AC50 Silver

- **Quick-Cure Vinylester Anchoring Adhesive**
- **New Easy Dispensing Formula**
- **Free Quik-Flow Nozzle Included**

TESTED TO
ICC-ES AC58
CREEP RESISTANCE

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Powers®
FASTENING INNOVATIONS

A domestic company headquartered in Brewster, NY

AC50 Silver™

Adhesive Anchoring System

PRODUCT DESCRIPTION

The AC50 Silver is a two-component adhesive anchoring system. The system includes injection adhesive in plastic cartridges, mixing nozzles, dispensing tools and hole cleaning equipment. The AC50 Silver is designed for bonding threaded rod and reinforcing bar hardware into drilled holes in solid concrete base materials.

GENERAL APPLICATIONS AND USES

- Bonding threaded rod and reinforcing bar into hardened concrete
- Evaluated for installation and use in dry holes
- Can be installed in a range of base material temperatures

FEATURES AND BENEFITS

- Designed for use with threaded rod & reinforcing bar hardware elements
- Cartridge design allows for multiple uses using extra mixing nozzles
- Mixing nozzles proportion adhesive and provide simple delivery method into drilled holes
- Evaluated and recognized for long term and short term loading (see performance tables for applicable temperature ranges)

APPROVALS AND LISTINGS

Conforms to requirements of ASTM C 881, Types I, II, IV and V, Grade 3, Classes A & B (also meets Type III except for elongation)

Department of Transportation listings – see www.powers.com or contact transportation agency

GUIDE SPECIFICATIONS

CSI Divisions: 03151- *Concrete Anchoring.* Adhesive anchoring system shall be AC50 Silver as supplied by Powers Fasteners, Inc., Brewster, NY. Anchors shall be installed in accordance with published instructions and requirements of the Authority Having Jurisdiction.

PACKAGING

Dual (side-by-side) Cartridge: 28 fl. oz. (825 mL)

10:1 mix ratio

STORAGE LIFE & CONDITIONS

Fifteen months in a dry, dark environment with temperature ranging from 32˚F to 86˚F (0˚C to 30˚C)

ANCHOR SIZE RANGE (TYP.)

3/8" to 1" diameter threaded rod;
No. 3 to No. 8 reinforcing bar (rebar)

SUITABLE BASE MATERIALS

Normal-weight concrete

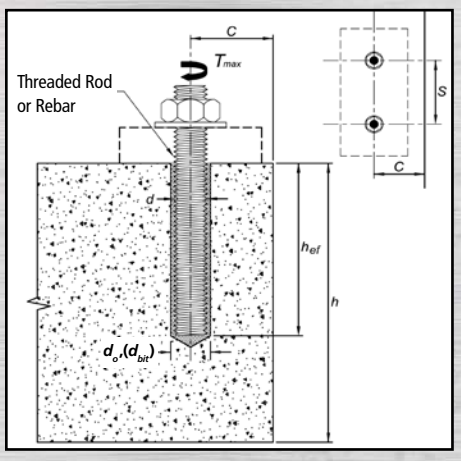
INSTALLATION SPECIFICATIONS

Installation Specifications for Threaded Rod and Reinforcing Bar

Dimension/Property		Notation	Units	Nominal Anchor Size				
Threaded Rod		-	-	**3/8"**	**1/2"**	**5/8"**	**3/4"**	**1"**
Reinforcing Bar		-	-	**#3**	**#4**	**#5**	**#6**	**#8**
Nominal anchor diameter		d	in. (mm)	0.375 (9.5)	0.500 (12.7)	0.625 (15.9)	0.750 (19.1)	0.875 (22.2)
Nominal diameter of drilled hole		d_o,(d_{bit})	in.	7/16 ANSI	9/16 ANSI	3/4 ANSI	7/8 ANSI	1-1/8 ANSI
Minimum embedment		$h_{ef,min}$	in. (mm)	2-3/8 (60)	2-3/4 (70)	3-1/8 (79)	3-1/2 (89)	4 (102)
Minimum concrete member thickness		h_{min}	in. (mm)	h_{ef} + 1-1/4 (h_{ef} + 30)		h_{ef} + 2 d_o		
Minimum spacing distance		s_{min}	in. (mm)	1-7/8 (48)	2-1/2 (64)	3-1/8 (79)	3-3/4 (95)	5 (127)
Minimum edge distance[1]		c_{min}	in. (mm)	1-7/8 (48)	2-1/2 (64)	3-1/8 (79)	3-3/4 (95)	5 (127)
Critical edge distance		c_{ac}	in. (mm)	2x h_{ef}				
Maximum torque (only possible after full cure time of adhesive)	A36 or F1554 Grade 36	T_{max}	ft.- lbs. (N-m)	10 (13)	25 (34)	50 (68)	90 (122)	165 (224)
	F593 Condition CW stainless steel rod or ASTM A193 Grade B7 carbon steel rod			15 (20)	33 (45)	60 (81)	105 (142)	165 (224)
Effective cross sectional area of threaded rod		A_{se}	in.^{2} (mm^2)	0.078 (50)	0.142 (92)	0.226 (146)	0.335 (216)	0.606 (391)
Effective cross sectional area of reinforcing bar		A_{se}	in.^{2} (mm^2)	0.110 (71)	0.200 (129)	0.310 (200)	0.440 (284)	0.790 (510)

1. For installations between the minimum edge distance and 5 anchor diameters, the tabulated maximum torque must be reduced (multiplied) by a factor of 0.40.

Detail of Steel Hardware Elements used with Injection Adhesive System



Threaded Rod and Deformed Reinforcing Bar Material Properties

Steel Description (General)	**Steel Specification** (ASTM)	**Nominal Anchor Size** (inch)	**Minimum Yield Strength,** f_y (ksi)	**Minimum Ultimate Strength,** f_u (ksi)
Carbon rod	A 36 or F 1554 and Grade 36	3/8 through 1-1/4	36.0	58.0
Stainless rod (Alloy 304 / 316)	F 593, Condition CW	3/8 through 5/8	65.0	100.0
		3/4 through 1	45.0	85.0
High strength carbon rod	A 193, Grade B7	3/8 through 1	105.0	125.0
Grade 60 reinforcing bar	A 615, A 767, or A 996	3/8 through 1 (#3 through #8)	60.0	90.0
Grade 40 reinforcing bar	A 615	3/8 through 3/4 (#3 through #6)	40.0	70.0

AC50 Silver™

INSTALLATION INSTRUCTIONS FOR SOLID BASE MATERIALS

Gel (working) Time and Curing Table

Temperature of Base Material		Gel (Working) Time	Full Curing Time
°F	°C		
5	-15	120 minutes	48 hours
14	-10	90 minutes	24 hours
23	-5	90 minutes	14 hours
32	0	45 minutes	7 hours
41	5	35 minutes	4 hours
60	15	15 minutes	3 hours
68	20	8 minutes	90 minutes
86	30	4 minutes	60 minutes
95	35	3 minutes	45 minutes

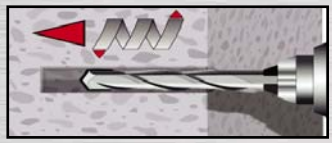
For installations in base material temperature between 5°F and 32°F the cartridge temperature must be conditioned to between 68°F and 95°F (20°C - 35°C).

Hole Cleaning Equipment Selection Table for AC50 Silver

Threaded Rod Diameter (Inch)	Rebar Size (No.)	ANSI Drill Bit Diameter (Inch)	Min. Brush Diameter, Dmin (Inches)	Brush Length, L (Inches)	Steel Wire Brush (Cat. #)	Blowout Tool	Number Of Cleaning Actions
3/8	#3	7/16	0.475	6-3/4	08284	Compressed air nozzle only (min. 90 psi)	4x blowing 4x brushing 4x blowing
1/2	#4	9/16	0.600	6-3/4	08285		
5/8	#5	3/4	0.790	7-7/8	08278		
3/4	#6	7/8	0.920	7-7/8	08287		
7/8	-	1	1.045	11-7/8	08288		
1	#8	1-1/8	1.175	11-7/8	08289		

INSTALLATION INSTRUCTIONS FOR SOLID BASE MATERIALS

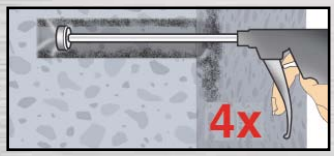
DRILLING



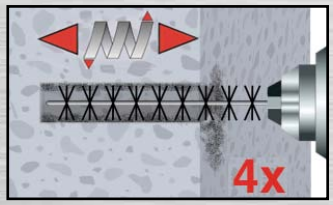
1 - Drill a hole into the base material with a rotary hammer drill tool to the size and embedment required by the selected anchor (reference installation specifications for threaded rod and reinforcing bar). The tolerances of the carbide drill bit should meet the requirements of ANSI Standard B212.15. **Precaution:** Wear suitable eye and skin protection. Avoid inhalation of dusts during drilling and/or removal.

Note! After drilling and prior to hole cleaning, all standing water in the drilled bore hole must be removed if present to facilitate a dry hole condition. (e.g. vacuum, compressed air, etc.)

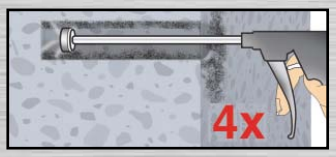
HOLE CLEANING: BLOW 4x, BRUSH 4x, BLOW 4x



2a - Starting from the bottom or back of the anchor hole, blow the hole clean using a compressed air nozzle (min. 90 psi) a minimum of four times (4x).
• Use a compressed air nozzle (min. 90 psi) for anchor rod 3/8" to 1" diameter or reinforcing bar (rebar) sizes #3 to #8.

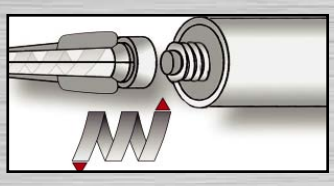


2b - Determine wire brush diameter (reference hole cleaning equipment selection table) and attach the brush with adaptor to a rotary drill tool or battery screw gun. Brush the hole with the selected wire brush a minimum of four times (4x). A brush extension (supplied by Powers Fasteners, Cat. #08282) should be used for holes drilled deeper than the listed brush length.
The wire brush diameter should be checked periodically during use. The brush must be replaced if it becomes worn (less than D_{min}, reference hole cleaning equipment selection table) or does not come into contact with the sides of the drilled hole.



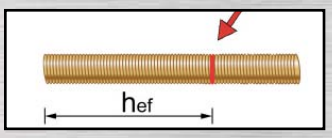
2c - Finally, blow the hole clean again a minimum of four times (4x).
• Use a compressed air nozzle (min. 90 psi) for anchor rod 3/8" to 1" diameter or reinforcing bar (rebar) sizes #3 to #8. When finished the hole should be clean and free of dust, debris, ice, grease, oil or other foreign material.

PREPARING

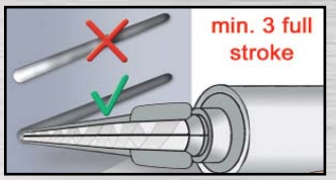


3- Check adhesive expiration date on cartridge label. Do not use expired product. Review Material Safety Data Sheet (MSDS) before use. Cartridge temperature must be between 32°F - 95°F (0°C - 35°C) when in use. Consideration should be given to the reduced gel time of the adhesive in warm temperatures.

Attach a supplied mixing nozzle to the cartridge. Do not modify the mixer in any way and make sure the mixing element is inside the nozzle. Load the cartridge into the correct dispensing tool. A new mixing nozzle must be used for every working interruption longer than the published working times (reference gel time and curing time table) as well as for new cartridges.

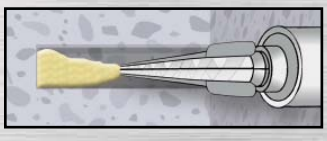


4 - Prior to inserting the anchor rod or rebar into the filled bore hole, the position of the embedment depth has to be marked on the anchor. Verify anchor element is straight and free of surface damage.



5 - For new cartridges and nozzles: prior to dispensing into the anchor hole, squeeze out separately a minimum three full strokes of the mixed adhesive. Discard non-uniform adhesive until the mixed adhesive shows a consistent **gray** color.
Review and note the published working and cure times (reference gel time and curing time table) prior to injection of the mixed adhesive into the cleaned anchor hole.

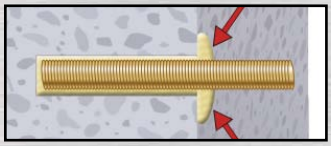
INSTALLATION



6 - Fill the cleaned hole approximately two-thirds full with mixed adhesive starting from the bottom or back of the anchor hole. Slowly withdraw the mixing nozzle as the hole fills to avoid creating air pockets or voids. For embedment depth greater than 7-1/2" an extension nozzle must be used with the mixing nozzle.

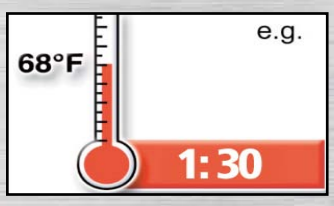
Piston plugs (see Adhesive Piston Plug Table) must be used with and attached to mixing nozzle and extension tube for horizontal installations with anchor rod from 3/4" to 1" diameter and rebar sizes #6 to #8 where embedment exceeds 8 anchors diameters. Insert piston plug to the back of the drilled hole and inject as described in the method above. During installation the piston plug will be naturally extruded from the drilled hole by the adhesive pressure.
Attention! Do not install anchors overhead.

7 - The anchor should be free of dirt, grease, oil or other foreign material. Push clean threaded rod or reinforcing bar into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. Observe the gel (working) time.



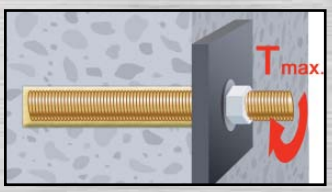
8 - Be sure that the anchor is fully seated at the bottom of the hole and that some adhesive has flowed from the hole and all around the top of the anchor. If there is not enough adhesive in the hole, the installation must be repeated. Minor adjustments to the anchor may be performed during the gel time but the anchor shall not be moved after final placement and during cure.

CURING & FIXTURE



9 - Allow the adhesive anchor to cure to the specified full curing time prior to applying any load (reference gel time and curing time table).

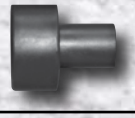
Do not disturb, torque or load the anchor until it is fully cured.



10 - After full curing of the adhesive anchor, a fixture can be installed to the anchor and tightened up to the maximum torque (reference gel time and curing time table) by using a calibrated torque wrench.

Take care not to exceed the maximum torque for the selected anchor.

Adhesive Piston Plugs

Threaded Rod Diameter (Inch)	Rebar Size (No.)	ANSI Drill Bit Diameter (Inch)	Plug Size (Inch)	Plastic Plug (Cat. #)	Horizontal Installations
3/4	#6	7/8	7/8	08300	
7/8	#7	1	1	08301	
1	#8	1-1/8	1-1/8	08303	

A plastic extension tube must be used with piston plugs.

AC50 Silver™

ULTIMATE AND ALLOWABLE LOAD CAPACITIES FOR AC50 SILVER

Installed with Threaded Rod in Normal Weight Concrete (based on bond strength/concrete capacity)[1,2,3,4,5,6,7]

Nominal Anchor Diameter (in.)	Minimum Embedment Depth h_{ef} (in.)	Minimum Concrete Compressive Strength					
		2,500 psi		3,000 psi		4,000 psi	
		Ultimate Tension Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)	Ultimate Tension Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)	Ultimate Tension Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)
3/8	3-3/8	6,520	1,630	6,765	1,690	7,165	1,790
1/2	4-1/2	11,860	2,965	12,300	3,075	13,025	3,255
5/8	5-5/8	18,520	4,630	19,205	4,800	20,345	5,085
3/4	6-3/4	22,420	5,605	23,255	5,815	24,630	6,160
1	9	29,005	7,250	30,080	7,520	31,860	7,965

1. Allowable load capacities listed are calculated using an applied safety factor of 4.0. Consideration of safety factors of 10 or higher may be necessary depending on the application, such as life safety or overhead.
2. Linear interpolation may be used to determine allowable loads for intermediate embedments and compressive strengths.
3. The tabulated load values are applicable to single anchors installed at critical edge and spacing distances and where the minimum member thickness is 2.5 times the embedment depth.
4. The tabulated load values are applicable for dry concrete. Holes must be drilled with a hammer drill and an ANSI carbide drill bit. Installations in wet concrete or in water-filled holes may require a reduction in capacity. Contact Powers Fasteners for more information concerning these installation conditions.
5. Adhesives experience reductions in capacity at elevated temperatures. See the in-service temperature chart for allowable load capacities.
6. Allowable bond strength/concrete capacity must be checked against allowable steel strength in tension to determine the controlling allowable load.
7. Allowable shear capacity is controlled by allowable steel strength for the given conditions.

Installed with Reinforcing Bar in Normal Weight Concrete (based on bond strength/concrete capacity)[1,2,3,4,5,6,7]

Nominal Anchor Diameter d (#)	Minimum Embedment Depth h_{ef} in.	Minimum Concrete Compressive Strength					
		2,500 psi		3,000 psi		4,000 psi	
		Ultimate Tension Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)	Ultimate Tension Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)	Ultimate Tension Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)
#3	3 3/8	6,225	1,555	6,460	1,615	6,840	1,710
#4	4 1/2	10,480	2,620	10,870	2,720	11,515	2,880
#5	5 5/8	16,830	4,210	17,455	4,365	18,490	4,625
#6	6 3/4	15,545	3,885	16,120	4,030	17,075	4,270
#6	9	16,015	4,005	16,610	4,155	17,590	4,400
#8	9	34,095	8,525	35,360	8,840	37,455	9,365
#8	12	39,060	9,765	40,510	10,130	42,910	10,730

1. Allowable load capacities listed are calculated using an applied safety factor of 4.0. Consideration of safety factors of 10 or higher may be necessary depending on the application, such as life safety or overhead.
2. Linear interpolation may be used to determine allowable loads for intermediate embedments and compressive strengths.
3. The tabulated load values are applicable to single anchors installed at critical edge and spacing distances and where the minimum member thickness is 2.5 times the embedment depth.
4. The tabulated load values are applicable for dry concrete. Holes must be drilled with a hammer drill and an ANSI carbide drill bit. Installations in wet concrete or in water-filled holes may require a reduction in capacity. Contact Powers Fasteners for more information concerning these installation conditions.
5. Adhesives experience reductions in capacity at elevated temperatures. See the in-service temperature chart for allowable load capacities.
6. Allowable bond strength/concrete capacity must be checked against allowable steel strength in tension to determine the controlling allowable load.
7. Allowable shear capacity is controlled by allowable steel strength for the given conditions.

ALLOWABLE LOAD CAPACITIES FOR AC50 SILVER

Installed into Uncracked Normal-Weight Concrete with Threaded Rod and Reinforcing Bar (Based on Steel Strength)[1,2,3]

Nominal Rod Diameter or Rebar Size (in. or #)	Steel Elements – Threaded Roc and Reinforcing Bar									
	A36 or F1554 Grade 36		A193, Grade B7		F 593, CW (SS)		Grade 60 Rebar		Grade 40 Rebar	
	Tension (lbs.)	Shear (lbs.)	Tension (lbs.)	Shear (lbs.)	Tension (lbs.)	Shear (lbs.)	Tension (lbs.)	Shear (lbs.)	Tension (lbs.)	Shear (lbs.)
3/8 or #3	2,115	1,090	4,375	2,225	3,630	1,870	2,655	1,320	2,210	1,310
1/2 or #4	3,755	1,940	7,775	4,055	6,470	3,330	4,710	2,345	3,925	2,380
5/8 or #5	5,870	3,025	12,150	6,260	10,130	5,210	7,370	3,670	6,135	3,690
3/4 of #6	8,455	4,355	17,495	9,010	12,400	6,390	10,590	5,285	8,835	5,235
7/8 or #7	11,510	5,930	23,810	12,265	16,860	8,680	14,425	7,195	12,025	7,140
1 or #8	15,035	7,745	31,100	16,020	22,020	11,340	18,840	9,400	15,708	9,400
1-1/4	23,485	12,100	48,560	25,035	34,420	17,780	-	-	-	-

1. Allowable load capacities listed are calculated for the steel element type as defined by AISC (ASD).
2. Allowable steel strength in tension must be checked against allowable bond strength/concrete capacity in tension to determine the controlling allowable load.
3. The tabulated load values are applicable to single anchors installed at critical edge and spacing distances and where the minimum member thickness is 2.5 times the embedment depth.

In-Service Temperature Chart For Allowable Load Capacities[1]

Base Material Temperature		Reduction Factor For Temperature
° F	° C	
0	-18	1.00
32	0	1.00
50	10	1.00
70	20	1.00
90	30	0.91
110	40	0.82
140	60	0.69
180	80	0.52

1. Linear interpolation may be used to derive reduction factors for temperatures between those listed.

AC50 Silver™

ORDERING INFORMATION

AC50 Silver Cartridges

Cat. No.	Description	Std. Ctn.	Pallet
08497	AC50 Silver 28 fl. oz. dual cartridge	8	400

One AC50 Silver mixing nozzle is packaged with each cartridge.
AC50 Silver mixing nozzles must be used to ensure complete and proper mixing of the adhesive.

Cartridge System Mixing Nozzles

Cat. No.	Description	Std. Pkg.	Std. Ctn.
08294	Extra mixing nozzle (with 8" extension) for AC50 Silver	2	24
08281	Mixing nozzle extension, 8" minimum	2	24

Dispensing Tools for Injection Adhesive

Cat. No.	Description	Std. Box	Std. Ctn.
08494	28 fl. oz. Standard metal manual tool	1	10
08444	28 fl. oz. Battery powered tool (cordless)	1	-
08496	28 fl. oz. Pneumatic tool	1	-

Hole Cleaning Tools and Accessories

Cat. No.	Description	Std. Pkg.
08284	Wire brush for 7/16"ANSI hole (3/8" rod or #3 rebar)	1
08285	Wire brush for 9/16"ANSI hole (1/2" rod or #4 rebar)	1
08286	Wire brush for 11/16"ANSI hole (5/8" rod or #5 rebar)	1
08278	Wire brush for 3/4"ANSI hole (5/8" rod or #5 rebar)	1
08287	Wire brush for 7/8"ANSI hole (3/4" rod or #6 rebar)	1
08289	Wire brush for 1-1/8"ANSI hole (1" rod or # 8 rebar)	1
08283	SDS-Plus adapter for steel brushes	1
08296	Standard drill adapter for steel brushes (e.g. Jacobs Chuck)	1
08282	Steel brush extension, 12"	1
08292	Air compressor nozzle with extension	1
08465	Adjustable torque wrench with 1/2" square drive (10 to 150 ft.-lbs.)	1
08466	Adjustable torque wrench with 1/2" square drive (25 to 250 ft.-lbs.)	1

Adhesive Pistons

Cat. No.	Description	ANSI Drill Dia.	Threaded Rod Size	Reinforcing Bar Size	Std. Bag	Std. Ctn.
08300	7/8" Plug	7/8"	3/4"	#6	10	100
08301	1" Plug	1"	7/8"	#7	10	100
08303	1-1/8" Plug	1-1/8"	1"	#8	10	100

POWERS FASTENERS **BRANCH INFORMATION**

USA LOCATIONS

CITY	ADDRESS	CONTACT	PHONE	FAX
Alabama	5405 Buford Hwy Suite 410 Norcross, GA 30071-3984	Jeff Hatchett	205-520-6044	678-966-9242
Atlanta	5405 Buford Hwy Suite 410 Norcross, GA 30071-3984	Ryan Raica	678-966-0000	678-966-9242
Boston	2 Powers Lane, Brewster, NY 10509	Jack Armour	800-524-3244	914-576-6483
Charlotte	349 L West Tremont Avenue, Charlotte, NC 28203	Bob Aurisy	704-375-5012	704-376-5517
Chicago	2472 Wisconsin Avenue, Downers Grove, IL 60515	Dan Gilligan	630-960-3156	630-960-3912
Dallas	10625 King Williams Drive, Dallas, TX 75220	Matt Henderson	972-506-9258	972-506-9290
Denver	2475 West Second Street #35, Denver, CO 80223	Jared Hemmert	303-922-9202	303-922-9228
Detroit	21600 Wyoming Avenue, Oak Park, MI 48237	Glen Gaskill	248-543-8600	248-543-8601
Florida	2412 Lynx Lane, Orlando, FL 32804	John Christy	813-626-4500	813-626-4545
Houston	13833 North Promenade, Suite 100, Stafford, TX 77477	Vaughn Eshelman	281-491-0351	281-491-0367
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