	FPS	PSI	FPS	PSI	FPS	PSI
0.5	30	0.58	0.17	0.30	0.03	0.31	0.04	0.27	0.03
1.0	60	1.15	0.60	0.61	0.13	0.62	0.13	0.54	0.10
1.5	90	1.73	1.27	0.91	0.27	0.93	0.28	0.81	0.20
2.0	120	2.30	2.16	1.21	0.46	1.24	0.48	1.08	0.34
2.5	150	2.88	3.27	1.52	0.69	1.55	0.73	1.35	0.52
3.0	180	3.45	4.59	1.82	0.96	1.86	1.02	1.62	0.73
3.5	210	4.03	6.10	2.12	1.28	2.17	1.36	1.89	0.97
4.0	240	4.60	7.82	2.42	1.64	2.48	1.74	2.16	1.24
4.5	270	5.18	9.72	2.73	2.04	2.79	2.17	2.43	1.54
5.0	300	5.75	11.81	3.03	2.48	3.11	2.64	2.70	1.87
6.0	360	6.90	16.56	3.64	3.48	3.73	3.69	3.24	2.62
7.0	420	8.05	22.03	4.24	4.63	4.35	4.92	3.78	3.49
8.0	480	9.20	28.21	4.85	5.93	4.97	6.29	4.32	4.47
9.0	540	10.35	35.09	5.45	7.38	5.59	7.83	4.86	5.56
10.0	600	11.50	42.65	6.06	8.96	6.21	9.52	5.40	6.76
11.0	660	12.65	50.89	6.67	10.70	6.83	11.35	5.94	8.06
12.0	720	13.80	59.78	7.27	12.57	7.45	13.34	6.48	9.47
13.0	780			7.88	14.57	8.07	15.47	7.02	10.99
14.0	840			8.48	16.72	8.70	17.75	7.56	12.61
15.0	900			9.09	19.00	9.32	20.16	8.10	14.32
16.0	960			9.70	21.41	9.94	22.72	8.64	16.14
17.0	1,020			10.30	23.95	10.56	25.42	9.17	18.06
18.0	1,080			10.91	26.63	11.18	28.26	9.71	20.08
19.0	1,140			11.51	29.43	11.80	31.24	10.25	22.19
20.0	1,200			12.12	32.36	12.42	34.35	10.79	24.40
22.0	1,320			13.33	38.61	13.66	40.98	11.87	29.11
24.0	1,440			14.55	45.36	14.91	48.15	12.95	34.20
26.0	1,560			15.76	52.61	16.15	55.84	14.03	39.67
28.0	1,680			16.97	60.35			15.11	45.51
30.0	1,800							16.19	51.71
32.0	1,920							17.27	58.27

Shaded area represents velocities over 5 fps. Use with caution.

Friction losses are calculated using Hazen-Williams equation (C = 140) and minimum inside diameter. See pg 148 for friction loss formulas.

Friction Loss Characteristics

POLYETHYLENE (PE) PLASTIC PIPE ID CONTROLLED

Size: ½" thru 4" Flow: 1 thru 500GPM
 PE 3408 ASTM D-2239 C=140 PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

Size	½"		¾"		1"		1¼"		1½"		2"		2½"		3"		4"	
Avg ID	0.622		0.824		1.049		1.380		1.610		2.067		2.469		3.068		4.026	
Flow GPM	Velocity FPS	PSI Loss																
1	1.05	0.49	0.60	0.12	0.37	0.04	0.21	0.01	0.16	0.00								
2	2.11	1.76	1.20	0.45	0.74	0.14	0.43	0.04	0.31	0.02	0.19	0.01						
3	3.16	3.73	1.80	0.95	1.11	0.29	0.64	0.08	0.47	0.04	0.29	0.01						
4	4.22	6.35	2.40	1.62	1.48	0.50	0.86	0.13	0.63	0.06	0.38	0.02	0.27	0.01				
5	5.27	9.60	3.00	2.44	1.85	0.76	1.07	0.20	0.79	0.09	0.48	0.03	0.33	0.01				
6	6.33	13.46	3.61	3.43	2.22	1.06	1.29	0.28	0.94	0.13	0.57	0.04	0.40	0.02	0.26	0.01		
7	7.38	17.91	4.21	4.56	2.60	1.41	1.50	0.37	1.10	0.18	0.67	0.05	0.47	0.02	0.30	0.01		
8	8.44	22.93	4.81	5.84	2.97	1.80	1.71	0.47	1.26	0.22	0.76	0.07	0.54	0.03	0.35	0.01		
9	9.49	28.52	5.41	7.26	3.34	2.24	1.93	0.59	1.42	0.28	0.86	0.08	0.60	0.03	0.39	0.01		
10	10.55	34.67	6.01	8.82	3.71	2.73	2.14	0.72	1.57	0.34	0.95	0.10	0.67	0.04	0.43	0.01		
12			7.21	12.37	4.45	3.82	2.57	1.01	1.89	0.48	1.15	0.14	0.80	0.06	0.52	0.02		
14			8.41	16.45	5.19	5.08	3.00	1.34	2.20	0.63	1.34	0.19	0.94	0.08	0.61	0.03		
16			9.61	21.07	5.93	6.51	3.43	1.71	2.52	0.81	1.53	0.24	1.07	0.10	0.69	0.04	0.40	0.01
18			10.82	26.21	6.67	8.10	3.86	2.13	2.83	1.01	1.72	0.30	1.20	0.13	0.78	0.04	0.45	0.01
20			12.02	31.85	7.42	9.84	4.28	2.59	3.15	1.22	1.91	0.36	1.34	0.15	0.87	0.05	0.50	0.01
22					8.16	11.74	4.71	3.09	3.46	1.46	2.10	0.43	1.47	0.18	0.95	0.06	0.55	0.02
24					8.90	13.79	5.14	3.63	3.78	1.72	2.29	0.51	1.61	0.21	1.04	0.07	0.60	0.02
26					9.64	16.00	5.57	4.21	4.09	1.99	2.48	0.59	1.74	0.25	1.13	0.09	0.65	0.02
28					10.38	18.35	6.00	4.83	4.41	2.28	2.67	0.68	1.87	0.28	1.21	0.10	0.70	0.03
30					11.12	20.85	6.43	5.49	4.72	2.59	2.86	0.77	2.01	0.32	1.30	0.11	0.76	0.03
32					11.86	23.50	6.86	6.19	5.04	2.92	3.06	0.87	2.14	0.36	1.39	0.13	0.81	0.03
34					12.61	26.29	7.28	6.92	5.35	3.27	3.25	0.97	2.28	0.41	1.47	0.14	0.86	0.04
36							7.71	7.69	5.67	3.63	3.44	1.08	2.41	0.45	1.56	0.16	0.91	0.04
38							8.14	8.50	5.98	4.02	3.63	1.19	2.54	0.50	1.65	0.17	0.96	0.05
40							8.57	9.35	6.30	4.42	3.82	1.31	2.68	0.55	1.73	0.19	1.01	0.05
42							9.00	10.24	6.61	4.83	4.01	1.43	2.81	0.60	1.82	0.21	1.06	0.06
44							9.43	11.16	6.93	5.27	4.20	1.56	2.94	0.66	1.91	0.23	1.11	0.06
46							9.86	12.12	7.24	5.72	4.39	1.70	3.08	0.71	1.99	0.25	1.16	0.07
48							10.28	13.11	7.56	6.19	4.58	1.84	3.21	0.77	2.08	0.27	1.21	0.07
50							10.71	14.14	7.87	6.68	4.77	1.98	3.35	0.83	2.17	0.29	1.26	0.08
55							11.78	16.87	8.66	7.97	5.25	2.36	3.68	0.99	2.38	0.35	1.38	0.09
60							12.85	19.82	9.44	9.36	5.73	2.77	4.02	1.17	2.60	0.41	1.51	0.11
65									10.23	10.86	6.21	3.22	4.35	1.36	2.82	0.47	1.64	0.13
70									11.02	12.45	6.68	3.69	4.69	1.55	3.03	0.54	1.76	0.14
75									11.81	14.15	7.16	4.19	5.02	1.77	3.25	0.61	1.89	0.16
80									12.59	15.95	7.64	4.73	5.35	1.99	3.47	0.69	2.01	0.18
85									13.38	17.84	8.12	5.29	5.69	2.23	3.68	0.77	2.14	0.21
90											8.59	5.88	6.02	2.48	3.90	0.86	2.27	0.23
95											9.07	6.50	6.36	2.74	4.12	0.95	2.39	0.25
100											9.55	7.15	6.69	3.01	4.33	1.05	2.52	0.28
110											10.50	8.53	7.36	3.59	4.77	1.25	2.77	0.33
120											11.46	10.02	8.03	4.22	5.20	1.47	3.02	0.39
130											12.41	11.62	8.70	4.89	5.63	1.70	3.27	0.45
140											13.37	13.33	9.37	5.61	6.07	1.95	3.52	0.52
150													10.04	6.38	6.50	2.22	3.78	0.59
160													10.71	7.19	6.94	2.50	4.03	0.67
170													11.38	8.04	7.37	2.79	4.28	0.74
180													12.05	8.94	7.80	3.11	4.53	0.83
190													12.72	9.88	8.24	3.43	4.78	0.92
200													13.39	10.87	8.67	3.78	5.03	1.01
220															9.54	4.50	5.54	1.20
240															10.40	5.29	6.04	1.41
260															11.27	6.14	6.54	1.64
280															12.14	7.04	7.05	1.88
300															13.00	8.00	7.55	2.13
320															13.87	9.02	8.05	2.40
340																	8.56	2.69
360																	9.06	2.99
380																	9.57	3.30
400																	10.07	3.63
420																	10.57	3.98
440																	11.08	4.33
460																	11.58	4.71
480																	12.08	5.09
500																	12.59	5.49

Shaded area represents velocities over 5 fps. Use with caution.

See pg 148 for friction loss formulas

Friction Loss Characteristics

PVC CLASS 200 IPS PLASTIC PIPE

Size: 1/2" thru 6" Flow: 1 thru 500GPM

ASTM D-2241 (1120, 1220) SDR 21 C=150 PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

size	1/2"		3/4"		1"		1 1/4"		1 1/2"		2"		2 1/2"		3"		4"		6"	
Avg.ID	0.696		0.910		1.169		1.482		1.700		2.129		2.581		3.146		4.046		5.955	
Pipe OD	0.840		1.050		1.315		1.660		1.900		2.375		2.875		3.500		4.500		6.625	
Avg Wall	0.072		0.070		0.073		0.089		0.100		0.123		0.147		0.177		0.227		0.335	
MinWall	0.062		0.060		0.063		0.079		0.090		0.113		0.137		0.167		0.214		0.316	
Flow GPM	Velocity FPS	PSI Loss																		
1	0.84	0.25	0.49	0.07	0.30	0.02	0.19	0.01	0.14	0.00										
2	1.68	0.90	0.99	0.24	0.60	0.07	0.37	0.02	0.28	0.01	0.18	0.00								
3	2.53	1.90	1.48	0.52	0.90	0.15	0.56	0.05	0.42	0.02	0.27	0.01								
4	3.37	3.24	1.97	0.88	1.19	0.26	0.74	0.08	0.56	0.04	0.36	0.01	0.24	0.01						
5	4.21	4.89	2.46	1.33	1.49	0.39	0.93	0.12	0.71	0.06	0.45	0.02	0.31	0.01						
6	5.05	6.86	2.96	1.86	1.79	0.55	1.11	0.17	0.85	0.09	0.54	0.03	0.37	0.01	0.25	0.00				
7	5.90	9.12	3.45	2.47	2.09	0.73	1.30	0.23	0.99	0.12	0.63	0.04	0.43	0.02	0.29	0.01				
8	6.74	11.68	3.94	3.17	2.39	0.94	1.49	0.30	1.13	0.15	0.72	0.05	0.49	0.02	0.33	0.01				
9	7.58	14.53	4.43	3.94	2.69	1.17	1.67	0.37	1.27	0.19	0.81	0.06	0.55	0.02	0.37	0.01				
10	8.42	17.66	4.93	4.79	2.99	1.42	1.86	0.45	1.41	0.23	0.90	0.08	0.61	0.03	0.41	0.01				
12	10.11	24.75	5.91	6.71	3.58	1.98	2.23	0.63	1.69	0.32	1.08	0.11	0.73	0.04	0.49	0.02				
14	11.79	32.93	6.90	8.93	4.18	2.64	2.60	0.83	1.98	0.43	1.26	0.14	0.86	0.06	0.58	0.02				
16	13.48	42.16	7.88	11.44	4.78	3.38	2.97	1.07	2.26	0.55	1.44	0.18	0.98	0.07	0.66	0.03	0.40	0.01		
18	15.16	52.44	8.87	14.23	5.37	4.21	3.34	1.33	2.54	0.68	1.62	0.23	1.10	0.09	0.74	0.03	0.45	0.01		
20			9.85	17.29	5.97	5.11	3.72	1.61	2.82	0.83	1.80	0.28	1.22	0.11	0.82	0.04	0.50	0.01		
22			10.84	20.63	6.57	6.10	4.09	1.92	3.11	0.99	1.98	0.33	1.35	0.13	0.91	0.05	0.55	0.01		
24			11.82	24.24	7.17	7.17	4.46	2.26	3.39	1.16	2.16	0.39	1.47	0.15	0.99	0.06	0.60	0.02		
26			12.81	28.11	7.76	8.31	4.83	2.62	3.67	1.34	2.34	0.45	1.59	0.18	1.07	0.07	0.65	0.02		
28			13.80	32.25	8.36	9.53	5.20	3.01	3.95	1.54	2.52	0.52	1.71	0.20	1.15	0.08	0.70	0.02		
30			14.78	36.64	8.96	10.83	5.57	3.41	4.24	1.75	2.70	0.59	1.84	0.23	1.24	0.09	0.75	0.03		
32					9.55	12.21	5.94	3.85	4.52	1.97	2.88	0.66	1.96	0.26	1.32	0.10	0.80	0.03	0.37	0.00
34					10.15	13.66	6.32	4.31	4.80	2.21	3.06	0.74	2.08	0.29	1.40	0.11	0.85	0.03	0.39	0.00
36					10.75	15.18	6.69	4.79	5.08	2.45	3.24	0.82	2.20	0.32	1.48	0.12	0.90	0.04	0.41	0.01
38					11.35	16.78	7.06	5.29	5.36	2.71	3.42	0.91	2.33	0.36	1.57	0.14	0.95	0.04	0.44	0.01
40					11.94	18.45	7.43	5.82	5.65	2.98	3.60	1.00	2.45	0.39	1.65	0.15	1.00	0.04	0.46	0.01
42					12.54	20.20	7.80	6.37	5.93	3.27	3.78	1.09	2.57	0.43	1.73	0.16	1.05	0.05	0.48	0.01
44					13.14	22.02	8.17	6.94	6.21	3.56	3.96	1.19	2.69	0.47	1.81	0.18	1.10	0.05	0.51	0.01
46					13.73	23.91	8.55	7.54	6.49	3.86	4.14	1.29	2.82	0.51	1.90	0.19	1.15	0.06	0.53	0.01
48					14.33	25.87	8.92	8.15	6.78	4.18	4.32	1.40	2.94	0.55	1.98	0.21	1.20	0.06	0.55	0.01
50					14.93	27.90	9.29	8.79	7.06	4.51	4.50	1.51	3.06	0.59	2.06	0.23	1.25	0.07	0.58	0.01
55							10.22	10.49	7.76	5.38	4.95	1.80	3.37	0.71	2.27	0.27	1.37	0.08	0.63	0.01
60							11.15	12.33	8.47	6.32	5.40	2.11	3.67	0.83	2.47	0.32	1.50	0.09	0.69	0.01
65							12.07	14.30	9.18	7.33	5.85	2.45	3.98	0.96	2.68	0.37	1.62	0.11	0.75	0.02
70							13.00	16.40	9.88	8.41	6.30	2.81	4.29	1.10	2.89	0.42	1.74	0.12	0.81	0.02
75							13.93	18.63	10.59	9.56	6.75	3.20	4.59	1.25	3.09	0.48	1.87	0.14	0.86	0.02
80							14.86	21.00	11.29	10.77	7.20	3.60	4.90	1.41	3.30	0.54	1.99	0.16	0.92	0.02
85									12.00	12.05	7.65	4.03	5.21	1.58	3.50	0.60	2.12	0.18	0.98	0.03
90									12.71	13.40	8.10	4.48	5.51	1.76	3.71	0.67	2.24	0.20	1.04	0.03
95									13.41	14.81	8.55	4.95	5.82	1.94	3.92	0.74	2.37	0.22	1.09	0.03
100									14.12	16.28	9.00	5.45	6.12	2.13	4.12	0.81	2.49	0.24	1.15	0.04
110											9.90	6.50	6.74	2.55	4.53	0.97	2.74	0.29	1.27	0.04
120											10.80	7.63	7.35	2.99	4.95	1.14	2.99	0.34	1.38	0.05
130											11.70	8.85	7.96	3.47	5.36	1.32	3.24	0.39	1.50	0.06
140											12.60	10.16	8.57	3.98	5.77	1.52	3.49	0.45	1.61	0.07
150											13.50	11.54	9.19	4.52	6.18	1.73	3.74	0.51	1.73	0.08
160											14.40	13.01	9.80	5.10	6.60	1.95	3.99	0.57	1.84	0.09
170													10.41	5.70	7.01	2.18	4.24	0.64	1.96	0.10
180													11.02	6.34	7.42	2.42	4.49	0.71	2.07	0.11
190													11.64	7.01	7.83	2.67	4.74	0.79	2.19	0.12
200													12.25	7.71	8.24	2.94	4.98	0.86	2.30	0.13
220													13.47	9.19	9.07	3.51	5.48	1.03	2.53	0.16
240													14.70	10.80	9.89	4.12	5.98	1.21	2.76	0.18
260															10.72	4.78	6.48	1.41	2.99	0.21
280															11.54	5.48	6.98	1.61	3.22	0.25
300															12.37	6.23	7.48	1.83	3.45	0.28
320															13.19	7.02	7.98	2.06	3.68	0.31
340															14.02	7.86	8.47	2.31	3.91	0.35
360															14.84	8.73	8.97	2.57	4.14	0.39
380																	9.47	2.84	4.37	0.43
400																	9.97	3.12	4.60	0.48
420																	10.47	3.42	4.83	0.52
440																	10.97	3.72	5.06	0.57
460																	11.46	4.04	5.29	0.62
480																	11.96	4.37	5.52	0.67
500																	12.46	4.72	5.75	0.72

Shaded area represents velocities over 5 fps. Use with caution.

See pg 148 for friction loss formulas

Friction Loss Characteristics

PVC Class 200 IPS Plastic Pipe

Size: 6" thru 18"

Flow: 20 thru 4700GPM

ANSI/ASAE S376.2 ASTM 2241 SDR21 C=150 PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

Size	6"		8"		10"		12"		14"		16"		18"	
Avg.ID	5.955		7.755		9.666		11.464		12.588		14.384		15.246	
Pipe OD	6.625		8.625		10.750		12.750		14.000		16.000		18.000	
Avg Wall	0.335		0.435		0.542		0.643		0.706		0.808		1.377	
Min Wall	0.316		0.410		0.511		0.606		0.666		0.762		0.857	
Flow GPM	Velocity FPS	PSI Loss												
20	0.23	0.00	0.14	0.00	0.09	0.00	0.06	0.00	0.05	0.00	0.04	0.00	0.04	0.00
40	0.46	0.01	0.27	0.00	0.17	0.00	0.12	0.00	0.10	0.00	0.08	0.00	0.07	0.00
60	0.69	0.01	0.41	0.00	0.26	0.00	0.19	0.00	0.15	0.00	0.12	0.00	0.11	0.00
80	0.92	0.02	0.54	0.01	0.35	0.00	0.25	0.00	0.21	0.00	0.16	0.00	0.14	0.00
100	1.15	0.04	0.68	0.01	0.44	0.00	0.31	0.00	0.26	0.00	0.20	0.00	0.18	0.00
150	1.73	0.08	1.02	0.02	0.66	0.01	0.47	0.00	0.39	0.00	0.30	0.00	0.26	0.00
200	2.30	0.13	1.36	0.04	0.87	0.01	0.62	0.01	0.51	0.00	0.39	0.00	0.35	0.00
250	2.88	0.20	1.70	0.06	1.09	0.02	0.78	0.01	0.64	0.01	0.49	0.00	0.44	0.00
300	3.45	0.28	2.04	0.08	1.31	0.03	0.93	0.01	0.77	0.01	0.59	0.00	0.53	0.00
350	4.03	0.37	2.37	0.10	1.53	0.04	1.09	0.02	0.90	0.01	0.69	0.01	0.61	0.00
400	4.60	0.48	2.71	0.13	1.75	0.05	1.24	0.02	1.03	0.01	0.79	0.01	0.70	0.00
450	5.18	0.59	3.05	0.16	1.97	0.06	1.40	0.02	1.16	0.02	0.89	0.01	0.79	0.01
500	5.75	0.72	3.39	0.20	2.18	0.07	1.55	0.03	1.29	0.02	0.99	0.01	0.88	0.01
550	6.33	0.86	3.73	0.24	2.40	0.08	1.71	0.04	1.42	0.02	1.08	0.01	0.97	0.01
600	6.90	1.01	4.07	0.28	2.62	0.10	1.86	0.04	1.54	0.03	1.18	0.01	1.05	0.01
650	7.48	1.17	4.41	0.32	2.84	0.11	2.02	0.05	1.67	0.03	1.28	0.02	1.14	0.01
700	8.05	1.34	4.75	0.37	3.06	0.13	2.17	0.06	1.80	0.04	1.38	0.02	1.23	0.01
750	8.63	1.52	5.09	0.42	3.28	0.14	2.33	0.06	1.93	0.04	1.48	0.02	1.32	0.02
800	9.20	1.72	5.43	0.48	3.49	0.16	2.48	0.07	2.06	0.04	1.58	0.02	1.40	0.02
850	9.78	1.92	5.77	0.53	3.71	0.18	2.64	0.08	2.19	0.05	1.68	0.03	1.49	0.02
900			6.11	0.59	3.93	0.20	2.79	0.09	2.32	0.06	1.77	0.03	1.58	0.02
950			6.44	0.65	4.15	0.22	2.95	0.10	2.45	0.06	1.87	0.03	1.67	0.02
1000			6.78	0.72	4.37	0.25	3.10	0.11	2.57	0.07	1.97	0.04	1.76	0.03
1050			7.12	0.79	4.59	0.27	3.26	0.12	2.70	0.07	2.07	0.04	1.84	0.03
1100			7.46	0.86	4.80	0.29	3.41	0.13	2.83	0.08	2.17	0.04	1.93	0.03
1150					5.02	0.32	3.57	0.14	2.96	0.09	2.27	0.05	2.02	0.03
1200					5.24	0.34	3.73	0.15	3.09	0.10	2.37	0.05	2.11	0.04
1250					5.46	0.37	3.88	0.16	3.22	0.10	2.46	0.05	2.19	0.04
1300					5.68	0.40	4.04	0.17	3.35	0.11	2.56	0.06	2.28	0.04
1350					5.90	0.43	4.19	0.19	3.48	0.12	2.66	0.06	2.37	0.05
1400					6.11	0.46	4.35	0.20	3.60	0.13	2.76	0.07	2.46	0.05
1450					6.33	0.49	4.50	0.21	3.73	0.14	2.86	0.07	2.55	0.05
1500					6.55	0.52	4.66	0.23	3.86	0.14	2.96	0.08	2.63	0.06
1600					6.99	0.59	4.97	0.26	4.12	0.16	3.16	0.08	2.81	0.06
1700					7.42	0.66	5.28	0.29	4.38	0.18	3.35	0.09	2.98	0.07
1800							5.59	0.32	4.63	0.20	3.55	0.11	3.16	0.08
1900							5.90	0.35	4.89	0.22	3.75	0.12	3.34	0.09
2000							6.21	0.39	5.15	0.25	3.94	0.13	3.51	0.10
2100							6.52	0.42	5.41	0.27	4.14	0.14	3.69	0.11
2200							6.83	0.46	5.66	0.29	4.34	0.15	3.86	0.12
2300							7.14	0.50	5.92	0.32	4.54	0.17	4.04	0.13
2400							7.45	0.54	6.18	0.34	4.73	0.18	4.21	0.14
2500							7.76	0.59	6.44	0.37	4.93	0.19	4.39	0.15
2600							8.07	0.63	6.69	0.40	5.13	0.21	4.56	0.16
2700							8.38	0.67	6.95	0.43	5.32	0.22	4.74	0.17
2800							8.69	0.72	7.21	0.46	5.52	0.24	4.91	0.18
2900							9.00	0.77	7.47	0.49	5.72	0.26	5.09	0.19
3000							9.31	0.82	7.72	0.52	5.92	0.27	5.27	0.20
3100							9.62	0.87	7.98	0.55	6.11	0.29	5.44	0.22
3200							9.93	0.92	8.24	0.59	6.31	0.31	5.62	0.23
3300									8.50	0.62	6.51	0.32	5.79	0.24
3400									8.75	0.66	6.70	0.34	5.97	0.26
3500									9.01	0.69	6.90	0.36	6.14	0.27
3600									9.27	0.73	7.10	0.38	6.32	0.29
3700									9.53	0.77	7.30	0.40	6.49	0.30
3800											7.49	0.42	6.67	0.32
3900											7.69	0.44	6.85	0.33
4000											7.89	0.46	7.02	0.35
4100											8.09	0.48	7.20	0.37
4200											8.28	0.51	7.37	0.38
4300													7.55	0.40
4400													7.72	0.42
4500													7.90	0.43
4600													8.07	0.45
4700													8.25	0.47

Shaded area represents velocities over 5 fps.
Use with caution.

See pg 148 for friction loss formulas

Friction Loss Characteristics

PVC CLASS 315 IPS PLASTIC PIPE

Size: 1/2" thru 6" Flow: 1 thru 500GPM

ASTM D-2239 (1120, 1220) SDR 13.5 C=150 PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

Size	1/2"		3/4"		1"		1 1/4"		1 1/2"		2"		2 1/2"		3"		4"		6"			
Avg.ID	0.696		0.874		1.101		1.394		1.598		1.983		2.423		2.948		3.794		5.583			
Pipe OD	0.840		1.050		1.315		1.660		1.900		2.375		2.875		3.500		4.500		6.625			
Avg Wall	0.072		0.088		0.107		0.133		0.151		0.196		0.226		0.274		0.353		0.521			
Min Wall	0.062		0.078		0.097		0.123		0.141		0.176		0.213		0.259		0.333		0.491			
Flow GPM	Velocity FPS	PSI Loss																				
1	0.84	0.25	0.53	0.08	0.34	0.03	0.21	0.01	0.16	0.00												
2	1.68	0.90	1.07	0.30	0.67	0.10	0.42	0.03	0.32	0.02	0.21	0.01										
3	2.53	1.90	1.60	0.63	1.01	0.20	0.63	0.06	0.48	0.03	0.31	0.01										
4	3.37	3.24	2.14	1.07	1.35	0.35	0.84	0.11	0.64	0.06	0.42	0.02	0.28	0.01								
5	4.21	4.89	2.67	1.61	1.68	0.53	1.05	0.17	0.80	0.09	0.52	0.03	0.35	0.01								
6	5.05	6.86	3.20	2.26	2.02	0.74	1.26	0.23	0.96	0.12	0.62	0.04	0.42	0.02	0.28	0.01						
7	5.90	9.12	3.74	3.01	2.36	0.98	1.47	0.31	1.12	0.16	0.73	0.06	0.49	0.02	0.33	0.01						
8	6.74	11.68	4.27	3.86	2.69	1.25	1.68	0.40	1.28	0.20	0.83	0.07	0.56	0.03	0.38	0.01						
9	7.58	14.53	4.81	4.80	3.03	1.56	1.89	0.49	1.44	0.25	0.93	0.09	0.63	0.03	0.42	0.01						
10	8.42	17.66	5.34	5.83	3.37	1.90	2.10	0.60	1.60	0.31	1.04	0.11	0.69	0.04	0.47	0.02						
12	10.11	24.75	6.41	8.17	4.04	2.66	2.52	0.84	1.92	0.43	1.25	0.15	0.83	0.06	0.56	0.02						
14	11.79	32.93	7.48	10.87	4.71	3.53	2.94	1.12	2.24	0.58	1.45	0.20	0.97	0.08	0.66	0.03						
16	13.48	42.16	8.55	13.92	5.39	4.53	3.36	1.44	2.56	0.74	1.66	0.26	1.11	0.10	0.75	0.04	0.45	0.01				
18	15.16	52.44	9.61	17.32	6.06	5.63	3.78	1.79	2.88	0.92	1.87	0.32	1.25	0.12	0.85	0.05	0.51	0.01				
20			10.68	21.05	6.73	6.84	4.20	2.17	3.20	1.12	2.08	0.39	1.39	0.15	0.94	0.06	0.57	0.02				
22			11.75	25.11	7.40	8.16	4.62	2.59	3.52	1.33	2.28	0.47	1.53	0.18	1.03	0.07	0.62	0.02				
24			12.82	29.50	8.08	9.59	5.04	3.04	3.83	1.57	2.49	0.55	1.67	0.21	1.13	0.08	0.68	0.02				
26			13.89	34.21	8.75	11.12	5.46	3.53	4.15	1.82	2.70	0.64	1.81	0.24	1.22	0.09	0.74	0.03				
28			14.96	39.25	9.42	12.76	5.88	4.05	4.47	2.08	2.91	0.73	1.95	0.27	1.31	0.11	0.79	0.03				
30			16.02	44.60	10.10	14.50	6.30	4.60	4.79	2.37	3.11	0.83	2.08	0.31	1.41	0.12	0.85	0.04				
32					10.77	16.34	6.72	5.18	5.11	2.67	3.32	0.93	2.22	0.35	1.50	0.14	0.91	0.04	0.42	0.01		
34					11.44	18.28	7.14	5.80	5.43	2.98	3.53	1.04	2.36	0.39	1.60	0.15	0.96	0.04	0.45	0.01		
36					12.12	20.32	7.56	6.45	5.75	3.32	3.74	1.16	2.50	0.44	1.69	0.17	1.02	0.05	0.47	0.01		
38					12.79	22.46	7.98	7.13	6.07	3.67	3.94	1.28	2.64	0.48	1.78	0.19	1.08	0.05	0.50	0.01		
40					13.46	24.70	8.40	7.84	6.39	4.03	4.15	1.41	2.78	0.53	1.88	0.20	1.13	0.06	0.52	0.01		
42					14.14	27.04	8.82	8.58	6.71	4.41	4.36	1.54	2.92	0.58	1.97	0.22	1.19	0.07	0.55	0.01		
44					14.81	29.47	9.24	9.35	7.03	4.81	4.57	1.68	3.06	0.63	2.07	0.24	1.25	0.07	0.58	0.01		
46					15.48	32.00	9.66	10.15	7.35	5.22	4.77	1.83	3.20	0.69	2.16	0.27	1.30	0.08	0.60	0.01		
48					16.16	34.62	10.08	10.98	7.67	5.65	4.98	1.98	3.34	0.75	2.25	0.29	1.36	0.08	0.63	0.01		
50					16.83	37.34	10.50	11.85	7.99	6.09	5.19	2.13	3.47	0.80	2.35	0.31	1.42	0.09	0.65	0.01		
55							11.55	14.13	8.79	7.27	5.71	2.54	3.82	0.96	2.58	0.37	1.56	0.11	0.72	0.02		
60							12.60	16.60	9.59	8.54	6.23	2.99	4.17	1.13	2.82	0.43	1.70	0.13	0.79	0.02		
65							13.65	19.26	10.39	9.91	6.74	3.47	4.52	1.31	3.05	0.50	1.84	0.15	0.85	0.02		
70							14.70	22.09	11.18	11.37	7.26	3.98	4.86	1.50	3.29	0.58	1.98	0.17	0.92	0.03		
75							15.75	25.10	11.98	12.91	7.78	4.52	5.21	1.70	3.52	0.66	2.13	0.19	0.98	0.03		
80							16.80	28.29	12.78	14.55	8.30	5.09	5.56	1.92	3.76	0.74	2.27	0.22	1.05	0.03		
85									13.58	16.28	8.82	5.70	5.91	2.15	3.99	0.83	2.41	0.24	1.11	0.04		
90									14.38	18.10	9.34	6.33	6.25	2.39	4.23	0.92	2.55	0.27	1.18	0.04		
95									15.18	20.01	9.86	7.00	6.60	2.64	4.46	1.02	2.69	0.30	1.24	0.05		
100									15.98	22.00	10.38	7.70	6.95	2.90	4.69	1.12	2.83	0.33	1.31	0.05		
110											11.41	9.18	7.64	3.46	5.16	1.33	3.12	0.39	1.44	0.06		
120											12.45	10.79	8.34	4.07	5.63	1.57	3.40	0.46	1.57	0.07		
130											13.49	12.51	9.03	4.72	6.10	1.82	3.68	0.53	1.70	0.08		
140											14.53	14.35	9.73	5.41	6.57	2.08	3.97	0.61	1.83	0.09		
150											15.56	16.31	10.42	6.15	7.04	2.37	4.25	0.69	1.96	0.11		
160											16.60	18.38	11.12	6.93	7.51	2.67	4.54	0.78	2.09	0.12		
170													11.81	7.76	7.98	2.99	4.82	0.87	2.23	0.13		
180													12.51	8.62	8.45	3.32	5.10	0.97	2.36	0.15		
190													13.20	9.53	8.92	3.67	5.39	1.08	2.49	0.16		
200													13.90	10.48	9.39	4.03	5.67	1.18	2.62	0.18		
220													15.29	12.50	10.33	4.81	6.24	1.41	2.88	0.22		
240													16.68	14.69	11.27	5.66	6.80	1.66	3.14	0.25		
260															12.21	6.56	7.37	1.92	3.40	0.29		
280															13.15	7.52	7.94	2.20	3.67	0.34		
300															14.08	8.55	8.50	2.50	3.93	0.38		
320															15.02	9.64	9.07	2.82	4.19	0.43		
340															15.96	10.78	9.64	3.16	4.45	0.48		
360															16.90	11.98	10.20	3.51	4.71	0.54		
380																10.77	3.88	4.97	5.59			
400																11.34	4.27	5.24	6.65			
420																	11.90	4.67	5.50	7.71		
440																	12.47	5.09	5.76	8.78		
460																	13.04	5.53	6.02	9.84		
480																	13.61	5.98	6.28	10.91		
500																	14.17	6.45	6.54	12.08		

See pg 148 for friction loss formulas

Friction Loss Characteristics

SCHEDULE 40 PVC IPS PLASTIC PIPE

Size: 1/2" thru 6" Flow: 1 thru 500GPM

ASTM D-1785 (1120, 1220) C=150 PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

size	1/2"		3/4"		1"		1 1/4"		1 1/2"		2"		2 1/2"		3"		4"		6"	
Avg ID	0.602		0.804		1.029		1.360		1.590		2.047		2.445		3.042		3.998		6.031	
Pipe OD	0.840		1.050		1.315		1.660		1.900		2.375		2.875		3.500		4.500		6.625	
Avg Wall	0.119		0.123		0.143		0.150		0.155		0.164		0.215		0.229		0.251		0.297	
Min Wall	0.109		0.113		0.133		0.140		0.145		0.154		0.203		0.216		0.237		0.280	
Flow GPM	Velocity FPS	PSI Loss																		
1	1.13	0.50	0.63	0.12	0.39	0.04	0.22	0.01	0.16	0.00										
2	2.25	1.82	1.26	0.44	0.77	0.13	0.44	0.03	0.32	0.02	0.19	0.00								
3	3.38	3.85	1.89	0.94	1.16	0.28	0.66	0.07	0.48	0.03	0.29	0.01								
4	4.50	6.55	2.52	1.60	1.54	0.48	0.88	0.12	0.65	0.06	0.39	0.02	0.27	0.01						
5	5.63	9.91	3.16	2.42	1.93	0.73	1.10	0.19	0.81	0.09	0.49	0.03	0.34	0.01						
6	6.75	13.89	3.79	3.40	2.31	1.02	1.32	0.26	0.97	0.12	0.58	0.04	0.41	0.02	0.26	0.01				
7	7.88	18.48	4.42	4.52	2.70	1.36	1.54	0.35	1.13	0.16	0.68	0.05	0.48	0.02	0.31	0.01				
8	9.01	23.66	5.05	5.79	3.08	1.74	1.76	0.45	1.29	0.21	0.78	0.06	0.55	0.03	0.35	0.01				
9	10.13	29.43	5.68	7.20	3.47	2.17	1.99	0.56	1.45	0.26	0.88	0.08	0.61	0.03	0.40	0.01				
10	11.26	35.77	6.31	8.75	3.85	2.63	2.21	0.68	1.61	0.32	0.97	0.09	0.68	0.04	0.44	0.01				
12	13.51	50.14	7.57	12.27	4.62	3.69	2.65	0.95	1.94	0.44	1.17	0.13	0.82	0.05	0.53	0.02				
14	15.76	66.71	8.84	16.32	5.39	4.91	3.09	1.26	2.26	0.59	1.36	0.17	0.96	0.07	0.62	0.03				
16	18.01	85.42	10.10	20.90	6.17	6.29	3.53	1.62	2.58	0.76	1.56	0.22	1.09	0.09	0.71	0.03	0.41	0.01		
18	20.26	106.3	11.36	25.99	6.94	7.82	3.97	2.01	2.90	0.94	1.75	0.28	1.23	0.12	0.79	0.04	0.46	0.01		
20			12.62	31.59	7.71	9.51	4.41	2.45	3.23	1.14	1.95	0.33	1.36	0.14	0.88	0.05	0.51	0.01		
22			13.89	37.69	8.48	11.35	4.85	2.92	3.55	1.37	2.14	0.40	1.50	0.17	0.97	0.06	0.56	0.02		
24			15.15	44.28	9.25	13.33	5.29	3.43	3.87	1.60	2.34	0.47	1.64	0.20	1.06	0.07	0.61	0.02		
26			16.41	51.36	10.02	15.46	5.74	3.98	4.20	1.86	2.53	0.54	1.77	0.23	1.15	0.08	0.66	0.02		
28			17.67	58.91	10.79	17.73	6.18	4.56	4.52	2.13	2.73	0.62	1.91	0.26	1.23	0.09	0.71	0.02		
30			18.94	66.94	11.56	20.15	6.62	5.19	4.84	2.42	2.92	0.71	2.05	0.30	1.32	0.10	0.77	0.03		
32					12.33	22.71	7.06	5.85	5.16	2.73	3.12	0.80	2.18	0.34	1.41	0.12	0.82	0.03	0.36	0.00
34					13.10	25.41	7.50	6.54	5.49	3.06	3.31	0.89	2.32	0.38	1.50	0.13	0.87	0.03	0.38	0.00
36					13.87	28.24	7.94	7.27	5.81	3.40	3.51	0.99	2.46	0.42	1.59	0.14	0.92	0.04	0.40	0.01
38					14.64	31.22	8.38	8.04	6.13	3.76	3.70	1.10	2.59	0.46	1.68	0.16	0.97	0.04	0.43	0.01
40					15.41	34.33	8.82	8.84	6.46	4.13	3.89	1.21	2.73	0.51	1.76	0.18	1.02	0.05	0.45	0.01
42					16.18	37.58	9.26	9.67	6.78	4.52	4.09	1.32	2.87	0.56	1.85	0.19	1.07	0.05	0.47	0.01
44					16.95	40.96	9.71	10.54	7.10	4.93	4.28	1.44	3.00	0.61	1.94	0.21	1.12	0.06	0.49	0.01
46					17.73	44.47	10.15	11.45	7.42	5.35	4.48	1.57	3.14	0.66	2.03	0.23	1.17	0.06	0.52	0.01
48					18.50	48.12	10.59	12.39	7.75	5.79	4.67	1.69	3.28	0.71	2.12	0.25	1.23	0.07	0.54	0.01
50					19.27	51.90	11.03	13.36	8.07	6.25	4.87	1.83	3.41	0.77	2.20	0.27	1.28	0.07	0.56	0.01
55							12.13	15.94	8.88	7.45	5.36	2.18	3.75	0.92	2.42	0.32	1.40	0.08	0.62	0.01
60							13.24	18.72	9.68	8.75	5.84	2.56	4.09	1.08	2.65	0.37	1.53	0.10	0.67	0.01
65							14.34	21.72	10.49	10.15	6.33	2.97	4.44	1.25	2.87	0.43	1.66	0.11	0.73	0.02
70							15.44	24.91	11.30	11.65	6.82	3.41	4.78	1.43	3.09	0.50	1.79	0.13	0.79	0.02
75							16.54	28.31	12.10	13.23	7.30	3.87	5.12	1.63	3.31	0.56	1.91	0.15	0.84	0.02
80							17.65	31.90	12.91	14.91	7.79	4.36	5.46	1.84	3.53	0.63	2.04	0.17	0.90	0.02
85									13.72	16.69	8.28	4.88	5.80	2.06	3.75	0.71	2.17	0.19	0.95	0.03
90									14.52	18.55	8.76	5.43	6.14	2.29	3.97	0.79	2.30	0.21	1.01	0.03
95									15.33	20.50	9.25	6.00	6.48	2.53	4.19	0.87	2.42	0.23	1.07	0.03
100									16.14	22.55	9.74	6.59	6.82	2.78	4.41	0.96	2.55	0.25	1.12	0.03
110											10.71	7.87	7.51	3.31	4.85	1.14	2.81	0.30	1.23	0.04
120											11.68	9.24	8.19	3.89	5.29	1.34	3.06	0.36	1.35	0.05
130											12.66	10.72	8.87	4.52	5.73	1.56	3.32	0.41	1.46	0.06
140											13.63	12.30	9.55	5.18	6.17	1.79	3.57	0.47	1.57	0.06
150											14.61	13.97	10.24	5.89	6.61	2.03	3.83	0.54	1.68	0.07
160											15.58	15.75	10.92	6.63	7.05	2.29	4.08	0.61	1.79	0.08
170													11.60	7.42	7.50	2.56	4.34	0.68	1.91	0.09
180													12.28	8.25	7.94	2.85	4.59	0.75	2.02	0.10
190													12.97	9.12	8.38	3.15	4.85	0.83	2.13	0.11
200													13.65	10.03	8.82	3.46	5.11	0.92	2.24	0.12
220													15.01	11.96	9.70	4.13	5.62	1.09	2.47	0.15
240													16.38	14.06	10.58	4.85	6.13	1.28	2.69	0.17
260															11.46	5.63	6.64	1.49	2.92	0.20
280															12.35	6.46	7.15	1.71	3.14	0.23
300															13.23	7.34	7.66	1.94	3.37	0.26
320															14.11	8.27	8.17	2.19	3.59	0.30
340															14.99	9.25	8.68	2.45	3.81	0.33
360															15.87	10.29	9.19	2.72	4.04	0.37
380																9.70	3.01	4.26	0.41	
400																10.21	3.31	4.49	0.45	
420																10.72	3.62	4.71	0.49	
440																11.23	3.95	4.94	0.53	
460																11.74	4.28	5.16	0.58	
480																12.25	4.64	5.38	0.63	
500																12.76	5.00	5.61	0.68	

Shaded area represents velocities over 5 fps.
Use with caution.

See pg 148 for friction loss formulas

Friction Loss Characteristics

PVC SCHEDULE 40 IPS PLASTIC PIPE

Size: 4" thru 12" Flow: 10 thru 3000GPM
 ASTM D1785 C=150 PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

size	4"		6"		8"		10"		12"	
Avg.ID	3.998		6.031		7.942		9.976		11.889	
Pipe OD	4.500		6.625		8.625		10.750		12.750	
Avg Wall	0.251		0.297		0.342		0.387		0.431	
Min Wall	0.237		0.280		0.322		0.365		0.406	
Flow GPM	Velocity FPS	PSI Loss								
10	0.26	0.00	0.11	0.00	0.06	0.00	0.04	0.00	0.03	0.00
20	0.51	0.01	0.22	0.00	0.13	0.00	0.08	0.00	0.06	0.00
30	0.77	0.03	0.34	0.00	0.19	0.00	0.12	0.00	0.09	0.00
40	1.02	0.05	0.45	0.01	0.26	0.00	0.16	0.00	0.12	0.00
50	1.28	0.07	0.56	0.01	0.32	0.00	0.20	0.00	0.14	0.00
60	1.53	0.10	0.67	0.01	0.39	0.00	0.25	0.00	0.17	0.00
70	1.79	0.13	0.79	0.02	0.45	0.00	0.29	0.00	0.20	0.00
80	2.04	0.17	0.90	0.02	0.52	0.01	0.33	0.00	0.23	0.00
90	2.30	0.21	1.01	0.03	0.58	0.01	0.37	0.00	0.26	0.00
100	2.55	0.25	1.12	0.03	0.65	0.01	0.41	0.00	0.29	0.00
120	3.06	0.36	1.35	0.05	0.78	0.01	0.49	0.00	0.35	0.00
140	3.57	0.47	1.57	0.06	0.91	0.02	0.57	0.01	0.40	0.00
160	4.08	0.61	1.79	0.08	1.03	0.02	0.66	0.01	0.46	0.00
180	4.59	0.75	2.02	0.10	1.16	0.03	0.74	0.01	0.52	0.00
200	5.11	0.92	2.24	0.12	1.29	0.03	0.82	0.01	0.58	0.00
225	5.74	1.14	2.52	0.15	1.46	0.04	0.92	0.01	0.65	0.01
250	6.38	1.39	2.80	0.19	1.62	0.05	1.02	0.02	0.72	0.01
275	7.02	1.65	3.08	0.22	1.78	0.06	1.13	0.02	0.79	0.01
300	7.66	1.94	3.37	0.26	1.94	0.07	1.23	0.02	0.87	0.01
325	8.30	2.25	3.65	0.30	2.10	0.08	1.33	0.03	0.94	0.01
350	8.93	2.58	3.93	0.35	2.26	0.09	1.43	0.03	1.01	0.01
375			4.21	0.40	2.43	0.10	1.54	0.03	1.08	0.01
400			4.49	0.45	2.59	0.12	1.64	0.04	1.15	0.02
425			4.77	0.50	2.75	0.13	1.74	0.04	1.23	0.02
450			5.05	0.56	2.91	0.15	1.84	0.05	1.30	0.02
475			5.33	0.62	3.07	0.16	1.95	0.05	1.37	0.02
500			5.61	0.68	3.23	0.18	2.05	0.06	1.44	0.02
550			6.17	0.81	3.56	0.21	2.25	0.07	1.59	0.03
600			6.73	0.95	3.88	0.25	2.46	0.08	1.73	0.03
650			7.29	1.10	4.20	0.29	2.66	0.09	1.88	0.04
700			7.85	1.26	4.53	0.33	2.87	0.11	2.02	0.05
750					4.85	0.38	3.07	0.12	2.16	0.05
800					5.17	0.42	3.28	0.14	2.31	0.06
850					5.50	0.47	3.48	0.16	2.45	0.07
900					5.82	0.53	3.69	0.17	2.60	0.07
950					6.15	0.58	3.89	0.19	2.74	0.08
1000					6.47	0.64	4.10	0.21	2.89	0.09
1050					6.79	0.70	4.30	0.23	3.03	0.10
1150					7.44	0.83	4.71	0.27	3.32	0.12
1200					7.76	0.90	4.92	0.30	3.46	0.13
1250							5.12	0.32	3.61	0.14
1300							5.33	0.34	3.75	0.15
1350							5.53	0.37	3.90	0.16
1400							5.74	0.39	4.04	0.17
1500							6.15	0.45	4.33	0.19
1550							6.35	0.47	4.47	0.20
1600							6.56	0.50	4.62	0.21
1650							6.76	0.53	4.76	0.23
1700							6.97	0.56	4.91	0.24
1750							7.17	0.59	5.05	0.25
1800									5.20	0.27
1850									5.34	0.28
1900									5.48	0.29
1950									5.63	0.31
2000									5.77	0.32
2100									6.06	0.35
2200									6.35	0.39
2300									6.64	0.42
2400									6.93	0.45
2500									7.22	0.49
2600										
2700										
2800										
2900										
3000										

See pg 148 for friction loss formulas

Friction Loss Characteristics

SCHEDULE 80 PVC IPS PLASTIC PIPE

Size: 1/2" thru 6" Flow: 1 thru 500GPM

ASTM D-1785 (1120, 1220) C=150 PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

Size	1/2"		3/4"		1"		1 1/4"		1 1/2"		2"		2 1/2"		3"		4"		6"	
Avg ID	0.526		0.722		0.935		1.254		1.476		1.913		2.289		2.864		3.786		5.709	
Pipe OD	0.840		1.050		1.315		1.660		1.900		2.375		2.875		3.500		4.500		6.625	
Avg Wall	0.157		0.164		0.190		0.203		0.212		0.231		0.293		0.318		0.357		0.458	
Min Wall	0.147		0.154		0.179		0.191		0.200		0.218		0.276		0.300		0.337		0.432	
Flow GPM	Velocity FPS	PSI Loss																		
1	1.47	0.97	0.78	0.21	0.47	0.06	0.26	0.01	0.19	0.01										
2	2.95	3.50	1.57	0.75	0.93	0.21	0.52	0.05	0.37	0.02	0.22	0.01								
3	4.42	7.42	2.35	1.59	1.40	0.45	0.78	0.11	0.56	0.05	0.33	0.01								
4	5.90	12.64	3.13	2.71	1.87	0.77	1.04	0.18	0.75	0.08	0.45	0.02	0.31	0.01						
5	7.37	19.11	3.91	4.09	2.33	1.16	1.30	0.28	0.94	0.13	0.56	0.04	0.39	0.01						
6	8.85	26.78	4.70	5.74	2.80	1.63	1.56	0.39	1.12	0.18	0.67	0.05	0.47	0.02	0.30	0.01				
7	10.32	35.63	5.48	7.63	3.27	2.17	1.82	0.52	1.31	0.24	0.78	0.07	0.55	0.03	0.35	0.01				
8	11.80	45.63	6.26	9.77	3.73	2.78	2.08	0.67	1.50	0.30	0.89	0.09	0.62	0.04	0.40	0.01				
9	13.27	56.75	7.04	12.15	4.20	3.45	2.34	0.83	1.69	0.37	1.00	0.11	0.70	0.04	0.45	0.01				
10	14.75	68.98	7.83	14.77	4.67	4.20	2.59	1.01	1.87	0.46	1.11	0.13	0.78	0.05	0.50	0.02				
12			9.39	20.70	5.60	5.88	3.11	1.41	2.25	0.64	1.34	0.18	0.93	0.08	0.60	0.03				
14			10.96	27.55	6.53	7.83	3.63	1.88	2.62	0.85	1.56	0.24	1.09	0.10	0.70	0.03				
16			12.52	35.27	7.47	10.03	4.15	2.40	3.00	1.09	1.78	0.31	1.25	0.13	0.80	0.04	0.46	0.01		
18			14.09	43.87	8.40	12.47	4.67	2.99	3.37	1.35	2.01	0.38	1.40	0.16	0.90	0.05	0.51	0.01		
20			15.65	53.32	9.33	15.16	5.19	3.63	3.75	1.64	2.23	0.47	1.56	0.19	0.99	0.07	0.57	0.02		
22					10.27	18.08	5.71	4.33	4.12	1.96	2.45	0.56	1.71	0.23	1.09	0.08	0.63	0.02		
24					11.20	21.24	6.23	5.09	4.49	2.30	2.68	0.65	1.87	0.27	1.19	0.09	0.68	0.02		
26					12.13	24.64	6.75	5.91	4.87	2.67	2.90	0.76	2.02	0.32	1.29	0.11	0.74	0.03		
28					13.07	28.26	7.26	6.77	5.24	3.06	3.12	0.87	2.18	0.36	1.39	0.12	0.80	0.03		
30					14.00	32.12	7.78	7.70	5.62	3.48	3.34	0.99	2.34	0.41	1.49	0.14	0.85	0.04		
32					14.93	36.19	8.30	8.68	5.99	3.92	3.57	1.11	2.49	0.46	1.59	0.16	0.91	0.04	0.40	0.01
34					15.87	40.49	8.82	9.71	6.37	4.39	3.79	1.24	2.65	0.52	1.69	0.17	0.97	0.04	0.43	0.01
36							9.34	10.79	6.74	4.88	4.01	1.38	2.80	0.58	1.79	0.19	1.02	0.05	0.45	0.01
38							9.86	11.93	7.12	5.40	4.24	1.53	2.96	0.64	1.89	0.21	1.08	0.06	0.48	0.01
40							10.38	13.11	7.49	5.93	4.46	1.68	3.11	0.70	1.99	0.24	1.14	0.06	0.50	0.01
42							10.90	14.35	7.87	6.49	4.68	1.84	3.27	0.77	2.09	0.26	1.20	0.07	0.53	0.01
44							11.42	15.65	8.24	7.08	4.91	2.00	3.43	0.84	2.19	0.28	1.25	0.07	0.55	0.01
46							11.94	16.99	8.61	7.69	5.13	2.18	3.58	0.91	2.29	0.31	1.31	0.08	0.58	0.01
48							12.45	18.38	8.99	8.32	5.35	2.35	3.74	0.98	2.39	0.33	1.37	0.08	0.60	0.01
50							12.97	19.83	9.36	8.97	5.57	2.54	3.89	1.06	2.49	0.36	1.42	0.09	0.63	0.01
55							14.27	23.65	10.30	10.70	6.13	3.03	4.28	1.27	2.74	0.43	1.57	0.11	0.69	0.01
60							15.57	27.79	11.24	12.57	6.69	3.56	4.67	1.49	2.98	0.50	1.71	0.13	0.75	0.02
65									12.17	14.58	7.25	4.13	5.06	1.72	3.23	0.58	1.85	0.15	0.81	0.02
70									13.11	16.73	7.80	4.74	5.45	1.98	3.48	0.66	1.99	0.17	0.88	0.02
75									14.05	19.01	8.36	5.38	5.84	2.25	3.73	0.76	2.13	0.19	0.94	0.03
80									14.98	21.42	8.92	6.06	6.23	2.53	3.98	0.85	2.28	0.22	1.00	0.03
85									15.92	23.96	9.48	6.78	6.62	2.83	4.23	0.95	2.42	0.24	1.06	0.03
90											10.03	7.54	7.01	3.15	4.48	1.06	2.56	0.27	1.13	0.04
95											10.59	8.34	7.40	3.48	4.73	1.17	2.70	0.30	1.19	0.04
100											11.15	9.17	7.79	3.83	4.97	1.29	2.85	0.33	1.25	0.04
110											12.26	10.94	8.57	4.57	5.47	1.53	3.13	0.39	1.38	0.05
120											13.38	12.85	9.34	5.37	5.97	1.80	3.42	0.46	1.50	0.06
130											14.49	14.90	10.12	6.22	6.47	2.09	3.70	0.54	1.63	0.07
140											15.61	17.09	10.90	7.14	6.96	2.40	3.98	0.62	1.75	0.08
150													11.68	8.11	7.46	2.73	4.27	0.70	1.88	0.10
160													12.46	9.14	7.96	3.07	4.55	0.79	2.00	0.11
170													13.24	10.23	8.46	3.44	4.84	0.88	2.13	0.12
180													14.02	11.37	8.95	3.82	5.12	0.98	2.25	0.13
190													14.80	12.57	9.45	4.22	5.41	1.09	2.38	0.15
200													15.57	13.82	9.95	4.64	5.69	1.19	2.50	0.16
220															10.94	5.54	6.26	1.42	2.75	0.19
240															11.94	6.51	6.83	1.67	3.00	0.23
260															12.93	7.55	7.40	1.94	3.25	0.26
280															13.93	8.66	7.97	2.23	3.51	0.30
300															14.92	9.84	8.54	2.53	3.76	0.34
320															15.92	11.09	9.11	2.85	4.01	0.39
340																	9.68	3.19	4.26	0.43
360																	10.25	3.55	4.51	0.48
380																	10.82	3.92	4.76	0.53
400																	11.39	4.31	5.01	0.58
420																	11.95	4.72	5.26	0.64
440																	12.52	5.14	5.51	0.70
460																	13.09	5.59	5.76	0.76
480																	13.66	6.04	6.01	0.82
500																	14.23	6.52	6.26	0.88

See pg 148 for friction loss formulas

Shaded area represents velocities over 5 fps.
Use with caution.

Friction Loss Characteristics

PVC SCHEDULE 80 IPS PLASTIC PIPE

Size: 4" thru 12" Flow: 10 thru 3000GPM

ASTM D1785 C=150 PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

size	4"		6"		8"		10"		12"	
Avg.ID	3.786		5.709		7.565		9.493		11.294	
Pipe OD	4.500		6.625		8.625		10.750		12.750	
Avg Wall	0.357		0.458		0.530		0.629		0.728	
Min Wall	0.337		0.432		0.500		0.593		0.687	
Flow GPM	Velocity FPS	PSI Loss								
10	0.28	0.00	0.13	0.00	0.07	0.00	0.05	0.00	0.03	0.00
20	0.57	0.02	0.25	0.00	0.14	0.00	0.09	0.00	0.06	0.00
30	0.85	0.04	0.38	0.00	0.21	0.00	0.14	0.00	0.10	0.00
40	1.14	0.06	0.50	0.01	0.29	0.00	0.18	0.00	0.13	0.00
50	1.42	0.09	0.63	0.01	0.36	0.00	0.23	0.00	0.16	0.00
60	1.71	0.13	0.75	0.02	0.43	0.00	0.27	0.00	0.19	0.00
70	1.99	0.17	0.88	0.02	0.50	0.01	0.32	0.00	0.22	0.00
80	2.28	0.22	1.00	0.03	0.57	0.01	0.36	0.00	0.26	0.00
90	2.56	0.27	1.13	0.04	0.64	0.01	0.41	0.00	0.29	0.00
100	2.85	0.33	1.25	0.04	0.71	0.01	0.45	0.00	0.32	0.00
120	3.42	0.46	1.50	0.06	0.86	0.02	0.54	0.01	0.38	0.00
140	3.98	0.62	1.75	0.08	1.00	0.02	0.63	0.01	0.45	0.00
160	4.55	0.79	2.00	0.11	1.14	0.03	0.72	0.01	0.51	0.00
180	5.12	0.98	2.25	0.13	1.28	0.03	0.81	0.01	0.58	0.00
200	5.69	1.19	2.50	0.16	1.43	0.04	0.91	0.01	0.64	0.01
225	6.40	1.49	2.82	0.20	1.60	0.05	1.02	0.02	0.72	0.01
250	7.12	1.81	3.13	0.24	1.78	0.06	1.13	0.02	0.80	0.01
275	7.83	2.15	3.44	0.29	1.96	0.07	1.25	0.02	0.88	0.01
300	8.54	2.53	3.76	0.34	2.14	0.09	1.36	0.03	0.96	0.01
325	9.25	2.94	4.07	0.40	2.32	0.10	1.47	0.03	1.04	0.01
350	9.96	3.37	4.38	0.46	2.50	0.12	1.58	0.04	1.12	0.02
375			4.69	0.52	2.67	0.13	1.70	0.04	1.20	0.02
400			5.01	0.58	2.85	0.15	1.81	0.05	1.28	0.02
425			5.32	0.65	3.03	0.17	1.92	0.06	1.36	0.02
450			5.63	0.73	3.21	0.18	2.04	0.06	1.44	0.03
475			5.95	0.80	3.39	0.20	2.15	0.07	1.52	0.03
500			6.26	0.88	3.56	0.22	2.26	0.07	1.60	0.03
550			6.88	1.05	3.92	0.27	2.49	0.09	1.76	0.04
600			7.51	1.24	4.28	0.31	2.72	0.10	1.92	0.04
650			8.14	1.44	4.63	0.36	2.94	0.12	2.08	0.05
700			8.76	1.65	4.99	0.42	3.17	0.14	2.24	0.06
750					5.35	0.48	3.40	0.16	2.40	0.07
800					5.70	0.54	3.62	0.18	2.56	0.08
850					6.06	0.60	3.85	0.20	2.72	0.09
900					6.42	0.67	4.07	0.22	2.88	0.09
950					6.77	0.74	4.30	0.24	3.04	0.10
1000					7.13	0.81	4.53	0.27	3.20	0.12
1050					7.49	0.89	4.75	0.29	3.36	0.13
1150					8.20	1.05	5.21	0.35	3.68	0.15
1200					8.56	1.14	5.43	0.38	3.84	0.16
1250							5.66	0.41	4.00	0.17
1300							5.89	0.44	4.16	0.19
1350							6.11	0.47	4.32	0.20
1400							6.34	0.50	4.48	0.22
1500							6.79	0.57	4.80	0.24
1550							7.02	0.60	4.96	0.26
1600							7.24	0.64	5.12	0.28
1650							7.47	0.68	5.28	0.29
1700							7.70	0.72	5.44	0.31
1750							7.92	0.76	5.60	0.33
1800									5.76	0.34
1850									5.92	0.36
1900									6.08	0.38
1950									6.24	0.40
2000									6.40	0.42
2100									6.72	0.46
2200									7.04	0.50
2300									7.36	0.54
2400									7.68	0.58
2500									8.00	0.63
2600										
2700										
2800										
2900										
3000										

See pg 148 for friction loss formulas

Friction Loss Characteristics

TYPE 'K' COPPER TUBING

Size: 1/2" thru 3" Flow: 1 thru 600 GPM

ASTM B 88 C=140 PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

size	1/2"		5/8"		3/4"		1"		1 1/4"		1 1/2"		2"		2 1/2"		3"			
Avg ID	0.527		0.652		0.745		0.995		1.245		1.481		1.959		2.435		2.907			
Pipe OD	0.625		0.750		0.875		1.125		1.375		1.625		2.125		2.625		3.125			
Avg Wall	0.049		0.049		0.065		0.065		0.065		0.072		0.083		0.095		0.109			
Flow GPM	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss		
1	1.47	1.09	0.96	0.39	0.74	0.20	0.41	0.05	0.26	0.02										
2	2.94	3.94	1.92	1.40	1.47	0.73	0.82	0.18	0.53	0.06										
3	4.41	8.35	2.88	2.97	2.21	1.55	1.24	0.38	0.79	0.13										
4	5.88	14.23	3.84	5.05	2.94	2.64	1.65	0.65	1.05	0.22										
5	7.35	21.51	4.80	7.64	3.68	3.99	2.06	0.98	1.32	0.33										
6	8.81	30.15	5.76	10.70	4.41	5.59	2.47	1.37	1.58	0.46	1.12	0.20								
7	10.28	40.12	6.72	14.24	5.15	7.44	2.88	1.82	1.84	0.61	1.30	0.26								
8	11.75	51.37	7.68	18.24	5.88	9.53	3.30	2.33	2.11	0.78	1.49	0.34								
9	13.22	63.90	8.64	22.68	6.62	11.85	3.71	2.90	2.37	0.97	1.67	0.42								
10	14.69	77.66	9.60	27.57	7.35	14.41	4.12	3.52	2.63	1.18	1.86	0.51								
12			11.52	38.64	8.82	20.20	4.95	4.94	3.16	1.66	2.23	0.71	1.28	0.18						
14			13.44	51.41	10.29	26.87	5.77	6.57	3.69	2.21	2.60	0.95	1.49	0.24						
16			15.36	65.83	11.76	34.41	6.59	8.42	4.21	2.83	2.98	1.22	1.70	0.31						
18			17.28	81.88	13.23	42.80	7.42	10.47	4.74	3.52	3.35	1.51	1.91	0.39						
20					14.70	52.02	8.24	12.72	5.26	4.28	3.72	1.84	2.13	0.47						
22					16.17	62.06	9.07	15.18	5.79	5.10	4.09	2.19	2.34	0.56	1.51	0.19	1.06	0.08		
24					17.64	72.91	9.89	17.84	6.32	5.99	4.46	2.58	2.55	0.66	1.65	0.23	1.16	0.10		
26							10.71	20.69	6.84	6.95	4.84	2.99	2.76	0.77	1.79	0.27	1.26	0.11		
28							11.54	23.73	7.37	7.97	5.21	3.43	2.98	0.88	1.93	0.30	1.35	0.13		
30							12.36	26.96	7.90	9.06	5.58	3.89	3.19	1.00	2.06	0.35	1.45	0.15		
32							13.19	30.39	8.42	10.21	5.95	4.39	3.40	1.12	2.20	0.39	1.54	0.16		
34							14.01	34.00	8.95	11.42	6.32	4.91	3.61	1.26	2.34	0.44	1.64	0.18		
36							14.84	37.79	9.48	12.70	6.70	5.46	3.83	1.40	2.48	0.49	1.74	0.20		
38							15.66	41.77	10.00	14.04	7.07	6.03	4.04	1.55	2.61	0.54	1.83	0.23		
40							16.48	45.94	10.53	15.43	7.44	6.63	4.25	1.70	2.75	0.59	1.93	0.25		
42							17.31	50.28	11.06	16.89	7.81	7.26	4.47	1.86	2.89	0.65	2.03	0.27		
44									11.58	18.41	8.18	7.91	4.68	2.03	3.03	0.70	2.12	0.30		
46									12.11	19.99	8.56	8.59	4.89	2.20	3.17	0.76	2.22	0.32		
48									12.63	21.63	8.93	9.30	5.10	2.38	3.30	0.83	2.32	0.35		
50									13.16	23.33	9.30	10.03	5.32	2.57	3.44	0.89	2.41	0.38		
55									14.48	27.84	10.23	11.96	5.85	3.07	3.78	1.06	2.66	0.45		
60									15.79	32.70	11.16	14.05	6.38	3.60	4.13	1.25	2.90	0.53		
65									17.11	37.93	12.09	16.30	6.91	4.18	4.47	1.45	3.14	0.61		
70									18.43	43.51	13.02	18.70	7.44	4.79	4.82	1.66	3.38	0.70		
75											13.95	21.24	7.97	5.45	5.16	1.89	3.62	0.80		
80											14.88	23.94	8.51	6.14	5.50	2.13	3.86	0.90		
85											15.81	26.79	9.04	6.87	5.85	2.38	4.10	1.01		
90											16.74	29.78	9.57	7.63	6.19	2.65	4.35	1.12		
95											17.67	32.91	10.10	8.44	6.54	2.93	4.59	1.24		
100											18.60	36.19	10.63	9.28	6.88	3.22	4.83	1.36		
110			Shaded area represents velocities over 7 fps.										11.69	11.07	7.57	3.84	5.31	1.62		
120			Use with caution, where water hammer is a concern.										12.76	13.01	8.26	4.51	5.79	1.91		
130													13.82	15.08	8.95	5.23	6.28	2.21		
140													14.88	17.30	9.63	6.00	6.76	2.54		
150													15.95	19.66	10.32	6.82	7.24	2.88		
160													17.01	22.16	11.01	7.69	7.72	3.25		
170													18.07	24.79	11.70	8.60	8.21	3.63		
180															12.39	9.56	8.69	4.04		
190															13.07	10.57	9.17	4.46		
200															13.76	11.62	9.66	4.91		
220															15.14	13.87	10.62	5.86		
240															16.51	16.29	11.59	6.88		
260															17.89	18.90	12.55	7.98		
280															19.27	21.68	13.52	9.15		
300																	14.48	10.40		
320																			15.45	11.72
340																			16.42	13.11
360																			17.38	14.58
380																			18.35	16.11
400																				
420																				
440																				
460																				
480																				
500																				

See pg 148 for friction loss formulas

Friction Loss Characteristics

TYPE 'L' COPPER TUBING

Size: 1/2" thru 3" Flow: 1 thru 500GPM
 C=140 PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

size	1/2"		5/8"		3/4"		1"		1"		1 1/2"		2"		2 1/2"		3"	
Avg.ID	0.545		0.666		0.785		1.025		1.265		1.505		1.985		2.465		2.945	
Pipe OD	0.625		0.750		0.875		1.125		1.375		1.625		2.125		2.625		3.125	
Avg Wall	0.040		0.042		0.045		0.050		0.055		0.060		0.070		0.080		0.090	
Flow GPM	Velocity FPS	PSI Loss																
1	1.37	0.93	0.92	0.35	0.66	0.16	0.39	0.04	0.25	0.02								
2	2.75	3.35	1.84	1.26	1.32	0.57	0.78	0.15	0.51	0.06								
3	4.12	7.09	2.76	2.67	1.99	1.20	1.17	0.33	0.76	0.12								
4	5.49	12.09	3.68	4.56	2.65	2.05	1.55	0.56	1.02	0.20								
5	6.87	18.27	4.60	6.89	3.31	3.09	1.94	0.85	1.27	0.30								
6	8.24	25.61	5.52	9.65	3.97	4.34	2.33	1.18	1.53	0.43	1.08	0.18						
7	9.62	34.07	6.44	12.84	4.63	5.77	2.72	1.58	1.78	0.57	1.26	0.24						
8	10.99	43.63	7.36	16.45	5.30	7.39	3.11	2.02	2.04	0.72	1.44	0.31						
9	12.36	54.26	8.28	20.45	5.96	9.19	3.50	2.51	2.29	0.90	1.62	0.39						
10	13.74	65.95	9.20	24.86	6.62	11.17	3.88	3.05	2.55	1.10	1.80	0.47						
12			11.04	34.85	7.95	15.66	4.66	4.28	3.06	1.54	2.16	0.66	1.24	0.17				
14			12.88	46.36	9.27	20.83	5.44	5.69	3.57	2.04	2.52	0.88	1.45	0.23				
16			14.72	59.37	10.59	26.68	6.21	7.28	4.08	2.62	2.88	1.12	1.66	0.29				
18			16.56	73.84	11.92	33.18	6.99	9.06	4.59	3.25	3.24	1.40	1.86	0.36				
20					13.24	40.33	7.77	11.01	5.10	3.96	3.60	1.70	2.07	0.44				
22					14.57	48.11	8.54	13.14	5.61	4.72	3.96	2.03	2.28	0.53	1.48	0.18	1.03	0.08
24					15.89	56.53	9.32	15.44	6.12	5.55	4.32	2.38	2.49	0.62	1.61	0.22	1.13	0.09
26							10.10	17.90	6.63	6.43	4.68	2.76	2.69	0.72	1.75	0.25	1.22	0.11
28							10.87	20.54	7.14	7.38	5.04	3.17	2.90	0.82	1.88	0.29	1.32	0.12
30							11.65	23.33	7.65	8.38	5.40	3.60	3.11	0.94	2.01	0.33	1.41	0.14
32							12.43	26.30	8.16	9.45	5.76	4.06	3.31	1.05	2.15	0.37	1.51	0.15
34							13.20	29.42	8.67	10.57	6.12	4.54	3.52	1.18	2.28	0.41	1.60	0.17
36							13.98	32.71	9.18	11.75	6.48	5.05	3.73	1.31	2.42	0.46	1.69	0.19
38							14.76	36.15	9.69	12.99	6.84	5.58	3.93	1.45	2.55	0.51	1.79	0.21
40							15.53	39.75	10.20	14.28	7.21	6.13	4.14	1.59	2.69	0.56	1.88	0.23
42							16.31	43.51	10.71	15.63	7.57	6.71	4.35	1.75	2.82	0.61	1.98	0.26
44									11.22	17.04	7.93	7.32	4.56	1.90	2.95	0.66	2.07	0.28
46									11.73	18.50	8.29	7.94	4.76	2.07	3.09	0.72	2.16	0.30
48									12.24	20.02	8.65	8.60	4.97	2.24	3.22	0.78	2.26	0.33
50									12.75	21.59	9.01	9.27	5.18	2.41	3.36	0.84	2.35	0.35
55									14.02	25.76	9.91	11.06	5.70	2.88	3.69	1.00	2.59	0.42
60									15.30	30.26	10.81	13.00	6.21	3.38	4.03	1.18	2.82	0.50
65									16.57	35.10	11.71	15.07	6.73	3.92	4.36	1.37	3.06	0.57
70									17.85	40.26	12.61	17.29	7.25	4.50	4.70	1.57	3.29	0.66
75											13.51	19.65	7.77	5.11	5.04	1.78	3.53	0.75
80											14.41	22.14	8.28	5.76	5.37	2.01	3.76	0.84
85											15.31	24.77	8.80	6.44	5.71	2.25	4.00	0.94
90											16.21	27.54	9.32	7.16	6.04	2.50	4.23	1.05
95											17.11	30.44	9.84	7.91	6.38	2.76	4.47	1.16
100											18.01	33.47	10.35	8.70	6.71	3.03	4.70	1.28
110													11.39	10.38	7.39	3.62	5.17	1.52
120													12.43	12.20	8.06	4.25	5.65	1.79
130													13.46	14.15	8.73	4.93	6.12	2.07
140													14.50	16.23	9.40	5.66	6.59	2.38
150													15.53	18.44	10.07	6.43	7.06	2.70
160													16.57	20.78	10.74	7.24	7.53	3.05
170													17.60	23.25	11.41	8.11	8.00	3.41
180															12.09	9.01	8.47	3.79
190															12.76	9.96	8.94	4.19
200															13.43	10.95	9.41	4.61
220															14.77	13.07	10.35	5.50
240															16.12	15.35	11.29	6.46
260															17.46	17.80	12.23	7.49
280															18.80	20.42	13.17	8.59
300																	14.11	9.76
320																	15.05	11.00
340																	15.99	12.31
360																	16.94	13.69
380																	17.88	15.13
400																		
420																		
440																		
460																		
480																		
500																		

See pg 148 for friction loss formulas

Friction Loss Characteristics

TYPE 'M' COPPER TUBING

Size: 1/2" thru 3" Flow: 1 thru 500GPM
C=140 PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

size	1/2"		5/8"		3/4"		1"		1 1/4"		1 1/2"		2"		2 1/2"		3"	
Avg.ID	0.569		0.690		0.811		1.055		1.291		1.527		2.009		2.495		2.981	
Pipe OD	0.625		0.750		0.875		1.125		1.375		1.625		2.125		2.625		3.125	
Avg Wall	0.028		0.030		0.032		0.035		0.042		0.049		0.058		0.065		0.072	
Flow GPM	Velocity FPS	PSI Loss																
1	1.26	0.75	0.86	0.29	0.62	0.13	0.37	0.04	0.24	0.01								
2	2.52	2.71	1.71	1.06	1.24	0.48	0.73	0.13	0.49	0.05								
3	3.78	5.75	2.57	2.25	1.86	1.03	1.10	0.29	0.73	0.11								
4	5.04	9.80	3.43	3.83	2.48	1.75	1.47	0.49	0.98	0.18								
5	6.30	14.81	4.28	5.80	3.10	2.64	1.83	0.73	1.22	0.27								
6	7.56	20.76	5.14	8.13	3.72	3.70	2.20	1.03	1.47	0.39	1.05	0.17						
7	8.82	27.62	6.00	10.81	4.34	4.92	2.57	1.37	1.71	0.51	1.22	0.23						
8	10.08	35.37	6.86	13.84	4.96	6.31	2.93	1.75	1.96	0.66	1.40	0.29						
9	11.34	44.00	7.71	17.22	5.58	7.84	3.30	2.18	2.20	0.82	1.57	0.36						
10	12.60	53.48	8.57	20.93	6.20	9.53	3.67	2.65	2.45	0.99	1.75	0.44						
12			10.28	29.33	7.44	13.36	4.40	3.72	2.94	1.39	2.10	0.61	1.21	0.16				
14			12.00	39.02	8.68	17.78	5.13	4.94	3.43	1.85	2.45	0.82	1.42	0.22				
16			13.71	49.97	9.93	22.77	5.87	6.33	3.92	2.37	2.80	1.05	1.62	0.28				
18			15.43	62.15	11.17	28.32	6.60	7.87	4.41	2.95	3.15	1.30	1.82	0.34				
20			17.14	75.55	12.41	34.42	7.33	9.57	4.90	3.58	3.50	1.58	2.02	0.42				
22					13.65	41.06	8.06	11.42	5.39	4.28	3.85	1.89	2.22	0.50	1.44	0.17	1.01	0.07
24					14.89	48.24	8.80	13.41	5.88	5.02	4.20	2.22	2.43	0.58	1.57	0.20	1.10	0.09
26							9.53	15.56	6.36	5.83	4.55	2.57	2.63	0.68	1.70	0.24	1.19	0.10
28							10.26	17.85	6.85	6.68	4.90	2.95	2.83	0.78	1.84	0.27	1.29	0.11
30							11.00	20.28	7.34	7.59	5.25	3.35	3.03	0.88	1.97	0.31	1.38	0.13
32							11.73	22.85	7.83	8.56	5.60	3.78	3.23	0.99	2.10	0.35	1.47	0.15
34							12.46	25.57	8.32	9.57	5.95	4.23	3.44	1.11	2.23	0.39	1.56	0.16
36							13.20	28.42	8.81	10.64	6.30	4.70	3.64	1.24	2.36	0.43	1.65	0.18
38							13.93	31.42	9.30	11.76	6.65	5.20	3.84	1.37	2.49	0.48	1.74	0.20
40							14.66	34.55	9.79	12.94	7.00	5.71	4.04	1.50	2.62	0.52	1.84	0.22
42							15.40	37.81	10.28	14.16	7.35	6.26	4.25	1.65	2.75	0.57	1.93	0.24
44									10.77	15.43	7.70	6.82	4.45	1.79	2.88	0.63	2.02	0.26
46									11.26	16.76	8.05	7.40	4.65	1.95	3.01	0.68	2.11	0.29
48									11.75	18.13	8.40	8.01	4.85	2.11	3.15	0.73	2.20	0.31
50									12.24	19.56	8.75	8.64	5.05	2.27	3.28	0.79	2.30	0.33
55									13.46	23.33	9.62	10.31	5.56	2.71	3.60	0.95	2.53	0.40
60									14.69	27.41	10.50	12.11	6.07	3.19	3.93	1.11	2.75	0.47
65									15.91	31.79	11.37	14.04	6.57	3.70	4.26	1.29	2.98	0.54
70									17.14	36.47	12.25	16.11	7.08	4.24	4.59	1.48	3.21	0.62
75											13.12	18.31	7.58	4.82	4.92	1.68	3.44	0.71
80											14.00	20.63	8.09	5.43	5.24	1.89	3.67	0.80
85											14.87	23.08	8.59	6.07	5.57	2.12	3.90	0.89
90											15.75	25.66	9.10	6.75	5.90	2.35	4.13	0.99
95											16.62	28.36	9.60	7.46	6.23	2.60	4.36	1.09
100											17.50	31.19	10.11	8.21	6.55	2.86	4.59	1.20
110													11.12	9.79	7.21	3.41	5.05	1.44
120													12.13	11.51	7.87	4.01	5.51	1.69
130													13.14	13.34	8.52	4.65	5.97	1.96
140													14.15	15.31	9.18	5.33	6.43	2.24
150													15.16	17.39	9.83	6.06	6.89	2.55
160													16.17	19.60	10.49	6.83	7.35	2.87
170													17.18	21.93	11.14	7.64	7.81	3.21
180															11.80	8.50	8.26	3.57
190															12.45	9.39	8.72	3.95
200															13.11	10.33	9.18	4.34
220															14.42	12.32	10.10	5.18
240															15.73	14.47	11.02	6.09
260															17.04	16.79	11.94	7.06
280															18.35	19.25	12.86	8.10
300																	13.77	9.20
320																	14.69	10.37
340																	15.61	11.60
360																	16.53	12.90
380																	17.45	14.26
400																		
420																		
440																		
460																		
480																		
500																		

Shaded area represents velocities over 7 fps.
Use with caution, where water hammer is a concern.

See pg 148 for friction loss formulas

Friction Loss Characteristics

HDPE DR 7 265 PSI (IPS SIZE, OD CONTROLLED)

Size: 3" thru 18"

Flow: 50 thru 4000GPM

ANSI/ASAE S376.3 PE3408, ASTM D2239 C=150

PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

size	3"		4"		6"		8"		10"		12"		14"		16"		18"	
Avg.ID	2.440		3.136		4.589		6.013		7.494		8.890		9.760		11.156		12.550	
Pipe OD	3.500		4.500		6.625		8.625		10.750		12.750		14.000		16.000		18.000	
Avg Wall	0.530		0.682		1.018		1.306		1.628		1.930		2.120		2.422		2.725	
Min Wall	0.500		0.643		0.946		1.232		1.536		1.821		2.000		2.286		2.571	
Flow GPM	Velocity FPS	PSI Loss																
50	3.43	0.78	2.07	0.23	0.97	0.04	0.56	0.01	0.36	0.00	0.26	0.00	0.21	0.00	0.16	0.00	0.13	0.00
60	4.11	1.09	2.49	0.32	1.16	0.05	0.68	0.01	0.44	0.00	0.31	0.00	0.26	0.00	0.20	0.00	0.16	0.00
70	4.80	1.45	2.90	0.43	1.36	0.07	0.79	0.02	0.51	0.01	0.36	0.00	0.30	0.00	0.23	0.00	0.18	0.00
80	5.48	1.86	3.32	0.55	1.55	0.09	0.90	0.02	0.58	0.01	0.41	0.00	0.34	0.00	0.26	0.00	0.21	0.00
90	6.17	2.31	3.73	0.68	1.74	0.11	1.02	0.03	0.65	0.01	0.46	0.00	0.39	0.00	0.30	0.00	0.23	0.00
100	6.85	2.81	4.15	0.83	1.94	0.13	1.13	0.03	0.73	0.01	0.52	0.01	0.43	0.00	0.33	0.00	0.26	0.00
120	8.22	3.93	4.98	1.16	2.32	0.18	1.35	0.05	0.87	0.02	0.62	0.01	0.51	0.00	0.39	0.00	0.31	0.00
140	9.59	5.23	5.81	1.54	2.71	0.24	1.58	0.06	1.02	0.02	0.72	0.01	0.60	0.01	0.46	0.00	0.36	0.00
160	10.96	6.70	6.64	1.98	3.10	0.31	1.81	0.08	1.16	0.03	0.83	0.01	0.69	0.01	0.52	0.00	0.41	0.00
180			7.47	2.46	3.49	0.39	2.03	0.10	1.31	0.04	0.93	0.02	0.77	0.01	0.59	0.01	0.47	0.00
200			8.30	2.99	3.87	0.47	2.26	0.13	1.45	0.04	1.03	0.02	0.86	0.01	0.66	0.01	0.52	0.00
220			9.13	3.56	4.26	0.56	2.48	0.15	1.60	0.05	1.14	0.02	0.94	0.01	0.72	0.01	0.57	0.00
240			9.96	4.19	4.65	0.66	2.71	0.18	1.74	0.06	1.24	0.03	1.03	0.02	0.79	0.01	0.62	0.00
260			10.79	4.86	5.04	0.76	2.93	0.20	1.89	0.07	1.34	0.03	1.11	0.02	0.85	0.01	0.67	0.01
280			11.62	5.57	5.42	0.87	3.16	0.23	2.03	0.08	1.45	0.03	1.20	0.02	0.92	0.01	0.73	0.01
300					5.81	0.99	3.39	0.27	2.18	0.09	1.55	0.04	1.28	0.03	0.98	0.01	0.78	0.01
320					6.20	1.12	3.61	0.30	2.32	0.10	1.65	0.04	1.37	0.03	1.05	0.01	0.83	0.01
340					6.59	1.25	3.84	0.34	2.47	0.12	1.76	0.05	1.46	0.03	1.11	0.02	0.88	0.01
360					6.97	1.39	4.06	0.37	2.62	0.13	1.86	0.06	1.54	0.04	1.18	0.02	0.93	0.01
380					7.36	1.54	4.29	0.41	2.76	0.14	1.96	0.06	1.63	0.04	1.25	0.02	0.98	0.01
400					7.75	1.69	4.51	0.45	2.91	0.16	2.06	0.07	1.71	0.04	1.31	0.02	1.04	0.01
450					8.72	2.10	5.08	0.56	3.27	0.19	2.32	0.08	1.93	0.05	1.48	0.03	1.17	0.02
500					9.69	2.56	5.64	0.69	3.63	0.24	2.58	0.10	2.14	0.06	1.64	0.03	1.30	0.02
550					10.66	3.05	6.21	0.82	4.00	0.28	2.84	0.12	2.36	0.08	1.80	0.04	1.42	0.02
600					11.62	3.58	6.77	0.96	4.36	0.33	3.10	0.14	2.57	0.09	1.97	0.05	1.55	0.03
650							7.33	1.12	4.72	0.38	3.36	0.17	2.78	0.11	2.13	0.06	1.68	0.03
700							7.90	1.28	5.09	0.44	3.61	0.19	3.00	0.12	2.29	0.06	1.81	0.04
750							8.46	1.45	5.45	0.50	3.87	0.22	3.21	0.14	2.46	0.07	1.94	0.04
800							9.03	1.64	5.81	0.56	4.13	0.24	3.43	0.16	2.62	0.08	2.07	0.05
850							9.59	1.83	6.18	0.63	4.39	0.27	3.64	0.17	2.79	0.09	2.20	0.05
900							10.16	2.04	6.54	0.70	4.65	0.30	3.85	0.19	2.95	0.10	2.33	0.06
950							10.72	2.25	6.90	0.77	4.90	0.34	4.07	0.21	3.11	0.11	2.46	0.06
1000							11.28	2.48	7.26	0.85	5.16	0.37	4.28	0.23	3.28	0.12	2.59	0.07
1050							11.85	2.71	7.63	0.93	5.42	0.40	4.50	0.26	3.44	0.13	2.72	0.08
1100									7.99	1.01	5.68	0.44	4.71	0.28	3.61	0.15	2.85	0.08
1150									8.35	1.10	5.94	0.48	4.93	0.30	3.77	0.16	2.98	0.09
1200									8.72	1.19	6.19	0.52	5.14	0.33	3.93	0.17	3.11	0.10
1250									9.08	1.28	6.45	0.56	5.35	0.35	4.10	0.19	3.24	0.10
1300									9.44	1.38	6.71	0.60	5.57	0.38	4.26	0.20	3.37	0.11
1350									9.81	1.48	6.97	0.64	5.78	0.41	4.43	0.21	3.50	0.12
1400									10.17	1.58	7.23	0.69	6.00	0.44	4.59	0.23	3.63	0.13
1450									10.53	1.69	7.49	0.74	6.21	0.47	4.75	0.24	3.76	0.14
1500									10.90	1.80	7.74	0.78	6.42	0.50	4.92	0.26	3.89	0.15
1550									11.26	1.91	8.00	0.83	6.64	0.53	5.08	0.28	4.02	0.16
1600									11.62	2.03	8.26	0.88	6.85	0.56	5.25	0.29	4.14	0.16
1650											8.52	0.93	7.07	0.59	5.41	0.31	4.27	0.17
1700											8.78	0.99	7.28	0.63	5.57	0.33	4.40	0.18
1750											9.03	1.04	7.50	0.66	5.74	0.35	4.53	0.19
1800											9.29	1.10	7.71	0.70	5.90	0.36	4.66	0.21
1900											9.81	1.21	8.14	0.77	6.23	0.40	4.92	0.23
2000											10.32	1.33	8.57	0.85	6.56	0.44	5.18	0.25
2100											10.84	1.46	8.99	0.93	6.88	0.48	5.44	0.27
2200											11.36	1.59	9.42	1.01	7.21	0.53	5.70	0.30
2300											11.87	1.73	9.85	1.10	7.54	0.57	5.96	0.32
2400													10.28	1.19	7.87	0.62	6.22	0.35
2500													10.71	1.28	8.20	0.67	6.48	0.38
2600													11.14	1.38	8.52	0.72	6.74	0.41
2700													11.56	1.48	8.85	0.77	6.99	0.43
2800													11.99	1.58	9.18	0.82	7.25	0.46
2900															9.51	0.88	7.51	0.50
3000															9.83	0.94	7.77	0.53
3300															10.82	1.12	8.55	0.63
3600															11.80	1.31	9.33	0.74
3900																	10.10	0.86
4000																	10.36	0.90

Shaded area represents velocities over 5 fps.
Use with caution.

See pg 148 for friction loss formulas

Friction Loss Characteristics

HDPE DR 9 200 PSI (IPS SIZE, OD CONTROLLED)

Size: 3" thru 18"

Flow: 50 thru 4000GPM

ANSI/ASAE S376.3 PE3408, ASTM D2239 C=150

PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

size	3"		4"		6"		8"		10"		12"		14"		16"		18"	
Avg.ID	2.674		3.440		5.065		6.593		8.218		9.746		10.700		12.230		13.760	
Pipe OD	3.500		4.500		6.625		8.625		10.750		12.750		14.000		16.000		18.000	
Avg Wall	0.413		0.530		0.780		1.016		1.266		1.502		1.650		1.885		2.120	
Min Wall	0.389		0.500		0.736		0.958		1.194		1.417		1.556		1.778		2.000	
Flow GPM	Velocity FPS	PSI Loss																
50	2.85	0.50	1.72	0.15	0.80	0.02												
60	3.42	0.70	2.07	0.20	0.95	0.03												
70	3.99	0.93	2.41	0.27	1.11	0.04												
80	4.56	1.19	2.76	0.35	1.27	0.05												
90	5.14	1.48	3.10	0.43	1.43	0.07												
100	5.71	1.80	3.45	0.53	1.59	0.08	0.94	0.02										
120	6.85	2.52	4.14	0.74	1.91	0.11	1.13	0.03										
140	7.99	3.35	4.83	0.98	2.23	0.15	1.31	0.04										
160	9.13	4.29	5.52	1.26	2.54	0.19	1.50	0.05	0.97	0.02								
180			6.21	1.57	2.86	0.24	1.69	0.07	1.09	0.02								
200			6.90	1.90	3.18	0.29	1.88	0.08	1.21	0.03								
220			7.59	2.27	3.50	0.35	2.06	0.10	1.33	0.03								
240			8.27	2.67	3.82	0.41	2.25	0.11	1.45	0.04	1.03	0.02						
260			8.96	3.10	4.13	0.47	2.44	0.13	1.57	0.04	1.12	0.02						
280			9.65	3.55	4.45	0.54	2.63	0.15	1.69	0.05	1.20	0.02						
300					4.77	0.61	2.82	0.17	1.81	0.06	1.29	0.03	1.07	0.02				
320					5.09	0.69	3.00	0.19	1.93	0.07	1.37	0.03	1.14	0.02				
340					5.41	0.77	3.19	0.21	2.05	0.07	1.46	0.03	1.21	0.02				
360					5.73	0.86	3.38	0.24	2.17	0.08	1.55	0.04	1.28	0.02				
380					6.04	0.95	3.57	0.26	2.30	0.09	1.63	0.04	1.35	0.02				
400					6.36	1.05	3.75	0.29	2.42	0.10	1.72	0.04	1.43	0.03				
450					7.16	1.30	4.22	0.36	2.72	0.12	1.93	0.05	1.60	0.03	1.23	0.02		
500					7.95	1.58	4.69	0.44	3.02	0.15	2.15	0.07	1.78	0.04	1.36	0.02		
550					8.75	1.89	5.16	0.52	3.32	0.18	2.36	0.08	1.96	0.05	1.50	0.03		
600					9.54	2.22	5.63	0.61	3.62	0.21	2.58	0.09	2.14	0.06	1.64	0.03	1.29	0.02
650							6.10	0.71	3.93	0.24	2.79	0.11	2.32	0.07	1.77	0.04	1.40	0.02
700							6.57	0.82	4.23	0.28	3.01	0.12	2.49	0.08	1.91	0.04	1.51	0.02
750							7.04	0.93	4.53	0.32	3.22	0.14	2.67	0.09	2.05	0.05	1.62	0.03
800							7.51	1.05	4.83	0.36	3.44	0.16	2.85	0.10	2.18	0.05	1.72	0.03
850							7.98	1.17	5.14	0.40	3.65	0.17	3.03	0.11	2.32	0.06	1.83	0.03
900							8.45	1.30	5.44	0.45	3.87	0.19	3.21	0.12	2.45	0.06	1.94	0.04
950							8.92	1.44	5.74	0.49	4.08	0.21	3.39	0.14	2.59	0.07	2.05	0.04
1000							9.39	1.58	6.04	0.54	4.30	0.24	3.56	0.15	2.73	0.08	2.15	0.04
1050							9.86	1.73	6.34	0.59	4.51	0.26	3.74	0.16	2.86	0.09	2.26	0.05
1100									6.65	0.65	4.72	0.28	3.92	0.18	3.00	0.09	2.37	0.05
1150									6.95	0.70	4.94	0.31	4.10	0.19	3.14	0.10	2.48	0.06
1200									7.25	0.76	5.15	0.33	4.28	0.21	3.27	0.11	2.59	0.06
1250									7.55	0.82	5.37	0.36	4.45	0.23	3.41	0.12	2.69	0.07
1300									7.85	0.88	5.58	0.38	4.63	0.24	3.55	0.13	2.80	0.07
1350									8.16	0.94	5.80	0.41	4.81	0.26	3.68	0.14	2.91	0.08
1400									8.46	1.01	6.01	0.44	4.99	0.28	3.82	0.15	3.02	0.08
1450									8.76	1.08	6.23	0.47	5.17	0.30	3.96	0.16	3.12	0.09
1500									9.06	1.15	6.44	0.50	5.35	0.32	4.09	0.17	3.23	0.09
1550									9.36	1.22	6.66	0.53	5.52	0.34	4.23	0.18	3.34	0.10
1600									9.67	1.29	6.87	0.56	5.70	0.36	4.36	0.19	3.45	0.11
1650									9.97	1.37	7.09	0.60	5.88	0.38	4.50	0.20	3.56	0.11
1700											7.30	0.63	6.06	0.40	4.64	0.21	3.66	0.12
1750											7.52	0.67	6.24	0.42	4.77	0.22	3.77	0.12
1800											7.73	0.70	6.41	0.45	4.91	0.23	3.88	0.13
1900											8.16	0.78	6.77	0.49	5.18	0.26	4.09	0.14
2000											8.59	0.85	7.13	0.54	5.46	0.28	4.31	0.16
2100											9.02	0.93	7.48	0.59	5.73	0.31	4.53	0.17
2200											9.45	1.02	7.84	0.65	6.00	0.34	4.74	0.19
2300											9.88	1.10	8.20	0.70	6.27	0.37	4.96	0.21
2400													8.55	0.76	6.55	0.40	5.17	0.22
2500													8.91	0.82	6.82	0.43	5.39	0.24
2600													9.27	0.88	7.09	0.46	5.60	0.26
2700													9.62	0.94	7.36	0.49	5.82	0.28
2800													9.98	1.01	7.64	0.53	6.03	0.30
2900															7.91	0.56	6.25	0.32
3000															8.18	0.60	6.46	0.34
3300															9.00	0.71	7.11	0.40
3600															9.82	0.84	7.76	0.47
3900																	8.40	0.55
4000																	8.62	0.57

Shaded area represents velocities over 5 fps. Use with caution.

See pg 148 for friction loss formulas

Friction Loss Characteristics

HDPE DR 11 160 PSI (IPS SIZE, OD CONTROLLED)

Size: 3" thru 18"

Flow: 50 thru 4000GPM

ANSI/ASAE S376.3 PE3408, ASTM D2239 C=150

PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

size	3"		4"		6"		8"		10"		12"		14"		16"		18"	
Avg.ID	2.826		3.632		5.349		6.963		8.678		10.292		11.300		12.914		14.532	
Pipe OD	3.500		4.500		6.625		8.625		10.750		12.750		14.000		16.000		18.000	
Avg Wall	0.337		0.434		0.638		0.831		1.036		1.229		1.350		1.543		1.734	
Min Wall	0.318		0.409		0.602		0.784		0.977		1.159		1.273		1.455		1.636	
Flow GPM	Velocity FPS	PSI Loss																
50	2.55	0.38	1.55	0.11	0.71	0.02												
60	3.07	0.53	1.86	0.16	0.86	0.02												
70	3.58	0.71	2.17	0.21	1.00	0.03												
80	4.09	0.91	2.47	0.27	1.14	0.04												
90	4.60	1.13	2.78	0.33	1.28	0.05												
100	5.11	1.37	3.09	0.40	1.43	0.06	0.84	0.02										
120	6.13	1.92	3.71	0.57	1.71	0.09	1.01	0.02										
140	7.15	2.56	4.33	0.76	2.00	0.11	1.18	0.03										
160	8.17	3.28	4.95	0.97	2.28	0.15	1.35	0.04										
180	9.20	4.08	5.57	1.20	2.57	0.18	1.51	0.05										
200	10.22	4.96	6.19	1.46	2.85	0.22	1.68	0.06	1.08	0.02	0.77	0.01						
220	11.24	5.91	6.80	1.74	3.14	0.27	1.85	0.07	1.19	0.03	0.85	0.01						
240	12.26	6.95	7.42	2.05	3.42	0.31	2.02	0.09	1.30	0.03	0.92	0.01						
260			8.04	2.38	3.71	0.36	2.19	0.10	1.41	0.03	1.00	0.01						
280			8.66	2.73	3.99	0.41	2.36	0.11	1.52	0.04	1.08	0.02						
300			9.28	3.10	4.28	0.47	2.52	0.13	1.63	0.04	1.16	0.02						
320			9.90	3.49	4.56	0.53	2.69	0.15	1.73	0.05	1.23	0.02						
340			10.52	3.91	4.85	0.59	2.86	0.16	1.84	0.06	1.31	0.02	1.09	0.02				
360			11.13	4.34	5.13	0.66	3.03	0.18	1.95	0.06	1.39	0.03	1.15	0.02				
380					5.42	0.73	3.20	0.20	2.06	0.07	1.46	0.03	1.21	0.02				
400					5.70	0.80	3.37	0.22	2.17	0.08	1.54	0.03	1.28	0.02				
450					6.42	1.00	3.79	0.28	2.44	0.09	1.73	0.04	1.44	0.03				
500					7.13	1.21	4.21	0.34	2.71	0.12	1.93	0.05	1.60	0.03	1.22	0.02		
550					7.84	1.45	4.63	0.40	2.98	0.14	2.12	0.06	1.76	0.04	1.35	0.02		
600					8.56	1.70	5.05	0.47	3.25	0.16	2.31	0.07	1.92	0.04	1.47	0.02		
650					9.27	1.97	5.47	0.55	3.52	0.19	2.50	0.08	2.08	0.05	1.59	0.03		
700					9.98	2.26	5.89	0.63	3.79	0.21	2.70	0.09	2.24	0.06	1.71	0.03	1.35	0.02
750					10.69	2.57	6.31	0.71	4.06	0.24	2.89	0.11	2.40	0.07	1.83	0.04	1.45	0.02
800							6.73	0.80	4.33	0.27	3.08	0.12	2.56	0.08	1.96	0.04	1.55	0.02
850							7.15	0.90	4.61	0.31	3.27	0.13	2.72	0.09	2.08	0.04	1.64	0.03
900							7.57	1.00	4.88	0.34	3.47	0.15	2.88	0.09	2.20	0.05	1.74	0.03
950							7.99	1.10	5.15	0.38	3.66	0.16	3.04	0.10	2.32	0.05	1.84	0.03
1000							8.42	1.21	5.42	0.42	3.85	0.18	3.20	0.12	2.45	0.06	1.93	0.03
1050							8.84	1.33	5.69	0.45	4.04	0.20	3.36	0.13	2.57	0.07	2.03	0.04
1100							9.26	1.45	5.96	0.50	4.24	0.22	3.51	0.14	2.69	0.07	2.13	0.04
1150							9.68	1.57	6.23	0.54	4.43	0.23	3.67	0.15	2.81	0.08	2.22	0.04
1200							10.10	1.70	6.50	0.58	4.62	0.25	3.83	0.16	2.94	0.08	2.32	0.05
1250							10.52	1.83	6.77	0.63	4.81	0.27	3.99	0.17	3.06	0.09	2.42	0.05
1300									7.04	0.68	5.01	0.29	4.15	0.19	3.18	0.10	2.51	0.05
1350									7.31	0.72	5.20	0.32	4.31	0.20	3.30	0.10	2.61	0.06
1400									7.58	0.78	5.39	0.34	4.47	0.21	3.43	0.11	2.70	0.06
1450									7.86	0.83	5.59	0.36	4.63	0.23	3.55	0.12	2.80	0.07
1500									8.13	0.88	5.78	0.38	4.79	0.24	3.67	0.13	2.90	0.07
1550									8.40	0.94	5.97	0.41	4.95	0.26	3.79	0.14	2.99	0.08
1600									8.67	0.99	6.16	0.43	5.11	0.27	3.91	0.14	3.09	0.08
1650									8.94	1.05	6.36	0.46	5.27	0.29	4.04	0.15	3.19	0.09
1700									9.21	1.11	6.55	0.48	5.43	0.31	4.16	0.16	3.28	0.09
1750									9.48	1.17	6.74	0.51	5.59	0.32	4.28	0.17	3.38	0.10
1800									9.75	1.23	6.93	0.54	5.75	0.34	4.40	0.18	3.48	0.10
1900									10.29	1.36	7.32	0.59	6.07	0.38	4.65	0.20	3.67	0.11
2000											7.70	0.65	6.39	0.42	4.89	0.22	3.86	0.12
2100											8.09	0.72	6.71	0.45	5.14	0.24	4.06	0.13
2200											8.47	0.78	7.03	0.50	5.38	0.26	4.25	0.15
2300											8.86	0.85	7.35	0.54	5.63	0.28	4.44	0.16
2400													7.67	0.58	5.87	0.30	4.64	0.17
2500													7.99	0.63	6.12	0.33	4.83	0.18
2600													8.31	0.68	6.36	0.35	5.02	0.20
2700													8.63	0.72	6.61	0.38	5.22	0.21
2800													8.95	0.77	6.85	0.40	5.41	0.23
2900															7.09	0.43	5.60	0.24
3000															7.34	0.46	5.80	0.26
3300															8.07	0.55	6.38	0.31
3600															8.81	0.64	6.96	0.36
3900																	7.53	0.42
4000																	7.73	0.44

Shaded area represents velocities over 5 fps.
Use with caution.

See pg 148 for friction loss formulas

Friction Loss Characteristics

HDPE DR 13.5 128 PSI (IPS SIZE, OD CONTROLLED)

Size: 3" thru 18" Flow: 1 thru 4000GPM
 ANSI/ASAE S376.2 PE3408, ASTM D2239 C=150 PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

size	3"		4"		6"		8"		10"		12"		14"		16"		18"	
Avg.ID	2.950		3.794		5.583		7.269		9.062		10.748		11.802		13.488		15.174	
Pipe OD	3.500		4.500		6.625		8.625		10.750		12.750		14.000		16.000		18.000	
Avg Wall	0.275		0.353		0.521		0.678		0.844		1.001		1.099		1.256		1.413	
Min Wall	0.259		0.333		0.491		0.639		0.796		0.944		1.037		1.185		1.333	
Flow GPM	Velocity FPS	PSI Loss																
50	2.34	0.31	1.42	0.09	0.65	0.01												
60	2.81	0.43	1.70	0.13	0.79	0.02												
70	3.28	0.58	1.98	0.17	0.92	0.03												
80	3.75	0.74	2.27	0.22	1.05	0.03												
90	4.22	0.92	2.55	0.27	1.18	0.04												
100	4.69	1.11	2.83	0.33	1.31	0.05	0.77	0.01										
120	5.63	1.56	3.40	0.46	1.57	0.07	0.93	0.02										
140	6.56	2.08	3.97	0.61	1.83	0.09	1.08	0.03										
160	7.50	2.66	4.54	0.78	2.09	0.12	1.24	0.03										
180	8.44	3.31	5.10	0.97	2.36	0.15	1.39	0.04										
200			5.67	1.18	2.62	0.18	1.54	0.05	0.99	0.02	0.71	0.01						
220			6.24	1.41	2.88	0.22	1.70	0.06	1.09	0.02	0.78	0.01						
240			6.80	1.66	3.14	0.25	1.85	0.07	1.19	0.02	0.85	0.01						
260			7.37	1.92	3.40	0.29	2.01	0.08	1.29	0.03	0.92	0.01						
280			7.94	2.20	3.67	0.34	2.16	0.09	1.39	0.03	0.99	0.01						
300					3.93	0.38	2.32	0.11	1.49	0.04	1.06	0.02						
320					4.19	0.43	2.47	0.12	1.59	0.04	1.13	0.02						
340					4.45	0.48	2.63	0.13	1.69	0.05	1.20	0.02	1.00	0.01				
360					4.71	0.54	2.78	0.15	1.79	0.05	1.27	0.02	1.05	0.01				
380					4.97	0.59	2.93	0.16	1.89	0.06	1.34	0.02	1.11	0.02				
400					5.24	0.65	3.09	0.18	1.99	0.06	1.41	0.03	1.17	0.02				
450					5.89	0.81	3.47	0.22	2.24	0.08	1.59	0.03	1.32	0.02				
500					6.54	0.98	3.86	0.27	2.48	0.09	1.77	0.04	1.46	0.03	1.12	0.01		
550					7.20	1.17	4.25	0.33	2.73	0.11	1.94	0.05	1.61	0.03	1.23	0.02		
600					7.85	1.38	4.63	0.38	2.98	0.13	2.12	0.06	1.76	0.04	1.35	0.02		
650					8.51	1.60	5.02	0.44	3.23	0.15	2.30	0.07	1.90	0.04	1.46	0.02		
700							5.41	0.51	3.48	0.17	2.47	0.08	2.05	0.05	1.57	0.03	1.24	0.01
750							5.79	0.58	3.73	0.20	2.65	0.09	2.20	0.05	1.68	0.03	1.33	0.02
800							6.18	0.65	3.97	0.22	2.83	0.10	2.34	0.06	1.79	0.03	1.42	0.02
850							6.56	0.73	4.22	0.25	3.00	0.11	2.49	0.07	1.91	0.04	1.51	0.02
900							6.95	0.81	4.47	0.28	3.18	0.12	2.64	0.08	2.02	0.04	1.59	0.02
950							7.34	0.90	4.72	0.31	3.36	0.13	2.78	0.08	2.13	0.04	1.68	0.02
1000							7.72	0.98	4.97	0.34	3.53	0.15	2.93	0.09	2.24	0.05	1.77	0.03
1050							8.11	1.08	5.22	0.37	3.71	0.16	3.08	0.10	2.35	0.05	1.86	0.03
1100									5.47	0.40	3.89	0.18	3.22	0.11	2.47	0.06	1.95	0.03
1150									5.71	0.44	4.06	0.19	3.37	0.12	2.58	0.06	2.04	0.04
1200									5.96	0.47	4.24	0.21	3.52	0.13	2.69	0.07	2.13	0.04
1250									6.21	0.51	4.41	0.22	3.66	0.14	2.80	0.07	2.21	0.04
1300									6.46	0.55	4.59	0.24	3.81	0.15	2.92	0.08	2.30	0.04
1350									6.71	0.59	4.77	0.26	3.95	0.16	3.03	0.08	2.39	0.05
1400									6.96	0.63	4.94	0.27	4.10	0.17	3.14	0.09	2.48	0.05
1450									7.20	0.67	5.12	0.29	4.25	0.19	3.25	0.10	2.57	0.05
1500									7.45	0.71	5.30	0.31	4.39	0.20	3.36	0.10	2.66	0.06
1550									7.70	0.76	5.47	0.33	4.54	0.21	3.48	0.11	2.75	0.06
1600									7.95	0.80	5.65	0.35	4.69	0.22	3.59	0.12	2.84	0.07
1650									8.20	0.85	5.83	0.37	4.83	0.24	3.70	0.12	2.92	0.07
1700											6.00	0.39	4.98	0.25	3.81	0.13	3.01	0.07
1750											6.18	0.41	5.13	0.26	3.92	0.14	3.10	0.08
1800											6.36	0.44	5.27	0.28	4.04	0.14	3.19	0.08
1900											6.71	0.48	5.57	0.31	4.26	0.16	3.37	0.09
2000											7.06	0.53	5.86	0.34	4.49	0.18	3.54	0.10
2100											7.42	0.58	6.15	0.37	4.71	0.19	3.72	0.11
2200											7.77	0.63	6.44	0.40	4.93	0.21	3.90	0.12
2300											8.12	0.69	6.74	0.44	5.16	0.23	4.08	0.13
2400													7.03	0.47	5.38	0.25	4.25	0.14
2500													7.32	0.51	5.61	0.27	4.43	0.15
2600													7.62	0.55	5.83	0.29	4.61	0.16
2700													7.91	0.59	6.06	0.31	4.78	0.17
2800													8.20	0.63	6.28	0.33	4.96	0.18
2900															6.50	0.35	5.14	0.20
3000															6.73	0.37	5.32	0.21
3300															7.40	0.44	5.85	0.25
3600															8.07	0.52	6.38	0.29
3900																	6.91	0.34
4000																	7.09	0.36

See pg 148 for friction loss formulas

Friction Loss Characteristics

C900 DR 18 CLASS 150 (C.I.O.D.)

Size: 4" thru 12"

Flow: 25 thru 8500GPM

AWWA C900 ASTM D1784 C=150

PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

size	4"		6"		8"		10"		12"	
Avg.ID	4.234		6.088		7.984		9.792		11.646	
Pipe OD	4.800		6.900		9.050		11.100		13.200	
Avg Wall	0.283		0.406		0.533		0.654		0.777	
Min Wall	0.267		0.383		0.503		0.617		0.733	
Flow GPM	Velocity FPS	PSI Loss								
25	0.57	0.01	0.28	0.00	0.16	0.00	0.11	0.00	0.08	0.00
50	1.14	0.05	0.55	0.01	0.32	0.00	0.21	0.00	0.15	0.00
75	1.71	0.11	0.83	0.02	0.48	0.01	0.32	0.00	0.23	0.00
100	2.28	0.19	1.10	0.03	0.64	0.01	0.43	0.00	0.30	0.00
125	2.84	0.29	1.38	0.05	0.80	0.01	0.53	0.00	0.38	0.00
150	3.41	0.41	1.65	0.07	0.96	0.02	0.64	0.01	0.45	0.00
175	3.98	0.54	1.93	0.09	1.12	0.02	0.74	0.01	0.53	0.00
200	4.55	0.69	2.20	0.12	1.28	0.03	0.85	0.01	0.60	0.01
225	5.12	0.86	2.48	0.15	1.44	0.04	0.96	0.01	0.68	0.01
250	5.69	1.05	2.75	0.18	1.60	0.05	1.06	0.02	0.75	0.01
275	6.26	1.25	3.03	0.21	1.76	0.06	1.17	0.02	0.83	0.01
300	6.83	1.47	3.30	0.25	1.92	0.07	1.28	0.02	0.90	0.01
325	7.40	1.70	3.58	0.29	2.08	0.08	1.38	0.03	0.98	0.01
350	7.97	1.95	3.85	0.33	2.24	0.09	1.49	0.03	1.05	0.01
375	8.53	2.22	4.13	0.38	2.40	0.10	1.60	0.04	1.13	0.02
400	9.10	2.50	4.40	0.43	2.56	0.11	1.70	0.04	1.20	0.02
450			4.95	0.53	2.88	0.14	1.91	0.05	1.35	0.02
500			5.50	0.65	3.20	0.17	2.13	0.06	1.50	0.03
550			6.05	0.77	3.52	0.21	2.34	0.08	1.65	0.03
600			6.60	0.91	3.84	0.24	2.55	0.09	1.80	0.04
700			7.71	1.20	4.48	0.32	2.98	0.12	2.11	0.05
800			8.81	1.54	5.12	0.41	3.40	0.15	2.41	0.07
900			9.91	1.92	5.76	0.51	3.83	0.19	2.71	0.08
1000					6.40	0.62	4.26	0.23	3.01	0.10
1100					7.04	0.74	4.68	0.28	3.31	0.12
1200					7.68	0.87	5.11	0.32	3.61	0.14
1300					8.32	1.01	5.53	0.38	3.91	0.16
1400					8.96	1.16	5.96	0.43	4.21	0.19
1500					9.60	1.32	6.38	0.49	4.51	0.21
1600					10.24	1.49	6.81	0.55	4.81	0.24
1700							7.23	0.62	5.11	0.27
1800							7.66	0.69	5.41	0.29
1900							8.08	0.76	5.72	0.33
2000							8.51	0.83	6.02	0.36
2100							8.94	0.91	6.32	0.39
2200							9.36	0.99	6.62	0.43
2300									6.92	0.46
2400									7.22	0.50
2500									7.52	0.54
2600									7.82	0.58
2700									8.12	0.63
2800										
2900										
3000										
3100										
3200										
3300										
3400										
3500										
3600										
3800										
3900										
4000										
4200										
4400										
4600										
4800										
5000										
5500										
6000										
6500										
7000										
7500										
8000										
8500										

Shaded area represents velocities over 5 fps.
Use with caution.

See pg 148 for friction loss formulas

Friction Loss Characteristics

C900 DR 25 CLASS 100 (C.I.O.D.)

Size: 4" thru 12"

Flow: 25 thru 8500GPM

AWWA C900 ASTM D1784 C=150

PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

size	4"		6"		8"		10"		12"	
Avg.ID	4.392		6.314		8.282		10.158		12.080	
Pipe OD	4.800		6.900		9.050		11.100		13.200	
Avg Wall	0.204		0.293		0.384		0.471		0.560	
Min Wall	0.192		0.276		0.362		0.444		0.528	
Flow GPM	Velocity FPS	PSI Loss								
25	0.53	0.01	0.26	0.00	0.15	0.00	0.10	0.00	0.07	0.00
50	1.06	0.04	0.51	0.01	0.30	0.00	0.20	0.00	0.14	0.00
75	1.59	0.09	0.77	0.02	0.45	0.00	0.30	0.00	0.21	0.00
100	2.12	0.16	1.02	0.03	0.59	0.01	0.40	0.00	0.28	0.00
125	2.64	0.24	1.28	0.04	0.74	0.01	0.49	0.00	0.35	0.00
150	3.17	0.34	1.54	0.06	0.89	0.02	0.59	0.01	0.42	0.00
175	3.70	0.45	1.79	0.08	1.04	0.02	0.69	0.01	0.49	0.00
200	4.23	0.58	2.05	0.10	1.19	0.03	0.79	0.01	0.56	0.00
225	4.76	0.72	2.30	0.12	1.34	0.03	0.89	0.01	0.63	0.01
250	5.29	0.88	2.56	0.15	1.49	0.04	0.99	0.01	0.70	0.01
275	5.82	1.05	2.81	0.18	1.64	0.05	1.09	0.02	0.77	0.01
300	6.35	1.23	3.07	0.21	1.78	0.06	1.19	0.02	0.84	0.01
325	6.87	1.43	3.33	0.24	1.93	0.07	1.29	0.02	0.91	0.01
350	7.40	1.63	3.58	0.28	2.08	0.07	1.38	0.03	0.98	0.01
375			3.84	0.32	2.23	0.08	1.48	0.03	1.05	0.01
400			4.09	0.36	2.38	0.10	1.58	0.04	1.12	0.02
450			4.61	0.45	2.68	0.12	1.78	0.04	1.26	0.02
500			5.12	0.54	2.97	0.14	1.98	0.05	1.40	0.02
550			5.63	0.65	3.27	0.17	2.17	0.06	1.54	0.03
600			6.14	0.76	3.57	0.20	2.37	0.08	1.68	0.03
700			7.16	1.01	4.16	0.27	2.77	0.10	1.96	0.04
800			8.19	1.29	4.76	0.35	3.16	0.13	2.24	0.05
900			9.21	1.61	5.35	0.43	3.56	0.16	2.52	0.07
1000			10.23	1.95	5.95	0.52	3.95	0.19	2.80	0.08
1100					6.54	0.62	4.35	0.23	3.08	0.10
1200					7.14	0.73	4.74	0.27	3.36	0.12
1300					7.73	0.85	5.14	0.31	3.63	0.14
1400					8.33	0.97	5.54	0.36	3.91	0.16
1500					8.92	1.11	5.93	0.41	4.19	0.18
1600					9.52	1.25	6.33	0.46	4.47	0.20
1700							6.72	0.52	4.75	0.22
1800							7.12	0.57	5.03	0.25
1900							7.51	0.63	5.31	0.27
2000							7.91	0.70	5.59	0.30
2100							8.30	0.76	5.87	0.33
2200							8.70	0.83	6.15	0.36
2300									6.43	0.39
2400									6.71	0.42
2500									6.99	0.45
2600									7.27	0.49
2700									7.55	0.52
2800									7.83	0.56
2900									8.11	0.60
3000									8.39	0.64
3100									8.67	0.68
3200										
3300										
3400										
3500										
3600										
3800										
3900										
4000										
4200										
4400										
4600										
4800										
5000										
5500										
6000										
6500										
7000										
7500										
8000										
8500										

Shaded area represents velocities over 5 fps.
Use with caution.

See pg 148 for friction loss formulas

Drip Equations

Number of Emitters per Plant

$$\text{Emitters per tree} = \frac{\text{canopy area (sq. ft.)} \times 0.75}{\text{wetted area per emitter (sq. ft.)}}$$

Soil Type	Wetted Area	
	Diameter (ft.)	Area (sq. ft.)
Sand	2 - 3	3 - 7
Sandy Loam	3 - 4.5	7 - 16
Loam	3 - 5	7 - 20
Clay-Loam	4 - 6	13 - 28
Clay	5 - 7	20 - 58

Flow per zone

$$\text{Flow per zone (gpm)} = \frac{\text{Total number of drippers} \times \text{dripper flow rate (gph)}}{60 \text{ (minutes)}}$$

Precipitation Rate for Evenly Spaced Laterals and Emitters

Precipitation Rate for Drip Laterals (inches/hour)							
Emitter Flow	Emitter Spacing	Spacing Between Drip Laterals					
		6 in.	12 in.	18 in.	24 in.	30 in.	36 in.
0.53 gph	12 in.	1.62	0.81	0.54	0.40	0.32	0.27
0.53 gph	18 in.	1.08	0.54	0.36	0.27	0.22	0.18
0.53 gph	24 in.	0.81	0.40	0.27	0.20	0.16	0.13
1.02 gph	12 in.	3.11	1.56	1.04	0.78	0.62	0.52
1.02 gph	18 in.	2.07	1.04	0.69	0.52	0.41	0.35
1.02 gph	24 in.	1.56	0.78	0.52	0.39	0.31	0.26

Precipitation Rate Formula:

$$\text{Precipitation Rate (in./hr.)} = \frac{231.1 \times \text{Emitter Flow (gph)}}{\text{Lateral Spacing (in.)} \times \text{Emitter Spacing (in.)}}$$

Note: This formula applies to evenly spaced drip irrigation laterals and emitters.

Precipitation Rate for a Single Lateral

Precipitation Rate (in./hr) of a Single Row of Dripline in a Contained Landscape						
Emitter Flow	Emitter Spacing	Width of Contained Landscape				
		1 ft.	2 ft.	3 ft.	4 ft.	5 ft.
0.53 gph	12 in.	0.81	0.40	0.27	0.20	0.16
0.53 gph	18 in.	0.54	0.27	0.18	0.13	0.11
0.53 gph	24 in.	0.40	0.20	0.13	0.10	0.08
1.02 gph	12 in.	1.56	0.78	0.52	0.39	0.31
1.02 gph	18 in.	1.04	0.52	0.35	0.26	0.21
1.02 gph	24 in.	0.78	0.39	0.26	0.19	0.16

Precipitation Rate Formula:

$$\text{Precipitation Rate (in./hr.)} = \frac{231.1 \times \text{Emitter Flow (gph)}}{\text{Width of Contained Area (in.)} \times \text{Emitter Spacing (in.)}}$$

Thermal Effects on Drip Hose and Dripline

For recurring, ambient temperatures above 73°F (23°C), multiply PSI rating of selected tubing by the appropriate FACTOR from the table below. Result will be the temp-corrected maximum PSI rating for the tubing selected. For temperatures not shown, but between 73°F & 140°F (23°C & 60°C), interpolate to obtain the temp-corrected maximum PSI. Use this information to select the appropriate pressure regulator to assure tubing life expectancy and warranty coverage.

°F	°C	FACTOR
73°	23°	1.00
80°	27°	0.92
90°	32°	0.81
100°	38°	0.70
110°	43°	0.60
120°	49°	0.45
130°	54°	0.32
140°	60°	0.18

Below Grade Drip Hose & Dripline Installations

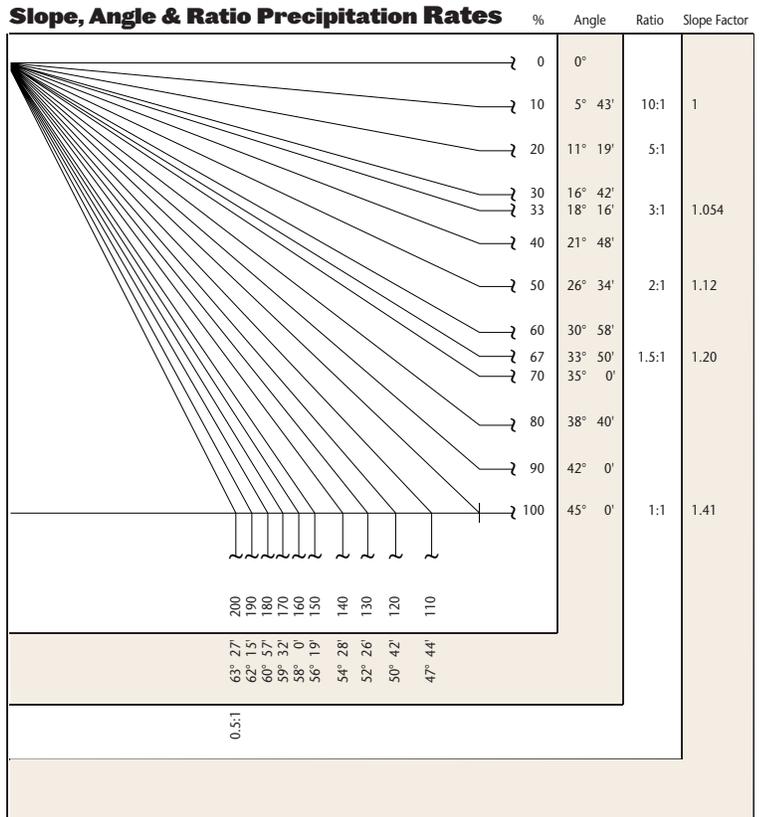
When installing Blue Stripe drip hose below grade, consult ANSI/ASAE S376.2: Design, Installation and Performance of Underground, Thermoplastic Irrigation Pipelines for installation protocols regarding trench conditions, water packing of the drip hose prior to backfill & the quality of backfill material. Failure to follow these installation protocols will shorten the life of the tubing and may void the warranty.

Pressure Loss Through Water Meters Precipitation Rate Reference Charts

Pressure Loss—psi

FLOW GPM	NOMINAL SIZE						
	½"	¾"	1"	1½"	2"	3"	4"
1	0.2	0.1					
2	0.3	0.2					
3	0.4	0.3					
4	0.6	0.5	0.1				
5	0.9	0.6	0.2				
6	1.3	0.7	0.3				
7	1.8	0.8	0.4				
8	2.3	1.0	0.5				
9	3.0	1.3	0.6				
10	3.7	1.6	0.7				
11	4.4	1.9	0.8				
12	5.1	2.2	0.9				
13	6.1	2.6	1.0				
14	7.2	3.1	1.1				
15	8.3	3.6	1.2				
16	9.4	4.1	1.4	0.4			
17	10.7	4.6	1.6	0.5			
18	12.0	5.2	1.8	0.6			
19	13.4	5.8	2.0	0.7			
20	15.0	6.5	2.2	0.8			
22		7.9	2.8	1.0			
24		9.5	3.4	1.2			
26		11.2	4.0	1.4			
28		13.0	4.6	1.6			
30		15.0	5.3	1.8	0.7		
32			6.0	2.1	0.8		
34			6.9	2.4	0.9		
36			7.8	2.7	1.0		
38			8.7	3.0	1.2		
40			9.6	3.3	1.3		
42			10.6	3.6	1.4		
44			11.7	3.9	1.5		
46			12.8	4.2	1.6		
48			13.9	4.5	1.7		
50			15.0	4.9	1.9	0.7	
52				5.3	2.1		
54				5.7	2.2		
56				6.2	2.3		
58				6.7	2.5		
60				7.2	2.7	1.0	
65				8.3	3.2	1.1	
70				9.8	3.7	1.3	
75				11.3	4.3	1.5	
80				12.8	4.9	1.6	0.7
90				16.1	6.2	2.0	0.8
100				20.0	7.8	2.5	0.9
110					9.5	2.9	1.0
120					11.3	3.4	1.2
130					13.0	3.9	1.4
140					15.1	4.5	1.6
150					17.3	5.1	1.8
160					20.0	5.8	2.1
170						6.5	2.4
180						7.2	2.7
190						8.0	3.0
200						9.0	3.2
220						11.0	3.9
240						13.0	4.7
260						15.0	5.5
280						17.3	6.3
300						20.0	7.2
350							10.0
400							13.0
450							16.2
500							20.0

Slope, Angle & Ratio Precipitation Rates



Maximum Precipitation Rates

Soil Texture	Maximum Precipitation Rates: Inches Per Hour							
	0 to 5% slope		5 to 8% slope		8 to 12% slope		12% + slope	
	Cover	Bare	Cover	Bare	Cover	Bare	Cover	Bare
Coarse sandy soils	2.00	2.00	2.00	1.50	1.50	1.0	1.0	0.50
Coarse sandy soils over compact subsoils	1.75	1.50	1.25	1.00	1.00	0.75	0.75	0.40
Uniform light sandy loams	1.75	1.00	1.25	0.80	1.00	0.60	0.75	0.40
Light sandy loams over compact subsoils	1.25	0.75	1.00	0.50	0.75	0.40	0.50	0.30
Uniform silt loams	1.00	0.50	0.80	0.40	0.60	0.30	0.40	0.20
Silt loams over compact subsoil	0.60	0.30	0.50	0.25	0.40	0.15	0.30	0.10
Heavy clay or clay loam	0.20	0.15	0.15	0.10	0.12	0.08	0.10	0.06

The maximum PR values listed are as suggested by the United States Department of Agriculture.
The values are average and may vary with respect to actual soil condition and condition of ground cover.

Wire Sizing

Method of Wire Sizing for Electrical Components of an Automatic Irrigation System

Data Needed

- Maximum current draw of the electrical unit (valve or controller) in amperes (I)
- Distance in feet (one way) to the electrical unit (F)
- The allowable voltage drop in the wire without affecting functions of the electrical unit (Vd)

Steps

1. Calculate the maximum allowable wire resistance per 1000 feet with the following formula:

$$R = \frac{*500 \times Vd}{F \times I}$$

where R = allowable wire resistance per 1000 feet.

2. Select the wire size from Chart #2 which has a resistance less than that calculated in the above formula.

Example: A valve with a minimum operating voltage of 20 volts and inrush current of .30 amps is to be located 2680 ft. from a controller. The controller minimum output voltage is 24 V ac.

The allowable voltage drop
(Vd) = 24 – 20 = 4 volts
The distance to valve (F) = 2680 ft.
The current draw (I) = .3 amps

$$R = \frac{500 \times 4}{2680 \times .3} = 2.49 \text{ ohm}/1000 \text{ ft.}$$

From Chart #2 we find that #14 AWG wire has slightly too much resistance. Therefore, choose #12 AWG copper wire. The accompanying charts are useful for quick and easy selection of wire sizes for valves with standard and optional solenoids. Chart #3 is set up to provide maximum wire runs given a standard 24 V ac valve with a minimum operating voltage of 20 volts and a controller output of 24 V ac Chart #4 is a multiplier factor for determining maximum wire runs for other controller output voltages and optional solenoids.

Example: Determine maximum wire run to a valve with model 24 V ac-D solenoid and controller output voltage of 26 volts and #14 control and ground wire.

From Chart #3 we find a length of 2590 ft. with #14 ground and control wire. From Chart #4 the multiplier factor at 26 V ac controller output with a model 24 V ac-D solenoid is 4.33. Therefore, the maximum wire distance to the valve is: 4.33 x 2590 feet = 11,215 feet.

* This assumes control wire and ground wire are the same size.

Minimum Operating Voltages at Various Static Pressures (standard 24 V ac solenoid)

Chart 1
Minimum Solenoid Operating Voltage Under Various Line Pressure

Line Pressure	Voltage (Internal Bleed Configurations)	Voltage (External Bleed Configurations)
200 psi (13,8 Bar)	21.1	
175 psi (12,1 Bar)	20.2	
150 psi (10,3 Bar)	19.1	20.0
125 psi (8,6 Bar)	18.2	19.1
100 psi (6,9 Bar)	17.1	18.2
75 psi (5,2 Bar)	16.1	17.3
50 psi (3,4 Bar)	16.0	16.4

Chart 2
Copper Wire Resistance of Various Sizes

Sizes AWG	Resistance at 20°C Ohms per 1000 ft.
4	.25
6	.40
8	.64
10	1.02
12	1.62
14	2.57
16	4.10
18	6.51

Chart 3

Maximum One-way Distance (ft.) Between Controller and Valve (standard 24 VAC solenoid) †

Valve Wire Sizing							
Ground Wire	Control Wire						
	18	16	14	12	10	8	6
18	1020	1260	1470	1640	1770	1860	1930
16	1260	1630	2000	2330	2610	2810	2960
14	1470	2000	2590	3180	3710	4150	4480
12	1640	2330	3180	4120	5050	5900	6590
10	1770	2610	3710	5050	6540	8030	9380
8	1860	2810	4150	5900	8030	10400	12770
6	1930	2960	4480	6590	9380	12770	16540

† Solenoid Model: 24 V ac Pressure: 150 psi Voltage Drop: 4 V Min. Op. Voltage: 20 V Amperage (peak): 0.3A

Multiplier Factor for Various Controller Output Voltages and Optional Low-voltage Solenoids

Chart 4

Controller Output Voltage	24-Volt Solenoids		
	24 V ac	24 V ac-D	24 VDC
28	2.00	5.77	5.45
27	1.75	5.05	4.77
26	1.50	4.33	4.09
25	1.25	3.61	3.41
24	1.00	2.88	2.73
23	.75	2.16	2.05
22	.50	1.44	1.36

Chart 5

Controller Output Voltage	12-Volt Solenoids		
	12 V.a.c.	12 V ac-D	12 VDC
16	.58	2.50	1.96
15	.50	2.08	1.63
14	.41	1.67	1.30
13	.33	1.25	.98
12	.25	.83	.65
11	.17	.42	.33

Toro Limited Warranty for Irrigation Products

The Toro Company and its affiliate, Toro Warranty Company, pursuant to an agreement between them, jointly warrants to the owner each new piece of irrigation product (featured in the current catalog at date of installation) against defects in material and workmanship for a period described herein, provided they are used for irrigation purposes under manufacturer's recommended specifications.

During the warranty period, we will repair or replace, at our option, any part found to be defective. Your remedy is limited solely to the replacement or repair of defective parts. This warranty does not apply (i) to Acts of God (e.g., lightning, flooding, etc.) unless specifically listed under the Extended Lightning Protection Warranty provided herein; or (ii) to products not manufactured by Toro when used in conjunction with Toro products; or (iii) where equipment is used or installation is performed in any manner contrary to Toro's specifications and instructions, or where equipment is altered or modified.

Return the defective part to your irrigation contractor or installer, or your local distributor who may be listed in your telephone/web directory under "Irrigation Supplies" or "Sprinkler Systems", or contact The Toro Warranty Company, 5825 Jasmine Street, Riverside, California, 92504, phone (877) 345-8676, for the location of your nearest Toro distributor, or outside the U.S., call (951) 688-9221.

Neither Toro nor Toro Warranty Company is liable for indirect, incidental or consequential damages in connection with the use of equipment, including but not limited to vegetation loss, the cost of substitute equipment or services required during periods of malfunction or resulting non-use, property damage or personal injury resulting from installer's actions, whether negligent or otherwise. Some states do not allow the exclusion of incidental or consequential damages, so this exclusion may not apply to you.

All implied warranties, including those of merchantability and fitness for use, are limited to the duration of this express warranty. Some states do not allow limitations on how long an implied warranty lasts, so this limitation may not apply to you.

This warranty gives you specific legal rights and you may have other rights, which vary from state to state.

Standard Warranty

Toro Irrigation Division products are covered by this warranty for a period of two years from the date of installation, except as otherwise noted.

Extended Three-Year Warranty

The following products are covered by this warranty for three years from date of installation: TMC-212 Series and DDC™ WP Controller.

Extended Five-Year Warranty

The following products are covered by this warranty for five years from date of installation: Fixed **Sprays**: 570Z PR and 570Z PRX Series ; **Rotors**: T5, TR50XT, T7, TS90 and 640 Series **Valves**: EZ-Flo Plus, TPV, P-220 and 220 Brass Series ; **Controllers**: EVOLUTION®, TMC-424E, Custom Command and TDC Series **Sensors**: TWRS Wireless RainSensor™ Series (receiver and transmitter)

Sentinel® Series Product Warranty

All Sentinel Centrals, with the exception of centrals covered by the Toro National Support Network (NSN®), and Sentinel hand-held remotes are covered by this warranty for a period of two years from date of installation. All Sentinel Series satellites are covered by this warranty for a period of five years from date of installation.

Landscape Drip Warranty

Warranty period from date of delivery:

DL2000™ Series Dripline

- Emitters 2 years
- Hose 5 years (prorated)
- Rootguard 7 years

Drip In® Series Dripline

- Emitters 2 years
- Hose 5 years (prorated)

Blue Stripe® Hose

- All 7 years (prorated)

Fittings

- All 1 year

Emission Devices

- All (except NGE) 1 year
- NGE® Emitter and Drip Bubblers 2 years

Filters and Components

- All 1 year

Other Accessories

- All 1 year

Grounding

The Toro Warranty for Irrigation Controllers is void if controller is not properly grounded per instruction manual. A good ground source is a mandatory component of overall surge protection for Toro Irrigation Control Systems. Grounding electrode(s) should be placed at each automatic controller or controller group locations. The resistance to the grounding electrode should not exceed 10 Ohms when measured with a Megger Earth Resistance Testing instrument or equivalent. It is the responsibility of the installer to connect all electronic irrigation equipment for which he is responsible to earth ground in accordance with Article 250 of the National Electrical Code (NEC). Even with optimum grounding, neither Toro nor Toro Warranty Company are liable for product failures due to acts of God (i.e., lightning, flooding, etc.), and these failures are not covered by warranty.



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