INSTALLATION &
OPERATION MANUAL

Fan Powered Terminals

VAV TERMINALS

Titus

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.

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.

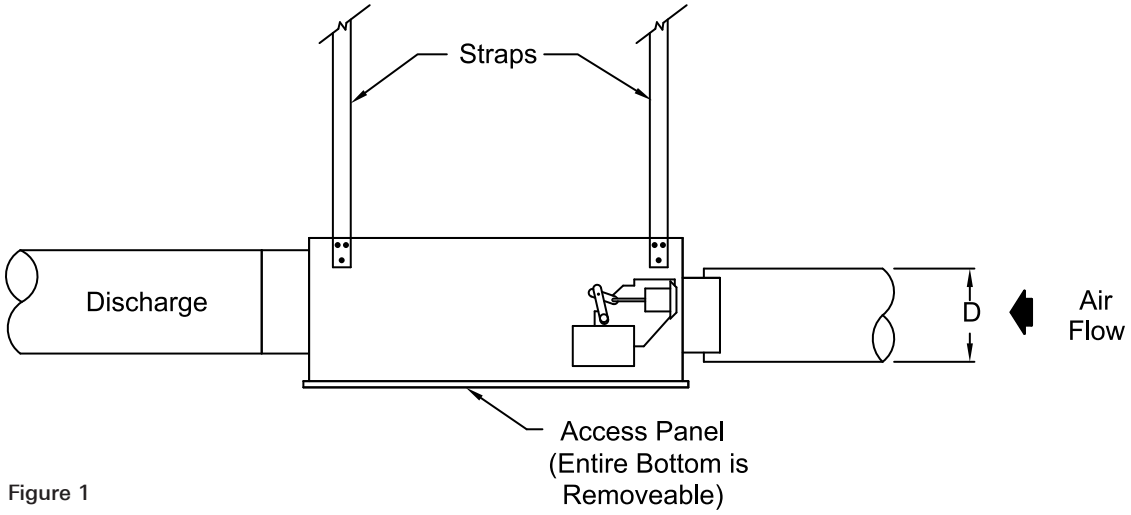

Figure 1

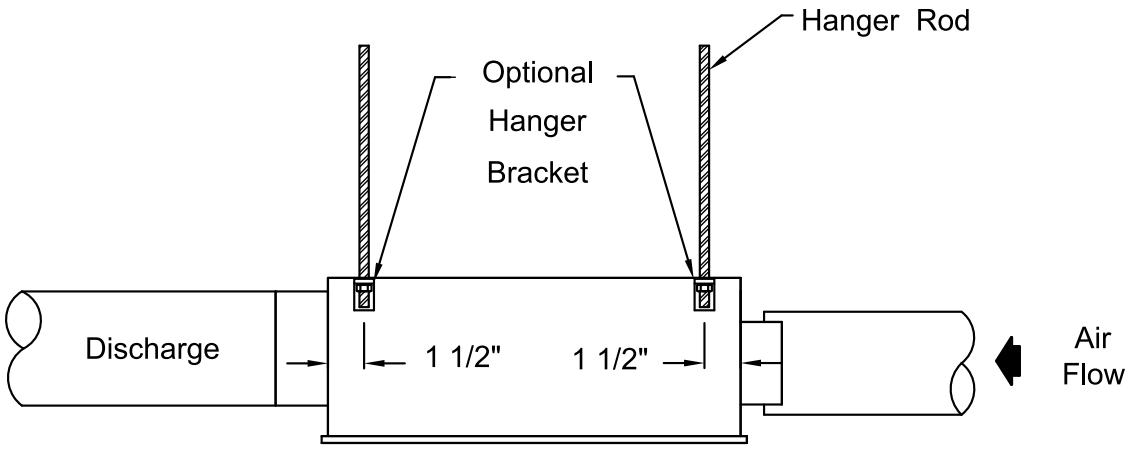

Figure 2

Duct Connections

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.

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.

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

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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		

UP

303155001015

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.

FLS and FLP Models

These units use an opposed blade damper assembly that is not repairable. The entire assembly must be replaced.

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.

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.

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 MotorMotor is equipped with permanently lubricated bearings. Inspect fan and motor assembly for accumulation of dust and dirt as required 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.

Remote PWM Speed

Please note remote PWM shall be set via BMS...any attempt to balance locally will be reset via BMS overide.

The remote PWM controller has a manual adjust potentiometer that allows the user to override the automation signal for 15 minutes, if the automation signal is less than 0.1VDC. This feature, allows heat to be used during construction and achieve air balancing before the automation is installed. However, if the automation is connected and available, automation tools should be used to balance the air.

Steps for Air Balance

AUTOMATION AIR BALANCE

If Automation is already installed, air balance can be achieved using automation tools. Please notice that a control signal less than 0.2Vdc may put the ACU+ into manual override. Avoid setting the automation signal to less than 0.2Vdc. **Caution: turning Adjust locks out the automation signal for 15 minutes.** Cycle power for faster lockout removal.

MANUAL AIR BALANCE

The ACU+ can be manually adjusted before automation 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.

Automation 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.

Replacement Parts List

Description	Part Number
Multipoint Velocity Sensors	
Size 6"	3151520002
Size 8"	3151520004
Size 10"	3151520006
Size 12"	3151520007
Size 14"	3151520008
Size 16"	3151520009
Damper Shaft Extension	
Short Stub All Sizes	70300301
Long Ext. Sz 6,14,16	70300302
Long Ext. Sz 8,10,12	70300303
Shaft Bearing – All	70324901
Primary Damper Assembly (TFS,TQS,TQP)	
Size 6	31171301
Size 8	31171303
Size 10	31171305
Size 12	31171306
Size 14	31171307
Size 16	31171308
Primary Damper Assembly (FLS, FLP)	
Sizes 2, 3	31171303
Size 4 FLS	31462102
Size 4 FLP	31462101
Induced Air Filters	
Model TFS	
B,C 16x14	1026491614
D,E 14x18	1026491418
Model TFS-F Fantom IQ™	
B,C 11x14	1026491114
D,E 18x17	1026491817
Model TQS, TQP2,	
3,4 19x17	1026491917
5,6,7 27x20	1026492720
Model FLS	
2,3,4 10x15	1026491015
Model FLP	
2,4 18x10	1026491810

Description	Part Number
Filter Bracket Universal	
71124401	
Filter Clip, Wire	10262701
Control Tube	
Red Stripe .25" O.D.	61510035
Green Stripe .25" O.D.	61510034
Red Stripe .38" O.D.	61510279
Green Stripe .38" O.D.	61510280
Tees for Sensor Taps	
Plastic .25"	42150011
Plastic .38"	42150020
Plugs for Tees	
0.25"(1/4")	42160081
0.38"(3/8")	10015601
Fan Motor Fuse (SC-CL-G 300V)	
1 Amp	10048301
3 Amp	10048501
4 Amp	10048601
6 Amp	10048801
8 Amp	10049001
10 Amp	10049101
12 Amp	10049201
15 Amp	10049301
20 Amp	10105201
Disconnects	
Fan Toggle 10027801	
Door Interlock 3P/30A	10329101
Door Interlock 3P/60A	10329201
Door Handle	10329301
Adapter Kits	
Door Interlock 3P/30A	31489601
Door Interlock 3P/60A	31489602
Fan Relays	
1 Pole, 24V Coil	10156901
2 Pole, 24V Coil	10161801

Replacement Parts List (continued)

Description	Part Number
Contactors, Magnetic	
2P/20A, 24V coil	10054401
2P/20A, 120V coil	10054402
2P/20A, 208/240V coil	10054404
2P/20A, 277V coil	10054403
Safety Devices	
Auto Reset Thermal Cutout for Elec. Coils	10052101
Air Flow Switch (AFS)	10269501
AFS Sensor 4" length	10057201
AFS Sensor 6" length	10057202
P.E. Switch, 1 step	10000901
P.E. Switch, 2 step	10199801
P.E. Switch, 3 step	10199802
Control Transformers	
120/24V, 50 VA	10029301
208/240/24V, 50 VA	10057501
277/24V, 50 VA	10006601
Hanger Brackets	
TFS	7247020103
TQS, TQP, FLS, FLP	70738001
Fan Speed Controllers (SCR)	
120V10055301	
208/240V10057601	
277V10053301	
Fan Motor Capacitors	
(120V, 208/240V, 277V)	
1/10 Hp Motor 4 MFD	10053001
1/6 Hp Motor 4MFD	10053001
1/4 Hp Motor 5 MFD	10053002
1/3 Hp Motor 10 MFD	10053003
1/2 Hp Motor 10 MFD	10053003
3/4 Hp Motor 20 MFD	10055701
1 Hp Motor 25 MFD	10053004
Mounting Bracket (all)	10054501

Description	Part Number
ECM Motor Components	
ECM Motor Mounting Assembly Includes:	31372602
Motor Belly Band	
Grommet Set (3)	
Nut, ¼ - 20 x 1½	
Hex Bolt ¼ x ¾	
¼ x ¾ Screw (3)	
Washers (4)	
PWM (Manual Operation)	15011201
PWM (Remote Operation)	10362701
277V Power Cable, 8 ft.	10320501
277V Power Cable, 5 ft.	10320502
24V Comm. Cable, 8 ft.	10334901
24V Comm. Cable, 5 ft.	10334902
120V Power Cable, 8 ft.	10343501
120V Power Cable, 5 ft.	10343502
Power Filter (1 hp)	10335001
Power Filter (½, 1/3 hp)	10335001

Replacement Parts List (continued)

FAN MOTORS & BLOWERS

Model	Unit Size	HP	120V/1	208/240V/1	277V/1	Blower Assembly
TFS, TFS-F Left Hand Unit	A	1/10	10051101	10056901	10051102	10192501
	B	1/6	10095302	10150102	10096702	10192402
	C	1/4	10051204	10150104	10051203	10045002
	D	1/3	10151205	10151206	10151204	10358002
	E	3/4	10317204	10317205	10317206	10051006
TFS, TFS-F Right Hand Unit	B	1/6	10095301	10150101	10096701	10192401
	C	1/4	10051201	10150103	10051202	10045001
	D	1/3	10151201	10151203	10151202	10358001
	E	3/4	10317201	10317201	10317203	10051005
TQS	2	1/6	10095301	10150101	10096701	10051001
	3	1/4	10051201	10056902	10051202	10044601
	4	1/3	10151201	10151203	10151202	10051003
	5	1/3	10151201	10151203	10151202	10051003
	6	3/4	10051401	10057003	10051402	10051005
	7	1	N/A	31423101	31423102	10311701
TQP	2	1/6	10095301	10150101	10096701	10051001
	3	1/4	10051201	10056902	10051202	10044601
	4	1/3	10151201	10151203	10151202	10044601
	5	1/3	10151201	10151203	10151202	10051003
	6	3/4	10051401	10057003	10051402	10051005
FLS	2	1/6	10095301	10150101	10096701	10045501
	3	1/4	10095303	10150103	10096703	10045001
	4	1/6	10095301	10150101	10096701	10045002
FLP	2	1/6	10095301	10150101	10096701	10045001
	4	1/4	10095303	10150103	10096703	10045001

Replacement Parts List (continued)

ECM FAN MOTORS & BLOWERS

Model	Unit Size	1HP	120V/1	208/240V/1	277V/1	Blower Assembly
TFS w/ECM Motor Left Hand Unit	A	1/3	321014-095	321014-119	321014-093	10192401
	B	1/3	321014-063	321014-111	321014-055	10192402
	C	1/3	321014-064	321014-112	321014-056	10045002
	D	1/2	321014-065	321014-113	321014-057	10358002
	E	3/4	321014-075	321014-114	321014-076	10051006
TFS w/ECM MotorRight Hand Unit	B	1/3	321014-047	321014-103	321014-039	10192401
	C	1/3	321014-048	321014-104	321014-040	10045001
	D	1/2	321014-049	321014-105	321014-041	10358001
	E	3/4	321014-071	321014-106	321014-072	10051006
TFS-F w/ECM MotorLeft Hand Unit	B	1/3	321014-067	321014-115	321014-059	10192402
	C	1/3	321014-068	321014-116	321014-060	10045002
	D	1/2	321014-069	321014-117	321014-061	10358002
	E	3/4	321014-077	321014-118	321014-078	10051006
TFS-F w/ECM Motor Right Hand Unit	B	1/3	321014-051	321014-107	321014-043	10192401
	C	1/3	321014-052	321014-108	321014-044	10045001
	D	1/2	321014-053	321014-109	321014-045	10358001
	E	3/4	321014-073	321014-110	321014-074	10051005
TQS w/ECM Motor	4	1/2	321014-016	321014-121	321014-001	10051003
	6	1	321014-017	321014-122	321014-002	10051005
TQS w/UltraLoc w/ ECM Motor	4	1/2	321014-018	321014-123	321014-003	10051003
	6	1	321014-019	321014-124	321014-004	10051005
TQS-IAQ w/ECM Motor	4	1/2	321014-020	321014-125	321014-005	10051003
	6	1	321014-021	321014-126	321014-006	10051005
TQS-IAQ & UltraLoc w/ ECM Motor	4	1/2	321014-022	321014-127	321014-007	10051003
	6	1	321014-023	321014-128	321014-008	10051005
FLS w/ ECM Motor	3	1/3	321014-028	321014-133	321014-013	10045001
	4CW	1/3	321014-029	321014-134	321014-014	10045002
	4CCW	1/3	321014-030	321014-135	321014-015	10045002
TQP w/ ECM Motor	4	1/2	321014-036	321014-139	321014-035	10051003
	6	1	321014-038	321014-140	321014-037	10051005

Notes

Notes

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