Morrison Maierle
engineers ▪ surveyors ▪ planners ▪ scientists

SHOP DRAWING SUBMITTAL REVIEW

PROJECT NAME:	Carroll College Anthrozoology
DATE :	12.3.2019
DESCRIPTION:	HVAC Submittals

MORRISON MAIERLE INC. REVIEW				RESPONSE REQUIRED OF CONTRACTOR	
☐	No Exceptions Taken	☐	Rejected	☐	Resubmittal Not Required
☒	Make Corrections Noted	☒	Comments Attached	☐	Resubmit in Entirety
☐	Revisions Needed			☒	Revise and Resubmit Noted Items
				☐	Submit Specified Item(s)

This review is only for general conformance with the design concept of this project and general compliance with the information given in the contract documents, based on the information provided by the Contractor. Corrections or comments made on the shop drawings during the review do not relieve the Contractor from compliance with the project drawings and specifications. The contractor remains responsible for all details and accuracy for confirming and correcting all quantities and dimensions, for selecting fabrication processes and techniques of construction, for coordinating work with all trades, and for performing all work in a safe and satisfactory manner.

Morrison Maierle, Inc.

By: K. Ireland Date: 12-3-19

REMARKS:

1. **Spiral Duct**
   a. No exceptions taken
2. **Flex Duct**
   a. No exceptions taken
3. **High Efficiency Take-Offs**
   a. No exceptions taken
4. **Exhaust Fans**
   a. **EF-1, EF-2, EF-3 and EF-4**
      i. No exceptions taken
5. **GRDs**
   a. **S-1, S-2, S-3, S-4, S-5, S-6, R-1, R-3, F-1**
      i. No exceptions taken

   b. **R-2**
      i. There is no NC, Throw, Velocity or Pressure Drop Data associated with this GRD. Please re-submit with airflow data.
6. **Volume Dampers**
   a. No exceptions taken
7. **Electric Heaters**
   a. **EH-1, EH-2 and EH-3**
      i. No exceptions taken
8. **Louvers**
   a. **L-1 and L-2**
      i. No exceptions taken

9. Furnaces

a. FN-1, FN-2 and FN-3

i. No exceptions taken

10. Condensing Units

a. CU-1, CU-2 and CU-3

i. No exceptions taken

11. Controls

a. No exceptions taken

Sleeping Giant Mechanical

Letter of Transmittal

Jake Dolezal
Matt Dolezal
1 Depot Hill Rd
PO Box 436
Boulder, MT 59602
406.594.5541
406.459.1234

To: Dick Anderson Construction

Date: 11/14/2019

Job #: Carroll College Canine Center

Re: Carroll College Anthrozoology

Attn: Jake Ziegler

We are sending you: ☐ Attached ☐ Under separate cover via _____ the following:

☐ Drawings ☐ Plans ☐ Prints ☐ Specifications

☐ O/M's ☐ As Builts ☐ Samples ☒ Submittals

Copies	Date	Number	Description
1	11/14/2019		Spiral Pipe
			Duct Take Offs
			Flex Duct
			Manual Dampers
			Grilles and Registers
			Furnaces
			Condensers

Transmitted as checked below:

☒ For approval ☐ Approved as noted ☐ Resubmit _____ copies for approval

☐ For your use ☐ Approved as submitted ☐ Submit _____ copies for distribution

☐ As requested ☐ Returned for corrections ☐ Return _____ corrected copies

☐ For review ☐ Other _____

Remarks:

Copy to:

Signed: Jake Dolezal

HVAC SUBMITTALS:

Project: Carroll College Anthrozoology

Architect: SMA Architects

Engineer: Morrison-Maierle

Contractor: Sleeping Giant Mechanical

Manufacturers Rep: S. Conley Sales, Inc.

DICK ANDERSON CONSTRUCTION

Submittal Acknowledgement

- ◉ Reviewed
- ☐ Note Markings
- ☐ Revise and Resubmit
- ☐ Rejected

BY jziegler 11/15/2019 8:31:19 AM

THIS SUBMITTAL REVIEWED FOR GENERAL CONFORMITY WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS. REVIEW DOES NOT RELIEVE THE SUBMITTER FROM ANY OBLIGATIONS UNDER THE CONTRACT DOCUMENTS. SUBCONTRACTOR / SUPPLIER SHALL BE RESPONSIBLE FOR:

1. Verification of dimensions.
2. Conformance with all governing codes.
3. Means, methods, techniques, sequences and procedures of construction.
4. Coordination with other trades.

S. CONLEY Established 2001

384 Gallatin Park Dr. Suite 201, Bozeman, MT 59715, Ph 406.585.7333 Fax 585.7666

Table of Contents:

ESTIMATED LEAD TIMES OF EQUIPMENT AS OF 11/12/19:

Lead Times are working days/weeks to ship from factory

Does not include transit time

Spiral Pipe	2-3 Weeks
Flex Duct	2 Weeks
High Efficiency Take-Offs	2 Weeks
Exhaust Fans	4-5 Weeks
Grilles, Registers and Diffusers	4-5 Weeks
Volume Dampers	2-3 Weeks
Electric Heaters	4-5 Weeks
Louvers	4-5 Weeks

384 Gallatin Park Dr. Suite 201, Bozeman, MT 59771
(O) 406.585.7333 (F) 406.585.7666

Carroll College Anthrozoology

Spiral Pipe

Spiral Pipe and Fittings – L&L Fabrication

1 – Lot low pressure galvanized single wall spiral pipe and fittings with couplers every 10'

ABOVE 12" DIAMETER:

LP DUCT	
14"	50
16"	15
LP FITTING - 90	
14"	1
16"	1
LP FITTING- Tee	
14/12/10	1

REGISTER CANS – OUTSIDE DIMENSIONS WITH 1" LIP TURNED IN

20/8 ON 14"	2
20/8 ON 16"	2

12" DIAMETER AND BELOW:

LP DUCT	
10"	55
12"	205
6"	85
8"	135
LP FITTING - 45	
12"	4
6"	4
8"	2
LP FITTING - 90	
10"	1
12"	6
6"	5

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8"	5
LP FITTING - CAP	
12" PIPE CAP	4
8" PIPE CAP	2
LP FITTING- Tee	
12/12/10	9
LP FITTING-CROSS	
12/12/10/10	1

REGISTER CANS – OUTSIDE DIMENSIONS WITH 1” LIP TURNED IN

20/8 ON 10"	2
20/8 ON 12"	2
20/8 ON 8"	2

See attached copy of equipment schedule and additional submittal data.

SUBMITTAL
SINGLE WALL ROUND

LEWIS & LAMBERT

QUOTE #: 1908-155 DATE: 11/12/2019

PROJECT: Carroll College Anthrozoology LOCATION: Helena, Montana

ENGINEER: N/A CUSTOMER: S. Conley Sales

SYSTEM
Low Pressure-Option 1

PRODUCT
Single Wall Round Spiral Duct and Matching Fittings.

CONSTRUCTION
All spiral pipe and fittings are manufactured in accordance with the latest edition of SMACNA 2005 Duct Construction Standards

MATERIAL

☐ G-60 Paint Grip ☑ G-90 Galvanized

Steel is of lock-forming quality, conforming to A-653 standards manufactured as Spiral Lock-seam in accordance with the following table:

Spiral Duct	Gauge	Fittings	Gauge
4" - 26"	26	4" - 26"	24
28 - 42	24	28 - 42	22
44" - 66"	22	44" - 66"	20

Branch Taps

☐ Conical Taps
☑ High Efficiency Taps
☐ Lateral Taps
☐ Straight Taps

FITTING / ASSEMBLY SEAMS

☑ Tack Wire Welded and Sealed
☐ Full Wire Welded

*SPIRAL DUCT/PIPE * FITTINGS * SEALANT * ACOUSTICAL/THERMAL PANELS * ANGLE RINGS*
P. O. Box 14439 5936 EDEN DRIVE FORT WORTH, TX 76117
800-299-8340 *email* spiral@lewisandlambert.com * 817-834-2971 *fax*
WEB PAGE www.lewisandlambert.com/spiral.html

SUBMITTAL
SINGLE WALL ROUND

LEWIS & LAMBERT

CONNECTIONS

- [x] Coupling Slip-Fit
- [ ] Dura Flange

FITTING INFORMATION

- [ ] PROVIDED AS PIPE AND LOOSE TAPS
- [ ] PROVIDED AS PIPE WITH MANIFOLDED TAPS AND REDUCERS
- [x] PROVIDED AS PIPE AND SEPARATE BARREL FITTINGS

ELBOW RADIUS PROVIDED AS: [x] 1 1/2 x Diameter

COMMENTS:

*SPIRAL DUCT/PIPE * FITTINGS * SEALANT * ACOUSTICAL/THERMAL PANELS * ANGLE RINGS*
P. O. Box 14439 5936 EDEN DRIVE FORT WORTH, TX 76117
800-299-8340 *email* spiral@lewisandlambert.com * 817-834-2971 *fax*
WEB PAGE www.lewisandlambert.com/spiral.html

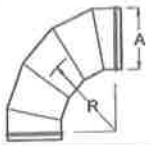
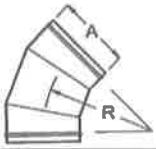
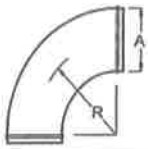
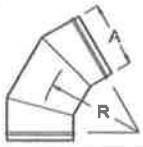
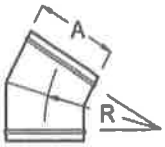
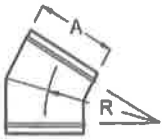
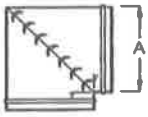
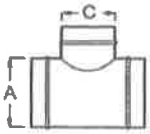
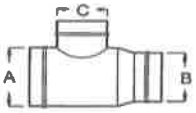
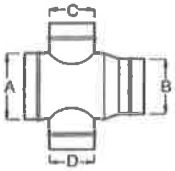
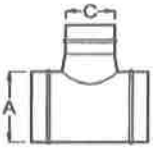
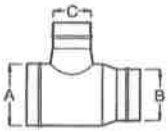
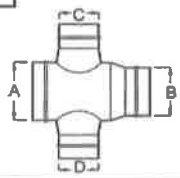
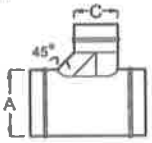
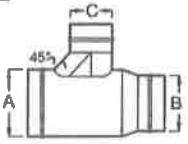
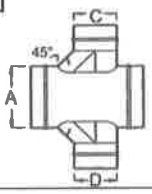
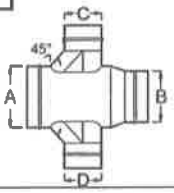
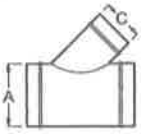
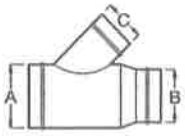
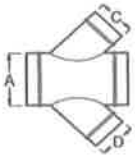
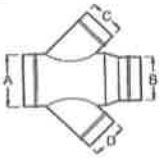
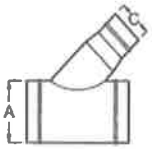
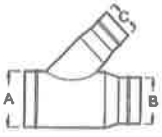
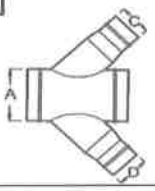
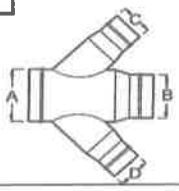
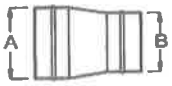
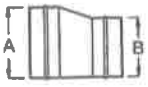
☑ SPIRAL PIPE

LEWIS & LAMBERT
SPIRAL DIVISION

LONG SEAM PIPE ☐

Project: Carroll College Anthrozoology Quote #: 1908-155

SINGLE WALL ROUND PIPE & FITTINGS

☑  E5-90	☐  E3-45	☐  SE-90	☐  SE-45	☐  E3-60
☐  E2-30	☐  E2-22 1/2	☐  EV2-90	☐  HTE3-90	☐  HTE2-45
☐  T1	☐  T1R	☐  T2R	☐  CT1	☐  CT1R
☐  CT2R	☐  HT1	☑  HT1R	☐  HT2	☐  HT2R
☐  L1	☐  L1R	☐  L2	☐  L2R	☐  CL1
☐  CL1R	☐  CL2	☐  CL2R	☐  R1	☐  ER1

Dimensions: A = Inlet Size B = Outlet Size C, D = Branch Sizes R = Radius

***Items checked or highlighted are included in this project.**

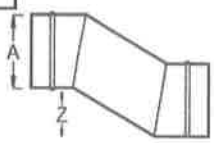
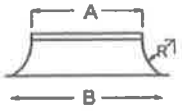
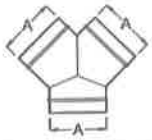
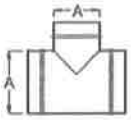
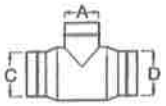
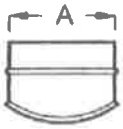
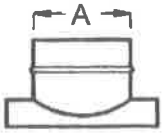
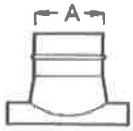
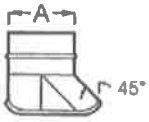
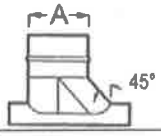
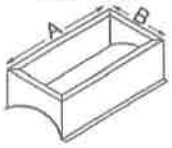
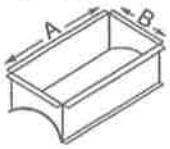
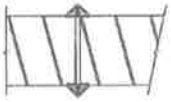
☑ SPIRAL PIPE

LEWIS & LAMBERT
SPIRAL DIVISION

LONG SEAM PIPE ☐

Project: Carroll College Anthrozoology Quote #: 1908-155

SINGLE WALL ROUND PIPE AND FITTINGS

☐  OS	☐  BM	☐  Y2	☐  Y2	☐  BT
☐  BTR	☐  DEP	☐  FEC	☐  SQR	☑  DC
☐  FC	☐  TP	☐  TSP	☐  TCP	☐  TCSP
☐  LP	☐  LSP	☐  HTP	☐  HTSP	☐  LCP
☐  LCSP	☐ Flanges In  PRTI	☐ Flanges Out  PRTO	☑ Flanges In  PTRBI	☐ Flanges Out  PTRBO
☐  Dura-Flange	☐  SpiralMate	☐  Angle Ring		

Dimensions: **A** = Inlet Size **B** = Outlet Size **C, D** = Branch Sizes **R** = Radius

***Items checked or highlighted are included in this project.**

SUBMITTAL
SINGLE WALL ROUND

LEWIS & LAMBERT

QUOTE #: 1908-155 DATE: 11/12/2019

PROJECT: Carroll College Anthrozoology LOCATION: Helena, Montana

ENGINEER: N/A CUSTOMER: S. Conley Sales

SYSTEM
Low Pressure-Option 2

PRODUCT
Single Wall Round Spiral Duct and Matching Fittings.

CONSTRUCTION
All spiral pipe and fittings are manufactured in accordance with the latest edition of SMACNA 2005 Duct Construction Standards

MATERIAL

☐ G-60 Paint Grip ☑ G-90 Galvanized

Steel is of lock-forming quality, conforming to A-653 standards manufactured as Spiral Lock-seam in accordance with the following table:

Spiral Duct	Gauge	Fittings	Gauge
4" - 26"	26	4" - 26"	24
28 - 42	24	28 - 42	22
44" - 66"	22	44" - 66"	20

Branch Taps

☐ Conical Taps ☐ Lateral Taps

☑ High Efficiency Taps ☐ Straight Taps

FITTING / ASSEMBLY SEAMS

☑ Tack Wire Welded and Sealed

☐ Full Wire Welded

*SPIRAL DUCT/PIPE * FITTINGS * SEALANT * ACOUSTICAL/THERMAL PANELS * ANGLE RINGS*
P. O. Box 14439 5936 EDEN DRIVE FORT WORTH, TX 76117
800-299-8340 *email* spiral@lewisandlambert.com * 817-834-2971 *fax*
WEB PAGE www.lewisandlambert.com/spiral.html

SUBMITTAL
SINGLE WALL ROUND

LEWIS & LAMBERT

CONNECTIONS

- [x] Coupling Slip-Fit
- [ ] Dura Flange

FITTING INFORMATION

- [ ] PROVIDED AS PIPE AND LOOSE TAPS
- [ ] PROVIDED AS PIPE WITH MANIFOLDED TAPS AND REDUCERS
- [x] PROVIDED AS PIPE AND SEPARATE BARREL FITTINGS

ELBOW RADIUS PROVIDED AS: [x] 1 1/2 x Diameter

COMMENTS:

*SPIRAL DUCT/PIPE * FITTINGS * SEALANT * ACOUSTICAL/THERMAL PANELS * ANGLE RINGS*
P. O. Box 14439 5936 EDEN DRIVE FORT WORTH, TX 76117
800-299-8340 *email* spiral@lewisandlambert.com * 817-834-2971 *fax*
WEB PAGE www.lewisandlambert.com/spiral.html

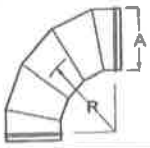
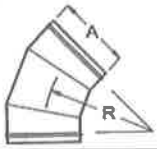
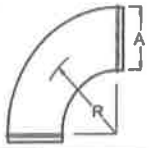
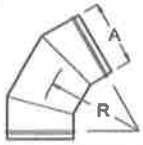
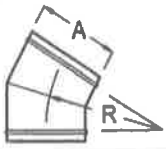
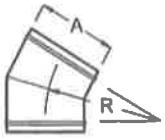
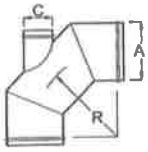
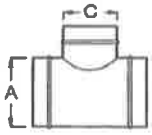
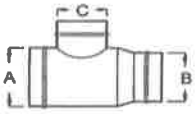
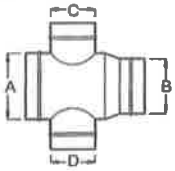
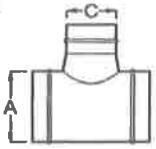
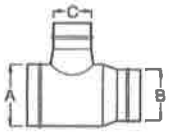
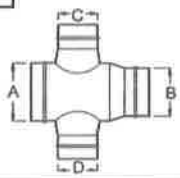
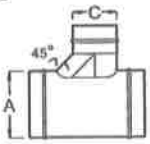
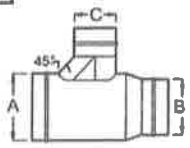
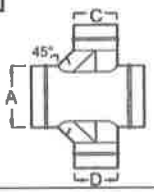
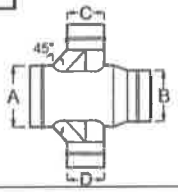
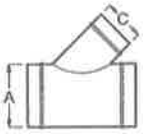
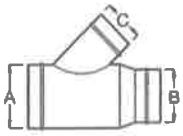
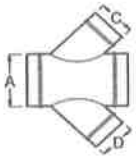
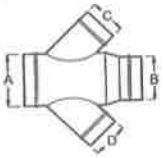
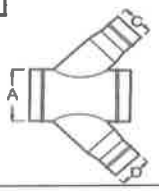
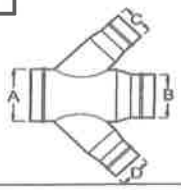
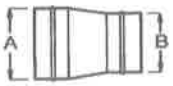
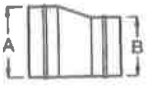
☑ SPIRAL PIPE

LEWIS & LAMBERT
SPIRAL DIVISION

LONG SEAM PIPE ☐

Project: Carroll College Anthrozoology Quote #: 1908-155

SINGLE WALL ROUND PIPE & FITTINGS

☐  E5-90	☐  E3-45	☑  SE-90	☑  SE-45	☐  E3-60
☐  E2-30	☐  E2-22 1/2	☐  EV2-90	☐  HTE3-90	☐  HTE2-45
☐  T1	☐  T1R	☐  T2R	☐  CT1	☐  CT1R
☐  CT2R	☑  HT1	☐  HT1R	☑  HT2	☐  HT2R
☐  L1	☐  L1R	☐  L2	☐  L2R	☐  CL1
☐  CL1R	☐  CL2	☐  CL2R	☐  R1	☐  ER1

Dimensions: A = Inlet Size B = Outlet Size C, D = Branch Sizes R = Radius

***Items checked or highlighted are included in this project.**

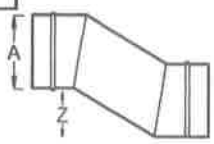
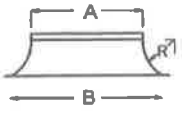
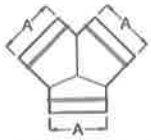
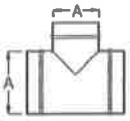
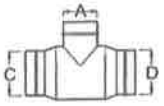
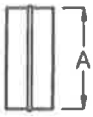
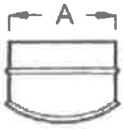
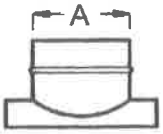
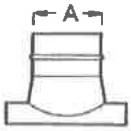
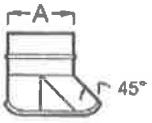
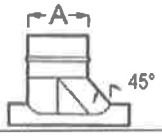
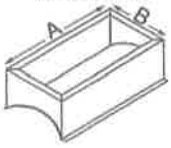
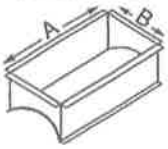
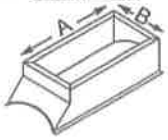
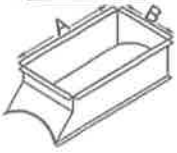
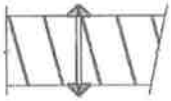
☑ SPIRAL PIPE

LEWIS & LAMBERT
SPIRAL DIVISION

LONG SEAM PIPE ☐

Project: Carroll College Anthrozoology Quote #: 1908-155

SINGLE WALL ROUND PIPE AND FITTINGS

☐  OS	☐  BM	☐  Y2	☐  Y2	☐  BT
☐  BTR	☑  DEP	☐  FEC	☐  SQR	☑  DC
☐  FC	☐  TP	☐  TSP	☐  TCP	☐  TCSP
☐  LP	☐  LSP	☐  HTP	☐  HTSP	☐  LCP
☐  LCSP	☐  PRTI	☐  PRTO	☑  PTRBI	☐  PTRBO
☐  Dura-Flange	☐  SpiralMate	☐  Angle Ring		

Dimensions: A = Inlet Size B = Outlet Size C, D = Branch Sizes R = Radius

***Items checked or highlighted are included in this project.**

384 Gallatin Park Dr. Suite 201, Bozeman, MT 59771
(O) 406.585.7333 (F) 406.585.7666

Carroll College Anthrozoology

Flex Duct

Flex Duct - Flexmaster

7 – Boxes (25'/Box) Flexmaster Type 5B low pressure R6.0 Flex Duct

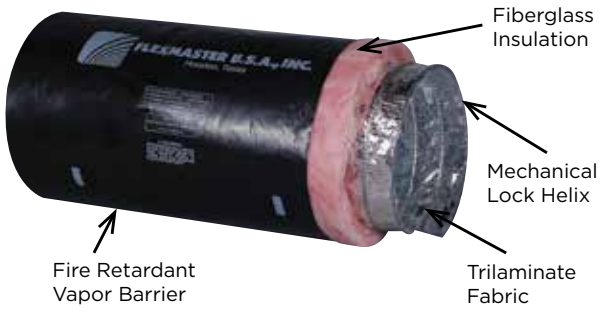
- 1 – 6"
- 3 – 8"
- 3 – 10"

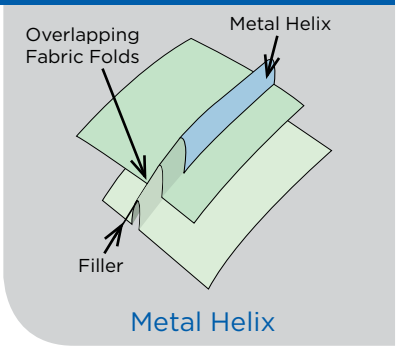
See attached copy of equipment schedule and additional submittal data.

SUBMITTAL DATA

Flexmaster U.S.A.® 5B

Low Pressure Flexible Duct Insulated





Technical Data	
Standard Lengths (ft)	25 ft, Special lengths on request
Inside Diameter (in)	3", 4", 5", 6", 7", 8", 9", 10", 12", 14", 15", 16", 18", 20"
Air Friction Loss	See Friction Loss Chart for details
Vapor Barrier Permeance	(.10) perm A.S.T.M. E96, Procedure A
Test Standard	UL181
Tested By	Intertek/ETL
Certifications Met	Class 1 Air Connector, NFPA 90A and 90B, BOCA, SBBC, HUD/FHA, MIN Property Std.
Internal Working Pressure (w.g.)	15" w.g. positive 10" w.g. negative thru 12" dia. 5" w.g. negative 14" & 16" dia. 1" w.g. negative, 18" & 20" dia.
Rated Velocity	5500 F.P.M.
Min Burst Pressure	2 1/2 times working pressure
Operating Temperature Range	-20° to +250°F
Flame/Smoke	25/50
Insulation Thermal Conductance	R4.2, R6, R8

Like the UL Mark, the ETL Listed Mark shows that our product has been independently tested by a Nationally Recognized Testing Laboratory (NRTL). It shows that it has met the requirements of widely accepted product safety standards and that we have agreed to periodic follow-up inspections to verify continued compliance.

Construction Features

The Flexmaster U.S.A.® Type 5B is manufactured to meet the highest quality standards in strength, permeability and fire resistance required in a flexible duct. Tested to UL standard 181, this Class 1 Air Connector is fabricated for application in a low to medium pressure HVAC air distribution system.

Duct Fabric

A Trilaminate of Aluminum Foil, Fiberglass and Aluminized Polyester, mechanically locked to the duct helix without the use of adhesives.

Duct Helix

Made from corrosive resistant galvanized steel, the duct helix is mechanically formed to attach the duct fabric without the use of adhesives.

Vapor Barrier

Black, fire retardant, Polyethylene material. Excellent strength at low temperatures. Will not age harden.

Insulation

Fiberglass insulation jacket, factory wrapped.

Flexmaster U.S.A.®
5235 Ted Street
Houston, TX 77040 USA
Tel. +1.713.462.7694
Fax +1.713.939.8441
www.FlexmasterUSA.com
www.Masterduct.com

FLEXMASTER U.S.A.®
A MASTERDUCT COMPANY

384 Gallatin Park Dr. Suite 201, Bozeman, MT 59771
(O) 406.585.7333 (F) 406.585.7666

Carroll College Anthrozoology

High Efficiency Take-Offs

High Efficiency Take-offs - Flexmaster

16 – Flexmaster Model STOD-BO3 High Efficiency Take-offs with Damper, Locking Quadrant and 2" Stand-off

- 1 – 6"
- 14 – 8"
- 1 – 10"

See attached copy of equipment schedule and additional submittal data.

SUBMITTAL DATA

Flexmaster U.S.A.® Side Takeoff 90°

SHEET METAL FITTINGS

The Flexmaster U.S.A.® Side Takeoff (STO) is manufactured from 26 gauge, or heavier, galvanized steel to meet SMACNA and UMC Standards for commercial construction.

The Side Takeoff is manufactured with a 1" formed on flange and Stick on Gasket to provide air-tight installation.

The Side Takeoff should be installed using SMACNA installation standards.

Standard Features

- 26 gauge G90 Galvanized Steel
- 4" w.g. construction
- 1" Flange with Unique Corner Clips for Extra Strength
- Prepunched Mounting Holes
- Double Sided Adhesive Gasket for Minimal Leakage

Optional Features

Gauge Options: standard 26 ga

- ☐ 24 ga
- ☐ 22 ga
- ☐ 20 ga

Material Options:

- ☐ Aluminum
- ☐ Stainless steel

Construction Options:

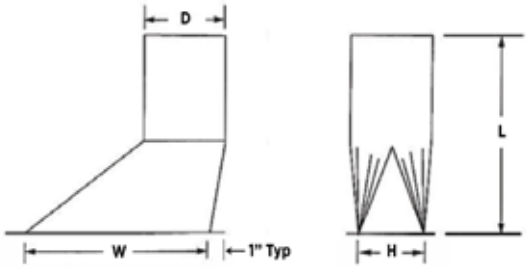
- ☐ All seams sealed

Damper Options:

- ☒ BO3, Build-Out (2"), 3/8" square shaft, U-bolt, nylon bushings, locking quadrant, handle
- ☐ BO4, Build-Out (2"), 3/8" square shaft, U-bolt, nylon bushings, Rossi Everlock locking quadrant, handle

BO3
- 2" Build out
- Locking Quadrant
- 3/8" Aluminum Square Shaft
- Nylon Bushing

BO4
- 2" Rossi (Ever-lock) Build out
- Locking Quadrant
- 3/8" Aluminum Square Shaft
- Nylon Bushing



Order Size	Diameter (D)	Length (L) w/ and w/o Damper	Height (H)	Width (W)
5"	4 ⅞"	13"	5"	9"
6"	5 ⅞"	14"	5"	9"
7"	6 ⅞"	13"	5"	11"
8"	7 ⅞"	14"	6"	12"
9"	8 ⅞"	13"	7"	13"
10"	9 ⅞"	14"	8"	14"
12"	11 ⅞"	14"	10"	16"
14"	13 ⅞"	14"	12"	18"
15"	14 ⅞"	13"	13"	19"
16"	15 ⅞"	13"	14"	20"
18"	17 ⅞"	13"	16"	22"
20"	19 ⅞"	13"	18"	24"

(+/-) 1/8" Tolerance on all Sizes.

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Carroll College Anthrozoology

Exhaust Fans

Exhaust Fans – ACME Engineering and Manufacturing

3 – TAG: EF1, EF2 & EF3 – ACME Model VQ Ceiling Exhaust Fans – 120V/1 Phase, Plug Disconnect, Vibration Isolation Kits, Speed control Shipped loose for field Mountiing in Fan. EF-3 controlled by digital programmable time-clock – Intermatic Model ET1705C.

1 – TA: EF-4 – ACME Model VQL Inline Ceiling Cabinet Fan – 120V/1 Phase, Plug Disconnect, Vibration Isolation Kits, Speed control Shipped loose for field Mountiing in Fan, Wall mounted Dehumidistat

See attached copy of equipment schedule and additional submittal data.

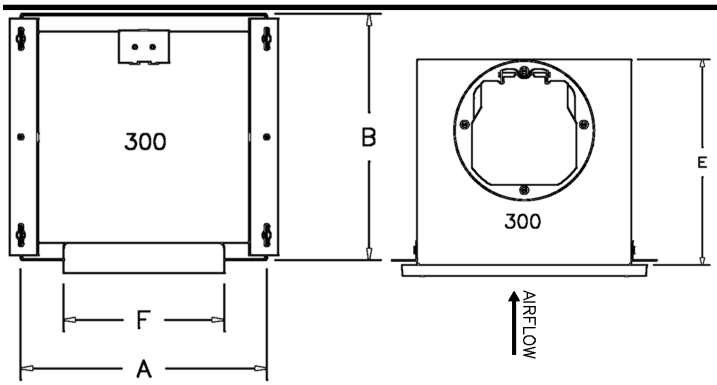
TAG: EF1, EF2, EF3

Acme Engineering and Manufacturing Corporation
P.O. Box 978, Muskogee, OK 74402

Project: Carroll College Anthrozoology
Location:
Customer: S. Conley, Inc.
Architect:
Engineer:
Contractor:
Submitted by: Gary Wambeke

S. Conley, Inc.

Print Date: 11/11/2019 4:40:06 PM



Plan View

Elevation View

A	B	F
12.25	12.25	8.00

E
11.75

DIMENSIONS (inches)

VQ

Ceiling Exhauster

Standard Construction Features

- Backdraft damper
- Centrifugal wheel
- Heavy gauge galvanized steel housing
- Horizontal discharge standard, field rotatable for Vertical flow
- Internal Plug in type disconnect
- Low Profile White Polymeric Grille
- Motors designed for continuous operation and permanently lubricated
- Resilient motor mounts
- Sound-absorbing acoustic insulation 2.0 Density 1/2" thick Black
- Thermally protected motor
- 2 Year Fan/Motor Warranty

Options & Accessories

- 207241A - 3178 VDH100 Vibration Isolation Kit
- 992801 - 3 Amp Speed Control 120VAC, Mounts Internally, Not Mounted or Wired

992624 - VQ0300 120/1/60

PERFORMANCE (Altitude = 3898 ft, Temp = 68 Degrees F, Density = 0.065 lb/ft3)

Qty	Model Size
1	VQ0300

Volume (cfm)	SP (in wg)	Watts	Speed (rpm)	TS (fpm)	OV (fpm)	Weight (lbs)
210	0.125	193	631	1239	602	20.60

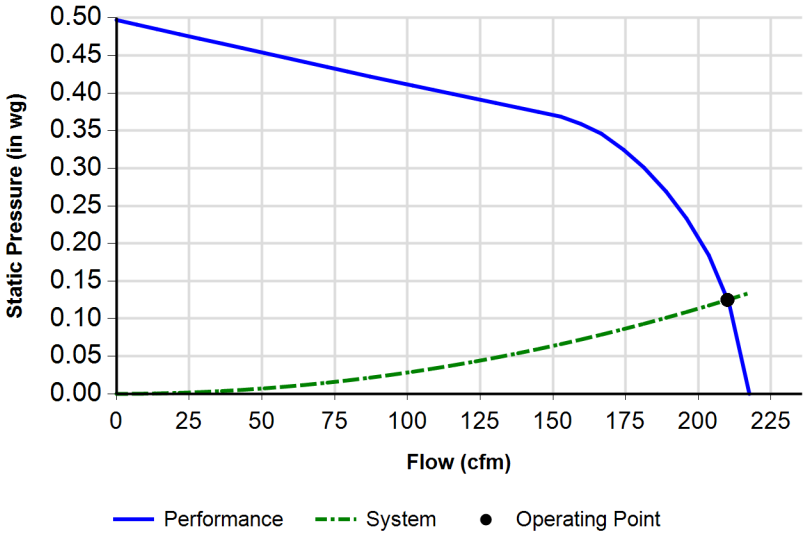
Motor Info.						
HP	Volts	Phase	Hz	Encl	RPM	Sp/Wdg
1/12 Hp	120	1	60	ODP	1750	1SPD

Fan Rating: 507

Sound Pressure			Sound Power Octave Values								Static	Total
Sones*	LwA	dBA*	1	2	3	4	5	6	7	8	Eff	Eff
1.2	44.8	33.3	40.3	47.2	46.3	44.0	38.7	32.3	27.0	3.3	0.00	0.00

*in free space @5 feet/1.5 Meters

The sound ratings shown are loudness values in hemispherical sones at 1.5 m (5ft) in a hemispherical free field calculated per AMCA Standard 301. Values are shown for Installation Type B: free inlet hemispherical sone levels. The AMCA certified ratings seal applies to sone ratings only.



TAG: EF1, EF2, EF3

Acme Engineering and Manufacturing Corporation

P.O. Box 978, Muskogee, OK 74402

S. Conley, Inc.

Print Date: 11/11/2019 4:40:06 PM

Project: Carroll College Anthrozoology
Location:
Customer: S. Conley, Inc.
Architect:
Engineer:
Contractor:
Submitted by: Gary Wambeke

Plan View
Request Dimensions From Factory

VQSC

VQ Speed Controllers

Standard Construction Features

- 3 A, 120 VAC, 60 Hz
- Internally mounted by customer
- Positive on/off position
- Pre-wired with quick connect plug-ins for ease of installation
- Rotary dial for variable selection of fan speed and sound level

DIMENSIONS (inches)

992801 - 3 Amp Speed Control 120VAC, Mounts Internally, Not Mounted or Wired

PERFORMANCE (Altitude = 0 ft, Temp = 0 Degrees F, Density = 0.000 lb/ft3)

Qty	Model Size	Weight (lbs)
1	Controller	0.66

TAG: EF1, EF2, EF3

Acme Engineering and Manufacturing Corporation

P.O. Box 978, Muskogee, OK 74402

Project: Carroll College Anthrozoology
Location:
Customer: S. Conley, Inc.
Architect:
Engineer:
Contractor:
Submitted by: Gary Wambeke

S. Conley, Inc.

Print Date: 11/11/2019 4:40:07 PM

207241A - 3178 VDH100 Vibration Isolation Kit

PERFORMANCE (Altitude = 0 ft, Temp = 0 Degrees F, Density = 0.000 lb/ft3)

Qty	Model Size	Weight (lbs)
1	VQISOKIT	0.30

TAG: EF4

Acme Engineering and Manufacturing Corporation
P.O. Box 978, Muskogee, OK 74402

S. Conley, Inc.

Print Date: 11/11/2019 4:40:07 PM

Project: Carroll College Anthrozoology
Location:
Customer: S. Conley, Inc.
Architect:
Engineer:
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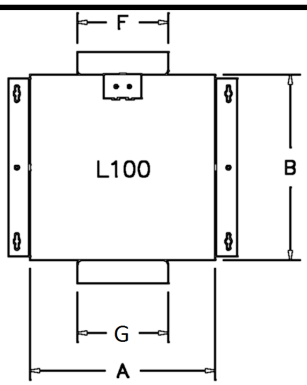
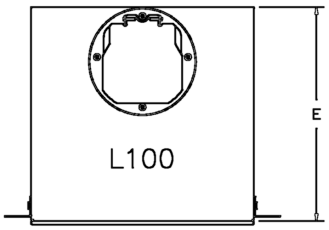
Submitted by: Gary Wambeke



Plan View



Elevation View

A	B	F	G
12.25	12.25	6.00	6.00

E
11.75

DIMENSIONS (inches)

VQL

Inline & Cabinet Exhauster

Standard Construction Features

Backdraft damper
Centrifugal wheel
Heavy gauge galvanized steel housing
Internal Plug in type disconnect
Motors designed for continuous operation and permanently lubricated
Removable access panel
Resilient motor mounts
Thermally protected motor
Vertical discharge standard, field rotatable for Horizontal flow
2 Year Fan/Motor Warranty

Options & Accessories

207241A - 3178 VDH100 Vibration Isolation Kit
992801 - 3 Amp Speed Control 120VAC, Mounts Internally, Not Mounted or Wired
993955 - Wall Mounted Dehumidistat White

VQL0100 120/1/60 S1 992630

PERFORMANCE (Altitude = 3898 ft, Temp = 68 Degrees F, Density = 0.065 lb/ft3)

Qty	Model Size
1	VQL0100

Volume (cfm)	SP (in wg)	Watts	Speed (rpm)	TS (fpm)	OV (fpm)	Weight (lbs)
103	0.125	77	714	1402	525	19.00

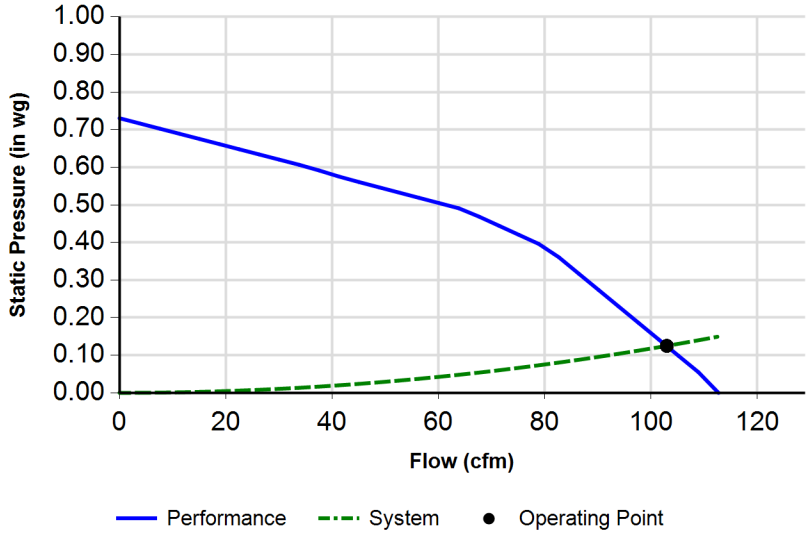
Motor Info.						
HP	Volts	Phase	Hz	Encl	RPM	Sp/Wdg
1/29 Hp	120	1	60	ODP	1750	1SPD

Fan Rating: 507

Sound Pressure			Sound Power Octave Values								Static	Total
Sones*	LwA	dBA*	1	2	3	4	5	6	7	8	Eff	Eff
0.5	38.8	27.3	34.5	44.6	35.6	36.2	34.9	29.0	16.5	5.6	0.00	0.00

*in free space @5 feet/1.5 Meters

The sound ratings shown are loudness values in hemispherical sones at 1.5 m (5ft) in a hemispherical free field calculated per AMCA Standard 301. Values are shown for Installation Type B: free inlet hemispherical sone levels. The AMCA certified ratings seal applies to sone ratings only.



TAG: EF4

Acme Engineering and Manufacturing Corporation

P.O. Box 978, Muskogee, OK 74402

S. Conley, Inc.

Print Date: 11/11/2019 4:40:07 PM

Project: Carroll College Anthrozoology
Location:
Customer: S. Conley, Inc.
Architect:
Engineer:
Contractor:
Submitted by: Gary Wambeke

Elevation View
Request Dimensions From Factory

DIMENSIONS (inches)

993955 - Wall Mounted Dehumidistat White

PERFORMANCE (Altitude = 0 ft, Temp = 0 Degrees F, Density = 0.000 lb/ft3)

VQHUMI

Humidistat

Standard Construction Features

- Automatic Shutoff
- cUL Listed
- Dual Voltage (24V/120V)
- Fits single-gang box
- UL Listing
- Variable setting from 20-80% relative humidity

Qty	Model Size	Weight (lbs)
1	Dehumidstat	0.00

TAG: EF4

Acme Engineering and Manufacturing Corporation

P.O. Box 978, Muskogee, OK 74402

Project: Carroll College Anthrozoology
Location:
Customer: S. Conley, Inc.
Architect:
Engineer:
Contractor:
Submitted by: Gary Wambeke

S. Conley, Inc.

Print Date: 11/11/2019 4:40:07 PM

Plan View
Request Dimensions From Factory

VQSC

VQ Speed Controllers

Standard Construction Features

- 3 A, 120 VAC, 60 Hz
- Internally mounted by customer
- Positive on/off position
- Pre-wired with quick connect plug-ins for ease of installation
- Rotary dial for variable selection of fan speed and sound level

DIMENSIONS (inches)

992801 - 3 Amp Speed Control 120VAC, Mounts Internally, Not Mounted or Wired

PERFORMANCE (Altitude = 0 ft, Temp = 0 Degrees F, Density = 0.000 lb/ft3)

Qty	Model Size	Weight (lbs)
1	Controller	0.66

TAG: EF4

Acme Engineering and Manufacturing Corporation

P.O. Box 978, Muskogee, OK 74402

Project: Carroll College Anthrozoology
Location:
Customer: S. Conley, Inc.
Architect:
Engineer:
Contractor:
Submitted by: Gary Wambeke

S. Conley, Inc.

Print Date: 11/11/2019 4:40:07 PM

207241A - 3178 VDH100 Vibration Isolation Kit

PERFORMANCE (Altitude = 0 ft, Temp = 0 Degrees F, Density = 0.000 lb/ft3)

Qty	Model Size	Weight (lbs)
1	VQISOKIT	0.30

INTERMATIC®

MODEL ET1700 Series

Installation and User Instructions

Electronic 7-Day Time Switch

With Battery Carryover

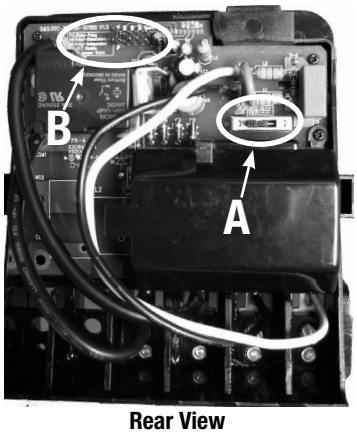
⚠ WARNING ***Risk of Fire or Electric Shock***

- Disconnect power at the circuit breaker(s) or disconnect switch(es) before installing or servicing.
- Installation and/or wiring must be in accordance with national and local electrical code requirements.
- For outdoor locations or wet locations (rain-tight), conduit hubs that comply with requirements of the UL514B (standard for fitting conduit and outlet boxes) are to be used.
- This enclosure does not provide grounding between conduit connections. When metallic conduit is used, you must also install grounding type bushings and jumper wire.
- For plastic enclosures, bonding between conduit connections is not automatic and must be provided as part of the installation.
- Use #18 - #10 AWG wires, rated at least 75°C - COPPER conductors ONLY.
- If the power disconnect point is out of sight, lock it in the OFF position and tag it to prevent unexpected application power.
- Make sure there is no wire insulation under the terminal plate on the time switch connector. Firmly tighten terminal screws.
- Do not remove insulator that is covering terminals.
- KEEP DOOR CLOSED AT ALL TIMES when not servicing.

NOTICE

- Do NOT touch circuit board components, contact can create a static discharge, which can damage the microprocessor.

Front View



Rear View

Description

The Intermatic ET1700 Series Electronic 7-Day Time Switch automatically switches loads to a preset weekly schedule with to-the-minute accuracy.

The independent 7-day programming provides complete flexibility for applications where load switching differs each day of the week.

Use the ET1700 series as an ON/OFF timer in applications requiring 7-day load control such as lighting, air conditioning systems, pumps, etc. Each load output of the Time Switch can support up to 14 timed ON and 14 timed OFF events per day. The program can be overridden by pushing the ON/OFF load override button(s).

The ET1700 Series Time Switch is designed to directly switch tungsten or ballast loads up to its rating, and inductive or resistive loads up to 30A at 120, 208, 240, or 277 VAC.

Specifications

Time Switch

- Input Voltage: 120/208/240/277 VAC, 60 Hz
- Power Consumption: 6.0 W Max.
- Contact Configuration: SPST (ET1705C), DPST (ET1725C), and SPDT (ET1715C). See wiring diagrams on next page.

Switch Ratings—ET1705C, ET1725C (per pole)

- 30 A Inductive/Resistive, 120/240 VAC, 60 Hz
- 20 A Magnetic Ballast, 120-277 VAC, 60 Hz
- 1 A Electronic Ballast 120-277 VAC, 60 Hz
- 20 A Resistive, 28 VDC
- 5 A Tungsten: 120/240 VAC, 60 Hz
- 1 HP, 120 VAC, 60 Hz
- 2 HP, 240 VAC, 60 Hz

Switch Ratings—ET1715C (NO/NC) Normally Open/Normally Closed Contact

- 20 A/10 A Inductive/Resistive, 120/240 VAC, 60 Hz
- 20 A/3 A Magnetic Ballast, 120-277 VAC, 60 Hz
- 1 A Electronic Ballast 120-277 VAC, 60 Hz **(NO)**
- 5 A Tungsten: 120/240 VAC, 60 Hz
- 1 HP / ¼ HP, 120 VAC, 60 Hz
- 2 HP / ½ HP, 240 VAC, 60 Hz

Set Points (Events)—Each load output of the Time Switch can support up to 14 timed ON and 14 timed OFF events per day.

Battery-Powered Clock Operation—3 years minimum (uses 2 AAA industrial grade alkaline batteries, supplied)

Minimum ON or OFF time—1 minute

Maximum ON or OFF time—6 days, 23 hours, 59 minutes

Shipping Weight—2.5 lb. (1.1 kg)

Enclosures—Three enclosure options are available.

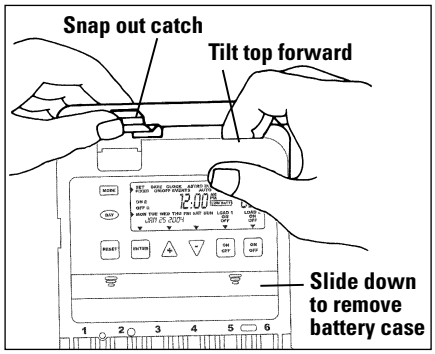
- ET17x5C – TYPE 1 indoor metal enclosure
- ET17x5CR – TYPE 3R indoor/outdoor lockable metal enclosure
- ET17x5CPD82 – TYPE 3R indoor/outdoor lockable impact resistant polycarbonate enclosure with clear cover

Knockouts—Combination 1/2-3/4 inch size, 1 on back and each side, 2 on bottom

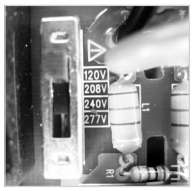
Wire Size—AWG #18 through #10

Installation Instructions

1. Remove the mechanism from the case by depressing the catch at the top of the case and pulling out, as shown.

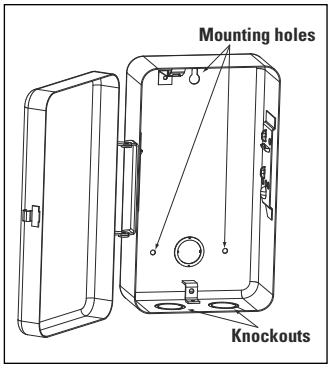


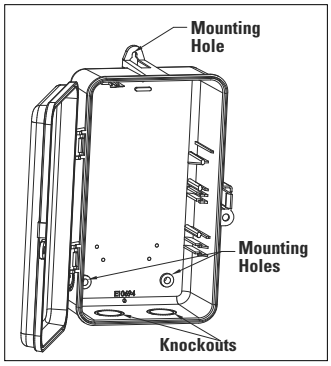
2. Set voltage selector for desired input voltage. The timer is shipped with voltage set for 277 VAC. **To operate at 120, 208 or 240 VAC, move the selector switch to the desired setting as marked on the circuit board.** See location **A** in Rear View above and detail at the right.



3. The timer is shipped with DST (Daylight Saving Time) enabled. To disable DST, insert a jumper at location marked DST. See location **B** in Rear View above and detail at the right.
4. **ET1725C ONLY—**Decide whether you want to control multiple loads simultaneously (SIM), independently (IND), or with a 2-second pulse (PUL) (e.g., for use with mechanically held contactors or bell ringing applications), and make sure the jumper is positioned accordingly. See location **B** in Rear View above and detail at the right. (The unit is shipped with the loads set for IND.)

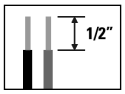
5. Mount the enclosure in the desired location using the 3 mounting holes provided.





Position at eye level if possible, providing space to the left of the enclosure for the cover to swing open fully, as shown.

6. Replace the mechanism in the enclosure.
7. Lift the left side of the plastic insulator off the retaining post and pivot it up and away to expose the terminal strip.
8. Strip the supply and load wires to 1/2". **Use #18 - #10 AWG wires, rated at least 75°C - COPPER conductors ONLY.**

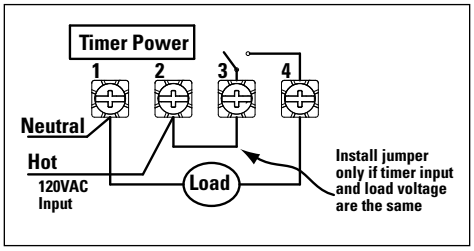


9. Insert the wire ends under the proper terminal plates (see wiring diagrams elsewhere on this page) and tighten the screws firmly.
10. Connect ground wire to grounding terminal at bottom of enclosure.
11. Replace the plastic insulator on the retaining post.
12. Remove the battery case by sliding it down as shown by the arrows, then install 2 AAA alkaline batteries. Make sure the batteries are pointing in the direction shown.
13. Verify that the display is **ON** to make sure the batteries are OK. If the display shows scrambled information, press the RESET button to clear it up.
14. Apply power to the Time Switch.

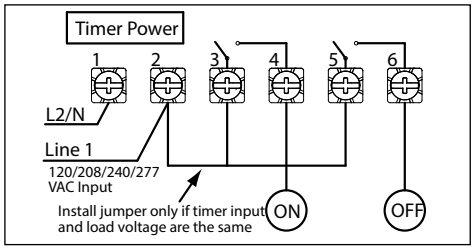
IMPORTANT: Press and hold the **ENTER** button, then press the **RESET** button. The screen will flash 12:00 AM and MON, and timer status is Manual Mode.
NOTE: You must reset the time switch using this procedure whenever you change the jumpers.

The Time Switch is now ready for programming.

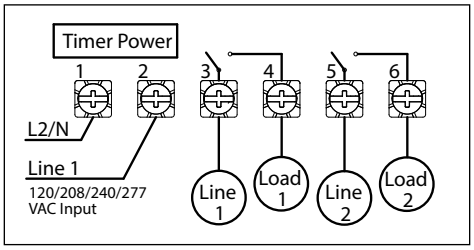
Wiring Diagrams



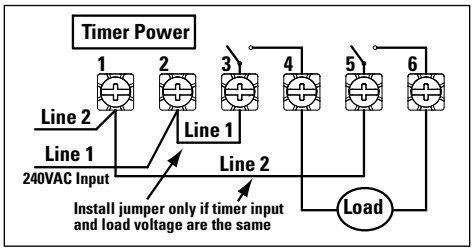
ET1705 configured for SPST, 120 VAC load



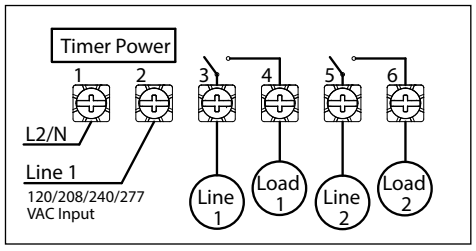
ET1725 configured for pulse SPST load with jumper set to PUL



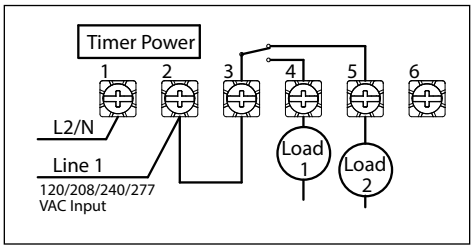
ET1725 configured for 2 SPST loads with jumper set to IND



ET1725 configured for 240 VAC DPST load with jumper set to SIM



ET1725 configured for DPST loads with jumper set to SIM



ET1715 configured for SPDT load switching

Programming Overview

By pressing the **MODE** button, the Time Switch will cycle through the menus necessary for programming the current time, date, and timed events.

The basic procedure is to use the **MODE** button to move from one menu to the next (e.g., DATE, TIME, etc.), the **+** or **–** buttons for the first part of a setting (e.g., MONTH), the **ENTER** button to move to the next part of the setting (e.g., YEAR), then **MODE** to exit and move to the next menu. To skip a menu, press **MODE** to move ahead.

If you make a mistake, press the* MODE *button repeatedly to cycle back around to the error, then make the correct entry.

NOTE: *DATE and TIME must be set before you can access any other programming menus.*

Setting Date

1. Press the **MODE** button repeatedly until the words SET and DATE appear in the upper area of the display.
2. Press the **+** or **–** buttons to enter the current Month.
3. Press the **ENTER** button when the Month is correct to save the setting. The screen advances to current Date.
4. Again press the **+** or **–** buttons to enter the current Date, followed by the **ENTER** button.
5. Repeat to set the correct Year.
6. Press the **MODE** button to exit and advance to setting the time.

Setting Time

1. If necessary, press the **MODE** button repeatedly until the words SET and CLOCK appear in the upper area of the display.
2. Press the **+** or **–** buttons to enter the current time.
   NOTE: To go from AM to PM, keep pressing the **+** or **–** buttons to cycle through the day. You can hold the **+** or **–** buttons down for 3 seconds to make the time scroll quickly.
3. Press the **MODE** button to exit and advance to setting Events.

Setting ON/OFF Events

1. If necessary, press the **MODE** button repeatedly until the words SET ON/OFF EVENTS and EVENT 01 appear on the display.
2. If necessary, press the **ENTER** button to display ON @ or OFF @ (depending on what you want to set).
3. Press the **DAY** button to display 12:00 am and all days of the week.
4. Press the **+** or **–** buttons to enter the time you want to set.
   NOTE: *To go from AM to PM, keep pressing the* **+** *or* **–** *buttons to cycle through the day. You can hold the* **+** *or* **–** *buttons down for 3 seconds to make the time scroll quickly.*
5. If you want the Event to occur for a combination of days rather than every day (e.g., weekends only, weekdays only, or individual days), press the **DAY** button again as necessary to cycle through the individual days or combination of days you want.
   NOTE: To choose a combination not shown during cycling (e.g., Tuesday and Thursday), you must create an individual event for each of the days you want.
6. ***ET1725C ONLY***—For a multi-circuit device with loads set independently, you can choose the load you want the event to control. The default setting is for both loads, as you can see on the display. Press the **ON/OFF** button under a load to remove the load from the event.
7. When you have set the event correctly, you have two choices:
   - Press the **ENTER** button to set the next ON/OFF event (up to 28 events).
   - Press the **MODE** button to exit.

Operating the Time Switch

Press the **MODE** button repeatedly to select the desired operating mode on the display. There are 2 options:

- **AUTO**—where the Time Switch follows the events you have programmed, turning the circuits ON and OFF at the time(s) set.
  NOTE: *You can override programmed events and force the Time Switch ON or OFF by pressing the* ***ON/OFF*** *button.*
- **MANUAL**—where any events set are disabled and the Time Switch controls all circuits through the **ON/OFF** button.

NOTE: *You can review or edit any programmed events at any time by pressing the* ***MODE*** *button repeatedly to return to the appropriate menu, then following programming instruction provided on this sheet.*

OPTIONAL – Deleting (Clearing) an Event

Use this procedure to clear the settings programmed for an event.

1. If necessary, press the **MODE** button repeatedly until the words SET ON/OFF EVENTS are shown on the display.
2. Press the **ENTER** button as necessary to cycle through events that have been set until you see the event you want to delete.
3. Press the **+** or **–** buttons AT THE SAME TIME to display --:--.
4. Press the **MODE** button to exit.

Battery Maintenance

- Batteries can be easily replaced without removing the Time Switch mechanism or field wiring.
- Press in and downward (in the direction of the arrows) on the battery cover.
- It is recommended to replace the batteries every 2-3 years with 2 AAA industrial grade alkaline cells as part of normal maintenance on the Time Switch.
- Be sure to observe battery polarity markings when installing batteries.
- No other battery maintenance is required.

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Carroll College Anthrozoology

Grilles, Registers and Diffusers

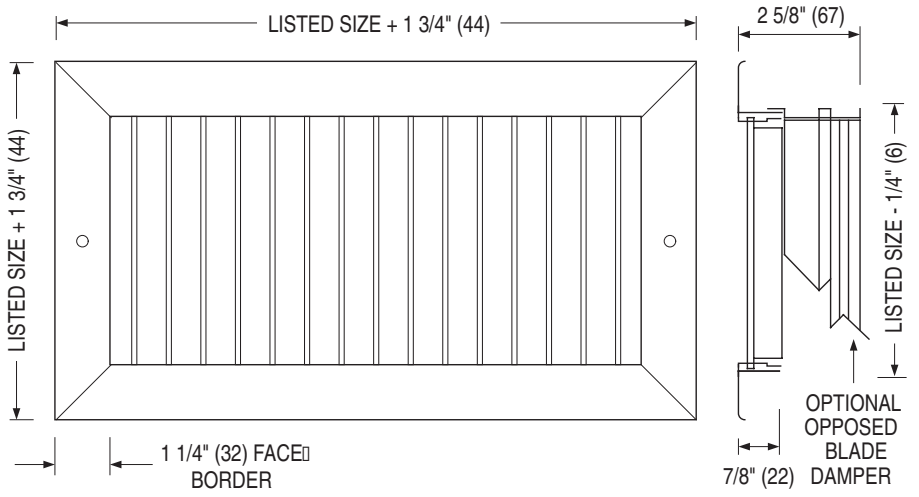
Nailor Industries Grilles, Registers and Diffusers

QTY	TAG	MODEL	FRAME STYLE	NECK	DAMPER	COLOR	MATERIAL	THROW
10	S1	61SH-O	SURFACE	18/6	OBD	WHITE	STEEL	N/A
2	S2	49-481	SURFACE SIDEWALL OR CEILING	54/6	NONE	WHITE	ALUM	N/A
7	S3	RNS	24/24 LAY-IN	8"	NONE	WHITE	ALUM	N/A
3	S4	RNS	12/12 SURFACE	6"	NONE	WHITE	ALUM	N/A
2	S5	RNS	12/12 SURFACE	8"	NONE	WHITE	ALUM	N/A
2	S6	RNS	24/24 SURFACE	8"	NONE	WHITE	ALUM	N/A
1	R1	6145V	SURFACE	30/18	NONE	WHITE	STEEL	N/A
ROTATE 90 DEGREES FOR BARS TO BE PARALLEL TO 18" DIMENSION								
10	R2	6155V	SURFACE	16/10	NONE	WHITE	STEEL	N/A
ROTATE 90 DEGREES FOR BARS TO BE PARALLEL TO 10" DIMENSION								
2	R3	6155H	SURFACE	20/10	NONE	WHITE	STEEL	N/A
1	F1	49-480	SURFACE - FLOOR GRILLE	14/5	NONE	WHITE	ALUM	N/A

Note: Verify Surface/Lay-In Mounting Type and Neck Sizes Before Releasing.

Nailor Industries Inc.

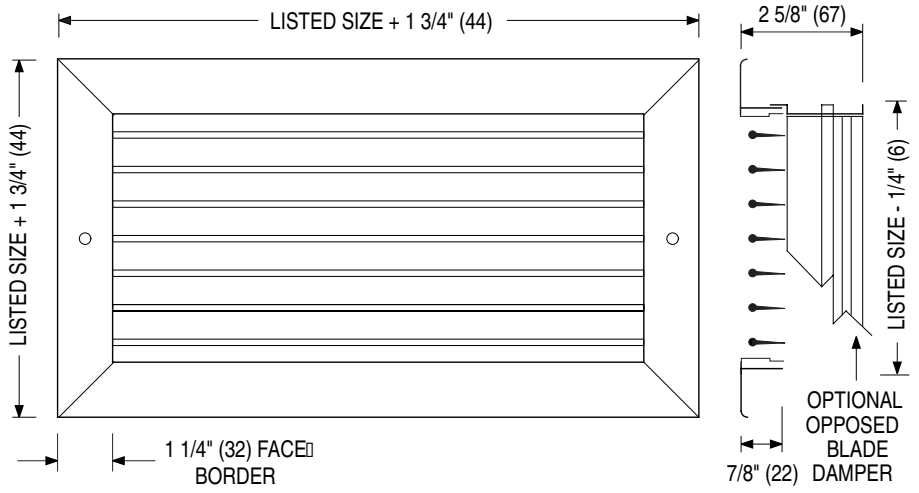
STEEL SUPPLY GRILLES & REGISTERS
SINGLE DEFLECTION • ADJUSTABLE
MODELS: 61SV(-O) AND 61SH(-O)



❑ **Frame/Border Type S:**
Surface Mount

❑ **Model 61SV**
Single Deflection Grille
Vertical Front Blades

❑ **Model 61SV-O**
Single Deflection Register
Vertical Front Blades
(Includes O. B. Damper)



☑ **Frame/Border Type S:**
Surface Mount

❑ **Model 61SH**
Single Deflection Grille
Horizontal Front Blades

☑ **Model 61SH-O**
Single Deflection Register
Horizontal Front Blades
(Includes O. B. Damper)

DESCRIPTION:

1. Construction: Corrosion resistant steel. Roll-formed frame mechanically interlocked with mitered corners for strength. A single set of roll-formed 'teardrop' blades on 3/4" (19) centers provide air control in a single plane. Blades are individually pivoted to ensure positive positioning when adjusted to desired deflection setting.
2. Optional roll-formed steel opposed blade damper has a screw driver slot operator accessible through face of register.
3. Minimum size is 4" x 4" (102 x 102).
   Maximum size is 48" x 36" (1219 x 914).
4. Type S Surface mount frame has a 1 1/4" (32) face border and a 1" (25) overlap margin.
5. Standard fastening is Type A countersunk screw holes.
6. Standard finish is AW Appliance White.

OPTIONS:

1. Finish:
   - ❑ SP Special _____ .
2. Fastening (Type S):
   - ❑ Type C Concealed mounting straps
   - ❑ Type D Concealed screw holes in neck
   - ❑ Type N None.
3. ❑ PF Plaster sub-frame
4. ❑ IS Insect screen
5. ❑ Other _____ .

SCHEDULE TYPE:	Page 1 of 2 Dimensions are in inches (mm).			
PROJECT:				
ENGINEER:	**DATE**	**B SERIES**	**SUPERSEDES**	**DRAWING NO.**
CONTRACTOR:	**9 - 24 - 19**	**6100**	**2 - 1 - 11**	**6100-1**

Nailor® Industries Inc.

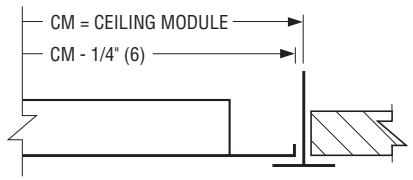
STEEL SUPPLY GRILLES & REGISTERS
SINGLE DEFLECTION • ADJUSTABLE
MODELS: 61SV(-O) AND 61SH(-O)

Panel Mounted/Ceiling Modules

❑ Border Type PLS: Steel Lay-in Panel

The grille or register is mounted in an extended panel to suit standard T-Bar Lay-in type ceilings.

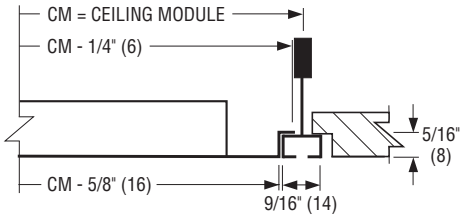
Type PLS Lay-in Panel



❑ Border Type FPS: Steel Fineline® Panel

The grille or register is mounted in an extended panel that will fit a 9/16" (14) narrow regressed (bolt slot) T-Bar ceiling grid or 9/16" (14) Flat T-Bar with tegular ceiling tile.

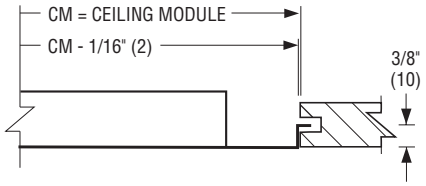
Type FPS Fineline® Panel



❑ Border Type SPS: Steel Spline Panel

The grille or register is mounted in an extended panel to suit spline type ceiling modules. CM 24" x 24" (600 x 600) only.

Type SPS Spline Panel

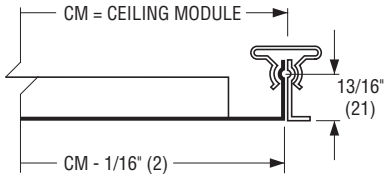


Note: Splines on two opposite sides.

❑ Border Type MPS: Steel Metal Pan Panel

The grille or register is mounted in an extended panel to suit metal pan ceilings that have snap-in type ceiling modules. CM 24" x 24" (600 x 600) only.

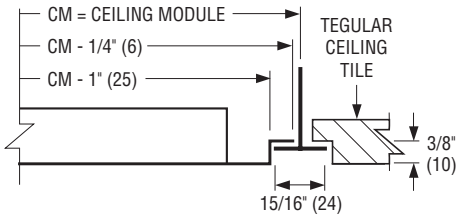
Type MPS Metal Pan Panel



❑ Border Type TPS: Steel Tegular Panel

The grille or register is mounted in a panel that will extend below a 15/16" (24) Flat T-Bar ceiling grid.

Type TPS Tegular Panel



Available Border Type PLS, FPS and TPS Ceiling Module Sizes

Ceiling Module	
Imperial Units (in.)	**Metric Units (mm)**
12 x 12 24 x 12 36 x 12	300 x 300 600 x 300 900 x 300
48 x 12 20 x 20 24 x 24	1200 x 300 500 x 500 600 x 600
36 x 24 48 x 24	900 x 600 1200 x 600

Maximum grille neck size is CM Ceiling Module – 3" (76).

SCHEDULE TYPE:	Page 2 of 2 Dimensions are in inches (mm).			
PROJECT:				
ENGINEER:	**DATE**	**B SERIES**	**SUPERSEDES**	**DRAWING NO.**
CONTRACTOR:	**9 - 24 - 19**	**6100**	**2 - 1 - 11**	**6100-1**

PERFORMANCE NOTES FOR SUPPLY GRILLES AND REGISTERS:
MODEL SERIES: 5100, 6100 AND 6700

Throw, Spread and Drop

The isovel diagrams shown below, illustrate in plan view, the relationship of horizontal spread to throw for three standard vertical blade deflections and represent a typical high side wall supply outlet. The isovels (throw values) are for the cataloged terminal velocities of 150, 100 and 50 fpm.

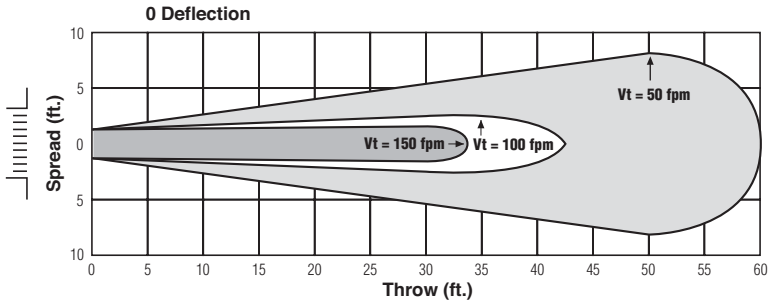
Cataloged data, in accordance with the test code, is with the grille mounted 9" (229) below the ceiling and benefiting from the ceiling coanda effect under isothermal conditions. Throw values without ceiling effect (greater than 24" (610) from a surface parallel to the airflow) may be approximated by multiplying the cataloged throw by x 0.7.

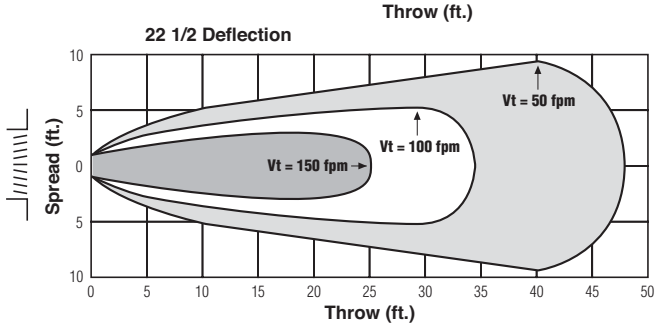
In order to offset potential draft problems caused by premature drop, it is recommended to set the blades with an upward deflection setting of 15 – 20° in free space conditions. The angle of spread and temperature differential between the supply air and room air (ΔT) also effects the drop of the airstream.

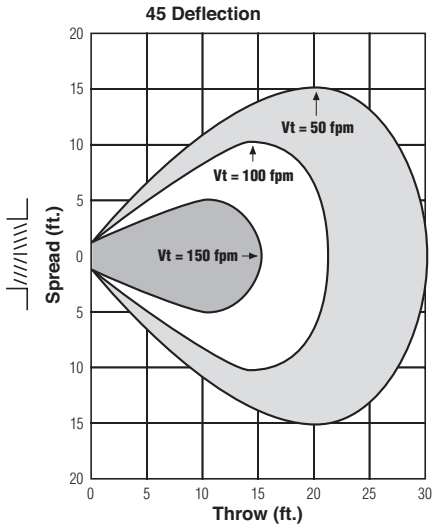
Under constant conditions of temperature, volume and core velocity, the wider the spread, the smaller the drop. Typical cold supply air (20°F ΔT) reduces horizontal throw by approximately 30%. Warm air will increase throw by approximately 30% and reduce drop.

For a full explanation of the effects of spread, throw, temperature and drop, refer to the engineering guide at the back of the catalog.

SPREAD CHARACTERISTICS WITH THREE DEFLECTION SETTINGS







NC Corrections for Blade Deflection (add)

Model Type	Damper	Blade Deflection		
		0°	22 1/2°	45°
Double Deflection	With	0	+ 2	+ 7
	Without	– 4	– 2	+ 3
Single Deflection	With	– 4	– 1	+ 4
	Without	– 8	– 6	+ 1

Note: Damper corrections are for wide open damper.

TP Correction Factors for Grilles Without Damper (multiply)

Blade Deflection	0°	22 1/2°	45°
Double Deflection Factor	x .80	x .83	x .89
Single Deflection Factor	x .73	x .76	x .85

NC Corrections for Throttling Damper (add)

Additional Pressure Drop (in. w.g.)	.05"	.15"	.25"
Approx. Damper Opening	75%	67%	50%
NC add	+ 6	+ 11	+ 18

PERFORMANCE DATA: SUPPLY GRILLES AND REGISTERS • 5100, 6100 AND 6700 SERIES

MODELS: 51DV, 51DH, 51SV, 51SH, 61DV, 61DH, 61SV, 61SH, 67DV, 67DH, 67SV, 67SH

Listed Duct Size (inches)	Alternate Sizes (inches)	Core Area (sq. ft.)	Ak Factor	Core Velocity Pressure		300 .006	400 .010	500 .016	600 .022	700 .031	800 .040	1000 .062	1200 .090	1400 .122
				Total Pressure	0°	.015	.026	.041	.059	.081	.106	.165	.238	.324
					22 1/2°	.017	.030	.047	.068	.093	.122	.190	.274	.373
					45°	.026	.046	.072	.103	.142	.186	.289	.417	.567
6 x 6	8 x 4 10 x 4	0.20		CFM		60	80	100	120	140	160	200	240	280
				Noise Criteria		–	–	–	–	19	23	29	35	40
			.14	Throw	0°	5-7-13	7-9-16	8-12-18	10-14-20	11-15-21	12-16-23	15-18-25	16-20-27	17-21-30
			.12		22 1/2°	4-6-10	6-7-13	6-10-14	8-11-16	9-12-17	10-13-18	12-14-20	13-16-22	14-17-24
			.10		45°	3-4-7	4-5-8	4-6-9	5-7-10	6-8-11	6-8-12	8-9-13	8-10-14	9-11-15
8 x 6	10 x 5 12 x 4	0.27		CFM		81	108	135	162	189	216	270	324	378
				Noise Criteria		–	–	–	15	20	24	30	36	41
			.18	Throw	0°	5-8-15	8-12-18	10-14-20	11-16-23	13-18-25	15-19-27	17-21-30	18-23-32	19-24-35
			.16		22 1/2°	4-6-12	6-10-14	8-11-16	9-13-18	10-14-20	12-15-22	14-17-24	14-18-26	15-19-28
			.14		45°	3-4-8	4-6-9	5-7-10	6-8-12	7-9-13	8-10-14	9-11-15	9-12-16	10-12-18
10 x 6	12 x 5 16 x 4	0.35		CFM		105	140	175	210	245	280	350	420	490
				Noise Criteria		–	–	–	16	21	25	31	37	42
			.24	Throw	0°	6-9-18	9-13-21	10-16-24	12-19-26	15-20-28	17-21-30	20-23-33	21-25-36	22-27-39
			.21		22 1/2°	5-7-14	7-10-17	8-13-19	10-15-21	12-16-22	14-17-24	16-18-26	17-20-29	18-22-31
			.18		45°	3-5-9	5-7-11	5-8-12	6-10-13	8-10-14	9-11-15	10-12-17	11-13-18	11-14-20
8 x 8	14 x 5	0.38		CFM		114	152	190	228	266	304	380	456	532
				Noise Criteria		–	–	–	17	22	26	32	38	43
			.26	Throw	0°	6-9-19	9-14-22	11-16-25	13-19-27	16-21-29	18-22-32	19-24-34	21-26-37	23-28-40
			.22		22 1/2°	5-7-15	7-11-18	9-13-20	10-15-22	13-17-23	14-18-26	15-19-27	17-21-30	18-22-32
			.20		45°	3-5-10	5-7-11	6-8-13	7-10-14	8-11-15	9-11-16	10-12-17	11-13-19	12-14-20
12 x 6	18 x 4	0.42		CFM		126	168	210	252	294	336	420	504	588
				Noise Criteria		–	–	–	17	22	26	32	38	43
			.29	Throw	0°	6-9-19	9-14-22	11-16-25	13-19-27	16-21-30	18-22-32	19-24-34	21-28-38	23-29-41
			.25		22 1/2°	5-7-15	7-11-18	9-13-20	10-15-22	13-17-24	14-18-26	15-19-27	17-22-30	18-23-33
			.22		45°	3-5-10	5-7-11	6-8-13	7-10-14	8-11-15	9-11-16	10-12-17	11-14-19	12-15-21
14 x 6	10 x 8	0.50		CFM		150	200	250	300	350	400	500	600	700
				Noise Criteria		–	–	–	18	23	27	33	39	44
			.34	Throw	0°	6-11-20	10-15-23	12-18-25	15-20-28	16-22-31	19-23-33	21-25-36	23-28-40	25-31-43
			.30		22 1/2°	5-9-16	8-12-18	10-14-20	12-16-22	13-18-25	15-18-26	17-20-29	18-22-32	20-25-34
			.26		45°	3-6-10	5-8-12	6-9-13	8-10-14	8-11-16	10-12-17	11-13-18	12-14-20	13-16-22
12 x 8	16 x 6 24 x 4	0.58		CFM		174	232	290	348	406	464	580	696	812
				Noise Criteria		–	–	–	19	24	28	34	40	45
			.39	Throw	0°	7-11-21	10-15-24	12-19-27	15-21-30	17-23-32	20-24-34	22-27-38	24-30-42	26-32-45
			.34		22 1/2°	6-9-17	8-12-19	10-15-22	12-17-24	14-18-26	16-19-27	18-22-30	19-24-34	21-26-36
			.30		45°	4-6-11	5-8-12	6-10-14	8-11-15	9-12-16	10-12-17	11-14-19	12-15-21	13-16-23
10 x 10	14 x 7 26 x 4	0.61		CFM		183	244	305	366	427	488	610	732	854
				Noise Criteria		–	–	–	19	24	28	34	40	45
			.41	Throw	0°	7-11-21	10-16-24	13-19-28	16-21-30	17-23-32	20-24-35	23-28-39	24-30-42	27-32-46
			.36		22 1/2°	6-9-17	8-13-19	10-15-22	13-17-24	14-18-26	16-19-28	18-22-31	19-24-34	22-26-37
			.31		45°	4-6-11	5-8-12	7-10-14	8-11-15	9-12-16	10-12-18	12-14-20	12-15-22	14-16-23
18 x 6	14 x 8 28 x 4 30 x 4	0.65		CFM		195	260	325	390	455	520	650	780	910
				Noise Criteria		–	–	15	20	25	29	35	41	46
			.44	Throw	0°	7-12-22	11-16-25	13-20-29	16-22-32	18-24-34	21-25-36	24-29-40	25-32-45	28-34-48
			.38		22 1/2°	6-10-18	9-13-20	10-16-23	13-18-26	14-19-27	17-20-29	19-23-32	20-26-36	22-27-38
			.33		45°	4-6-11	6-8-13	7-10-15	8-11-16	9-12-17	11-13-18	12-15-20	13-16-23	14-17-24
12 x 10	20 x 6 24 x 5	0.74		CFM		222	296	370	444	518	592	740	888	1036
				Noise Criteria		–	–	15	20	25	29	35	41	46
			.50	Throw	0°	8-13-24	11-17-27	14-21-31	17-24-33	20-26-36	22-27-39	25-31-43	27-33-48	30-36-51
			.44		22 1/2°	6-10-19	9-14-22	11-17-25	14-19-26	16-21-29	18-22-31	20-25-34	22-26-38	24-29-41
			.38		45°	4-7-12	6-9-14	7-11-16	9-12-17	10-13-18	11-14-20	13-16-22	14-17-24	15-18-26
22 x 6	16 x 8 28 x 5 36 x 4	0.80		CFM		240	320	400	480	560	640	800	960	1120
				Noise Criteria		–	–	16	21	26	30	36	42	47
			.54	Throw	0°	8-13-25	11-18-28	15-22-32	18-25-35	20-27-38	23-28-41	26-32-45	28-35-50	31-38-53
			.47		22 1/2°	6-10-20	9-14-22	12-18-26	14-20-28	16-22-30	18-22-33	21-26-36	22-28-40	25-30-42
			.41		45°	4-7-13	6-9-14	8-11-16	9-13-18	10-14-19	12-14-21	13-16-23	14-18-25	16-19-27
12 x 12	14 x 10 18 x 8 24 x 6 38 x 4	0.90		CFM		270	360	450	540	630	720	900	1080	1260
				Noise Criteria		–	–	16	21	26	30	36	42	47
			.61	Throw	0°	9-14-26	12-18-29	15-23-33	18-26-36	21-27-39	24-29-42	27-33-47	29-36-51	32-39-56
			.53		22 1/2°	7-11-21	10-14-23	12-18-26	14-21-29	17-22-31	19-23-34	22-26-38	23-29-41	26-31-45
			.46		45°	5-7-13	6-9-15	8-12-17	9-13-18	11-14-20	12-15-21	14-17-24	15-18-26	16-20-28
18 x 10	30 x 6	1.13		CFM		339	452	565	678	791	904	1130	1356	1582
				Noise Criteria		–	–	17	22	27	31	37	43	48
			.77	Throw	0°	9-15-29	14-20-33	17-25-36	20-29-40	24-30-43	27-33-46	30-36-51	33-40-57	35-43-61
			.67		22 1/2°	7-12-23	11-16-26	14-20-29	16-23-32	19-24-34	22-26-37	24-29-41	26-32-46	28-34-49
			.58		45°	5-8-15	7-10-17	9-13-18	10-15-20	12-15-22	14-17-23	15-18-26	17-20-29	18-22-31

For performance data notes, see F24.

PERFORMANCE DATA: SUPPLY GRILLES AND REGISTERS • 5100, 6100 AND 6700 SERIES

MODELS: 51DV, 51DH, 51SV, 51SH, 61DV, 61DH, 61SV, 61SH, 67DV, 67DH, 67SV, 67SH

Listed Duct Size (inches)	Alternate Sizes (inches)	Core Area (sq. ft.)	Ak Factor	Core Velocity Pressure		300 .006	400 .010	500 .016	600 .022	700 .031	800 .040	1000 .062	1200 .090	1400 .122
				Total Pressure	0°	.015	.026	.041	.059	.081	.106	.165	.238	.324
					22 1/2°	.017	.030	.047	.068	.093	.122	.190	.274	.373
					45°	.026	.046	.072	.103	.142	.186	.289	.417	.567
14 x 14	16 x 12 20 x 10 24 x 8 34 x 6	1.24		CFM		372	496	620	744	868	992	1240	1488	1736
				Noise Criteria		–	–	17	22	27	31	37	43	48
			.84	Throw	0°	11-18-33	16-25-39	20-29-42	24-33-47	27-36-51	31-39-54	35-42-60	39-47-66	41-51-71
			.73		22 1/2°	9-14-26	13-20-31	16-23-34	19-26-38	22-29-41	25-31-43	28-34-48	31-38-53	33-41-57
			.64		45°	6-9-17	8-13-20	10-15-21	12-17-24	14-18-26	16-20-27	18-21-30	20-24-33	21-26-36
18 x 12	16 x 14 22 x 10 28 x 8 38 x 6	1.37		CFM		411	548	685	822	959	1096	1370	1644	1918
				Noise Criteria		–	–	18	23	28	32	38	44	49
			.93	Throw	0°	11-18-33	16-25-39	20-30-43	24-33-47	28-36-51	32-39-54	35-43-61	39-47-67	41-51-72
			.81		22 1/2°	9-14-26	13-20-31	16-24-34	19-26-38	22-29-41	26-31-43	28-34-49	31-38-54	33-41-58
			.71		45°	6-9-17	8-13-20	10-15-22	12-17-24	14-18-26	16-20-27	18-22-31	20-24-34	21-26-36
24 x 10	20 x 12 30 x 8	1.52		CFM		456	608	760	912	1064	1216	1520	1824	2128
				Noise Criteria		–	–	18	23	28	32	38	44	49
			1.03	Throw	0°	12-19-35	16-25-41	21-32-45	25-35-50	29-38-53	34-41-57	37-45-65	41-50-70	43-53-76
			.90		22 1/2°	10-15-28	13-20-33	17-26-36	20-28-40	23-30-42	27-33-46	30-36-51	33-40-56	34-42-61
			.78		45°	6-10-18	8-13-21	11-16-23	13-18-25	15-19-27	17-21-29	19-23-32	21-25-35	22-27-38
16 x 16	18 x 14 22 x 12 30 x 8	1.64		CFM		492	656	820	984	1148	1312	1640	1968	2296
				Noise Criteria		–	–	18	23	28	32	38	44	49
			1.12	Throw	0°	12-20-37	17-26-42	22-32-47	26-37-51	31-40-56	35-42-59	39-47-67	42-51-73	46-56-79
			.97		22 1/2°	10-16-30	14-21-34	18-26-38	21-30-41	25-32-45	28-34-47	31-38-54	34-41-58	37-45-63
			.84		45°	6-10-19	9-13-21	11-16-24	13-19-26	16-20-28	18-21-30	20-24-34	21-26-37	23-28-40
24 x 12	18 x 16 20 x 14 30 x 10 36 x 8	1.85		CFM		555	740	925	1110	1295	1480	1850	2220	2590
				Noise Criteria		–	–	19	24	29	33	39	45	50
			1.26	Throw	0°	12-20-38	18-27-44	22-33-48	27-38-54	32-40-58	36-44-62	40-48-69	44-54-76	48-58-82
			1.09		22 1/2°	10-16-30	14-22-35	18-26-38	22-30-43	26-32-46	29-35-50	32-38-55	35-43-61	38-46-66
			.95		45°	6-10-19	9-14-22	11-17-24	14-19-27	16-20-29	18-22-31	20-24-35	22-27-38	24-29-41
18 x 18	20 x 16 24 x 14 28 x 12 32 x 10	2.10		CFM		630	840	1050	1260	1470	1680	2100	2520	2940
				Noise Criteria		–	–	19	24	29	33	39	45	50
			1.43	Throw	0°	13-21-40	19-29-47	24-36-52	29-40-57	33-43-62	38-47-66	42-52-74	47-57-81	50-62-87
			1.24		22 1/2°	10-17-32	15-23-38	19-29-42	23-32-46	26-34-50	30-38-53	34-42-59	38-46-65	40-50-70
			1.08		45°	7-11-20	10-15-24	12-18-26	15-20-29	17-22-31	19-24-33	21-26-37	24-29-41	25-31-44
30 x 12	20 x 18 22 x 16 26 x 14 36 x 10	2.32		CFM		696	928	1160	1392	1624	1856	2320	2784	3248
				Noise Criteria		–	–	20	25	30	34	40	46	51
			1.58	Throw	0°	14-23-43	21-31-50	26-39-56	31-43-61	36-47-67	41-50-71	46-56-79	50-61-86	54-67-94
			1.37		22 1/2°	11-18-34	17-25-40	21-31-45	25-34-49	29-38-54	33-40-57	32-45-63	40-49-69	43-54-75
			1.19		45°	7-12-22	11-16-25	13-20-28	16-22-31	18-24-34	21-25-36	23-28-40	25-31-43	27-34-47
24 x 16	32 x 12	2.50		CFM		750	1000	1250	1500	1750	2000	2500	3000	3500
				Noise Criteria		–	–	20	25	30	34	40	46	51
			1.70	Throw	0°	14-24-45	22-32-52	27-40-58	32-45-64	37-49-68	43-52-74	48-58-82	52-64-90	56-68-97
			1.48		22 1/2°	11-19-36	18-26-42	22-32-46	26-36-51	30-39-54	34-42-59	38-46-66	42-51-72	45-54-78
			1.29		45°	7-12-23	11-16-26	14-20-29	16-23-32	19-25-34	22-26-37	24-29-41	26-32-45	28-34-49
20 x 20	22 x 18	2.61		CFM		783	1044	1305	1566	1827	2088	2610	3132	3654
				Noise Criteria		–	–	20	25	30	34	40	46	51
			1.77	Throw	0°	15-24-46	22-32-53	27-41-59	32-46-65	38-50-70	44-53-75	49-59-84	53-65-92	58-70-99
			1.54		22 1/2°	12-19-37	18-26-42	22-33-47	26-37-52	30-40-56	35-42-60	39-47-67	42-52-74	46-56-79
			1.34		45°	8-12-23	11-16-27	14-21-30	16-23-33	19-25-35	22-27-38	25-30-42	27-33-46	29-35-50
36 x 12	22 x 20 24 x 18 26 x 16 30 x 14	2.79		CFM		837	1116	1395	1674	1953	2232	2790	3348	3906
				Noise Criteria		–	–	20	25	30	34	40	46	51
			1.90	Throw	0°	15-25-48	23-34-55	28-42-61	34-48-68	40-51-73	45-55-77	50-61-86	55-68-95	59-73-103
			1.65		22 1/2°	12-20-38	18-27-44	22-34-49	27-38-54	32-41-58	36-44-62	40-49-69	44-54-76	47-58-82
			1.44		45°	8-13-24	12-17-28	14-21-31	17-24-34	20-26-37	23-28-39	25-31-43	28-34-48	30-37-52
22 x 22	24 x 20 26 x 18 30 x 16 40 x 12	3.17		CFM		951	1268	1585	1902	2219	2536	3170	3804	4438
				Noise Criteria		–	–	21	26	31	35	41	47	52
			2.16	Throw	0°	17-27-50	24-36-58	29-45-65	36-50-71	42-54-77	47-58-82	53-65-92	58-71-101	62-77-109
			1.87		22 1/2°	14-22-40	19-29-46	23-36-52	29-40-57	34-43-62	38-46-66	42-52-74	46-57-81	50-62-87
			1.63		45°	9-14-25	12-18-29	15-23-33	18-25-36	21-27-39	24-29-41	27-33-46	29-36-51	31-39-55
42 x 12	36 x 14	3.27		CFM		981	1308	1635	1962	2289	2616	3270	3924	4578
				Noise Criteria		–	–	21	26	31	35	41	47	52
			2.22	Throw	0°	17-27-51	24-36-59	30-45-66	36-51-72	42-55-77	48-59-83	53-66-93	59-72-101	63-77-109
			1.93		22 1/2°	14-22-41	19-29-47	24-36-53	29-41-58	34-44-62	38-47-66	42-53-74	47-58-81	50-62-87
			1.68		45°	9-14-26	12-18-30	15-23-33	18-26-36	21-28-39	24-30-42	27-33-47	30-36-51	32-39-55
30 x 18	24 x 22 34 x 16 40 x 14	3.54		CFM		1062	1416	1770	2124	2478	2832	3540	4248	4956
				Noise Criteria		–	–	21	26	31	35	41	47	52
			2.41	Throw	0°	18-28-53	25-37-61	31-47-69	37-53-75	44-57-81	50-61-86	56-69-97	61-75-106	66-81-115
			2.09		22 1/2°	14-22-42	20-30-49	25-38-55	30-42-60	35-46-65	40-49-69	45-55-78	49-60-85	53-65-92
			1.82		45°	9-14-27	13-19-31	16-24-35	19-27-38	22-29-41	25-31-43	28-35-49	31-38-53	33-41-58

For performance data notes, see F24.

PERFORMANCE DATA: SUPPLY GRILLES AND REGISTERS • 5100, 6100 AND 6700 SERIES
MODELS: 51DV, 51DH, 51SV, 51SH, 61DV, 61DH, 61SV, 61SH, 67DV, 67DH, 67SV, 67SH

Listed Duct Size (inches)	Alternate Sizes (inches)	Core Area (sq. ft.)	Ak Factor	Core Velocity Pressure		300 .006	400 .010	500 .016	600 .022	700 .031	800 .040	1000 .062	1200 .090	1400 .122
				Total Pressure	0° 22 1/2° 45°	.015 .017 .026	.026 .030 .046	.041 .047 .072	.059 .068 .103	.081 .093 .142	.106 .122 .186	.165 .190 .289	.238 .274 .417	.324 .373 .567
24 x 24	26 x 22 28 x 20 32 x 18 36 x 16	3.79		CFM		1137	1516	1895	2274	2653	3032	3790	4548	5306
				Noise Criteria		–	–	21	26	31	35	41	47	52
			2.58	Throw	0°	18-29-55	29-36-62	33-48-70	39-55-77	45-59-83	51-62-89	57-70-99	62-77-108	68-83-117
			2.24		22 1/2°	14-23-44	21-31-50	26-38-56	31-44-62	36-47-66	41-50-71	46-56-79	50-62-86	54-66-94
			1.95		45°	9-15-28	13-20-31	17-24-35	20-28-39	23-30-42	26-31-45	29-35-50	31-39-54	34-42-59
36 x 18	32 x 20 40 x 16 46 x 14	4.29		CFM		1287	1716	2145	2574	3003	3432	4290	5148	6006
				Noise Criteria		–	15	22	27	32	36	42	48	53
				Throw	0°	19-31-58	28-42-68	35-52-75	2-58-83	48-63-89	55-68-95	61-75-106	68-83-117	73-89-125
					22 1/2°	15-25-46	22-34-54	28-42-60	34-46-66	38-50-71	44-54-76	49-60-85	54-66-94	58-71-100
					45°	10-16-29	14-21-34	18-26-38	21-29-42	24-32-45	28-34-48	31-38-53	34-42-59	37-45-63
26 x 26	28 x 24 48 x 14	4.47		CFM		1341	1788	2235	2682	3129	3576	4470	5364	6258
				Noise Criteria		–	15	22	27	32	36	42	48	53
			3.04	Throw	0°	19-32-59	28-43-69	35-53-77	43-59-85	49-65-91	56-69-98	63-77-109	69-85-120	75-91-129
			2.64		22 1/2°	15-26-47	22-34-55	28-42-62	34-47-68	39-52-73	45-55-78	50-62-87	55-68-96	60-73-103
			2.30		45°	10-16-30	14-22-35	18-27-32	22-30-43	25-33-46	28-35-49	32-39-55	35-43-60	38-46-65
30 x 24	32 x 22 36 x 20 40 x 18	4.77		CFM		1431	1908	2385	2862	3339	3816	4770	5724	6678
				Noise Criteria		–	15	22	27	32	36	42	48	53
			3.24	Throw	0°	20-33-61	29-44-71	36-54-79	44-61-87	51-67-94	58-71-101	65-79-112	71-87-123	77-94-133
			2.81		22 1/2°	16-26-49	23-35-57	29-43-63	35-49-70	41-54-75	46-57-81	52-63-90	57-70-98	62-75-106
			2.46		45°	10-17-31	15-22-36	18-27-40	22-31-44	26-34-47	29-36-51	33-40-56	36-44-62	39-47-67
42 x 18	28 x 26	4.99		CFM		1497	1997	2495	2994	3493	3992	4990	5988	6986
				Noise Criteria		–	16	23	28	33	37	43	49	54
			3.39	Throw	0°	20-33-62	30-44-72	37-55-80	44-62-88	52-67-95	59-72-102	66-80-114	72-88-125	77-95-135
			2.94		22 1/2°	16-26-50	24-35-58	30-44-64	35-50-70	42-54-76	47-58-82	53-64-91	58-70-100	62-76-108
			2.57		45°	10-17-31	15-22-36	19-28-40	22-31-44	26-34-48	30-36-51	33-40-57	36-44-63	39-48-68
28 x 28	30 x 26 36 x 22 40 x 20	5.20		CFM		1560	2080	2600	3120	3640	4160	5200	6240	7280
				Noise Criteria		–	16	23	28	33	37	43	49	54
			3.54	Throw	0°	21-34-63	30-45-74	38-56-82	45-63-90	53-69-97	60-74-104	67-82-116	74-90-128	79-97-137
			3.07		22 1/2°	17-27-50	24-36-59	30-45-66	36-50-72	42-55-78	48-59-83	54-66-93	59-72-102	63-78-110
			2.68		45°	11-17-32	15-23-37	19-28-41	23-32-45	27-35-49	30-37-52	34-41-58	37-45-64	40-49-69
42 x 20	30 x 28	5.57		CFM		1671	2228	2785	3342	3899	4456	5570	6684	7798
				Noise Criteria		–	16	23	28	33	37	43	49	54
			3.79	Throw	0°	22-35-66	31-47-76	39-58-84	47-66-93	55-71-100	62-76-107	70-84-120	76-93-131	82-100-142
			3.29		22 1/2°	18-28-53	25-38-61	31-46-67	38-53-74	44-57-80	50-61-86	56-67-96	61-74-105	66-80-114
			2.87		45°	11-18-33	16-24-38	20-29-42	24-33-47	28-36-50	31-38-54	35-42-60	38-47-66	41-50-71
36 x 24	40 x 22 44 x 20	5.74		CFM		1722	2296	2870	3444	4018	4592	5740	6888	8036
				Noise Criteria		–	16	23	28	33	37	43	49	54
			3.90	Throw	0°	23-36-68	32-49-78	41-60-88	49-68-96	57-74-104	64-78-112	72-88-124	78-96-137	85-104-148
			3.39		22 1/2°	18-29-54	26-39-62	33-48-70	39-54-77	46-59-83	51-62-90	58-70-99	62-77-110	68-83-118
			2.96		45°	12-18-34	16-25-39	21-30-44	25-34-48	29-37-52	32-39-56	36-44-62	39-48-69	43-52-74
30 x 30	34 x 26 38 x 24 48 x 20	5.99		CFM		1797	2396	2995	3594	4193	4792	5990	7188	8386
				Noise Criteria		–	16	23	28	33	37	43	49	54
			4.07	Throw	0°	23-36-69	33-49-80	41-61-89	49-69-98	57-75-106	65-80-113	73-89-126	80-98-138	86-106-150
			3.53		22 1/2°	18-29-55	26-39-64	33-49-71	39-55-78	46-60-85	52-64-90	58-71-101	64-78-110	69-85-120
			3.08		45°	12-18-35	17-25-40	21-31-45	25-35-49	29-38-53	33-40-57	37-45-63	40-49-69	43-53-75
42 x 24	36 x 28 42 x 24 46 x 22	6.72		CFM		2016	2688	3360	4032	4704	5376	6720	8064	9408
				Noise Criteria		–	17	24	29	34	38	44	50	55
			4.57	Throw	0°	24-39-72	34-51-84	43-64-93	51-72-102	60-78-111	68-84-118	77-93-132	84-102-144	90-111-157
			3.96		22 1/2°	19-31-58	27-41-67	34-51-74	41-58-82	48-62-89	54-67-94	62-74-106	67-82-115	72-89-126
			3.46		45°	12-20-36	17-26-42	22-32-47	26-36-51	30-39-56	34-42-59	39-47-66	42-51-72	45-56-79
32 x 32	40 x 26	6.84		CFM		2052	2736	3420	4104	4788	5472	6840	8208	9576
				Noise Criteria		–	17	24	29	34	38	44	50	55
			4.65	Throw	0°	24-39-73	34-52-84	43-65-94	52-73-103	61-79-112	69-84-119	77-94-133	84-103-146	91-112-158
			4.04		22 1/2°	19-31-58	27-42-67	34-52-75	42-58-82	49-63-90	55-67-95	62-75-106	67-82-117	73-90-126
			3.52		45°	12-20-37	17-26-42	22-33-47	26-37-52	31-40-56	35-42-60	39-47-67	42-52-73	46-56-79
36 x 30	38 x 28	7.22		CFM		2166	2888	3610	4332	5054	5776	7220	8664	10108
				Noise Criteria		–	17	24	29	34	38	44	50	55
			4.91	Throw	0°	25-40-76	36-54-87	45-68-98	54-76-108	63-82-116	71-87-124	80-98-139	87-108-151	94-116-164
			4.26		22 1/2°	20-32-61	29-43-70	36-54-78	43-61-86	50-66-93	57-70-99	64-78-111	70-86-121	75-93-131
			3.72		45°	13-20-38	18-27-44	23-34-49	27-38-54	32-41-58	36-44-62	40-49-70	44-54-76	47-58-82
48 x 24	34 x 34 36 x 32 38 x 30 42 x 28	7.69		CFM		2307	3076	3845	4614	5383	6152	7690	9228	10766
				Noise Criteria		–	18	25	30	35	39	45	51	56
			5.23	Throw	0°	26-41-77	37-55-90	46-69-100	55-77-109	64-84-118	73-90-127	82-100-142	90-109-155	97-118-167
			4.54		22 1/2°	21-33-62	30-44-72	37-55-80	44-62-87	51-67-94	58-72-102	66-80-114	72-87-124	78-94-134
			3.96		45°	13-22-39	19-28-45	23-45-50	28-39-55	32-42-59	37-45-64	41-50-71	45-55-78	49-59-84

For performance data notes, see F24.

PERFORMANCE DATA: SUPPLY GRILLES AND REGISTERS • 5100, 6100 AND 6700 SERIES

MODELS: 51DV, 51DH, 51SV, 51SH, 61DV, 61DH, 61SV, 61SH, 67DV, 67DH, 67SV, 67SH

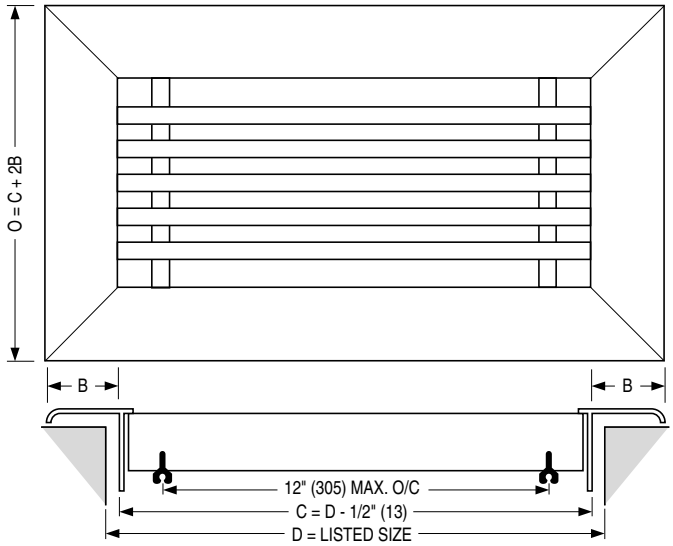
Listed Duct Size (inches)	Alternate Sizes (inches)	Core Area (sq. ft.)	Ak Factor	Core Velocity Pressure		300 .006	400 .010	500 .016	600 .022	700 .031	800 .040	1000 .062	1200 .090	1400 .122
				Total Pressure	0°	.015	.026	.041	.059	.081	.106	.165	.238	.324
					22 1/2°	.017	.030	.047	.068	.093	.122	.190	.274	.373
					45°	.026	.046	.072	.103	.142	.186	.289	.417	.567
36 x 34	38 x 32 40 x 30 48 x 26	8.20		**CFM**		**2460**	**3280**	**4100**	**4920**	**5740**	**6560**	**8200**	**9840**	**11480**
				Noise Criteria		–	18	25	30	35	39	45	51	56
			5.58	**Throw**	0°	26-42-79	37-57-91	47-70-102	57-79-111	65-85-121	75-91-129	84-102-144	91-111-158	98-121-171
			4.84		22 1/2°	21-34-63	30-46-73	38-56-82	46-63-89	52-68-97	60-73-103	67-82-115	73-89-126	78-97-137
			4.22		45°	13-21-40	19-29-	24-35-51	29-40-56	33-43-61	38-46-65	42-51-72	46-56-79	49-61-86
36 x 36	38 x 34 42 x 30 46 x 28	8.69		**CFM**		**2607**	**3476**	**4345**	**5214**	**6083**	**6952**	**8690**	**10428**	**12166**
				Noise Criteria		–	18	25	30	35	39	45	51	56
			5.91	**Throw**	0°	28-45-84	36-60-96	49-74-108	60-84-117	69-90-127	78-96-136	88-108-152	96-117-166	104-127-180
			5.13		22 1/2°	22-36-67	31-48-77	39-59-86	48-67-94	55-72-102	62-77-109	70-86-122	77-94-133	83-102-144
			4.48		45°	14-23-42	20-30-48	25-37-54	30-42-59	35-45-64	39-48-68	44-54-76	48-59-83	52-64-90
38 x 38	42 x 34	9.70		**CFM**		**2910**	**3880**	**4850**	**5820**	**6790**	**7760**	**9700**	**11640**	**13580**
				Noise Criteria		–	19	26	31	36	40	46	52	57
			6.60	**Throw**	0°	28-47-88	42-62-101	53-78-114	62-88-125	73-95-134	83-101-143	93-114-161	101-125-176	109-134-190
			5.72		22 1/2°	22-38-70	34-50-81	42-62-91	50-70-100	58-76-107	66-81-114	74-91-129	81-100-141	87-107-152
			5.00		45°	14-24-44	21-31-51	27-39-57	31-44-63	37-48-67	42-51-72	47-57-81	51-63-88	55-67-95
42 x 36	44 x 34 48 x 30	10.16		**CFM**		**3048**	**4064**	**5080**	**6096**	**7112**	**8128**	**10160**	**12192**	**14224**
				Noise Criteria		–	19	26	31	36	40	46	52	57
			6.91	**Throw**	0°	29-48-90	43-64-104	53-80-117	64-90-127	75-97-138	85-104-147	95-117-165	104-127-180	112-138-195
			5.99		22 1/2°	23-38-72	34-51-83	42-64-94	51-72-102	60-78-110	68-83-118	76-94-132	83-102-144	90-110-156
			5.23		45°	15-24-45	22-32-52	27-40-59	32-45-64	38-49-69	43-52-74	48-59-83	52-64-90	56-69-98
40 x 40	42 x 38 46 x 34 48 x 32	10.77		**CFM**		**3231**	**4308**	**5385**	**6462**	**7539**	**8616**	**10770**	**12924**	**15078**
				Noise Criteria		–	19	26	31	36	40	46	52	57
			7.32	**Throw**	0°	31-50-94	44-67-108	56-84-121	67-94-132	77-102-143	88-108-153	99-121-171	108-132-187	117-143-203
			6.35		22 1/2°	25-40-75	35-54-86	45-67-97	54-75-106	62-82-114	70-86-122	79-97-137	86-106-150	94-114-162
			5.55		45°	16-25-47	22-34-54	28-42-61	34-47-66	39-51-72	44-54-77	50-61-86	54-66-94	59-72-102
42 x 42	44 x 40 46 x 38 48 x 36	11.89		**CFM**		**3567**	**4756**	**5945**	**7134**	**8323**	**9512**	**11890**	**14268**	**16646**
				Noise Criteria		–	20	27	32	37	41	47	53	58
			8.09	**Throw**	0°	32-52-97	46-69-112	58-86-125	69-97-138	81-105-149	92-112-159	102-125-178	112-138-195	122-145-210
			7.02		22 1/2°	26-42-78	37-55-90	46-69-100	55-78-110	65-84-119	74-90-127	82-100-142	90-110-156	98-119-168
			6.12		45°	16-26-49	23-35-56	29-43-63	35-49-69	41-53-75	46-56-80	51-63-89	56-69-98	61-75-105
44 x 44	46 x 42	13.07		**CFM**		**3921**	**5228**	**6535**	**7842**	**9149**	**10456**	**13070**	**15684**	**18298**
				Noise Criteria		–	20	27	32	37	41	47	53	58
			8.89	**Throw**	0°	34-55-104	49-74-120	61-92-133	74-104-146	86-112-158	97-120-168	109-133-189	120-146-207	129-158-223
			7.71		22 1/2°	27-44-83	39-59-96	49-74-106	59-83-117	69-90-126	78-96-134	87-106-151	96-117-166	103-126-178
			6.73		45°	17-28-52	25-37-60	31-46-67	37-52-73	43-56-79	49-60-84	55-67-95	60-73-104	65-79-112
46 x 46		14.30		**CFM**		**4290**	**5720**	**7150**	**8580**	**10010**	**11440**	**14300**	**17160**	**20020**
				Noise Criteria		–	20	27	32	37	41	47	53	58
			9.72	**Throw**	0°	35-57-107	51-76-124	63-95-138	76-107-151	89-116-163	101-124-174	113-138-195	124-151-214	134-163-231
			8.44		22 1/2°	28-46-86	41-61-99	50-76-110	61-86-121	71-93-130	81-99-139	90-110-156	99-121-171	107-130-185
			7.36		45°	18-29-54	26-38-62	32-48-69	38-54-76	45-58-82	51-62-87	57-69-98	62-76-107	62-82-116
48 x 48		15.59		**CFM**		**4677**	**6236**	**7795**	**9354**	**10913**	**12472**	**15590**	**18708**	**21826**
				Noise Criteria		–	21	28	33	38	42	48	54	59
			10.60	**Throw**	0°	37-60-113	53-80-131	67-100-146	80-113-159	94-122-173	106-131-185	119-146-206	131-159-226	140-173-244
			9.20		22 1/2°	30-48-90	42-64-105	54-80-117	64-90-127	75-98-138	85-105-148	95-117-165	105-127-181	112-138-195
			8.03		45°	19-30-57	27-40-66	34-50-73	40-57-80	47-61-87	53-66-93	60-73-103	62-80-113	70-87-122

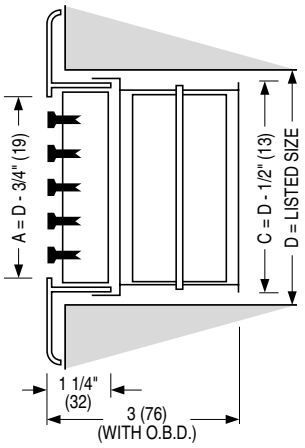
Performance Notes:

1. All pressures are in inches w.g..
2. Core Velocity is in feet per minute.
3. Performance data is based on double deflection grille with opposed blade damper (register).
4. 0°, 22 1/2° and 45° represent vertical blade deflection angles and horizontal spread.
5. Throw values are given for terminal velocities of 150, 100 and 50 fpm under isothermal conditions.
6. Additional performance notes and correction factors for various models and settings may be found on page F20.
7. Noise Criteria (NC) values are based upon 10dB room absorption, re 10^{-12} watts @ 0° deflection. Dash (–) in space indicates an Noise Criteria of less than 15.
8. Data derived from tests conducted in accordance with ANSI/ASHRAE Standard 70 – 2006.

Nailor Industries Inc.

LINEAR BAR GRILLES AND REGISTERS
ALUMINUM • FIXED BARS
MODEL SERIES: 4900





Dimensions are in inches (mm).

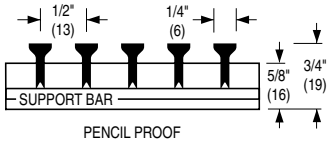
Series 4900 Extruded Aluminum Linear Bar Grilles and Registers are suitable for ceiling, sidewall or sill installation.
End caps are staked and mitered.
Minimum nominal width = 1 1/2" (38).
Maximum nominal width = 24" (610).
Available in 1/2" (13) nominal increments in width and 1" (25) in length.
Maximum single section length = 72" (1829).
Multiple-section assemblies are provided with alignment strips.

DAMPER SELECTION
(Optional)

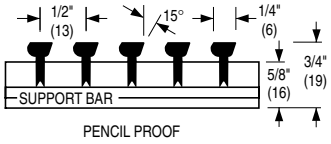
❑ **OPPOSED BLADE**
minimum width = 2 1/2" (63).

SINGLE BLADE
with friction hinge on 1 1/2" (38) and 2" (51) widths.

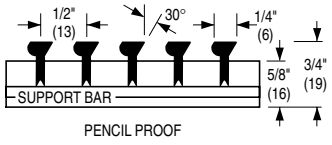
CORE SELECTION



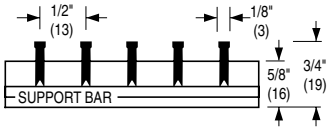
❑ 49-240 0° Deflection



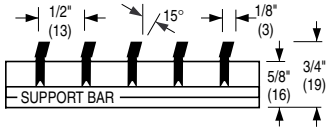
❑ 49-241 15° Deflection



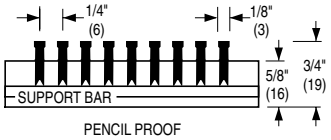
❑ 49-243 30° Deflection



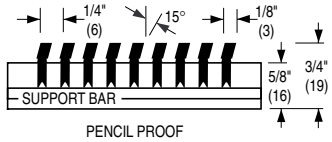
❑ 49-280 0° Deflection



❑ 49-281 15° Deflection

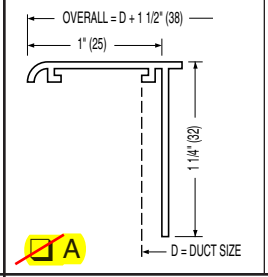


❑ 49-480 0° Deflection

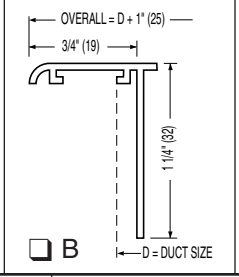


☒ 49-481 15° Deflection

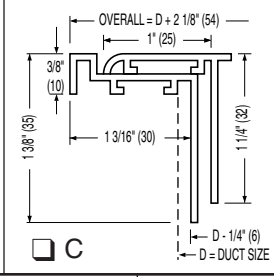
FRAME SELECTION



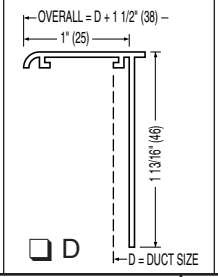
☒ A



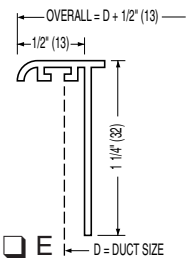
❑ B



❑ C

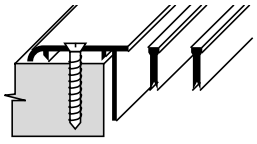


❑ D

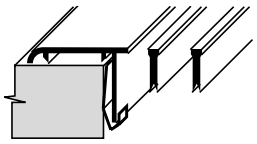


❑ E

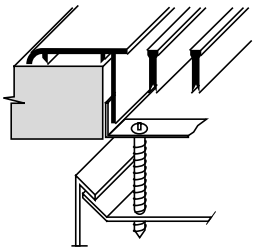
FASTENING SELECTION



☒ TYPE A
#8 Countersunk Screw Holes.
(except Frame E)



❑ TYPE B
Spring Clip
Sill applications only.
(except Frame C)



❑ TYPE C Concealed Mounting - (not recom. for cores with 1/4" (6) spacing)

FINISH:

- ☒ AW Appliance White
- ❑ AL Aluminum
- ❑ SA Satin (clear) Anodized
- ❑ BC Brushed clear-coat lacquer
- ❑ MI Mill
- ❑ SP Special

SCHEDULE TYPE:	S2
PROJECT:	Carroll College Anthrozoology
ENGINEER:	
CONTRACTOR:	

DATE	B SERIES	SUPERSEDES	DRAWING NO.
16 - 9 - 99R	4900	5 - 95	4900-1

PERFORMANCE DATA:

MODEL 49-481 • 1/4" (6) SPACING • 1/8" (3) BARS • 15° DEFLECTION

Free Area Square Feet per Lineal Foot	Nominal Duct Width	Total Pressure		.012	.026	.049	.077	.109	.148	.195	.247	.304
.034	1 1/2"	Airflow, CFM/FT.		14	20	27	34	41	48	54	61	68
		Noise Criteria		–	–	22	30	35	39	43	46	49
		Throw	Sill or Floor	1-1-1	3-3-3	4-4-4	7-7-7	9-9-10	10-11-12	12-13-15	13-14-16	14-16-18
			Side Wall	2-4-6	4-7-10	6-10-14	7-12-17	9-14-20	10-16-22	12-18-25	13-20-27	14-22-30
.049	2"	Airflow, CFM/FT.		20	29	39	49	59	69	78	88	98
		Noise Criteria		–	–	20	27	32	37	41	44	47
		Throw	Sill or Floor	1-1-1	4-4-4	6-6-6	9-9-9	11-11-12	12-13-15	14-16-18	15-17-19	16-18-20
			Side Wall	3-5-7	5-8-11	7-11-15	9-14-19	11-16-22	12-18-25	14-20-27	15-22-29	16-24-32
.065	2 1/2"	Airflow, CFM/FT.		26	39	52	65	78	91	104	117	130
		Noise Criteria		–	–	20	27	32	37	41	44	47
		Throw	Sill or Floor	1-1-1	5-5-5	8-8-8	10-10-11	13-14-15	14-15-17	17-18-20	19-20-21	21-21-22
			Side Wall	4-6-8	6-9-12	8-12-16	10-15-20	13-19-24	14-20-26	17-23-30	19-26-33	21-28-36
.082	3"	Airflow, CFM/FT.		33	49	66	82	98	115	131	148	164
		Noise Criteria		–	–	20	27	32	37	41	44	47
		Throw	Sill or Floor	2-2-2	6-6-6	9-9-9	12-12-13	15-15-16	17-18-19	20-21-22	21-22-23	23-23-24
			Side Wall	4-6-9	7-10-13	9-13-17	12-16-21	15-20-25	17-22-28	20-26-32	21-28-35	23-31-39
.099	3 1/2"	Airflow, CFM/FT.		40	59	79	99	119	138	158	178	198
		Noise Criteria		–	–	20	28	33	37	41	44	47
		Throw	Sill or Floor	2-2-2	8-8-8	11-11-11	13-13-14	16-17-18	19-20-21	22-22-23	23-24-25	26-26-26
			Side Wall	5-7-9	8-11-14	11-15-19	13-17-22	16-21-26	19-24-30	22-28-34	23-30-37	26-33-40
.117	4"	Airflow, CFM/FT.		47	70	94	117	140	164	187	220	234
		Noise Criteria		–	–	21	28	34	38	42	45	48
		Throw	Sill or Floor	3-3-3	9-9-9	12-12-12	15-15-15	18-19-20	21-21-22	23-24-25	25-25-26	28-28-28
			Side Wall	5-7-10	9-12-15	12-16-20	15-19-24	18-23-28	21-26-32	23-29-35	25-32-39	29-36-42
.152	5"	Airflow, CFM/FT.		61	91	121	152	182	212	243	274	304
		Noise Criteria		–	–	22	29	34	39	43	46	49
		Throw	Sill or Floor	3-3-3	9-9-9	13-13-13	16-16-17	20-20-21	23-23-24	25-25-26	28-28-28	31-31-31
			Side Wall	7-9-12	10-13-17	14-18-22	16-21-26	20-25-30	23-28-34	25-31-37	28-34-40	31-38-44
.186	6"	Airflow, CFM/FT.		74	111	149	186	223	260	298	335	372
		Noise Criteria		–	–	22	30	35	40	43	47	50
		Throw	Sill or Floor	4-4-4	10-10-10	14-14-14	18-18-18	22-22-22	25-25-25	28-28-28	30-30-30	33-32-32
			Side Wall	8-10-13	11-14-18	15-19-23	19-23-27	23-27-31	25-30-35	28-33-39	31-37-42	34-40-45

Performance Notes:

1. Throws are given at 150, 100 and 50 fpm terminal velocities.
2. Throw values are based on a 4 foot section with a cooling ΔT of 20°F (11°C).

   For other lengths, use the correction factor table shown.
3. Total Pressure is in inches w.g..
4. Noise Criteria [NC] values are based on a 10 foot active section. For other lengths, use the correction factor table shown.
5. Return Air Applications:

   Noise Criteria value is increased by + 4.

   Negative Static Pressure = 0.8 x Total Pressure.
6. Dash (–) in space indicates an Noise Criteria level of less than 15.
7. Data derived from tests conducted in accordance with ANSI/ASHRAE Standard 70–2006.

Noise Criteria Correction for Length

Active Length, ft.	1	2	4	8	10	15	20
Correction Factor	-10	-7	-4	-1	0	+2	+3

Throw Correction for Length

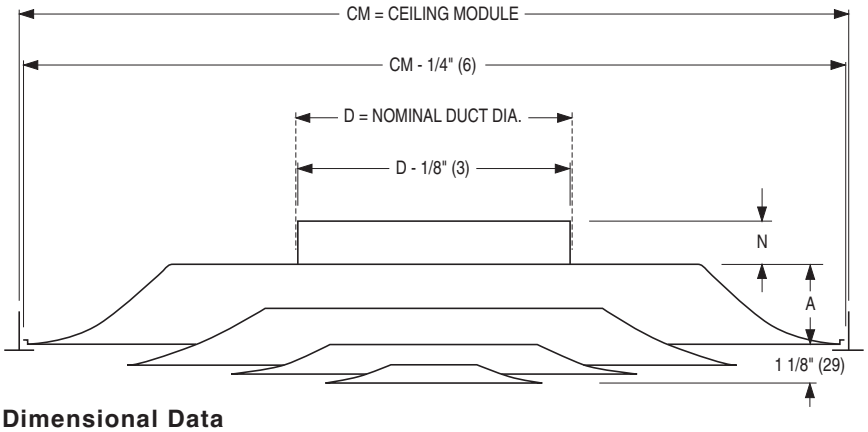
Active Length	Terminal Velocity		
	150 fpm	100 fpm	50 fpm
1 ft.	0.5	0.6	0.7
10 ft. +	1.6	1.4	1.2

Nominal Width	Ak Factor per foot	
	Supply	Return
1 1/2"	.045	.041
2"	.059	.053
2 1/2"	.074	.065
3"	.091	.080
3 1/2"	.108	.091
4"	.126	.108
5"	.161	.138
6"	.195	.166

SQUARE CEILING DIFFUSERS
FIXED PATTERN • LOUVERED FACE
STEEL • ROUND NECK • 4 CONE
MODEL: RNS

Nailor® Industries Inc.

☑ TYPE L Lay-in T-Bar



Dimensional Data

Ceiling Module CM		Imperial Units (inches)					Metric Units (mm)				
Imperial Modules	Metric Modules	Duct Size D	N	A	B	F	Duct Size D	N	A	B	F
12 x 12	300 x 300	4*	3 1/4	1	11	13	102*	83	25	279	330
		5, 6, 7, 8	1 1/4				127, 152, 178, 203	32			
24 x 24	600 x 600	6, 8, 10, 12, 14, 15	1 1/4	2 5/16	22	24 3/4	152, 203, 254, 305, 356, 381	32	59	559	629

* Supplied with a reducer.

DESCRIPTION:

1. Material: Heavy gauge, corrosion-resistant steel.
2. The diffuser delivers the air in a true 360° radial horizontal pattern. Designed to minimize smudging and streaking of ceiling.
3. Excellent for VAV systems. The uniform near horizontal jets from the louvered cones maintain effective air motion over a considerable range of air volumes.
4. The models consist of four die-formed concentric cones in all sizes which eliminate mitered corners and provide uniform appearance in all neck sizes.
5. A spring clip arrangement permits quick, easy installation and removal of the inner cone assembly.
6. Diffuser has a removable plug for screwdriver adjustment of the optional damper without removing the inner core.
7. Standard finish is AW Appliance White.

OPTIONS:

- ❑ EX External Foil-Back Insulation, installed - R-4.2
- ❑ EXB External Foil-Back Insulation, ships loose - R-4.2
- ❑ MIB Molded Insulation Blanket - R-6.0 (24 x 24 only)
- ❑ EIC Extended Inlet Collar (2.25") with bead
- ❑ EQT Earthquake Tabs

Finish:

- ❑ SP Special. Specify _____ .

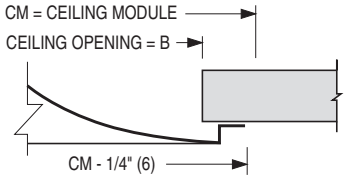
QB Quadrant Blanks:

- ❑ QB3 3-Way Blow
- ❑ QC2 2-Way Corner Blow
- ❑ QB2 2-Way Opposite Blow
- ❑ QB1 1-Way Blow

Dimensions are in inches (mm). Fineline® is a registered trademark of USG Interiors Inc.

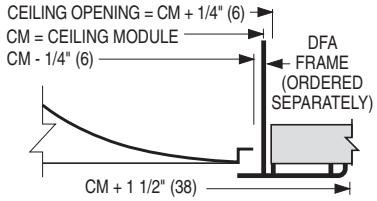
❑ TYPE L Surface Mount

Hard duct connection recommended.

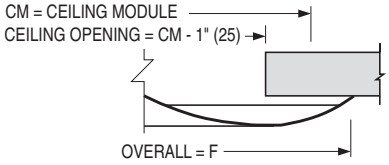


❑ TYPE L Surface Mount With DFA

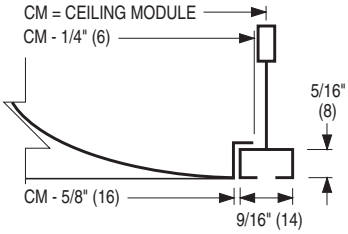
Drywall/Plaster frame. Recommended for flexible duct connection and ceiling access



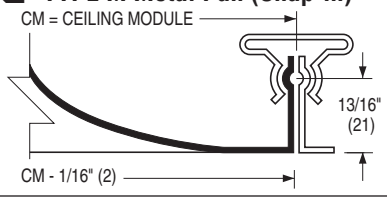
☑ TYPE S Surface Mount



❑ TYPE F Fineline®

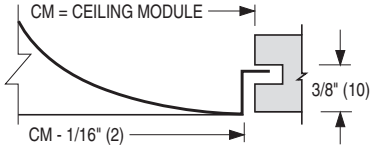


❑ TYPE M Metal Pan (Snap-in)



❑ TYPE SP Spline

For one directional exposed T-Bar or fully concealed grid. 1 spline on two opposite sides. Steel lift brackets on other.



SCHEDULE TYPE:	S3 S4 S5 S6				
PROJECT:	Carroll College Anthrozoology				
ENGINEER:		**DATE**	**B SERIES**	**SUPERSEDES**	**DRAWING NO.**
CONTRACTOR:		**4 - 20 - 17**	**RNS**	**1 - 24 - 17**	**4200-1**

PERFORMANCE DATA:

Models RNS and ARNS • 12 x 12 (300 x 300) Face Size

Nominal Neck Size	Neck Velocity, FPM	400	500	600	700	800	900	1000	1200	1400	1600
	Velocity Pressure	.010	.016	.023	.031	.040	.051	.063	.090	.122	.160
4" Dia.	Total Pressure	.014	.022	.032	.043	.056	.071	.088	.126	.172	.224
	Airflow, CFM	35	44	52	61	70	79	87	105	122	140
	Throw	1-2-4	2-2-5	2-3-5	2-3-6	2-4-7	3-4-7	3-5-7	4-5-8	4-6-9	5-7-9
	Noise Criteria	—	—	—	—	—	11	19	25	30	35
5" Dia.	Total Pressure	.017	.026	.038	.051	.067	.085	.105	.151	.206	.269
	Airflow, CFM	55	68	82	95	109	123	136	164	191	218
	Throw	2-2-5	2-3-6	2-4-6	2-4-7	2-5-8	3-6-9	4-6-9	5-7-10	5-8-11	6-8-11
	Noise Criteria	—	—	—	—	—	14	22	28	33	38
6" Dia.	Total Pressure	.018	.029	.043	.060	.079	.100	.128	.175	.250	.325
	Airflow, CFM	80	100	120	140	160	180	200	235	275	315
	Throw	1-2-4	1-2-5	1-3-6	2-3-6	2-4-8	3-4-8	3-4-10	4-5-10	4-6-14	5-8-14
	Noise Criteria	—	—	11	16	20	22	24	31	38	41
7" Dia.	Total Pressure	.022	.035	.050	.068	.089	.112	.138	.199	.271	.354
	Airflow, CFM	107	134	160	187	214	241	267	321	374	428
	Throw	2-4-8	3-5-9	4-6-10	4-7-11	5-8-12	5-9-13	6-10-14	7-10-14	9-11-15	10-12-16
	Noise Criteria	—	—	12	17	20	24	27	33	39	42
8" Dia.	Total Pressure	.031	.047	.065	.087	.110	.140	.168	.235	.310	.395
	Airflow, CFM	140	175	210	245	280	315	350	420	490	560
	Throw	3-5-9	4-5-11	5-7-13	5-8-14	6-9-14	6-10-15	7-11-16	8-12-17	10-13-18	11-14-18
	Noise Criteria	—	—	13	18	22	26	29	35	40	44

Models RNS and ARNS • 20 x 20 (500 x 500) Face Size

Nominal Neck Size	Neck Velocity, FPM	400	500	600	700	800	900	1000	1200	1400	1600
	Velocity Pressure	.010	.016	.023	.031	.040	.051	.063	.090	.122	.160
6" Dia.	Total Pressure	.015	.023	.033	.045	.058	.074	.091	.130	.176	.230
	Airflow, CFM	80	100	120	140	160	180	200	235	275	315
	Throw	1-1-3	1-2-4	1-2-4	1-3-5	2-3-6	2-3-6	2-4-7	3-5-8	3-5-8	4-6-9
	Noise Criteria	—	—	14	18	21	26	29	34	38	41
8" Dia.	Total Pressure	.018	.028	.041	.055	.072	.091	.112	.161	.219	.286
	Airflow, CFM	140	175	210	245	280	315	350	420	490	560
	Throw	1-2-5	2-3-6	2-4-6	3-4-7	3-5-7	4-5-8	4-6-8	5-6-9	6-7-10	6-8-11
	Noise Criteria	—	11	16	20	23	28	31	36	40	43
10" Dia.	Total Pressure	.023	.036	.052	.071	.092	.117	.144	.207	.281	.367
	Airflow, CFM	220	270	330	380	435	490	545	655	765	870
	Throw	2-4-6	3-4-7	4-5-8	4-6-9	5-6-9	5-7-10	6-7-10	6-8-11	7-9-12	8-9-13
	Noise Criteria	—	13	18	22	25	30	33	38	42	45

Performance Notes:

1. Throws are given at 150, 100 and 50 fpm terminal velocities, under isothermal conditions.
2. All pressures are in inches w.g..
3. The addition of quadrant blanks reduces the effective area and for a given air volume, increases the discharge velocity. This will result in an increase in throw, pressure drop and sound level. To determine throw, select the diffuser as if it were supplying a larger volume of air. The table shows the percentage increase required to determine selection of diffuser size and throw. To correct pressure drop and Noise Criteria, use correction factors as shown for 4-way blow values.
4. Noise Criteria (NC) are based on a room absorption of 10 dB, re 10^{-12} watts. Dash (—) in space denotes an Noise Criteria level less than 10.
5. Data derived from independent tests conducted in accordance with ANSI/ ASHRAE Standard 70-2006.

Neck Size Diameter in Inches	Nominal Overall Face Size	Ak Factor
6	12 x 12	.131
8	12 x 12	.202
6	24 x 24	.180
8	24 x 24	.227
10	24 x 24	.331
12	24 x 24	.450
14	24 x 24	.511
15	24 x 24	.625

Quadrant Blanks (Blow)	% Increase in Air Volume for Throw Determination	% Increase in Static Pressure Drop	NC Sound Level Increase
1 (3-way)	35	125	8
2 (2-way)	100	450	19

PERFORMANCE DATA:

Models RNS and ARNS • 24 x 24 (600 x 600) Face Size

Nominal Neck Size	Neck Velocity, FPM	400	500	600	700	800	900	1000	1200	1400	1600
	Velocity Pressure	**.010**	**.016**	**.023**	**.031**	**.040**	**.051**	**.063**	**.090**	**.122**	**.160**
6" Dia.	**Total Pressure**	.015	.023	.035	.045	.060	.076	.095	.135	.186	.240
	Airflow, CFM	**80**	**100**	**120**	**140**	**160**	**180**	**200**	**235**	**275**	**315**
	Throw	1-1-4	1-2-5	1-2-6	1-3-7	2-4-9	2-5-9	3-6-11	3-6-12	4-7-14	6-8-15
	Noise Criteria	—	—	—	13	17	21	24	27	32	36
8" Dia.	**Total Pressure**	.021	.033	.047	.063	.082	.105	.128	.183	.245	.325
	Airflow, CFM	**140**	**175**	**210**	**245**	**280**	**315**	**350**	**420**	**490**	**560**
	Throw	1-1-5	1-2-6	1-3-8	2-4-8	3-5-10	3-6-10	4-6-13	5-8-13	6-8-16	7-10-17
	Noise Criteria	—	—	13	17	20	25	28	33	37	40
10" Dia.	**Total Pressure**	.024	.037	.047	.074	.097	.123	.150	.215	.293	.372
	Airflow, CFM	**220**	**270**	**330**	**380**	**435**	**490**	**545**	**655**	**765**	**870**
	Throw	1-3-6	2-4-8	3-5-9	4-6-12	5-6-12	5-7-14	6-9-15	6-10-15	8-13-17	9-13-18
	Noise Criteria	—	11	16	20	23	28	31	36	40	43
12" Dia.	**Total Pressure**	.026	.039	.057	.075	.097	.127	.150	.245	.310	.410
	Airflow, CFM	**315**	**390**	**470**	**550**	**630**	**705**	**785**	**990**	**1100**	**1255**
	Throw	2-3-7	3-4-9	3-5-10	4-6-13	5-7-13	5-8-15	5-8-16	7-9-18	9-11-18	10-12-19
	Noise Criteria	—	13	18	21	24	29	32	37	41	44
14" Dia.	**Total Pressure**	.030	.050	.070	.100	.110	.160	.200	.240	.390	.490
	Airflow, CFM	**425**	**530**	**635**	**745**	**850**	**955**	**1060**	**1270**	**1490**	**1695**
	Throw	3-4-9	4-5-11	4-7-13	5-7-16	6-9-16	7-11-16	7-11-19	9-13-19	11-16-19	11-16-27
	Noise Criteria	—	14	19	22	25	29	32	37	42	45
15" Dia.	**Total Pressure**	.033	.054	.072	.100	.127	.163	.204	.280	.395	.500
	Airflow, CFM	**490**	**615**	**735**	**860**	**985**	**1110**	**1230**	**1470**	**1720**	**1970**
	Throw	5-7-10	6-8-11	7-9-14	8-10-17	8-13-18	10-15-19	11-16-22	12-18-27	13-20-32	15-22-34
	Noise Criteria	—	15	20	23	26	30	33	38	43	46

Performance Notes:

1. Throws are given at 150, 100 and 50 fpm terminal velocities, under isothermal conditions.
2. All pressures are in inches w.g..
3. The addition of quadrant blanks reduces the effective area and for a given air volume, increases the discharge velocity. This will result in an increase in throw, pressure drop and sound level. To determine throw, select the diffuser as if it were supplying a larger volume of air. The table shows the percentage increase required to determine selection of diffuser size and throw. To correct pressure drop and Noise Criteria, use correction factors as shown for 4-way blow values.
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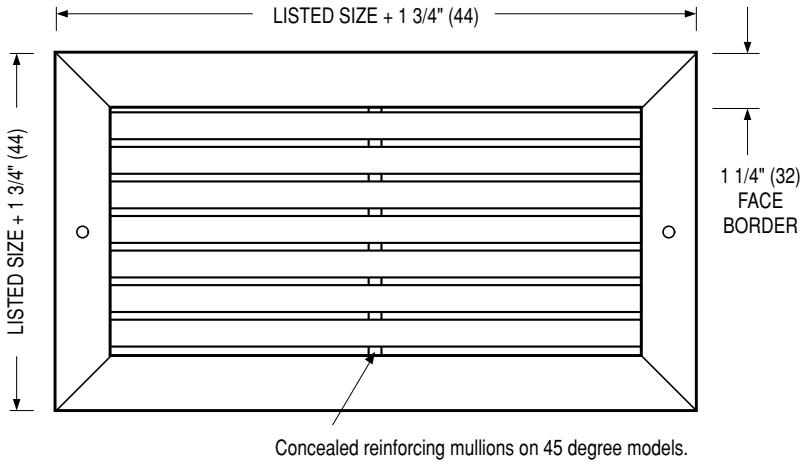
5. Data derived from independent tests conducted in accordance with ANSI/ ASHRAE Standard 70-2006.

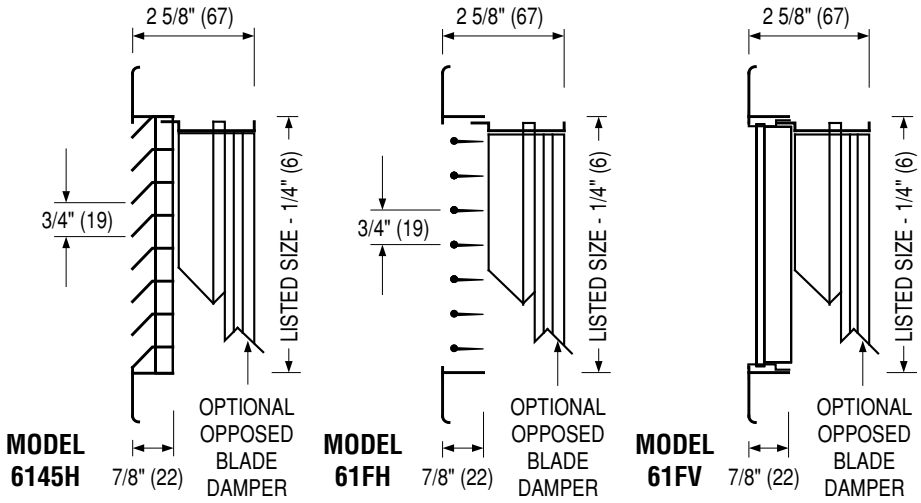
Neck Size Diameter in Inches	Nominal Overall Face Size	Ak Factor
6	12 x 12	0.131
8	12 x 12	0.202
6	24 x 24	0.180
8	24 x 24	0.227
10	24 x 24	0.331
12	24 x 24	0.450
14	24 x 24	0.511
15	24 x 24	0.625

Quadrant Blanks (Blow)	% Increase in Air Volume for Throw Determination	% Increase in Static Pressure Drop	NC Sound Level Increase
1 (3-way)	35	125	8
2 (2-way)	100	450	19

STEEL RETURN GRILLES & REGISTERS
FIXED BLADES • 3/4" (19) SPACING
MODELS: 6145H(-O), 6145V(-O), 61FH(-O) AND 61FV(-O) TYPE S

Nailor Industries Inc.





- ❑ **MODEL 6145H**
  Single Deflection Grille
  Fixed 45° Horizontal Blades
- ❑ **MODEL 6145H-O**
  Single Deflection Register
  Fixed 45° Horizontal Blades
  (Includes O. B. Damper)
- ☑ **MODEL 6145V**
  Single Deflection Grille
  Fixed 45° Vertical Blades
- ❑ **MODEL 6145V-O**
  Single Deflection Register
  Fixed 45° Vertical Blades
  (Includes O. B. Damper)
- ❑ **MODEL 61FH**
  Single Deflection Grille
  Fixed 0° Horizontal Blades
- ❑ **MODEL 61FH-O**
  Single Deflection Register
  Fixed 0° Horizontal Blades
  (Includes O. B. Damper)
- ❑ **MODEL 61FV**
  Single Deflection Grille
  Fixed 0° Vertical Blades
- ❑ **MODEL 61FV-O**
  Single Deflection Register
  Fixed 0° Vertical Blades
  (Includes O. B. Damper)

DESCRIPTION:

1. Construction: Corrosion-resistant steel. Roll-formed frame mechanically interlocked with reinforced mitered corners for strength. Roll-formed blades on 3/4" (19) centers are fixed at 0 or 45 degrees to match and compliment the supply grilles and registers. 45 degree model utilizes a concealed rear reinforcing mullion (max. 16" (406) centers) and a single blade pack that provides a continuous louvered appearance. 0 degree models utilize a visible face mullion when blade length exceeds 16" (406).
2. Optional roll-formed steel opposed blade damper has a screwdriver slot operator accessible through face of register.
3. Minimum size is 4" x 4" (102 x 102).
   Maximum size is 48" x 36" (1219 x 914).
4. Type S Surface mount frame has a 1 1/4" (32) face border and a 1" (25) overlap margin.
5. Standard fastening is Type A countersunk screw holes.
6. Standard finish is AW Appliance White.

OPTIONS:

1. Finish:
   ❑ SP Special _____ .
2. Fastening:
   ❑ Type C Concealed mounting straps
   ❑ Type N None.
3. ❑ PF Plaster frame
4. ❑ IS Insect screen
5. ❑ Other _____ .

SCHEDULE TYPE:	R1
PROJECT:	Carroll College Anthrozoology
ENGINEER:	
CONTRACTOR:	

Dimensions are in inches (mm).

DATE	B SERIES	SUPERSEDES	DRAWING NO.
2 - 1 - 11	6100	6100-3A/17-10-00	6100-3

PERFORMANCE DATA:

FIXED BLADE RETURN GRILLES AND REGISTERS • 5100, 6100 AND 6700 SERIES

MODELS: 5145H, 6145H, 6745H, 5145V, 6145V, 6745V, 51FB45, 61FB45, 67FB45

Listed Duct Size (inches)	Alternate Sizes (inches)	Core Area (sq. ft.)	Ak Factor	Core Velocity Velocity Pressure Neg. Static Pressure	100 .001 .003	200 .002 .014	300 .006 .031	400 .010 .055	500 .016 .086	600 .022 .124	700 .031 .168	800 .040 .220	900 .050 .278	1000 .062 .344
6 x 6	8 x 4 10 x 4	0.20	0.23	**CFM** Noise Criteria	**20** –	**40** –	**60** –	**80** –	**100** –	**120** 19	**140** 24	**160** 28	**180** 32	**200** 36
8 x 6	10 x 5 12 x 4	0.28	0.30	**CFM** Noise Criteria	**28** –	**56** –	**84** –	**112** –	**140** 15	**168** 20	**196** 25	**224** 29	**252** 33	**280** 37
10 x 6	12 x 5 16 x 4	0.35	0.37	**CFM** Noise Criteria	**35** –	**70** –	**105** –	**140** –	**175** 16	**210** 21	**245** 26	**280** 30	**315** 34	**350** 38
8 x 8	14 x 5	0.38	0.40	**CFM** Noise Criteria	**38** –	**76** –	**114** –	**152** –	**190** 17	**228** 22	**266** 27	**304** 31	**342** 35	**380** 39
12 x 6	18 x 4	0.42	0.45	**CFM** Noise Criteria	**42** –	**84** –	**126** –	**168** –	**210** 18	**252** 23	**294** 27	**336** 32	**378** 36	**420** 40
12 x 8	16 x 6 24 x 4	0.58	0.59	**CFM** Noise Criteria	**58** –	**116** –	**174** –	**232** –	**290** 19	**348** 24	**406** 28	**464** 33	**522** 37	**580** 41
10 x 10	14 x 7 26 x 4	0.61	0.62	**CFM** Noise Criteria	**61** –	**122** –	**183** –	**244** –	**305** 19	**366** 24	**427** 29	**488** 34	**549** 37	**610** 41
18 x 6	14 x 8 30 x 4 28 x 4	0.65	0.67	**CFM** Noise Criteria	**65** –	**130** –	**195** –	**260** 15	**325** 20	**390** 25	**455** 30	**520** 34	**585** 38	**650** 41
12 x 10	16 x 8 20 x 6 24 x 5	0.74	0.74	**CFM** Noise Criteria	**74** –	**148** –	**222** –	**296** 15	**370** 20	**444** 25	**518** 30	**592** 35	**666** 39	**740** 42
12 x 12	14 x 10 24 x 6 18 x 8 38 x 4	0.90	0.89	**CFM** Noise Criteria	**90** –	**180** –	**270** –	**360** 16	**450** 21	**540** 26	**630** 31	**720** 36	**810** 39	**900** 42
14 x 14	16 x 12 24 x 8 20 x 10 34 x 6	1.24	1.22	**CFM** Noise Criteria	**124** –	**248** –	**372** –	**496** 16	**620** 21	**744** 26	**868** 31	**992** 36	**1116** 40	**1240** 43
18 x 12	16 x 14 28 x 8 22 x 10 38 x 6	1.37	1.34	**CFM** Noise Criteria	**137** –	**274** –	**411** –	**548** 17	**685** 22	**822** 27	**959** 32	**1096** 37	**1233** 40	**1370** 43
24 x 10	20 x 12 30 x 8	1.52	1.49	**CFM** Noise Criteria	**152** –	**304** –	**456** –	**608** 17	**760** 22	**912** 27	**1064** 32	**1216** 38	**1368** 41	**1520** 44
16 x 16	18 x 14 30 x 8 22 x 12	1.64	1.58	**CFM** Noise Criteria	**164** –	**328** –	**492** –	**656** 18	**820** 23	**984** 28	**1148** 33	**1312** 38	**1476** 41	**1640** 44
24 x 12	18 x 16 30 x 10 20 x 14 36 x 8	1.85	1.78	**CFM** Noise Criteria	**185** –	**370** –	**555** –	**740** 18	**925** 23	**1110** 28	**1295** 33	**1480** 38	**1665** 41	**1850** 45
18 x 18	20 x 16 28 x 12 24 x 14 32 x 10	2.10	2.01	**CFM** Noise Criteria	**210** –	**420** –	**630** –	**840** 18	**1050** 23	**1260** 29	**1470** 34	**1680** 39	**1890** 42	**2100** 45
30 x 12	20 x 18 26 x 14 22 x 16 36 x 10	2.32	2.23	**CFM** Noise Criteria	**232** –	**464** –	**696** –	**928** 19	**1160** 24	**1392** 29	**1624** 34	**1856** 39	**2088** 42	**2320** 46
20 x 20	24 x 18 30 x 14 26 x 16 36 x 12	2.61	2.48	**CFM** Noise Criteria	**261** –	**522** –	**783** –	**1044** 19	**1305** 24	**1566** 30	**1827** 35	**2088** 40	**2349** 43	**2610** 46
22 x 22	24 x 20 30 x 16 26 x 18 36 x 14	3.17	3.00	**CFM** Noise Criteria	**317** –	**634** –	**951** –	**1268** 20	**1585** 25	**1902** 31	**2219** 35	**2536** 40	**2853** 43	**3170** 47
30 x 18	24 x 22 40 x 14 34 x 16	3.54	3.34	**CFM** Noise Criteria	**354** –	**708** –	**1062** –	**1416** 20	**1770** 25	**2124** 31	**2478** 36	**2832** 41	**3186** 44	**3540** 48
24 x 24	26 x 22 32 x 18 28 x 20 36 x 16	3.79	3.56	**CFM** Noise Criteria	**379** –	**758** –	**1137** –	**1516** 20	**1895** 25	**2274** 31	**2653** 36	**3032** 41	**3411** 44	**3790** 48
36 x 18	32 x 20 46 x 14 40 x 16	4.27	4.01	**CFM** Noise Criteria	**427** –	**854** –	**1281** –	**1708** 21	**2135** 26	**2562** 32	**2989** 37	**3416** 42	**3843** 45	**4270** 49
26 x 26	28 x 24 48 x 14	4.47	4.19	**CFM** Noise Criteria	**447** –	**894** –	**1341** –	**1788** 21	**2235** 26	**2682** 32	**3129** 37	**3576** 42	**4023** 45	**4470** 49
30 x 24	28 x 26 36 x 20 32 x 22 40 x 18	4.77	4.46	**CFM** Noise Criteria	**477** –	**954** –	**1431** 15	**1908** 22	**2385** 27	**2862** 33	**3339** 38	**3816** 42	**4293** 46	**4770** 50
28 x 28	30 x 26 40 x 20 36 x 22	5.20	4.85	**CFM** Noise Criteria	**520** –	**1040** –	**1560** 15	**2080** 22	**2600** 27	**3120** 33	**3640** 38	**4160** 43	**4680** 46	**5200** 50
36 x 24	30 x 28 44 x 20 40 x 22	5.74	5.35	**CFM** Noise Criteria	**574** –	**1148** –	**1722** 15	**2296** 22	**2870** 28	**3444** 34	**4018** 38	**4592** 43	**5166** 47	**5740** 51
30 x 30	34 x 26 48 x 20 38 x 24	5.99	5.57	**CFM** Noise Criteria	**599** –	**1198** –	**1797** 15	**2396** 22	**2995** 28	**3594** 34	**4193** 39	**4792** 43	**5391** 47	**5990** 51

For performance data notes, see F42.

PERFORMANCE DATA:

FIXED BLADE RETURN GRILLES AND REGISTERS • 5100, 6100 AND 6700 SERIES

MODELS: 5145H, 6145H, 6745H, 5145V, 6145V, 6745V, 51FB45, 61FB45, 67FB45

Listed Duct Size (inches)	Alternate Sizes (inches)	Core Area (sq. ft.)	Ak Factor	Core Velocity Velocity Pressure Neg. Static Pressure	100 .001 .003	200 .002 .014	300 .006 .031	400 .010 .055	500 .016 .086	600 .022 .124	700 .031 .168	800 .040 .220	900 .050 .278	1000 .062 .344
32 x 32	36 x 30 46 x 22 38 x 28	6.84	6.34	**CFM** Noise Criteria	**684** –	**1368** –	**2052** 16	**2736** 23	**3420** 29	**4104** 35	**4788** 39	**5472** 44	**6156** 48	**6840** 52
48 x 24	34 x 34 38 x 30 36 x 32 48 x 28	7.69	7.13	**CFM** Noise Criteria	**769** –	**1538** –	**2307** 17	**3076** 23	**3845** 29	**4614** 35	**5383** 40	**6152** 44	**6921** 48	**7690** 52
36 x 36	38 x 34 46 x 28 42 x 30 48 x 26	8.69	8.02	**CFM** Noise Criteria	**869** –	**1738** –	**2607** 17	**3476** 24	**4345** 29	**5214** 36	**6083** 41	**6952** 45	**7821** 49	**8690** 53
38 x 38	42 x 34 48 x 30 44 x 34	9.70	8.94	**CFM** Noise Criteria	**970** –	**1940** –	**2910** 18	**3880** 24	**4850** 30	**5820** 36	**6790** 41	**7760** 45	**8730** 49	**9700** 53
40 x 40	42 x 36 48 x 32 46 x 34	10.77	9.90	**CFM** Noise Criteria	**1077** –	**2154** –	**3231** 18	**4308** 24	**5385** 30	**6462** 36	**7539** 42	**8616** 45	**9693** 50	**10770** 54
42 x 42	46 x 42	11.89	10.92	**CFM** Noise Criteria	**1189** –	**2378** –	**3567** 19	**4756** 25	**5945** 31	**7134** 37	**8323** 42	**9512** 46	**10701** 50	**11890** 54
44 x 44		13.07	11.98	**CFM** Noise Criteria	**1307** –	**2614** –	**3921** 19	**5228** 25	**6535** 31	**7842** 37	**9149** 42	**10456** 46	**11763** 50	**13070** 54
46 x 46		14.30	13.10	**CFM** Noise Criteria	**1430** –	**2860** –	**4290** 20	**5720** 26	**7150** 32	**8580** 38	**10010** 43	**11440** 47	**12870** 51	**14300** 55
48 x 48		15.59	14.26	**CFM** Noise Criteria	**1559** –	**3118** –	**4677** 20	**6236** 26	**7795** 32	**9354** 38	**10913** 43	**12472** 47	**14031** 51	**15590** 55

Performance Notes:

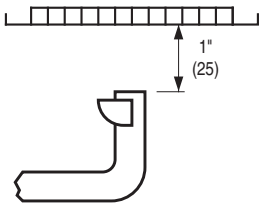
1. All pressures are in inches w.g..
2. Core Velocity is in feet per minute.
3. Performance data is for grille with opposed blade damper. Apply the following correction factors for grille without damper.

Negative Static Pressure Listed Value x 0.91.

Noise Criteria Listed value – 4.

4. Noise Criteria (NC) values are based upon 10dB room absorption, re 10^{-12} watts. Dash (–) in space indicates an Noise Criteria of less than 15.
5. Data derived from tests conducted in accordance with ANSI/ASHRAE Standard 70 – 2006.

Air Measurement



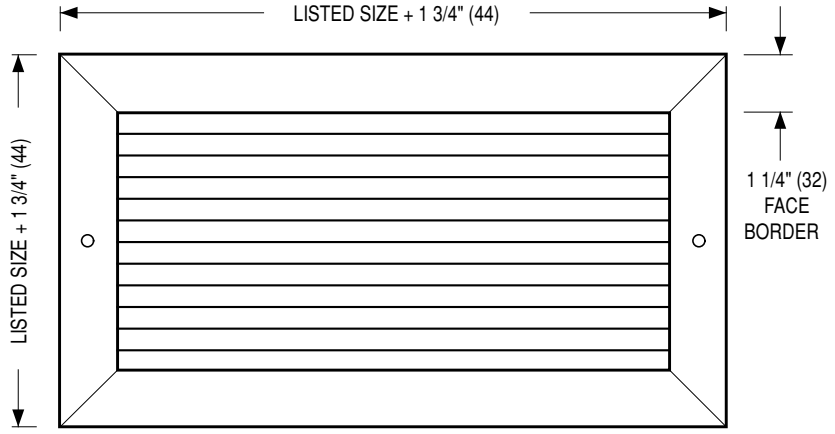
Alnor Velometer with 2220A or 6070P Jet Probe

Airflow Measurements:

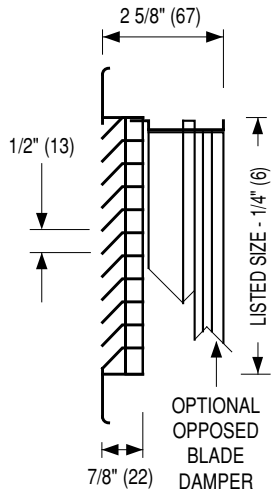
1. Balancing factors are applicable with or without dampers, providing uniform airflow exists into grille or register.
2. Take velocity readings at a number of locations on the inlet face (a minimum of 4), while positioning probe as shown above, one inch out from the face.
3. Total the various velocity readings and divide by the number of readings taken to arrive at an average inlet velocity (Vk in FPM).
4. Calculate the airflow (CFM) by multiplying the average velocity by the appropriate Ak factor.
Airflow (CFM) = Average velocity (Vk) x Ak.

Nailor Industries Inc.

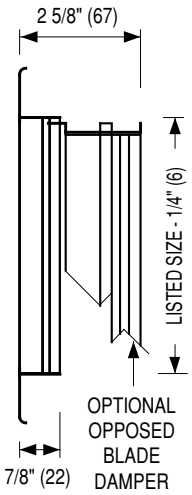
STEEL RETURN GRILLES & REGISTERS
FIXED BLADES • 1/2" (13) CENTERS
MODELS: 6155H(-O) AND 6155V(-O) TYPE S



Model 6155H



MODEL 6155H
Horizontal Blades



MODEL 6155V
Vertical Blades

☑ **MODEL 6155H**
Single Deflection Grille
Fixed 45° Horizontal Blades

☐ **MODEL 6155H-O**
Single Deflection Register
Fixed 45° Horizontal Blades
(Includes O. B. Damper)

☑ **MODEL 6155V**
Single Deflection Grille
Fixed 45° Vertical Blades

☐ **MODEL 6155V-O**
Single Deflection Register
Fixed 45° Vertical Blades
(Includes O. B. Damper)

DESCRIPTION:

1. Construction: Corrosion resistant steel. Roll-formed frame mechanically interlocked with reinforced mitered corners for strength. Streamlined shaped blades on 1/2" (13) centers are fixed at 45 degrees. Concealed reinforcing mullions on maximum 16" (406) centers. No see through when viewed from straight ahead.
2. Optional roll-formed steel opposed blade damper has a concealed lever operator.
3. Minimum size is 4" x 4" (102 x 102). Maximum size is 48" x 36" (1219 x 914).
4. Type S surface mount frame has a 1 1/4" (32) face border and a 1" (25) overlap margin.
5. Standard fastening is Type A countersunk screw holes.
6. Standard finish is AW Appliance White.

OPTIONS:

1. Finish:
   ☐ SP Special _____ .
2. Fastening:
   ☐ Type N None.
3. ☐ PF Plaster frame
4. ☐ IS Insect screen
5. ☐ Other _____ .

SCHEDULE TYPE:	R2 R3
PROJECT:	Carroll College Anthrozoology
ENGINEER:	
CONTRACTOR:	

Dimensions are in inches (mm).

DATE	B SERIES	SUPERSEDES	DRAWING NO.
2 - 7 - 11	6100	6100-3B/17-10-00	6100-8

PERFORMANCE DATA:

FIXED BLADE RETURN GRILLES AND REGISTERS • 5100, 6100 AND 6700 SERIES

MODELS: 5155H, 6155H, 6755H, 5155V, 6155V, 6755V, 51FB55, 61FB55, 67FB55

Listed Duct Size (inches)	Alternate Sizes (inches)	Core Area (sq. ft.)	Ak Factor	Core Velocity Velocity Pressure Neg. Static Pressure	100 .001 .005	200 .002 .018	300 .006 .041	400 .010 .073	500 .016 .114	600 .022 .164	700 .031 .223	800 .040 .292	900 .050 .369	1000 .062 .456
6 x 6	8 x 4 10 x 4	0.20	0.23	**CFM** Noise Criteria	**20** –	**40** –	**60** –	**80** –	**100** 16	**120** 21	**140** 26	**160** 30	**180** 34	**200** 38
8 x 6	10 x 5 12 x 4	0.28	0.30	**CFM** Noise Criteria	**28** –	**56** –	**84** –	**112** –	**140** 17	**168** 22	**196** 27	**224** 31	**252** 35	**280** 39
10 x 6	12 x 5 16 x 4	0.35	0.37	**CFM** Noise Criteria	**35** –	**70** –	**105** –	**140** –	**175** 18	**210** 23	**245** 28	**280** 32	**315** 36	**350** 40
8 x 8	14 x 5	0.38	0.40	**CFM** Noise Criteria	**38** –	**76** –	**114** –	**152** –	**190** 19	**228** 24	**266** 29	**304** 33	**342** 37	**380** 41
12 x 6	18 x 4	0.42	0.45	**CFM** Noise Criteria	**42** –	**84** –	**126** –	**168** 15	**210** 20	**252** 25	**294** 29	**336** 34	**378** 38	**420** 42
12 x 8	16 x 6 24 x 4	0.58	0.59	**CFM** Noise Criteria	**58** –	**116** –	**174** –	**232** 16	**290** 21	**348** 26	**406** 30	**464** 35	**522** 39	**580** 43
10 x 10	14 x 7 26 x 4	0.61	0.62	**CFM** Noise Criteria	**61** –	**122** –	**183** –	**244** 16	**305** 21	**366** 26	**427** 31	**488** 36	**549** 39	**610** 43
18 x 6	14 x 8 30 x 4 28 x 4	0.65	0.67	**CFM** Noise Criteria	**65** –	**130** –	**195** –	**260** 17	**325** 22	**390** 27	**455** 32	**520** 36	**585** 40	**650** 43
12 x 10	16 x 8 20 x 6 24 x 5	0.74	0.74	**CFM** Noise Criteria	**74** –	**148** –	**222** –	**296** 17	**370** 22	**444** 27	**518** 32	**592** 37	**666** 41	**740** 44
12 x 12	14 x 10 24 x 6 18 x 8 38 x 4	0.90	0.89	**CFM** Noise Criteria	**90** –	**180** –	**270** –	**360** 18	**450** 23	**540** 28	**630** 33	**720** 38	**810** 41	**900** 44
14 x 14	16 x 12 24 x 8 20 x 10 34 x 6	1.24	1.22	**CFM** Noise Criteria	**124** –	**248** –	**372** –	**496** 18	**620** 23	**744** 28	**868** 33	**992** 38	**1116** 42	**1240** 45
18 x 12	16 x 14 28 x 8 22 x 10 38 x 6	1.37	1.34	**CFM** Noise Criteria	**137** –	**274** –	**411** 15	**548** 20	**685** 25	**822** 30	**959** 35	**1096** 40	**1233** 43	**1370** 46
24 x 10	20 x 12 30 x 8	1.52	1.49	**CFM** Noise Criteria	**152** –	**304** –	**456** 15	**608** 20	**760** 25	**912** 30	**1064** 35	**1216** 41	**1368** 44	**1520** 47
16 x 16	18 x 14 30 x 8 22 x 12	1.64	1.58	**CFM** Noise Criteria	**164** –	**328** –	**492** 16	**656** 21	**820** 26	**984** 31	**1148** 36	**1312** 41	**1476** 44	**1640** 47
24 x 12	18 x 16 30 x 10 20 x 14 36 x 8	1.85	1.78	**CFM** Noise Criteria	**185** –	**370** –	**555** 16	**740** 21	**925** 26	**1110** 31	**1295** 36	**1480** 41	**1665** 44	**1850** 48
18 x 18	20 x 16 28 x 12 24 x 14 32 x 10	2.10	2.01	**CFM** Noise Criteria	**210** –	**420** –	**630** 16	**840** 21	**1050** 26	**1260** 32	**1470** 37	**1680** 42	**1890** 45	**2100** 48
30 x 12	20 x 18 26 x 14 22 x 16 36 x 10	2.32	2.23	**CFM** Noise Criteria	**232** –	**464** –	**696** 16	**928** 22	**1160** 27	**1392** 32	**1624** 37	**1856** 42	**2088** 45	**2320** 49
20 x 20	24 x 18 30 x 14 26 x 16 36 x 12	2.61	2.48	**CFM** Noise Criteria	**261** –	**522** –	**783** 16	**1044** 22	**1305** 27	**1566** 33	**1827** 38	**2088** 43	**2349** 46	**2610** 49
22 x 22	24 x 20 30 x 16 26 x 18 36 x 14	3.17	3.00	**CFM** Noise Criteria	**317** –	**634** –	**951** 17	**1268** 23	**1585** 28	**1902** 34	**2219** 38	**2536** 43	**2853** 46	**3170** 50
30 x 18	24 x 22 40 x 14 34 x 16	3.54	3.34	**CFM** Noise Criteria	**354** –	**708** –	**1062** 17	**1416** 23	**1770** 28	**2124** 34	**2478** 39	**2832** 44	**3186** 47	**3540** 51
24 x 24	26 x 22 32 x 18 28 x 20 36 x 16	3.79	3.56	**CFM** Noise Criteria	**379** –	**758** –	**1137** 17	**1516** 23	**1895** 28	**2274** 34	**2653** 39	**3032** 44	**3411** 47	**3790** 51
36 x 18	32 x 20 46 x 14 40 x 16	4.27	4.01	**CFM** Noise Criteria	**427** –	**854** –	**1281** 18	**1708** 25	**2135** 29	**2562** 36	**2989** 41	**3416** 46	**3843** 49	**4270** 53
26 x 26	28 x 24 48 x 14	4.47	4.19	**CFM** Noise Criteria	**447** –	**894** –	**1341** 18	**1788** 25	**2235** 30	**2682** 36	**3129** 41	**3576** 46	**4023** 49	**4470** 53
30 x 24	28 x 26 36 x 20 32 x 22 40 x 18	4.77	4.46	**CFM** Noise Criteria	**477** –	**954** –	**1431** 19	**1908** 26	**2385** 31	**2862** 37	**3339** 42	**3816** 46	**4293** 50	**4770** 54
28 x 28	30 x 26 40 x 20 36 x 22	5.20	4.85	**CFM** Noise Criteria	**520** –	**1040** –	**1560** 19	**2080** 26	**2600** 31	**3120** 37	**3640** 42	**4160** 47	**4680** 50	**5200** 54
36 x 24	30 x 28 44 x 20 40 x 22	5.74	5.35	**CFM** Noise Criteria	**574** –	**1148** –	**1722** 19	**2296** 26	**2870** 32	**3444** 38	**4018** 42	**4592** 47	**5166** 51	**5740** 55
30 x 30	34 x 26 48 x 20 38 x 24	5.99	5.57	**CFM** Noise Criteria	**599** –	**1198** –	**1797** 19	**2396** 26	**2995** 32	**3594** 38	**4193** 43	**4792** 47	**5391** 51	**5990** 55

For performance data notes, see F46.

PERFORMANCE DATA:

FIXED BLADE RETURN GRILLES AND REGISTERS • 5100, 6100 AND 6700 SERIES

MODELS: 5155H, 6155H, 6755H, 5155V, 6155V, 6755V, 51FB55, 61FB55, 67FB55

Listed Duct Size (inches)	Alternate Sizes (inches)	Core Area (sq. ft.)	Ak Factor	Core Velocity Velocity Pressure Neg. Static Pressure	100 .001 .005	200 .002 .018	300 .006 .041	400 .010 .073	500 .016 .114	600 .022 .164	700 .031 .223	800 .040 .292	900 .050 .369	1000 .062 .456
32 x 32	36 x 30 46 x 22 38 x 28	6.84	6.34	**CFM** Noise Criteria	**684** –	**1368** 15	**2052** 20	**2736** 27	**3420** 33	**4104** 39	**4788** 43	**5472** 48	**6156** 52	**6840** 56
48 x 24	34 x 34 38 x 30 36 x 32 48 x 28	7.69	7.13	**CFM** Noise Criteria	**769** –	**1538** 16	**2307** 21	**3076** 27	**3845** 33	**4614** 39	**5383** 44	**6152** 48	**6921** 52	**7690** 56
36 x 36	38 x 34 46 x 28 42 x 30 48 x 26	8.69	8.02	**CFM** Noise Criteria	**869** –	**1738** 17	**2607** 21	**3476** 28	**4345** 33	**5214** 40	**6083** 45	**6952** 49	**7821** 53	**8690** 57
38 x 38	42 x 34 48 x 30 44 x 34	9.70	8.94	**CFM** Noise Criteria	**970** –	**1940** 18	**2910** 22	**3880** 28	**4850** 34	**5820** 40	**6790** 45	**7760** 49	**8730** 53	**9700** 57
40 x 40	42 x 36 48 x 32 46 x 34	10.77	9.90	**CFM** Noise Criteria	**1077** –	**2154** 18	**3231** 23	**4308** 29	**5385** 35	**6462** 41	**7539** 47	**8616** 50	**9693** 55	**10770** 59
42 x 42	44 x 40 48 x 36 46 x 38	11.89	10.92	**CFM** Noise Criteria	**1189** –	**2378** 19	**3567** 24	**4756** 30	**5945** 36	**7134** 42	**8323** 47	**9512** 51	**10701** 55	**11890** 59
44 x 44	46 x 42	13.07	11.98	**CFM** Noise Criteria	**1307** –	**2614** 19	**3921** 24	**5228** 30	**6535** 36	**7842** 42	**9149** 47	**10456** 51	**11763** 55	**13070** 59
46 x 46		14.30	13.10	**CFM** Noise Criteria	**1430** 15	**2860** 20	**4290** 25	**5720** 31	**7150** 37	**8580** 43	**10010** 48	**11440** 52	**12870** 56	**14300** 60
48 x 48		15.59	14.26	**CFM** Noise Criteria	**1559** 15	**3118** 20	**4677** 25	**6236** 31	**7795** 37	**9354** 43	**10913** 48	**12472** 52	**14031** 56	**15590** 60

Performance Notes:

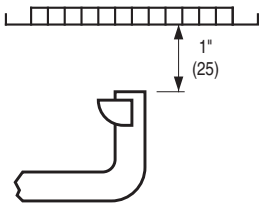
1. All pressures are in inches w.g..
2. Core Velocity is in feet per minute.
3. Performance data is for grille with opposed blade damper. Apply the following correction factors for grille without damper.

Negative Static Pressure Listed Value x 0.91.

Noise Criteria Listed value – 4.

4. Noise Criteria (NC) values are based upon 10dB room absorption, re 10^{-12} watts. Dash (–) in space indicates an Noise Criteria of less than 15.
5. Data derived from tests conducted in accordance with ANSI/ASHRAE Standard 70 – 2006.

Air Measurement



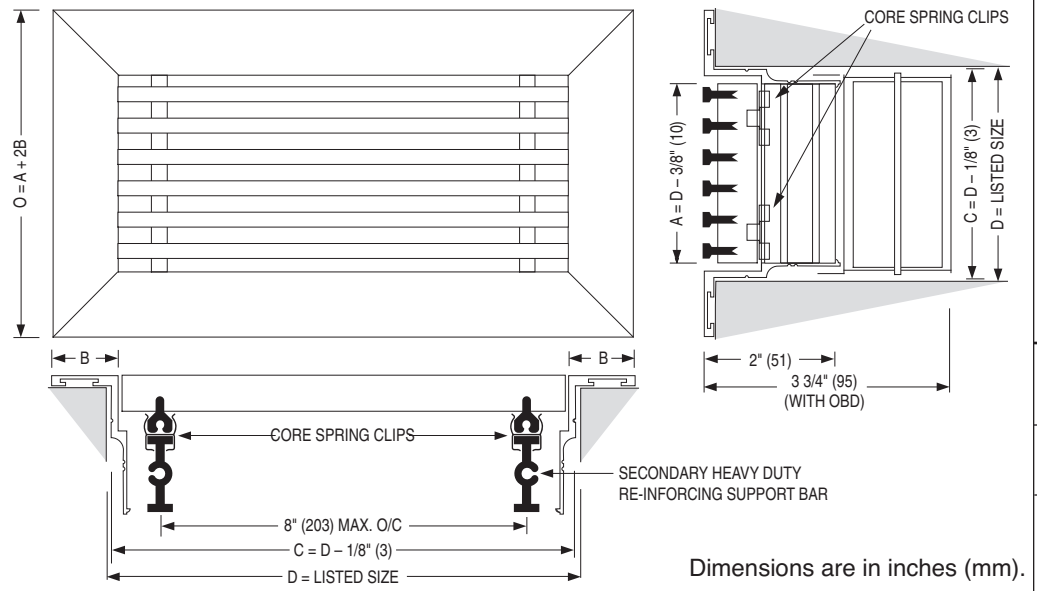
Alnor Velometer with 2220A or 6070P Jet Probe

Airflow Measurements:

1. Balancing factors are applicable with or without dampers, providing uniform airflow exists into grille or register.
2. Take velocity readings at a number of locations on the inlet face (a minimum of 4), while positioning probe as shown above, one inch out from the face.
3. Total the various velocity readings and divide by the number of readings taken to arrive at an average inlet velocity (Vk in FPM).
4. Calculate the airflow (CFM) by multiplying the average velocity by the appropriate Ak factor.
Airflow (CFM) = Average velocity (Vk) x Ak.

Nailor® Industries Inc.

HEAVY DUTY LINEAR BAR GRILLES AND REGISTERS
ALUMINUM • REMOVABLE CORE
MODEL SERIES: 4900



Dimensions are in inches (mm).

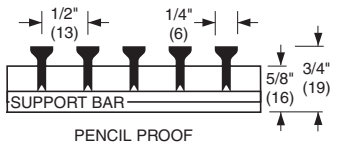
Designed for floor or sill installations.
End caps are staked, welded and mitered.
Standard heavy duty reinforced core utilizes an additional cross-bar support.
Spacing does not exceed 8" (203) on centers.
Core are removable and supplied with core spring clips as standard.
Available in 1/2" (13) nominal increments in width and 1" (25) in length.

DAMPER SELECTION
(Optional)

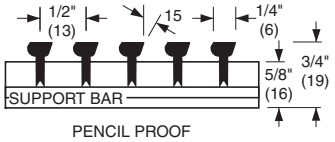
❑ **OPPOSED BLADE**
minimum width = 2 1/2" (63).

SINGLE BLADE
with friction hinge on 1 1/2" (38) and 2" (51) widths.

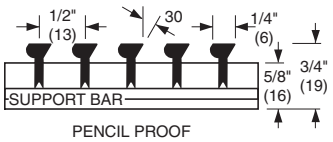
CORE SELECTION



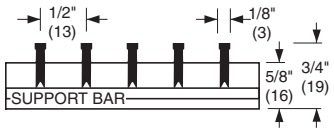
❑ 49-240 0° Deflection



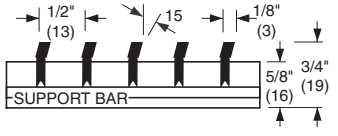
❑ 49-241 15° Deflection



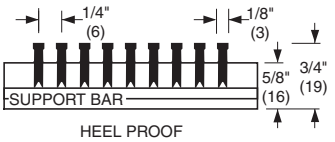
❑ 49-243 30° Deflection



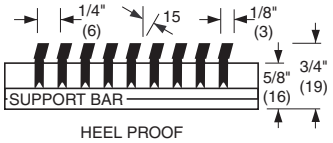
❑ 49-280 0° Deflection



❑ 49-281 15° Deflection



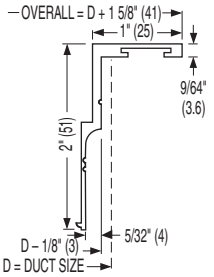
❑ 49-480 0° Deflection



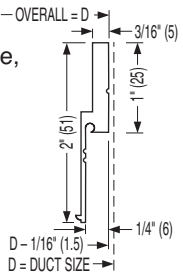
❑ 49-481 15° Deflection

FRAME SELECTION

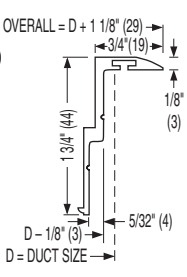
❑ F
1" (25) Border Flange



❑ G
No Flange, Flush Mounting

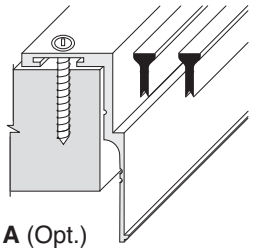


❑ H
3/4" (19) Border Flange

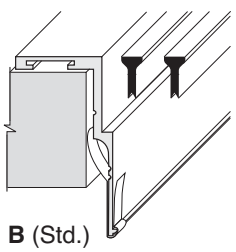


FINISH:
- ❑ AW Appliance White
- ❑ AL Aluminum
- ❑ SA Satin (clear) Anodized
- ❑ BC Brushed clear-coat lacquer
- ❑ MI Mill
- ❑ SP Special

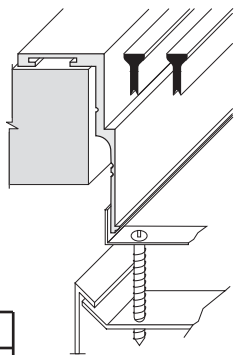
FASTENING SELECTION



❑ **A** (Opt.)
#8 Countersunk Screw Holes (Frame F only)



❑ **B** (Std.)
Spring Clip (Frames F or H)



❑ **C**
Concealed Mounting - (not recommended for cores with 1/4" (6) spacing)

❑ **N**
None (Lay-in)

SCHEDULE TYPE:	F1			
PROJECT:	Carroll College Anthrozoology			
ENGINEER:	**DATE**	**B SERIES**	**SUPERSEDES**	**DRAWING NO.**
CONTRACTOR:	**12 - 1 -15**	**4900**	**4 - 10 -14**	**4900-2**

PERFORMANCE DATA:

MODEL 49-480 • 1/4" (6) SPACING • 1/8" (3) BARS • 0° DEFLECTION

Free Area Square Feet per Lineal Foot	Nominal Duct Width	Total Pressure		.011	.024	.043	.068	.096	.130	.171	.218	.269
.031	1 1/2"	Airflow, CFM/FT.		12	19	25	31	37	43	50	56	62
		Noise Criteria		–	–	–	20	24	29	33	36	39
		Throw	Sill or Floor	1-1-1	2-2-2	4-4-4	6-6-6	8-8-9	9-10-11	10-11-13	12-13-15	13-15-18
			Side Wall	2-4-6	4-7-10	6-9-13	7-11-16	8-13-19	9-15-21	10-16-23	12-18-25	13-20-28
.047	2"	Airflow, CFM/FT.		19	28	37	47	56	66	75	84	94
		Noise Criteria		–	–	–	18	23	29	32	36	39
		Throw	Sill or Floor	1-1-1	4-4-4	6-6-6	9-9-9	11-11-12	12-13-15	14-15-17	15-17-19	16-18-20
			Side Wall	3-5-7	5-8-11	7-11-15	9-14-19	11-16-22	12-18-25	14-20-27	15-22-29	16-24-32
.065	2 1/2"	Airflow, CFM/FT.		26	39	52	65	78	91	104	117	130
		Noise Criteria		–	–	–	20	24	30	34	37	40
		Throw	Sill or Floor	1-1-1	5-5-5	8-8-8	10-10-11	13-14-15	15-16-17	16-18-20	20-20-21	22-22-22
			Side Wall	4-6-8	6-9-12	8-12-16	10-15-20	13-18-24	15-21-27	16-22-30	20-27-34	22-30-38
.083	3"	Airflow, CFM/FT.		33	50	66	83	100	116	133	149	166
		Noise Criteria		–	–	–	20	26	31	35	38	41
		Throw	Sill or Floor	2-2-2	6-6-6	9-9-10	12-12-13	15-16-17	18-19-20	20-21-22	23-23-23	25-25-25
			Side Wall	4-6-9	7-10-14	9-13-18	12-17-22	15-20-25	18-23-29	20-26-33	23-30-37	25-32-39
.102	3 1/2"	Airflow, CFM/FT.		41	61	82	102	122	143	163	184	204
		Noise Criteria		–	–	15	21	27	32	36	39	42
		Throw	Sill or Floor	2-2-2	7-7-7	10-10-11	15-15-15	17-18-19	20-21-22	22-23-24	25-25-26	27-27-27
			Side Wall	5-7-10	8-11-15	10-15-20	15-19-24	17-22-27	20-25-31	22-28-35	25-32-39	27-34-41
.122	4"	Airflow, CFM/FT.		49	73	98	122	146	171	195	220	244
		Noise Criteria		–	–	16	22	29	33	37	40	43
		Throw	Sill or Floor	3-3-3	8-8-8	12-12-13	15-15-16	19-19-20	21-21-23	24-24-25	26-26-27	29-29-30
			Side Wall	6-8-11	9-12-16	12-16-20	15-20-25	19-24-29	21-26-32	24-30-36	26-33-39	30-37-46
.157	5"	Airflow, CFM/FT.		63	94	125	157	188	220	251	282	314
		Noise Criteria		–	–	16	22	28	33	37	40	43
		Throw	Sill or Floor	4-4-4	9-9-9	14-14-14	17-17-17	21-21-22	24-24-24	27-27-27	29-29-29	32-32-32
			Side Wall	7-9-12	11-14-18	14-18-22	17-21-26	21-26-31	24-29-35	27-33-39	30-36-42	33-40-46
.194	6"	Airflow, CFM/FT.		78	116	155	194	233	272	310	349	388
		Noise Criteria		–	–	18	24	30	35	38	42	43
		Throw	Sill or Floor	5-5-5	10-10-10	15-15-15	18-18-18	23-23-23	25-25-25	28-28-29	31-31-31	34-34-34
			Side Wall	8-10-13	12-15-19	15-19-23	20-24-28	23-27-32	26-31-37	29-34-39	33-39-44	37-43-48

Performance Notes:

1. Throws are given at 150, 100 and 50 fpm terminal velocities.
2. Throw values are based on a 4 foot section with a cooling ΔT of 20°F (11°C).

For other lengths, use the correction factor table shown.

3. Total Pressure is in inches w.g..
4. Noise Criteria [NC] values are based on a 10 foot active section. For other lengths, use the correction factor table shown.
5. Return Air Applications:

   Noise Criteria value is increased by + 4.

   Negative Static Pressure = 0.8 x Total Pressure.

6. Dash (–) in space indicates an Noise Criteria level of less than 15.
7. Data derived from tests conducted in accordance with ANSI/ASHRAE Standard 70–2006.

Noise Criteria Correction for Length

Active Length, ft.	1	2	4	8	10	15	20
Correction Factor	-10	-7	-4	-1	0	+2	+3

Throw Correction for Length

Active Length	Terminal Velocity		
	150 fpm	100 fpm	50 fpm
1 ft.	0.5	0.6	0.7
10 ft. +	1.6	1.4	1.2

Nominal Width	Ak Factor per foot	
	Supply	Return
1 1/2"	.041	.034
2"	.056	.048
2 1/2"	.074	.064
3"	.092	.078
3 1/2"	.111	.098
4"	.131	.111
5"	.166	.143
6"	.203	.173

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Carroll College Anthrozoology

Volume Dampers

Volume Dampers – Nailor Industries

2 – Nailor Model 1820 Opposed Blade Manual Volume Dampers with Locking Quadrant and 2" Stand-off

- 2 – 18/18

13 – Nailor Model 1890 Single Blade Round Manual Volume Dampers with Locking Quadrant and 2" Standoff.

- 1 – 6"
- 12 – 10"

See attached copy of equipment schedule and additional submittal data.

MANUAL BALANCING DAMPER
MODELS: 1810 PARALLEL BLADE
1820 OPPOSED BLADE

Nailor Industries Inc.

The Nailor 1800 Series Dampers are especially designed for manual balancing applications. They are suitable for use in the majority of commercial low to medium pressure and velocity HVAC systems.
They are designed and built to provide a cost effective and reliable damper for reduced volume control and not positive shut-off. They are not recommended for applications as an automatic control damper.
The 1800 Series includes many of the design features incorporated in the Nailor 1000 Series Control Dampers. These include a sturdy hat channel frame with die-formed corner gussets for reinforcement, a roll-formed vee groove blade design that maximizes strength and zero maintenance concealed linkage (out of the air stream) for reduced air turbulence.
Nailor's 1800 Series exceed the volume damper design recommendations in SMACNA "HVAC Duct Construction Standards - Metal and Flexible" and offer an economical manufactured product alternative to custom 'shop built' dampers.

STANDARD CONSTRUCTION:

Frame: 5" x 7/8" x 16 ga. (127 x 22 x 1.6) galvanized steel hat channel with die-formed corner gussets. Low profile (flat top and bottom) on dampers 10" (254) high and under.

Blades: 6" (152) wide on 5 1/2" (140) centers. 16 ga. (1.6) galv. steel vee groove design. Parallel or opposed action.

Linkage: Concealed type totally enclosed within the frame and out of the airstream. Plated steel.

Bearings: 1/2" (13) dia. Celcon®.

Axles: 1/2" (13) dia. plated steel double bolted to blades.

Drive Shaft: 6" (152) long x 1/2" (13) dia. double-bolted fixed drive shaft on each damper section. The drive shaft is easily removed if required.

Temperature Range: -50°F to +250°F (-46°C to +121°C).

Sizes (Duct W x H):

Minimum		Maximum	
Single Section		Single Section	Multiple Section
Single Blade (parallel) 6" x 4" (152 x 102)	Two Blades (parallel or opposed) 8" x 10" (203 x 254)	48" x 72" (1219 x 1829)	96" x 144" (2438 x 3658)

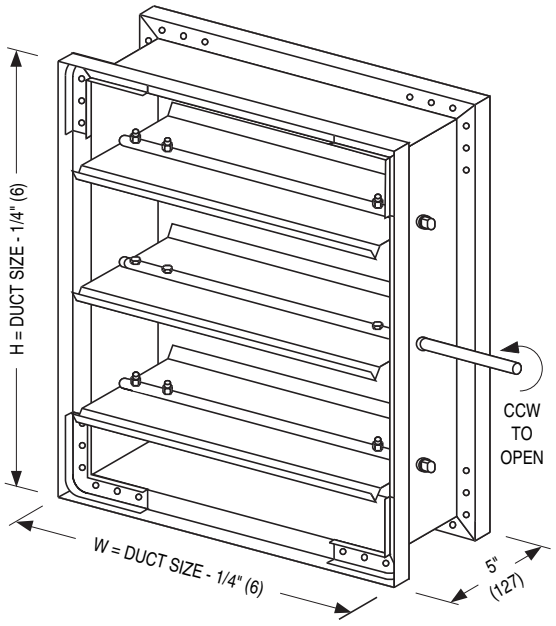
OPTIONS:

- ❑ **BO** Oilite bearings
- ❑ **304** Stainless Steel construction
- ❑ **DLO** Lock-on drive shaft
- ❑ **HLQ** Hand-locking quadrant (one required per damper section)
- ☑ **HL2** Hand-locking quadrant with 2" (51) stand-off bracket
- ❑ Other _____.

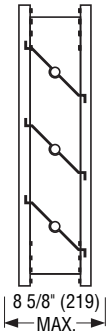
PERFORMANCE:

Dampers are designed to operate in a clean, dry environment. For proper operation, dampers must be installed without racking. The hand quadrant must be installed on the indicated drive blade.

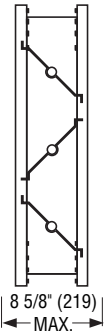
Models 1810/1820 - Maximum Performance Ratings	
Maximum Face Velocity	2000 fpm (10 m/s)
Maximum System Pressure	2.5 in. w.g. (625 Pa)

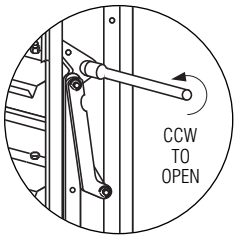


❑ **MODEL 1810** PARALLEL BLADE (optional)

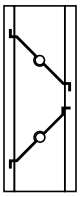


☑ **MODEL 1820** OPPOSED BLADE (standard)



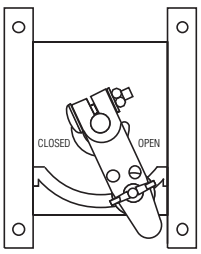


The low profile frame illustration is used to maximize free area on units 10" (254) high and under.



OPTIONAL LOCK-ON DRIVE SHAFT

OPTIONAL HAND-LOCKING QUADRANT
7/8" (22) stand-off



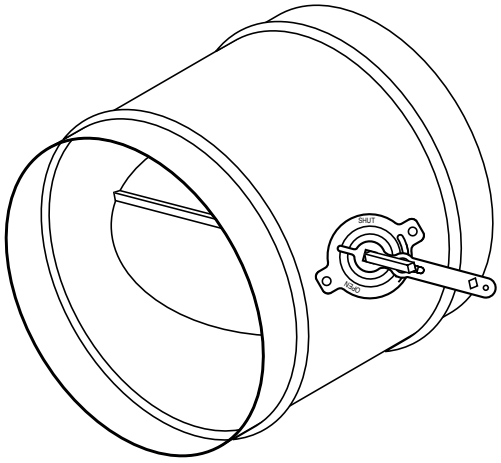
Dimensions are in inches (mm).

SCHEDULE TYPE:				
PROJECT:	Carroll College Anthrozoology			
ENGINEER:	**DATE**	**A SERIES**	**SUPERSEDES**	**DRAWING NO.**
CONTRACTOR:	**12 - 4 - 12**	**1800**	**10 - 1 - 10**	**1800-1**

Nailor® Industries Inc.

ROUND MANUAL BALANCING DAMPER
STEEL
MODEL: 1890

The Nailor Model 1890 is a manual balancing, butterfly damper which has been designed for all types of round ductwork applications and is suitable for use in the majority of low pressure and velocity commercial HVAC systems. The 1890 installs easily in round spiral ductwork.
The 1890 is supplied as standard with a hand locking quadrant.
They are not intended to be used in applications as a positive shut-off or automatic control damper.



STANDARD CONSTRUCTION:

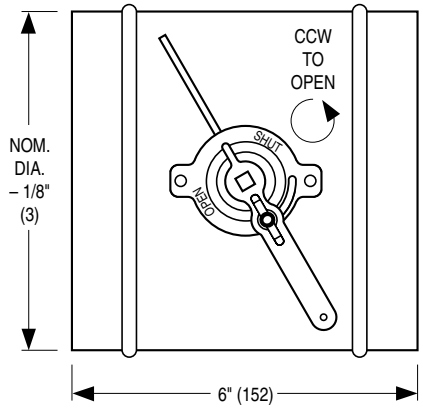
FRAME: 22 ga. (0.86) corrosion-resistant steel with stiffening beads up to 12" (305) dia. 20 ga. (0.91) over 12" (305) dia.

BLADE: 22 ga. (0.86) corrosion-resistant steel up to 12" (305) dia., 20 ga. (1.0) over 12" (305) dia.

DRIVE SHAFT/ AXLE: 1/4" (6) square plated steel.

AVAILABLE SIZES: 4" (102) through 20" (508) diameter in nominal 1" (25) increments.

TEMPERATURE RANGE: -50°F to 250°F (-45°C to +121°C)



OPTIONS:

- ☑ **SB** 2" (51) stand-off bracket for hand locking quadrant.
- ☐ **BO** Oilite bearings.
- ☐ **A38** 3/8" (9.5) square axle. No hand locking quadrant (control supplied by others).
- ☑ **A38Q** 3/8" (9.5) square axle with matching hand locking quadrant.
- ☐ Special features _____ .

PERFORMANCE:

Dampers are designed to operate in a clean, dry environment.
Maximum System Pressure: 2" w.g. (500 Pa).
Maximum Face Velocity: 2000 fpm (10 m/s).

SCHEDULE TYPE:		Dimensions are in inches (mm).			
PROJECT:	Carroll College Anthrozoology				
ENGINEER:		**DATE**	**B SERIES**	**SUPERSEDES**	**DRAWING NO.**
CONTRACTOR:		**9 - 29 - 10**	**1800**	**17 - 5 - 99RR**	**1800-3**

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Carroll College Anthrozoology

Electric Heaters

Electric Heaters - King

2 – TAG: EH1, EH-2 – King Model LPWA2045 Electric Wall Heaters, 4500 Watts, 208/1 Phase with Integral Stat and disconnect

1 – TAG: EH3 – King Model KDSRU2050-1 Ceiling Heaters, 5000 Watts, 208/1 Phase with Integral Stat and disconnect

See attached copy of equipment schedule and additional submittal data.

king

SUBMITTAL SHEET

LPWA Architectural Series Wall Heater
1500 to 4500 Watts
120, 208, 240, 277 Volts

DATE: _____

JOB NAME: Carroll College Anthrozoology

LOCATION: Helena, MT

ARCHITECT: SMA Architects

ENGINEER: Morrison Maierle

CONTRACTOR: Sleeping Giant Mechanical

SUBMITTED BY: _____

SELECTION								
ITEM	QTY	CATALOG NUMBER	TAG	WATTS	VOLTS	PHASE Ø	AMPS	AVAILABLE CONTROLS
1	2	LPWA2045	EH1, EH2	4500	208	1		Integral Stat and Disconnect

ACCESSORIES AND CONTROLS				
ITEM	QTY	CATALOG NUMBER	TAG	DESCRIPTION
1	2	TP	EH1 EH2	Tamper Proof In Built Stat
2	2	CB3	EH1 EH2	Circuit Breaker Disconnect

SELECTION

WATTAGE	120V		208V		240V		277V		WT. (lbs.)
	MODEL	UPC# 093319	MODEL	UPC# 093319	MODEL	UPC# 093319	MODEL	UPC# 093319	
1500	LPWA1215	18370							24
2000	LPWA1220	18372	LPWA2020	18374	LPWA2420	18378	LPWA2720	18384	
2750	LPWA1227	18250							
3000			LPWA2030	18376	LPWA2430	18380	LPWA2730	18386	
4000			LPWA2040	18251	LPWA2440	18382	LPWA2740	18252	
4500			LPWA2045	18240	LPWA2445	18193			

FACTORY INSTALLED OPTIONS

ADD SUFFIX	DESCRIPTION	WT. (lbs.)
-BZ	Grill—Dark Bronze	24
-W	Grill—White	24
-CT24	Transformer that converts 208, 240 and 277 Volts to 24 Volt Control Remote Circuit (add power contactor (-C) for 3KW—5KW 1-Phase models)	24.5
-CX	Contactor for 3KW—5KW 1-Phase Models (Line Voltage Coil)	24.5
-S	Surface Can Included	24
-TP	Factory Installed Tamperproof Thermostat	24
-CB2	20 Amp Double Pole Circuit Breaker / Disconnect	.5
-CB3	30 Amp Double Pole Circuit Breaker / Disconnect	.5

MODEL CODE

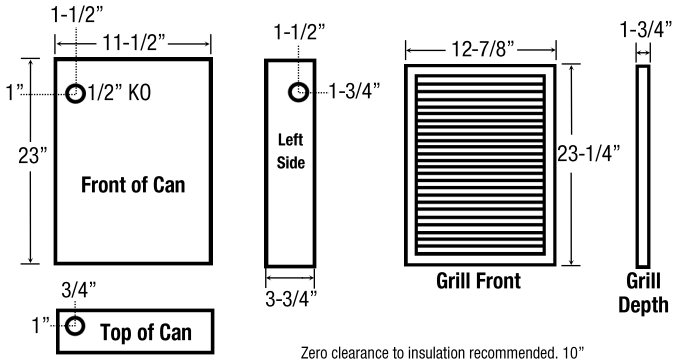
MODEL # LPWA2445-TP	LPWA	24	45	T

Series (Unit Heater)
Voltage (120, 208, 240, 277)
Watts
Thermostat (Optional)

ACCESSORIES

MODEL	DESCRIPTION	UPC# 093319	WT. (lbs.)
LPWAIC	Architectural Recess Wall Can	18200	6.5
LPWASA	Surface Can	18197	5
LPWAG	LPWA Series Grill—Anodized Aluminum	18158	7
LPWA-TP	Tamperproof Thermostat Replacement	18140	2

DIMENSIONS



Zero clearance to insulation recommended. 10" above floor and 6" from adjacent wall surface.

ENGINEERING SPECIFICATIONS

Contractor shall supply and install LPWA Series wall surface-mounted forced-air electric heaters manufactured by King Electrical Mfg. Co. of the wattage and voltage as indicated on the plans.

Grill: Heavy extruded 12 gauge aluminum grill provides high impact resistance to damage. Grill is attached with tamperproof screws (hex socket/pinned). All controls are easily accessed through grill with slotted screwdriver. Standard color is anodized aluminum. Optional dark bronze or white available.

Elements: Element assemblies shall be non-glowing design. Element assemblies shall consist of steel sheathed heating tubes in a furnace-brazed, plate-finned, block design. Each sheathed tube shall contain a coiled Ni-Chrome wire embedded in an insulator of Magnesium Oxide. The element assembly shall provide the specific wattage indicated on the plans.

Optional Built-in Thermostat: Single Pole factory installed hydraulic capillary tube with precision control. Operating 40°F to 90°F. Thermostat is tamperproof to prevent unauthorized adjustment.

Fan / Heat / Off Switch: Tamperproof 3-position switch provides heating and summer fan-only operation. The DPST off switch provides a "positive off" that disconnects all ungrounded conductors. Controls are easily accessed through grill with slotted screwdriver.

Fan Delay Switch: The fan continues to operate after the thermostat shuts off in order to remove the residual heat left in the elements.

Unit Bearing Motor: Permanently lubricated cast iron motor with enclosed rotor provides long-lasting, trouble-free operation and a 20cc oil reservoir. Thermally protected. 1300 RPM.

Indicator Light: Illuminates when the thermal cutout trips and turns off when the limit resets.

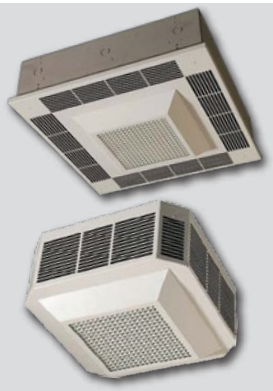
Auto-Reset Thermal Cutout: Heater shuts off when an overheat condition exists and automatically resets when the normal operating temperature returns.

Wall Box: 20 gauge electro galvanized steel. Factory installed ground wire. Minimum 4" clearance to floors and 6" to sidewalls. Zero clearance to combustibles in the wall.

Optional Circuit Breaker / Disconnect: Transformer Relay 24V control.

Approvals: UL (E41422)

Commercial Ceiling Heater KDS Series



Model Code:

KDS	A	24	20
A	B	C	D

A: Series
B: A=Surface R=Recessed mount
C: 20 - 208V 24 - 240V
27 - 277V 48 - 480V
D: Watts (20=2000 - 100=10000)
E: -1 single phase -3 three phase

TAG: EH3

- Totally enclosed fan and lifetime-lubricated ball bearing motor
- Three stainless steel tubular hating elements with aluminum fins
- High-limit temperature control with automatic reset
- Fan delay purges heater of residual heat
- Installation recessed into a T-bar ceiling for KDSR units
- Installation surface mounted for KDSA or KDSB units
- Recommended installation height: 8-12 ft. (2.4-3.6m)
- Standard color: white (-BW) (Almond optional)
- Built-in contactor for: all units at 347V, 480V, 600V, all units from 5-10 kW, and all units at 3-Phase
- Continuous circulation controlled by a built in switch (with power-on indicator light (-CV))
- 208V, 240V, 277V, 347V, 480V, 600V, 1 or 3-Phase
- Standard finish: epoxy/polyester powder paint
- Outlet grill made of flat ribbon wire
- 1-year warranty against defects, 10-year on element

The KDS Series Ceiling Heater

Designed for ceiling mount, this unit heater provides a high level of comfort. Driven by a powerful motor, the fan creates circulation by blowing downward warm air accumulation near ceilings.

Engineering Specifications

Contractor shall supply and install KDS Series electric heaters of the wattage and voltage as indicated on the plans.

Color: Standard: white Optional: Almond, metallic silver, bronze, metallic charcoal, aluminum, semi-gloss black. Custom colors available upon request.
Finish: Standard: epoxy/polyester powder paint.
Voltage: 208V, 240V, 277V, 347V, 480V, 600V, 1 or-3 phase.
Construction: Grill made of flat ribbon wire. High-limit temperature control with automatic reset.
Fan: Totally enclosed and lifetime-lubricated ball bearing motor. Fan delay purges heater of residual heat.
Heating element: Three stainless steel tubular heating elements with aluminum fins.
Warranty: 1-year warranty against defects. 10-year warranty on the heating elements.

Control: Line voltage control standard. Built-in 240V contactor for: all units from 5 to 10kW, all units at 347V, 480V, 600V, all units at 3-phase. 24V and 120V control circuit available. Built-in tamperproof thermostat available. 24V relay (with or without transformer) available. Continuous circulation controlled by a built-in switch with power-on indicator light available (-CV). Any remote thermostat or relay must be connected to the heater control terminal block. 4
Installation: Recommended height: between 8 ft. (2.4 m) and 12 ft. (3.6 m). Recessed into insulated or T-bar ceiling (KDSR). Surface mounting (KDSA and KDSB).
Application: Apartment building, commercial building, drop ceiling, stairwell, garage.

Commercial Ceiling Heater KDS Series

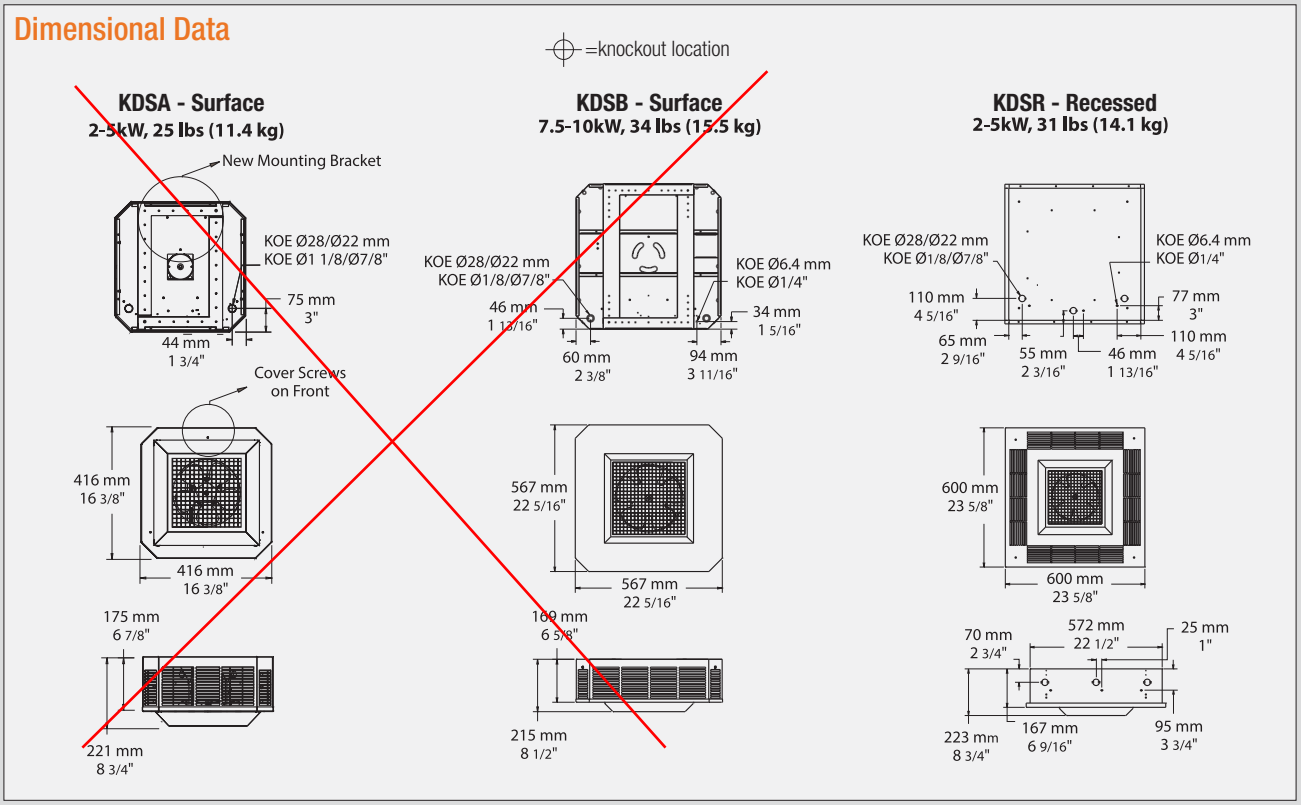
Ordering Information *Add suffix -A for optional almond color

	SURFACE MODEL *KDSA*	UPC	RECESS MODEL *KDSR*	UPC	SURFACE MODEL *KDSB*	UPC	VOLTS *1ph*	WATTS
	KDSAU2420-1	30850	KDSRU2420-1	30906			240	2000
	KDSAU2430-1	30852	KDSRU2430-1	30908			240	3000
240V	KDSAU2440-1	30854	KDSRU2440-1	30910			240	4000
	KDSAU2450-1	30856	KDSRU2450-1	30912			240	5000
					KDSBU2475-1	30962	240	7500
					KDSBU24100-1	30964	240	10000
	KDSAU2020-1	30858	KDSRU2020-1	30914			208	2000
	KDSAU2030-1	30860	KDSRU2030-1	30916			208	3000
208V	KDSAU2040-1	30862	KDSRU2040-1	30918			208	4000
	KDSAU2050-1	30864	KDSRU2050-1	30920			208	5000
					KDSBU2075-1	30966	208	7500
					KDSBU20990-1	30968	208	9900
	KDSAU2720-1	30866	KDSRU2720-1	30922			277	2000
	KDSAU2730-1	30868	KDSRU2730-1	30924			277	3000
277V	KDSAU2740-1	30870	KDSRU2740-1	30926			277	4000
	KDSAU2750-1	30872	KDSRU2750-1	30928			277	5000
					KDSBU2775-1	30970	277	7500
					KDSBU27100-1	30972	277	10000
	KDSAU4820-1	30874	KDSRU4820-1	30930			480	2000
	KDSAU4830-1	30876	KDSRU4830-1	30932			480	3000
480V	KDSAU4840-1	30878	KDSRU4840-1	30934			480	4000
	KDSAU4850-1	30880	KDSRU4850-1	30936			480	5000
					KDSBU4875-1	30974	480	7500
					KDSBU48100-1	30976	480	10000

	SURFACE MODEL *KDSA*	UPC	RECESS MODEL *KDSR*	UPC	SURFACE MODEL *KDSB*	UPC	VOLTS *3ph*	WATTS
	KDSAU2420-3	30882	KDSRU2420-3	30938			240	2000
	KDSAU2430-3	30884	KDSRU2430-3	30940			240	3000
240V	KDSAU2440-3	30886	KDSRU2440-3	30942			240	4000
	KDSAU2450-3	30888	KDSRU2450-3	30944			240	5000
					KDSBU2475-3	30978	240	7500
					KDSBU24100-3	30980	240	10000
	KDSAU2020-3	30890	KDSRU2020-3	30946			208	2000
	KDSAU2030-3	30892	KDSRU2030-3	30948			208	3000
208V	KDSAU2040-3	30894	KDSRU2040-3	30950			208	4000
	KDSAU2050-3	30896	KDSRU2050-3	30952			208	5000
					KDSBU2075-3	30982	208	7500
					KDSBU20990-3	30984	208	9900
	KDSAU4820-3	30898	KDSRU4820-3	30954			480	2000
	KDSAU4830-3	30900	KDSRU4830-3	30956			480	3000
480V	KDSAU4840-3	30902	KDSRU4840-3	30958			480	4000
	KDSAU4850-3	30904	KDSRU4850-3	30960			480	5000
					KDSBU4875-3	30986	480	7500
					KDSBU48100-3	30988	480	10000

Commercial Ceiling Heater KDS Series

Dimensional Data



Control Options

MODEL	DESCRIPTION
Product no-RT	Factory installed (Only) 24V relay with transformer
Product no-R	Factory installed 24V relay without transformer
Product no-120	Factory installed 120V control circuit
Product no -RCV24	Factory installed summer fan 24V remote control + pilot light (switch not included)
Product no -RCV240	Factory installed summer fan 240V remote control + pilot light (switch not included)
KDSA-T-BAR KDSB-T-BAR	Adapter for T-bar ceiling (KDSA/KDSB kits)
Product no-CV	Factory installed summer fan switch + pilot light
Product no -DIS20	Factory installed disconnect switch 277V and less, double pole, 20 Amp
Product no -DIS40	Factory installed disconnect switch 600V max, three pole, 40 Amp
Product no -DIS80	Factory installed disconnect switch 600V, three pole, 80 Amp
KDS-T-AV	Built-in tamper-proof thermostat kit
Product #-T-AV	Factory installed built-in tamper-proof thermostat

Options

ADD SUFFIX	DESCRIPTION
-A	Almond color
-AE	Metallic Silver color (10% up-charge applies)
-BZ	Bronze color (10% up-charge applies)
-CM	Metallic Charcoal color (10% up-charge applies)
-AL	Aluminum color (10% up-charge applies)
-NL	Semi-Gloss Black (10% up-charge applies)
-BW	White

384 Gallatin Park Dr. Suite 201, Bozeman, MT 59771
(O) 406.585.7333 (F) 406.585.7666

Carroll College Anthrozoology

Louvers

Louvers – Nailor Industries

2 – Nailor Model 1606DHP Extruded Aluminum Drainable Blade Louvers with bird Screen and Powder Coat Finish – COLOR TO BE SELECTED FROM STD COLOR CHART

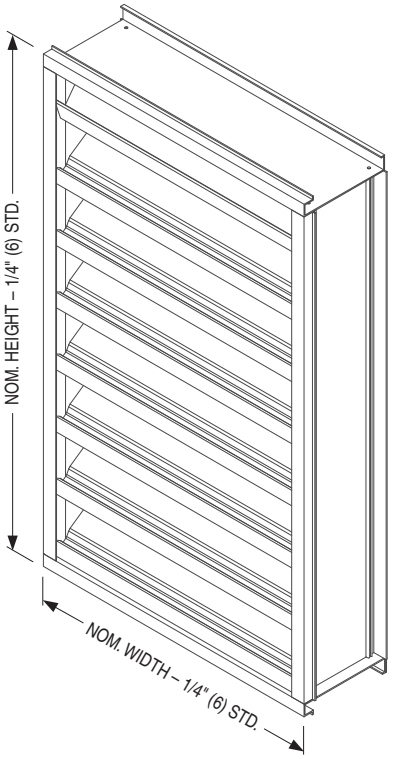
- L1 – 16/20
- L2 – 24/16

See attached copy of equipment schedule and additional submittal data.

EXTRUDED ALUMINUM STATIONARY LOUVER
6" (152) DEEP • HIGH PERFORMANCE DRAINABLE BLADE
MODEL: 1606DHP

Nailor Industries Inc.

Nailor Model 1606DHP is designed to provide excellent weather protection in non-wind driven rain conditions. With its high free area and water penetration velocity, this louver offers a blend of air performance and aesthetics that compliment any structure's exterior styling. The drainable head feature is enhanced by the drainable blade design which utilizes additional rain gutters that divert collected water through concealed side downspouts. Blades are reinforced with full length integral bosses for superior strength. Suitable for use in exhaust and low to medium velocity intake applications where water penetration concerns are a priority. Available in channel, flanged or glazing adapter type, the 6" (152) deep frame installs easily in most common wall configurations.



STANDARD CONSTRUCTION:

FRAME:	6" (152) deep, Type 6063-T5 extruded aluminum, .080" (2.03) nominal wall thickness. Integral downspouts and caulking slot provided.
BLADES:	Type 6063-T5 extruded aluminum, .080" (2.03) nominal wall thickness, with reinforcing bosses.
BLADE ANGLE:	Fixed at 31 degrees.
BLADE SPACING:	Approximately 4" (102) on centers.
BLADE SUPPORT BRACKETS:	Concealed type, factory installed on rear of louver on maximum 48" (1219) centers. Reinforced with 1 1/2" x 2" (38 x 51) angle (adds approx. 2" [51] to overall louver depth).
MULLIONS:	Concealed type allowing continuous line appearance up to 120" (3048) wide. Larger assemblies require separate visible frames with downspouts.
SCREEN:	3/4" x .051 (19 x 1.3) expanded, flattened aluminum bird screen in removable frame, inside (rear) mount (adds approximately 3/8" [10] to louver depth).
FINISH:	Mill.
MINIMUM SIZE:	12" W x 12" H (305 x 305).
MAX. SINGLE SECTION SIZE:	120" W x 84" H (3048 x 2134) or 84" W x 120" H (2134 x 3048). 70 sq. ft. (6.5m²). Larger louvers will require field assembly of smaller sections.

OPTIONS:

- ❑ **FL** Flanged Frame.
- ❑ **BSSS** Type 304 S.S. Bird Screen.
- ❑ **BSN** No Bird Screen.
- ❑ **ISA** Aluminum Insect Screen.
- ❑ **ISSS** Type 304 S.S. Insect Screen.
- ❑ **WE** Welded Construction.
- ❑ **ESI** Extended Sill.
- ❑ **FR1** 1" (25) Filter Rack.
- ❑ **FR2** 2" (51) Filter Rack.
- ❑ **PAC** Perimeter Anchor Clips.
- ❑ Other: _____ .

OPTIONAL FINISHES:

- ❑ **PC3** Powder Coat AAMA 2603. Color: _____ .
- ❑ **PC4** High Performance Powder Coat AAMA 2604 (Equivalent to 50% Kynar®). Color: _____ .
- ❑ **PC5** Fluoropolymer Powder Coat AAMA 2605 (Equivalent to 70% Kynar®). Color: _____ .
- ❑ **PCC** Prime Coat.
- ❑ **AN04** Clear Anodized 204-R1.
- ❑ **AN15** Clear Anodized 215-R1.

Color Anodized:

- ❑ **ANLB** Light Bronze.
- ❑ **ANMB** Medium Bronze.
- ❑ **ANDB** Dark Bronze.
- ❑ **ANBK** Black.

OPTIONAL W x H SIZING (1/4" [6.5] Undersize standard):

- ❑ **U00** Exact Size.
- ❑ **U38** Undersize 3/8" (9.5).
- ❑ **U50** Undersize 1/2" (12.7).

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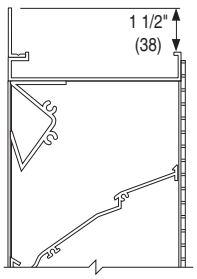
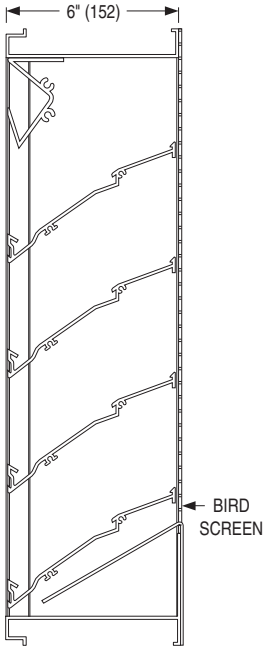


FLANGED FRAME (FL) (OPTIONAL)



SCHEDULE TYPE:				
PROJECT:				
ENGINEER:	**DATE**	**B SERIES**	**SUPERSEDES**	**DRAWING NO.**
CONTRACTOR:	**2 - 10 - 14**	**1600**	**NEW**	**1606DHP**

Dimensions are in inches (mm).

EXTRUDED ALUMINUM STATIONARY LOUVER
6" (152) DEEP • HIGH PERFORMANCE
DRAINABLE BLADE • PERFORMANCE DATA
MODEL: 1606DHP

FREE AREA in Square Feet and Square Meters

Height in Inches and Meters	Width in Inches and Meters																		
	12	**18**	**24**	**30**	**36**	**42**	**48**	**54**	**60**	**66**	**72**	**78**	**84**	**90**	**96**	**102**	**108**	**114**	**120**
	0.30	0.46	0.61	0.76	0.91	1.07	1.22	1.37	1.52	1.68	1.83	1.98	2.13	2.29	2.44	2.59	2.74	2.90	3.05
12	**0.31**	**0.51**	**0.70**	**0.89**	**1.09**	**1.28**	**1.48**	**1.67**	**1.87**	**2.06**	**2.25**	**2.45**	**2.64**	**2.84**	**3.03**	**3.22**	**3.42**	**3.61**	**3.81**
0.30	0.03	0.05	0.07	0.08	0.10	0.12	0.14	0.16	0.17	0.19	0.21	0.23	0.25	0.26	0.28	0.30	0.32	0.34	0.35
18	**0.60**	**0.98**	**1.35**	**1.73**	**2.11**	**2.48**	**2.86**	**3.23**	**3.61**	**3.99**	**4.36**	**4.74**	**5.11**	**5.49**	**5.87**	**6.24**	**6.62**	**6.99**	**7.37**
0.46	0.06	0.09	0.13	0.16	0.20	0.23	0.27	0.30	0.34	0.37	0.41	0.44	0.48	0.51	0.54	0.58	0.61	0.65	0.68
24	**0.90**	**1.47**	**2.03**	**2.60**	**3.16**	**3.73**	**4.29**	**4.85**	**5.42**	**5.98**	**6.55**	**7.11**	**7.67**	**8.24**	**8.80**	**9.37**	**9.93**	**10.49**	**11.06**
0.61	0.08	0.14	0.19	0.24	0.29	0.35	0.40	0.45	0.50	0.56	0.61	0.66	0.71	0.77	0.82	0.87	0.92	0.97	1.03
30	**1.19**	**1.93**	**2.68**	**3.42**	**4.16**	**4.90**	**5.64**	**6.39**	**7.13**	**7.87**	**8.61**	**9.35**	**10.10**	**10.84**	**11.58**	**12.32**	**13.07**	**13.81**	**14.55**
0.76	0.11	0.18	0.25	0.32	0.39	0.46	0.52	0.59	0.66	0.73	0.80	0.87	0.94	1.01	1.08	1.14	1.21	1.28	1.35
36	**1.33**	**2.16**	**3.00**	**3.83**	**4.66**	**5.49**	**6.32**	**7.15**	**7.98**	**8.81**	**9.65**	**10.48**	**11.31**	**12.14**	**12.97**	**13.80**	**14.63**	**15.46**	**16.30**
0.36	0.12	0.20	0.28	0.36	0.43	0.51	0.59	0.66	0.74	0.82	0.90	0.97	1.05	1.13	1.20	1.28	1.36	1.44	1.51
42	**1.77**	**2.87**	**3.97**	**5.07**	**6.17**	**7.27**	**8.37**	**9.47**	**10.57**	**11.67**	**12.78**	**13.88**	**14.98**	**16.08**	**17.18**	**18.28**	**19.38**	**20.48**	**21.58**
1.07	0.16	0.27	0.37	0.47	0.57	0.68	0.78	0.88	0.98	1.08	1.19	1.29	1.39	1.49	1.60	1.70	1.80	1.90	2.01
48	**2.05**	**3.33**	**4.61**	**5.89**	**7.17**	**8.45**	**9.65**	**11.01**	**12.29**	**13.57**	**14.85**	**16.13**	**17.41**	**18.69**	**19.97**	**21.24**	**22.52**	**23.80**	**25.08**
1.22	0.19	0.31	0.43	0.55	0.67	0.79	0.90	1.02	1.14	1.26	1.38	1.50	1.62	1.74	1.85	1.97	2.09	2.21	2.33
54	**2.34**	**3.80**	**5.26**	**6.73**	**8.19**	**9.65**	**11.11**	**12.57**	**14.03**	**15.49**	**16.95**	**18.41**	**19.87**	**21.33**	**22.79**	**24.25**	**25.71**	**27.17**	**28.64**
1.37	0.22	0.35	0.49	0.62	0.76	0.90	1.03	1.17	1.30	1.44	1.57	1.71	1.85	1.98	2.12	2.25	2.39	2.52	2.66
60	**2.64**	**4.28**	**5.92**	**7.57**	**9.21**	**10.86**	**12.50**	**14.14**	**15.79**	**17.43**	**19.07**	**20.72**	**22.36**	**24.01**	**25.65**	**27.29**	**28.94**	**30.58**	**32.22**
1.52	0.24	0.40	0.55	0.70	0.86	1.01	1.16	1.31	1.47	1.62	1.77	1.92	2.08	2.23	2.38	2.54	2.69	2.84	2.99
66	**2.92**	**4.74**	**6.56**	**8.39**	**10.21**	**12.03**	**13.85**	**15.67**	**17.49**	**19.31**	**21.13**	**22.96**	**24.78**	**26.60**	**28.42**	**30.24**	**32.06**	**33.88**	**35.71**
1.68	0.27	0.44	0.61	0.78	0.95	1.12	1.29	1.46	1.63	1.79	1.96	2.13	2.30	2.47	2.64	2.81	2.98	3.15	3.32
72	**3.21**	**5.22**	**7.22**	**9.22**	**11.23**	**13.23**	**15.24**	**17.24**	**19.24**	**21.25**	**23.25**	**25.25**	**27.26**	**29.26**	**31.26**	**33.27**	**35.27**	**37.27**	**39.28**
1.83	0.30	0.48	0.67	0.86	1.04	1.23	1.42	1.60	1.79	1.97	2.16	2.35	2.53	2.72	2.90	3.09	3.28	3.46	3.65
78	**3.50**	**5.68**	**7.87**	**10.05**	**12.23**	**14.41**	**16.60**	**18.78**	**20.96**	**23.14**	**25.33**	**27.51**	**29.69**	**31.87**	**34.05**	**36.24**	**38.42**	**40.60**	**42.78**
1.98	0.33	0.53	0.73	0.93	1.14	1.34	1.54	1.74	1.95	2.15	2.35	2.56	2.76	2.96	3.16	3.37	3.57	3.77	3.97
84	**3.79**	**6.16**	**8.52**	**10.89**	**13.25**	**15.61**	**17.98**	**20.34**	**22.71**	**25.07**	**27.43**	**29.80**	**32.16**	**34.53**	**36.89**	**39.25**	**41.62**	**43.98**	**46.35**
2.13	0.35	0.57	0.79	1.01	1.23	1.45	1.67	1.89	2.11	2.33	2.55	2.77	2.99	3.21	3.43	3.65	3.87	4.09	4.31
90	**4.08**	**6.63**	**9.17**	**11.72**	**14.26**	**16.81**	**19.35**	**21.89**	**24.44**	**26.98**	**29.53**	**32.07**	**34.62**	**37.16**	**39.71**	**42.25**	**44.79**	**47.34**	**49.88**
2.29	0.38	0.62	0.85	1.09	1.32	1.56	1.80	2.03	2.27	2.51	2.74	2.98	3.22	3.45	3.69	3.93	4.16	4.40	4.63
96	**4.37**	**7.09**	**9.82**	**12.54**	**15.27**	**17.99**	**20.71**	**23.44**	**26.16**	**28.89**	**31.61**	**34.33**	**37.06**	**39.78**	**42.50**	**45.23**	**47.95**	**50.98**	**53.40**
2.44	0.41	0.66	0.91	1.17	1.42	1.67	1.92	2.18	2.43	2.68	2.94	3.19	3.44	3.70	3.95	4.20	4.45	4.71	4.96
102	**4.66**	**7.57**	**10.47**	**13.38**	**16.28**	**19.19**	**22.09**	**25.00**	**27.90**	**30.81**	**33.71**	**36.62**	**39.52**	**42.43**	**45.34**	**48.24**	**51.15**	**54.05**	**56.96**
2.59	0.43	0.70	0.97	1.24	1.51	1.78	2.05	2.32	2.59	2.86	3.13	3.40	3.67	3.94	4.21	4.48	4.75	5.02	5.29
108	**4.95**	**8.04**	**11.12**	**14.21**	**17.29**	**20.38**	**23.46**	**26.55**	**29.63**	**32.72**	**35.80**	**38.89**	**41.97**	**45.06**	**48.14**	**51.23**	**54.31**	**57.40**	**60.48**
2.74	0.46	0.75	1.03	1.32	1.61	1.89	2.18	2.47	2.75	3.04	3.33	3.61	3.90	4.19	4.47	4.76	5.05	5.33	5.62
114	**5.24**	**8.51**	**11.78**	**15.04**	**18.31**	**21.58**	**24.84**	**28.11**	**31.38**	**34.65**	**37.91**	**41.18**	**44.45**	**47.71**	**50.98**	**54.25**	**57.52**	**60.78**	**64.05**
2.90	0.49	0.79	1.09	1.40	1.70	2.00	2.31	2.61	2.92	3.22	3.52	3.83	4.13	4.43	4.74	5.04	5.34	5.65	5.95
120	**5.53**	**8.98**	**12.42**	**15.87**	**19.31**	**22.76**	**26.21**	**29.65**	**33.10**	**36.54**	**39.99**	**43.44**	**46.88**	**50.33**	**53.78**	**57.22**	**60.67**	**64.11**	**67.56**
3.05	0.51	0.83	1.15	1.47	1.79	2.11	2.43	2.75	3.07	3.40	3.72	4.04	4.36	4.68	5.00	5.32	5.64	5.96	6.28

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SCHEDULE TYPE:	Page 2 of 3 Dimensions are in inches (mm).			
PROJECT:				
ENGINEER:	**DATE**	**B SERIES**	**SUPERSEDES**	**DRAWING NO.**
CONTRACTOR:	**2 - 10 - 14**	**1600**	**NEW**	**1606DHP**

EXTRUDED ALUMINUM STATIONARY LOUVER 6" (152) DEEP • HIGH PERFORMANCE DRAINABLE BLADE • PERFORMANCE DATA MODEL: 1606DHP

AIRFLOW/ WATER PENETRATION DATA
for 48" x 48" (1219 x 1219) Louver Size

	Free Area %	60%
	Free Area sq. ft. (sq. m.)	9.65 (0.90)
INTAKE	Free Area Velocity at Point of Beginning Water Penetration at .01 oz./sq. ft. (3 ml/sq. m) (15 min. test duration)	1186 fpm (361 m/min.)
INTAKE	Air Volume at 1186 fpm Free Area Velocity	11,445 cfm (5401 l/s)
INTAKE	Pressure Drop @ 1186 fpm	.19 in. w.g. (47 Pa)

NOTE: To minimize water penetration when sizing intake louvers, select a Free Area Velocity that is **below** the point of beginning water penetration.

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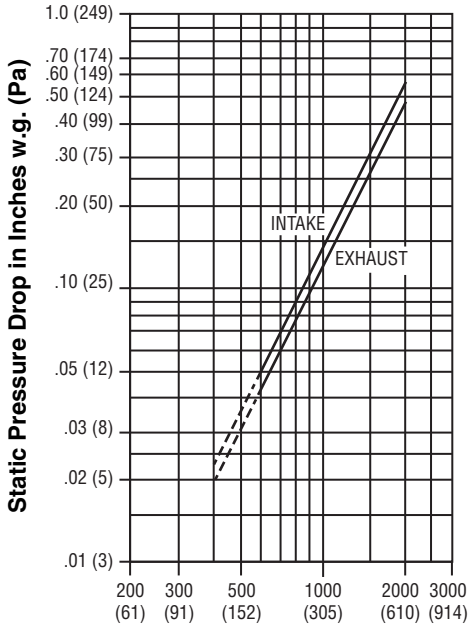
Nailor Industries Inc. certifies the Model 1606DHP shown herein is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Program. Seal applies to air performance ratings and water penetration ratings.

PRESSURE DROP



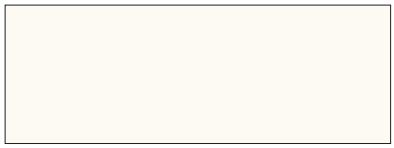
Air Velocity in Feet (Meters) Per Minute Through Free Area

Louver test size: 48" x 48" (1219 x 1219 mm).
Standard air density @ 0.075 lbs/ft³.
Tested to AMCA Fig. 5.5 - 6.5.

SCHEDULE TYPE:	Page 3 of 3 Dimensions are in inches (mm).			
PROJECT:				
ENGINEER:	**DATE**	**B SERIES**	**SUPERSEDES**	**DRAWING NO.**
CONTRACTOR:	**2 - 10 - 14**	**1600**	**NEW**	**1606DHP**

Nailor® Industries Inc.

Louver Finishes & Color Guide

 Slate Blue **LF01**	 Medium Bronze **LF02**	 Sandstone **LF03**
 Light Gray **LF04**	 Charcoal **LF05**	 Bone White **LF06**
 Western Tan **LF07**	 Architectural Bronze **LF08**	 Regal Blue **LF09**
 Forest Green **LF10**	 Surrey Beige **LF11**	 Royal Brown **LF12**
 Barn Red **LF13**	 Burgundy **LF14**	 Clay **LF15**
Almond **LF16**	 Coastal White **LF17**	 Vista Green **LF18**
 Black **LF19**	 Gloss Black **LF20**	 Campus Green **LF21**

Nailor offers 21 standard paint colors selected for architectural exterior use which meet or exceed AAMA specifications and performance requirements for color retention, chalk resistance, gloss retention, erosion, corrosion and chemical resistance as well as dry film thickness and hardness. Our state-of-the-art powder coat system provides an environment friendly finishing solution with more uniform coverage and coating thickness. The result is an exceptional finish that better resists scratching, fading and general wear. Additional liquid coat facilities for special requirements complete our ability to provide unmatched beauty and durability for any application.

Custom color matching is also available upon request. Contact your local Nailor representative.

Available Finishes

FINISH TYPE	DESCRIPTION	STANDARD WARRANTY
Fluoropolymer Powder Coat AAMA 2605-Superior Finish (AKA: Powdura® 5000, Coraflon® Powder, Interpon® D3000-Fluoromax)	**"Ultimate"** − A next generation hyper durable powder coating, based on FEVE fluoropolymer resins and ceramic pigmentation that the industry has acknowledged as the foundation for superior performance coatings. They provide a hard surface that is resistant to scratching and scuffing, with superior color and gloss retention, when applied to a variety of exterior architectural applications. This technology represents the "ultimate" in environmentally friendly finishes, with Zero-VOC emissions. A new alternative to traditional 70% Kynar 500® / Hylar 500® PVDF fluoropolymer liquid coatings.	10 years (Consult Nailor for availability of extended warranty)
High Performance Powder Coat AAMA 2604 − High Performance Finish (AKA: Powdura® 4000, Envirocron® Ultra Durable Powder, Dynadure™ 400, Interpon® D2000)	**"Better"** − A high performance polyester powder coating, based on "super durable" resins that utilize infrared reflective pigments, which provides excellent resistance to outdoor weathering. A harder and more environmentally friendly coating than other liquid paint counterparts and with Zero-VOC emissions. A good alternative to 50% Kynar 500® / Hylar 5000® liquid coatings.	5 years
Durable Powder Coat AAMA 2603 − Pigmented Organic Coatings (AKA: Powdura® 3000, Envirocron® Durable Powder, Dynadure™ 300, Interpon® D1000)	**"Good"** − A durable powder coat based on thermosetting polyester resin technology. Provides a good economical combination of physical and chemical resistance properties. Environmentally superior to liquid spray paints and Zero – VOC emissions.	1 year
Clear Anodize 215-R1 AA-M10C22A41 (0.7 mil. min.)	Architectural Class I. Clear, colorless and hard oxide aluminum coating that resists weathering and chemical attack. Recommended for severely corrosive and abrasive atmospheric exposure.	5 years
Clear Anodize 204-R1 AA-M10C22A31 (0.4 − 0.7 mil.)	Architectural Class II. Clear, colorless and hard oxide aluminum coating that resists weathering and chemical attack. Recommended for normal weather exposure.	1 year
Color Anodize AA-M10C22A44 (0.7 mil. min.)	Architectural Class I. "Two-step" aluminum coating process. Following a standard anodizing procedure, a second electrolytic process deposits colored metallic pigments which penetrate the aluminum oxide pores, producing a corrosion resistant, colorfast finish. Available in light, medium, dark bronze and black.	5 years
Prime Coat	Prime coat provides a stable base for painting of louvers in the field. Surface pretreatment includes degreasing and a chemical cleaning before an epoxy prime coat is applied. Finish coat should be field applied as soon as possible for best adhesion, after a thorough cleaning for dust etc. that can contaminate the final finish and cause premature flaking or peeling.	N/A

Paint finish warranties are not applicable to steel products.

Goodman
Air Conditioning & Heating

GMVC96 (B)

HEATING INPUT: 40,000–120,000 BTU/H

TWO-STAGE, VARIABLE-SPEED ECM GAS FURNACE UP TO 96% AFUE

Contents

ENERGY STAR

ComfortBridge™ technology

CoolCloud™

Standard Features

- Integrated communicating ComfortBridge™ Technology
- Commissioning and diagnostics via on board Bluetooth with the CoolCloud phone and tablet application
- Heavy-duty aluminized-steel tubular heat exchanger
- Stainless-steel secondary heat exchanger
- Two-stage gas valve provides quiet, economical heating
- Durable Silicon Nitride igniter
- Quiet two-speed induced draft blower
- Compatible with any single-stage thermostat
- Self-diagnostic control board with constant memory fault code history output to a triple 7-segment display
- Color-coded low-voltage terminals with provisions for electronic air cleaner
- Efficient and quiet variable-speed airflow system gently ramps up or down according to heating or cooling demand
- Multiple continuous fan speed options offer quiet air circulation
- Auto-Comfort and enhanced dehumidification modes available
- All models comply with California 40 ng/J Low NOx emissions standard
- Can no longer be installed in California's South Coast Air Quality Management District (SCAQMD) on or after October 1, 2019.

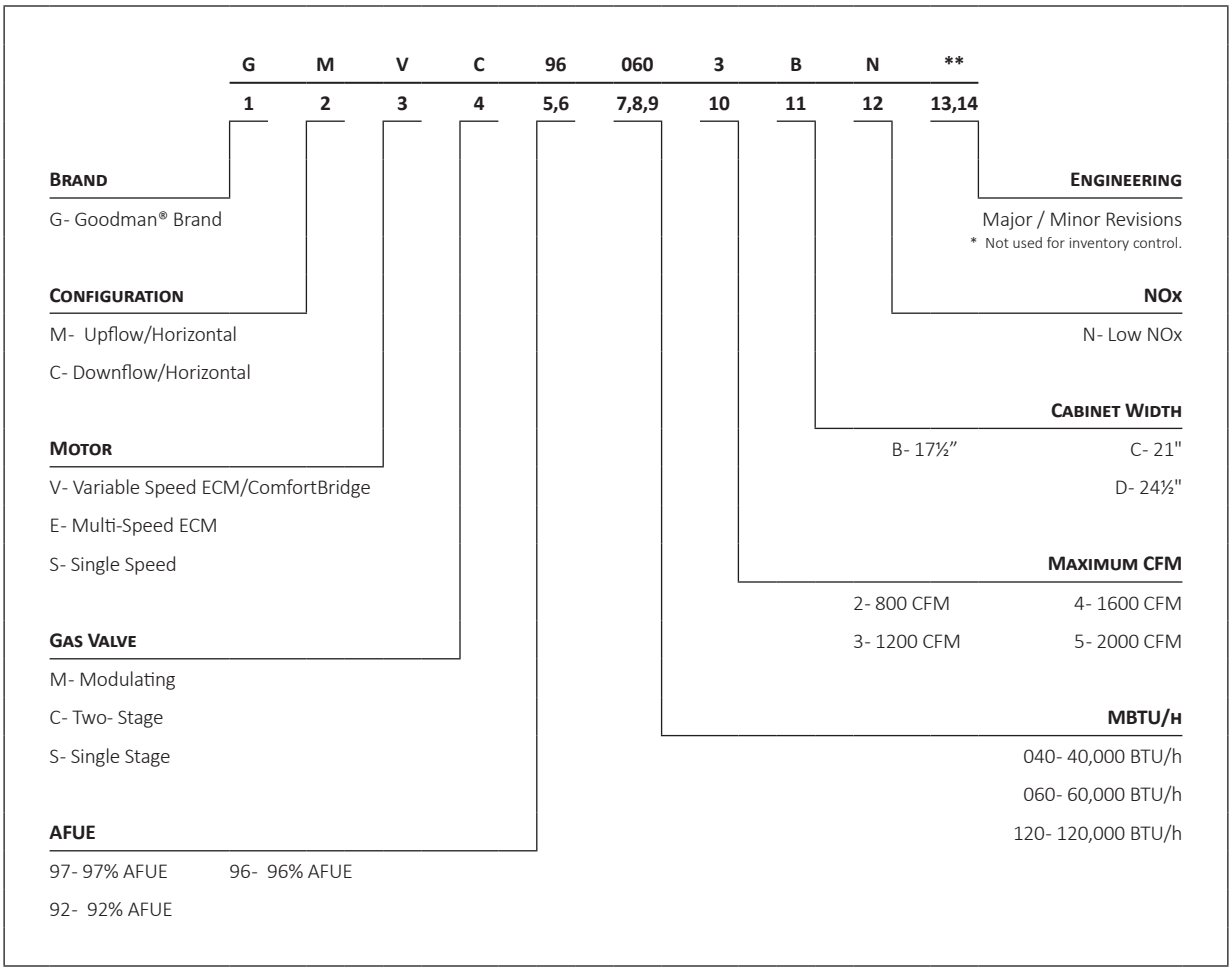
Cabinet Features

- Designed for multi-position installation — upflow, horizontal left or right
- Certified for direct vent (2-pipe) or non-direct vent (1-pipe)
- Easy to install top venting with optional side venting
- Convenient left or right connection for gas and electrical service
- Cabinet air leakage (Q_{Leak}) ≤ 2%
- Heavy-gauge steel cabinet with durable baked-enamel finish
- Fully insulated heat exchanger and blower section
- Airtight solid bottom or side-return with easy-cut tabs for effortless removal in bottom air-inlet applications

LIFETIME HEAT EXCHANGER LIMITED WARRANTY* | 10 YEAR UNIT REPLACEMENT LIMITED WARRANTY* | 10 YEAR PARTS LIMITED WARRANTY*

Intertek | AHRI CERTIFIED | COMPANY WITH QUALITY SYSTEM CERTIFIED BY DNV GL = ISO 9001 = | COMPANY WITH ENVIRONMENTAL SYSTEM CERTIFIED BY DNV GL = ISO 14001 = | BBB ACCREDITED BUSINESS

* Complete warranty details available from your local dealer or at www.goodmanmfg.com. To receive the Lifetime Heat Exchanger Limited Warranty (good for as long as you own your home), 10-Year Unit Replacement Limited Warranty and 10-Year Parts Limited Warranty, online registration must be completed within 60 days of installation. Online registration is not required in California or Québec.



ACCESSORIES

F-2 F-1 & 3

MODEL	DESCRIPTION	GMVC96 0403BNB	GMVC96 0603BNB	GMVC96 0803BNB	GMVC96 0804CNB	GMVC96 1005CNB	GMVC96 1005DNB	GMVC96 1205DNB
CVENT-2	Concentric Vent Kit (2")	√	√	√	√	√	√	---
CVENT-3	Concentric Vent Kit (3")	√	√	√	√	√	√	√
RF000142	Drain Kit-Horizontal Left Vertical Flue	√	√	√	√	√	√	√
EFR02	External Filter Rack with 16"x25" Permanent Filter	√	√	√	√	√	√	√
0170K00000S	Flush Mount Vent Kit- 3" or 2"	√	√	√	√	√	√	√
0170K00001S	Flush Mount Vent Kit- 2"	√	√	√	√	√	√	---
HASFK	High-Altitude Natural Gas Kit	HASFK-1	HASFK-1	HASFK-2	HASFK-2	HASFK-3	TBD	HASFK-2
HASFK	High-Altitude LP Gas Kit	HASFK-1	HASFK-1	HASFK-1	HASFK-2	HASFK-2	TBD	HASFK-2
LPLP03	Low LP Gas Pressure Switch	√	√	√	√	√	√	√
LPM-08	LP Conversion Kits	√	√	√	√	√	√	√

F-2 F-1 & 3

	GMVC96 0403BNB	GMVC96 0603BNB	GMVC96 0803BNB	GMVC96 0804CNB	GMVC96 1005CNB	GMVC96 1005DNB	GMVC96 1205DNB
HEATING DATA							
High Fire Input[1]	40,000	60,000	80,000	80,000	100,000	100,000	120,000
High Fire Output[1]	38,400	57,600	76,800	76,800	96,000	96,000	115,200
Low-Fire Steady-State Input[1]	28,000	42,000	56,000	56,000	70,000	70,000	84,000
Low-Fire Steady-State Output[1]	26,880	40,320	53,760	53,760	67,200	67,200	80,640
AFUE[2]	96	96	96	96	96	96	96
Temperature Rise Range (°F)	20- 50	35- 65	35- 65	25- 55	35- 65	30- 60	35- 65
Vent Diameter[3]	2"- 3"	2"- 3"	2"- 3"	2"- 3"	2"- 3"	2"- 3"	2"- 3"
No. of Burners	2	3	4	4	5	5	6
CIRCULATOR BLOWER							
Available AC @ 0.5" ESP	1.5- 3	1.5- 3	1.5- 3	1.5- 4	2- 5	2- 5	2- 5
Size (D x W)	10" x 8"	11" x 8"	11" x 8"	11" x 10"	11" x 10"	11" x 11"	11" x 11"
Horsepower @ 1075 RPM	½	½	½	¾	1	1	1
Speed	VS ECM	VS ECM	VS ECM	VS ECM	VS ECM	VS ECM	VS ECM
ELECTRICAL DATA							
Min. Circuit Ampacity[4]	7.8	7.8	7.8	10.6	14.4	14.4	14.4
Max. Overcurrent Device (amps)[5]	15	15	15	15	20	20	20
SHIPPING WEIGHT (LBS)	114	117	120	141	143	153	156

[1] Natural Gas BTU/h

[2] DOE AFUE based upon Isolated Combustion System (ICS)

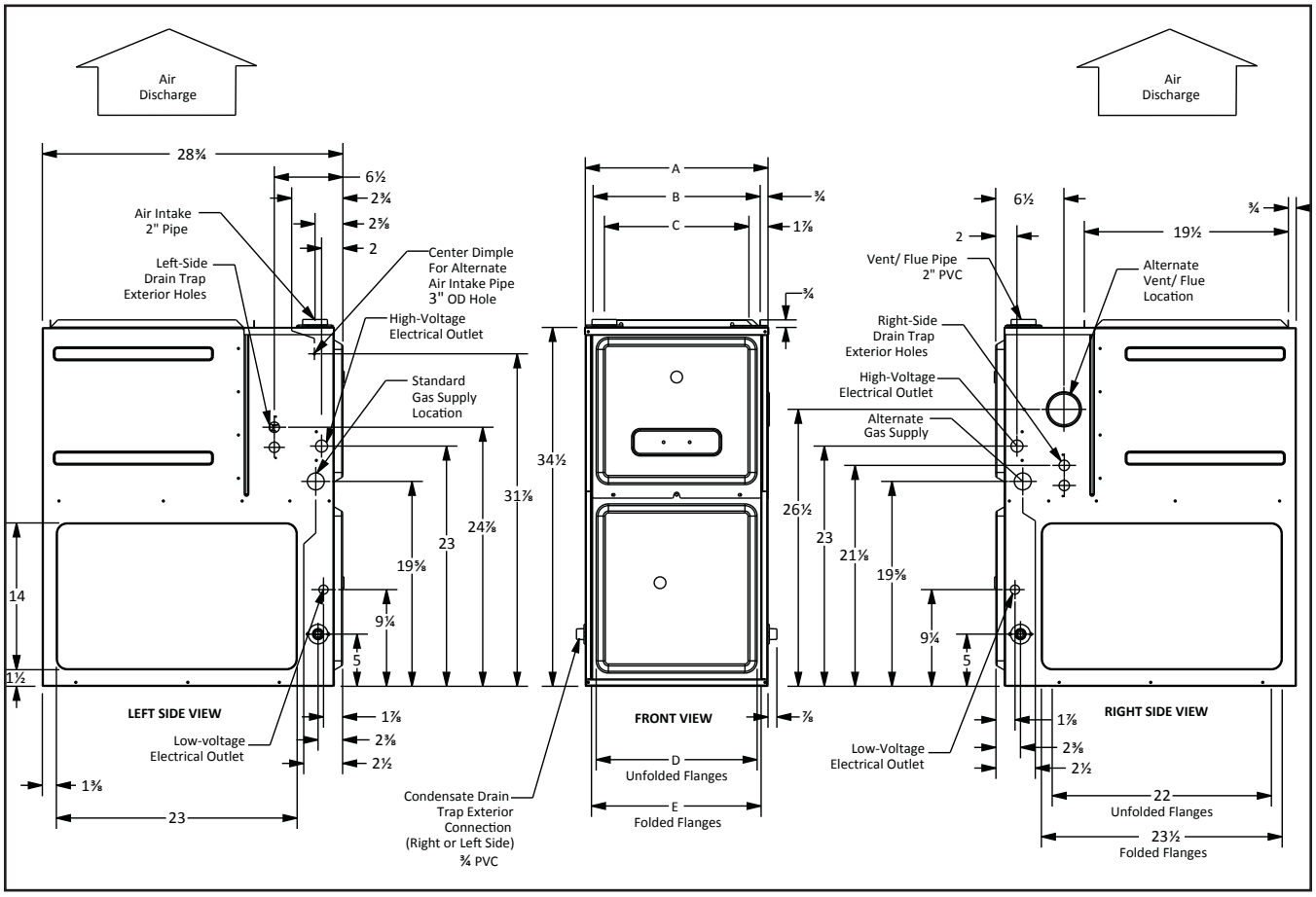
[3] Installer must supply one or two PVC pipes: one for combustion air (optional) and one for the flue outlet (required). Vent pipe must be either 2" or 3" in diameter, depending upon furnace input, number of elbows, length of run and installation (1 or 2 pipes). The optional Combustion Air Pipe is dependent on installation/code requirements and must be 2" or 3" diameter PVC.

[4] Minimum Circuit Ampacity = (1.25 x Circulator Blower Amps) + ID Blower amps. Wire size should be determined in accordance with National Electrical Codes. Extensive wire runs will require larger wire sizes.

[5] Maximum Overcurrent Protection Device refers to maximum recommended fuse or circuit breaker size. May use fuses or HACR-type circuit breakers of the same size as noted.

NOTES

- All furnaces are manufactured for use on 115 VAC, 60 Hz, single-phase electrical supply.
- Gas Service Connection ½" FPT
- Important: Size fuses and wires properly and make electrical connections in accordance with the National Electrical Code and/or all existing local codes.
- For bottom return: Failure to unfold flanges may reduce airflow by up to 18%. This could result in performance and noise issues.
- For servicing or cleaning, a 24" front clearance is required. Unit connections (electrical, flue and drain) may necessitate greater clearances than the minimum clearances listed above. In all cases, accessibility clearance must take precedence over clearances from the enclosure where accessibility clearances are greater.



				Air Discharge			Air Return
Model	W	D	H	A	B	C	D	E
GMVC960403BNB	17½"	28⅞"	34½"	17½"	16"	13⅞"	12⅛"	13⅝"
GMVC960603BNB	17½"	28⅞"	34½"	17½"	16"	13⅞"	12⅛"	13⅝"
GMVC960803BNB	17½"	28⅞"	34½"	17½"	16"	13⅞"	12⅛"	13⅝"
GMVC960804CNB	21"	28⅞"	34½"	21"	19½"	17⅞"	16"	17½"
GMVC961005CNB	21"	28⅞"	34½"	21"	19½"	17⅞"	16"	17½"
GMVC961005DNB	24½"	28⅞"	34½"	24½"	23"	20⅞"	19⅜"	20⅞"
GMVC961205DNB	24½"	28⅞"	34½"	24½"	23"	20⅞"	19⅜"	20⅞"

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIALS

Position	Sides	Rear	Front	Bottom	Flue	Top
Upflow	0"	0"	3"	C	0"	1"
Horizontal	6"	0"	3"	C	0"	6"

C = If placed on combustible floor, the floor MUST be wood ONLY.

MINIMUM FILTER SIZES

	GMVC96 0403BNB	GMVC96 0603BNB	GMVC96 0803BNB	GMVC96 0804CNB	GMVC96 1005CNB	GMVC96 1005DNB	GMVC96 1205DNB
Filter Size (in²) (Qty)	(1) 16 x 25 (side or bottom)				(1) 20 x 25 (bottom) or (2) 16 x 25 (side)		

Note: Other size filters of equal or greater dimensions may be used. Filters may also be centrally located.

MODEL/TEMP RISE RANGE (MID RISE)	GMVC96 0403BNB* 20-50 (35)		GMVC96 0603BNB* 35-65 (50)		GMVC96 0803BNB* 35-65 (50)		GMVC96 0804CNB* 25-55 (40)		GMVC96 1005CNB* 35-65 (50)		GMVC96 1005DNB* 30-60 (45)		GMVC96 1205DNB* 35-65 (50)	
	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE
Recommended cfm for high heat / expected temperature rise	1010	35	1072	50	1400	50	1760	40	1770	50	1980	45	2150	50
Lowest recommended cfm for hi heat / expected temperature rise	710	50	820	65	1090	65	1300	55	1360	65	1480	60	1650	65
Maximum cfm for hi heat / expected temperature rise	1400	25	1400	38	1650	43	1760	40	2200	40	2200	40	2200	48

NOTE: Low Heat CFM = High Heat CFM X .7. Low Heat Temperature Rise Is Expected to Equal High Heat Temparatue Rise ± 5%
0140F02402-A

GMVC960403BNB*
COOLING SPEED
(@ .1" - .8" W.C. ESP)

TONS	HIGH-STAGE	LOW-STAGE CFM
1.5	600	420
2	800	560
2.5	1,000	700
3	1,200	840
MAX	1,400	

GMVC960603BNB*
COOLING SPEED
(@ .1" - .8" W.C. ESP)

TONS	HIGH-STAGE	LOW-STAGE CFM
1.5	600	420
2	800	560
2.5	1,000	700
3	1,200	840
MAX	1,400	

GMVC960803BNB*
COOLING SPEED
(@ .1" - .8" W.C. ESP)

TONS	HIGH-STAGE	LOW-STAGE CFM
1.5	600	420
2	800	560
2.5	1,000	700
3	1,200	840
MAX	1,650	

GMVC960804CNB*
COOLING SPEED
(@ .1" - .8" W.C. ESP)

TONS	HIGH-STAGE	LOW-STAGE CFM
2	800	560
2.5	1,000	700
3	1,200	840
4	1,600	1120
MAX	1,760	

GMVC961005CNB*
COOLING SPEED
(@ .1" - .8" W.C. ESP)

TONS	HIGH-STAGE	LOW-STAGE CFM
2	800	560
3	1,200	840
4	1,600	1,120
5	2,000	1,400
MAX	2,200	

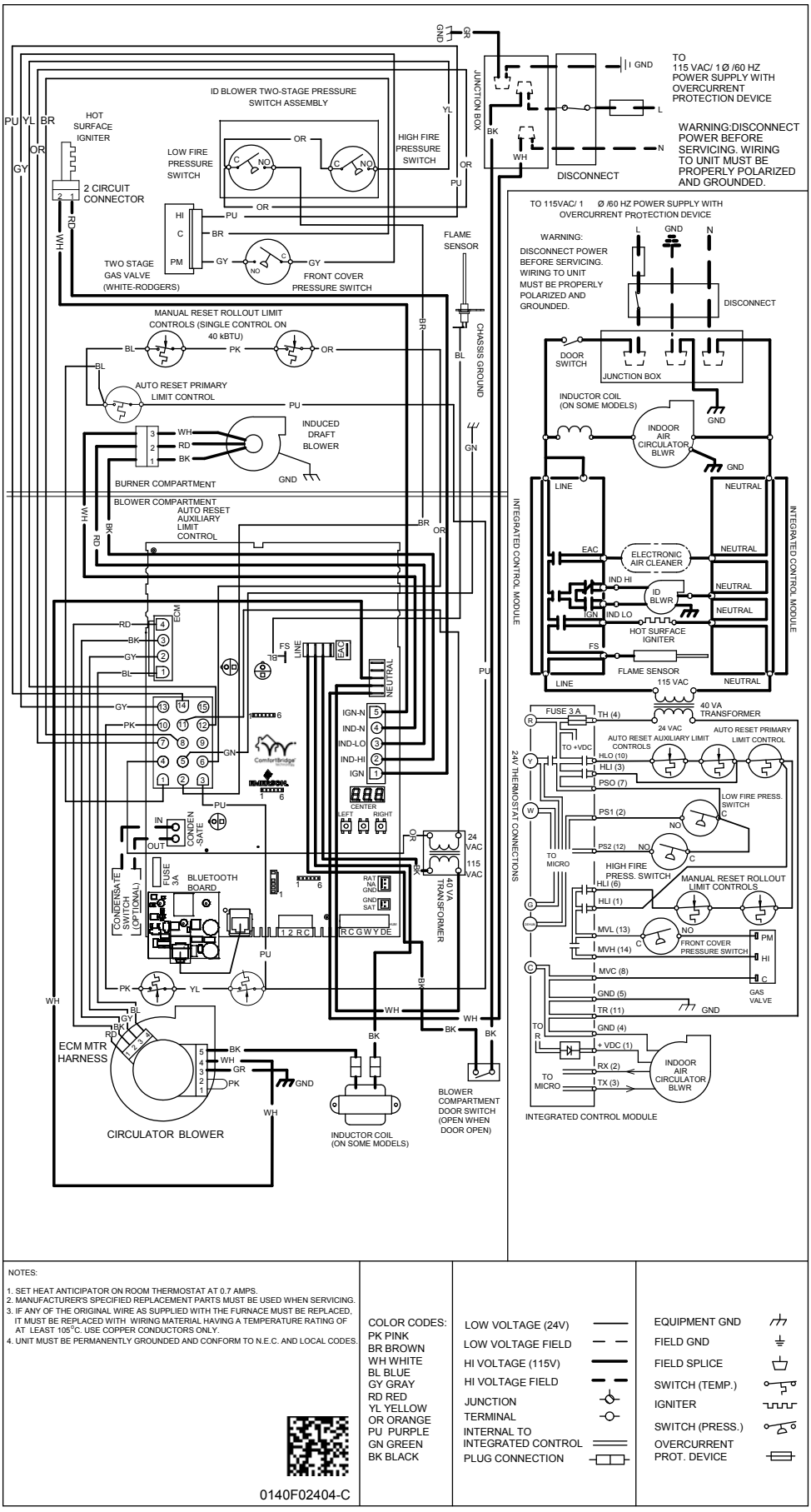
GMVC961005DNB*
COOLING SPEED
(@ .1" - .8" W.C. ESP)

TONS	HIGH-STAGE	LOW-STAGE CFM
2	800	560
3	1,200	840
4	1,600	1,120
5	2,000	1,400
MAX	2,200	

GMVC961205DNB*
COOLING SPEED
(@ .1" - .8" W.C. ESP)

TONS	HIGH-STAGE	LOW-STAGE CFM
2	800	560
3	1,200	840
4	1,600	1,120
5	2,000	1,400
MAX	2,200	

All furnaces ship as high speed for cooling. Installer must adjust blower speed as needed.
For most jobs, about 400 CFM per ton when cooling is desirable.
Do not operate above .5" w.c. ESP in heating mode. Operating CFM between .5" and .8" w.c. is tabulated for cooling purposes only.



NOTES:

1. SET HEAT ANTICIPATOR ON ROOM THERMOSTAT AT 0.7 AMPS.
2. MANUFACTURER'S SPECIFIED REPLACEMENT PARTS MUST BE USED WHEN SERVICING.
3. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE FURNACE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105°C. USE COPPER CONDUCTORS ONLY.
4. UNIT MUST BE PERMANENTLY GROUNDED AND CONFORM TO N.E.C. AND LOCAL CODES.

COLOR CODES:
PK PINK
BR BROWN
WH WHITE
BL BLUE
GY GRAY
RD RED
YL YELLOW
OR ORANGE
PU PURPLE
GN GREEN
BK BLACK

LOW VOLTAGE (24V)
LOW VOLTAGE FIELD
HI VOLTAGE (115V)
HI VOLTAGE FIELD
JUNCTION
TERMINAL
INTERNAL TO INTEGRATED CONTROL
PLUG CONNECTION

EQUIPMENT GND
FIELD GND
FIELD SPLICE
SWITCH (TEMP.)
IGNITER
SWITCH (PRESS.)
OVERCURRENT PROT. DEVICE

0140F02404-C

High Voltage: Disconnect all power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury, or death.

WARNING

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

Goodman
Air Conditioning & Heating

GSXC16

Cooling Capacity : 24,000 - 60,000 BTU/h

High-Efficiency Split System Air Conditioner Up to 17 SEER

ComfortBridge™ technology

CoolCloud™

SMART SPEED™

Contents

Standard Features

- High-efficiency two-stage scroll compressor
- Two-speed PSC condenser fan motor
- Integrated communicating ComfortBridge™ Technology
- Commissioning and diagnostics via indoor board Bluetooth with the CoolCloud™ phone and tablet application
- Factory-installed filter drier
- Factory-installed transformer
- Factory-installed high and low-pressure switches
- High-density foam compressor sound blanket
- Copeland® ComfortAlert™ built in diagnostics
- Fully charged for 15' of tubing length
- Factory-installed sensors monitoring coil and ambient temperature
- Contactor with lug connection
- In communicating mode, only two low voltage wires to the outdoor unit are required
- AHRI Certified- ETL Listed
- Ground lug connection
- Color-coded terminal strip for non-communicating set-up
- Copper tube & enhanced aluminum fin coil
- Customized control algorithms

Cabinet Features

- Heavy-gauge galvanized steel cabinet and louvered coil guards
- Service valves with sweat connections and easy-access gauge ports
- Engineered sound control top design
- Wire fan discharge grille
- Baked-on powder-paint finish with 500-hour salt-spray approval
- Single-panel access to controls with space for field-installed accessories
- Service port and controls are accessible while unit is operating
- Compact footprint
- Rust-resistant screws
- When properly anchored, meets the 2017 Florida Building Code unit integrity requirements for hurricane-type winds (Anchor bracket kits available.)

ENERGY STAR ASK ABOUT ENERGY STAR

Proper sizing and installation of equipment is critical to achieving optimal performance. Split system air conditioners and heat pumps must be matched with appropriate coil components to meet ENERGY STAR® criteria. Ask your contractor for details or visit www.energystar.gov.

LIFETIME COMPRESSOR LIMITED WARRANTY* | 10 YEAR UNIT REPLACEMENT LIMITED WARRANTY* | 10 YEAR PARTS LIMITED WARRANTY*

ETL LISTED c US Intertek

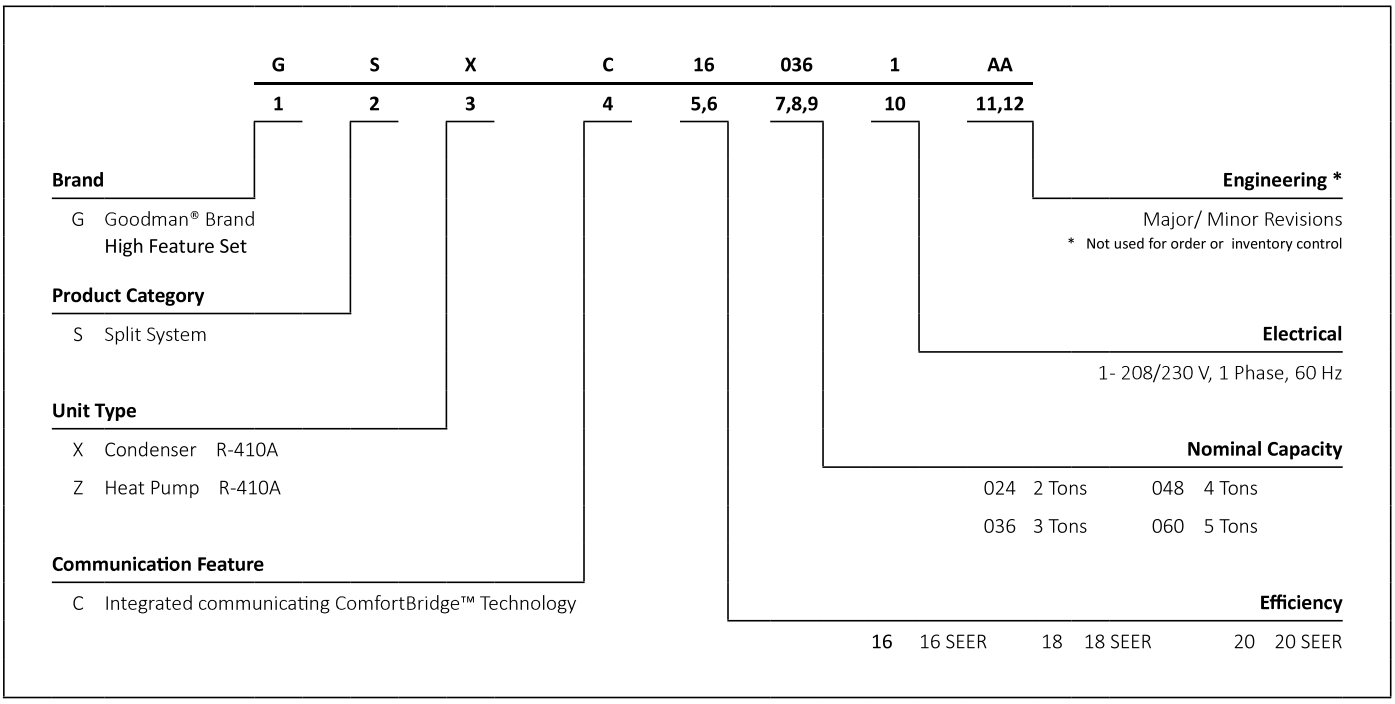
AHRI CERTIFIED

COMPANY WITH QUALITY SYSTEM CERTIFIED BY DNV GL = ISO 9001 =

COMPANY WITH ENVIRONMENTAL SYSTEM CERTIFIED BY DNV GL = ISO 14001 =

BBB ACCREDITED BUSINESS

* Complete warranty details available from your local dealer or at www.goodmanmfg.com. To receive the Lifetime Compressor Limited Warranty (good for as long as you own your home), 10-Year Unit Replacement Limited Warranty and 10-Year Parts Limited Warranty, online registration must be completed within 60 days of installation. Online registration is not required in California or Québec.


G S X C 16 036 1 AA
1 2 3 4 5,6 7,8,9 10 11,12
Brand
G Goodman® Brand High Feature Set
Product Category
S Split System
Unit Type
X Condenser R-410A
Z Heat Pump R-410A
Communication Feature
C Integrated communicating ComfortBridge™ Technology
Engineering *
Major/ Minor Revisions
* Not used for order or inventory control
Electrical
1- 208/230 V, 1 Phase, 60 Hz
Nominal Capacity
024 2 Tons
036 3 Tons
048 4 Tons
060 5 Tons
Efficiency
16 16 SEER
18 18 SEER
20 20 SEER

		CU-2		C-1 & 3
	GSXC16 0241C*	**GSXC16 0361C***	**GSXC16 0481C***	**GSXC16 0601C***
COOLING CAPACITY				
Nominal Cooling (BTU/h)	24,000	36,000	48,000	60,000
Decibels (High/Low) [4]	71/70	71/70	72/71	74/70
COMPRESSOR				
RLA	10.0	14.8	20.4	22.9
LRA	62.9	84.2	122.1	147.2
CONDENSER FAN MOTOR				
Horsepower (RPM)	1/6	1/6	1/6	1/3
FLA	1.1	1.2	1.2	2.8
REFRIGERATION SYSTEM				
Refrigerant Line Size[1]				
Liquid Line Size ("O.D.)	⅜"	⅜"	⅜"	⅜"
Suction Line Size ("O.D.)	¾"	⅞"	1⅛"	1⅛"
Refrigerant Connection Size				
Liquid Valve Size ("O.D.)	⅜"	⅜"	⅜"	⅜"
Suction Valve Size ("O.D.)	¾"	¾"	⅞"	⅞"
Valve Connection Type	Sweat	Sweat	Sweat	Sweat
Refrigerant Charge	92	114	177	191
ELECTRICAL DATA				
Voltage-Hz	208/230-1	208/230-1	208/230-1	208/230-1
Minimum Circuit Ampacity [2]	13.6	19.7	26.7	31.4
Max. Overcurrent Protection [3]	20	30	45	50
Min / Max Volts	197/253	197/253	197/253	197/253
Power Supply	½" or ¾"	½" or ¾"	½" or ¾"	½" or ¾"
EQUIPMENT WEIGHT (LBS)	180	201	263	304
SHIP WEIGHT (LBS)	197	223	285	326
ENERGY STAR® CERTIFIED	ENERGY STAR	ENERGY STAR	ENERGY STAR	ENERGY STAR

ENERGY STAR NOTES

- Proper sizing and installation of equipment is critical to achieving optimal performance. Split system air conditioners and heat pumps must be matched with appropriate coil components to meet ENERGY STAR® criteria. Ask your contractor for details or visit www.energystar.gov.
- The www.energystar.gov website provides up-to-date system combinations certified to meet ENERGY STAR® requirements.

[1] Tested and rated in accordance with AHRI Standard 210/240

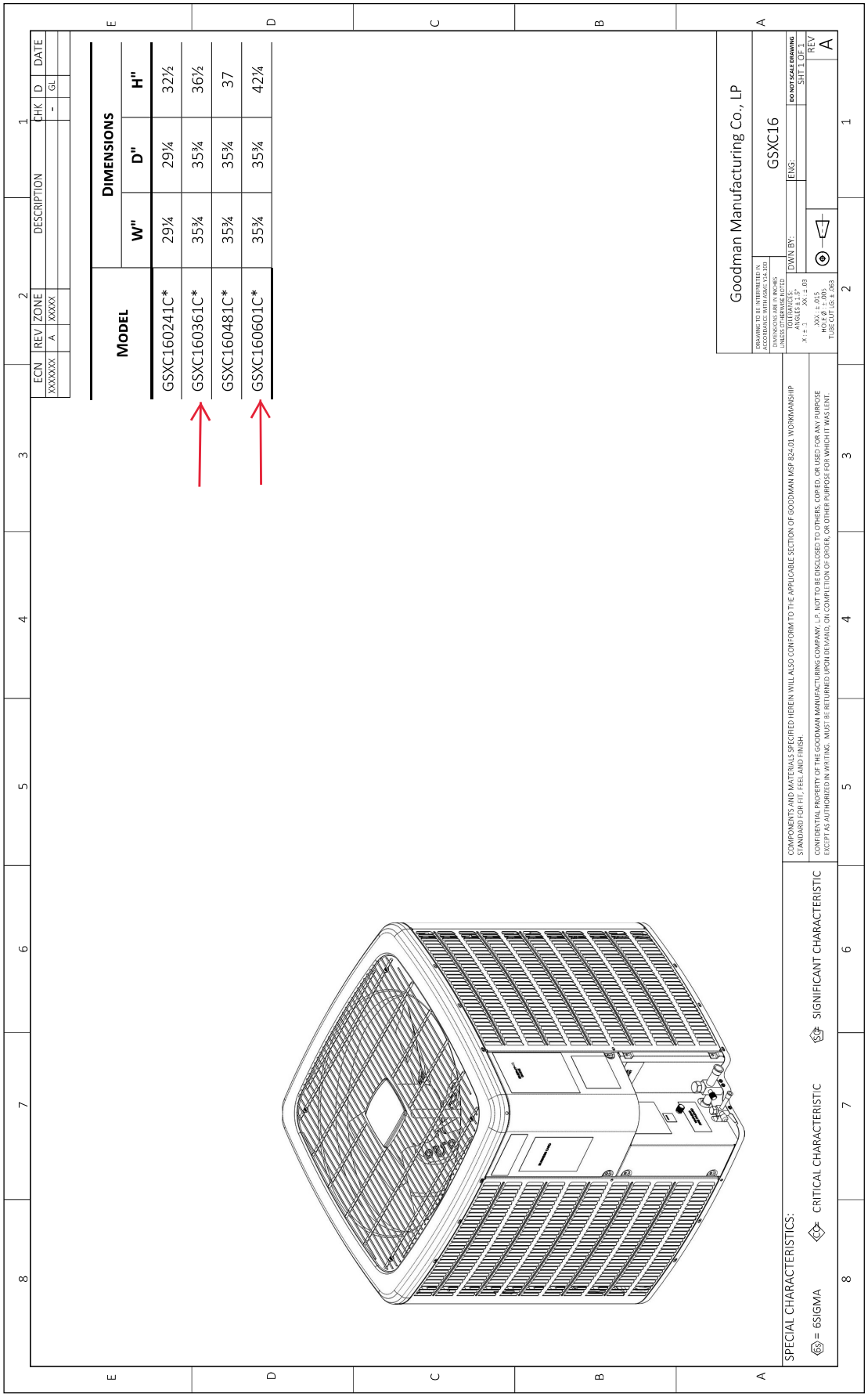
[2] Wire size should be determined in accordance with National Electrical Codes; extensive wire runs will require larger wire sizes

[3] Must use time-delay fuses or HACR-type circuit breakers of the same size as noted.

[4] Sound dBa ratings are based upon ANSI/AHRI Standard 220. Accordingly, all sound power levels are A-weighted.

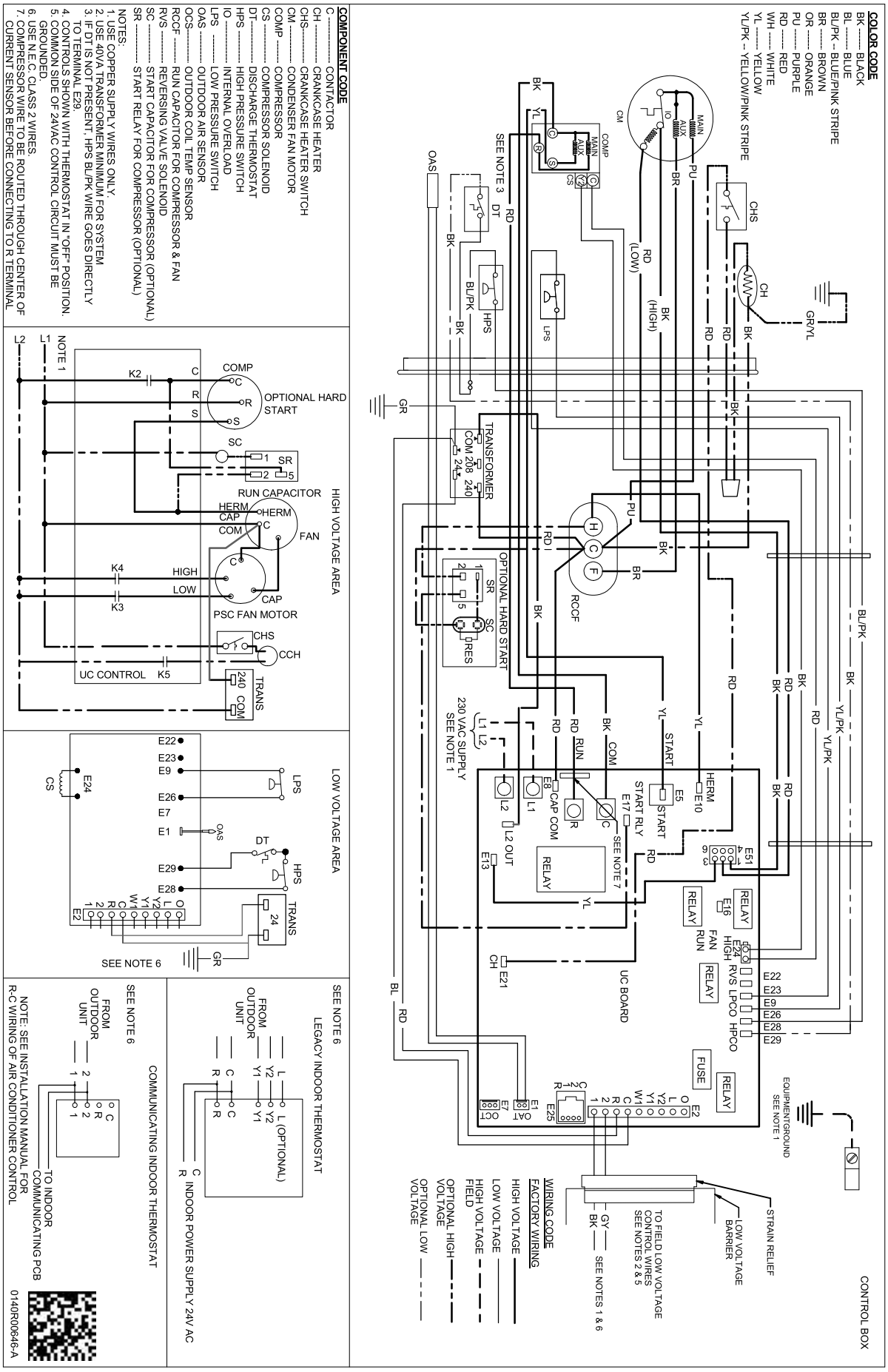
NOTES

- Always check the S&R plate for electrical data on the unit being installed.
- Installer will need to supply ⅞" to 1⅛" adapters for suction line connections.
- Unit is charged with refrigerant for 15' of ⅜" liquid line. System charge must be adjusted per Installation Instructions Final Charge Procedure.
- Installation of these units requires the specified TXV Kit to be installed on the indoor coil. THE SPECIFIED TXV IS DETERMINED BY THE OUTDOOR UNIT, NOT THE INDOOR COIL.


Goodman Manufacturing Co., LP
GSXC16
DIMENSIONS
MODEL
W"
D"
H"
GSXC160241C*
29¼
29¼
32½
GSXC160361C*
35¾
35¾
36½
GSXC160481C*
35¾
35¾
37
GSXC160601C*
35¾
35¾
42¼
ECN
REV
ZONE
DESCRIPTION
CHK
D.
DATE
SPECIAL CHARACTERISTICS:
6σ = 6SIGMA
CRITICAL CHARACTERISTIC
SIGNIFICANT CHARACTERISTIC
COMPONENTS AND MATERIALS SPECIFIED HEREIN WILL ALSO CONFORM TO THE APPLICABLE SECTION OF GOODMAN MSP 824-01 WORKMANSHIP STANDARD FOR FIT, FEEL AND FINISH.
CONFIDENTIAL PROPERTY OF THE GOODMAN MANUFACTURING COMPANY, L.P. NOT TO BE DISCLOSED TO OTHERS, COPIED, OR USED FOR ANY PURPOSE EXCEPT AS AUTHORIZED IN WRITING. MUST BE RETURNED UPON DEMAND, OR COMPLETION OF ORDER, OR OTHER PURPOSE FOR WHICH IT WAS LENT.
DRAWING TO BE INTERPRETED IN ACCORDANCE WITH ASME Y14.100
DIMENSIONS ARE IN INCHES
UNLESS OTHERWISE NOTED
TOLERANCES
ANGLES ± 1.5°
X ± .1 XX ± .03
XXX ± .015
HOLE Ø ± .005
TUBE CUT LG. ± .063
DWN BY:
ENG:
DO NOT SCALE DRAWING
SHT 1 OF 1
REV
A

WARNING | **High Voltage:** Disconnect all power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury, or death.

Wiring is subject to change. Always refer to the wiring diagram or the unit for the most up-to-date wiring.



MODEL	DESCRIPTION	GSXC16 024**	GSXC16 036**	GSXC16 048**	GSXC16 060**
ABK-20[1]	Anchor Bracket Kit	X	X	X	X
ASC-01	Anti-Short Cycle Kit	X	X	X	X
CSR-U-1	Hard-start Kit	X	X	X	
CSR-U-2	Hard-start Kit		X		
CSR-U-3	Hard-start Kit				X
FSK01A[2]	Freeze Protection Kit	X	X	X	X
LSK02A	Liquid Line Solenoid Valve	X	X	X	X
TX2N4[3]	TXV Kit	X			
TX2N4A[3]	TXV Kit	X			
TX3N4[3]	TXV Kit		X		
TX5N4[3]	TXV Kit			X	X

Note: Maximum number of installed accessories at the same time is limited by the size of the unit's control box.

1 Contains 20 brackets; four brackets needed to anchor unit to pad

2 Installed on indoor coil

3 Condensing units and heat pumps with reciprocating or rotary compressors require the use of start-assist components when used in conjunction with an indoor coil using a non-bleed thermal expansion valve refrigerant metering device or liquid solenoid kit. The TXV should always be sized based on the tonnage of the outdoor unit.

All AHRI system ratings are accessible in the System Configurator tool via PartnerLink.

Honeywell

T6 Pro Series Thermostats

SUBMITTAL SHEET

Job Name	Carroll College Anthrozoology Building
Engineer	Morrison Maierle
Mechanical Contractor	Sleeping Giant Mechanical
Contractor's P.O. No.	
Representative	Brandon Hatveldt Stevens Equipment Supply
Notes	

Model(s)				
TH6210U2001	Qty.		Notes	
TH6220U2000	Qty.	9	Notes	
TH6320U2008	Qty.		Notes	
Approval				
Service				
Tag No.				

APPLICATION

Model TH6320U2008: Up to 3H/2C Heat Pump systems or up to 2H/2C Conventional systems. Dual fuel and aux heat lockout with outdoor sensor.

Model TH6220U2000: Up to 2H/1C Heat Pump systems or up to 2H/2C Conventional systems. Dual fuel and aux heat lockout with outdoor sensor.

Model TH6210U2001: Up to 2H/1C Heat Pump systems or up to 1H/1C Conventional systems. No outdoor temperature lockouts.

SPECIFICATIONS

Terminal Designations: R, RC, C, W, 0/B, W2-AUX, E, Y, Y2, G, UA, K, S, and S.

Electrical Ratings:

Terminal	Voltage (50/G0Hz)	Running Current
W Heating	20-30Vac	0.02-1.0 A
W Heating	750 mV DC	100 mADC
W2 (Aux) Heating	20-30Vac	0.02-1.0 A
E Emergency Heat	20-30Vac	0.02-0.5A
Y Compressor Stage 1	20-30Vac	0.02-1.0 A
Y2 Compressor Stage 2	20-30Vac	0.02-1.0A
G Fan	20-30Vac	0.02-0.5A
0/B Changeover	20-30Vac	0.02-0.5A
U A Input	20-30Vac	0.02-0.5A

Power Consumption:
Backlight On: 1.0VA

Cool Indication: Displays "Cool On" when the thermostat turns the cooling on.

Heat Indication: Displays "Heat On" when the thermostat turns the heating on.

Clock Accuracy:
+/-1 minute every month (30 days) at 77˚F.
+/-2 minutes per month over the operating ambient temperature range.

Mounting Means: Thermostat packaged with a UWP™ mounting system that mounts directly on the wall in the living space using mounting screws and anchors provided. Use the cover plate (also included with thermostat) and its mounting bracket to mount the thermostat onto a vertical 2 x 4 in. junction box.

Temperature Ranges:
Heating: 40 ˚F to 90 ˚F (4.5 ˚C to 32 ˚C)
Cooling: 50 ˚F to 99 ˚F (10 ˚C to 37 ˚C)

Operating Ambient Temperature:
37 ˚F to 102 ˚F (2.8 ˚C to 38.9 ˚C)

Shipping Temperature:
-20 ˚F to 120 ˚F (-28.9 ˚C to 48.9 ˚C)

Operating Relative Humidity:
5% to 90% (non-condensing)

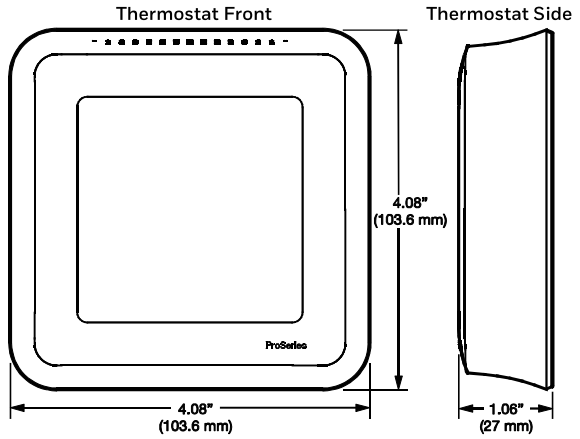
Physical Dimensions:
4-1/16" H x 4-1/16" W x 1-5/32" D
103.5 mm H x 103.5 mm W x 29 mm D

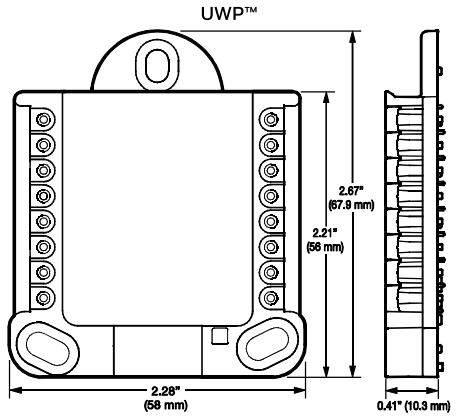
Color: White

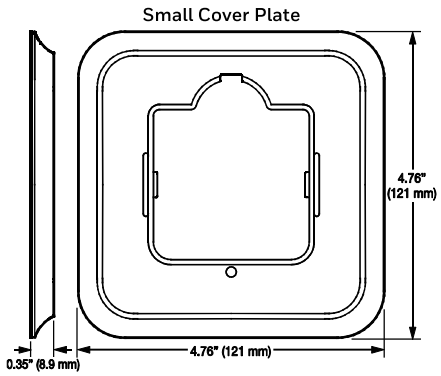
Product	Part Number	Temperature Setpoint Range	Working Ambient Temperature	Operating Relative Humidity	Shipping Temperature	Physical Dimensions in Inches (mm)	Color(s)
Thermostat	TH6210U2001 TH6220U2000 TH6320U2008	Heating: 40 °F to 90 °F (4.5 °C to 32 °C) Cooling: 50 °F to 99 °F (10 °C to 37 °C)	32 °F to 120 °F (0 C° to 48.9 °C)	5% to 90% (non condensing)	-20 °F to 120 °F (-28.9 °C to 48.9 °C)	4-1/16" H x 4-1/16" W x 1-5/32" D 103.5 mm H x 103.5 mm W x 29 mm D	White

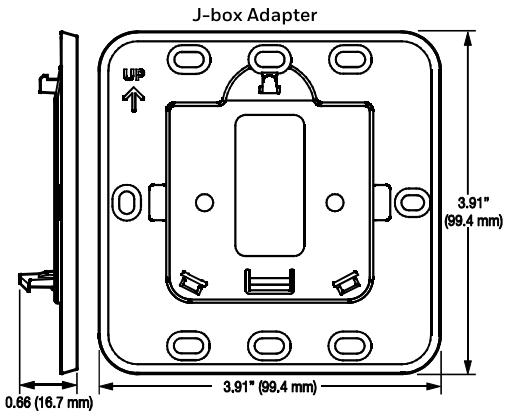
Product	Part Number	Physical Dimensions in Inches (mm)
UWP Wall plate	Included with thermostat.	2.67" H X 2.28" W X 0.41" D (67.9 mm H X 58 mm W X 10.3 mm D)
J-Box adaptor plate	Included with thermostat.	3.91" H X 3.91" W X 0.66" D (99.4 mm H X 99.4 mm W X 16.7 mm D)
Small cover plate	Included with thermostat.	4.76" H X 4.76" W X 0.35" D (121 mm H X 121 mm W X 8.9 mm D)
Large cover plate	Optional accessory. Not included with thermostat.	6.11" H X 6.11" W X 0.28" D (155.3 mm H X 155.3 mm W X 7 mm D)
Wired outdoor sensor C7089U1006	Not included with thermostat. Used for dual fuel or aux heat lockout only. Outdoor temp not displayed on thermostat. Not compatible with TH6210U model.	–
Wired indoor sensor C7189U1005	Not included with thermostat. Not compatible with TH6210U model.	–

DIMENSIONS (NOT TO SCALE)









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Excellence Without Compromise

EWC® CONTROLS INC.

TECHNICAL BULLETIN

Models BMPlus 3000/5000/7000 Rev. B

(DISPONIBLE EN ESPAÑOL EN EWCCONTROLS.COM)

ewccontrols.com/acrobat/090375a0244.pdf

Leave this bulletin on the job site for future reference!

The **BMPlus Zone Control System** allows you to easily upgrade an inefficient single zone HVAC system, into a Multi-zone, Energy savings, Comfort producing, HVAC system. The Superior Design, Intuitive Firmware, Simple Setup Options, Easy to Understand wiring and Backwards Compatibility, makes the BMPlus Zoning system the Contractors dream. Combined with EWC Motorized Dampers and any off-the-shelf Thermostats, EWC Controls sets another high standard in the residential & light commercial Forced Air Zoning Industry.

Zone Capacity The main module controls three zones using motorized dampers and may be expanded to 5 or 7 zones, using 1 or 2 Model **XM2 Expansion Modules**.

Compatible HVAC Systems Controls 2 & 3 stage conventional or dual fuel heat pumps, without the need for dual fuel kits. Also single or two-stage gas, oil, & hydronic heating systems, with single or two stage air conditioning. Constant or variable speed fan systems.

Compatible Thermostats ***Compatible with any off the shelf Heat Pump Thermostat (2heat/1cool). You may also use any regular Heat/Cool thermostat (1heat/1cool). You may still use regular Heat/Cool thermostats to control a Heat Pump system.***

Automatic Heat/Cool Changeover The BMPlus Zone system features automatic changeover from any thermostat allowing for individual zone comfort from the HVAC system.

Status LED A *green* STATUS LED pulses as a steady heart beat to indicate Micro- processor activity and 24v power is present.

System LEDs Function specific colored LED's illuminate to indicate the HVAC system mode of operation and active zone identification. See page 10 for details.

Damper LEDs Green LEDs labeled Zone 1 thru Zone 7 indicate which dampers are energized to the open position.

Operating Power **INPUT VOLTAGE:** 19-30VAC 60 Hz Transformer 40-100VA MAX. NEC Class 2.
CURRENT DRAW: Max 15VA @ 24VAC.
OVER-CURRENT PROTECTION: 4.0 amp

Operating Conditions **TEMPERATURE:** -20° to 160°F (-29° to 71°C)
HUMIDITY: 0% - 95% RH Non-Condensing.

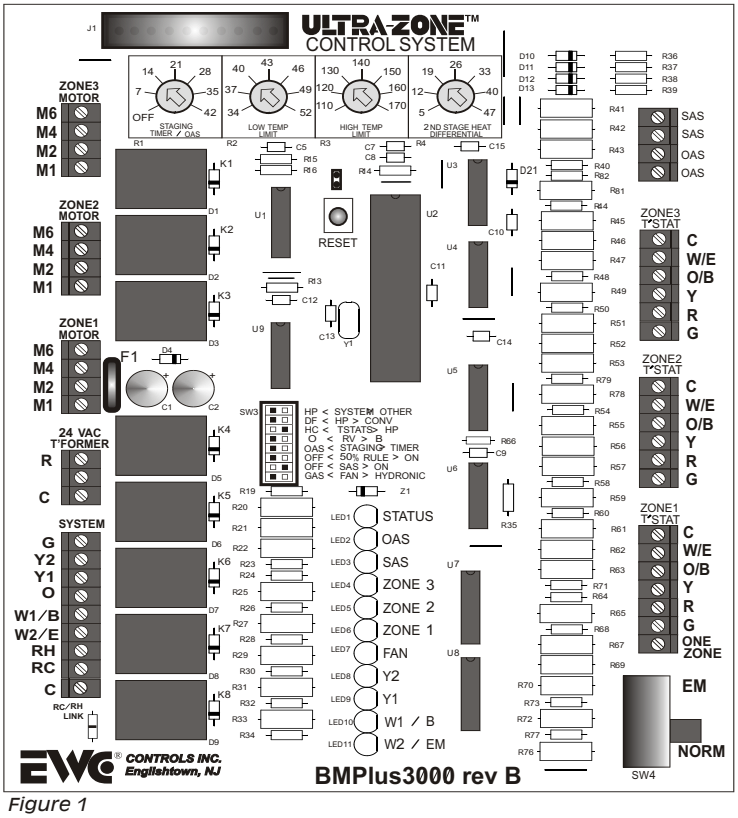


Figure 1

Box Contents

*** BMPlus 3000 Control Panel**
*** Supply Air Sensor**
*** Technical Bulletin TB228**
*** Mounting Hardware**

Thermal Circuit Breaker ***The BMPlus module has a Thermal circuit breaker that protects the module(s) from shorts in the damper and thermostat field wiring. It will not protect against shorts in the HVAC system wiring.***

CAUTION: When the circuit breaker is tripped it will get quite hot. To reset the breaker: *Shut off power to the panel. Find and repair the short. Restore the 24VAC power.*

Indoor Fan Control Any zone can activate the indoor fan and only the dampers in zones calling for continuous fan operation will open. Continuous fan operation will only occur when there are no active or pending, heat or cool demands. A dip switch is provided to enable automatic fan operation in heat mode. Useful for straight ***electric heat*** or ***hydronic*** heat applications.

***Built-In Timer Settings**

The panel has seven built-in Delay Timers that insure safe & reliable operation.

* Start-up Delay Timer = 3 minutes-fixed
* Short Cycle Timer = 3 minutes-fixed
* Change Over Timer = 4 minutes-fixed
* Opposing Call Timer = 20minutes-fixed
* Staging Timer = OFF or 7-42 min. -Adj.
* Supply Air Limit Timer = 3minutes-fixed
* Purge Delay Timer = 90 seconds-fixed

***Startup Delay Timer**

The panel will not activate any cooling or heating operation until the startup delay has expired. This occurs after any initial power up or power failure. Press the ***Reset*** button for 1 second to override.

***Short Cycle Timer**

When all zone demands are satisfied, the panel will not resume the same mode of operation for a minimum of 3 minutes.

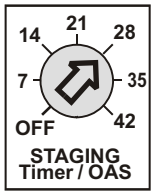
***Changeover Timer**

A built-in timer prevents the system from rapidly switching between heating and cooling modes. At the end of a call, a 4 minute timer is started and the panel will not switch to the opposing mode until the timer has expired.

***Opposing Call Delay Timer**

A 20 minute delay must expire, or the active zone(s) must satisfy, before the panel will honor a thermostat demand to changeover to the opposite mode of system operation.

Staging Timer / OAS



OFF, 7 to 42 minutes or 7 to 42 degrees F.

Any setting below 7 is off! DO NOT set to off if using OAS

The STAGING TIMER sets the amount of continuous call time in 1st stage, before second stage heat or cool is energized. **NOTE:** The potentiometer also serves as the *Outside Air Changeover Setting.*

The BMPlus 3000 can inhibit heat staging based on a ***Timer or Outside Air Temperature.*** **NOTE:** *An Optional OAS Sensor is required to use the OAS feature.* **NOTE:** *2nd stage cool delay defaults to 30 minutes, if OAS is chosen to inhibit 2nd stage Heat.*

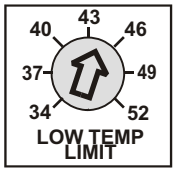
***Supply Air Limit Delay Timer**

The time delay of 3 minutes must expire before the BMPlus 3000 will re-energize heat or cool mode. This delay occurs when the processor detects the supply air temperature is higher or lower than the High or Low temperature limit settings.

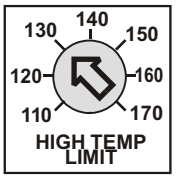
***Purge Delay Timer**

The last Damper(s) will be held Open for 90 seconds at the end of every call allowing a system purge into the last zone that was calling.

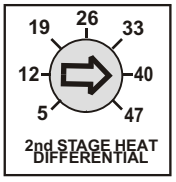
Cooling and Heating Limit Controls



The Adjustable Cooling Limit potentiometer sets the supply air temperature at which the cooling is cycled off and the fan continues to run, allowing the coil to warm up.



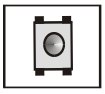
The Adjustable Heating Limit potentiometer sets the 1st stage heat supply air temperature, at which the heating is cycled off and the fan continues to run, allowing the heat exchanger or coil to cool down.



The Adjustable 2nd stage heat differential potentiometer sets the 2nd stage heat supply air temperature, at which the heating is cycled off and the fan continues to run, allowing the heat exchanger or coil to cool down.
NOTE: Allows the supply air sensor to be installed in the supply air plenum, regardless of the coil/heat exchanger configuration. Allows the installer to fine tune virtually any multi stage heating system!

Example:
Hi Temp. Limit =130°F plus 2nd stg. T= 40°F New Limit = 170°F.

Reset BUTTON



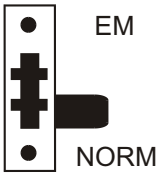
Always reset the CPU anytime you make dip-switch changes to the BMP3000 panel!

DO NOT use a sharp object to press the button! Your finger tip will work fine.

The separate reset buttons on the old BMP3000 have been replaced by a single button with dual functions. Momentarily pressing the RESET button clears the built-in timers controlling the Startup delay timer, Short cycle timer, W2 timer, Supply air sensor timer and the Changeover timer. This enables you to test the installation faster. *Caution should be observed when using this button.*

Pressing the RESET button for 7 seconds will reset the CPU for the entire zone system.

Emergency Heat Switch



An On-Board Switch is provided that allows the Customer to set the system to the Emergency heat mode.

This switch is shown in the NORMAL position.

This switch would be used for Heat Pump applications where the Customer chooses to use Regular Heat/Cool thermostats instead of Heat Pump thermostats.

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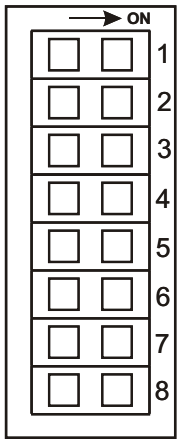
Selecting the Options Using the DIP Switches

***FS = Factory Settings

RECORD YOUR OWN DIP SWITCH SETTINGS HERE

Programming and setting up the BMPlus 3000 to control your HVAC system is very easy! Look below for an explanation of each dip switch function and choose your settings. Some functions may not apply to your application. Then use a pencil to mark/record your settings. If the settings get changed later on, you will have a record of the original settings.



HP < SYSTEM > OTHER FS
DF < HP > CONV FS
FS **HC < TSTATS > HP**
FS **O < RV > B**
OAS < STAGING > TIMER FS
FS **OFF < 50%RULE > ON**
FS **OFF < SAS > ON**
FS **GAS < FAN > HYDRONIC**

HP < SYSTEM > OTHER

Choose the type of ***HVAC system*** you want to control. Select **HP**, if your system is any type of Heat Pump. Select **OTHER**, if your system is a standard Gas or Oil furnace. Other setting also applies to straight electric furnaces or hydronic (hot water coil) heating systems.

DF < HP > CONV

Choose the ***type of Heat Pump*** you want to control. Select **DF** *(Restricted Mode)* if you wish to lock out the compressor during auxiliary heat operation, typically set for Dual Fuel operation. Select **CONV** *(Unrestricted Mode)* if you wish to have the compressor run during auxiliary heat operations, typically set for Electric Back-up.

HC < TSTATS > HP

Select **HC**, if you want to use regular ***Heat/Cool*** thermostats on your job. Select **HP**, if you want to use ***Heat Pump*** thermostats on your job. Remember that you can use standard Heat/Cool Thermostats on a Heat Pump application.

IMPORTANT NOTE: The BMPlus 3000 Zone Control System allows Heat Pump thermostats to be connected to all zones. Using heat pump thermostats means that the zone panel will obey thermostatic demands. This comfort over-ride feature provides a level of versatility to your zoning system and gives the homeowner comfort control over the system, instead of waiting for the adjustable timer to energize 2nd stage heat. *True thermostatic staging is not available when using 2 Stage compressor heatpumps, it is advisable to use Heat/Cool thermostats and allow the BMPlus to stage via the on-board timer. If true thermostatic staging is required, then it is recommended to upgrade to the Model UZC series of Control Panels.*

O < RV > B

Select the correct ***Reversing Valve*** signal for your particular Heat Pump. Choose **"O"** for any Heat Pump that energizes the RV in the cooling mode. Choose **"B"** for any Heat Pump that energizes the RV in heating mode.

OAS < STAGING > TIMER

Select **OAS**, if you want to delay auxiliary heat based on the outside air temperature sensor. Select **TIMER**, if you want to delay W2 and Y2 based on the adjustable on-board timer. **NOTE:** 'Y2' defaults to a 30 minute delay, when OAS is chosen. **NOTE:** An optional Outside Air Sensor (OAS) is required to use the OAS feature.

OFF < 50%RULE > ON

Select **OFF**, if you ***do not want*** to inhibit Y2 and/or auxiliary heat based on the total number of zones calling.
Select **ON**, if you ***do want to*** inhibit Y2 and/or auxiliary heat based on the total number of zones calling. More than half the total zones must be calling for the same mode of operation *(heat or cool),* or the BMPlus3000 will not stage up. This feature is a great way to save energy. Emergency heat mode will override the 50% rule.

OFF < SAS > ON

Select **OFF**, if you do not want to use the supply air sensor included with the BMPlus Zone Control system. Select **ON**, if you intend to use the included supply air sensor. *Refer to the data sheet included with the supply air sensor for details.*

GAS < FAN > HYDRONIC

Select **GAS**, if your HVAC system is a gas or oil forced air furnace. Select **HYDRONIC**, if your HVAC system has a hot water coil, or straight electric heat with no indoor blower support. Useful when you need the indoor blower to run automatically in heat mode, just like it does in cool mode. **NOTE:** *When you select **HP** on dip switch #1, the indoor fan mode is automatically set for you. There is no need to move this switch when setting up for Heat Pump operations.*

INSTALLATION & WIRING INSTRUCTIONS

WARNING: THESE PANELS ARE DESIGNED FOR USE WITH 24VAC. DO NOT USE OTHER VOLTAGES! USE CAUTION TO AVOID ELECTRIC SHOCK OR EQUIPMENT DAMAGE. ALL WORK SHOULD BE PERFORMED TO LOCAL AND NATIONAL CODES AND ORDINANCES. USE 18

Mount the panel housing in a suitable/convenient location. Mounting hardware is provided. Avoid locations that may become wet or produce condensation. Hot attics are OK. Use the knockouts on the panel housing as wire entryways. Strain relief fittings can be used if desired. Use care and do not damage the circuit board when removing the knockouts and making wire connections. NOTE: The 24vac power supply should be supplied by a separate transformer. DO NOT use the 24vac power supply from the HVAC system unless there is no other alternative. 2 zones and 2 dampers is the limit when stealing voltage from the HVAC system.

POWER WIRING

A single 24vac, 40va UL Listed transformer can power the BMPlus3000 Main module with up to 12 genuine ND or URD dampers. See page 9 for more load and transformer data.

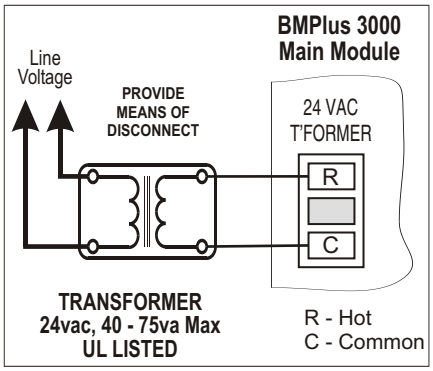


Figure 2 BMPlus 3000 Power

Thermostat Wiring

HEAT/COOL THERMOSTATS

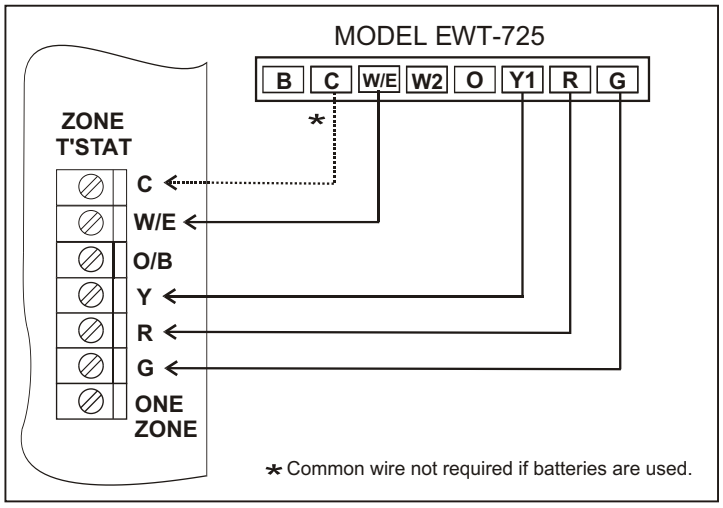


Figure 2a. Model EWT-725: Configured for 1 heat 1 cool. See thermostat instructions for further details.

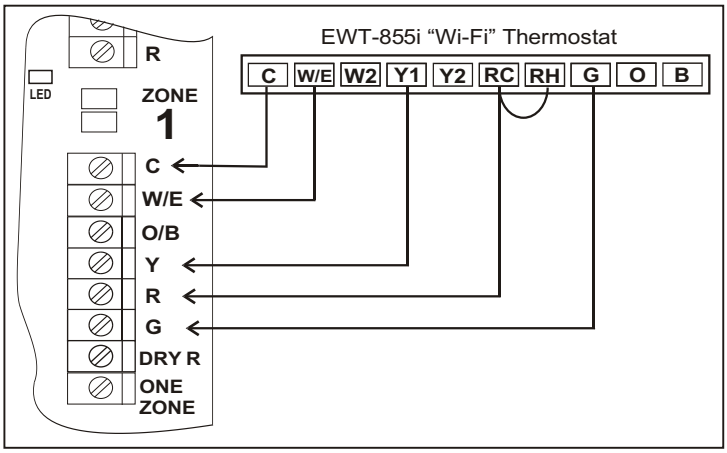


Figure 2b Typical "Wi-Fi" Thermostat Configured for 1 heat & 1 cool. See thermostat

HEAT PUMP THERMOSTATS

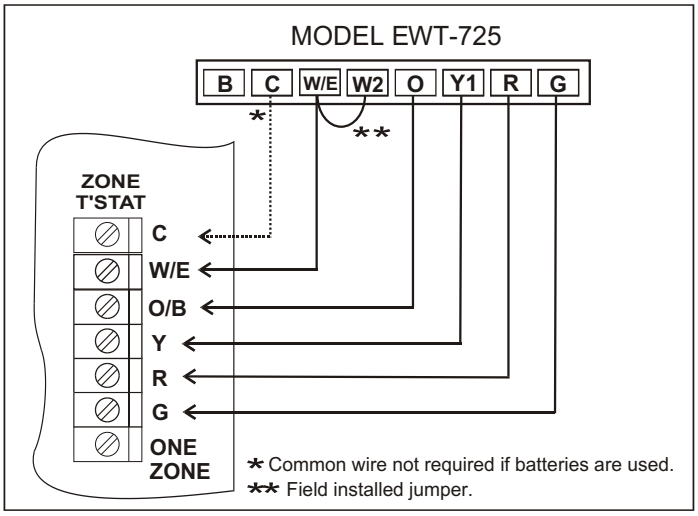


Figure 2c. Model EWT-725: configured for 2 heat 1 cool heat pump. See thermostat instructions for further details.

NOTE: The BMPlus 3000 allows the user to install Heat Pump thermostats on all zones. ***You may still use regular Heat/Cool type thermostats with a Heat Pump system and use the Staging Timer to energize the auxiliary heat. If you don't have enough wires available.*** **It is advisable to use Heat/Cool thermostats with 2 stage compressor Heat Pumps.**

TYPICAL 24v WIRELESS THERMOSTAT

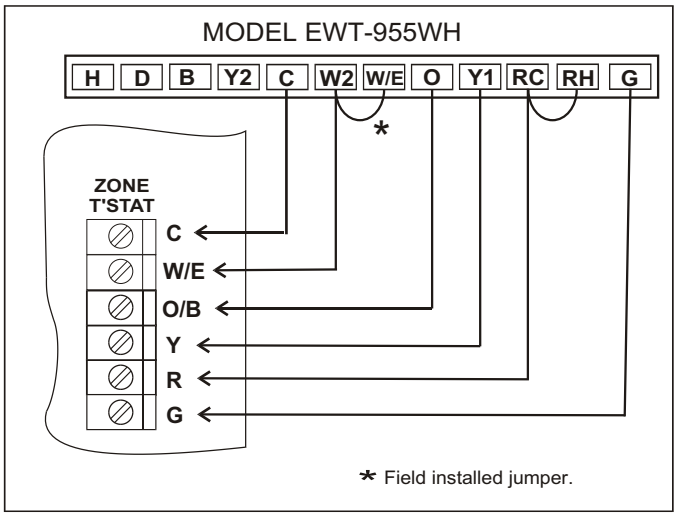


Figure 2d. Model EWT-955WH Wireless Thermostat: Configured for 2 heat 1 cool heat pump. See thermostat instructions for further

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THERMOSTAT WIRING CONTINUED

TYPICAL 24v WIRELESS THERMOSTAT

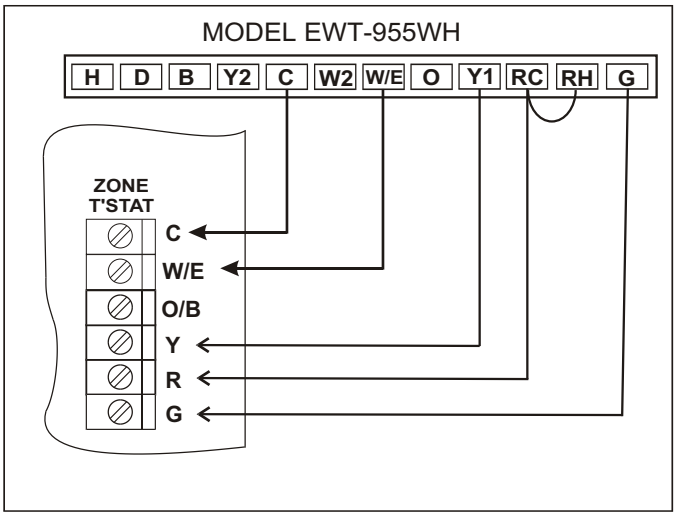

Figure 3. Model EWT-955WH Wireless Thermostat: Configured for 1 heat 1 cool. See thermostat instructions for further

TYPICAL 24v WiFi THERMOSTAT

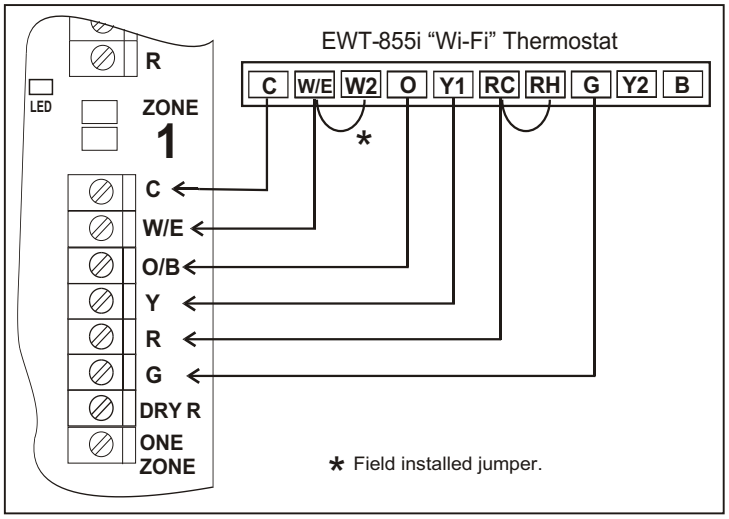

Figure 4 Typical "Wi-Fi" Thermostat Configured for 2 heat & 1 cool Heat Pump. See thermostat instructions for further details.

WIRING FOR RADIANT FLOOR HEAT

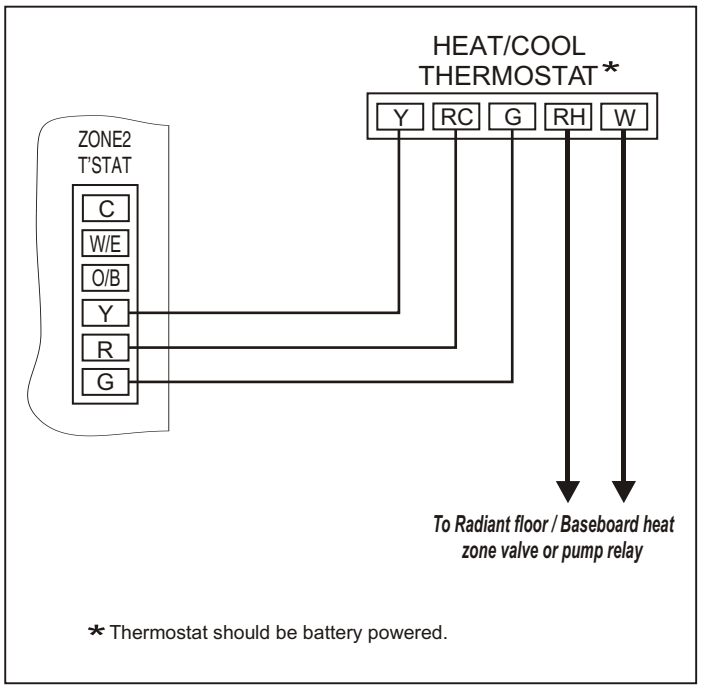

Figure 5 Wiring a split circuit thermostat to operate a Radiant floor heating or Baseboard heating Hydronic system. The BMPlus 3000 controls the cooling only in this type of configuration.

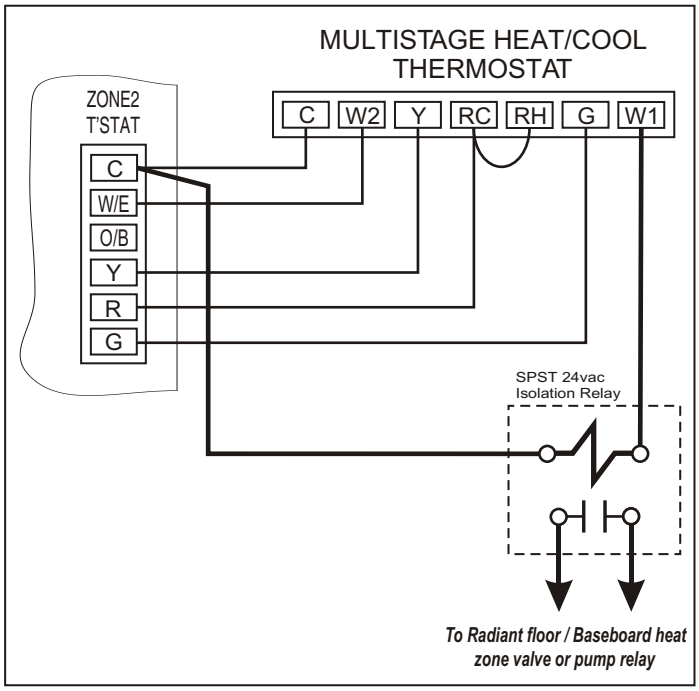

Figure 6 Wiring for a Radiant floor loop as the first stage of heat via the isolation relay and 2nd stage Forced Air heat is controlled through the zone panel.

SYSTEM WIRING

Single Transformer Gas or Electric Furnace & A/C 1 or 2 Stage Heat

Typical gas or Electric Furnace with A/C. *Note the common "C" wire is connected to the SYSTEM terminal block of the BMPlus 3000.*

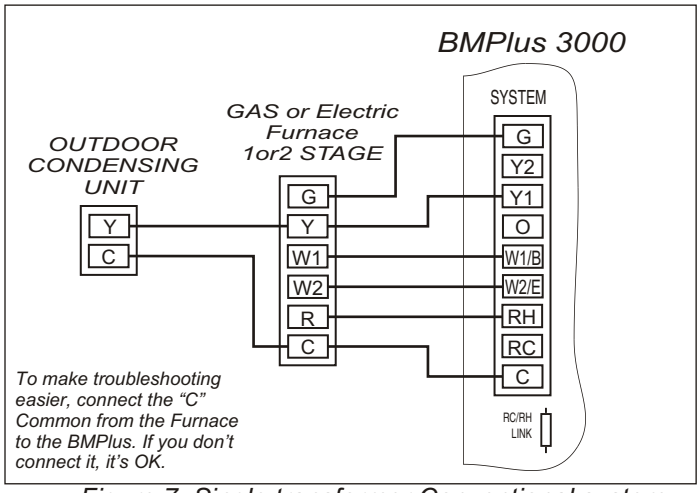

Figure 7 Single transformer Conventional system.

Conventional or Dual Fuel 2 Heat / 1 Cool Heatpump with O (Cool) Type Reversing Valve

Typical heat pump system wiring with electric resistance or Gas backup heat (No Dual Fuel kit required). This diagram applies to air cooled or geothermal / ground source systems.

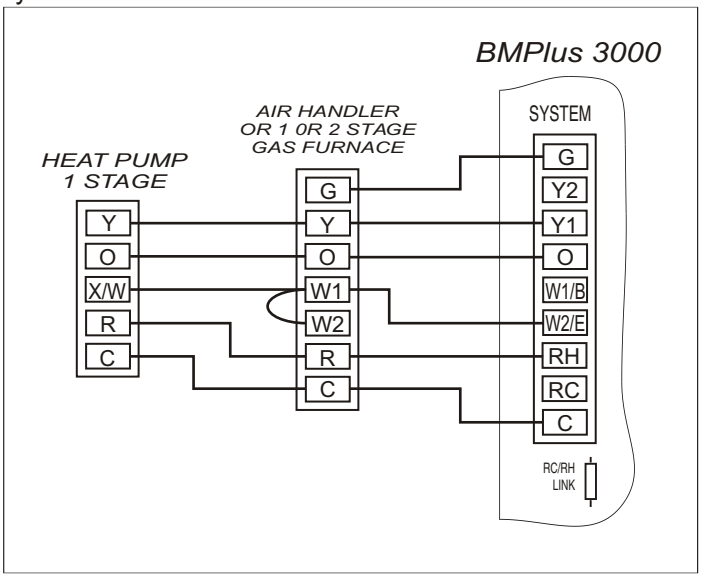

Figure 9 -- 2 Heat / 1 Cool Heat Pump System

Two Transformer Systems

Wiring diagram for a typical oil burner, hydronic zone / Air handler with A/C. Cut the Rc / Rh link on the BMPlus Panel for systems requiring isolation.

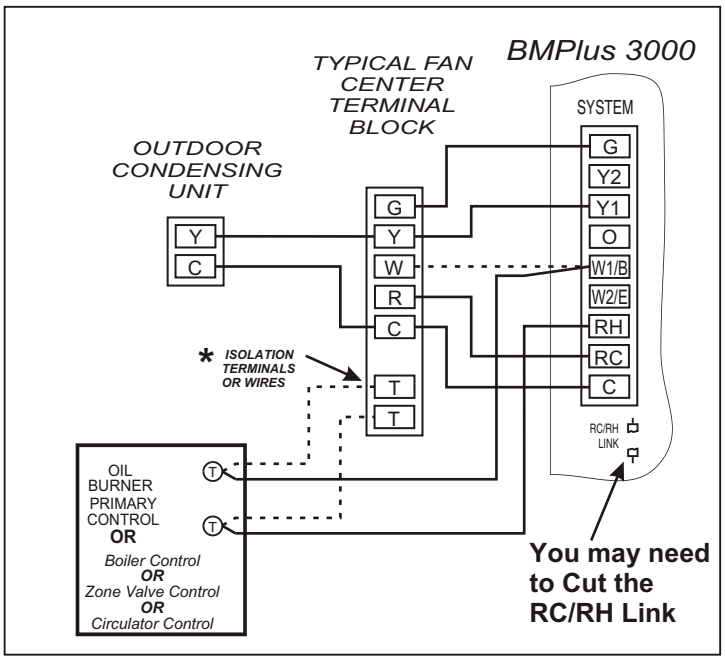

Figure 8 Two transformer Oil or Hydronic / A/C system.

**** Note: Your Air Handler may include a W terminal. That means it may have it's own isolation circuit. If you can confirm this, simply connect the W1/B terminal to the W terminal on the air handler. Do not cut the Rc/ Rh jumper. Wire up your Oil Burner, Circulator relay, or Hydronic Zone valve to the isolation contacts or wires provided in the air handler. The fan is controlled via the time delay relay inside the air handler.***

Don't worry if you accidentally cut the Rc/Rh link. Just install your own jumper across the Rc/Rh terminals!

Conventional or Dual Fuel 3 Heat / 2 Cool Heat Pump with O (Cool) Type Reversing Valve

Conventional or Dual Fuel Heat Pump wiring with 3 Heat / 2 Cool. With electric or Gas Furnace Backup (No dual fuel kit is required). This diagram applies to air cooled or geothermal / ground source systems.

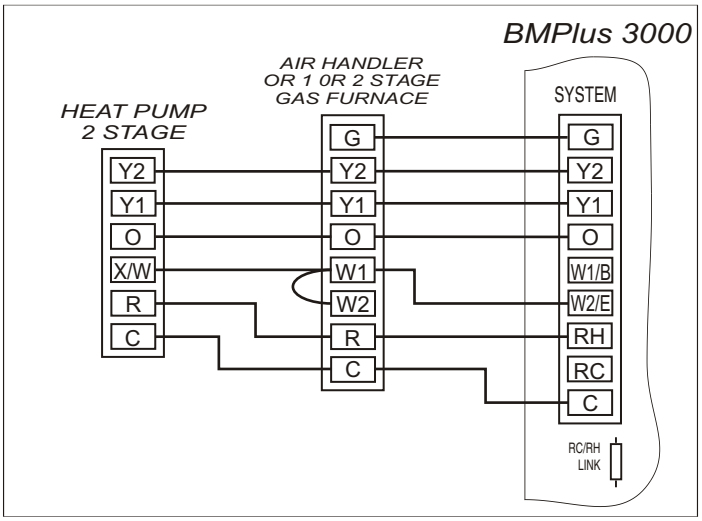

Figure 10 – 3 Heat / 2 Cool Heatpump System

**Note that a Conventional & Dual fuel heat pump wire up more or less the same. The difference is how auxiliary heat operates. In a Conventional system, the indoor fan & the compressor continues to run when auxiliary energizes. In a Dual Fuel system, the indoor fan & the compressor shuts down when auxiliary energizes. The BMPlus 3000 will perform these functions automatically. All you have to do is set the dip switches to the correct settings. Select CONV or DF at dip switch #2. Install regular Heat/Cool thermostats and choose to activate auxiliary heat by TIMER or by OUTSIDE AIR TEMPERATURE. (Optional Sensor required). Or you may choose to install Heat Pump Thermostats on all zones. When the thermostat auxiliary heat demand is satisfied, the BMPlus 3000 will stage down, unless DF or OAS has been selected and the outdoor temperature is lower than the OAS changeover setting. In that case the system will continue in FUEL mode, until all current heating demands are satisfied.

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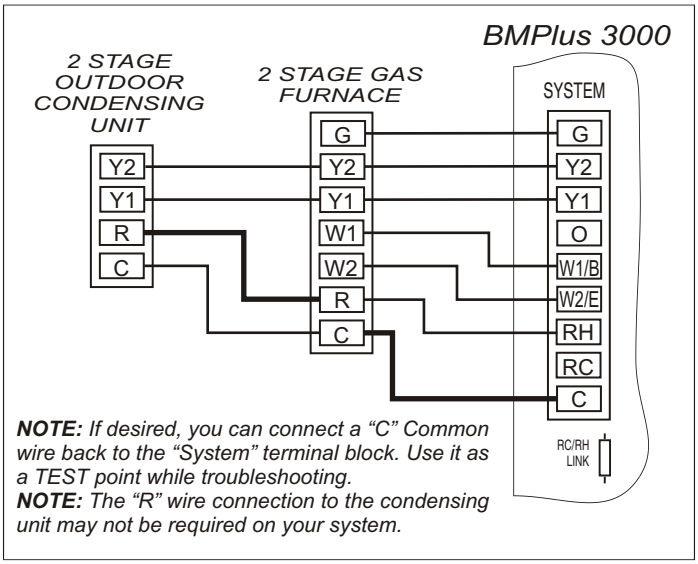
SYSTEM WIRING CONTINUED

Single Transformer Gas & A/C 2 stage heat 2 stage cool

Typical 2 stage gas furnace with 2 stage A/C. Constant or variable speed systems can be connected and controlled. Choose Timer or Outside air to delay 2nd stage.



NOTE: *If desired, you can connect a "C" Common wire back to the "System" terminal block. Use it as a TEST point while troubleshooting.*
NOTE: *The "R" wire connection to the condensing unit may not be required on your system.*

Figure 11 Single transformer 2 Stage Heat & Cool system

Warning: All of the wiring diagrams provided are general in nature and may not perfectly match your particular application, due to differences in HVAC Mfr's design and terminal designations and functions! Variations on these diagrams and other System or Thermostat applications are available by contacting the EWC Technical Support Hotline.

Conventional or Dual Fuel 3 Heat / 2 Cool Heat Pump with B (Heat) Type Reversing Valve

Conventional or Dual Fuel Heat Pump wiring with 3 Heat / 2 Cool with B (Heat) Type Reversing Valve. Electric or Gas Furnace Backup (No dual fuel kit is required). This diagram applies to air cooled or geothermal / ground source systems.

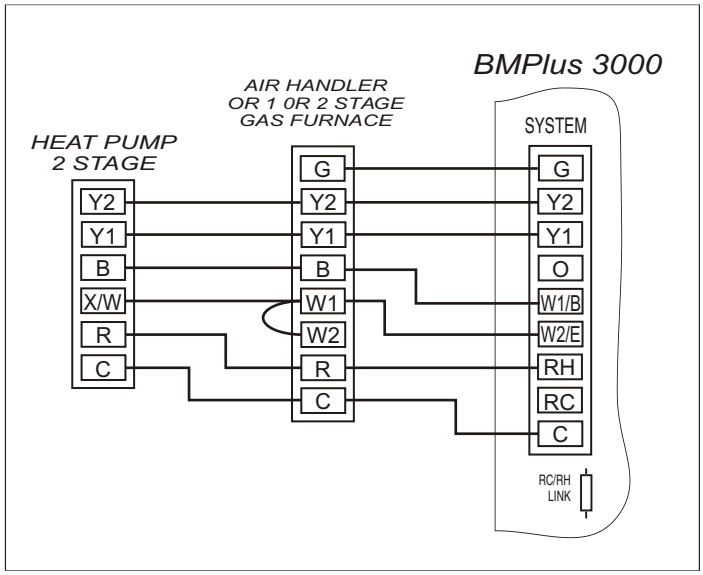


Figure 12 -- 3 Heat / 2 Cool Heat Pump with B (Heat) Type Reversing Valve

ENHANCED FEATURES AND FUNCTIONS

MODULE TO MODULE FACTORY POWER WIRING

The BMPlus 3000 includes Factory Power Wiring on all expanded systems. The 24 vac power to the expansion modules is fed through the bus cable. This simplifies your wiring and minimizes the chances of reversing polarity.

DUAL FUEL COMPATIBLE

The BMPlus 3000 is compatible with Dual Fuel Heat Pumps. *Dual Fuel kits are not required.* Select staging based on Adjustable Time Delay or an Optional Outside Air temperature Sensor. The intelligent firmware does the rest.

SHORTED ZONE FEATURE FIRMWARE

The BMPlus 3000 Zone Control System includes the Shorted Zone Feature. This feature allows the BMPlus to ignore demands from a zone thermostat that is putting out simultaneous demands for heat & cool. A condition most likely due to a short in the field wiring, incorrect wiring, or a defective thermostat. The BMPlus will honor any legitimate demands from any other zone(s), except the shorted zone. When the problem is identified and repaired, the BMPlus 3000 will automatically recognize that zone.

*** OFF, 7 TO 42 MINUTE STAGING TIME DELAY SETTINGS**

*** 7 TO 42°F. OUTSIDE AIR CHANGEOVER**

*** OPERATES WITH MULTI STAGE HEATPUMPS**

*** ADJUSTABLE DIFFERENTIAL LIMIT CONTROL**

***SECOND STAGE 50% ZONE RULE SAVES ENERGY**

*** STATUS LED's ARE INCLUDED ON ALL MODULES**

***1 ZONE MODE COMPLIES WITH CALIFORNIA TITLE 24**

*** SIMPLIFIED WIRING AND EASY SYSTEM SETUP**

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DAMPER WIRING AND CONFIGURATION

Note: All zone dampers default to the "OPEN" position after a purge delay has occurred. Dampers also default "OPEN" during changeover & short cycle delays, and when all zone demands are satisfied, and no signals are detected from the thermostats.

REFERENCE THESE DIAGRAMS PRIOR TO INSTALLATION AND POWER WIRING. DOING SO WILL SAVE TIME AND LABOR LATER ON.

ZONE MODULE DAMPER MOTOR TERMINAL BLOCK DESIGNATION & FUNCTION

Terminal M6 24vac to Close a damper(s)
Terminal M4 24vac to Open a damper(s)
Terminal M2 Constant 24vac HOT
Terminal M1 Common 24vac

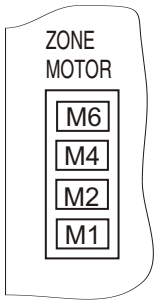


Figure 13

All Models ND, URD and SID Damper Wiring

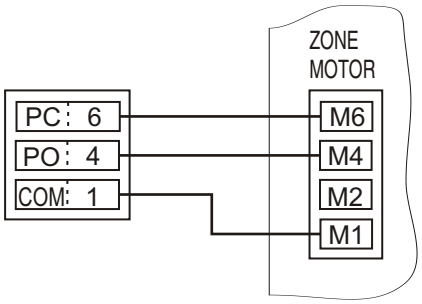
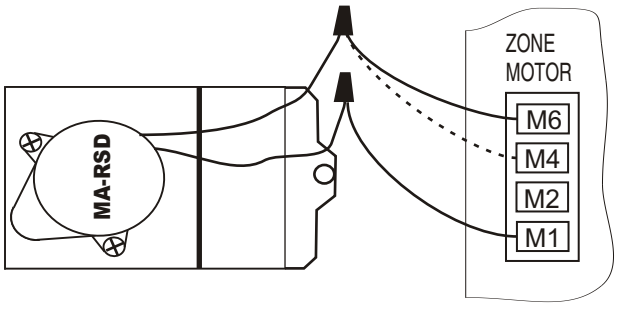


Figure 14

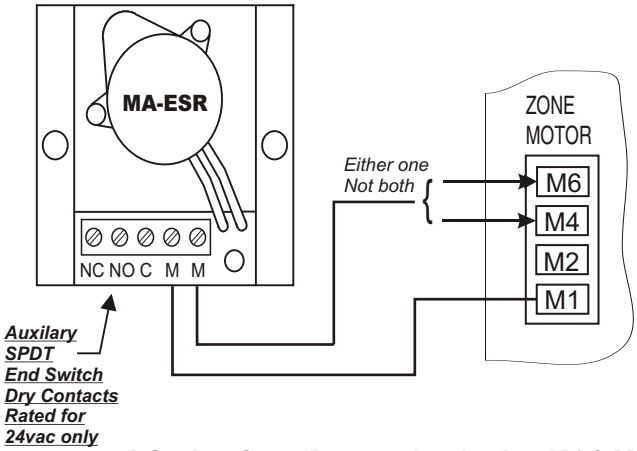
All Models RSD Damper Wiring



A Spring Open Damper is wired to M1 & M6
A Spring Close Damper is wired to M1 & M4

Figure 15

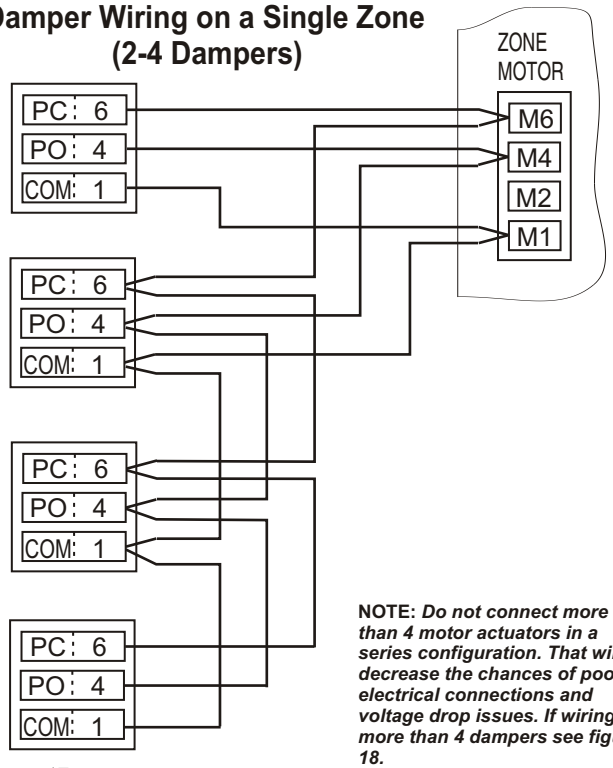
All Models ESR Damper Wiring



A Spring Open Damper is wired to M1 & M6
A Spring Close Damper is wired to M1 & M4

Figure 16

Multiple ND and/or URD Damper Wiring on a Single Zone (2-4 Dampers)



NOTE: ***Do not connect more than 4 motor actuators in a series configuration. That will decrease the chances of poor electrical connections and voltage drop issues. If wiring more than 4 dampers see figure 18.***

Figure 17

On all these dampers and most older style dampers, including competitor's dampers, always wire up number to number or designation to designation.

Do not overload your transformer!

Contact EWC Controls Technical Support when you are on the job site for assistance with damper wiring. Have a Multi-Meter, pocket screw driver and wire snips on hand.

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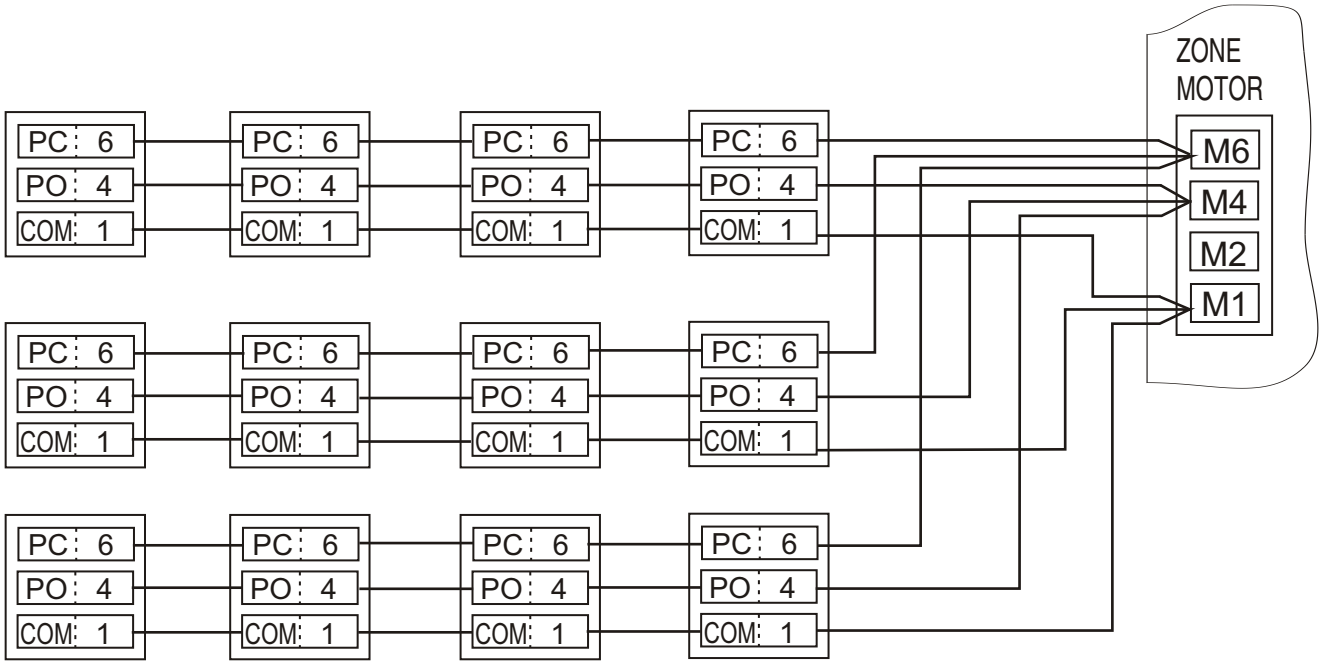
DAMPER WIRING CONTINUED

If you need to connect numerous dampers to a single zone, or you are using dampers of unknown current draw such as Spring Types, Isolation relays and separate power supplies may be required. Parallel as many dampers as you want as long the total current load of the motor actuators does not exceed the VA rating of the transformer. Other factors should also be considered, such as the full load amp rating of the isolating relay contacts, voltage drops from long wire runs and feeder conductor sizing to junction points.

NOTE: Some older style dampers and competitor's dampers cannot be paralleled and must be isolated or wired in tandem. Contact EWC Controls Technical Support for assistance.

Variations on this diagram and other damper solutions are available.



12 Dampers wired to a single zone.

Figure 18

BMPlus 3000, 5000, 7000, Revision "B" Recommended Power Solutions

ND / URD's @ 2 VA per damper

Zone Panel	Transformer Size 40VA	60VA	75VA
BMPlus 3000	12	22	30
BMPlus 5000	9	19	26
BMPlus 7000	5	15	23

These charts show the maximum number of dampers that can be connected to the entire BMPlus3000/5000/7000 based on the transformer being used.

Maximum number of dampers per ZONE is 12.

Use Class 2 UL Listed 1585 Inherently current limiting transformers only!

Spring Types @ 8 VA per damper

Zone Panel	Transformer Size 40VA	60VA	75VA
BMPlus 3000	3	5	7
BMPlus 5000	2	4	6
BMPlus 7000	1	3	5

Non-inherently current limiting transformers must have field provided over-current protection on the secondary 24 vac output. The table values provided pertain to genuine ULTRAZONE Dampers and Competitors typical 24vac Spring loaded dampers. Included in these VA load ratings are the correct number of thermostats, the BMPlus Zone System, and a 5% field factor. Spring loaded dampers draw higher currents & require more power.

TESTING DAMPER MOTORS

ND / URD / SMD / BMD Dampers - Connect 24vac common to terminal 1 and 24vac hot to terminal 4. Damper should Open. Remove 24vac hot from terminal 4 and apply to terminal 6. Damper should Close.

RDN / SMDL / BMDL Dampers - Connect 24vac common to terminal 1 and 24vac hot to terminals 2 and 4. Damper should Open. Remove 24vac hot from terminal 4. Damper should Close.

SR / ESR / RSD Power Close / Spring Open Dampers - Connect 24vac common & hot to the two motor (M) terminals. Damper should Close. Remove 24 vac hot. Damper should Open.

SR / ESR / RSD Power Open / Spring Close Dampers - Connect 24vac common & hot to the two motor (M) terminals. Damper should Open. Remove 24vac hot. Damper should Close.

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LED'S

BMPlus 3000 LED's

The BMPlus is equipped with 11 function specific LED's that indicate HVAC system operation and zone damper status. Familiarize yourself with the LED functions and definitions, in order to accurately determine the Zoned HVAC system status and mode of operation.

STATUS The STATUS LED pulses as a steady heart beat to indicate proper Microprocessor system status.

OAS The OAS LED illuminates solid to indicate that the Outdoor Temperature has fallen below the chosen set point. The OAS LED will blink rapidly to indicate a shorted or open Outdoor Air Sensor circuit.

SAS The SAS LED illuminates solid to indicate that the Supply Temperature has exceeded the chosen set point on either the HIGH TEMP LIMIT or the LOW TEMP LIMIT. The SAS LED will blink rapidly to indicate a shorted or open Supply Air Sensor circuit.

ZONE 3 The ZONE 3 LED will illuminate solid to indicate that damper(s) is energized open, and the Zone is active.

ZONE 2 The ZONE 2 LED will illuminate solid to indicate that damper(s) is energized open, and the Zone is active.

ZONE 1 The ZONE 1 LED will illuminate solid to indicate that damper(s) is energized open, and the Zone is active.

FAN The FAN LED will illuminate solid to indicate a demand for fan operation, during COOLING, HEATING, PURGE, or CONTINUOUS FAN operations.

Y2 The Y2 LED illuminates solid to indicate the 2nd stage of DX COOLING or DX HEATING is energized.

Y1 The Y1 LED illuminates solid to indicate the 1ST stage of DX COOLING or DX HEATING is energized.

W1/B The W1/B LED illuminates solid to indicate 1st stage of HEATING is energized in Gas/Hydronic mode.
The W1/B LED illuminates solid to indicate 'B' reversing valve is energized in HEAT PUMP operation.
NOTE: In Heat Pump Operation, this LED will stay illuminated after the call for heat is completed.

W2/E The W2/E LED illuminates solid to indicate 2nd or 3rd stage of HEATING is energized in GAS/HYDRONIC or HEAT PUMP mode.
The W2/E LED illuminates solid to indicate EMERGENCY HEAT is energized in HEAT PUMP mode.

NOTES:

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BMPlus3000 3 Zone Main Module

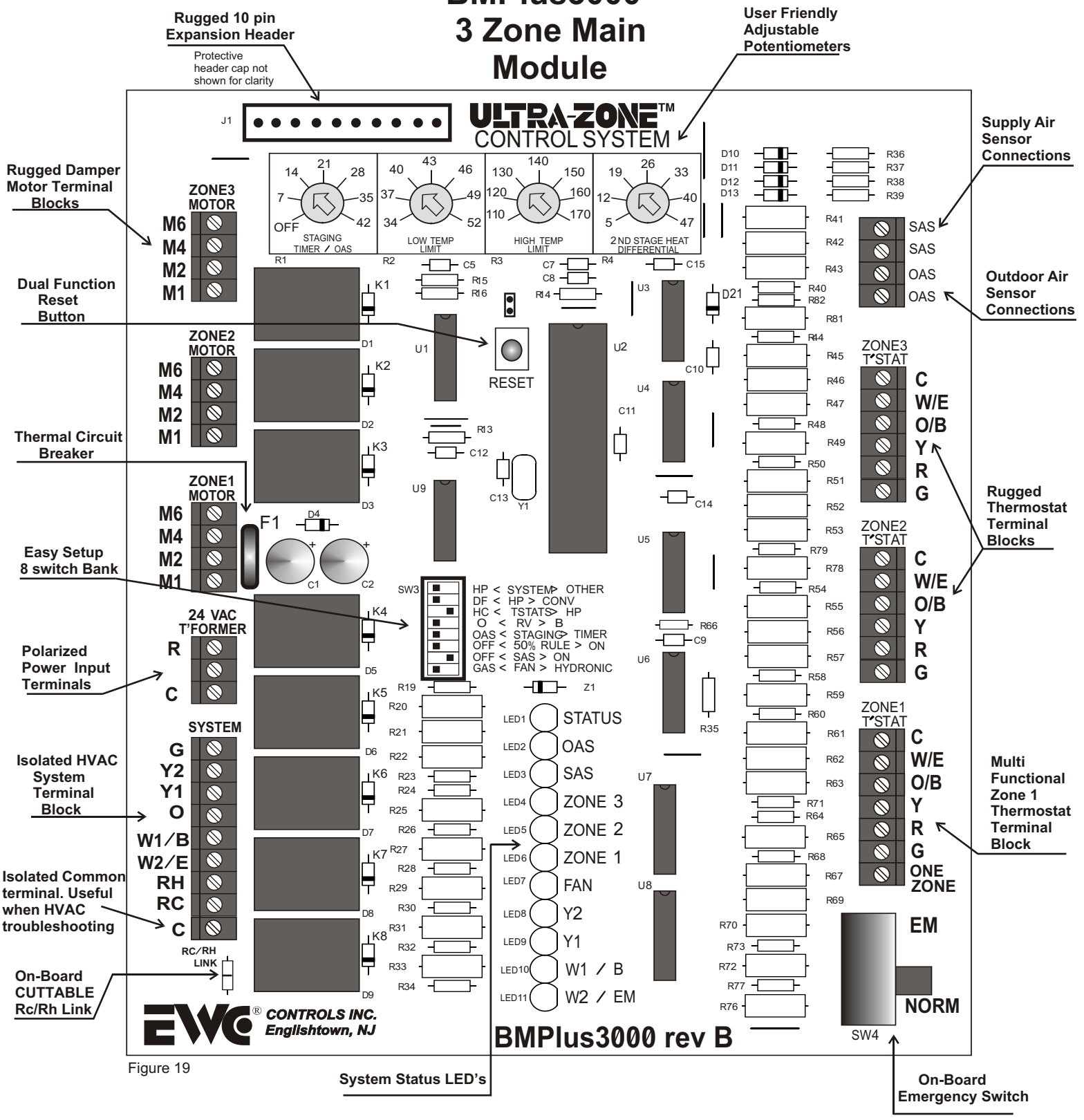


Figure 19

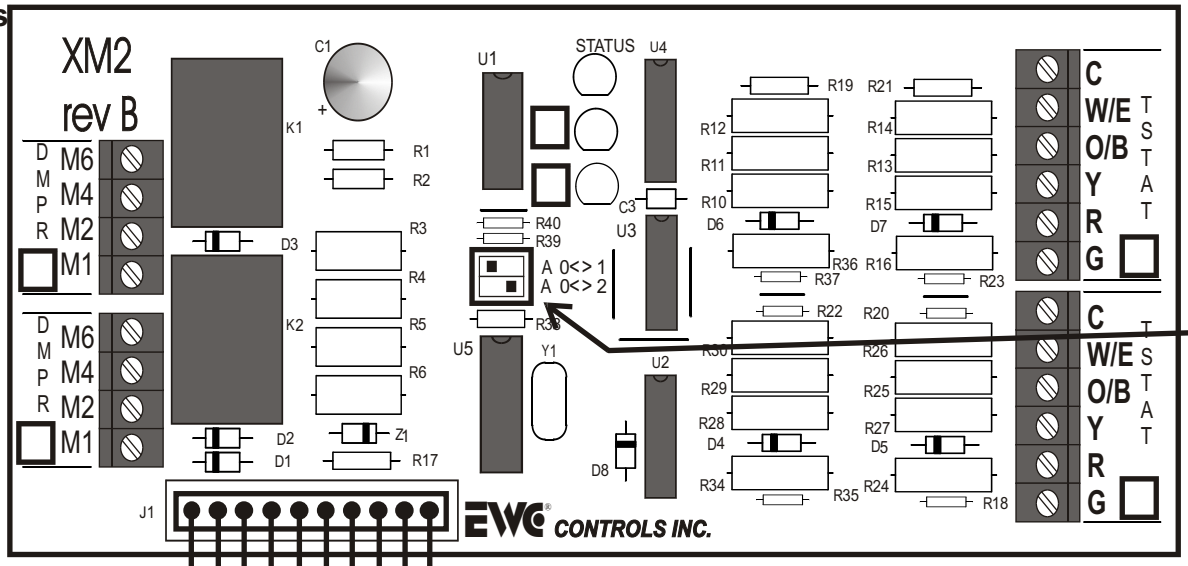
The **BMPlus 3000** Zone Control System includes Module to Module Factory Wiring. We power up the Expansion Modules for you. The **XM2** Expansion module includes a Status LED and Damper Status LED's.
See page 11 and 12 for drawing representations of a 5 and 7 zone system and appropriate dip switch settings.
All you have to do is:

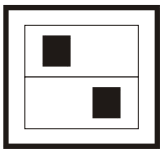
1. Set the dip switches to your specific application.
2. Connect your thermostats, dampers and system wiring.
3. Power up the Main Module
4. Check System Operation.
5. Enjoy.

Setting the XM2 Expansion Panel DIP Switches

Each expansion module has a 2 position DIP switch. Factory set to insure the main module recognizes each expansion module in the proper sequence.

BMPlus5000





DIP switch settings for 1st Expansion panel. Zones 4 & 5

FACTORY SUPPLIED POWER & DATA POLARIZED BUS CABLE

Protective header caps not shown for clarity

DO NOT CONNECT OR DISCONNECT BUS CABLE WHILE THE PANEL IS POWERED.

Provide Over-Current Protection

To Line Voltage

24 vac transformer

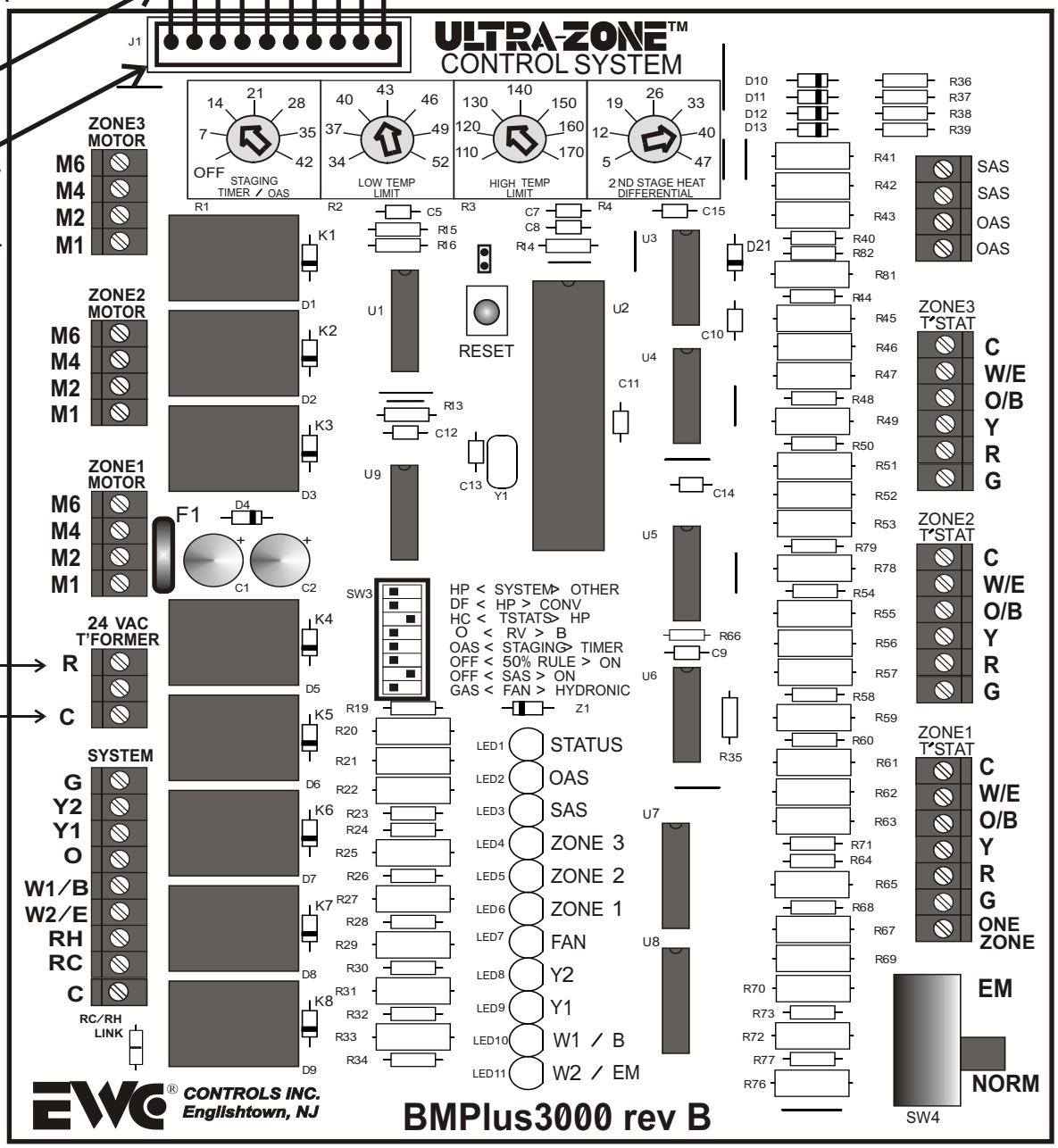


Figure 20

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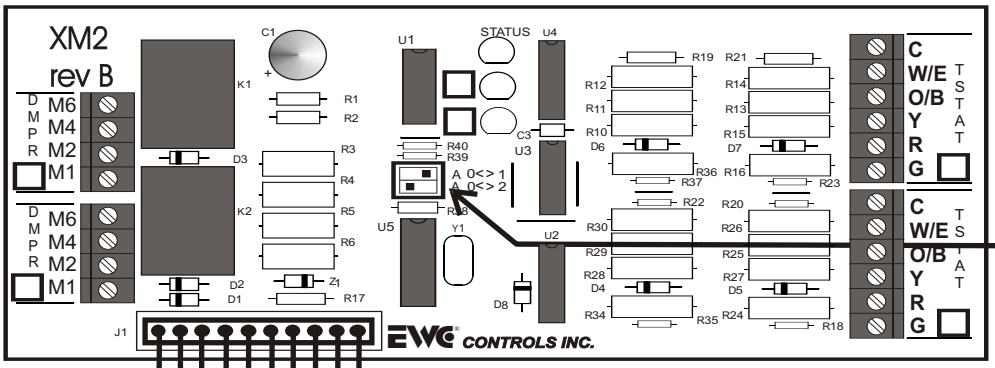
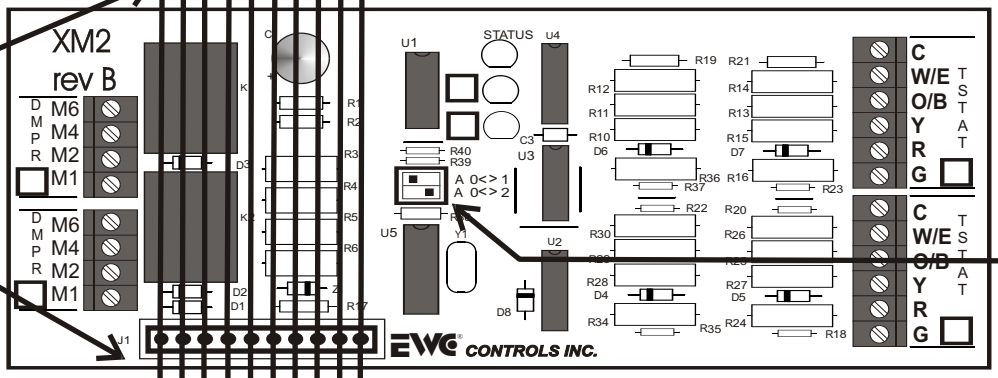
BMPlus7000

Setting the XM2 Expansion Panel DIP Switches

Each expansion panel has a 2 position DIP switch. Factory set to insure the main module recognizes each expansion module in the proper sequence.



DIP switch settings for 2nd Expansion panel. Zones 6 & 7

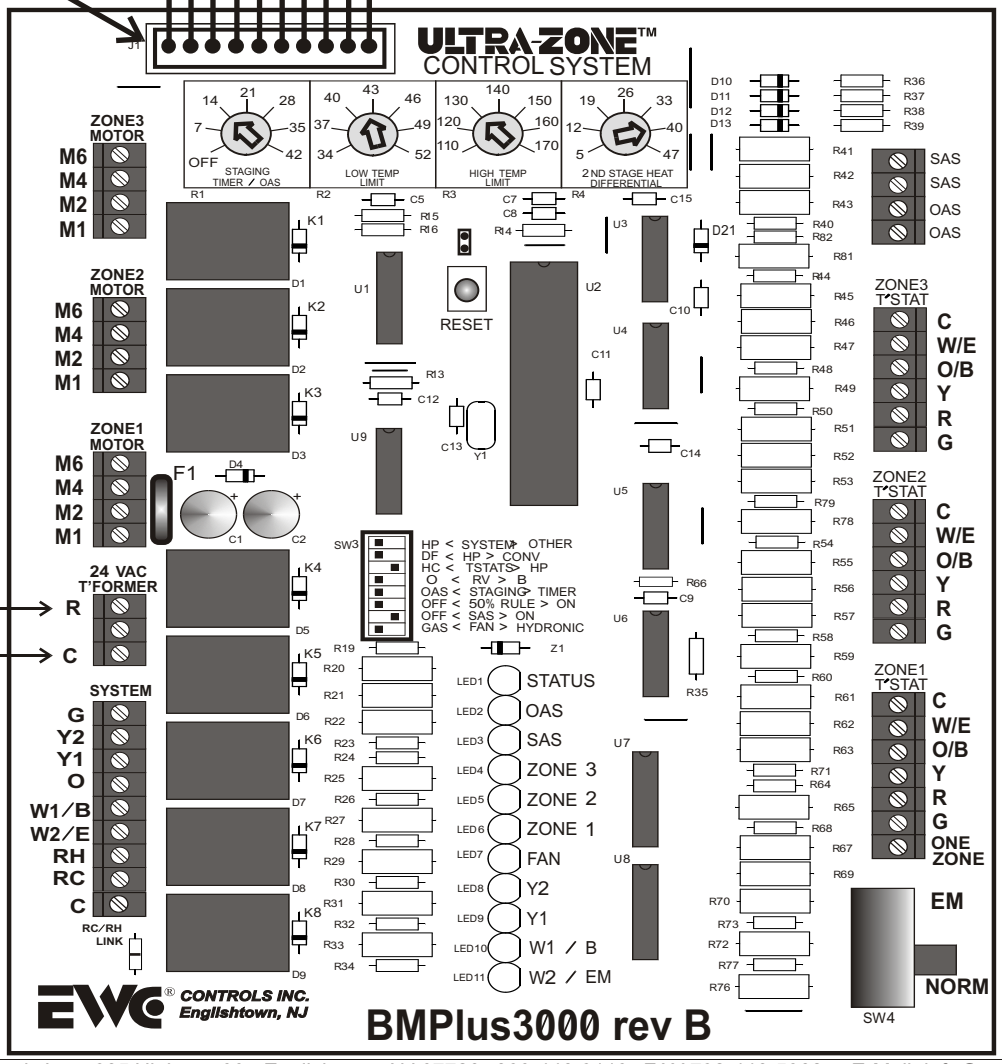


DIP switch settings for 1st Expansion panel. Zones 4 & 5

FACTORY SUPPLIED POWER & DATA POLARIZED BUS CABLE

Protective header caps not shown for clarity

DO NOT CONNECT OR DISCONNECT BUS CABLE WHILE THE PANEL IS POWERED.



BMPlus3000 rev B

Provide Over-Current Protection

To Line Voltage

24 vac transformer

Figure 21

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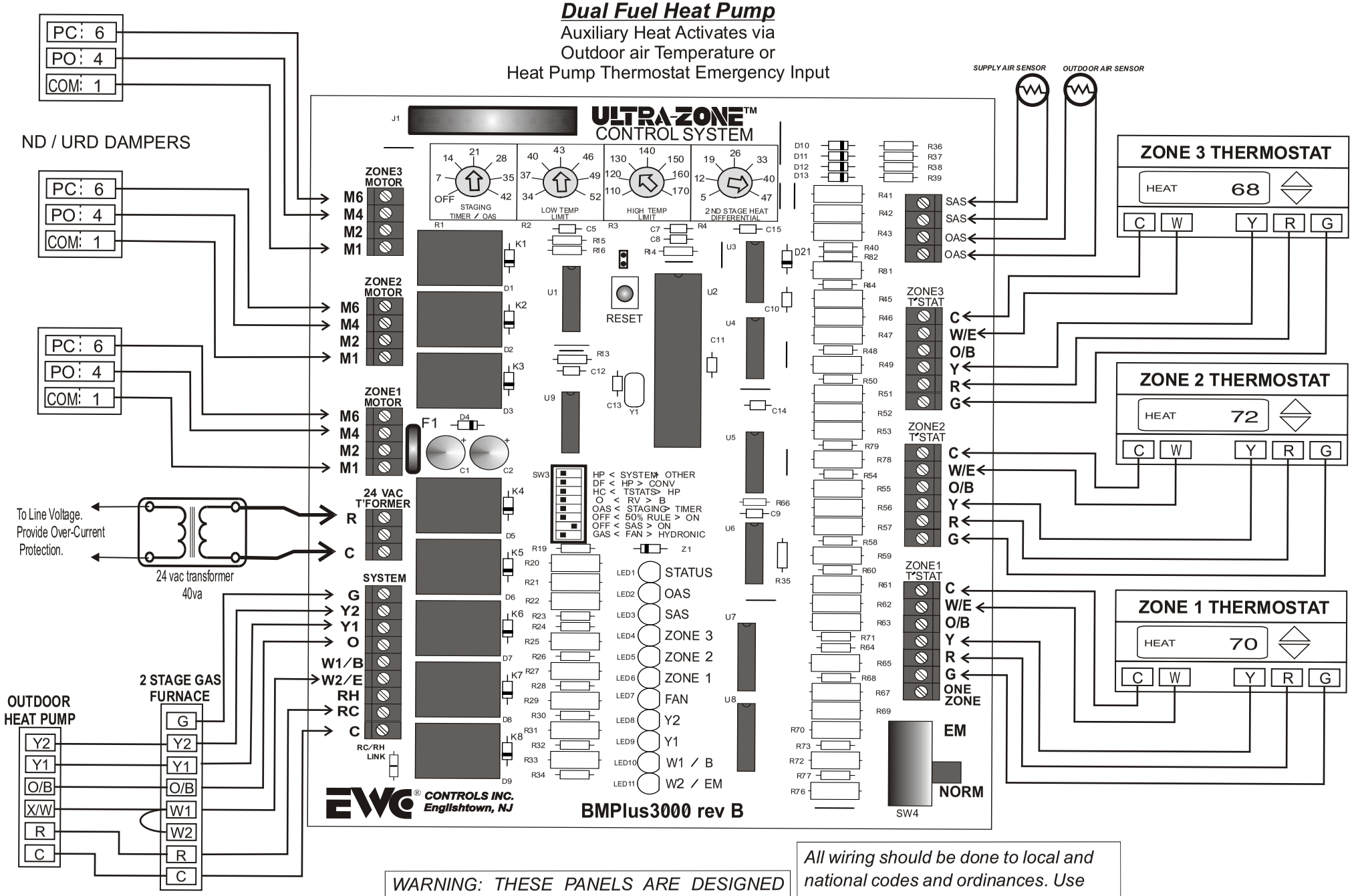
BMPlus 3000 Wiring Diagram

Dual Fuel Heat Pump

Auxiliary Heat Activates via
Outdoor air Temperature or
Heat Pump Thermostat Emergency Input



WARNING: THESE PANELS ARE DESIGNED FOR USE WITH 24VAC. DO NOT USE OTHER VOLTAGES! USE CAUTION TO AVOID ELECTRIC SHOCK OR EQUIPMENT DAMAGE.

All wiring should be done to local and national codes and ordinances. Use color-coded, multi-conductor wire. Wire number to number or letter to letter on each control.

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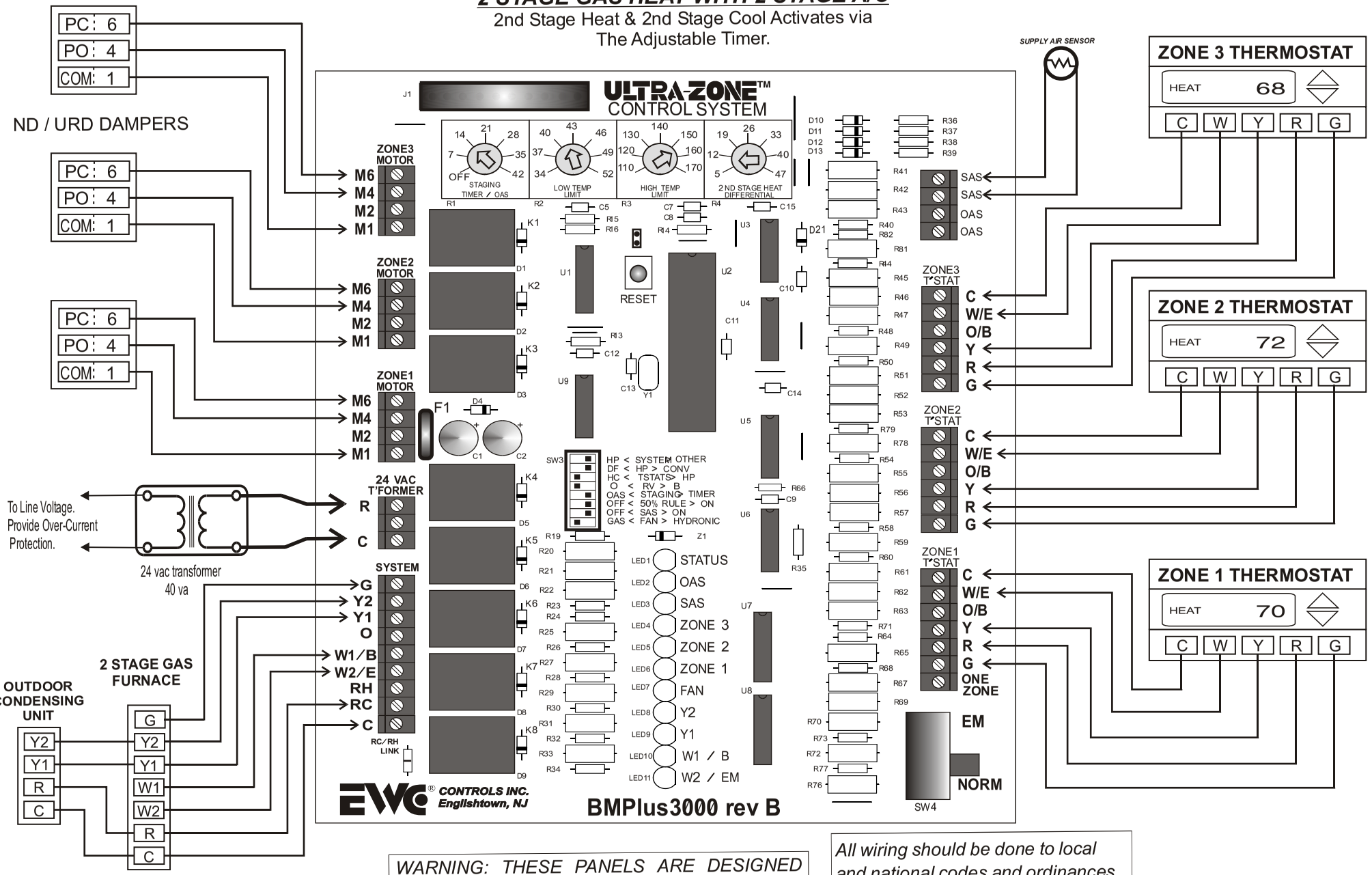
BMPlus 3000 Wiring Diagram

2 STAGE GAS HEAT WITH 2 STAGE A/C

2nd Stage Heat & 2nd Stage Cool Activates via
The Adjustable Timer.



WARNING: THESE PANELS ARE DESIGNED FOR USE WITH 24VAC. DO NOT USE OTHER VOLTAGES! USE CAUTION TO AVOID ELECTRIC SHOCK OR EQUIPMENT DAMAGE.

All wiring should be done to local and national codes and ordinances. Use color-coded, multi-conductor wire. Wire number to number or letter to letter on each control.

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T R O U B L E S H O O T I N G

SYMPTOM	SOLUTIONS
LED'S are responding properly but HVAC system is malfunctioning.	Check HVAC system wiring for proper connections. Check HVAC system wiring for shorts/miswiring. Check HVAC System. Refer to Technical Bulletin for correct Setup/Wiring/Dip Switch settings.
LED's are not responding properly and HVAC system is malfunctioning.	Check HVAC system wiring for shorts/miswiring. Check HVAC system wiring for proper connections. Check HVAC thermostat for proper connections. Refer to Technical Bulletin for correct Setup/Wiring/Dip Switch settings.
LED's illuminate and HVAC system functions normally but dampers do not respond.	Check damper motor wiring for proper connections. Check damper motor 24vac transformer voltage/fuse/BMPlus circuit breaker. Check damper motor wiring for shorts/miswiring. Refer to Technical Bulletin for correct Setup/Wiring. **REFER TO THE DAMPER MOTOR TESTING PAGE 9**
LED's do not illuminate and HVAC system does not respond.	Check HVAC & BMPlus system transformer supply voltage. Check HVAC & BMPlus system 24vac transformer voltage, fuse & the BMPlusB circuit breaker. Check HVAC & BMPlus system wiring for shorts/miswiring.

CHECK YOUR WIRING

DETECTING 24vac SHORTS	SYMPTOMS: Module(s) appear to be dead!
HVAC system not responding and BMPLUS 3000 LED's are off.	If 24vac short has occurred, 24vac will be present at the *BMPlus 3000 Module Input terminals R & C;* but 24vac will not be present at the *Thermostat R&C.*
Dampers not responding and THE BMPLUS 3000 LED's are off.	**SOLUTIONS:** Remove 24vac power from BMPlus 3000 and allow circuit breaker to cool! Find and repair short(s) in damper and/or thermostat field wiring. Restore 24 vac power.
ISOLATING 24vac SHORTS *F1 circuit breaker protects the BMPlus 3000 and reacts to a short in the damper motor or thermostat component and field wiring.*	Disconnect the wire(s) from the 'R' *terminals on the BMPlus 3000 thermostat terminal blocks ,* and the *"M2/M4/M6" terminals* on the BMPlus 3000 damper motor terminal blocks. Restore power. If the short is no longer present, Ohm out the thermostat and damper field wiring for shorts/misconnections. Replace or repair wires as necessary. Restore power. Module(s) will resume operation.

TESTING THERMOSTATS

Check to make sure that the thermostat Rc and Rh terminals are connected together, unless your application requires separation of these circuits.

Use the (C) Common terminal provided at each thermostat terminal block to wire up full 24 vac hard-wired thermostats.

You should reference the (C) Common terminal when troubleshooting incoming thermostat demand signals, even if no wire is connected there.

Make sure that you wire and configure your thermostats for the correct application. Most thermostats built today can be field configured to operate as regular Heat/ Cool type or as Heat Pump type. Remember that you can use regular Heat/Cool thermostats on the BMPlus 3000 for Heat Pump applications.

TECHNICAL SUPPORT

EWC Controls provides superior toll free Troubleshooting Support for the BMPlus 3000 when you are on the job site!
Call 1-800-446-3110 Monday - Friday 8am to 5pm EST
Otherwise call 1-732-446-3110 for information on the BMPlus 3000 and other ULTRA-ZONE products..

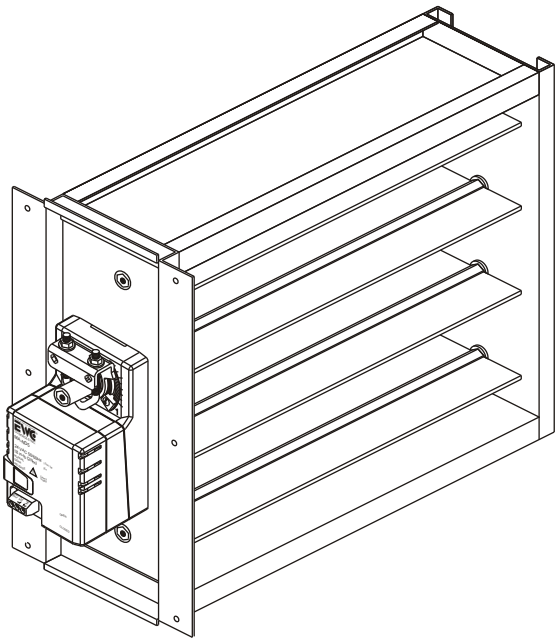
When calling for Technical Support, please have a multi-meter, pocket screwdriver, and wire cutter/stripper handy.

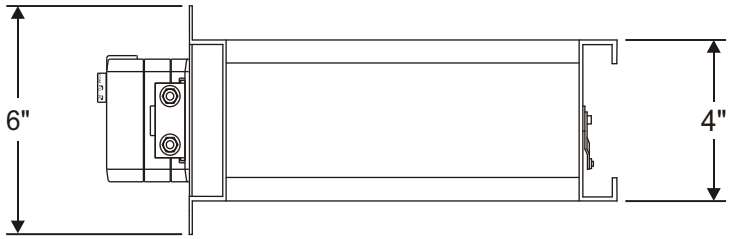
ULTRA-ZONE®
Forced Air Zone Controls

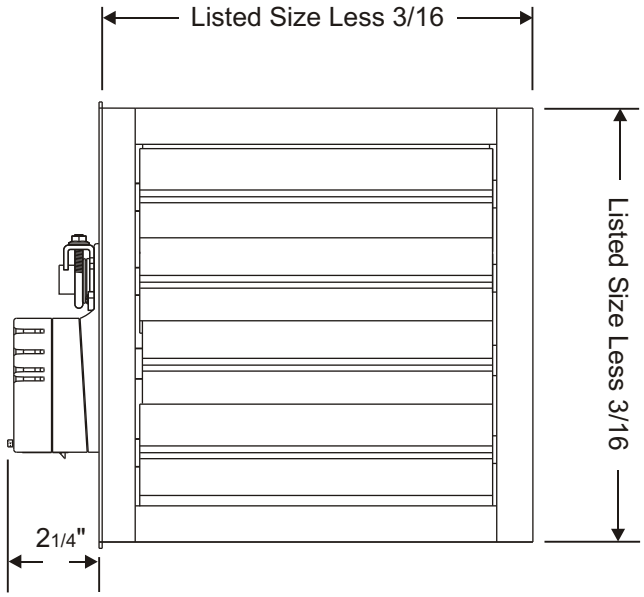
Technical Bulletin

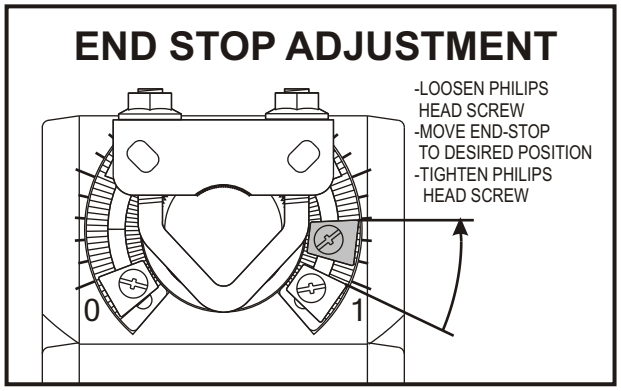
Model ND Rectangular Damper with MA-ND5 Actuator
"EcoNet Compatible"

- Heavy Duty extruded 0.80" aluminum construction.
- Glass Filled Nylon Bearings provide quiet operation.
- Overlapping parallel blades for low leakage.
- Power open / Power close function at 35 seconds.
- UL Listed Motor Actuator is rated for 24volt ac/dc.
- 3 wire power open & power close.
- 18"lb / 2Nm torque rating.
- 1 watt (1.5va) power requirement.
- Motor Actuator housing is rated NEMA1.
- End-Stop adjustment allows for a percentage of relief air (leakage) to be set when the damper is powered to the closed position. You may set a maximum open position as well.
- Bright green & red LED's indicate damper open/closed position, regardless of end stop adjustment.
- Designed to operate at static pressures up to 1.5" wc.
- Available in 6" x 8" thru 30" x 30" in one inch increments. Custom sizing is always available.
- Contact EWC Controls Inc. www.ewccontrols.com









Excellence Without Compromise
EWC® CONTROLS INC.

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P/N 090375A0251 REV. C 02.14.17

ULTRA-ZONE®
Forced Air Zone Controls

Technical Bulletin

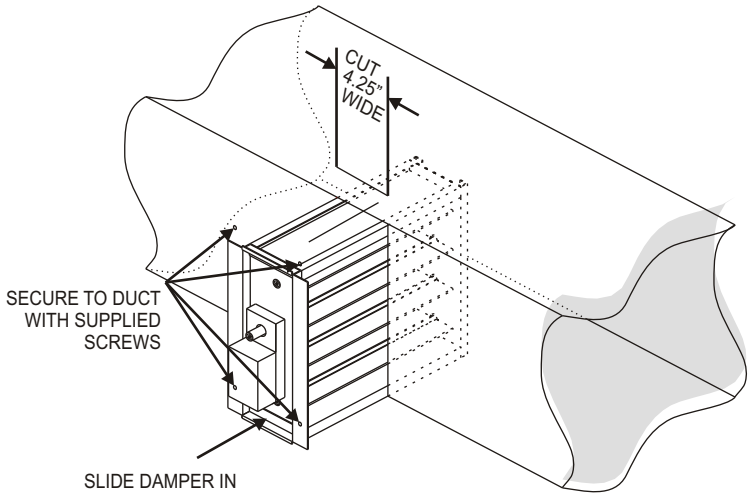
Model ND Rectangular Damper
with MA-ND5 Actuator
"EcoNet Compatible"

INSTALLATION AND WIRING

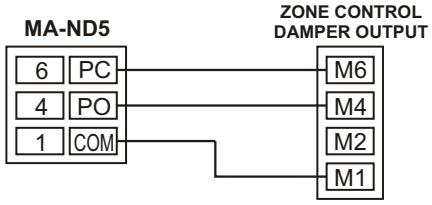
On the side of the duct, where the damper is to be mounted, cut a 4.25" wide slotted opening. Slide the damper into the opening and secure the damper to the duct with sheet metal screws. *Airflow can be from either direction and the Motor can be oriented in any position.* Larger sizes may require additional support by securing the back of the damper. If using duct board, additional support can be obtained by using Model DBA Duct Board Adaptors.

Motor Actuator Terminals

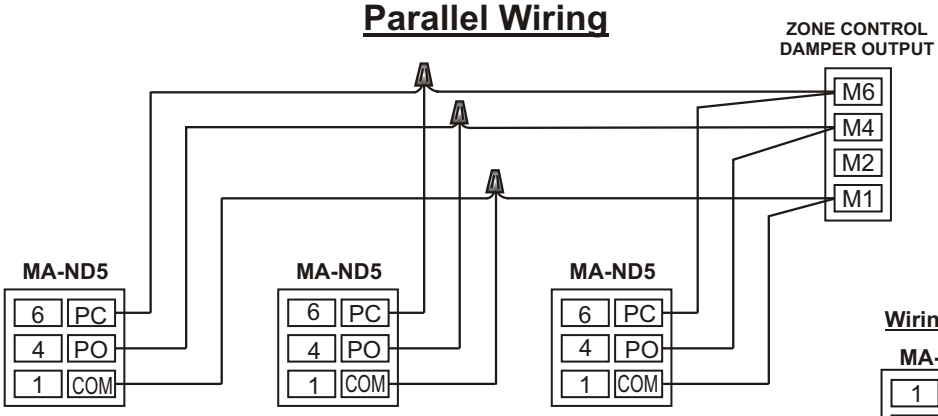
TERMINAL	DESCRIPTION
1 / COM	24v Common
4 / PO	24v Power to Open
6 / PC	24v Power to Close



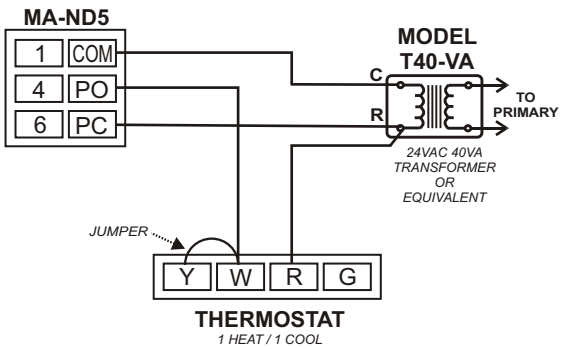
Wiring to a Zone Control Panel



Parallel Wiring



Wiring a Thermostat to Control a Single Damper



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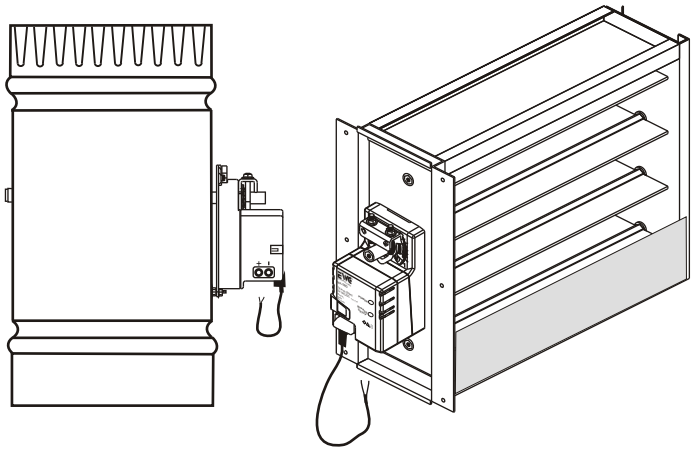
ULTRA-ZONE™
Forced Air Zone Controls

SUBMITTAL SHEET
Model SBD
Self-Balancing
Smart Bypass Damper



SBD Motor Actuator Specifications:

Operating Range - .1" - 2.4" W.C.
Pressure Sensor - Belimo D3 Dynamic Response
Air Pressure Connectors - 1/4" OD barbs integrated x2
Power - 24vac @ 4.0 volt/amp / 2.0 watt
Wiring - 18 AWG copper
Case - NEMA 3S, IP54
Gear Release - Manual
Maintenance: No Maintenance Required
Memory: Non-Volatile
Listings - UL, CE **Compliance -** ACCA Manual Zr
Pitot Tubes - Included x2
Pressure Tubing - 1/4" ID x 16' (NSF-51) Included x1
Mounting - The SBD can be mounted horizontally, vertically, or any other position required in the field.

Description of the SBD Motor Actuator:
The Smart Bypass Motor Actuator is a digital differential pressure controller with an integrated PI loop and intelligent software. **The Smart Bypass Damper is the only industry bypass solution that can automatically measure, monitor and maintain the designed operating static pressure of the HVAC system in all modes of operation.**

The Smart Bypass Damper includes all of the accessories needed for field installation.
No measuring instruments are required.

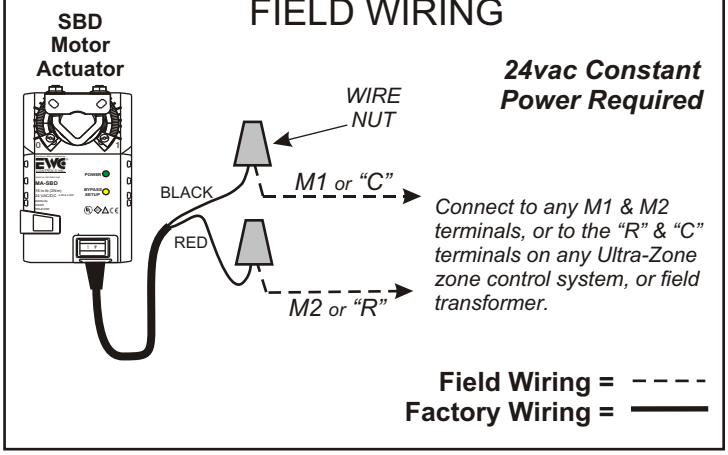
Submittal Specifications:
Furnish and install a Model SBD self-balancing bypass damper manufactured by EWC Controls. Round SBD's are fabricated from 24 gauge galvanized steel. Rolled shells include one female end and one male (crimped) end, with rigid stiffening beads. Includes pressure drop baffling for improved damper authority and linear response. Round SBD's are equipped with a Poron® gasket on the blade.
***Specify model SBD - 8", 10" , 12", 14", 16",18", 20"**

Furnish and install a Model SBD self-balancing bypass damper manufactured by EWC Controls. Rectangular SBD's shall be fabricated from mill finished, extruded 080" aluminum and glass filled nylon bearings. Includes pressure drop baffling for improved damper authority and linear response.
***Specify model SBD - 12x8, 12x10, 12x12, 20x8 20x10, 20x12, etc.**
**Custom sizing is available, call for details.*

How the Smart Bypass Damper Works:

The Ultra-Zone *Smart Bypass Damper* captures *(with the push of a button)* the total static pressure of the HVAC system during non-zoned mode, and modulates to maintain that same static pressure value, during zoned mode. As individual zone dampers open or close, the HVAC system static pressure will fluctuate. In order to maintain the true static pressure of the HVAC duct system during zoned HVAC operations, a bypass duct with a reliable bypass damper and a smart motor actuator must be installed. ***No other bypass damper is easier to setup, than the Ultra-Zone Smart Bypass Damper.***

"SBD" SMART BYPASS DAMPER FIELD WIRING



SUBMITTAL FORM
SUBMITTED BY:
JOB:
ARCHITECT:
ENGINEER:
CONTRACTOR:
LOCATION:

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SUBMITTAL SHEET
Model SBD Self-Balancing Smart Bypass Damper

Installing the SBD Bypass Damper:
Power up the SBD after installing it. The SBD will default closed and remain closed until you are ready for setup.

The pitot tubes and reference tubing are included with the SBD. ***Make sure you have removed these items from the shipping box before you throw the box away!***

Due to the unique design and the self-balancing feature of the SBD, there is no need to install and setup a separate bypass balancing hand damper.

Mount both pitot tubes within 2 feet of the air handler on the center line of the Supply & Return plenums. *Observe the direction of airflow stamped on the pitot tube mounting plate.* (See the graphic below)

Connect each pitot tube to the SBD barbed fittings using the supplied 1/4" ID plastic tubing. *Keep the plastic tubing as short as possible with no kinks, cuts or nicks.* Connect 24vac power to the SBD motor actuator.

Upon power-up, the SBD's Power LED will glow solid green. The yellow Bypass Setup button LED will blink, to indicate the SBD is ready and waiting for you to press the by-pass setup button LED and start the setup routine.

Preparing for Smart Bypass Setup:
Before pressing the *Bypass Setup button LED*, the installer must confirm the following:

(1) *Both pitot tubes have been properly installed.*
(2) *All zone dampers are in the open position.*
(3) *The HVAC system is running at full (CFM) speed.*
(4) *De-humidification mode/profile is not engaged. Wait 15 minutes after cooling startup, to ensure the enhanced airflow profile function is complete.*
(5) *The system air filter is new or clean.*

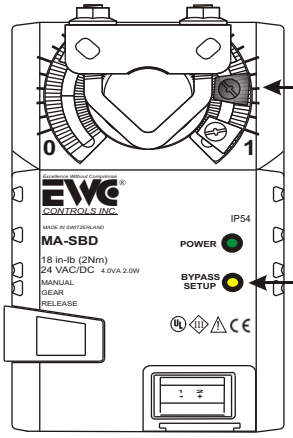
Proceed to the Smart Bypass Setup Procedure!

Smart Bypass Setup Procedure:

Upon power-up, the Bypass Setup button LED is blinking *(waiting for setup routine).*

1. *With a pencil or pen, press the Bypass Setup button LED* ***one time only!***

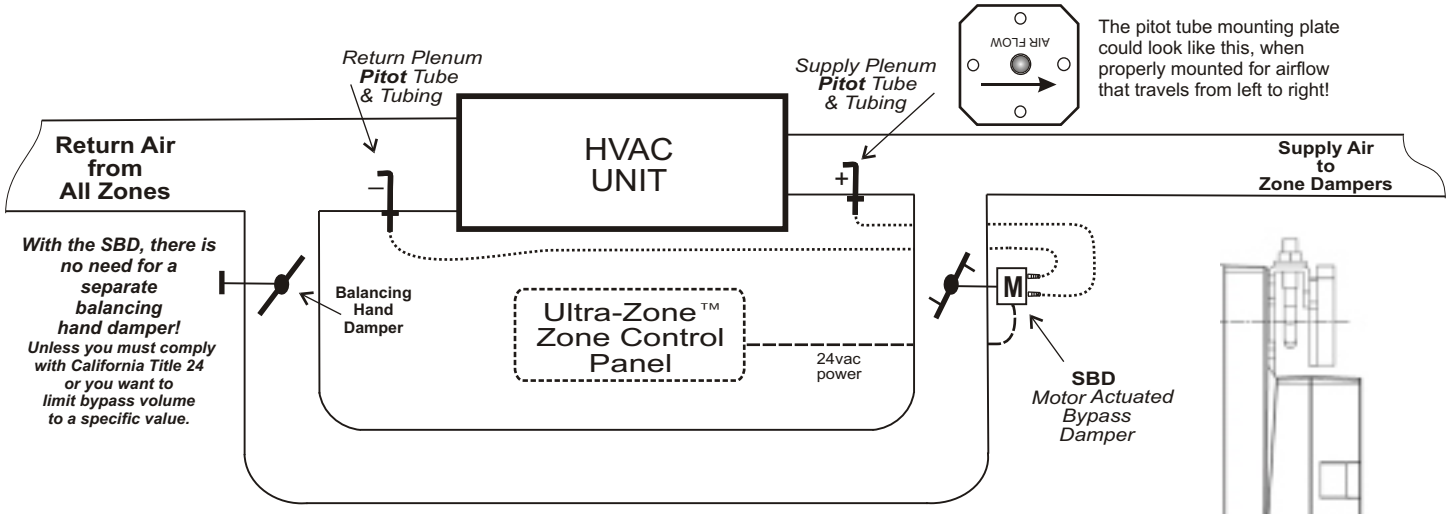
A. *The SBD will open and measure the system's total static pressure.*
B. *The SBD will close and measure the system's total static pressure.*
C. *The Bypass Setup LED will stop blinking and go out.* ***You are Done!***
D. *If your SBD does not stop blinking, it may be an indication that your bypass duct is too large. Adjust the "OPEN" travel limiter on the SBD to limit the full open position to 75% (or lower) and try again.*
E. *The SBD will now control the system static pressure in all modes.*
F. During idle periods, the SBD will stroke fully open. The SBD will close or modulate as necessary, when the blower starts back up again.



If your SBD does not auto configure, move the "OPEN" Travel Limit "UP" above the **1** mark. Then try again.

Press the Bypass Setup button LED

EWC Controls Recommended Bypass Duct Configuration



Connect the pitot/tubing from the Supply duct to the + port. Connect the pitot/tubing from the Return duct to the - port.

Note: *This drawing of the Smart Bypass Damper and bypass duct work is intended to serve as a guide. Your actual duct configuration may differ. Just make sure all components are installed and setup correctly. If required, call EWC Controls Technical Support for assistance.*

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