DU–IOM–014
2/18

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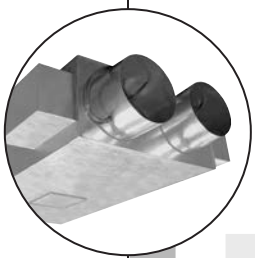
DU
Installation, Operation, and Maintenance

Dual Duct
Variable Air Volume Terminals



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Contents

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Model Number Description

Typical String: DU1 / B / P / 3000 / H / 08 / A / R / 08 / - / A / 1 / - / - / A / - / A / C1

Typical String: DU1R / C / - / - - - / - / 10 / A / R / 10 / A / A / 1 / D / - / - / - / A

Field	Field Description	Input Code	Description
1	Model	DU1	Attenuator, Flanged Discharge
		DU2	Attenuator, Slip & Drive Discharge
		DU3	Short, Flanged Discharge
		DU4	Short, Slip & Drive Discharge
		DU1R	Attenuator, w/ Hot Water Coil
		DD00	Short, Slip & Drive (2-Single Duct)
2	Casing Size	-	None
		A	Max 6" Inlet
		B	Max 8" Inlet
		C	Max 10" Inlet
		D	Max 12" Inlet
		E	Max 14" Inlet
		F	Max 16" Inlet
3	Control Type	-	No Controls (Field Installed DDC)
		P	Pneumatic
		A	Electronic Analog
		D	Direct Digital Controls
		F	DDC by Others (Factory Mounted)
4	Control Package	- - - -	None
		3000	Enter applicable 4 digit CP number
5	Totalizing Sensor	-	None
		H	High Range Orifice Plate
		S	Std Range Orifice Plate
6	Hot Inlet Size	05	5 inch
		06	6 inch
		07	7 inch
		08	8 inch
		09	9 inch
		10	10 inch
		12	12 inch
		14	14 inch
		16	16 inch
7	Hot Inlet Sensor	-	None
		A	Velocity Wing Cross Flow
8	Hot Inlet Location	R	Right Hand Side
		L	Left Hand Side
9	Cold Inlet Size	05	5 inch
		06	6 inch
		07	7 inch
		08	8 inch
		09	9 inch
		10	10 inch
		12	12 inch
		14	14 inch
		16	16 inch

Field	Field Description	Input Code	Description
10	Cold Inlet Sensor	-	None
		A	Velocity Wing Cross Flow
11	Casing Construction	A	22-gauge Galvanized Steel
		B	20-gauge Galvanized Steel
		E	22-gauge Galvanized Dual Wall
		M	20-gauge Galvanized Dual Wall
		F	22-gauge Galvanized Low Temp
12	Insulation	-	None
		1	1/2" Glass Fiber
		2	1" Glass Fiber
		3	1/2" Foil Face
		4	1" Foil Face
		5	3/8" Closed Cell
		6	1" Fibre-Lok
13	Hot Water Coil	-	None
		A	1 Row, HW, Right Hand
		B	1 Row, HW, Left Hand
		C	2 Row, HW, Right Hand
		D	2 Row, HW, Left Hand
14	Transformer, Class 2	-	None
		1	120v - 1ph/60Hz (40va)
		2	208v - 1ph/60Hz (40va)
		3	277v - 1ph/60Hz (40va)
		4	240v - 1ph/60Hz (40va)
		5	120v - 1ph/60Hz (50va)
15	Control Enclosures (2)	-	None
		A	Standard Enclosures
		B	Universal Enclosures
		C	Std Enclosures with Hinged Panel
		D	Univ Enclosures with Hinged Panel
16	Disconnect Switch	-	None
		B	SPST Line 120/277v 1-ph
		C	DPST Line 208/240v 1-ph
17	Access Door	-	None
		A	Bottom - Hinged Camlock
		B	Bottom - Patch Plate Type
		C	Bottom - Removable Camlock
18	Accessories	C1	Brackets(4) - Mounting (Field Installed)
		DC	Camlock Access Door, Top
		E6	Actuator, Rotary 24 vac Tri-State (Qty=2)
		G1	Lo-Leakage Casing Construction
		ST	Solid, 1pc Damper Shaft
		99	Special Construction - See Notes

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Product Description

Application

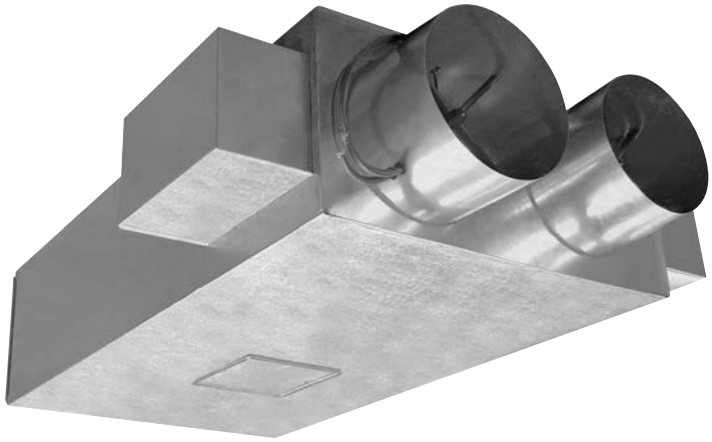
- Dual duct systems utilizing energy conserving fan controls with variable air volume (VAV) temperature control loops
- Hot and cold air flow rates are delivered to meet space loads, while maintaining desired total air flow rates to the space
- Pressure independent operation for precise air volume control of both hot and cold air flow
- Configurable for both mixing and non-mixing applications with variable or constant total flow to the space
- Maintain space temperature while maintaining air change rates or space pressurization, or meeting minimum ventilation rates.
- Control strategies using pneumatic, analog, or direct digital control (DDC) systems to satisfy any application

Features

- Integral attenuator on Models DU1, DU1R, & DU-2
- Compact Assembly with Models DU-3 & DU-4 (non-mixing applications)
- Flow sensor arrangements available in the inlets of the air terminal, and a flow totalizing sensor at the discharge, based on control strategy.
- Control sequence may be inlet sensing only (I sequences) or combination inlet total (I-T) sensing (one inlet sensor/one total sensor). Available with a variety of control sequences for mixing and non-mixing application.
- Hot & cold round inlet sizes from 5" to 16" diameter – can be different sizes on the air terminal
- Right or left hand hot inlet location
- Flanged or Slip & Drive Discharge Duct Connections
- 22 gauge steel, leak resistant casing lined with 1/2" thermal/acoustical insulation (NFPA 90A & UL181)
- Balancing taps / calibration chart included for field adjustment.

Options

- Steel control enclosure
- Bottom access door (Patch plate, Double cam-lock, Hinged)
- Model DU1R includes factory mounted 1, 2, or 4 row hot water coil
- Electric duct heater (installed downstream of the terminal discharge)
- 1" thick glass fiber insulation, 1/2" or 1" foil-faced insulation (taped edges), 3/8" closed cell “fiber-less” insulation, Fiber-Lok system using 1" high density foil-faced lining with steel encapsuled cut edges (approved by the stringent California Office of Safety, Health, and Planning Department (OSHPD), see page A-11.



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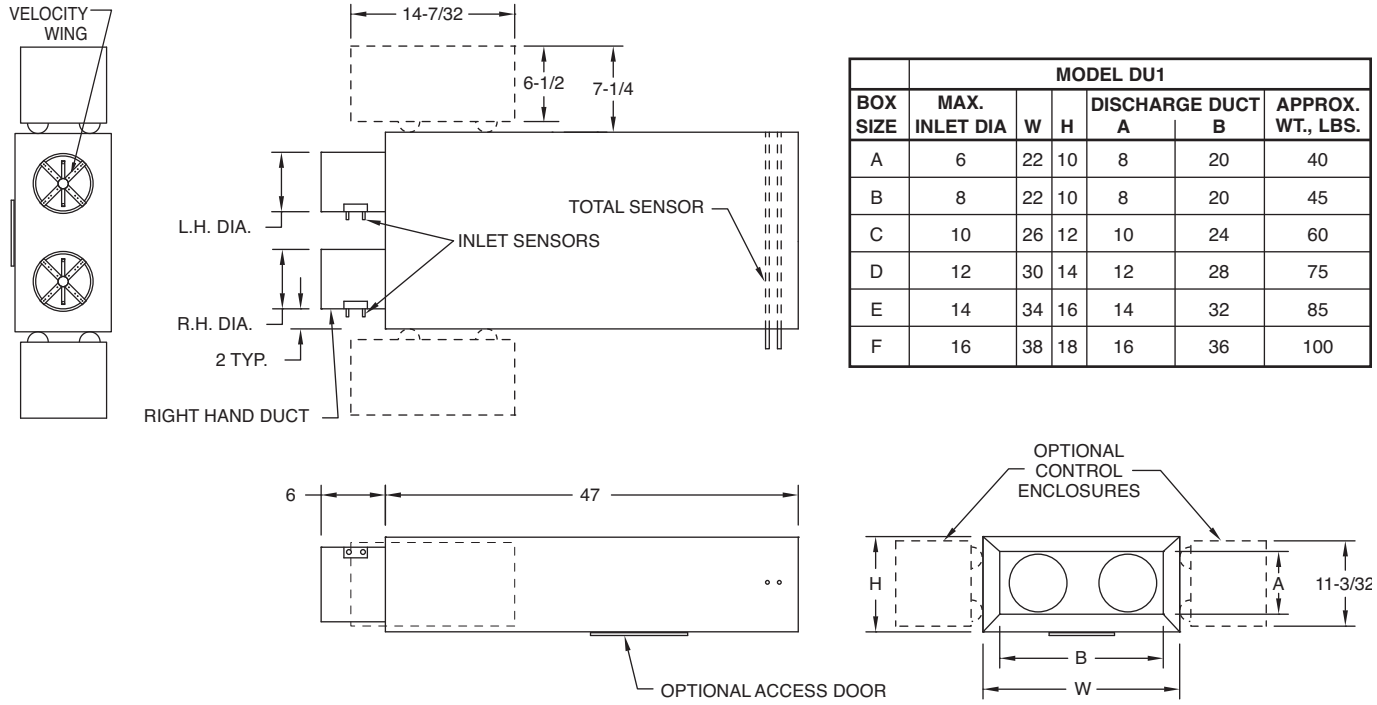
Product Description

Model DU1

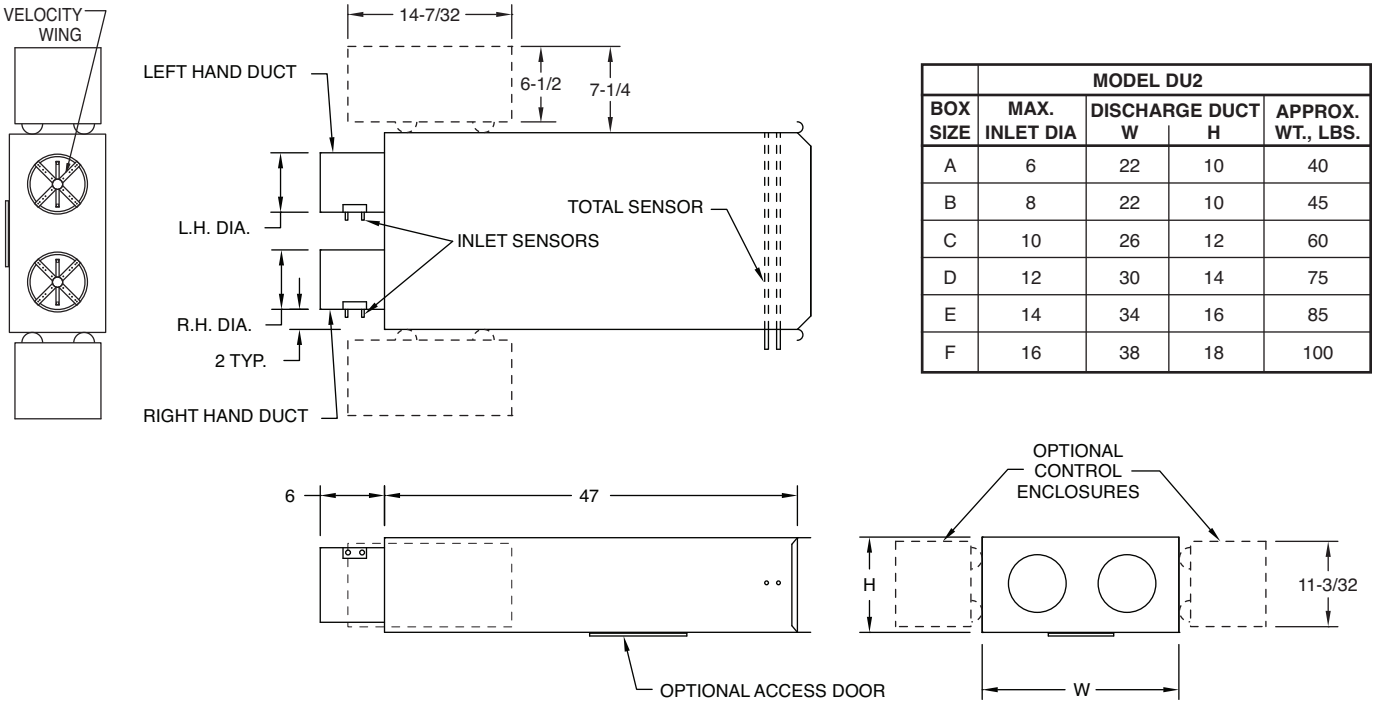
Dual Duct Attenuator - Flanged



	MODEL DU1					
BOX SIZE	MAX. INLET DIA	W	H	DISCHARGE DUCT A	DISCHARGE DUCT B	APPROX. WT., LBS.
A	6	22	10	8	20	40
B	8	22	10	8	20	45
C	10	26	12	10	24	60
D	12	30	14	12	28	75
E	14	34	16	14	32	85
F	16	38	18	16	36	100

Model DU2

Dual Duct Attenuator - Slip & Drive



	MODEL DU2			
BOX SIZE	MAX. INLET DIA	DISCHARGE DUCT W	DISCHARGE DUCT H	APPROX. WT., LBS.
A	6	22	10	40
B	8	22	10	45
C	10	26	12	60
D	12	30	14	75
E	14	34	16	85
F	16	38	18	100

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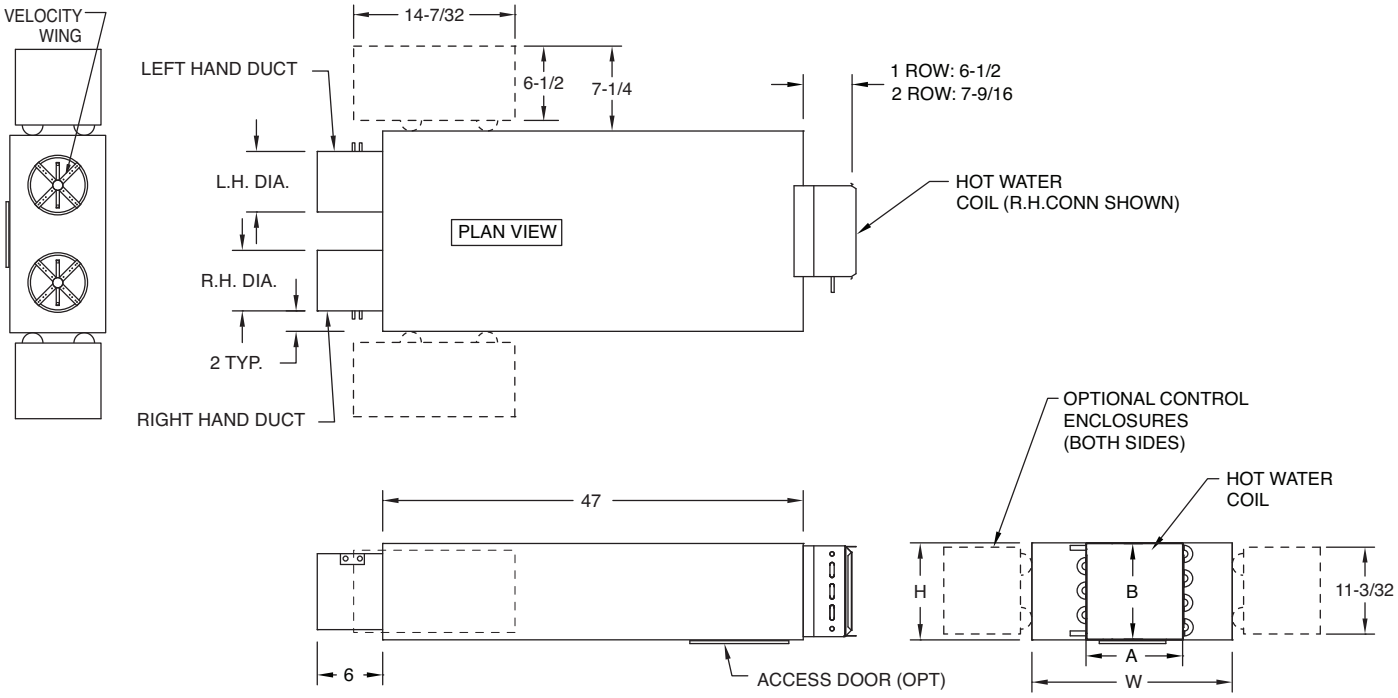
Product Description

Model DU1R

Dual Duct Attenuator & Hot Water Heat



- Control sequences for inlet sensing (I sequences) only.

MODEL DU1R							
BOX SIZE	MAX. INLET DIA	BOX		DISCHARGE DUCT		COIL CONN. (OD)	
		W	H	A	B	1 ROW	2 ROW
A	6	22	10	10	10	1/2	1/2
B	8	22	10	12	10	1/2	1/2
C	10	26	12	14	12-1/2	1/2	1/2
D	12	30	14	16	15	7/8	1/2
E	14	34	16	20	17-1/2	7/8	7/8
F	16	38	18	24	17-1/2	7/8	7/8

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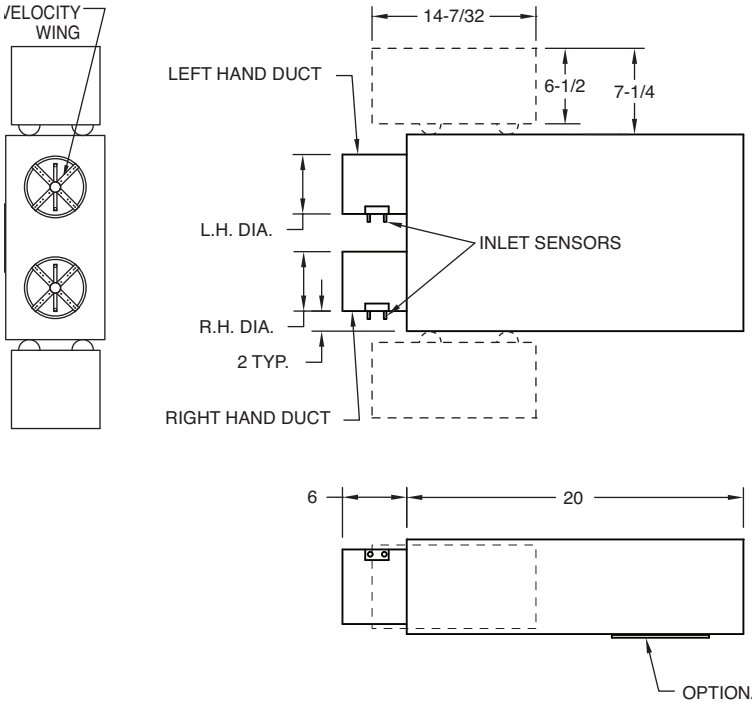
Product Description

Model DU3

Dual Duct Non-Mixing - Flanged

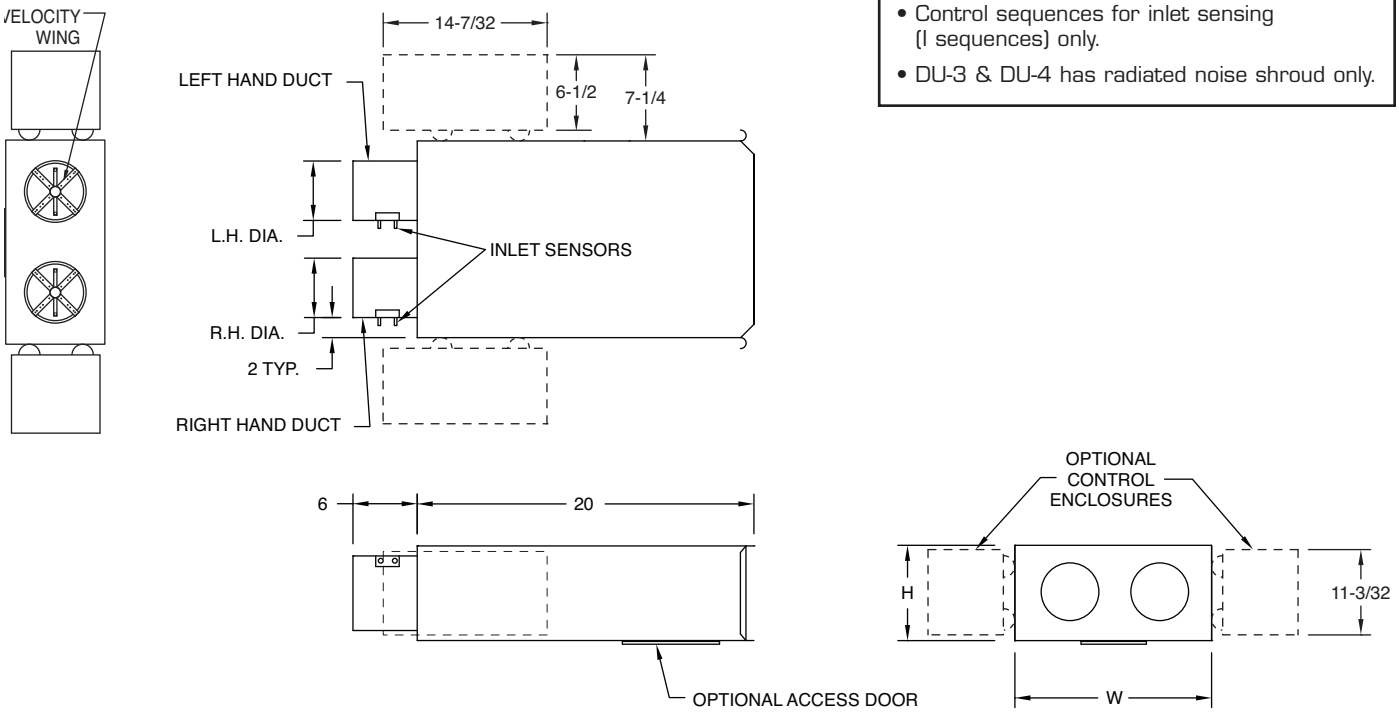


	MODEL DU3 & DU4					
BOX SIZE	MAX. INLET DIA	W	H	DISCHARGE DUCT A	DISCHARGE DUCT B	APPROX. WT., LBS.
A	6	22	10	8	20	32
B	8	22	10	8	20	36
C	10	26	12	10	24	48
D	12	30	14	12	28	60
E	14	34	16	14	32	68
F	16	38	18	16	36	80

Model DU4

Dual Duct Non-Mixing - Slip & Drive

- Models DU-3 & DU-4 are not available with hot water coils.
- Control sequences for inlet sensing (I sequences) only.
- DU-3 & DU-4 has radiated noise shroud only.



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Receiving and Inspection Instructions

- Check the bill of lading to verify receipt of all listed items (including any loose accessory items). Notify the carrier and the local ANEMOSTAT representative of any shortages or items shipped in error.
- Thoroughly examine all units for transportation damage (dents, punctures, etc). If damage is found, immediately notify and file a claim with the carrier. Note details of any damage on the bill of lading before signing for the shipment.
- Each terminal has a nameplate indicating the model number. When requested, the unit may also be mark with job-specific information (tagging). Locate the nameplate and verify that the correct units with options (controls, heating coils, etc) where received as ordered.
- Store units in a secure, dry location in the original packing, and do not stack any higher than as shipped.

Warning – Electrical Shock, Burn, and other Hazards

- All fastening straps or hangers must mechanically lock the terminal in place and withstand typical vibration and/or disturbances during use.
- Use caution during rigging such that all equipment remains adequately secured until it is affixed and secured in its final location.
- All supports must be designed to meet applicable local codes and ordinances. Before rigging and installation, check equipment weights such to ensure temporary and permanent supports are safely maintained.
- Make certain all power sources are disconnected prior to installation or servicing this equipment. Make certain if there are multiple power connections, that all are securely disconnected to avoid electrocution or shock injuries.
- Disconnect control circuits or pneumatic control systems to avoid injury when working on dampers or actuators, which may respond automatically to a remote control source.
- Guard against flame hazards when soldering or brazing water coil connections to avoid personal injury or property damage. Prior to using any open flame, keep a fire extinguisher nearby.
- All insulated units (except closed-cell) contain fiberglass wool. Disturbing the insulation could expose the installer to airborne particles of glass wool fibers and ceramic fibers. Certain jurisdictions feel that exposure to these fibers through inhalation can cause cancer. Glass wool fibers may also cause respiratory, skin or eye irritation.

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Unit Placement and Installation

- **THE FLOW SENSOR, PNEUMATIC TUBING AND DAMPER SHAFT ARE NOT TO BE USED FOR LIFTING OR SUPPORT. THEY ARE CRITICAL TO THE PROPER OPERATION OF THE UNIT.**
- To avoid product damage, only lift or handle the DU by fully supporting the unit from more than one location.
- Locate unit as per construction drawings, and be careful not to conflict with articles of other trades such as plumbing and electrical conduit.
- Consult SMACNA guidelines for proper transitioning and good workmanship practices.
- Using the support method from the construction plans and specification, suspend unit in a level horizontal plane noting direction of airflow. When utilizing sheet metal straps, up to 1" long screws may be utilized to penetrate the main casing. Do not secure hanging straps to unit appurtenances such as (but not limited to) electric heater cabinets, hot water coils, and control enclosures.

  For units equipped with optional hanging brackets, rods up to 3/8" diameter may be used with ANEMOSTAT brackets. Hanger rod locations are approximately 1" to 3" from the corner of the unit for most terminal configurations.
- Make certain not to obstruct service access to any electrical enclosures or access panels for access to the interior of the unit.
- Check with the local Anemostat representative if a terminal must be "flipped" over from its' intended orientation.

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Clearance Requirements

- Line voltage and low voltage electrical enclosures must have adequate clearances to meet requirements of NFPA 70 (NEC). This is typically 36" minimum. Note that additional clearance requirements may be required by local codes or building construction specifications.
- When provided with optional bottom or side casing access plate/panel, provide sufficient clearance to allow access.
- Unit should hang freely, and not make contact with any structure above.
- There are no internally replaceable components in the DU terminal units. All controls are externally accessible.

Duct Connections and Insulation

- Connecting duct should be configured and installed in accordance with SMACNA guidelines, local code requirements, and/or as specified for the project.
- Inlet duct should be the same size as unit inlet. Straight, solid (non-flexible) duct will yield the best airflow and acoustical performance. Duct should be slid over the round inlet of the terminal and fastened and sealed appropriately. Do not install the supply duct INSIDE the round inlet. Supply inlets are typically undersized -1/8" to allow duct to slip OVER the inlet. Provide insulation over the entire inlet collar, while allowing clearance for the air flow sensor tubing.
- Use caution when installing duct near inlet or discharge sensors. Damage to these devices will yield an non-functioning air terminal.
- The terminal should be installed with straightest possible supply duct practical for job conditions. Generally, a minimum of (3 x Diameter of the inlet size) of straight duct yields best performance.
- The discharge duct connection may utilize either a Slip & Drive or Flanged duct connection. Refer to appropriate product descriptions or submittal sheets for details. Provide 48" after the discharge prior to any transition for optimum flow control. Where space is limited, these dimensions may be reduced but an increase in minimum operating pressure and sound may occur.
- Units with integral electric heaters MUST be installed such that a minimum of 48 inches of full-size, straight downstream duct is connected before any elbows, filters, transitions or any other downstream air disturbance.
- If the terminal includes a hot water coil and is installed in a location with high humidity, the coil casing should be externally insulated.
- After all duct connections are made and sealed, check that the entire ductwork system is airtight.

Hot Water Connections (when applicable)

- Hot water heating coils require a field sweat connection to control valve(s) and water supply. Refer to unit construction submittal drawing for specific connection size. Use appropriate brazing alloy for connection.
- The hot water coil is provided in either a right or left hand connection configuration. If necessary, the coil can be rotated 180 degrees for the opposite hand connection.

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Electrical Connections

NOTE: This manual was written with the understanding that the line power and control wiring drawings submitted for the specific project have been acquired and are available during installation.

- Electrical wiring, connections, fusing and installation must conform to the local building codes and the NATIONAL ELECTRIC CODE (ANSI / NFPA 70).
- Connect the electronically actuated DU per wiring diagram supplied with the unit.
- Field installed electrical components must be mounted and wired per factory supplied wiring diagram. Factory wiring must not be altered without written approval from ANEMOSTAT; violation of this will void warranty.
- UL standards dictate that the power source must be within 10% of nameplate voltage, for safety and longevity. If incoming voltage is 10% above or below nameplate voltage, contact Power Company to correct before operating terminal.

Start-up Procedures

WARNING: Failure to adhere to these instructions, unauthorized installation, adjustment, alterations, modifications or maintenance can void the manufacturer's warranty, cause property damage, personal injury or death. For assistance or additional information, consult a qualified contractor or an ANEMOSTAT representative.

- Verify all electrical wire terminations are tightened prior to energizing terminal. Some loosening may have occurred during shipment and installation.
- Prior to start-up, the project specific control sequence / wiring diagram should be read and understood. A copy of this schematic is located on the interior of the electrical enclosure. If factory supplied analog or DDC controls are supplied, contact the project control contractor for specific start-up and balancing information.

Maintenance

- The DU VAV terminal unit has been designed and constructed for years of reliable use.
- If installed, inspect hot water coil periodically and clean fins via the access panel upstream of the water coil. Components should be replaced with ANEMOSTAT authorized parts to avoid conflict with ETL listing.

Factory Mounted DDC Controls

Anemostat will factory mount DDC controls of all types. Refer to the wiring diagrams provided by the temperature control manufacturer for proper wiring of these controls. The maximum and minimum CFM range is determined by the controls.

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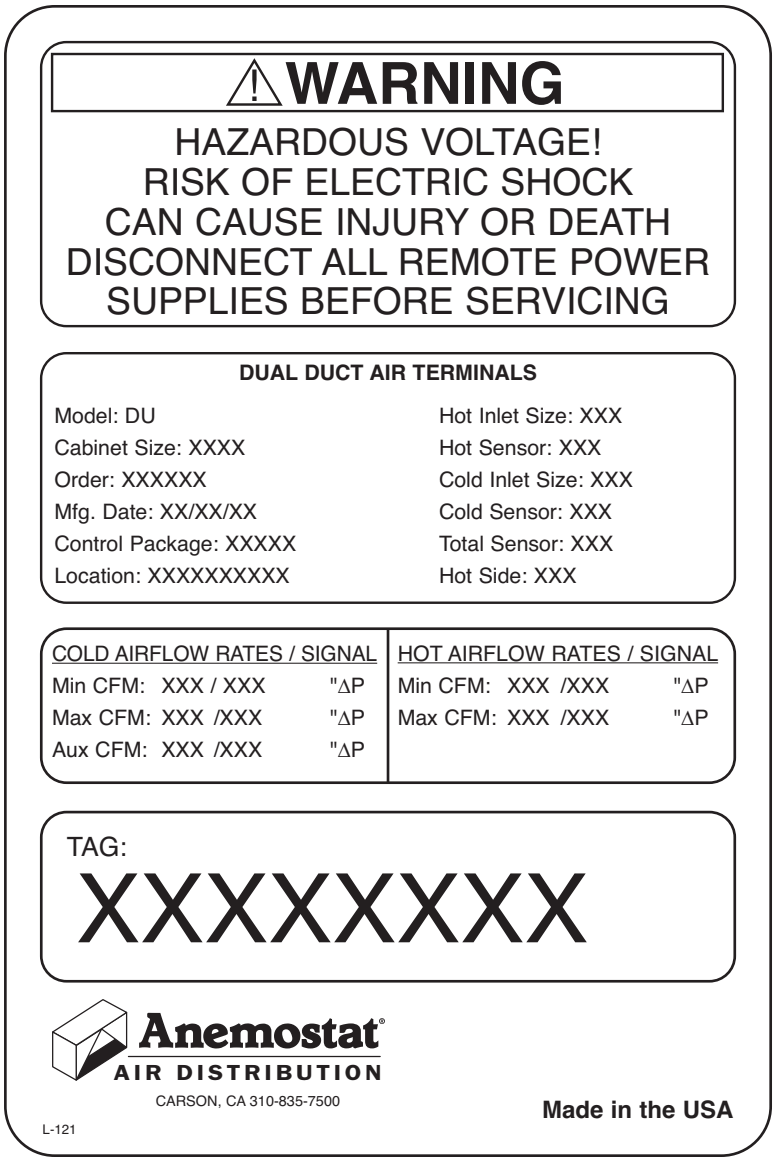
Unit Labeling

Labels are applied to each terminal as follows:

- Unit specific nameplate showing model number, manufactured date, and information regarding controls provided as appropriate.
- The appropriate airflow calibration chart indicating the airflow at varying airflow sensor signals.
- The appropriate wiring/piping diagram for controls provided by Anemostat. Refer to controls manual CM-1 for controls adjustment and troubleshooting procedures.
- Up arrow indicating the proper orientation of the unit for installation.
- Airflow direction arrow indicating the proper orientation of the duct connections.
- AHRI logo indicating the units performance is AHRI certified.
- Sheet Metal Workers Union logo indicating unit produced by members of The Sheet Metal Workers Union.



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Airflow Ranges (Velocity Wing™ Sensor)

Inlet Sensing

Type	Direct Digital		Analog Electronic		Pneumatic	
Controller	SimplyVAV / Conquest		Model 51		Model 31	
Inlet Size	Min Airflow	Max Airflow	Min Airflow	Max Airflow	Min Airflow	Max Airflow
5" Ø	45	350	22	305	50	287
6" Ø	75	575	45	470	81	469
7" Ø	100	750	70	635	106	612
8" Ø	135	1050	90	835	150	867
9" Ø	175	1350	115	1100	190	1098
10" Ø	215	1650	145	1355	234	1353
12" Ø	285	2200	155	1740	312	1802
14" Ø	390	3000	250	2300	428	2469
16" Ø	530	4100	447	3390	583	3366

Notes:

1. Minimum and maximum values shown are CFM
2. Minimum and maximum airflow with pressure independent controls based on the following flow sensor signals:
   Model 51 Controller - 1 VDC – 10 VDC
   Model 31 Controller - 0.03" w.g. – 1.0" w.g.
   Simply VAV / Conquest Controllers - 0.025" w.g. – 1.5" w.g.
3. Settings below the minimum are not recommended for accurate control when using pressure independent controls. Minimum airflow for pressure dependent applications is 0 cfm.
4. Pressure independent controls may be set for 0 CFM, at or above the minimum airflow shown in table 4, but not between.
5. Model 31 controller can be used either as direct or reverse acting for normally open or normally closed damper positions. Field adjustable start point and reset span.
6. Models 31 controllers equipped with separate adjustable knobs for maximum and minimum airflow settings.
7. Model 51 electronic analog controller maximum and minimum airflow settings field adjustable at the thermostat.
8. Airflow rates above maximum shown are available. Contact your Anemostat representative for application assistance.

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Airflow Ranges

Total Sensing • H Range • Model DU-1/DU-1R/DU-2

Type	Direct Digital		Analog Electronic		Pneumatic	
Controller	SimplyVAV / Conquest		Model 51		Model 31	
Casing Size	Min Airflow (CFM)	Max Airflow (CFM)	Min Airflow (CFM)	Max Airflow (CFM)	Min Airflow (CFM)	Max Airflow (CFM)
A	105	815	69	665	115	665
B	170	1335	113	1090	189	1090
C	280	2170	183	1770	307	1770
D	380	2940	248	2400	416	2400
E	425	3280	277	2680	464	2680
F	740	5720	483	4670	809	4670

Notes:
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2. Minimum and maximum airflow with pressure independent controls based on the following flow sensor signals:
   Model 51 Controller - 1 VDC – 10 VDC
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Airflow Ranges

Total Sensing • S Range • Model DU-1/DU-1R/DU-2

Type	Direct Digital		Analog Electronic		Pneumatic	
Controller	SimplyVAV / Conquest		Model 51		Model 31	
Casing Size	Min Airflow (CFM)	Max Airflow (CFM)	Min Airflow (CFM)	Max Airflow (CFM)	Min Airflow (CFM)	Max Airflow (CFM)
A	55	445	38	364	63	364
B	100	750	63	610	106	610
C	140	1100	92	885	153	885
D	230	1800	152	1470	255	1470
E	260	2030	172	1660	288	1660
F	435	3350	285	2750	476	2750

Notes:
1. Minimum and maximum values shown are CFM
2. Minimum and maximum airflow with pressure independent controls based on the following flow sensor signals:
   Model 51 Controller - 1 VDC – 10 VDC
   Model 31 Controller - 0.03" w.g. – 1.0" w.g.
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Typical Control Sequences

I-T MIXING SEQUENCES

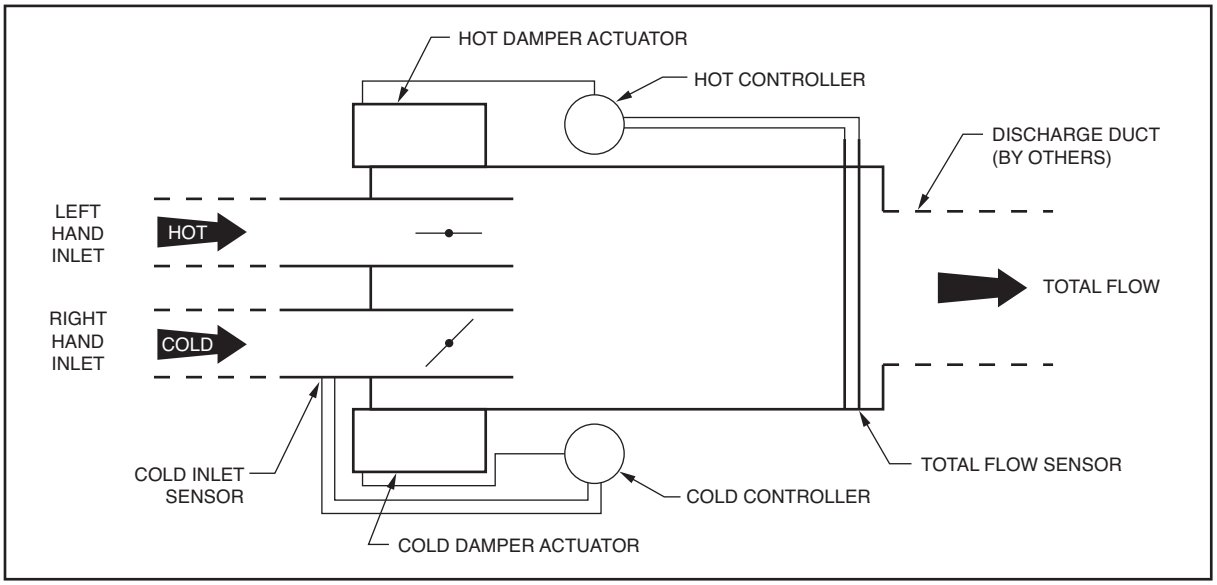
• COMBINATION INLET & TOTAL (I-T) AIR FLOW SENSING

• VAV HOT & COLD PRIMARY AIR

• PRESSURE INDEPENDENT

Model DU, I-T Air Flow Control Sequences control both flow and temperature of the supply air to the conditioned space. Air flow control is maintained by two pressure independent velocity controllers, each responsible for the control of cold and hot air flow, respectively. The air flow sensors, one each for the "cold controller" and the "hot controller", are arranged in series. One of the flow sensors is located in either the cold or hot supply inlet of the air terminal, and the other sensor is located at the discharge end of the air terminal. The total sensor at the discharge measures the combined hot and cold or total flow to the space. This arrangement is ideal for mixing of hot and cold flow while maintaining a constant flow rate from the air terminal to the space. Variable discharge temperatures are obtained by hot and cold mixture ratios.

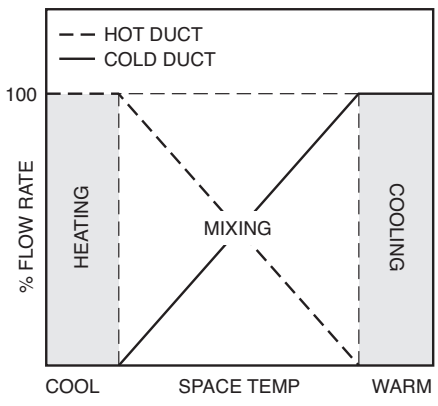
Figure 1: Example of Normally Closed Cold Damper with Inlet Sensor & Normally Open Hot Damper with Total Sensor



All I-T sequences are available with any combination of normally open or closed primary dampers (pneumatic) for use with direct or reverse action thermostats.

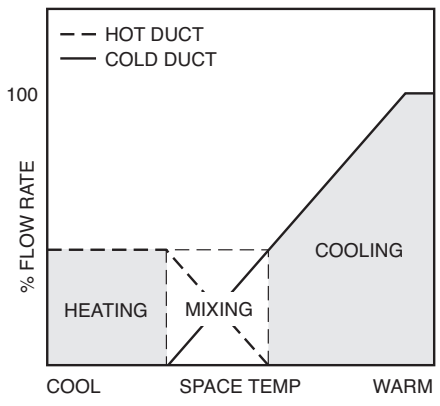
I-T1 Sequence

• Constant Total Air Flow



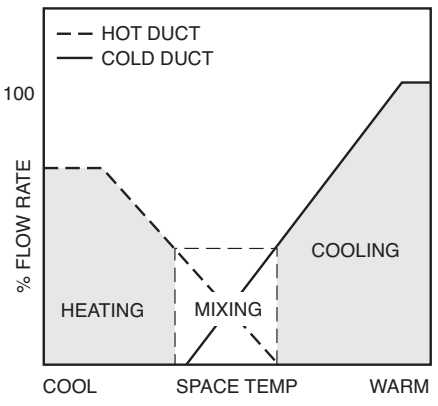
I-T2 Sequence

• Variable Total Air Flow With Mixing At Minimum Flow



I-T3 Sequence

• Dual Maximum Variable Total Air Flow With Mixing At Minimum Flow



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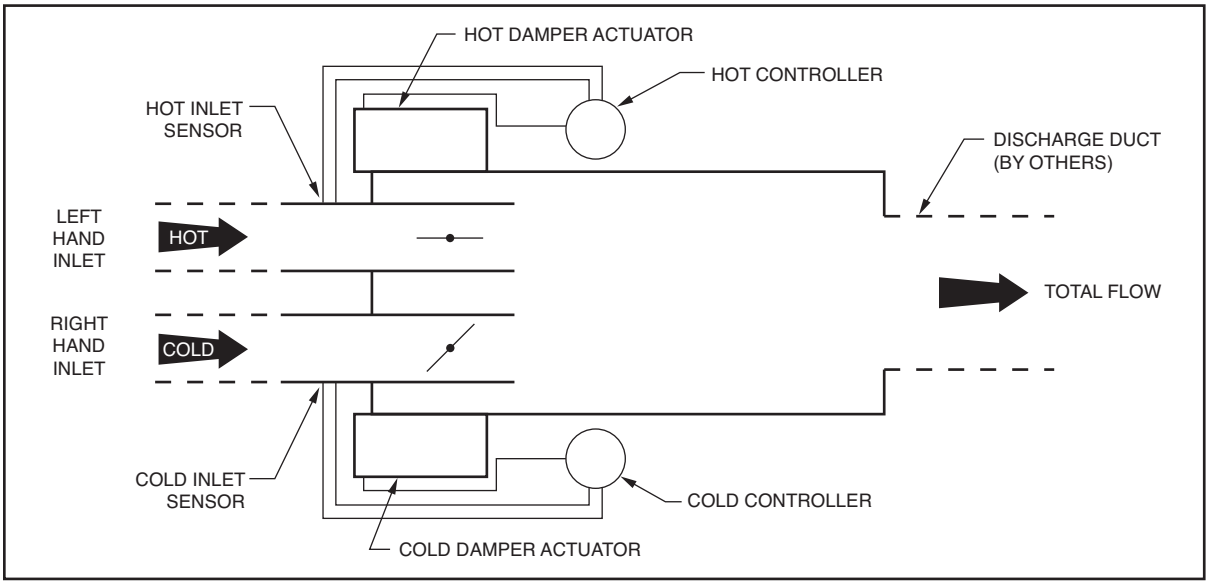
Typical Control Sequences

I SEQUENCES

- INLET (I) AIR FLOW SENSING
- VAV HOT & COLD PRIMARY AIR
- PRESSURE INDEPENDENT

Model DU, I Sequences control both flow and temperature of the supply air to the conditioned space. Air flow control is maintained by two pressure independent velocity controllers, each responsible for the control of cold and hot air flow, respectively. The air flow sensors, one each for the "cold controller" and the "hot controller", are arranged in parallel. One of the flow sensors is located in the cold supply inlet of the air terminal, and the other sensor is located in the hot supply inlet. Although inlet sensing sequences typically provide no mixing of hot and cold air, variations of mixing may be achieved with pneumatic controllers by varying their reset range & start point. I sequences are often used with Direct Digital Controls.

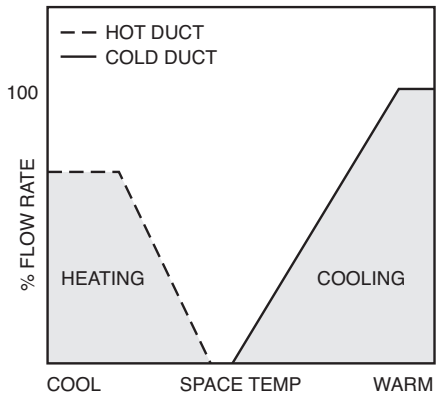
Figure 2: Example of Normally Closed Cold Damper with Inlet Sensor & Normally Open Hot Damper with Inlet Sensor



All I sequences are available with any combination of normally open or closed primary dampers (pneumatic) for use with direct or reverse action thermostats.

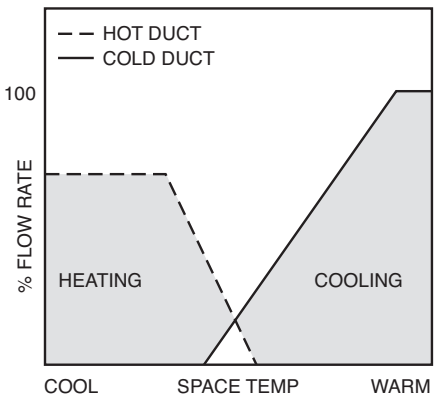
I-1 SEQUENCE

• Dual Maximum Flow With Zero Minimum - No Mixing



I-1A

• Dual Maximum Flow With Zero Minimum, & Adj. Mixing Overlap



I-2 SEQUENCE

• Dual Maximum & Dual Minimum Flow - No Mixing - N.C. Cold/N.O. Hot