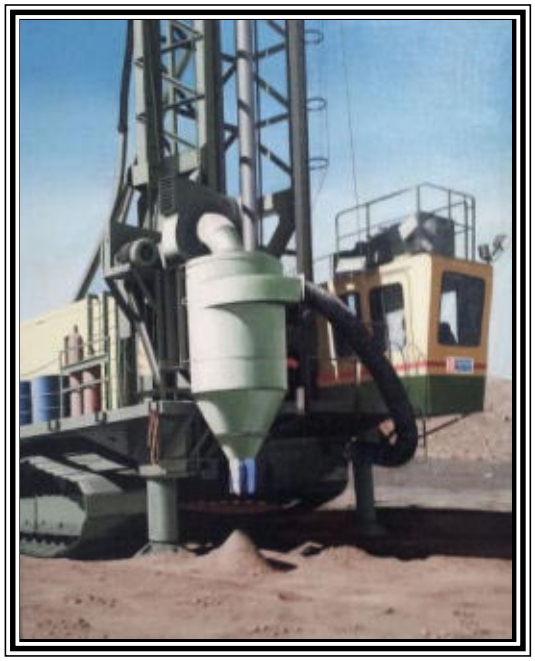
Filter/Clone®

DUST CONTROL SYSTEMS



SERVICE GUIDE

Manufactured by:
JOE TIPTON, INC.

TABLE OF CONTENTS

INTRODUCTION AND INITIAL STARTUP

INTRODUCTION Page 1
Basic Operation Page 2
INITIAL STARTUP Page 4
Blower Assembly Page 4
Speed Adjustment Page 4
Direction of Rotation Page 7
Compressed Air Supply Page 7
Pneumatic Timer Page 7
Electric Timer Page 10

REPLACEMENT PARTS

BLOWER ASSEMBLY Page 12
DUST COLLECTOR PICKUP POTS Page 13
TIMERS Page 14
DEFLECTOR ASSEMBLY Page 15
MISCELLANEOUS PARTS Page 16

MAINTENANCE

ROUTINE MAINTENANCE Page 23
TROUBLE SHOOTING Page 24

INTRODUCTION

The Filter/Clone Dust Collector is an advanced design utilizing a system of barrier filters located in the vortex of a cyclone. The use of the cyclone to centrifugally separate the heavier material from the fine dust has demonstrated a significant reduction in loading of the filter elements while at the same time allowing for an increase in volume of material collected.

In order to maintain the level of performance that is designed into each Filter/Clone Dust Collector, one should fully understand how the unit operates, so that periodic inspections and repairs can be performed. This manual is intended to explain to the user proper servicing techniques and offers special trouble shooting suggestions.

BASIC SPECIFICATIONS

Listed in the table below are the basic specifications of the various models of Filter/Clone units currently being used on blasthole drills.

MAX. BLOW-AIR CAPACITY (SCFM)	Filter/Clone MODEL	AIR FLOW (SCFM)	APPROX. HP	NO. FILTERS	SUCTION HOSE DIA.	BLOWER WHEEL
200	SIZE 1	600	1.7	1	4"	17" DIA.
300	SIZE 1.5	900	2.5	1	5"	17" DIA.
700	SIZE 2R4	2000	4.5	4	6" or 7"	18" DIA.
1000	SIZE 3SB	3000	11.0	4	8"	20" DIA.
1000	FC-3000	3000	11.0	4	8"	20" DIA.
1150	FC-3600	3600	13.0	4	8"	20" DIA. +
1300	SIZE 4SB	4500	15.0	6	8" or 10"	19.5" DIA.
1500	FC-4500	4500	17.0	6	8" or 10"	19.5" DIA.
1700	SIZE 5SB	5000	20.0	7	10" or 12"	365-BL
2400	SIZE 7SB	7000	25.0	9	12"	365-BL
3000	SIZE 9SB	9000	35.0	12	14"	400-BL

BASIC OPERATION

The basic operation of any Filter/Clone Dust Collector System can be described as follows: (refer to Figure 1)

A. A vacuum (approx. 17 inches of water) is generated in the clean air section of the **upper housing** by means of a **blower wheel** mounted on top of the dust collector. This in turn produces a somewhat lesser vacuum in the **lower housing**, the **suction hose**, the **precleaner**, and the **pick-up pot**. The result is that airborne material pushed to the surface by the drill's blow air is subsequently carried to the dust collector inlet through the suction hose. Material is prevented from climbing the drill pipe by means of a rubber belting **top gasket** that fits snugly around the drill steel. A rubber **intake cone** helps direct material coming out of the hole into the pickup pot.

B. The material enters the dust collector **inlet** tangentially to the lower housing. The heavier particles are then centrifugally forced to the outside wall of the collector and, due to gravity, eventually settle out in the **dropout cone**. The lighter material and fine dust are pulled by the vacuum to the vortex of the cyclone where it is captured by the filter elements. The **precleaner** is sometimes used to aid in large particle separation.

C. The filter elements are continually cleaned by forcing compressed air at 40 P.S.I. through the elements in a reverse direction to the primary flow of air. In order that the system air flow is never completely interrupted, the filters are cleaned in a sequential manner. The **impulse air controller** triggers the **impulse valve** located over each filter element to release the compressed air stored in the air tank. The pulse of air occurs every 3 to 4 seconds and lasts approximately 1/10 second. This rapid flow of air through the filter in a reverse direction performs two functions. First, it blows the majority of material off the surface of the filter paper. Second, it paralyzes the forward flow of air around the element in question, allowing the material to drop to the cone due to the force of gravity.

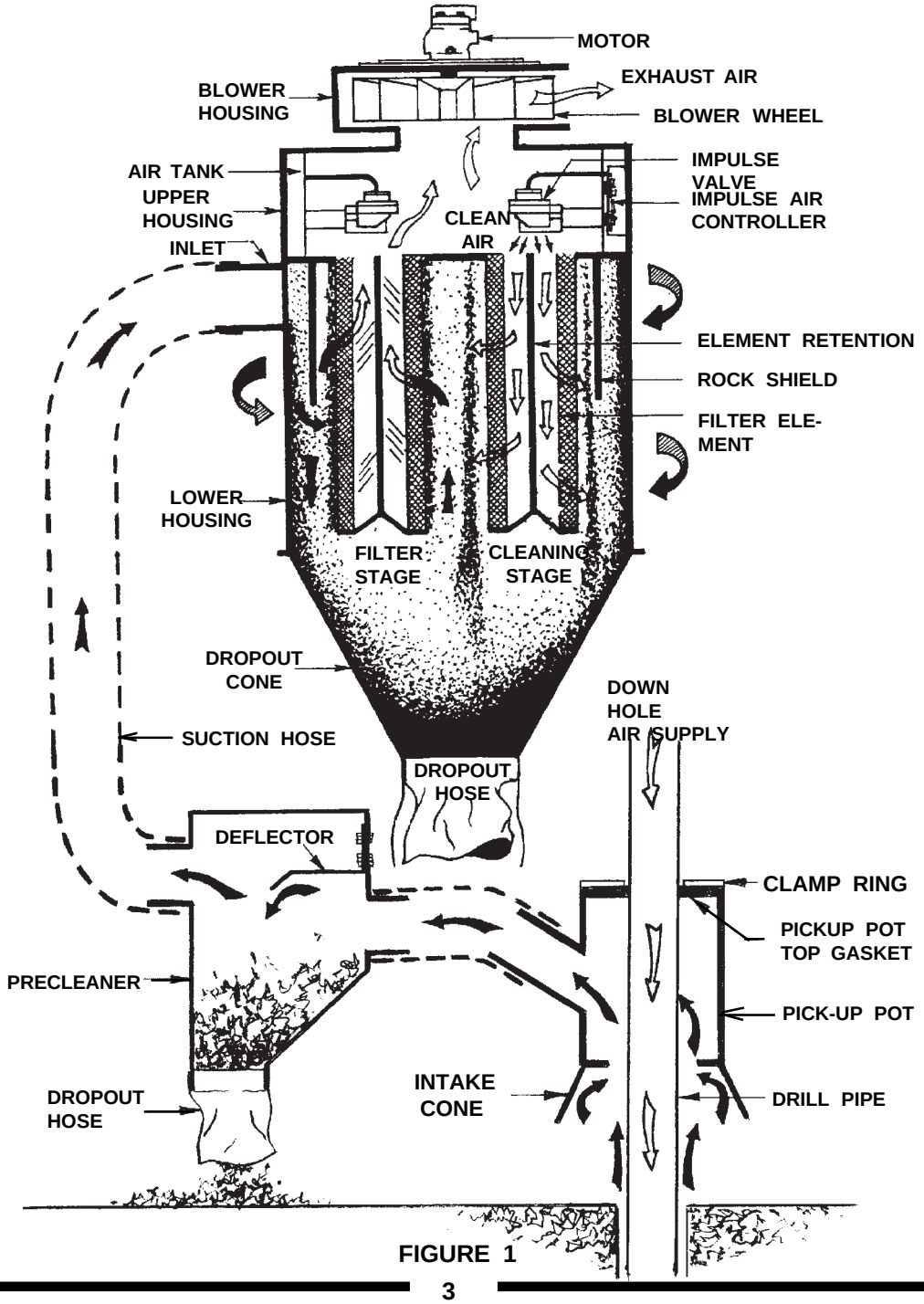

MOTOR
EXHAUST AIR
BLOWER HOUSING
BLOWER WHEEL
AIR TANK
UPPER HOUSING
INLET
IMPULSE VALVE
IMPULSE AIR CONTROLLER
CLEAN AIR
ELEMENT RETENTION
ROCK SHIELD
FILTER ELE-MENT
LOWER HOUSING
FILTER STAGE
CLEANING STAGE
DROPOUT CONE
SUCTION HOSE
DOWN HOLE AIR SUPPLY
DROPOUT HOSE
DEFLECTOR
CLAMP RING
PICKUP POT TOP GASKET
PRECLEANER
PICK-UP POT
DROPOUT HOSE
INTAKE CONE
DRILL PIPE

FIGURE 1

BASIC OPERATION (cont.)

D. As the material collects in the **dropout cone**, the weight eventually becomes great enough to overcome the upward pull of the **dropout hose** caused by the vacuum and the material then drops to the ground. At the same time material may also drop out of the bottom of the **precleaner** if one is installed.

INITIAL STARTUP

If the Filter/Clone dust system was installed on your drill at the factory, the unit should be set up ready to run. However, to make yourself familiar with the operation of the unit, it is advisable for you to go through the following setup procedures.

The dust system is divided functionally into two separate subsystems:

A. The **blower assembly** which provides the vacuum source.
B. The **compressed air supply** which cleans the filter elements.

BLOWER ASSEMBLY

The blower assembly consists of an aluminum blower wheel, an aluminum blower housing, and a hydraulic motor. For the unit to operate as it was designed, the blower wheel must turn at both the right speed and the right direction to produced the level of vacuum required.

1. SPEED ADJUSTMENT - The proper speed of the blower wheel is :

3000 rpm - without precleaner
3300 rpm - with precleaner

Although this speed can be set directly by use of a tachometer, the preferred method is to set the speed to give the desired vacuum as measured with a water manometer. A water manometer is a very simple device

consisting of a clear plastic tube bent into a "U" shape. The tube is partially filled with water so that two columns appear side by side and extend approximately half way up the length of the manometer (see Figure 2). If both ends of the tube are open to the atmosphere, then the water level in each leg of the manometer will be equal. However, if one leg is connected to a vacuum source, the air pressure in the other leg will be greater and will push the water column down on the side connected to atmosphere. At the same time, the column connected to the vacuum will rise. The distance in inches between the two water columns is the measurement of the vacuum in inches of water.

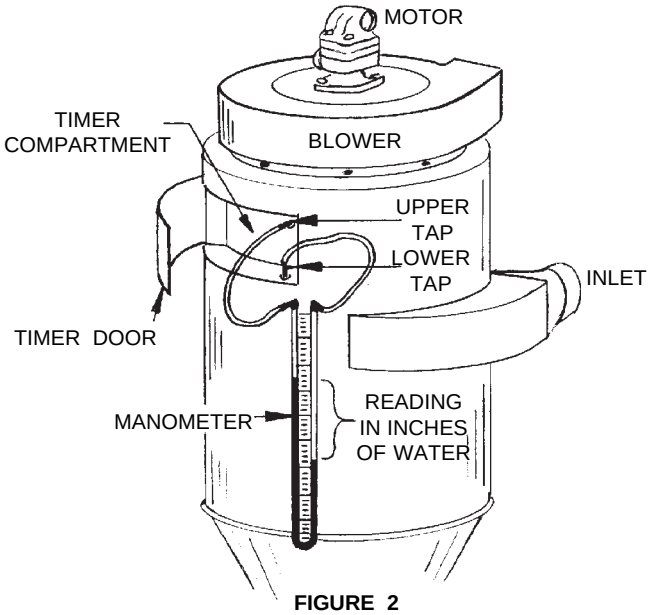


FIGURE 2

There are two places on the dust collector to measure the vacuum produced by the blower system. Referring to Figure 2, the upper tap is connected to the clean air side of the filter element. The lower tap is connected to the dirty air side of the filter element.

Both taps are found inside the timer compartment. The figure shows the manometer connected to both taps at the same time. This measurement would reflect the pressure drop across the filter element. To measure the clean air vacuum, connect one side of the manometer to the upper tap and the other side to atmosphere (see Figure 3). Likewise, to measure the dirty air side of the filter, connect one hose to the lower tap and the other hose to atmosphere. Normal readings (in inches of water) for the various configurations are shown at the top of Figure 3. Using clean filters, adjust the motor speed to achieve these readings.

NORMAL MANOMETER READINGS

	UPPER TAP	LOWER TAP	PRESSURE DROP
Size 1 , 1.5 (With Precleaner)	16-17 Inches	15-16 Inches	~1 Inch
Size 1, 1.5 (No Precleaner)	10-11 Inches	9-10 Inches	~1 Inch
Size 2R4 (With Precleaner)	17-18 Inches	14-15 Inches	2-3 Inches
Size 2R4 (No Precleaner)	12-13 Inches	9-10 Inches	2-3 Inches
Size 3SB (No Precleaner)	12-13 Inches	9-10 Inches	2-3 Inches
Size 4SB (No Precleaner)	12-13 Inches	9-10 Inches	2-3 Inches
Size 5SB (No Precleaner)	12-13 Inches	9-10 Inches	2-3 Inches
Size 7SB (No Precleaner)	12-13 Inches	9-10 Inches	2-3 Inches

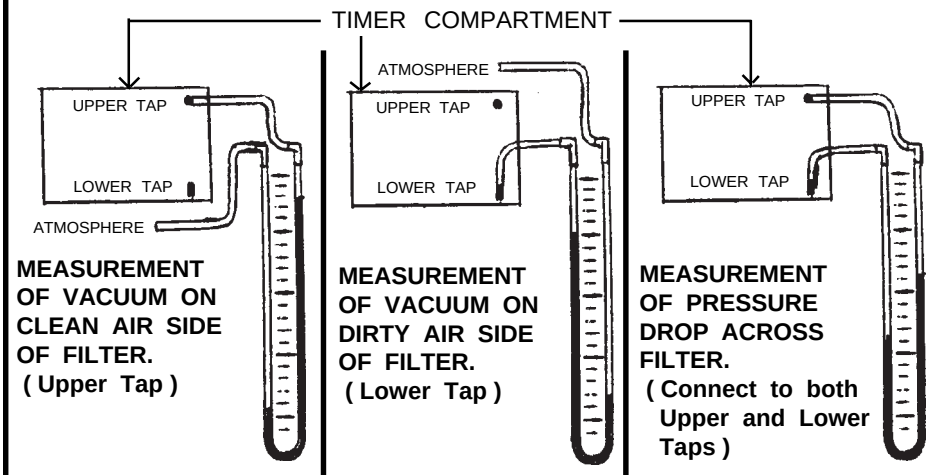


FIGURE 3

2. DIRECTION OF ROTATION - All Filter/Clone dust collectors have blower wheels that rotate in a clockwise direction when viewing the unit from the top. It is imperative that the blower turn in the right direction. It will not always be immediately obvious when the blower is turning backwards because the unit will still pull a vacuum of 2-3 inches of water. There are two methods to ensure that the fan is turning clockwise. The first is to make the measurements above. However, the easiest method is to physically view the fan as it is either starting or stopping and note the direction it is turning.

COMPRESSED AIR SUPPLY

The compressed air supply is used to back blow the filter elements to clean the filter material as described previously. As shown in Figure 1, the outside section of the top of the dust collector is a compressed air reservoir. This air tank is connected directly to the impulse valves which supply the air pulse to clean the filter. A schematic of the system is shown in Figure 4. The impulse valve is connected directly to the air tank through a short threaded pipe nipple. Pressure builds in the air tank and the impulse valve is held closed as long as the port on top of the valve is closed. Under this condition, air from the tank is allowed to flow to both the top and bottom of a rubber diaphragm. A light weight spring is used to ensure that the diaphragm stays seated in the closed position. When air is exhausted from the top of the valve, the pressure from air on the bottom of the diaphragm causes it to be lifted momentarily. A small orifice connecting the air tank supply to the top of the diaphragm causes the diaphragm to re-seat within approximately 0.1 second.

All Filter/Clone dust collectors have at least 4 impulse valves and these valves are made to sequentially pulse approximately every 4 seconds by one of two types of impulse air controllers, a pneumatic timer or an electric timer.

1. PNEUMATIC TIMER - The At-1000 air-logic timer consists of a series of pilot-operated three-way and four-way

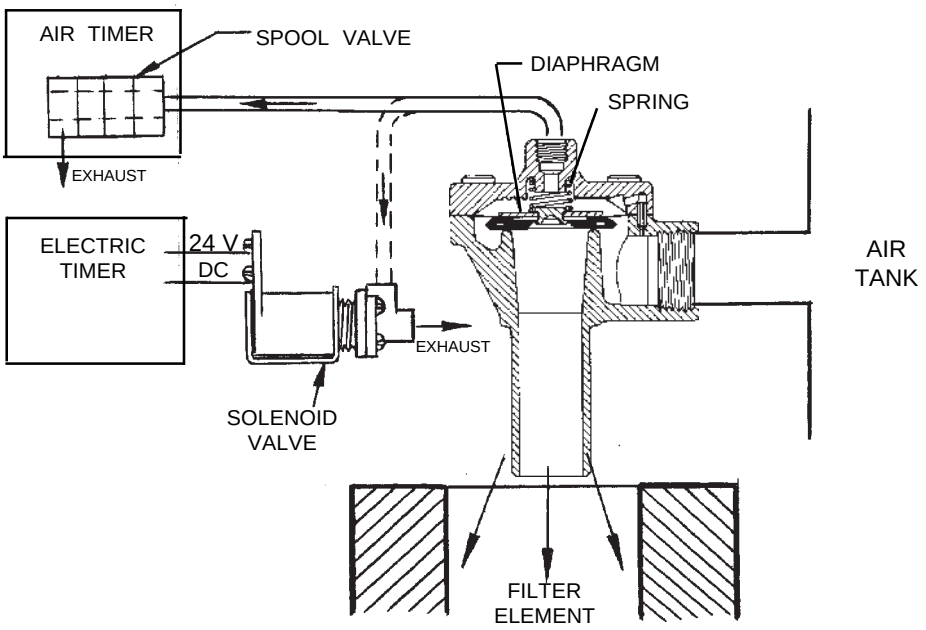


FIGURE 4

pneumatic valves interconnected by polyurethane tubing, and also connected to the dust collector's pressure manifold via the four impulse valves. The timer is shown schematically and pictorially in Figure 5. Operation of the timer can be summarized as follows:

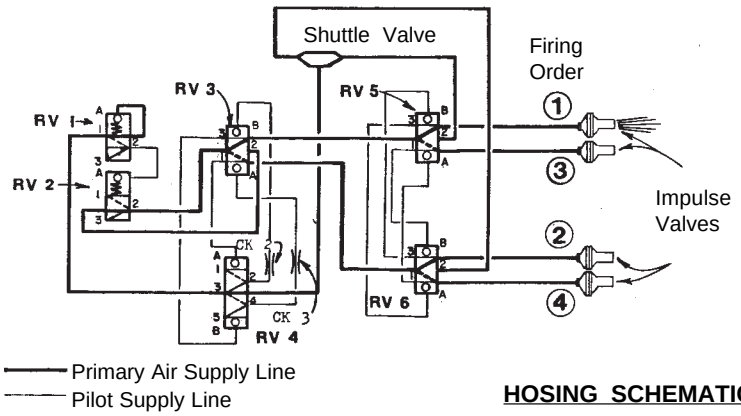
a. Pressure from the manifold is applied equally to both sides of the diaphragm in the impulse valve, thus keeping the valve seated and transferring air into the timer.

b. As pressure builds in the system, the spring loaded RV1 shifts position, applying pressure to the pilot A of RV2. This pressure shifts RV2 and exhausts air through port 1, which in turn exhausts the air from the interconnecting tubing back to one of the impulse valves (through RV3 and either RV5 or RV6).

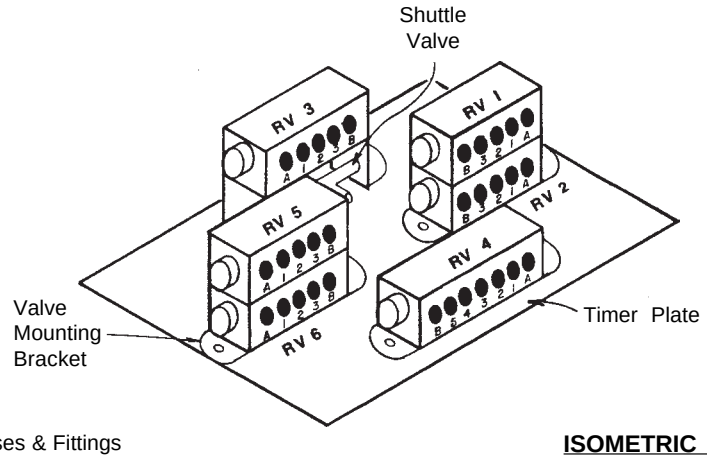
c. As air is exhausted from the top of one of the impulse

valves, that valve is made to pulse as described above.

d. Interconnecting tubing between pilots of RV3 and RV4, and between RV5 and RV6 causes the valve spools to change position when air is exhausted and thus changes the path of air flow during the succeeding fill-exhaust cycle. Thus, the diaphragm valves are opened sequentially at regulated intervals. Time between pulses is controlled by the rate of air entering the air tank.



HOSING SCHEMATIC



NOTE: Hoses & Fittings Omitted for Clarity.

ISOMETRIC VIEW

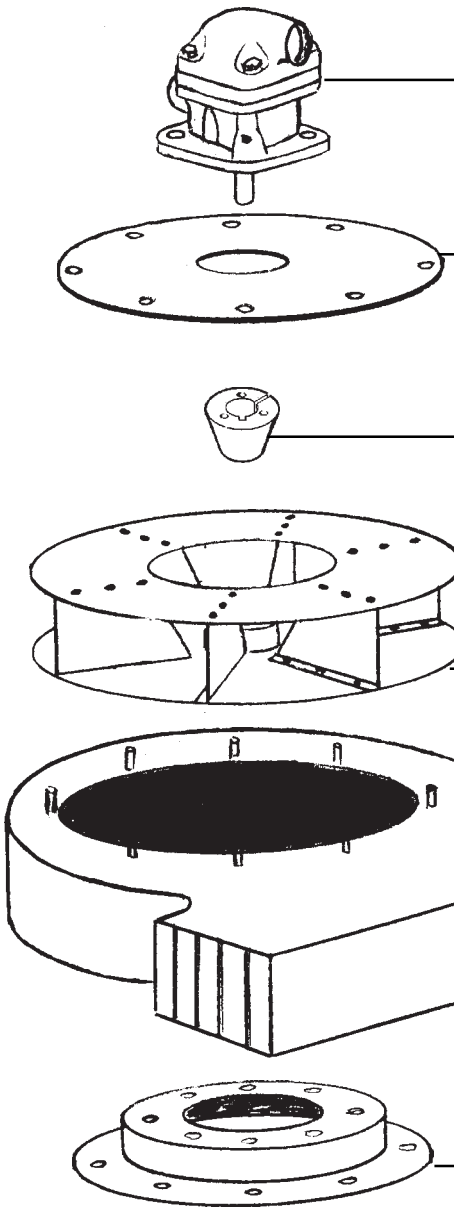
FIGURE 5

2. ELECTRIC TIMER - The DET-3000 and DET-1004 electric timers are 24 Volt controllers designed to sequentially activate 24 Volt solenoid directional air valves as shown in Figure 4. The solenoid valve, when activated, exhausts to atmosphere the air from the top of the impulse valve. Just as in the case with the pneumatic timer, exhausting this air causes the impulse valve to pulse. All electric timers are set up at the factory and should need no adjustment. However, it should be noted that some timers (i.e. those with 10 stations rather than 4) have a program wire which tells the timer how many stations are to be activated. If this wire is not connected for some reason, it should be connected to the pin indicating the number of stations to be fired (i.e. the number of filter elements). In addition, some timers have a screw adjustment marked "off-time". If your timer has this adjustment, you can adjust the time between pulses by turning this screw. Normally, it is set to pulse approximately every 3-4 seconds. However, depending on your air supply, you can cause the timer to pulse a little more or less often.

Unlike the pneumatic timer, the electric timer has no way of telling when the air pressure in the tank has reached the required 40 PSI of pressure before causing the impulse valve to pulse. **It is important to set the air pressure regulator controlling the air going to the tank to 40 PSI.** The time between pulses should be long enough such that the pressure in the tank reaches 40 PSI before each pulse occurs. Pulsing with less than this pressure will not adequately clean the filters and higher pressures will cause premature failure of the filter media.

REPLACEMENT PARTS

BLOWER ASSEMBLY



HYDRAULIC MOTOR

	P/N
Size 1.5	FC101005
Size 2R4	FC201005
Size 3SB	FC401005
Size 4SB	FC301005
Size 5SB	FC501005

BLOWER TOP PLATE

TAPER-LOCK BUSHING

Shaft Dia.	P/N
3/4 in.	BP100075
7/8 in.	BP100088

BLOWER WHEEL

	P/N
Size 1.5	BT173000
Size 2R4	BT184000
Size 3SB	BT205000
FC-3000	BT205000
Size 4SB	BT196000
FC-4500	BT196000
Size 5SB	BL365200
Size 7SB	BL365200

BLOWER HOUSING

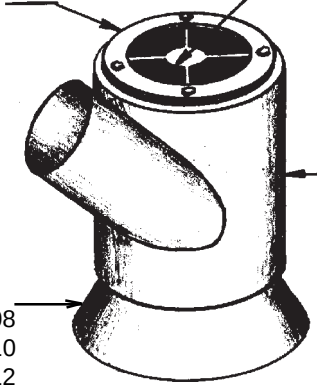
	P/N
Size 1.5	BT174000
Size 2R4	BT185000
Size 3SB	BT206000
Size 4SB	BT197000
Size 5SB	BL365100
Size 7SB	BL365100

BLOWER MOUNT
Call for P/N

DUST COLLECTOR PICKUP POTS

CLAMP RING
Size 1 FC130806
Size 1.5 FC130906
Size 2R4 FC131107

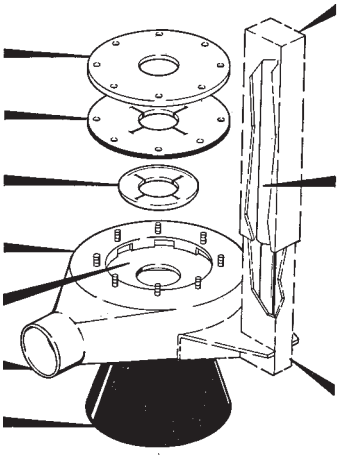
CLAMP RING GASKET
Size 1 FC1208xx
Size 1.5 FC1210xx
Size 2R4 FC1212xx
(where xx denotes the drill pipe dia. in inches).



PICKUP POT
Size 1 FC1-101
Size 1.5 FC15-101
Size 2R4 FC2-101

INTAKE CONE
Size 1 FC109008
Size 1.5 FC109010
Size 2R4 FC109012

SIZE 1, SIZE 1.5, and SIZE 2



CLAMP RING
(page 15)

CLAMP RING GASKET
(page 15)

PIPE WIPER
(page 19)

PICKUP POT
FC3-101

WIPER RETAINER
(page 15)

OUTLET TRANSITION

INTAKE CONE
FC-109-17

OUTER JACK BARREL
OBxx0305
(where xx denotes the cylinder stroke in inches).

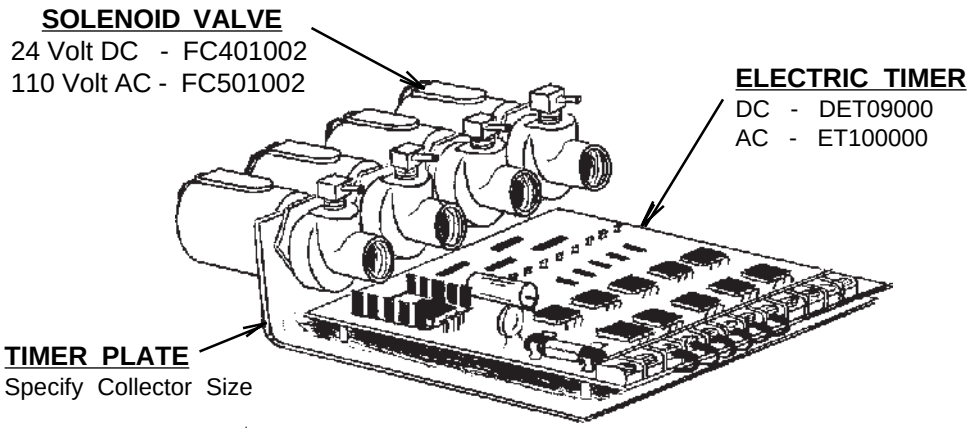
HYDRAULIC CYLINDER

Stroke	P/N
10”	FC141015
16”	FC141620
22”	FC142220
30”	FC143020
36”	FC143630
45”	FC144520

INNER JACK BARREL
FC-106-xx
(where xx denotes the cylinder stroke in inches).

SIZE 3 TOTAL COLLECTION

TIMERS

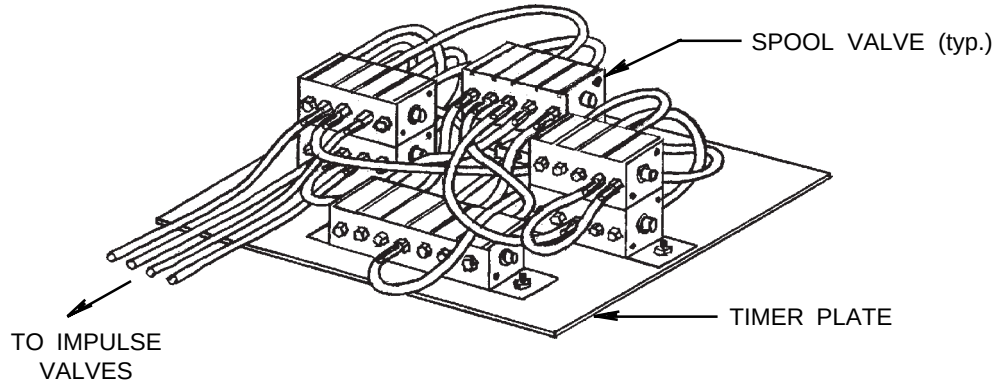


ELECTRIC TIMER ASSEMBLY

(Includes Solenoid Valves, Timer Plate, and Electric Timer)

COLLECTOR SIZE	PART NUMBER
1	DET-3000-10K
1.5	DET03002
2R4	DET03005

Note: Size 3 & Larger Collectors have solenoid valves mounted on top of impulse valves.



PNEUMATIC TIMER ASSEMBLY

PART NUMBER: AT100000

DEFLECTOR ASSEMBLY

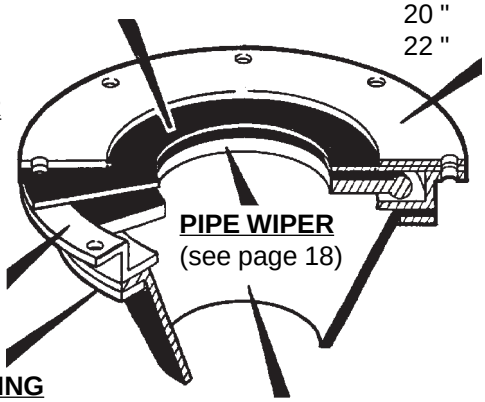
CLAMP RING GASKET
Part No. **FC12XXYY**
where **XX** is gasket diameter
and **YY** is drill pipe diameter.

CLAMP RING

Pipe Wiper Dia.	Part NO.
12 "	FC131709
14 "	FC131911
17 "	FC132413
20 "	FC132714
22 "	FC132716

WIPER RETAINER

Pipe Wiper	P/N
14 "	FC111711
17 "	FC112113
20 "	FC112414
22 "	FC112416



PIPE WIPER
(see page 18)

CONE CLAMP RING

Deflector Cone Dia.	P/N
17 "	FC131713
20 "	FC132016
24 "	FC132420

DEFLECTOR CONE

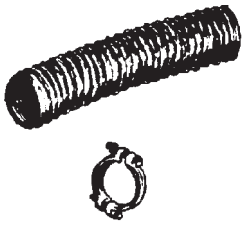
Outside Dia.	P/N
17 "	FC0917XX
20 "	FC0920XX
24 "	FC0924XX

where XX is drill pipe diameter.

MISCELLANEOUS PARTS

FILTER ELEMENT

COLLECTOR SIZE	PART NUMBER
1	FC101001
1	FC101031 (Heavy Duty)
1.5	FC151001
	FC151031 (Heavy Duty)
2	FC201001
	FC201031 (Heavy Duty)
3 & Larger	FC301001
	FC301031 (Heavy Duty)



SUCTION HOSE

PART NUMBER - (YY)180AR x (ZZ)

(YY) = Hose Dia. (in.) (ZZ) = Hose Length (in.)

(Example: 15 foot length of 12 inch diameter hose has Part No. - 12180AR x 15)

HOSE CLAMP

Hose Dia.	Part #	Hose Dia.	Part #
4 in.	HC100000	8 in.	HC000988
5 in.	HC125000	10 in.	HC001125
6 in.	HC150000	12 in.	HC001275

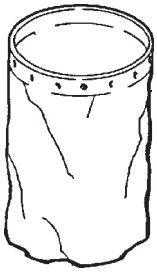
DROPOUT HOSE CLAMP

COLLECTOR SIZE	PART NUMBER
1 & 1.5	HC000128
2 & 3	HC000188
4 & Larger	HC000200

DROPOUT HOSE

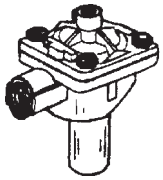
COLLECTOR SIZE	PART NUMBER
1 & 1.5	BL081601
2 & 3	BL101601
4 & Larger	BL121601
Precleaner	BL061601

MISCELLANEOUS PARTS



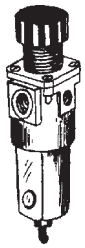
WIND SCREEN

COLLECTOR SIZE	PART NUMBER
2 & 3	FC230101
4 & Larger	FC450101



IMPULSE VALVE

COLLECTOR SIZE	PART NUMBER	REPAIR KIT
1	FC101002	FC101012
1.5 & 2	FC151002	FC151012
3 & Larger	FC201002	FC201012



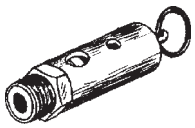
FILTER / REGULATOR

AIR LINE SIZE	PART NUMBER
1/4 in.	FR04Z027
1/2 in.	FR0754FM

FILTER ONLY

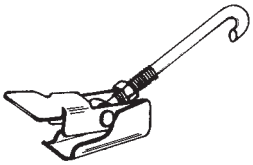
AIR LINE SIZE	PART NUMBER
1/4 in.	FR04Z034
1/2 in.	FR02Z764

MISCELLANEOUS PARTS



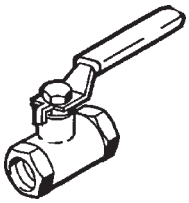
PRESSURE RELIEF VALVE

PART NO. AV100004



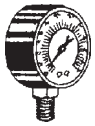
SIZE 1.5 CONE LATCH

PART NO. DC100001



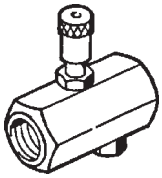
BALL VALVE

SIZE	PART NO.
1/4 "	BV710101
1/2 "	BV710301



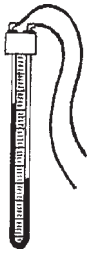
1/4 " PRESSURE GAGE

PART NO. PG144800



FLOW CONTROL VALVE

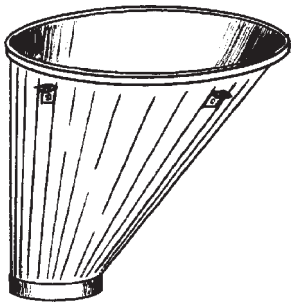
SIZE	PART NO.
1/2 "	HV100002



WATER MANOMETER

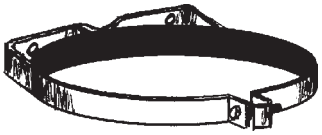
PART NO.
WM121124

MISCELLANEOUS PARTS



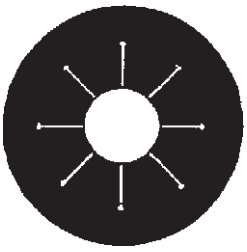
DROPOUT CONE

COLLECTOR	PART NO.
SIZE 1	FC101030
SIZE 1.5	FC150060
SIZE 2	FC200012
SIZE 3	FC300012
SIZE 4	FC400012
SIZE 5	FC504412
SIZE 7	FC700120



COLLECTOR MOUNTING BAND

COLLECTOR	PART NO.
SIZE 1	FC101050
SIZE 1.5	FC150050

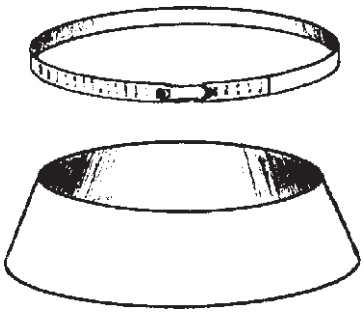


PIPE WIPER

PART NO. XXYYY

where **XX** designates the outer diameter and **YYY** designates the pipe size.
For example: A 17 inch diameter pipe wiper for use with 6.5 inch drill pipe would have the part number **17065**.

MISCELLANEOUS PARTS



PICKUP POT INTAKE CONE

Collector	Part No.
Size 1	FC109008
Size 1.5	FC109010
Size 2	FC109011
Size 3	FC109017

FILTER ELEMENT RETENTION

Collector	Part No.
Size 1	FC100040
Size 1.5	FC150020
Size 2R4	FC200402
Size 3 & up	FC300020

MAINTENANCE

ROUTINE MAINTENANCE

In order to insure that your Filter/Clone Dust Control system is operating to its design specifications, the following visual inspections should be performed on a periodic basis.

A. Verify that the dropout hose located at the bottom of the dust collector is securely fastened to the dropout cone. This hose should be free of any holes and should form a tight seal during the period when the collector is pulling a vacuum. The hose will open momentarily during each back-pulse of compressed air when the filter elements are being cleaned.

B. The suction hose leading from the pickup-pot to the collector should be clear of obstructions such as build-up of dirt or mud. There should be no kinks or extremely sharp bends in the suction hose.

C. Inspect the pickup-pot area to confirm the integrity of the pipe seal and the rubber intake cone attached to the bottom of the pot. If your system is equipped for dust only collection, special attention should be paid to leaks in the dust curtains surrounding the hole.

D. Listen to the back-pulsing of the filter elements. There should be a sharp pulse of air every 2-3 seconds. If a pressure gage is installed in the air supply line to the collector, verify that the air is pulsed at a peak pressure of approximately 40 PSI.

E. Observe the discharge of the blower assembly. There should be no visible dust emerging from the outlet of the blower housing. If there is, the filter elements and/or filter gaskets should be **replaced immediately to avoid damage to the blower wheel**.

F. The filters should be cleaned whenever possible by pulsing the elements with the blower system **turned off**. This can be done at the end of any drilling cycle, while changing drill pipe sections, and possibly between each hole.

TROUBLE SHOOTING

If, upon inspection of your dust control system, it is obvious that the unit is not operating properly, the following discussion should help you to trouble shoot the problem.

All problems with the Filter/Clone Dust Control System can be isolated through the use of a single test instrument, namely the water manometer discussed under the chapter on Basic Operation. Measurements should be made separately on the upper and lower vacuum taps located on the dust collector housing (see Figure 2 under Basic Operation). Typical readings for proper operation are listed in Figure 3. Depending on whether your readings are higher or lower than the normal values, the following explanations will apply.

Upper Tap HIGH - Lower Tap LOW

This situation indicates that the blower assembly is being "choked off", causing the vacuum in the clean air section to go up. The fact that the area around the filter elements (lower tap) is low indicates that air is not moving through the filters (i.e. plugged filter elements). The main reason that this occurs is failure of the back-pulsing system of compressed air. Three probable causes are:

1. The incoming air pressure is too low. This pressure should be maintained at approximately 40 PSI. Insert a gage at the point where air enters the collector to make your measurement.
2. The pneumatic or electric timer could be malfunctioning. Check the timer to see that each station is being fired at a timer interval of about 2-3 seconds between stations.
3. The impulse valves over the filter elements may themselves be faulty. If one of the diaphragms of the impulse valves develops a hole or a rock becomes lodged in the valve causing the diaphragm to seat improperly, the compressed air may never be allowed to build up to the required 40 PSI pressure and/or the valve may not fire properly. Also, for electric systems, the electric-air solenoid valve operating the impulse valve may be faulty.

Upper Tap HIGH - Lower Tap HIGH

This condition indicates that the system is being "choked-off" prior to the filter elements. This generally results from a plugged suction hose due to the build-up of dirt and mud or obstruction by a foreign obstacle such as a shot-sack. Another possibility would be when the pickup pot is extended to completely seal off the hole being drilled, thereby not allowing for appropriate make-up air (the difference between the dust-collector capacity and the blow-air capacity of the drill).

Upper Tap LOW - Lower Tap LOW

This condition points to a loss in suction capacity. The primary concern here is fan speed. The fan may be turning below the suggested 3000 RPM because of a problem in hydraulic oil supply (or the air supply in the case of an air motor). Another situation often occurs when the motor is changed out or repaired. The motor may be reconnected incorrectly to cause the blower wheel to turn in a reverse direction. When this happens, a vacuum will be produced and some air-flow will occur. The best way to verify proper rotation of the wheel is to observe it visually upon start-up or shut-down. The blower wheels on all *Filter/Clone* units should turn clock-wise when viewed from the top looking down at the collector.

As a final comment, one should note that the dust collector fan should be run as close to 3000 RPM as possible. Although the fan can easily tolerate higher speeds and the system will indeed pull more air at higher speeds, operating the system at such speeds can cause unnecessary wear of filter elements, dust collector housing, and suction hose.

Filter/Clone Dust Control Systems

MANOMETER READING				
Upper	**Lower**	**INDICATION**	**CAUSE**	**CURE**
High	Low	Loss of suction High reading across filter.	Plugged Filter	Check Pulse Air (Faulty timer, impulse valves, or low pressure)
High	High	Loss of suction Reading of zero across filter.	Plugged Hose. Pot too close to ground	Clear Air Path. Make sure Pot does not seal-off ground.
Low	Low	Loss of suction.	Low Fan Speed. Fan runs backwards. Dump Hose Missing.	Adjust Hydraulic Flow. Check Hyd. Hookup. Replace Dump Hose.
High	High	Poor filter life.	Fan Speed too high.	Reduce Hydraulic Flow to fan motor.

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