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Date: 09/28/2026
Return Request: Normal
Project: EBBING F35 SAPF
Supplier: Comfort Systems USA
Manufacturer: Titus
Submittal: VAV – Single Duct Fan Powered
Submittal Number: 23 30 00-2.11.3.2
Drawing # and Installation: Mechanical

ARCHITECT

Burns and McDonnell
Kansas City, MO 64114

ENGINEER

Byron Edward K. Fonseca

GENERAL CONTRACTOR

BL Harbert International

MECHANICAL SUBCONTRACTOR

Comfort Systems USA (Arkansas), Inc.
116 Commercial Ave.
Lowell, AR 72745
(479) 770.8992

NOTES:

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CSUSA PROJECT NO.
26-5039

jzuber@comfortar.com



SUBMITTAL

F-35: Special Access Program Facility - Variable Volume, Single Duct, Fan-Powered Units

Submittal

LOCATION	Fort Smith, Arkansas
DATE	September 9, 2026
PRODUCTS	Variable Volume, Single Duct, Fan-Powered Terminal Units - FPVAV-101-201B - Titu Register - Other Spec - Other Schedule - Other IOM - Other

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Submittal

JOB NAME	F-35: Special Access Program Facility - Variable Volume, Single Duct, Fan-Powered Units
PRODUCT	Variable Volume, Single Duct, Fan-Powered Terminal Units - FPVAV-101-201B
MANUFACTURER	Titus HVAC
LOCATION	Fort Smith, Arkansas
DATE	September 9, 2026
SPECIFICATION	23 30 00
ENGINEER	US Army Corp of Engineers
CONTRACTOR	Comfort Systems USA
SUBMITTED BY	Joey Smith

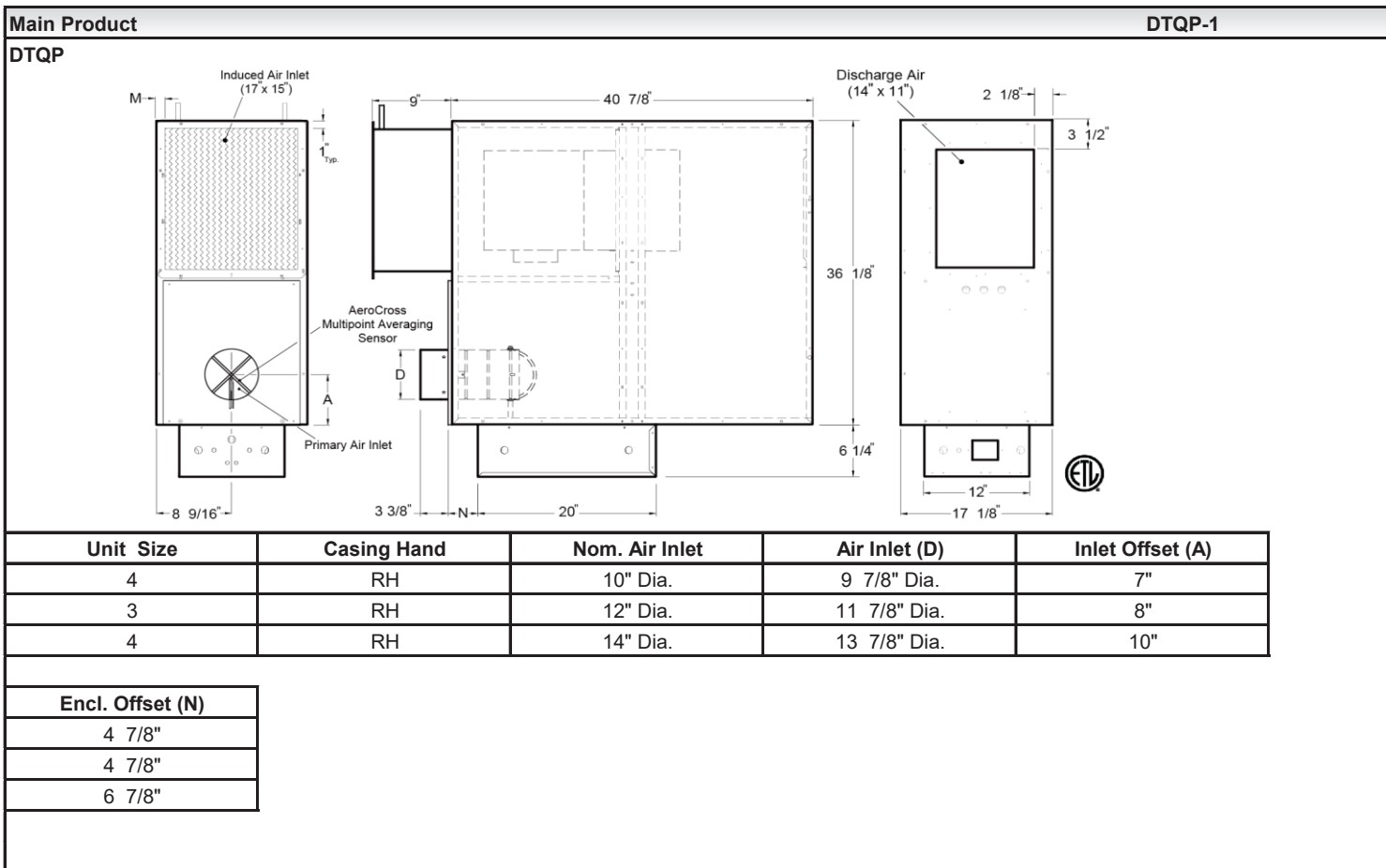
Project F-35 Special Access Progra
Architect
Engineer
Contractor
Designation



Date 09/09/2026
Office Powers of Arkansas
Preparer chad.fisher@powers-hvac.com
Version 2014.0.608

DTQP

Digital Parallel Fan Powered Terminal



General Description	DTQP-1
• Heavy steel casing, with leak resistant construction. • Dual density insulation, coated to prevent air erosion, meet requirements of NFPA 90A and UL 181. • Energy efficient fan motor, permanent split capacitor type, mounted in vibration isolators • Adjustable SCR fan speed control with minimum voltage stop. • Bottom access panels can be removed for service. • Multipoint, center averaging velocity sensor. • Primary air flow balancing connections. • Pressure independent primary flow control. • Single point electrical connections. • Rectangular discharge opening is designed for flanged duct connections.	

Option Schedule						DTQP-1	
ID	Quantity	Tag	UNIT SIZE	FAN BOX INLET SIZE	MAX PRIMARY CFM	MIN PRIMARY CFM	FAN CFM
1	1	FPVAV-101	4	10	1050	210	1100
2	1	FPVAV-102	3	12	1300	290	700

Project F-35 Special Access Progra
 Architect
 Engineer
 Contractor
 Designation



Date 09/09/2026
 Office Powers of Arkansas
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Option Schedule (continued) DTQP-1

SENSOR CODE 3 - AEROCROSS
UNIT ACC3 D - **TOGGLE DISC SW.**
LINER OPTION M - 1" EcoShield (Foil Face)
UNIT ACC4 F -IND. AIR FILTER
CASING CONFIG R -20 GA RIGHT HAND
UNIT ACC5 0 -NONE
FAN MOTOR VOLTAGE P -120V ECM MAN. PWM
WATER COIL W22 -2 ROW LH
DIGITAL CONTROLLER 0000 -NONE
ELECTRIC HEAT TYPE 000 -NONE
ACTUATOR TYPE 0000 -NONE
KW 0
CONTROL ACC1 00 -NONE
ELEC COIL ACC1 0 -NONE
CONTROL ACC2 00 -NONE
ELEC COIL ACC2 0 -NONE
CONTROL ACC3 00 -NONE
ELEC COIL ACC3 0 -NONE
UNIT ACC1 B -HANGER BRACKET
ELEC COIL ACC4 0 -NONE
UNIT ACC2 E -METAL CTRL ENCLOS

ID	Quantity	Tag	UNIT SIZE	FAN BOX INLET SIZE	MAX PRIMARY CFM	MIN PRIMARY CFM
3	1	FPVAV-201A	4	14	1680	360
4	1	FPVAV-201B	4	14	1680	360

FAN CFM
750
750

SENSOR CODE 3 - AEROCROSS
UNIT ACC3 D - **TOGGLE DISC SW.**
LINER OPTION M - 1" EcoShield (Foil Face)
UNIT ACC4 F -IND. AIR FILTER
CASING CONFIG R -20 GA RIGHT HAND
UNIT ACC5 0 -NONE
FAN MOTOR VOLTAGE P -120V ECM MAN. PWM
WATER COIL W23 -3 ROW LH
DIGITAL CONTROLLER 0000 -NONE
ELECTRIC HEAT TYPE 000 -NONE
ACTUATOR TYPE 0000 -NONE
KW 0
CONTROL ACC1 00 -NONE
ELEC COIL ACC1 0 -NONE
CONTROL ACC2 00 -NONE
ELEC COIL ACC2 0 -NONE
CONTROL ACC3 00 -NONE
ELEC COIL ACC3 0 -NONE
UNIT ACC1 B -HANGER BRACKET
ELEC COIL ACC4 0 -NONE
UNIT ACC2 E -METAL CTRL ENCLOS

Accessories DTQP-1

Motor Amperage Rating

FLA = Full Load Amperage

All fan motors are single phase, same voltage as electric coil (when supplied), with exception that 277V motors are used with 480V, 3 phase coils (4 wire wye).

UNIT SIZE	Motor HP	Voltage/Type	FLA
4	1/2	120V ECM	7.7
3	1/2	120V ECM	7.7

Project F-35 Special Access Progra
Architect
Engineer
Contractor
Designation

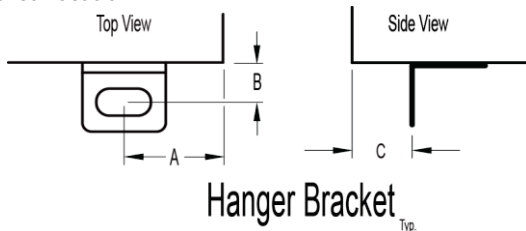


Date 09/09/2026
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Version 2014.0.608

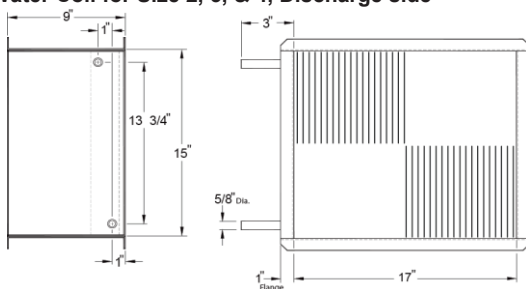
Accessories (continued)

DTQP-1

Hanger Bracket Location



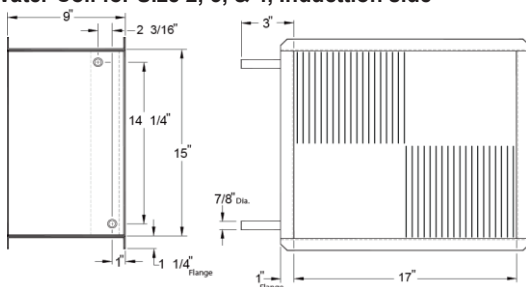
LH, 2-Row Water Coil for Size 2, 3, & 4, Discharge side



- Coils have 1/2 inch O.D. copper tubes, 0.016 thick wall.
- Aluminum plate fins, 10 per inch.
- Casing is 20 Gauge galvanized steel.
- Copper male solder Flanged duct connection.
- Flanged duct connection.
- Leak tested to 300 PSIG.
- Maximum working pressure, 240 PSIG
- Maximum 200 degree F water

UNIT SIZE	Water Weight (lbs)	Water Volume (gal)
4	2.9	0.35
3	2.9	0.35

LH, 3-Row Water Coil for Size 2, 3, & 4, Induction side



- Coils have 1/2 inch O.D. copper tubes, 0.016 thick wall.
- Aluminum plate fins, 10 per inch.
- Casing is 20 Gauge galvanized steel.
- Copper male solder Flanged duct connection.
- Flanged duct connection.
- Leak tested to 300 PSIG.
- Maximum working pressure, 240 PSIG
- Maximum 200 degree F water

UNIT SIZE	Water Weight (lbs)	Water Volume (gal)
4	4.2	0.5
3	4.2	0.5

Project: **F-35 Special Access Program Facility**Tag: **FPVAV-101**

Project Location:

File: F-35 Special Access Program Facility.tw2

Altitude: 449 Feet

Room:

User: Chad Fisher

AHU: AHU-101

Selection

Quantity	Model	Size			Primary CFM			Static			Max NC Levels		Electrical	
		Unit	Inlet	Outlet	Max.	Min.	Heating	Inlet	Down	Min	Rad	Dis	MCA	MOP
1	DTQP	04	10	14x11	1050	210	1310	1	0.25	0.23	48	29	9.6	15

- Notes:
1. See below for PWL calculations used to obtain Max NC rating.
 2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
 3. For parallel boxes, inlet static pressure includes downstream pressure drop.

Water pressure drop (WPd) is in ft. water

Hot Water Heating Coil Performance

MBH	CFM	EAT	Box LAT	APd	GPM	EWT	LWT	WPd	Rows	Conn.	% Glycol	FPI
32.3	1100	65.1	88	0.18	2.4	150	122.2	1.41	2	LH	0	10

Fan Performance

CFM	Fan SP	Hp
1100	0.43	0.50

Coil Selection Method: LAT - Solve for GPM at desired LAT and max water flow

Coil Position : Induction

Other Information**Accessories**

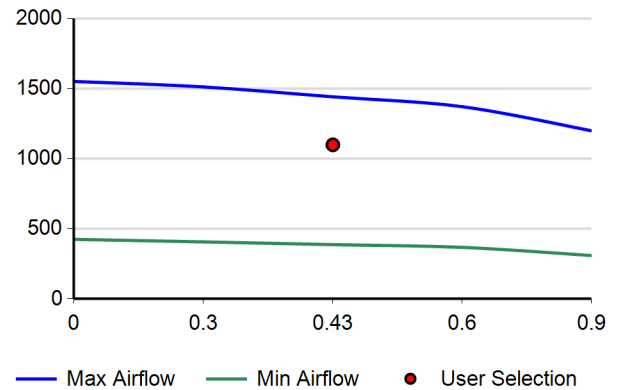
Maximum CFM : 2751

Design CFM : 1050

Safety Factor: 62%

Controls: DDC

Unit L x W x H: 40.875 X 36.125 X 17.125 in.

Heat Coil: Hot Water**Lining:** 1" Foil EcoShield**Attenuator:** No**Filter:** No**Motor:** ECM**Acoustic Summary**

Sound Description	Radiated Sound PWL						NC	Discharge Sound PWL						NC
	2	3	4	5	6	7		2	3	4	5	6	7	
Primary Sound	67	59	58	58	47	30	*	74	59	51	49	43	39	*
Fan Only Sound	76	69	72	73	66	55	*	76	71	67	60	58	58	*
Total Attenuation Per: AHRI 885-98	18	19	20	26	31	36	*	29	30	41	51	52	39	*
Room Sound Level	58	50	52	47	35	19	48	47	41	26	-	-	19	29

- Notes:
1. Selections are based on Titus as Manufacturer.
 2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
 3. All NC levels determined using AHRI 885-2008 Appendix E.
 4. All airflow, pressure losses and heating performance values have been corrected for altitude.
 5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
 6. Water pressure drop (WPd) units is in ft. water.

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Project: **F-35 Special Access Program Facility**Tag: **FPVAV-102**

Project Location:

File: F-35 Special Access Program Facility.tw2

Altitude: 449 Feet

Room:

User: Chad Fisher

AHU: AHU-101

Selection

Quantity	Model	Size			Primary CFM			Static			Max NC Levels		Electrical	
		Unit	Inlet	Outlet	Max.	Min.	Heating	Inlet	Down	Min	Rad	Dis	MCA	MOP
1	DTQP	03	12	14x11	1300	290	990	1	0.25	0.19	44	25	9.6	15

- Notes:
1. See below for PWL calculations used to obtain Max NC rating.
 2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
 3. For parallel boxes, inlet static pressure includes downstream pressure drop.

Water pressure drop (WPd) is in ft. water

Hot Water Heating Coil Performance

MBH	CFM	EAT	Box LAT	APd	GPM	EWT	LWT	WPd	Rows	Conn.	% Glycol	FPI
26.2	700	63.5	88	0.09	2.1	150	124.6	1.13	2	LH	0	10

Fan Performance

CFM	Fan SP	Hp
700	0.34	0.50

Coil Selection Method: LAT - Solve for GPM at desired LAT and max water flow

Coil Position : Induction

Other Information**Accessories**

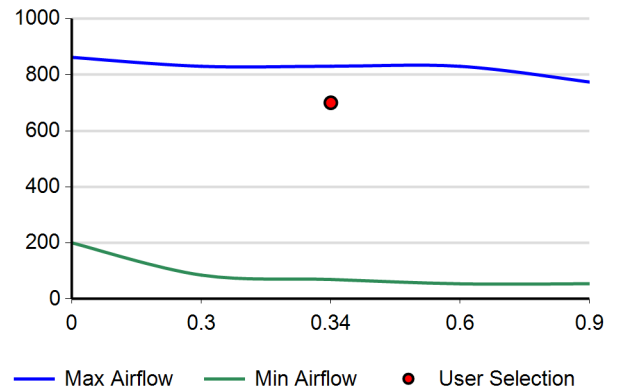
Maximum CFM : 2015

Design CFM : 1300

Safety Factor: 35%

Controls: DDC

Unit L x W x H: 40.875 X 36.125 X 17.125 in.

Heat Coil: Hot Water**Lining:** 1" Foil EcoShield**Attenuator:** No**Filter:** No**Motor:** ECM**Acoustic Summary**

Sound Description	Radiated Sound PWL						NC	Discharge Sound PWL						NC
	2	3	4	5	6	7		2	3	4	5	6	7	
Primary Sound	68	60	60	58	48	31	*	75	61	53	48	44	40	*
Fan Only Sound	72	66	69	69	62	49	*	74	68	63	56	52	51	*
Total Attenuation Per: AHRI 885-98	18	19	20	26	31	36	*	29	30	41	51	52	39	*
Room Sound Level	54	47	49	43	31	13	44	45	38	22	-	-	12	25

- Notes:
1. Selections are based on Titus as Manufacturer.
 2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
 3. All NC levels determined using AHRI 885-2008 Appendix E.
 4. All airflow, pressure losses and heating performance values have been corrected for altitude.
 5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
 6. Water pressure drop (WPd) units is in ft. water.

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Project: **F-35 Special Access Program Facility**Tag: **FPVAV-201A**

Project Location:

File: F-35 Special Access Program Facility.tw2

Altitude: 449 Feet

Room:

User: Chad Fisher

AHU: AHU-102

Selection

Quantity	Model	Size			Primary CFM			Static			Max NC Levels		Electrical	
		Unit	Inlet	Outlet	Max.	Min.	Heating	Inlet	Down	Min	Rad	Dis	MCA	MOP
1	DTQP	04	14	14x11	1680	360	1110	1	0.25	0.27	43	27	9.6	15

- Notes:
1. See below for PWL calculations used to obtain Max NC rating.
 2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
 3. For parallel boxes, inlet static pressure includes downstream pressure drop.

Water pressure drop (WPd) is in ft. water

Hot Water Heating Coil Performance

MBH	CFM	EAT	Box LAT	APd	GPM	EWT	LWT	WPd	Rows	Conn.	% Glycol	FPI
29.9	750	63.1	88	0.15	1.4	150	105	0.35	3	LH	0	10

Fan Performance

CFM	Fan SP	Hp
750	0.4	0.50

Coil Selection Method: LAT - Solve for GPM at desired LAT and max water flow

Coil Position : Induction

Other Information**Accessories**

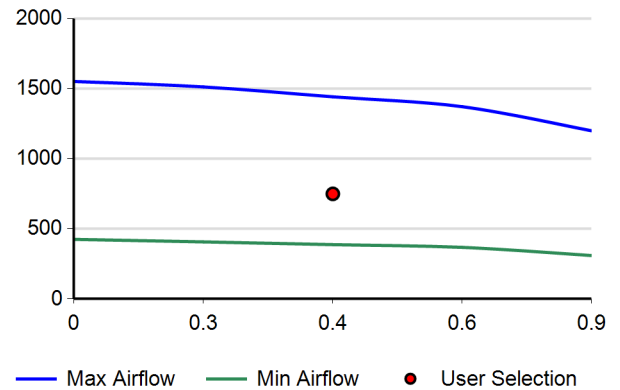
Maximum CFM : 3022

Design CFM : 1680

Safety Factor: 44%

Controls: DDC

Unit L x W x H: 40.875 X 36.125 X 17.125 in.

Heat Coil: Hot Water**Lining:** 1" Foil EcoShield**Attenuator:** No**Filter:** No**Motor:** ECM**Acoustic Summary**

Sound Description	Radiated Sound PWL						NC	Discharge Sound PWL						NC
	2	3	4	5	6	7		2	3	4	5	6	7	
Primary Sound	69	61	59	57	52	37	*	75	58	54	48	45	41	*
Fan Only Sound	73	65	68	68	61	49	*	74	69	64	57	54	53	*
Total Attenuation Per: AHRI 885-98	18	19	20	26	31	36	*	29	30	41	51	52	39	*
Room Sound Level	55	46	48	42	30	13	43	45	39	23	-	-	14	27

- Notes:
1. Selections are based on Titus as Manufacturer.
 2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
 3. All NC levels determined using AHRI 885-2008 Appendix E.
 4. All airflow, pressure losses and heating performance values have been corrected for altitude.
 5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
 6. Water pressure drop (WPd) units is in ft. water.

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Project: **F-35 Special Access Program Facility**Tag: **FPVAV-201B**

Project Location:

File: F-35 Special Access Program Facility.tw2

Altitude: 449 Feet

Room:

User: Chad Fisher

AHU: AHU-102

Selection

Quantity	Model	Size			Primary CFM			Static			Max NC Levels		Electrical	
		Unit	Inlet	Outlet	Max.	Min.	Heating	Inlet	Down	Min	Rad	Dis	MCA	MOP
1	DTQP	04	14	14x11	1680	360	1110	1	0.25	0.27	43	27	9.6	15

- Notes:
1. See below for PWL calculations used to obtain Max NC rating.
 2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
 3. For parallel boxes, inlet static pressure includes downstream pressure drop.

Water pressure drop (WPd) is in ft. water

Hot Water Heating Coil Performance

MBH	CFM	EAT	Box LAT	APd	GPM	EWT	LWT	WPd	Rows	Conn.	% Glycol	FPI
29.9	750	63.1	88	0.15	1.4	150	104.9	0.35	3	LH	0	10

Fan Performance

CFM	Fan SP	Hp
750	0.4	0.50

Coil Selection Method: LAT - Solve for GPM at desired LAT and max water flow

Coil Position : Induction

Other Information**Accessories**

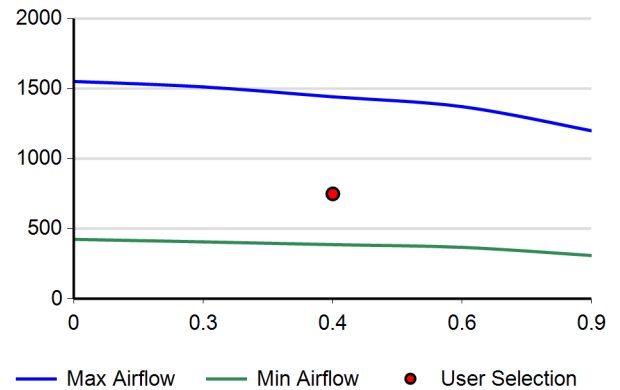
Maximum CFM : 3022

Design CFM : 1680

Safety Factor: 44%

Controls: DDC

Unit L x W x H: 40.875 X 36.125 X 17.125 in.

Heat Coil: Hot Water**Lining:** 1" Foil EcoShield**Attenuator:** No**Filter:** No**Motor:** ECM**Acoustic Summary**

Sound Description	Radiated Sound PWL						NC	Discharge Sound PWL						NC
	2	3	4	5	6	7		2	3	4	5	6	7	
Primary Sound	69	61	59	57	52	37	*	75	58	54	48	45	41	*
Fan Only Sound	73	65	68	68	61	49	*	74	69	64	57	54	53	*
Total Attenuation Per: AHRI 885-98	18	19	20	26	31	36	*	29	30	41	51	52	39	*
Room Sound Level	55	46	48	42	30	13	43	45	39	23	-	-	14	27

- Notes:
1. Selections are based on Titus as Manufacturer.
 2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
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Fan Powered Terminal Unit Schedule																																
F-35 Special Access Program Facility																																
Tag	AHU	Room	Model	Size				Primary CFM			Static Pressure			NC Levels		Atten.	Controls	Fan				Hot Water Heat Coil										
				Unit	Inlet	Outlet	Hand	Max	Min	Heating	Inlet	Down	Min	Rad	Dis					CFM	ESP	Hp	Volt/Ph	CFM	MBH	EAT	LAT	APd	GPM	EWT	LWT	WPd
FPVAV-101	AHU-101		DTQP	04	10	14x11	RH	1050	210	1310	1	0.25	0.23	48	29	No	DDC	1100	0.43	0.50	120/1	1100	32.3	65.1	88	0.18	2.4	150	122.2	1.41	2-L	
FPVAV-102	AHU-101		DTQP	03	12	14x11	RH	1300	290	990	1	0.25	0.19	44	25	No	DDC	700	0.34	0.50	120/1	700	26.2	63.5	88	0.09	2.1	150	124.6	1.13	2-L	
FPVAV-201A	AHU-102		DTQP	04	14	14x11	RH	1680	360	1110	1	0.25	0.27	43	27	No	DDC	750	0.4	0.50	120/1	750	29.9	63.1	88	0.15	1.4	150	105	0.35	3-L	
FPVAV-201B	AHU-102		DTQP	04	14	14x11	RH	1680	360	1110	1	0.25	0.27	43	27	No	DDC	750	0.4	0.50	120/1	750	29.9	63.1	88	0.15	1.4	150	104.9	0.35	3-L	

- Notes:
- 1. Selections are based on Titus as Manufacturer.
 - 2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
 - 3. All NC levels determined using AHRI 885-2008 Appendix E.
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 - 6. Water pressure drop (WPd) units is in ft. water.

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		Electrical	
vs	FPI	MCA	MOP
H	10	9.6	15
H	10	9.6	15
H	10	9.6	15
H	10	9.6	15

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Submittal

JOB NAME	F-35: Special Access Program Facility - Variable Volume, Single Duct, Fan-Powered Units
PRODUCT	Register
MANUFACTURER	Other
LOCATION	Fort Smith, Arkansas
DATE	September 9, 2026
ENGINEER	US Army Corp of Engineers
CONTRACTOR	Comfort Systems USA
SUBMITTED BY	Joey Smith

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION

Ebbing ANGB Special Access Program Facility

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEW	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/	REMARKS
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	DATE RCD FRM APPR AUTH	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		23 21 23	Equipment Data	2.2.4	G												
			Training Period	3.5.2	G												
			SD-06 Test Reports														
			Field Quality Control	3.3													
			SD-07 Certificates														
			Manufacturer's Representative	1.3.1													
			SD-10 Operation and Maintenance														
			Data														
			Operation and Maintenance	3.5.1	G												
			Manuals														
			Training	3.5.2	G												
		23 30 00	SD-02 Shop Drawings														
			Detail Drawings	1.4.4	G												
			SD-03 Product Data														
			Insulated Nonmetallic Flexible	2.8.1.1													
			Duct Runouts														
			Duct Connectors	2.8.1.1													
			Duct Access Doors	2.8.2	G												
			Fire Dampers	2.8.3													
			Manual Balancing Dampers	2.8.4	G												
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			Acoustical Duct Liner	2.8.6.2													
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SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION

Ebbing ANGB Special Access Program Facility

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/	REMARKS
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	DATE RCD FRM APPR AUTH	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		23 30 00	Room Fan-Coil Units	2.11.1	G												
			Variable Volume, Single Duct Terminal Units	2.11.3.1	G												
			Variable Volume, Single Duct, Fan-Powered Terminal Units	2.11.3.2	G												
			Reheat Units	2.11.3.3	G												
			Energy Recovery Devices	2.12	G												
			Test Procedures	1.4.5													
			Diagrams	1.2.1.2	G												
			Indoor Air Quality for Duct Sealants	2.8.1	S												
			SD-06 Test Reports														
			Performance Tests	3.11	G												
			Damper Acceptance Test	3.9	G												
			SD-07 Certificates														
			Ozone Depleting Substances Technician Certification	1.4.3													
			SD-08 Manufacturer's Instructions														
			Manufacturer's Installation Instructions	3.2													
			Operation and Maintenance Training	3.13.2													
			SD-10 Operation and Maintenance Data														
			Operation and Maintenance Manuals	3.13.1	G												

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION						CONTRACTOR											
Ebbing ANGB Special Access Program Facility																	
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION		DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
Page 16 of 26		23 30 00	Fire Dampers	2.8.3	G												
			Manual Balancing Dampers	2.8.4	G												
			Air Handling Units	2.10	G												
			Room Fan-Coil Units	2.11.1	G												
			Variable Volume, Single Duct Terminal Units	2.11.3.1	G												
			Variable Volume, Single Duct, Fan-Powered Terminal Units	2.11.3.2	G												
			Reheat Units	2.11.3.3	G												
			Energy Recovery Devices	2.12	G												
			SD-11 Closeout Submittals														
			Indoor Air Quality During Construction	3.12	S												
		23 52 00	SD-02 Shop Drawings														
			Detail Drawings	1.5													
			SD-03 Product Data														
			Materials and Equipment	2.1.1													
			Spare Parts	1.5													
			Water Treatment System	2.10													
			Boiler Water Treatment	2.10													
			Heating System Tests	3.7													
			Welding	1.3													
			Qualifications	3.7													
			Field Instructions	3.9													
			Tests	3.7													
			SD-06 Test Reports														

Submittal

JOB NAME	F-35: Special Access Program Facility - Variable Volume, Single Duct, Fan-Powered Units
PRODUCT	Spec
MANUFACTURER	Other
LOCATION	Fort Smith, Arkansas
DATE	September 9, 2026
ENGINEER	US Army Corp of Engineers
CONTRACTOR	Comfort Systems USA
SUBMITTED BY	Joey Smith

velocity across the inlet. Obtain flow measurement within plus or minus 5 percent of rated airflow with 1.5 diameters of straight duct upstream of unit and inlet static variation of 0.5 to 5.0 inches water gauge. Supply flow measuring taps for field balancing airflows.

- e. Attach a flow chart to each unit. Base acoustic performance of the terminal units upon units tested according to AHRI 880 I-P with the calculations prepared in accordance with AHRI 885. Provide sound power level as indicated. Show discharge sound power for minimum and 1-1/2 inches water gauge inlet static pressure. Provide acoustical lining according to NFPA 90A.
- f. Provide unit that incorporates single point electrical connection with electrical disconnect. Provide electrical components that are UL or ETL listed, installed in accordance with NFPA 70 and mounted in control box.

2.11.3.1 Variable Volume, Single Duct Terminal Units

Provide variable volume, single duct, terminal units with a calibrated air volume sensing device, air valve or damper, actuator, and accessory relays. Provide units that control air volume to within plus or minus 5 percent of each air set point volume as determined by the thermostat with variations in inlet pressures from 3/4 to 6 inch water gauge. Provide units with an internal resistance not exceeding 0.4 inch water gauge at maximum flow range. Provide external differential pressure taps separate from the control pressure taps for air flow measurement with a 0 to 1 inch water gauge range.

2.11.3.2 Variable Volume, Single Duct, Fan-Powered Terminal Units

Provide variable volume, single duct, fan-powered terminal units with a calibrated air volume sensing device, air valve or damper, actuator, fan and motor, and accessory relays. Provide units that have recirculating air inlet equipped with filter frame. Provide UL listed throwaway one inch thick fiberglass filters, standard dust-holding capacity. Provide units that control primary air volume to within plus or minus 5 percent of each air set point as determined by the thermostat with variations in inlet pressure from 3/4 to 6 inch water gauge. Provide unit fan that is centrifugal, direct-driven, double-inlet type with forward curved blades. Provide either single speed with speed controller or three-speed, permanently lubricated, high efficiency permanent split-capacitor type fan motor with thermal overload protection. Isolate fan/motor assembly from the casing to minimize vibration transmission. Provide factory furnished fan control that is wired into the unit control system. Provide a factory-mounted pressure switch to operate the unit fan whenever pressure exists at the unit primary air inlet or when the control system fan operates.

2.11.3.3 Reheat Units

2.11.3.3.1 Hot Water Coils

Provide fin-and-tube type hot-water coils constructed of seamless copper tubes and copper or aluminum fins mechanically bonded or soldered to the tubes. Provide headers that are constructed of cast iron, welded steel or copper. Provide casing and tube support sheets that are 16 gauge, galvanized steel, formed to provide structural strength. Provide tubes that are correctly circuited for proper water velocity without excessive

Submittal

JOB NAME	F-35: Special Access Program Facility - Variable Volume, Single Duct, Fan-Powered Units
PRODUCT	Schedule
MANUFACTURER	Other
LOCATION	Fort Smith, Arkansas
DATE	September 9, 2026
ENGINEER	US Army Corp of Engineers
CONTRACTOR	Comfort Systems USA
SUBMITTED BY	Joey Smith

VARIABLE AIR VOLUME TERMINAL UNIT SCHEDULE (VAV)

TAG	AHU CONNECTION	ROOM SERVED	NECK SIZE (IN)	TYPE	CASING TYPE	MAX AIRFLOW (CFM)	MIN. AIRFLOW (CFM)	ALTITUDE (FT)	HEATING COIL										MIN INLET PRESSUE (IN W.C.)	SOUND LEVEL (dBA)	ELECTRICAL			
									CAPACITY (MBH)	HEATING AIRFLOW (CFM)	AIRSIDE		PRESSURE DROP (IN W.C.)	FLOW (GPM)	WATERSIDE		PRESSURE DROP (FT W.C.)	ROWS			FPI	VOLTS	PHASE	NOTES
											EAT (DEG . F)	LAT (DEG . F)			EWT (DEG. F)	LWT (DEG. F)								
VAV-101	AHU-101	105 - STEP DESK	6	SINGLE DUCT	STANDARD	310	65	449	2.3	65	55	88	0.2	0.5	150	140.9	1	1-RH	10	1	30	120	1	1,2,3,4
VAV-102	AHU-101	106 - CORRIDOR	4	SINGLE DUCT	STANDARD	160	30	449	2.3	65	55	88	0.2	0.5	150	140.9	1	1-RH	10	1	30	120	1	1,2,3,4
VAV-103	AHU-101	107 - SCHEDULE & TRAINING	6	SINGLE DUCT	STANDARD	360	65	449	7.8	220	55	88	0.2	0.7	150	127.8	1	2-RH	10	1	30	120	1	1,2,3
VAV-104	AHU-101	108 - DO	4	SINGLE DUCT	STANDARD	165	30	449	4.6	130	55	88	0.2	0.7	150	137	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-105	AHU-101	109 - SARM	4	SINGLE DUCT	STANDARD	145	30	449	4.1	110	55	90	0.2	0.5	150	133.5	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-106	AHU-101	110 - SARM ADMIN	6	SINGLE DUCT	STANDARD	300	65	449	8.1	230	55	88	0.2	0.7	150	123	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-107	AHU-101	111 - STAN/EVAL	6	SINGLE DUCT	STANDARD	310	65	449	6.0	170	55	88	0.2	0.5	150	126	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-108	AHU-101	112 - AFE MAINTENANCE	8	SINGLE DUCT	STANDARD	530	125	449	5.3	150	55	88	0.2	0.6	150	132.5	1	1-RH	12	1	30	120	1	1,2,3,4
VAV-109	AHU-101	116 - PILOT LOCKER ROOM	8	SINGLE DUCT	STANDARD	550	550	449	11.6	550	55	75	0.2	0.7	150	116.5	1	1-RH	12	1	30	120	1	1,2,3,4
VAV-110	AHU-101	121 - HALL, 122 - CORRIDOR	4	SINGLE DUCT	STANDARD	140	30	449	3.4	95	55	88	0.2	0.5	150	136.5	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-111	AHU-101	124 - CORRIDOR, 125 - BREAK	6	SINGLE DUCT	STANDARD	370	65	449	4.6	130	55	88	0.2	0.6	150	134.8	1	1-RH	10	1	30	120	1	1,2,3,4
VAV-112	AHU-101	126 - MAINT DEBRIEF	6	SINGLE DUCT	STANDARD	270	65	449	9.0	240	55	90	0.2	0.8	150	124.5	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-113	AHU-101	131 - MAN TRAP, 135 SECURITY	8	SINGLE DUCT	STANDARD	640	125	449	9.0	255	55	88	0.2	0.6	150	120	2	1-RH	10	1	30	120	1	1,2,3,4
VAV-114	AHU-101	132 - CORRIDOR	8	SINGLE DUCT	STANDARD	410	125	449	17.3	405	55	95	0.2	1.1	150	118.5	1	1-RH	10	1	30	120	1	1,2,3
VAV-115	AHU-101	141 - MAN TRAP, 142 - VAULT 1 MISSION PLANNING	8	SINGLE DUCT	STANDARD	550	125	449	5.1	145	55	88	0.2	0.5	150	129.5	1	1-RH	12	1	30	120	1	1,2,3,4
VAV-116	AHU-101	143 - VAULT 1 ALIS/ODIN ADMIN	4	SINGLE DUCT	STANDARD	135	30	449	2.3	65	55	88	0.2	0.5	150	140.8	1	1-RH	10	1	30	120	1	1,2,3,4
VAV-117	AHU-101	145 - VAULT 1 LG BRIEF	6	SINGLE DUCT	STANDARD	280	65	449	8.3	235	55	88	0.2	0.8	150	129.3	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-118	AHU-101	146 - VAULT 1 SM BRIEF	6	SINGLE DUCT	STANDARD	180	65	449	3.0	85	55	88	0.2	0.5	150	138	1	1-RH	10	1	30	120	1	1,2,3,4
VAV-119	AHU-101	147 - VAULT 1 SM BRIEF	4	SINGLE DUCT	STANDARD	165	30	449	2.8	80	55	88	0.2	0.5	150	138.8	1	1-RH	10	1	30	120	1	1,2,3,4
VAV-120	AHU-101	151 - MAN TRAP 2, 152 - VAULT 2 MISSION PLANNING	8	SINGLE DUCT	STANDARD	550	125	449	5.3	150	55	88	0.2	0.6	150	132.5	1	1-RH	12	1	30	120	1	1,2,3,4
VAV-121	AHU-101	153 - VAULT 2 ALIS/ODIN ADMIN	4	SINGLE DUCT	STANDARD	135	30	449	2.4	65	55	90	0.2	0.5	150	140.2	1	1-RH	10	1	30	120	1	1,2,3,4
VAV-122	AHU-101	155 - VAULT 2 LG BRIEF	6	SINGLE DUCT	STANDARD	240	65	449	3.7	105	55	88	0.2	0.5	150	135.3	1	1-RH	12	1	30	120	1	1,2,3,4
VAV-123	AHU-101	156 - VAULT 2 SM BRIEF	6	SINGLE DUCT	STANDARD	185	65	449	3.0	85	55	88	0.2	0.5	150	138	1	1-RH	10	1	30	120	1	1,2,3,4
VAV-124	AHU-101	157 - VAULT 2 SM BRIEF	4	SINGLE DUCT	STANDARD	165	30	449	3.2	90	55	88	0.2	0.5	150	137.3	1	1-RH	10	1	30	120	1	1,2,3,4
VAV-125	AHU-101	161 - MAN TRAP 3, 162 - VAULT 3 MISSION	8	SINGLE DUCT	STANDARD	560	125	449	5.3	150	55	88	0.2	0.6	150	132.5	1	2-RH	12	1	30	120	1	1,2,3,4
VAV-126	AHU-101	163 - VAULT 3 SM BRIEF	4	SINGLE DUCT	STANDARD	170	30	449	3.2	90	55	88	0.2	0.5	150	137.3	1	1-RH	10	1	30	120	1	1,2,3,4
VAV-127	AHU-101	164 - VAULT 3 SM BRIEF	6	SINGLE DUCT	STANDARD	185	65	449	3.2	90	55	88	0.2	0.5	150	137.3	1	1-RH	10	1	30	120	1	1,2,3,4
VAV-128	AHU-101	165 - VAULT 3 SM BRIEF	6	SINGLE DUCT	STANDARD	280	65	449	8.3	235	55	88	0.2	0.8	150	129.4	1	1-RH	10	1	30	120	1	1,2,3,4
VAV-129	AHU-101	166 - VAULT 3 ALIS/ODIN	4	SINGLE DUCT	STANDARD	140	30	449	2.3	65	55	88	0.2	0.5	150	140.8	1	1-RH	10	1	30	120	1	1,2,3,4
VAV-130	AHU-101	129 - PRINT/COPY	4	SINGLE DUCT	STANDARD	135	135	449	2.9	135	55	75	0.2	0.5	150	138.4	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-201	AHU-102	202 - COMMAND SUPPORT STAFF	10	SINGLE DUCT	STANDARD	810	210	449	18.0	510	55	88	0.25	1.4	150	124.3	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-202	AHU-102	203 - APC/RA	4	SINGLE DUCT	STANDARD	140	30	449	3.7	105	55	88	0.2	0.5	150	135.3	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-203	AHU-102	204 - SQUADRON COMMANDER	6	SINGLE DUCT	STANDARD	230	65	449	7.1	200	55	88	0.2	0.7	150	129.8	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-204	AHU-102	205 - CONFERENCE ROOM	8	SINGLE DUCT	STANDARD	620	125	449	12.7	360	55	88	0.25	1.0	150	124.5	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-205	AHU-102	206 - IMSO	4	SINGLE DUCT	STANDARD	150	30	449	3.9	110	55	88	0.2	0.5	150	134.4	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-206	AHU-102	207 - SNR M-1	6	SINGLE DUCT	STANDARD	250	65	449	6.2	175	55	88	0.2	0.5	150	125.3	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-207	AHU-102	208 - SNR M-2	4	SINGLE DUCT	STANDARD	175	30	449	4.6	130	55	88	0.2	0.6	150	134.8	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-208	AHU-102	209 - SNR M-3	6	SINGLE DUCT	STANDARD	220	65	449	5.1	145	55	88	0.2	0.5	150	129.6	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-209	AHU-102	212 & 213 - COPY & STUDENT COLLAB	8	SINGLE DUCT	STANDARD	450	125	449	11.8	335	55	88	0.2	0.9	150	123.8	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-210A	AHU-102	214 - LARGE BRIEFING	10	SINGLE DUCT	STANDARD	750	210	449	12.3	350	55	88	0.35	1.0	150	125.4	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-210B	AHU-102	214 - LARGE BRIEFING	10	SINGLE DUCT	STANDARD	750	210	449	12.3	350	55	88	0.35	1.0	150	125.4	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-211	AHU-102	215 - AV	8	SINGLE DUCT	STANDARD	490	125	449	2.8	125	55	76	0.2	0.5	150	138.8	1	1-RH	12	1	30	120	1	1,2,3,4
VAV-212	AHU-102	217 - STUDENT LOCKERS	8	SINGLE DUCT	STANDARD	580	580	449	15.5	580	55	80	0.35	1.0	150	119	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-213	AHU-102	226 - IP M-1	4	SINGLE DUCT	STANDARD	145	30	449	4.2	120	55	88	0.2	0.6	150	136	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-214	AHU-102	227 - IP M-2	4	SINGLE DUCT	STANDARD	145	30	449	4.2	120	55	88	0.2	0.6	150	136	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-215	AHU-102	211 - RA	6	SINGLE DUCT	STANDARD	325	65	449	8.5	240	55	88	0.2	0.8	150	128.8	1	2-RH	10	1	30	120	1	1,2,3,4
VAV-216	AHU-102	229 - BREAKROOM	8	SINGLE DUCT	STANDARD	690	125	449	15															

- NOTES:
1. OPERATING FLUID IS WATER.
2. PROVIDE SINGLE POINT 120V ELECTRICAL CONNECTION AND DISCONNECT SWITCH.
3. PROVIDE CONTROL POWER TRANSFORMER (IF REQUIRED).
4. MINIMUM INLET STATIC PRESSURE INCLUDES PRESSURE DORP ACROSS THE VAV BOX. A PRESSURE DROP OF 0.25 IN W.C. IS ASSUMED IN THE LOW PRESSURE DUCT DOWNSTREAM OF VAV BOX.

FAN POWERED VARIABLE AIR VOLUME TERMINAL UNIT SCHEDULE (FPVAV)

Submittal

JOB NAME	F-35: Special Access Program Facility - Variable Volume, Single Duct, Fan-Powered Units
PRODUCT	IOM
MANUFACTURER	Other
LOCATION	Fort Smith, Arkansas
DATE	September 9, 2026
ENGINEER	US Army Corp of Engineers
CONTRACTOR	Comfort Systems USA
SUBMITTED BY	Joey Smith

Fan Powered Terminals VAV Terminals

Receiving Inspection

After unpacking the terminal, check it for shipping damage. If any shipping damage is found, report it immediately to the delivering carrier. Store units in a clean dry location and do not stack more than four high.

Also, inspect damper rotation of the unit by rotating the damper by hand to check for free movement, and ensure there is no damage or binding of the damper. If controls are connected to the damper, release the manual clutch (most controls are equipped with this) and rotate the damper by hand. If there is any restriction to the rotation of the damper, contact your Titus rep and inform them of this issue.

Caution: Do not use the inlet collar, damper shaft, flow sensor or air tubing as a handle to lift or move assembly. Damage to the unit or controls may result.

Before installation, remove fan packing and all foreign material from the unit. Check the blower wheel for free rotation.

Supporting the Assembly

Suspend the unit from the building structure in a horizontal plane with the access panels facing downward.

Do not obstruct the access panels with support channels or straps.

One inch long sheet metal screws can be used to penetrate the casing (see Figure 1). Use the support method prescribed for the rectangular duct on the job specifications. Unit may be equipped with optional hanging brackets (see Figure 2). Hanger rod up to 7/16" diameter may be used.

Any flexible conduit shall be supported per UL 60335, national electric code, and any state and local codes having jurisdiction

Note: If equipped with pneumatic controls, or unit is parallel fan type (Model TQP or FLP), the terminal must be mounted right side up. It must be level within ± 10 degrees of horizontal, both parallel to the air flow and at the right angle of air flow. The control side of the terminal is labeled with an arrow indicating UP.

Duct Connections

Slip each inlet duct over the inlet collar of the terminal. Fasten and seal the connection by the method prescribed by the job specification. The diameter of the inlet duct "D" in inches must be equal to the listed size of the terminal; e.g. a duct that actually measures 8 inches must be fitted to a size 8 terminal. The inlet collar of the terminal is made 1/8" smaller than listed size in order to fit inside the duct (see Figure 1).

Important: Do not insert duct work inside the inlet collar of the assembly.

Inlet duct should be installed in accordance with SMACNA guidelines. Rectangular discharge opening is designed for flanged duct connections. Fasten and seal by method prescribed in the job specification.

If single-point electronic velocity sensor is used, 3 to 5 inlet duct diameters of straight duct should be provided at the terminal inlet.

Minimum Access

Fan Powered terminals require sufficient clearance to service the fan blower assembly and internal actuator (if so equipped) from the bottom of the unit,

low voltage controls from the side of the unit, and line voltage motor controls or electric heat section (if so equipped) from the rear or discharge of the unit.

For bottom access panel removal, 3" minimum vertical clearance below the unit is required, plus sufficient horizontal clearance to slide the access panel clear of the bottom of the unit. Horizontal clearance is dependent on access panel dimensions as indicated on product submittals.

For low voltage control enclosure access, a minimum of 18" is recommended. Specific control enclosure location is indicated on product submittals. Panel for low voltage enclosures are removable (not hinged). For line voltage motor controls or electric heat control access, a minimum of 36" should be provided to allow full opening of hinged access doors. Specific location is indicated on product submittals.

Important: These recommendations do not preclude NEC or local codes that may be applicable, which are the responsibility of the installing contractor.

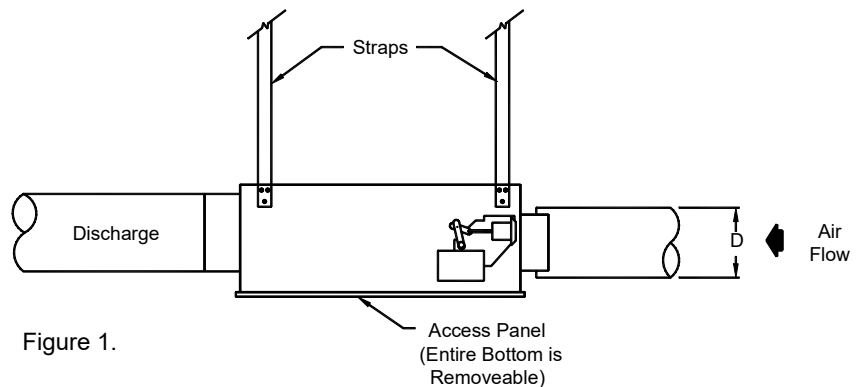
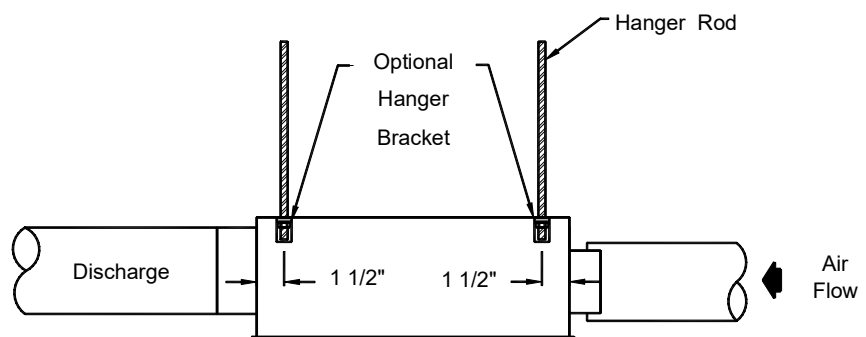


Figure 1.



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Figure 2.

Field Wiring

All field wiring must comply with the local codes and with the National Electrical Code (ANSI/NFPA 70-1996). Disconnect switches are optional equipment. Electrical, control, and piping diagrams are shown on the exterior labeling or on a diagram on the inside of the control and high voltage enclosure covers. Unless specified otherwise in the order write-up, all units are wired for a single point electrical connection to the fan and optional electrical heater. All electric heaters if provided by TITUS are balanced by kW per stage. The installing electrician should rotate incoming electric service by phase in order to help balance the building electric load.

Caution—Electrical Requirement:

- 1. Provide a safety disconnect per NEC 424-19, 20 & 21.
- 2. Disconnect all incoming power before wiring or servicing unit. All disconnect switches on the terminal (if so equipped) should be in OFF position while making power connections.
- 3. All field wiring must be in accordance with NEC and local code requirements. All units with electric heat should have copper wires for 125% of Nameplate Amperage.
- 4. Observe wiring diagram and instructions mounted on the unit. 480 V/3 phase units require a 4th (neutral) wire in addition to the full sized ground wire. All units must be grounded as required by NEC 424-14 and 250.

Unit Labeling

Each unit will have two main labels attached to the casing. The FAN UNIT label (Figure 3) lists the Model Number, Supply Voltage requirements, Motor Horsepower, and Overcurrent Protection requirements. The AIR FLOW label (Figure 4) lists the Model Number, Unit Size, Factory Order Number, and Location. The Location (or "Tag") indicates the engineer's planned location for the unit to be installed. There may be other labels attached to the unit, as options or codes may require.

Please read all labels on a typical unit, before beginning installation. If you have any questions, please contact the local TITUS Representative for clarification. Have the key points from the Air Flow label available for reference before calling.

Control Start-up, Operation

Detailed information regarding power, accessory and communications connections, start-up and operating procedures for the TITUS TD-1 controller (digital) or pneumatic and analog controls are available from your local TITUS representative. For specific information on controls by other manufacturers contact that manufacturer's local branch or dealer.

Note: Controllers may incorporate specific communication addresses based on Building Management Systems Architecture, and original engineering drawings. Installing the terminal in a different location than noted on unit label may result in excessive start-up labor.

Note: If unit is utilizing optional electric heat with solid state relay and is not energizing the coil, check the potentiometer on the SSR control board to ensure that it is in the 100% position.

Primary Air Damper

TFS, TQS and TQP Models:

To replace the damper blade and/or shaft assemblies:

- a. Disconnect power before servicing. Remove control enclosure cover to access actuator.b.
- Note position of damper shaft, using indicating arrow. Loosen linkage or actuator collar to allow damper to rotate freely.
- c. Remove bottom access door to expose damper assembly. Rotate damper to fully closed position, exposing rivets holding damper blade to shafts.
- d. Drill out rivets using 1/2" drill, rotate damper to fully open position, and slide damper and/or shaft assemblies out of the duct.
- e. Fit new damper and/or shaft assemblies in place, using 1/4-20 screws with lock nuts to replace rivets.
- f. Reverse procedure in steps c, b, and a, for assembly. When locking down actuator linkage or collar, position indicating arrow on damper in the same location as before the repair.

Note: FLS and FLP units use an opposed blade damper assembly that is not repairable. The entire assembly must be replaced.

 Titus Redefine your comfort zone.™			FAN UNIT		
MODEL NO.:	DTFS	CODE:	88-XXXXX-A 2 REV: 02		
MOTOR	VOLT:	277	PHASE:	1	HZ 60
	HP:	1/4	FLA(EA)	1.4	
HEAT	VOLT 277	PHASE	1	HZ	60
	KW	6.0	AMPS	21.66	
MOTOR (S) ARE THERMALLY PROTECTED					
MIN. SUPPLY CIRCUIT AMPS:			24 AMP		
MAX. FUSE OR OVERCURRENT PROTECTION:			30 AMP		
MAX. OUTLET AIR TEMPERATURE: 200F					
UNIT DESIGNED TO OPERATE AT NO LESS THAN 0.2 IWG STATIC PRESSURE					
ZERO CLEARANCE FROM UNIT, CONNECTED DUCT AND/OR PLENUM					
TO COMBUSTIBLE MATERIAL					

Figure 3. FAN UNIT Label

 Titus Redefine your comfort zone.™		AIR FLOW 	
MODEL NO.:	DTFS	SIZE:	C12
TOTAL CFM:	1100	MIN. CFM:	0
LOCATION:	AH-1		
FACTORY NO.:	XXXXX	ITEM:	1
MOTOR:	DL01 L&G		
COIL:	E41-277V KW 6.00		
THST:			
DPR. POSITION:	DL01-FMA L&G		
		 303155001015	

Figure 4. AIR FLOW Label

Standard PSC Motor Fan Flow Adjustment

Note: Before starting fan motor, follow steps 1 and 2.

1. Discharge ductwork should be connected. The minimum recommended discharge static pressure is 0.2" wg. Be sure fan packing is removed from units with fan packing!
2. All foreign materials should be removed from duct system. Filters should be installed where required.
3. Standard PSC motors are shipped from factory at full speed setting. Allow motor to run-in at least 15 minutes before adjusting speed. During initial run-in, check ductwork connections for leaks and repair if necessary. (Do not adjust fan speed down if ductwork is not connected).
4. Unit is equipped with manual fan speed control, mounted on the bottom of the line voltage motor enclosure or electric heat enclosure. Turning the control counterclockwise will reduce the fan speed; clockwise will increase speed.
5. Set the unit to full heating (maximum induction). Adjust and set remote balancing dampers, if present. Adjust the speed control to deliver the required CFM by measuring air quantity at the room outlets. Note: Minimum CFM required for electric heat shall not be less than 70 CFM/kW heating.
6. Proceed to primary air adjustment procedure, detailed in control installation information. Fan should be re-adjusted with primary air and ventilation air at maximum setpoint, to insure that no supply air is discharged at the induction port.

ECM Motor Fan Flow Adjustment

Note: Before starting fan motor, follow steps 1 and 2.

1. Discharge ductwork should be connected. The minimum recommended discharge static pressure is 0.2" wg. Be sure fan packing is removed from units with fan packing!
2. All foreign materials should be removed from duct system. Filters should be installed where required.
3. PWM Fan Speed Controller
 - a. ECM motors with manual PWM controllers are shipped from factory at design CFM when

- provided. Otherwise motors are shipped at motor full speed setting.
- b. ECM motors shipped with remote PWM controller require a signal from the DDC controller to control fan speed.

(See page 4 for operating instructions for remote pwm.)

- c. Allow motor to run-in at least 15 minutes before adjusting speed. During initial run-in, check ductwork connections for leaks and repair if necessary. (Do not adjust fan speed down if ductwork is not connected).
4. ECM unit is equipped with either a manual control or a remote control PWM fan speed controller, mounted on the bottom of the line voltage motor enclosure or electric heat enclosure.
 - a. The manual PWM controller has a screwdriver dial adjust pot and an LED readout. The LED display shows the flow index when the screwdriver adjust is turned. The flow index is a number from 0-100 which correlates to a CFM shown in the PWM calibration table. Use the screwdriver adjust to set the CFM of the unit.
 - b. Remote PWM controllers require a signal from the DDC controller to control fan speed. An increase in DDC voltage signal from 0-10Vdc correlates linearly to the 0-100 flow index shown in the PWM calibration table. A green lamp continuously flashes to indicate the flow index value. Long flashes represent the tens digit and short flashes represent the units digit of the flow index.
5. Set the unit to full heating (maximum induction). Adjust and set remote balancing dampers, if present. Adjust the speed control to deliver the required CFM by measuring air quantity at the room outlets. Note: Minimum CFM required for electric heat shall not be less than 70 CFM/kW heating.
6. Proceed to primary air adjustment procedure, detailed in control installation information. Fan should be re-adjusted with primary air and ventilation air at maximum setpoint, to insure that no supply air is discharged at the induction port.

Maintenance Procedures:
Fan and Motor

Motor is equipped with permanently lubricated bearings. Inspect fan and motor assembly for indication of dust and dirt accumulation by operating environment. Clean as necessary.

If fan motor does not run:

- a. Free rotation of blower wheel fan packing removed. Freight or installation damage.
- b. Check for proper unit power Disconnects should be ON .Check optional fusing.
- c. Check for proper control signal, P/E switch setting, proper air control 24 Vac at fan contactor, coil energized.

If fan motor runs, excessive noise:

- a. Clearance problems on blower. All components securely attached.
- b. Verify integrity of ductwork. Leaks or loose connections. Rattling diffusers or balancing dampers.
- c. Maximum CFM too high, or discharge static pressure too low

If fan motor runs, insufficient air flow:

- a. Check for ductwork restrictions. Dirty air filters. Clogged water coils.
- b. Re-adjust fan speed control.
- c. Discharge static pressure too high.

If repair or replacement is required:

Motor and fan should be removed as an assembly. Disconnect all power before servicing. Remove the hex nuts from the mounting lugs holding the fan assembly to the discharge panel, and lower the assembly. For model TFS, lift the motor / blower assembly to release the tabs from the discharge panel, then lower the assembly. Do not allow assembly to hang from wiring.

If removing motor from blower, first loosen the set screw holding the blower wheel to the motor shaft. Remove the three screws holding motor to the fan housing, and slide motor and fan housing apart.

Reverse the procedure for assembly.

Note: Over tightening motor mounting screws may crush isolation bushings, causing excessive fan noise.

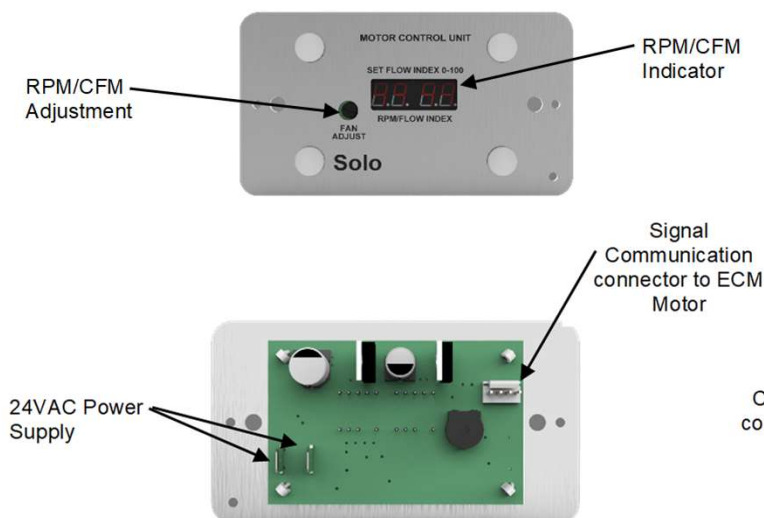
Optional Water Coil Cleaning

In most cases, the supply side of the water coil (optional) can be cleaned by removing the bottom access door and cleaning the coil face through the open space between the motor / blower assembly and the unit casing.

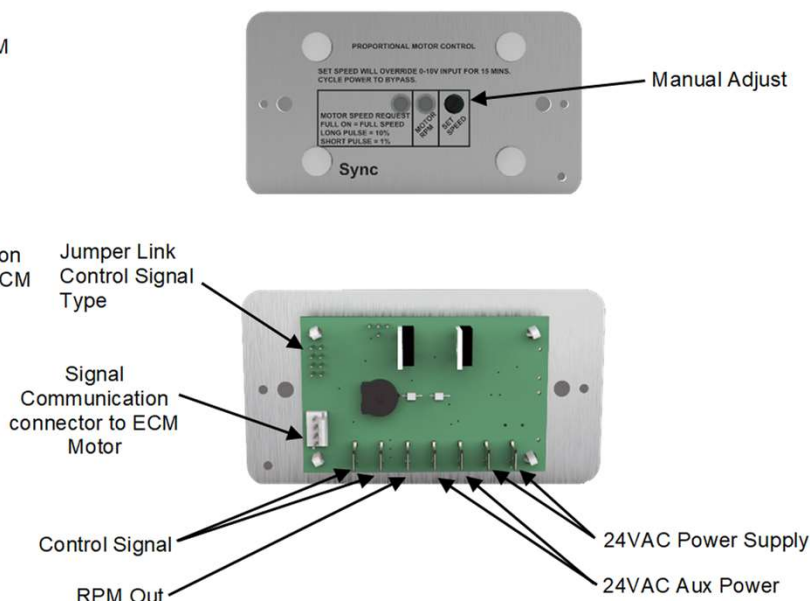
If more space is desired to clean the water coil, the motor / blower assembly may be removed and reinstalled as described above.

ECM Overview and Setup

Manual / Unit PWM Signal Interface Board



Remote PWM Signal Interface Board Details



The Manual PWM interface board allows accurate manual adjustment and monitor of fan with the GE Electric ECM Motor.

The Manual interface board features a 4 digit LED numerical display to allow easy reading in dark spaces. Watch the display and set the flow index with a screwdriver adjust. Twenty seconds later, the display shows the motor RPM. Then, the display periodically alternates between the flow index and motor RPM.

Operation

ECM motors configured for Vspd operation are factory configured for external torque or airflow adjustment. A numerical flow index accurately adjusts the fan to the desired torque or airflow. The flow index is a number from 0-100 having a linear relationship to the minimum to maximum torque or airflow range specified by Titus. Refer to the fan specifications, data and charts to convert the flow index to torque or mass airflow. The Manual PWM interface board allows local on/off and fan airflow adjustment. Rotating a single screwdriver adjuster changes the variable output signal to the motor from off to full output. While rotating the adjuster, a numerical flow index is locked on the illuminated numerical display. After adjustment, the display shows fan RPM.

The remote interface allows industry standard 0-10Vdc automation signals to adjust and monitor General Electric's ECM Motor.

The interface board provides remote adjustment of the ECM output from 0% to 100% of the programmed control range. A signal lamp on the control continuously flashes out the flow index². Instruments are not required to read the flow index. A 0-10Vdc signal connects RPM to the automation control. Jumpers allow the Interface to be configured for 0-10Vdc automation signal, 2-10Vdc automation signal, and manual/override control. The interface can also be used for stand-alone manual control.

The green lamp continuously indicates the flow index. After a pause, the lamp flashes out the tens digit, then the units digit of a number between 1 and 99. Long flashes represent the tens digit, and short flashes represent the units digit. For example, a flow index of 23 flashes two longs, then three shorts.

Two extra long flashes indicate a flow index of 0. An extra long flash and ten short flashes indicates a flow index of 100. The lamp flashes the signal that was present when the flash sequence started.

Turning Adjust controls the ECM motor to the manually adjusted setting. The manual setting has authority for 15 minutes. Set the unit to full heating (maximum induction). Adjust and set remote balancing dampers, if present. Adjust the speed control to deliver the required CFM by measuring air quantity at the room outlets.

ECM Overview and Setup

Remote PWM Signal Interface Board Details

Jumpers

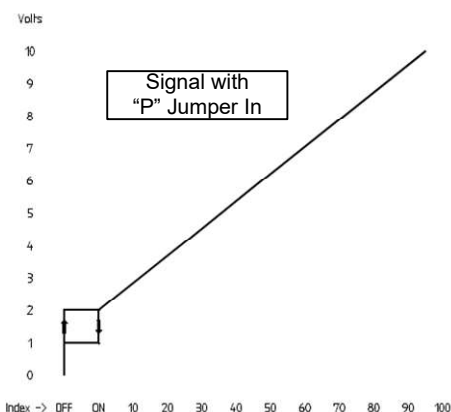
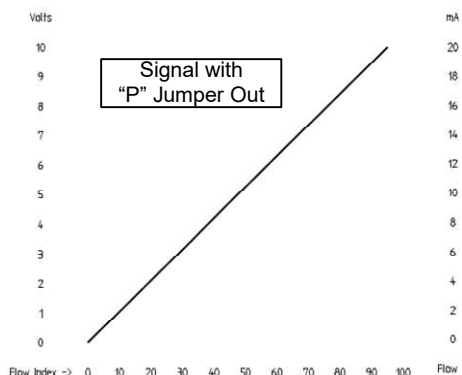
M – Enables SET SPEED potentiometer manual override (bypassed when automation SIGNAL exceeds 0.2VDC).



S – Enables SET SPEED potentiometer reversal (used when the set speed potentiometer is going to be adjusted from the component side of the board).

P – Enables hysteresis option

With P Jumper: Configures the SIGNAL input to a 2-10v range; corresponding to 0-100% motor speed request.



Input / Output Control Signals

Input

Power Supply: 18-30 VAC, 60Hz

SIGNAL & COMMON: 0-10VDC = 0-100% PWM request

ECM supplied feedback: 5VDC (motor at rest or not connected)

Output

PWM supplied to ECM: 18VDC (10mA max)

ON/OFF supplied to ECM: 18VDC (10mA max)

RPM & COMMON: 0-10VDC (5mA max) = 0-2000 RPM (10 RPM increments)

DDC Control - Air Balance

If the DDC Controller signal is already installed, air balance can be achieved using the DDC Controller software tools. Please notice that a control signal less than 0.2Vdc may put the interface board into manual override. Avoid setting the DDC signal to less than 0.2Vdc.

WARNING

Turning Adjust potentiometer locks out the BAS signal for 15 minutes

Cycle power ON/OFF for faster lockout removal.

Manual Air Balance

The interface board can be manually adjusted before the DDC Controller signal is available. The balancer's manual adjustment has authority until automation is connected.

Air Balancer

1. Use Adjust to set the air flow. This adjustment will have authority for at least 15 minutes.

2. Read the flashing green light and record the flow index on the air balance report.

DDC Integrator

1. Set the Signal to 0Vdc to invoke manual override.

2. Record the RPM on the air balance report.

3. Enter the flow index the air balancer entered on the air balance report.

4. Observe the RPM is at or near the RPM observed in step 2.

5. Cycle the motor on/off 5 times. This clears the manual override function unless the "M" jumper is in place.