

**TECHNICAL MANUAL**

**OPERATOR'S MANUAL**

**M081 ASPHALT MIXING PLANT**

**NSN 3895-01-369-2551**

Manufactured by  
WRT Equipment Ltd.  
818 43rd Street East  
Saskatoon, Saskatchewan  
Canada S7K 3V1

Contract DAAE07-92-C-1191

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**HEADQUARTERS  
DEPARTMENT OF THE ARMY**

**30 JUNE 1994**

**Operator's Manual**

**ASPHALT MIXING PLANT**

**NSN 3895-01-369-2551**

**REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2, located in the back of this manual, direct to: Commander, U.S. Army Tank-Automotive Command, ATTN: AMSTA-MB, Warren, Mi 48397-5000. A reply will be furnished to you.

**THIS MANUAL SET CONSISTS OF THE FOLLOWING:**

Volume 1	Operator's Manual	TM 5-3895-374-10
Volume 2	Maintenance Manual	TM 5-3895-374-24-1
Volume 3	Maintenance Manual	TM 5-3895-374-24-2
Volume 4	Parts Manual	TM 5-3895-374-24P

This manual is an Army authentication of a commercial manual. The manual is not formatted to Department of the Army specifications. This manual does contain the information needed to operate the AMP.

You will find pages in Appendix F of this manual have two page numbers. The page number that appears as "F-#" is the true page number that tracks with the table of contents. The other number is a page number that exists in the commercial vendor manual as it appears in commercial use. This commercial page number has been left on the page to maintain continuity with the internal page referencing of the commercial vendor sections.

Refer to TB 5-3895-374-14 for any Warranty Issues. This TB takes precedence over all vendor warranty information that may appear in this manual.

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**SAFETY SUMMARY**

**WARNING**

The following warnings and cautions apply to this technical manual. The applicable warnings and cautions are repeated within this text

**WARNING**

Do not operate equipment before reading all technical manuals. The operation of this equipment by untrained personnel is potentially hazardous.

**WARNING**

Frequent inspection of equipment, safety devices and working areas must be performed. Ensure operational and personnel safety. Correct potential or actual hazards.

**WARNING**

Be sure ground connections are made properly and firmly before any operations begin.

**CAUTION**

If any cleaning solvents or cleaners are used be aware of the safety precautions of these products. Most are both toxic and flammable. Keep off skin and use only in a well ventilated area in accordance with the manufacturers recommendations.

**WARNING**

High voltage is used in the operation of this equipment. Death on contact may result if personnel fail to observe safety precautions. DO NOT contact high voltage connections when installing or operating this equipment.

**WARNING**

Various fuels and lubricants used in the Asphalt Mixing Plant are toxic and flammable. Skin and eye protection are required. When adding hydraulic oil, nitrile or neoprene gloves and chemical resistant glasses must be worn to limit the chance of skin and eye contact with the oil. Good general ventilation is normally adequate. Keep away from open flame and other ignition sources.

**WARNING**

Remove watches, rings, and all other jewelry while working on or near this equipment. These items could result in injury or death to personnel, or damage to equipment.

**WARNING**

Use non-asbestos heat-resistant gloves, protective clothing, and safety glasses when working with high temperatures.

**WARNING**

Hearing protection is required for the operator and all personnel working in and around this equipment.

**CHAPTER 1  
INTRODUCTION**

**I. GENERAL INFORMATION**

**1-1 Scope**

This chapter is an introduction to the M081 Asphalt Mixing Plant and provides general information about the equipment, plant layout and set up, operation, maintenance, and descriptions of support equipment. This basic information is expanded in greater detail in TM 5-3895-374-24 and TM 5-3895-374-24P.

**1-2 Maintenance Forms and Procedures**

The following forms are to be used in the maintenance of the M081 Asphalt Mixing Plant.

US Army Accident Investigation Report	DA Form 285
Equipment Operators Qualification Record (Except Aircraft)	DA Form 348
Equipment Improvement Recommendation Recommended Changes to Publications and Blank Forms	(EIR) SF Form 368 DA Form 2028-2
Organizational Control Record for Equipment	DA Form 2401
Equipment Inspection and Maintenance Worksheet	DA Form 2404
Maintenance Request	DA Form 2407
Preventive Maintenance Schedule and Record	DA Form 314
DOD Fire Incident Report	DA Form 2324
Report of Discrepancy (ROD)	DA Form 364
Product Quality Deficiency Report	SF Form 368

**1-3 Safety Care and Handling**

Operation of the M081 Asphalt Mixing Plant requires personnel to be aware of potential hazards presented by the plant. Personnel should follow the requirements listed below to ensure a safe work environment.

1. Use of ear protection for all plant personnel working outside the control van.

2. Use of all safety devices and guards provided with the plant.
3. Personnel must wear the following protective items at all times.  
  
Coveralls (not loose fitting)  
Safety glasses with side shields  
Insulated gloves - non-asbestos  
Hard hat  
Safety shoes
4. Routine maintenance procedures to be followed at all times. Maintain all equipment in good operating condition. This includes but is not limited to:  
  
Fuel Lines  
Asphalt Lines  
Hot Oil Heating Lines  
Hydraulic Lines  
Electric Cables and Connectors  
Air Lines
5. Restrict entry to all confined spaces except for authorized and scheduled maintenance inspections. Establish a confined space entry SOP IAW DHEW (NIOSH) Publication No. 80-106 (provided with AMP) when maintenance requires work in a confined space. This SOP must be coordinated with your local medical (preventive medicine) authority. Prior to entry test for fumes and make provision for proper ventilation. Never work alone. Always use the buddy system when working in confined spaces.
6. Do not operate equipment in an enclosed area unless all exhaust fumes are safely vented away from the work area.
7. Army Field Manual (FM) 21-10 must be followed if the AMP is operated in conditions that expose its operators and maintainers to heat stress conditions.

**NOTE**

**The following potential hazards are listed to notify of situations to be avoided during the operation of the plant Recommendations are Included to provide the necessary information so that these hazards may be avoided.**

**II. HAZARDS AND RECOMMENDATIONS**

*Table 1-1. Hazards and Recommendations*

**1. Control Van**

HAZARD	DESCRIPTION	RECOMMENDATION
High voltage electrical	All electrical switch-gear are located in this unit and all power cables are attached to the power source in the van.	Operate and maintain in accordance with all safety procedures. Do not perform repair work without a qualified electrician.
Compressed air	The trailer air brake system is comprised of air lines, tanks and valves which activate the trailer brakes.	Maintain system in good operating condition. Release air pressure prior to repairing the system.

**2. Four Bin Feeder**

HAZARD	DESCRIPTION	RECOMMENDATION
Noise	Aggregate materials loaded into the four bin feeder by a front end loader may cause intermittent noise levels exceeding 85 dba.	Use of ear protection.
Operating machinery	V-Belt drives and moving conveyor belts.	Use of guards during operation. Operator should not wear loose fitting clothing.
High voltage electrical	Power cables.	Avoid contact when energized. Maintain in good condition. Use cable supports provided. Do not perform repair work without a qualified electrician.
Fluids under pressure	Hydraulic cylinders, lines and valves.	Maintain lines in good operating condition. Wear protective clothing while operating the plant. (gloves, coveralls, safety glasses, hard hat)

HAZARD	DESCRIPTION	RECOMMENDATION
Compressed air	The trailer air brake system is comprised of air lines, tanks and valves which activate the trailer brakes.	Maintain system in good operating condition. Release air pressure prior to repairing the system.

**3.Feed Conveyor**

HAZARD	DESCRIPTION	RECOMMENDATION
Operating machinery	Vibrating screen and moving conveyor belt.	Use of guards during operation. Operator should not wear loose fitting clothing.
Noise	Aggregate materials discharged onto the screen may cause steady noise levels exceeding 85 dba.	Use of ear protection.
High voltage electrical	Power cables.	Avoid contact when energized. Maintain in good condition. Use cable supports provided. Do not perform repair work without a qualified electrician.
Fluids under pressure	Hydraulic cylinders, lines and valves.	Maintain lines in good operating condition. Wear protective clothing while operating the plant. (gloves, coveralls, safety glasses, hard hat)
Compressed air	The trailer air brake system is comprised of air lines, tanks and valves which activate the trailer brakes.	Maintain system in good operating condition. Release air pressure prior to repairing the system.

**4.Drum Mixer**

HAZARD	DESCRIPTION	RECOMMENDATION
Noise	Aggregate materials discharged into the feed chute may cause steady noise levels exceeding 85 dba.	Use of ear protection.

HAZARD	DESCRIPTION	RECOMMENDATION
Operating machinery	The drum is chain driven.	Use of guards during operation. Operator should not wear loose fitting clothing.
High voltage electrical	Power cables.	Avoid contact when energized. Maintain in good condition. Use cable supports provided. Do not perform repair work without a qualified electrician.
Fluids under pressure	Diesel fuel lines, asphalt pump and lines. Hydraulic cylinders, lines and valves.	Maintain lines in good operating condition. Wear protective clothing while operating the plant. (gloves, coveralls, safety glasses, hard hat)
Compressed air	The trailer air brake system is comprised of air lines, tanks and valves which activate the trailer brakes.	Maintain system in good operating condition. Release air pressure prior to repairing the system.
High temperature	The burner creates temperatures to 8000 F. The drum, asphalt aggregate mixtures being discharged and exhaust gases will become hot (approximately 3000 F).	Wear protective clothing while operating the plant. (gloves, coveralls, safety glasses, hard hat, work boots)
Fumes	Asphalt hot mix is discharged from the drum mixer.	Avoid inhaling fumes and operating equipment in a confined area.
Flammable and combustible materials	The burner is a diesel fired unit. Liquid asphalt.	Inspect and maintain burner safety systems as per manuals. Operate equipment with trained personnel.

HAZARD	DESCRIPTION	RECOMMENDATION
Confined space	Repairs to the drum mixer will require work inside the drum.	Check drum for fumes prior to entry. Use a fan for fresh air circulation. Use motor control lock out device prior to entering the drum. Maintenance work may only be performed after proper safety procedures have been met.

**5.Surge Bin**

HAZARD	DESCRIPTION	RECOMMENDATION
Noise	Intermittent noise levels exceeding 85 dba may be caused by: the drag slat 'conveyor elevating asphalt hot mix to the batcher; air compressor; exhausting air from air cylinders; and asphalt being discharged from the batcher to the bin or from the bin into trucks.	Use of ear protection.
Operating machinery	The air compressor is belt driven. The drag slat conveyor is a chain with steel attached to it. The chain runs on sprockets. The conveyor drive is chain driven.	Use of guards during operation. Operator should not wear loose fitting clothing.
High voltage electrical	Power cables.	Avoid contact when energized. Maintain in good condition. Use cable supports provided. Do not perform repair work without a qualified electrician.



HAZARD	DESCRIPTION	RECOMMENDATION
Fluids under pressure	Hydraulic cylinders, lines and valves.	Maintain lines in good operating condition. Wear protective clothing while operating the plant. (gloves, coveralls, safety glasses, hard hat)
Compressed air	An air compressor is mounted on this unit and provides air at 125 psi to the gate cylinders. An air tank is part of the compressor. The trailer air brake system is comprised of air lines, tanks and valves which activate the trailer brakes.	Maintain system in good operating condition. Release air pressure prior to repairing the system.
High temperature	Asphalt aggregate mixtures being discharged and exhaust gases will become hot approximately 3000 F)	Wear protective clothing while operating the plant. (gloves, coveralls, safety glasses, hard hat)
Fumes	Asphalt hot mix is discharged from the slat conveyor.	Avoid inhaling fumes and operating equipment in a confined area.

**6. Baghouse**

HAZARD	DESCRIPTION	RECOMMENDATION
Noise	Steady noise levels exceeding 85 dba may be caused by: the air compressor, rotary exhaust fan and blower.	Use of ear protection.
Operating machinery	The air compressor is belt driven. The exhaust fan is belt driven.	Use of guards during operation. Operator should not wear loose fitting clothing.

HAZARD	DESCRIPTION	RECOMMENDATION
<p>High voltage electrical</p> <p>Fluids under pressure</p>	<p>Power cables.</p> <p>Hydraulic cylinders, lines and valves.</p>	<p>Avoid contact when energized. Maintain in good condition. Use cable supports provided. Do not perform repair work without a qualified electrician.</p> <p>Maintain lines in good operating condition. Wear protective clothing while operating the plant. (gloves, coveralls, safety glasses, hard hat)</p>
<p>Compressed air</p>	<p>An air compressor is mounted this unit and provides air at psi. An air tank is part of compressor. The trailer air brake system is comprised of air lines, tanks and valves which activate the trailer brakes.</p>	<p>Maintain system in good operating condition. Release air pressure prior to repairing the system.</p>
<p>High temperature</p>	<p>The air drawn from the drum into the baghouse is approximately 3000 F.</p>	<p>Wear protective clothing while operating the plant. (gloves, coveralls, safety glasses, hard hat)</p>
<p>Fumes</p>	<p>The air drawn from the drum mixer may contain diesel and/or asphalt fumes. Confined space</p>	<p>Avoid inhaling fumes and operating equipment in a confined area. Restrict entry</p>

**7. Generator Trailer**

HAZARD	DESCRIPTION	RECOMMENDATION
<p>Noise</p>	<p>Steady noise levels exceeding 85 dba may be caused by the generators.</p>	<p>Use of ear protection.</p>

HAZARD	DESCRIPTION	RECOMMENDATION
High voltage electrical	Produced by this equipment.	Avoid contact when energized. Maintain in good condition. Use cable supports provided. Do not perform repair work without a qualified electrician.
Fluids under pressure	Diesel lines and coolant hoses.	Maintain lines in good operating condition. Wear protective clothing while operating the plant. (gloves, coveralls, safety glasses, hard hat)
Compressed air	The trailer air brake system is comprised of air lines, tanks and valves which activate the trailer brakes.	Maintain system in good operating condition. Release air pressure prior to repairing the system.
High temperature	Operation will generate heat.	Wear protective clothing while operating the plant. (gloves, coveralls, safety glasses, hard hat)
Fumes	Diesel exhaust may cause nausea or headaches.	Avoid inhaling fumes and operating equipment in a confined area.
Flammable and combustible Materials	The generators are diesel engine powered units.	Inspect and maintain generators as per manuals.

**8. Dedrummer/Melter**

HAZARD	DESCRIPTION	RECOMMENDATION
High temperature asphalt.	Hot oil is used to melt the	Wear protective clothing while operating the plant (gloves, coveralls, safety glasses, hard hat).
Operating machinery drums.	A electric chain hoist is operated to raise and position not wear loose fitting clothing.	Use of guards during operation. Operator should

HAZARD	DESCRIPTION	RECOMMENDATION
High voltage electrical	Power cables.	Avoid contact when energized. Maintain in good condition. Use cable supports provided. Do not perform repair work without a qualified electrician.
Fluids under pressure	Hydraulic cylinders, lines and valves. Diesel lines. Heat transfer lines.	Maintain lines in good operating condition. Wear protective clothing while operating the plant (gloves, coveralls, safety glasses, hard hat).
Compressed air	The trailer air brake system is comprised of air lines, tanks and valves which activate the trailer brakes.	Maintain system in good operating condition. Release air pressure prior to repairing the system.
Confined space	The asphalt tank is 10 feet in diameter with one manhole. Entry may be required to locate leaks in the heating coils and to effect repairs.	Restrict entry. Repair by qualified repair personnel only, after proper procedures have been followed.
Flammable and combustible materials	A diesel tank is mounted on this unit. The liquid asphalt has a flash point of 4500 F. The heat transfer oil has a flash point of 5400 F.	Inspect and maintain as per manuals.

**9.Asphalt Tanker**

HAZARD	DESCRIPTION	RECOMMENDATION
Noise	Steady noise levels exceeding 85 dba may be caused by the burner blower. An air cylinder mounted on the tanker exhausts compressed air when operational and will cause intermittent noise.	Use of ear protection.

HAZARD	DESCRIPTION	RECOMMENDATION
High temperature	The hot oil heater has a diesel fired burner which heats the "hot transfer fluid". This fluid is circulated through heating coils which may reach temperatures of 4500 F in order to maintain an asphalt temperature of 3000 F. The hot oil heats asphalt lines and pumps.	Wear protective clothing while operating, inspecting or servicing the plant. (gloves, coveralls, safety glasses, hard hat)
High voltage electrical	Power cables.	Avoid contact when energized. Maintain in good condition. Use cable supports provided. Do not perform repair work without a qualified electrician.
Fluids under pressure	Hydraulic cylinders, lines and valves, diesel lines, heating oil lines.	Maintain lines in good operating condition. Wear protective clothing while operating the plant. (gloves, coveralls, safety glasses, hard hat)
Compressed air	The trailer air brake system is comprised of air lines, tanks and valves which activate the trailer brakes.	Maintain system in good operating condition. Release air pressure prior to repairing the system.
Confined space	The asphalt tank is 10 feet in diameter with one manhole. Entry may be required to locate leaks in the hot oil piping.	Restrict entry. Repair by qualified repair personnel only, and only after proper procedures have been followed.
Flammable and combustible materials	The burner is a diesel fired unit on the hot oil heater. The liquid asphalt has a flash point of 450° F. The heat transfer oil has a flash point of 5400 F.	Inspect and maintain as per manuals.

**10. Hydraulic Power Pack**

HAZARD	DESCRIPTION	RECOMMENDATION
Noise	The hydraulic pump may generate noise levels exceeding 85 dba.	Use of ear protection.
High temperature	The pump will cause the hydraulic oil to heat.	Wear protective clothing while operating the plant. (gloves, coveralls, safety glasses, hard hat)
High voltage electrical	Power cables and starter.	Avoid contact when energized. Maintain in good condition. Use cable supports provided. Do not perform repair work without a qualified electrician.
Fluids under pressure	Hydraulic lines and valves.	Maintain lines in good operating condition. Wear protective clothing while operating the plant. (gloves, coveralls, safety glasses, hard hat)
Flammable and combustible materials	Hydraulic oil. manuals.	Inspect and maintain as per

**1-4 Corrosion Prevention and Control (CPC)**

The M081 Asphalt Mixing Plant has been treated and painted with a Chemical Agent Resistive Coating (CARC). Maintain this coating in accordance with standard US Army procedures for this materiel.

**1-5 Destruction of Army Materiel to Prevent Enemy Use**

Refer to TM 43-0002-24 Destruction of Equipment to prevent Enemy Use.

**1-6 Reporting Equipment Improvement Recommendation (EIR)**

If your Asphalt Mixing Plant (AMP) needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Quality Deficiency Report). Mail it to: Commander, US Army Tank-Automotive Command, ATTN: AMSTA-QRD, Warren MI 48397-5000. We'll send you a reply.

**1-7 Warranty**

All information on warranty is contained in TB 5-3895-374-14. This document takes precedence over any information contained in the vendor information which may be contained in the manuals.

**1-8 Nomenclature Cross Reference List**

Shortened nomenclature is used in this manual to make procedures easier to read. A cross-reference between the shortened nomenclature and the official nomenclature is shown in the following table.

*Table 1-2. Nomenclature Cross Reference*

<b>Official Nomenclature</b>	<b>Manual Nomenclature</b>
Asphalt Plant	M081 Asphalt Mixing Plant
Asphalt Mixing Plant	
Plant	
AMP	

**1-9 List of Abbreviations**

The attached list contains abbreviations used in the manuals for the M081 Asphalt Mixing Plant.

**GENERAL**

AMP	Asphalt Mixing Plant	GFE	Government furnished equipment
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**BLENDING CONTROLS**

A/C	Liquid asphalt cement	RAP	Recycled asphalt pavement
*A/C	The A/C added to the mix by the asphalt and metering system	Vir	Virgin uncoated aggregate
rA/C	The A/C reclaimed from RAP	pps	Belt speed pickup pulses per second
mA/C	A/C whose content is lb/g based on the total mix	lb/g	Liquid density in pounds per gallon
aA/C	A/C whose content is based on the aggregate only	sec	Time measured in seconds
dTPH	The “d” signifies dry i.e. dry tons per hour	ESC	The key marked for escape
Dton	i.e dry tons		
wTPH	The prefix “w” signifies WET i.e. wet tons per hour	VOL	This material is measured by volume, not by scale, meter
wTon	i.e. Wet ton	F	Suffix specifying temperature in degrees Fahrenheit
(###)	Parentheses indicate that the value shown is the desired value entered by the user and is not a measured value	C	Suffix specifying temperature in degrees centigrade

**ELECTRICAL**

MCC	Motor Control Center	PLC	Programmable logic controller
PBL	Push Button lit	TS	Thermostat
M1	Controller motor	DPG	Digital pressure display
CR	Control relay	POT	Potentiometer
SS	Selector switch	MTR	Panel meter



SSL	Selector switch lit	PT	Pressure transmitter
LS	Limit switch	HRN	Warning horn
PL	Pilot light	PTX	Potential transformer
TS	Temperature switch	CT	Current transformer
OLS	Level switch	HTR	Heating element
PS	Pressure switch	TI	Digital temperature display
SV	Solenoid valve	JB	Junction box
PDT	Pressure transmitter	TE	Temperature element
SYS	System signal	UDC	Controller
AUX	Auxiliary contact	S	Switch
STC	Shunt trip coil	L	Light
KS	Key switch	FM	Meter
ALM	Alarm buzzer	GFR	Ground fault relay
BS	Bin switch	DWI	Digital weigh indicator
PB	Pushbutton		

### III. EQUIPMENT DESCRIPTION

#### 1-10 Asphalt Materiel Handling System

The Asphalt Mixing Plant is a materiel handling facility. This portable facility produces hot mix asphalt for the pavement of highways and other pavement requirements. The basic manufacturing process of the M081 Asphalt Mixing Plant involves removing free moisture from the aggregate, heating the aggregate and coating the aggregate with hot asphalt cement. This continuous process is accomplished within a drum mixer. In addition to the drum mixer various pieces of equipment are included to support the process. Each of the following components are trailer mounted to facilitate movement of this plant:

1. **Control Van.** The control van contains the controls and indicators necessary to start, monitor, change and stop the manufacturing process.
2. **Drum Mixer.** The drum mixer receives aggregate, from the feed conveyor dries and heats it. Liquid asphalt cement is injected into the drum and mixes with the aggregate. The hot mixture then exits the drum.
3. **Surge Bin.** The surge bin provides three basic functions. The asphalt from the drum mixer is fed by conveyor to the surge bin. This bin allows the continuous production of the asphalt mix in the drum mixer by providing a storage area to accumulate the mix. The surge bin bottom opening is located 12 feet above the ground. A truck loading area is located below this surge bin to allow the passage of a truck for loading.
4. **Baghouse.** The baghouse is attached to the exhaust end of the drum mixer and collects particulate matter from the exhaust air of the drum mixer.
5. **Dedrummer/Melter.** The dedrummer/melter raises the temperature of asphalt in drums to convert it to liquid asphalt and transfers it to the storage tanker.
6. **Asphalt Tanker.** The asphalt tanker stores liquid asphalt, heats it to operating temperature and transfers the liquid asphalt to the drum mixer.
7. **Feed Conveyor.** The feed conveyor transfers aggregate from the four bin feeder to the drum mixer. This aggregate is passed over a single screen designed to remove any contaminants or over-sized aggregate.
8. **Four Bin Feeder.** The four bin feeder accepts up to four different types of pre- screened aggregate. Each bin can be controlled to feed a desired proportion of the total mix.
9. **Generators.** The generators are supplied (GFE) to completely power the M081 Asphalt Mixing Plant where commercial power is not available. These diesel powered generators are supplied with their own technical manual set. The following wheeled components also form part of the plant:
10. **Dolly.** The eight wheel tandem axle dolly may be used to move the trailer mounted components of the Asphalt Mixing Plant.
11. **Standby Generator.** The standby generator is supplied (GFE) to provide power to certain components of the Asphalt Mixing Plant during non operational periods.

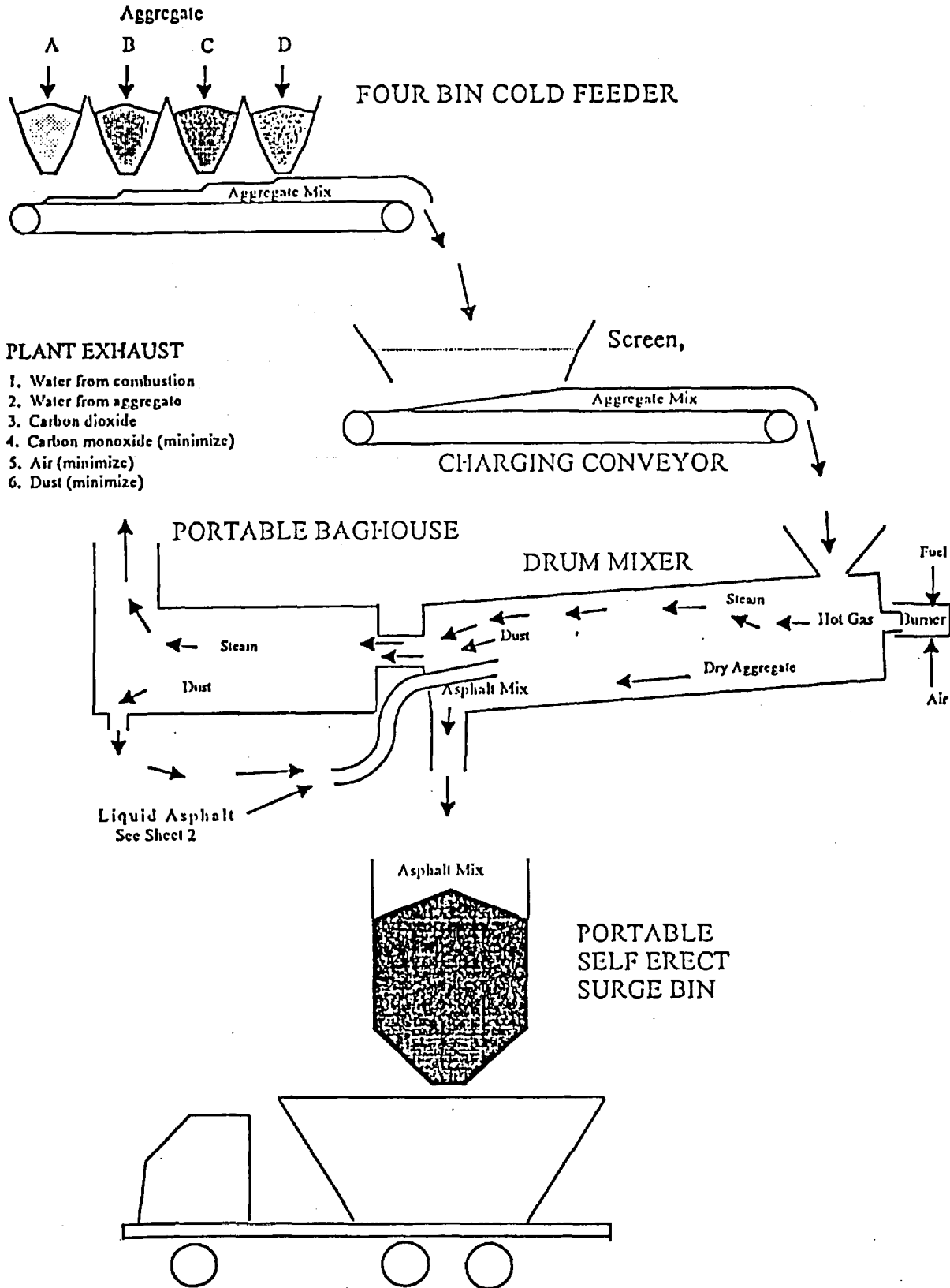


Figure 1-1 Material Flow - Sheet 1 of 2

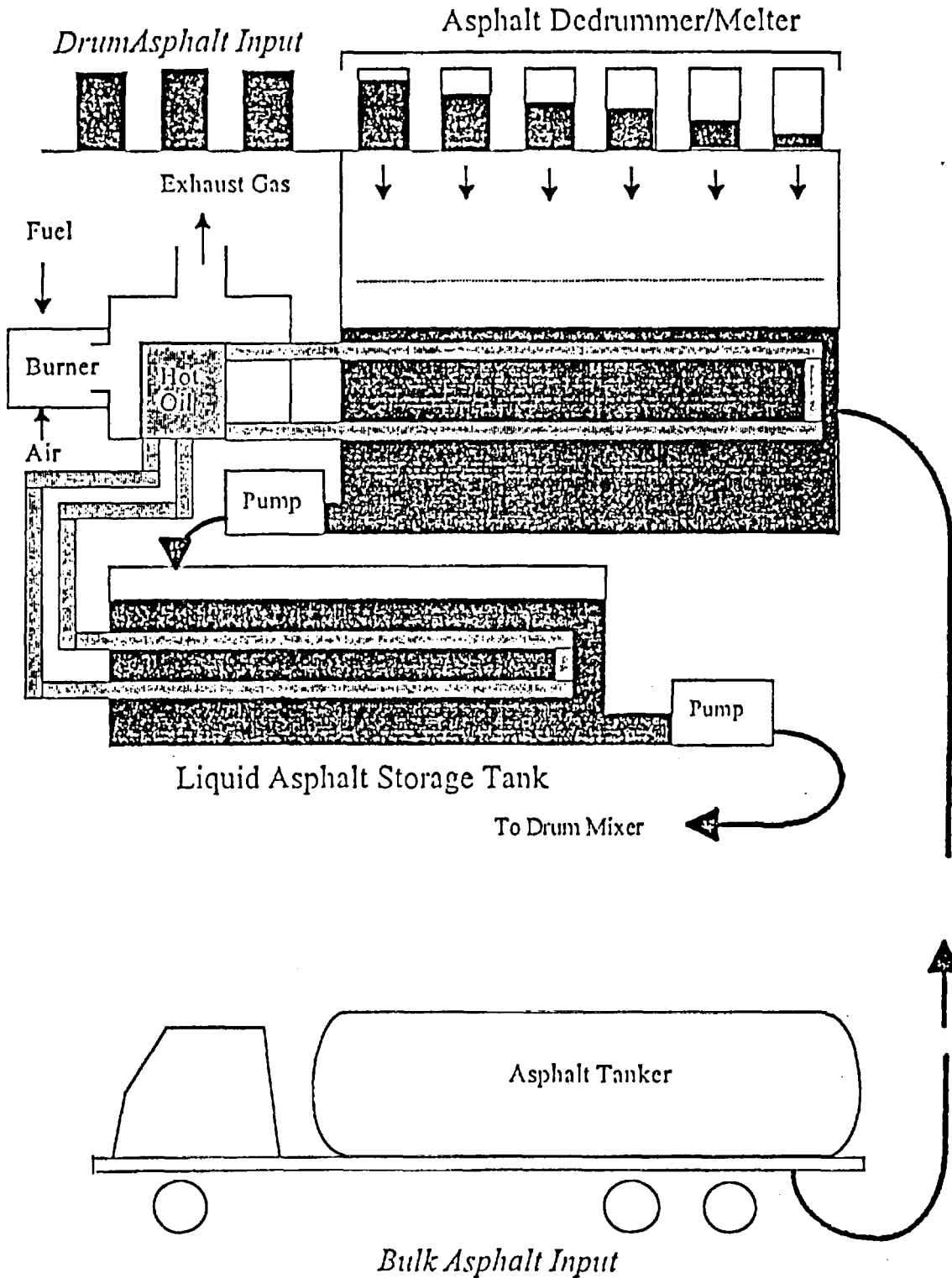


Figure 1-1 Material Flow - Sheet 2 of 2

## **1-12. Controls**

The M081 Asphalt Mixing Plant is designed to be operated automatically through a blending controller. This controller is a specially designed industrial computer. The plant may also be operated manually without the use of this blending controller. However, manual operation is not recommended as the quality of the product may not be to the high standards attainable through the blending controller.

The functions of the operator control panel are processed through a Programmable Logic Controller (PLC). This controller contains the programmable logic required to perform many electrical functions of the plant. Sequencing of electrical motors, time delays and sensor monitoring occurs within this PLC. Some of these functions may be altered by the plant operator.

The Asphalt Mixing Plant has a training mode which is accessed through the PLC. This permits control panel training of operators without running the components of the AMP.

**BLENDING CONTROLS**

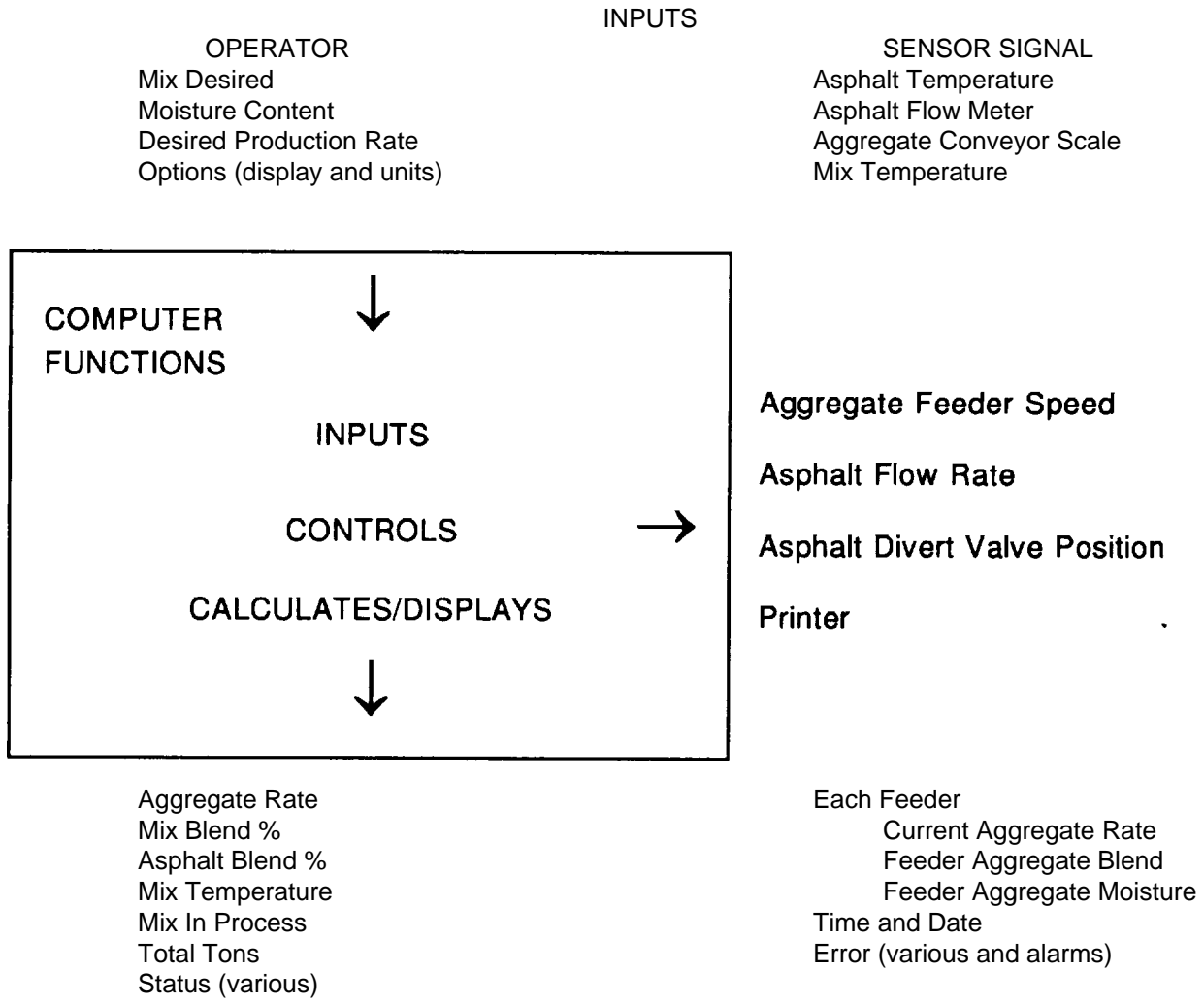


Figure 1-2. Blending Controls

### 1-13. Heating Process

The most efficient means of drying and heating the aggregate is to apply direct heat. This is accomplished with a burner that directs the flame into the drum. Attached to the inside of the drum are step-like pieces known as flights. When the drum rotates, the flights pick up the aggregate and drop it through the hot exhaust gas stream. An exhaust fan is used because it significantly increases the production rate over that of a natural draft process. The materials used in the Asphalt Mixing Plant tend to be very dusty. As they pass through the exhaust gas, which is moving at a velocity of about 800 to 1000 feet per minute, dust will be picked up and entrained in the exhaust gas. These gases are passed through a baghouse (fabric filters) which removes most of the dust and exhausts the remainder to the atmosphere. The contents of this exhaust are:

1. **Water from Combustion** This water is the result of the chemical reaction of combustion of the fuel with air. The carbon and hydrogen atoms of the fuel react with the air and produce water and carbon dioxide (ideal process).
2. **Water from Aggregate** This water is water contained on the surface of the aggregate when it is placed in the bin feeder.
3. **Carbon Dioxide** This is the product of combustion (see 1).
4. **Carbon Monoxide** This is an unwanted product of combustion produced when the combustion process takes place with insufficient air. This condition is known as a "rich burn" or as "less than 100% stoichiometric combustion air". The term stoichiometric refers to the ideal air/fuel ratio to achieve complete combustion. This is further defined in later sections of this document.
5. **Air** This is an unwanted product of combustion produced when the combustion process takes place with excess air. This condition is known as a "lean burn" or a "more than 100% stoichiometric combustion air". The term stoichiometric refers to the ideal air/fuel ratio to achieve complete combustion. This is further defined in later sections of this document.
6. **Dust** This is an unwanted element of the exhaust. The baghouse is efficient but not perfect. Very small particles are not removed and are exhausted to the atmosphere.

### 1-14 . Combustion Process

The simplest and most economical method of drying and heating the aggregate is with direct heat. A direct fired burner is the most efficient means of providing the direct

heat. The aggregate is exposed directly to the radiant and convective heat from the flame of the burner.

The basic function of the burner is to proportion oxygen (air) and fuel and to atomize and mix the fuel and oxygen to obtain complete combustion.

The flame shape plays an important role in the drying process within the drum mixer. The flame shape is adjusted to provide a short bushy flame which provides a flame over a large section of the drum cross-section and gives a more uniform temperature across the cross-section. There are a number of factors that determine the flame shape. As the combustion air is forced through the burner by a blower, it is delivered at a regulated pressure. Generally, the flame shape and intensity can be regulated by controlling the blower pressure, the amount of air forced through the burner, and the "swirl". The flame size is partially determined by the blower pressure, by the percentage of stoichiometric air provided to combustion by the blower, and by the ratio of the angular momentum of the burner air to its axial momentum. The type of fuel burned, the degree of atomization of the liquid fuel, the particle size of the fuel, the extent of premixing of the fuel and air, the combustion zone temperature, the amount of swirl, etc. will all effect the flame size and shape to some degree. Only a few of these factors are under the control of the operator. Other portions of this technical manual should be consulted for procedure for adjustments.

Combustion is basically a chemical reaction between a fuel and oxygen ( $O_2$ ) initiated by an ignition source. Complete combustion generates carbon dioxide ( $CO_2$ ) and water in the form of steam ( $H_2O$ ). For complete combustion of a fuel, there is a specific amount of oxygen required. In essence, there must be two oxygen (O) atoms available for each carbon (C) atom in the fuel ( $C+2O=CO_2$ ), and one oxygen (O) atom for every pair of hydrogen (H) atoms ( $2H+O=H_2O$ ). After the amount of oxygen needed for combustion is determined, the amount of combustion air that will provide that oxygen to the combustion process can be calculated. Since air is approximately 21% oxygen the amount of required combustion air is calculated by dividing the required amount of oxygen by .21. The resulting number is commonly called the "stoichiometric air required for combustion". Each fuel has its own unique stoichiometric air requirement, and is generally specified as a air-to-fuel ratio – the minimum amount of air needed to burn one unit of fuel. For example, the stoichiometric air required to burn one gallon of No 2 fuel oil is 1377 cubic feet (CF), so the stoichiometric air-to-fuel ratio is 1377 cubic feet per gallon. In the case of incomplete combustion, there will be a third combustion product -- carbon monoxide. Generally, if carbon monoxide is present it occurs in extremely small concentrations in the exhaust gases.

Complete combustion of a fuel with its stoichiometric air-to-fuel ratio requires extensive mixing of the fuel and air, so that every available oxygen atom will meet up with every available carbon and hydrogen atom. Unfortunately equipment that operates this efficiently does not exist. It is necessary to provide the combustion process with more



air than is stoichiometrically required. By doing this, the number of oxygen molecules available for the carbon and hydrogen molecules has been increased. For this reason the stoichiometric air requirement is frequently called the theoretical air requirement, and the additional air is known as excess air, generally stated as a percentage of stoichiometric air to fuel ratio is 1377 cubic feet per gallon, the amount of air needed for combustion is 1721 cubic feet.

While excess air is necessary to ensure that all the fuel burns, it is possible to overdo a good thing. Too much excess air wastes fuel. This happens because the excess air will be at the same temperature as the other components of the exhaust gas, and as part of the exhaust gas, it is exhausted from the stack. The rise in temperature of the excess gas consumes energy (BTU's). Exhausting hot excess air that was not needed to promote complete combustion is like throwing fuel into the air.

### **1-15. Drum Mixer**

The drum mixer is the component which completes the process of producing the hot asphalt mix. This rotating drum accepts an aggregate mix, dries the aggregate, and mixes the liquid asphalt with the aggregate to produce the asphalt mix. This process is accomplished on a continuous basis so that the mix will be consistent in content and temperature. A steady flow of aggregate, hot gas and hot liquid asphalt are all that is required. This simple statement of the process however does not properly indicate the complexity of operation of the Asphalt Mixing Plant. The plant has two surge points to allow the accumulation of materials in order to make the continuous operation of the plant much simpler. A surge bin is located at the drum mixer discharge point to collect the finished product (asphalt mix) and allow continuous operation of the drum mixer. Bins are used to hold the aggregate so as to ensure a steady stream of aggregate. These four bins also allow the production of different aggregate mixes. Each of the four bins are individually controlled and the blend can be changed by controlling the speed of the feeder on each bin. This allows a different amount of each aggregate to be fed to the feed conveyor, therefore producing a desired blend by controlling the proportion of each type of aggregate.

## **IV. PRINCIPLES OF OPERATION**

### **1-16. Setting the Mix**

The asphalt hotmix design is provided to the operator of the Asphalt Mixing Plant by the engineer or supervisor of the construction project. The raw materials required, aggregates and asphalt cement, have been provided and are ready for use. The mix design is input into the blending controller if it is not already in memory. Aggregate moisture content must be provided daily and input into the controller. The density of

the asphalt cement being used is obtained from the refinery delivery slip and is recorded into the controller. A detailed description of the plant operation is contained in Section 2-12 through 2-21.

### **1-17. Controlling the Mix**

The specific amount of each aggregate required is fed from the four bin feeder across a conveyor belt scale and weighed. The blending controller automatically proportions the asphalt cement required for the weighted amount of aggregate entering the drum mixer. As the aggregate feed rate varies the asphalt cement feed rate is varied. The operator controls the plant production rate through the blending controller. The surge bin allows the plant to continuously mix asphalt while trucks are being loaded and while they are hauling mix to the paving site. Mix control is accomplished by the blending controller during automatic operation. The operator controls the production rate of the plant, monitors mix characteristics and plant operations. A detailed description of the plant operation is contained in section 2-12 through 2-21.

## CHAPTER 2 OPERATING INSTRUCTIONS

### I. SET UP, TEAR DOWN AND MOVEMENT

#### 2-1. General

The following instructions are for information and guidance of personnel responsible for the proper operation of the Asphalt Mixing Plant. The operator must know how to perform every operation for which the plant is capable. This section contains instructions on the basic operating procedures to perform the specific task for which the plant was designed.

#### 2-2. Safety Precautions

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of operation and maintenance.

1. Do not smoke within 50 feet of the fuel tanks.
2. Wear protective goggles, gloves, and clothing to prevent fuel, oil, or asphalt from contacting eyes or skin.
3. Contact with fuel may cause temporary illness. Wear clean rubber gloves when handling fuel soaked parts. Avoid breathing fuel fumes. Do not take fuel internally. Work only in well ventilated areas. After handling fuel, wash hands thoroughly before eating or smoking.

### CAUTION

#### Do Not Apply Water to Fuel Fires

4. In case of a fuel fire, use an acceptable chemical extinguisher system.
5. Persons working on or near the M081 Asphalt Mixing Plant should be familiar with modern methods of resuscitation. Such information may be obtained from the Director of Base Medical Services.

6 Follow recommended hearing protection procedures when outside the control van during operations.

7 Static grounding cable must be attached to equipment and suitable ground before any plant operation is performed.

### **2-3. Choosing and Preparing a Site**

Proper operation of the M081 Asphalt Mixing Plant can only be achieved when the plant is properly assembled on site. The selection of a site is critical to proper operation of the unit. The site should have the following characteristics:

**1.Size:** Large enough to allow easy access by product trucks delivering materials and by asphalt trucks picking up product. Consideration should also be given to movement of the aggregate front end loader. The area should also be large enough to provide a stockpile area for aggregate. This could be considerable if a large selection of aggregate is planned.

**2.Level:** The site should have a area approximately 130 feet by 200 feet which is level. This will be needed to position and level the plant.

**3.Soil:** The soil should be capable of supporting the plant. Choose a site that is well drained and without any loose soil. If the site is graded to achieve a level condition, the soil should be compacted.

**4.Orientation:** The plant should be oriented, if possible, so that the exhaust from the burners is down wind (prevailing) from the control van, truck loading area, and four bin feeder.

**5.Location:** The plant should be located to provide service as close as possible to the customer. The plant site should also provide access to sanitation and other support facilities.

### **2-4. Layout and Placing the Equipment**

The plant will be located on a level area approximately 130 feet by 200 feet. Remember that additional space is required for truck and front end loader movement as well as stockpile area. Position the plant so that aggregate stockpiles may be readily accessed by the front end loader and travel distance minimized. The traffic flow of trucks loading with asphalt hot mix and the trucks delivering aggregate and liquid asphalt must be considered.

The control van is the first component to be positioned after the orientation of the plant to the site has been determined. Stake the two corners of the control van as indicated on the plant site layout.

**NOTE**

**A plant site layout figure 2-1 is included as is an alternate plant site layout figure 2-2.  
Choose one layout prior to beginning the positioning of the equipment.**

Specific procedures are provided later in the chapter for the set up of each component of the Asphalt Mixing Plant.

**Equipment Set Up Sequence**

- 1. Control Van:** The control van is set up first so that the tools and materials stored within this van will be available. This van also distributes the power from the generators to the other components.
- 2. Standby Generator:** This generator provides set up power to the control van.
- 3. Generator Trailer:** The two 200 kW generators provide system power requirements.
- 4. Hydraulic Power Pack:** The portable power pack provides the necessary hydraulic power to operate the hydraulic jacks which raise and position the trailers into operating position. Mechanical landing jacks are used by some of the trailers.
- 5. Surge Bin:** The surge bin is positioned next. The slat conveyor feed end must be in place prior to the set up of the drum mixer. The slat conveyor is lowered at the feed end and the drum mixer discharge chute is positioned over the slat conveyor.
- 6. Drum Mixer:** The drum mixer is positioned so it is properly aligned with the slat conveyor.

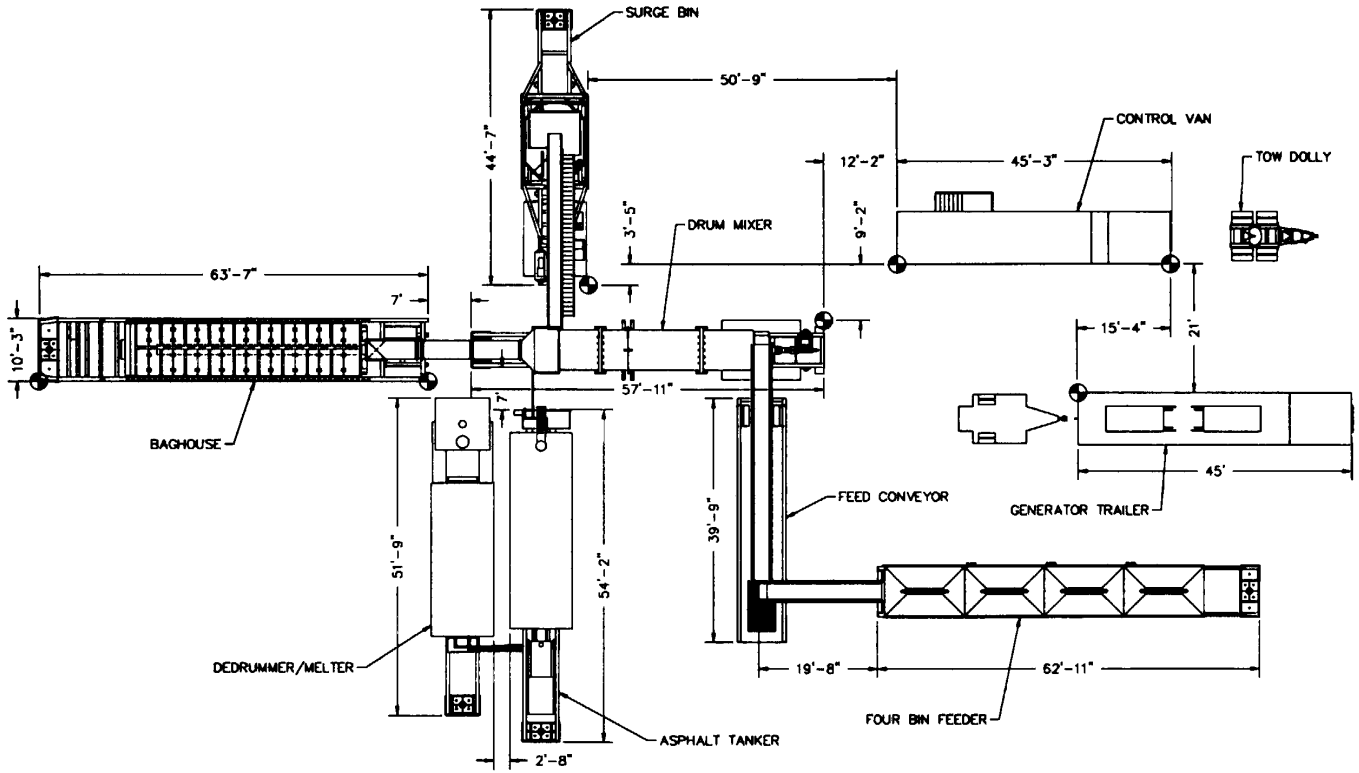


Figure 2-1. Plant Site Layout  
page 2-4

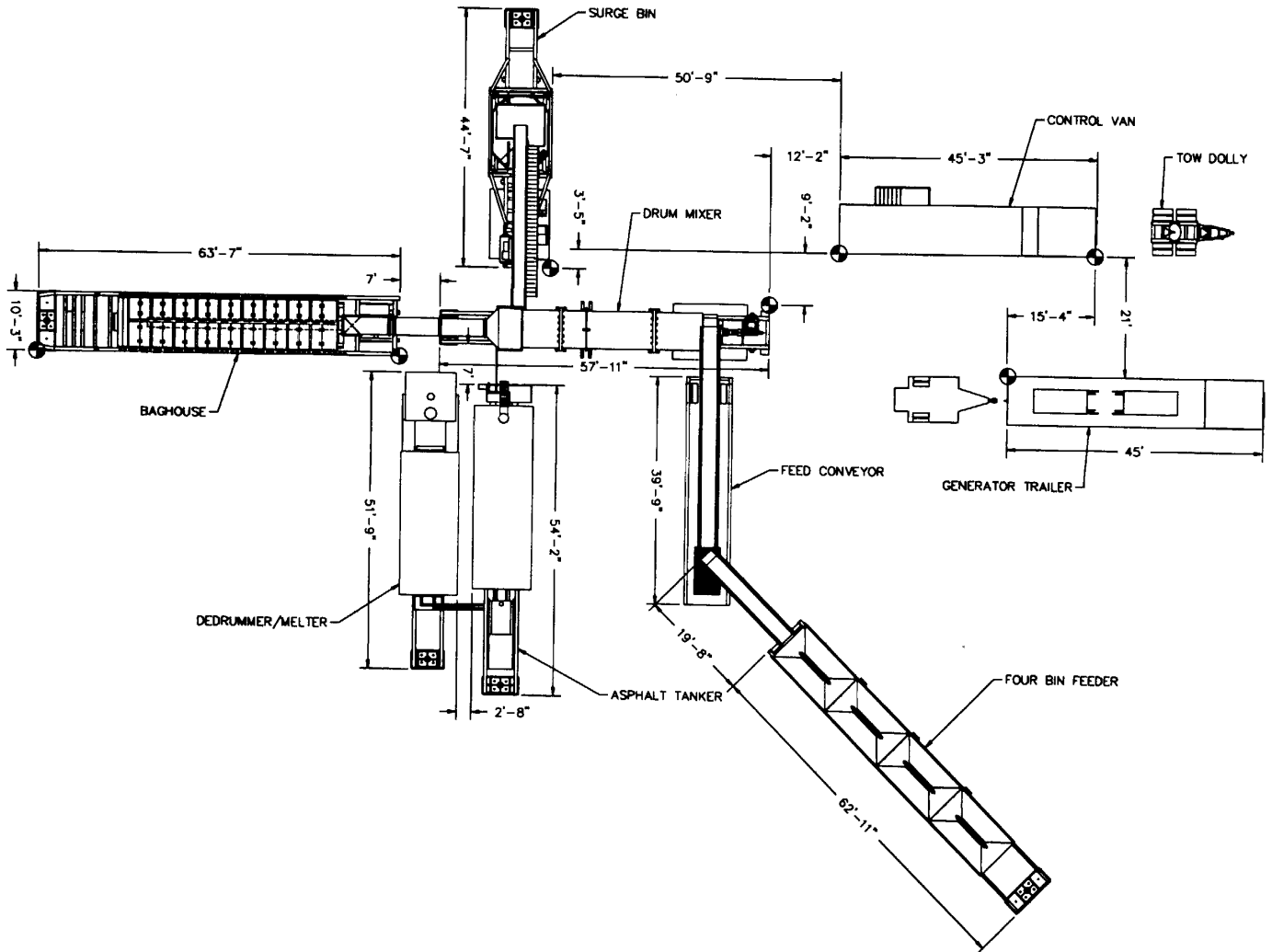


Figure 2-2. Alternate Plant Site Layout  
page 2-5

7. **Baghouse:** The baghouse is positioned in line with the drum mixer. An expansion joint in the ducting between the two components allows for slight misalignment.
8. **Asphalt Tanker:** The asphalt tanker is positioned next and connects to the drum mixer.
9. **Dedrummer/Melter:** The dedrummer/asphalt melter is positioned relative to the asphalt tanker.
10. **Feed Conveyor:** The feed conveyor is positioned so that the discharge chute is centered on the drum mixer inlet chute.
11. **Four Bin Feeder:** The four bin feeder is positioned so that the gathering conveyor discharges onto the upper portion of the screen on the feed conveyor.

## 2-5. Plant Set Up

The plant equipment must be set up in the following sequence.

1. Control Van
2. Standby Generator
3. Generator Trailer
4. Hydraulic Power Pack
5. Surge Bin
6. Drum Mixer
7. Baghouse
8. Asphalt Tanker
9. Dedrummer/Melter
10. Feed Conveyor
11. Four Bin Feeder

The AMP has been provided with three types of legs which are used to set up and support the plant.

**Landing Jacks:** One pair per trailer mounted at the gooseneck. Trailer landing legs or jacks. These are crank style and used for support prior to and after transport.

**Hydraulic Levelling Jacks:** One or more pair of hydraulic cylinders mounted on the trailer chassis. These are used to raise and lower the trailer so that the screw jacks may be positioned in the operating position or in the transport position (Not supplied on all trailers.)



**Screw Jacks:** Two or more pair of heavy adjustable screw legs with bearing pads which support the trailer while in the operating position.

The trailer is lowered or raised by the manual landing jacks or hydraulic jacks. The screw jacks only provide support. The screw jacks are not intended to raise or lower the trailer. Levelling of the trailer can best be accomplished by lowering the front of the trailer on the landing jacks until it is slightly lower than the rear end of the trailer. Position and adjust the rear screw jacks. Raise the kingpin end of the trailer slightly above level and position and adjust the front screw jacks. Retract the landing jacks so that the trailer is supported by the front and rear screw jacks.

The M081 Asphalt Mixing Plant is equipped with hardware storage boxes. Each component of the Asphalt Mixing Plant has at least one of these boxes. They are intended to store hardware not used while the plant is operating but required when it is in the transport mode. They also serve to store hardware not required while in the transport mode but required when operating. Use these boxes for the intended purpose. If hardware is required but not available on a component, check the hardware box to determine if the hardware has been stored there. The term level as used in these procedures refers to achieving a level indication when the level is positioned on the levelling pads or on a flat section of the chassis.

**NOTE**

**Match markings: All cable ends and electrical receptacles are marked with corresponding numbers. All components stored for transport are match marked. It is essential to match all markings during assembly.**

**CAUTION**

**Do not stand behind or near equipment being moved or positioned. Account for all personnel before moving equipment.**

**CAUTION**

**Do not stand under or near equipment being lifted or jacked. Clear the immediate area around equipment being raised or lowered into operating or transport position.**

**CAUTION**

**Do not place heavy loads or drive over electrical power cables or control cables. These cables may sustain internal damage which could cause injury.**

**NOTE**

**Damaged electrical power or control cables may prevent operation of the plant.**

**1 Control Van Set Up Procedures  
(See Figures 2-3 and 2-4)**

Position the Control Van according to the site layout that has been determined. This trailer is used to position the generator trailers. Measure from the control van according to Figure 2-1 or 2-2. Keep the Control Van parallel to both generator trailers.

Item	Procedure
1	Position the control van according to the site layout.
2	Disconnect the control van from the transport tractor.
3	Remove the transport strap from the two rear screw jack pads. Lower all screw jacks.
4	Raise the trailer on the jacks approximately one inch.
5	Using a four foot level, level the trailer along both its width and length.
6	Install the ground rod and connect to the van.
7	Install the access stairs. The stairs are stored on the goose neck of the trailer during transportation. Unbolt the stairs, use a fork lift to remove and place in position below the door.
8	The computer, monitor, keyboard and printer are stored for transport. Remove them from their boxes and install them by connecting them to the computer and 110 volt power outlet.
9	Remove the transport cover from the environmental control unit (ECU).
10	Install the air filter element into the ECU.

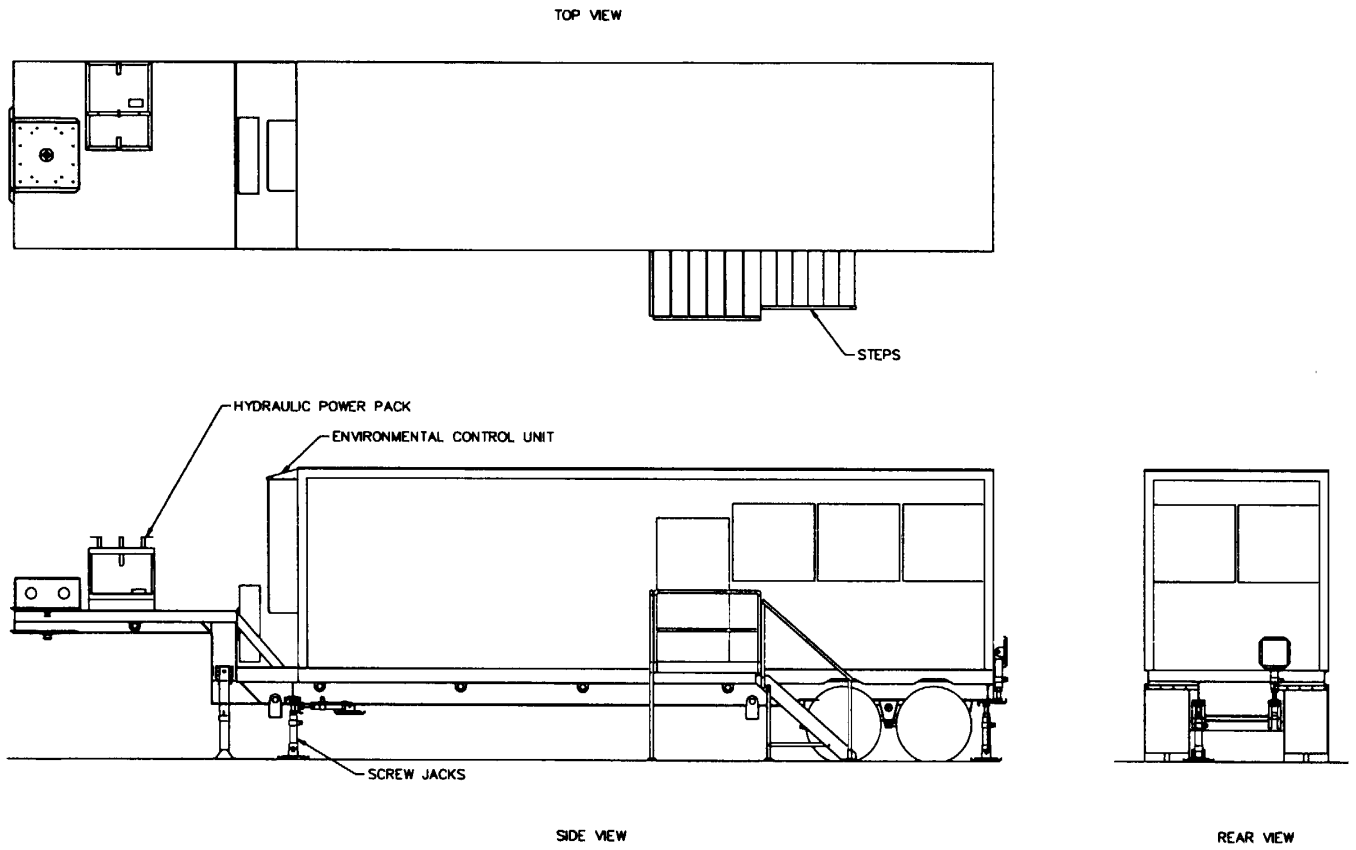
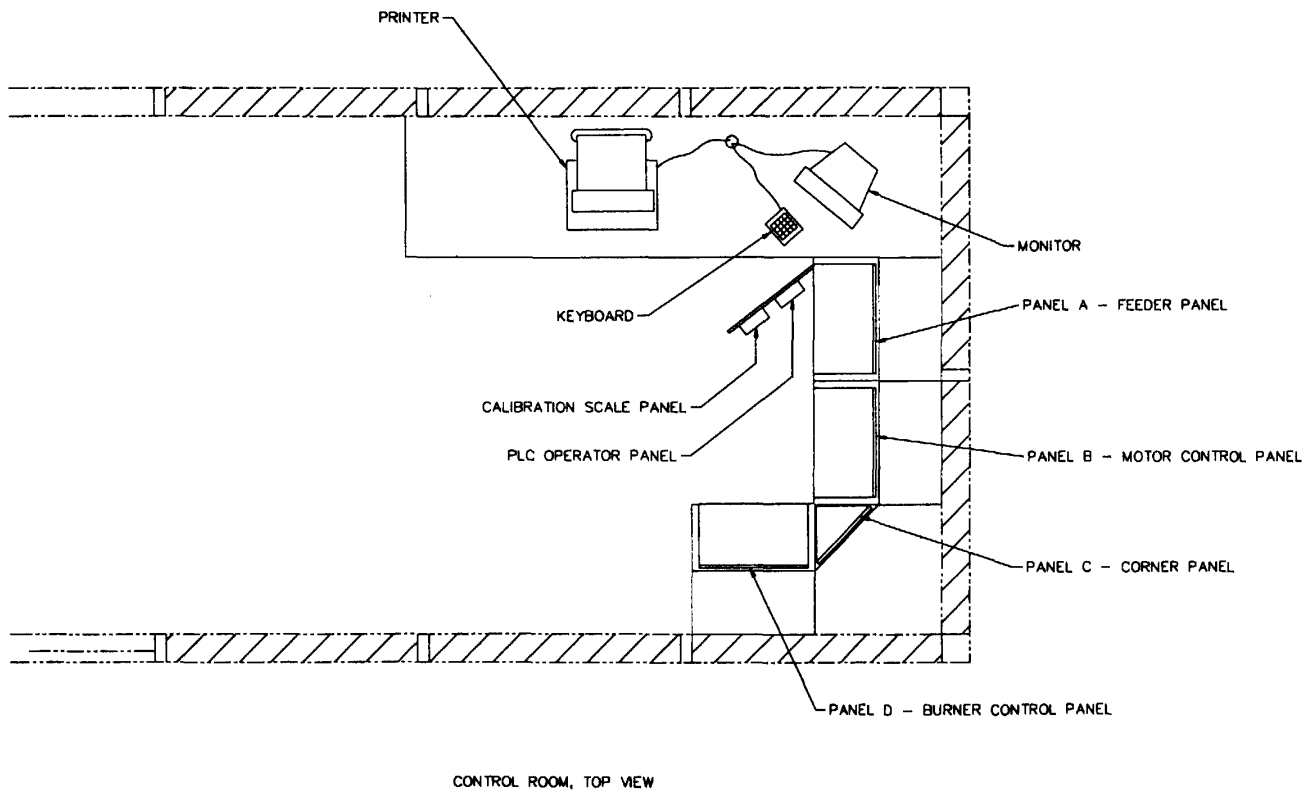


Figure 2-3. Control Van



CONTROL ROOM, TOP VIEW

Figure 2-4. Monitor/Printer Positioning

**2. Standby Generator Set Up Procedures**  
 (See Figures 2-1 and 2-6)

Item	Procedure
1 the control van.	Position the 60 kW generator according to the site layout and not more than 50 feet away from
2	Disconnect the generator from the transport tractor.
3	Lower the three support jacks and raise the generator one to two inches.
4 generator.	Install the ground rod and connect the green wire from the rod to the ground connector on the
5 generator.	Remove the power cable from the (generator trailer) storage position and connect to the
6	Feed the other end of the cable through the access port in the floor of the control van (below the door). Connect the cable to the motor control center #2 in the control van.

**3. Generator Trailer Set Up Procedures**  
 (See Figures 2-1, 2-5 and 2-6)

Item	Procedure
1	Position the 200 kW generator according to the site layout.
2	Disconnect the generator trailer from the transport tractor.
3	Lower the four screw jacks and raise the generator one to two inches.
4	Using a four foot level, level the trailer along both its width and length.
5	Install two ground rods (one for each generator) and connect the green wires from the rods to the ground connectors on the generators.

Item	Procedure
<p>6 follows: located below the control van near the goose neck.</p>	<p>Remove the two power cables from the 200 kW generator trailer storage position and connect as follows:</p> <p>Connect the first cable (CBL 137) to generator #1 then feed the other end through the port located below the control van near the goose neck. Connect the cable to the motor control center #1 in the control van.</p> <p>Connect the second cable (CBL 135) to generator #2 then feed the other end through the large port located below the door of the control van. Connect the cable to the motor control center #2 in the control van.</p>

**4. Hydraulic Power Pack Set Up Procedures**  
(See Figures 2-1 and 2-7)

Item	Procedure
<p>1 suitable lifting device.</p>	<p>Remove the power pack from its storage position on the goose-neck of the control van. Use a suitable lifting device.</p>
<p>2 match markings on the cable with the plug at either the van or hydraulic power unit.</p>	<p>Use the hydraulic power pack as required to set up plant trailers. When connecting power cord match markings on the cable with the plug at either the van or hydraulic power unit.</p>

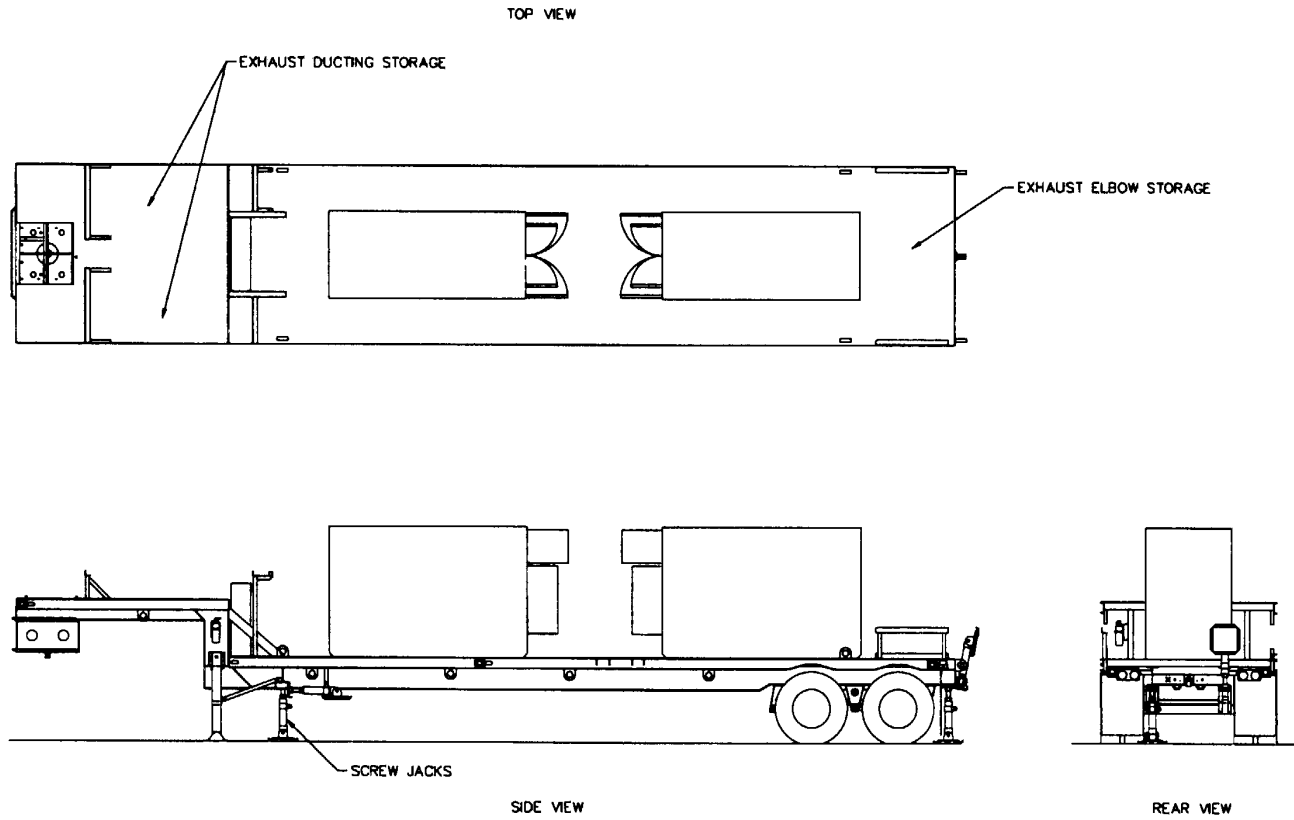


Figure 2-5. Generator Trailer

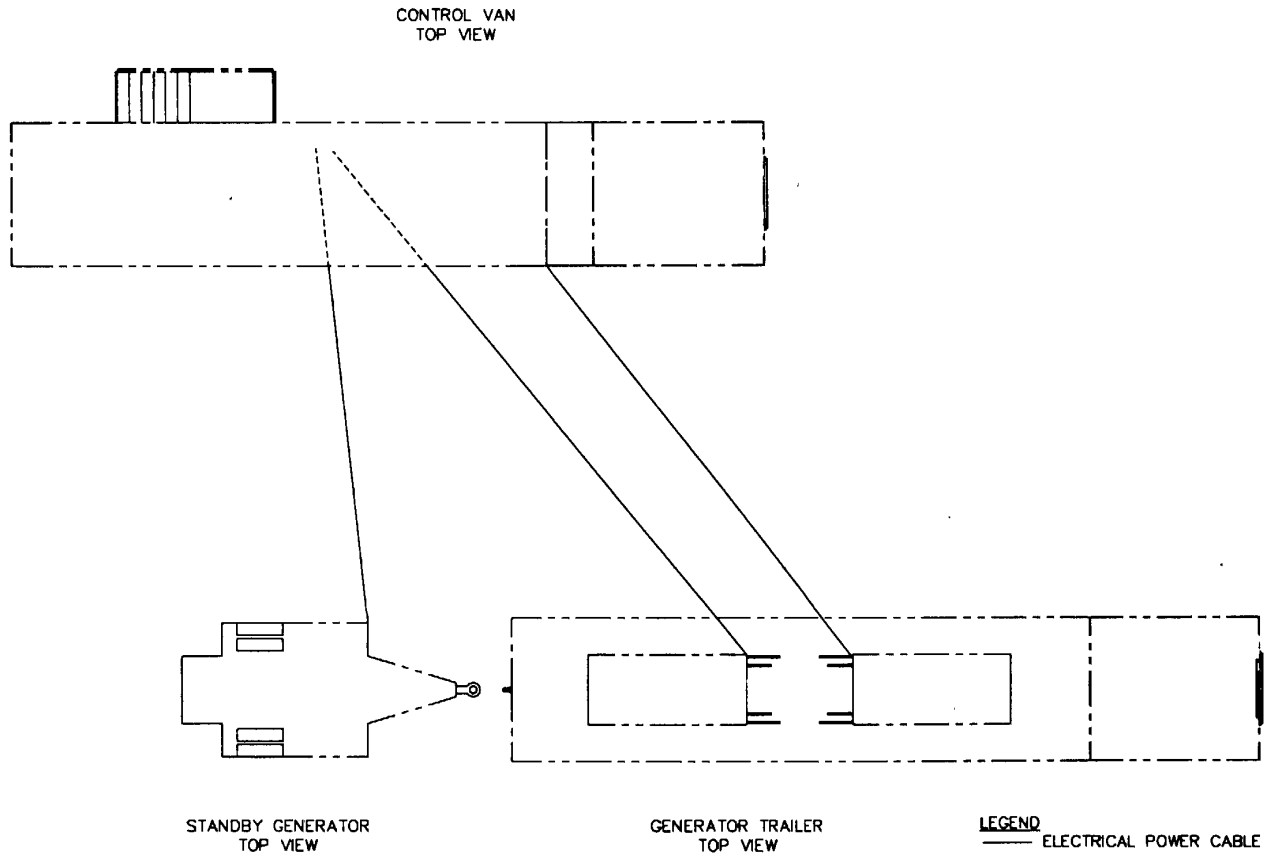


Figure 2-6. Standby Generator and Generator Electrical Power Cable Routing



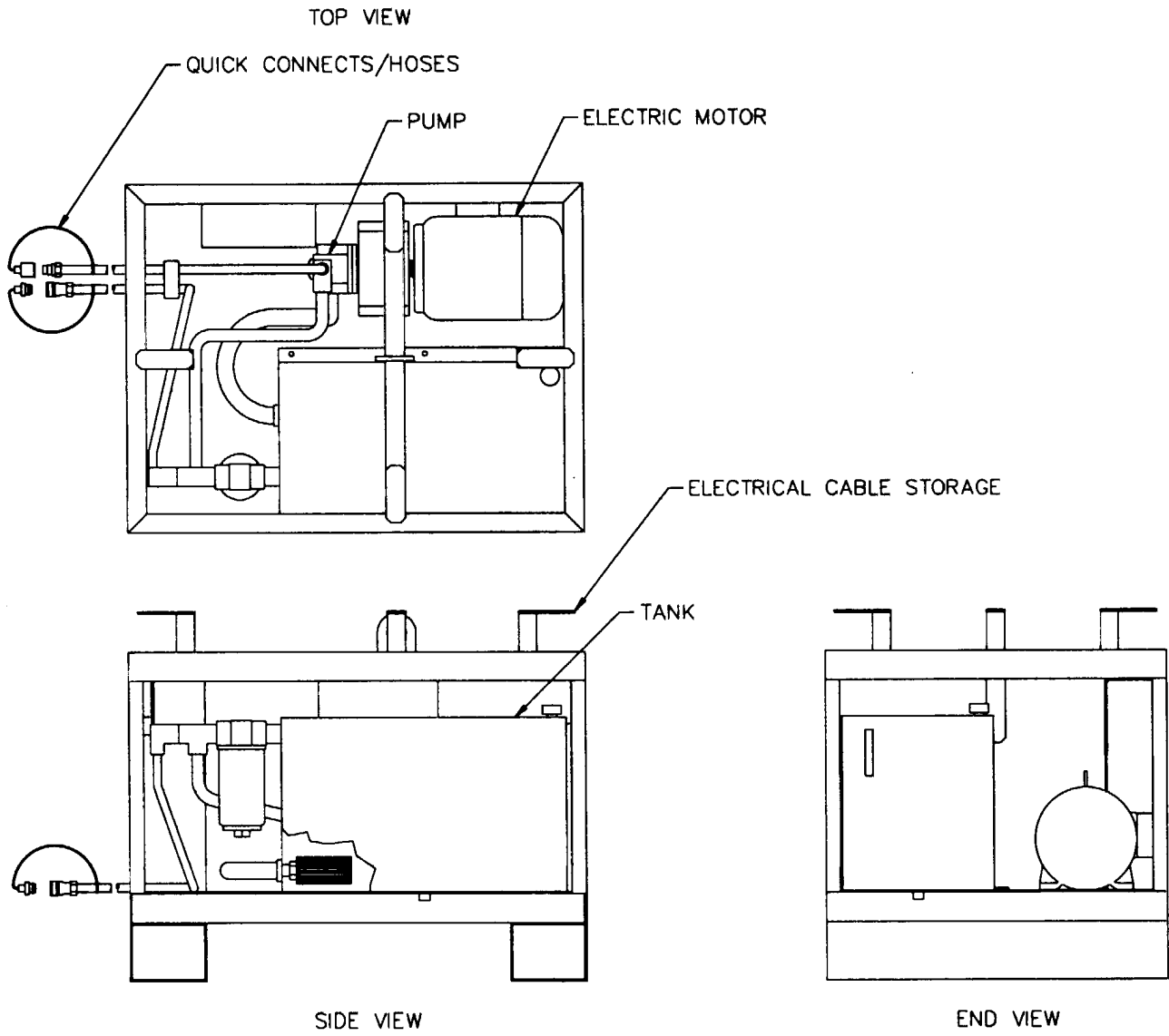


Figure 2-7. Hydraulic Power Pack  
page 2-15

**5. Surge Bin Set Up Procedures**

**(See Figures 2-1, 2-8, 2-9, 2-10 and 2-11)**

The Surge Bin should be staked prior to positioning it. Site along the right hand side of the Control Van and measure the correct distance to the Surge Bin according to the Layout Figure 2-1. Stake the rear corner of the Surge Bin. This trailer can be positioned. Keep the Surge Bin at a right angle to the Control Van.

**NOTE**

**The set up of the surge bin requires electrical power. See section 2-8, Electrical Power Supply before continuing.**

**NOTE**

**Electrical power cables and control cables are installed upon completion of the set up of all components of the AMP. Only those cables specifically mentioned in the set up procedures should be connected. Follow the cable installation procedure defined in item 12 of this section.**

Item	Procedure
1	Position the surge bin according to the site layout.
2	Disconnect the surge bin from the transport tractor.
3	Position the hydraulic power pack and connect the two hoses to lift jack valves.
4	Connect the power pack to the power cable and turn unit on.
5	Operating the valves raise and lower the trailer to level it.
6	Remove the power cord for the drive motor on the surge bin hydraulic pump (cord J111). Plug in to receptacle P111 at the control van.
7	Start the hydraulic pump on the surge bin. The switch is located on the right side of the surge bin.
8	Remove the pins holding lower support base to the main chassis from each of the four main chassis columns.
9	Push the center control lever to extend and lower the two cylinders mounted on the rear support base.

Item	Procedure
10 inserted.	Extend the cylinders and lower the support base until the two pins in the columns can be re-
11	Lock the pins in place by re-inserting the clip pins.
12 base.	Push the right control lever to extend and lower the two cylinders mounted on the front support
13 inserted.	Extend the cylinders and lower the support base until the two pins in the columns can be re-
14	Lock the pins in place by re-inserting the clip pins.
15	Shut off the electrical switch on the surge bin hydraulic pump.
16	Using the hydraulic power pack and the control valve bank connected to it extend the levelling jacks to raise the unit approximately 1/4" off the ground.
17	Placing a four foot level on the main beams at the front and rear of the unit and using the hydraulics, adjust the hydraulic levelling jacks until the unit is level front to back.
18	Secure and lower the rear screw jacks to accept the weight of the unit.
19	Adjust the screw jacks on the rear support base.
20	Adjust the screw jacks on the front support base.
21	Retract the hydraulic levelling jacks to lower the unit so the weight is resting on the base pads.
22	Check the unit to ensure it is level front to back on both sides.
23 base.	Check the unit to ensure it is level side to side on the front support base and on the rear support
24	Check the unit to ensure it is level side to side on the rear cross member.
25	If the unit is not level, repeat the necessary steps to level the unit.
26	DO NOT PROCEED UNTIL THE UNIT IS LEVEL.
27 bin.	Shut off the power for the portable hydraulic power pack and disconnect the hoses to the surge
28	The air brake lines and transport lighting cables have connections in the drive through area. Disconnect the two gladhands, 12 volt cable and 24 volt cable from their receptacles. Retract the hoses and cables to their storage location.

Item	Procedure
29	Start the hydraulic pump on the surge bin.
30	Remove the two conveyor support pins from their location at the rear of the chassis. Remove the two telescoping conveyor support structure pins.
31 lever.	Using the left side hydraulic control valve lever extend the conveyor lift cylinders by pulling the
32	The conveyor will slowly pivot around its support and raise into the operating position.
33	Re-insert the two conveyor support pins at the rear of the chassis.
34	Insert the pins into the upper telescoping conveyor support structure on each side.
35	Install the platform handrail.
36	Remove the four corner pins holding the bin legs to the support structure by using the hydraulics to remove the weight from the pins.
37	Raise the bin by operating the center and right control valve levers simultaneously. Carefully observe the cylinder extension to ensure that the bin is going up equally at all four corners.
38	When the bin has been raised to the operating height re-insert the four corner pins.
39 hydraulic cylinders.	Lower the bin slightly so that the weight of the bin rests on the support pins and not on the
40	Shut off the hydraulic pump on the surge bin.
41	Position the conveyor stairs and handrail on the conveyor.
42	Close the front and rear bin doors.
43	Fold down the ladders.
44	Remove the bolts holding the bypass chute in the transport position on the platform.
45	Use a crane to lift, position and lower the bypass chute over the slide chute.
46	Bolt the two chutes together.
47	Remove the transport bolt at the bottom of the slide chute. This permits the chute to pivot back into the operating position.

Item	Procedure
48	Remove the feed hopper from its transport position on the rear of the chassis and install it onto the feed end of the slat conveyor.

**NOTE**

**The surge bin air compressor may be used to power air wrenches for the balance of the plant set up. Power to the air compressor is obtained through the control panel.**

**Motor Control Center #2 - turn surge bin air compressor breaker to the on position.**

**Feeder panel - turn the power key to the on position.**

**Motor control panel - turn surge bin air selector switch to the on position.**

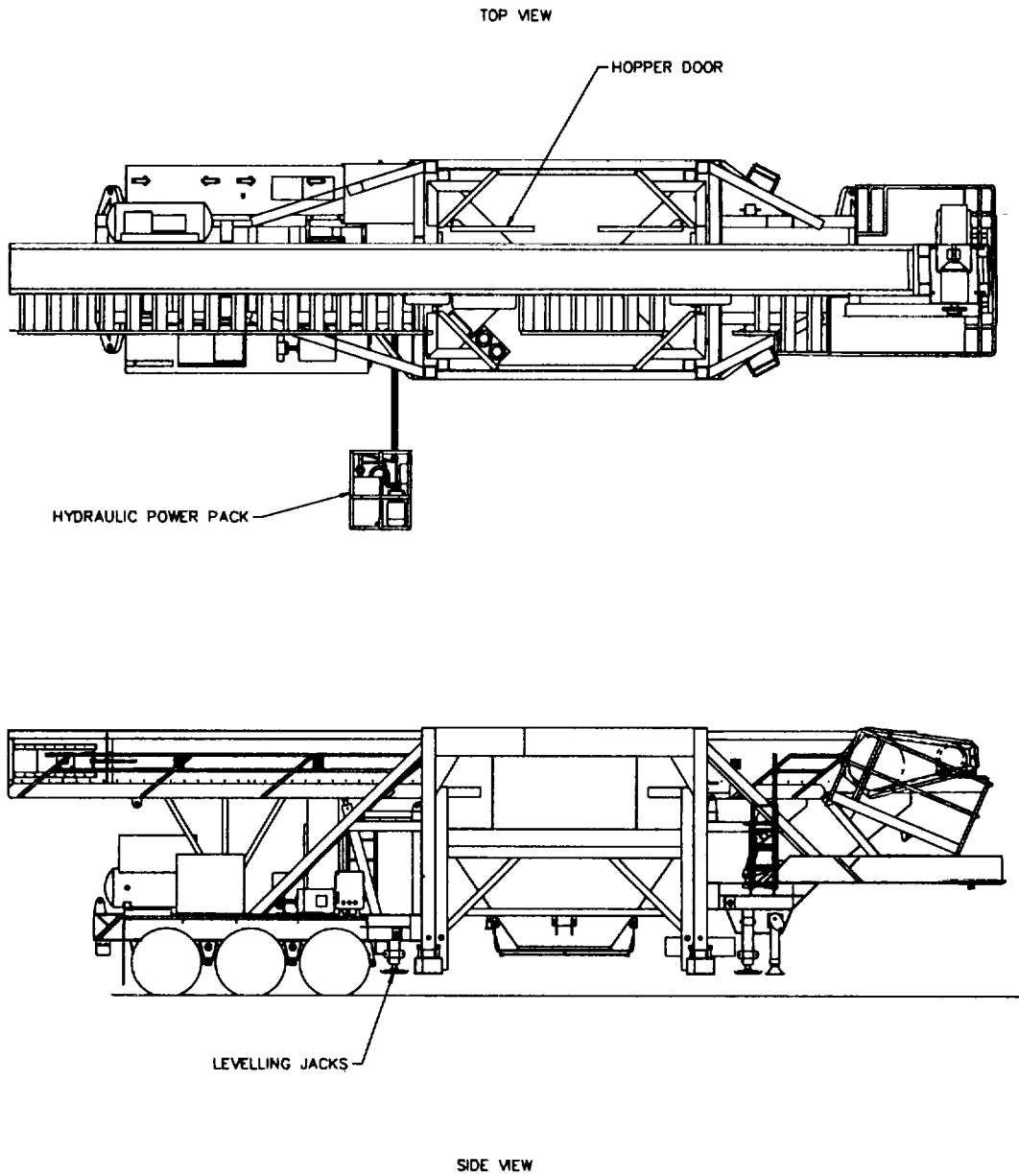
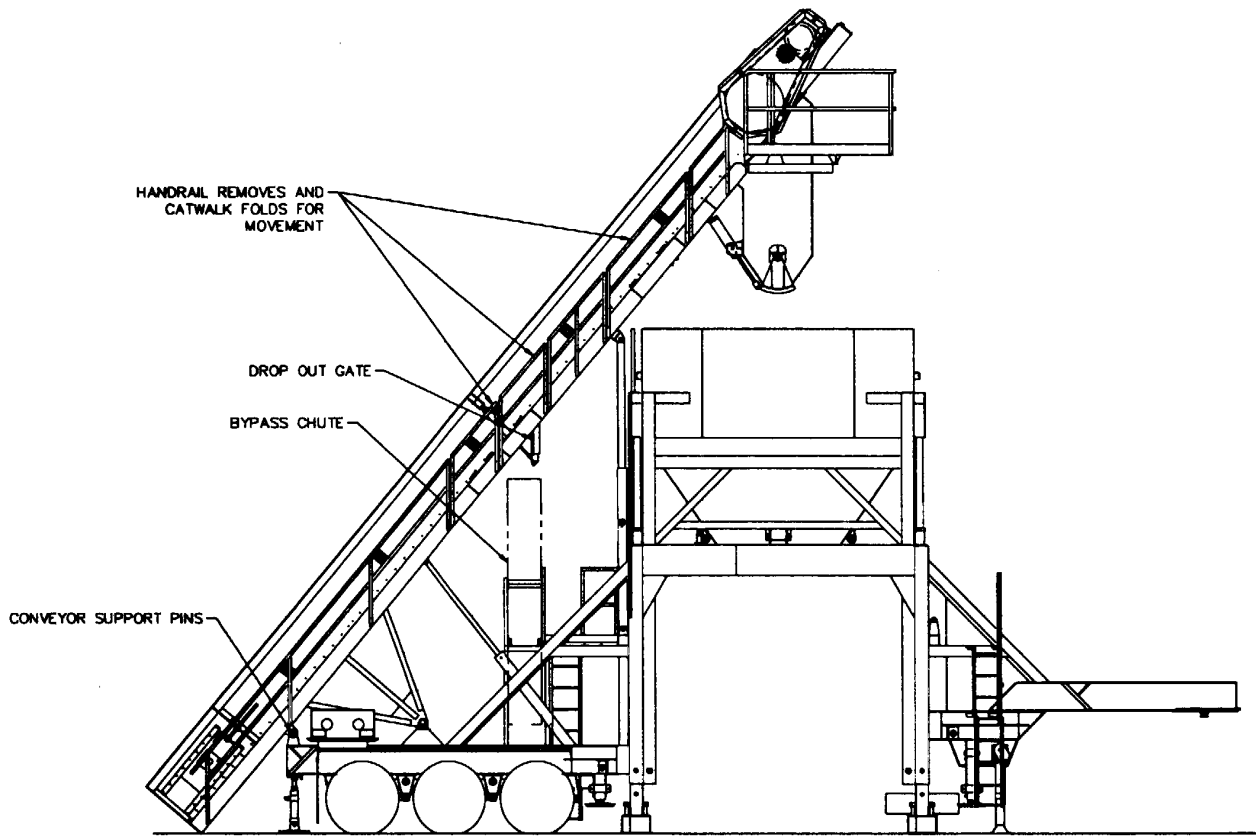


Figure 2-8. Surge Bin Transport Configuration  
page 2-20



SIDE VIEW

Figure 2-9. Surge Bin Operating Configuration  
page 2-21

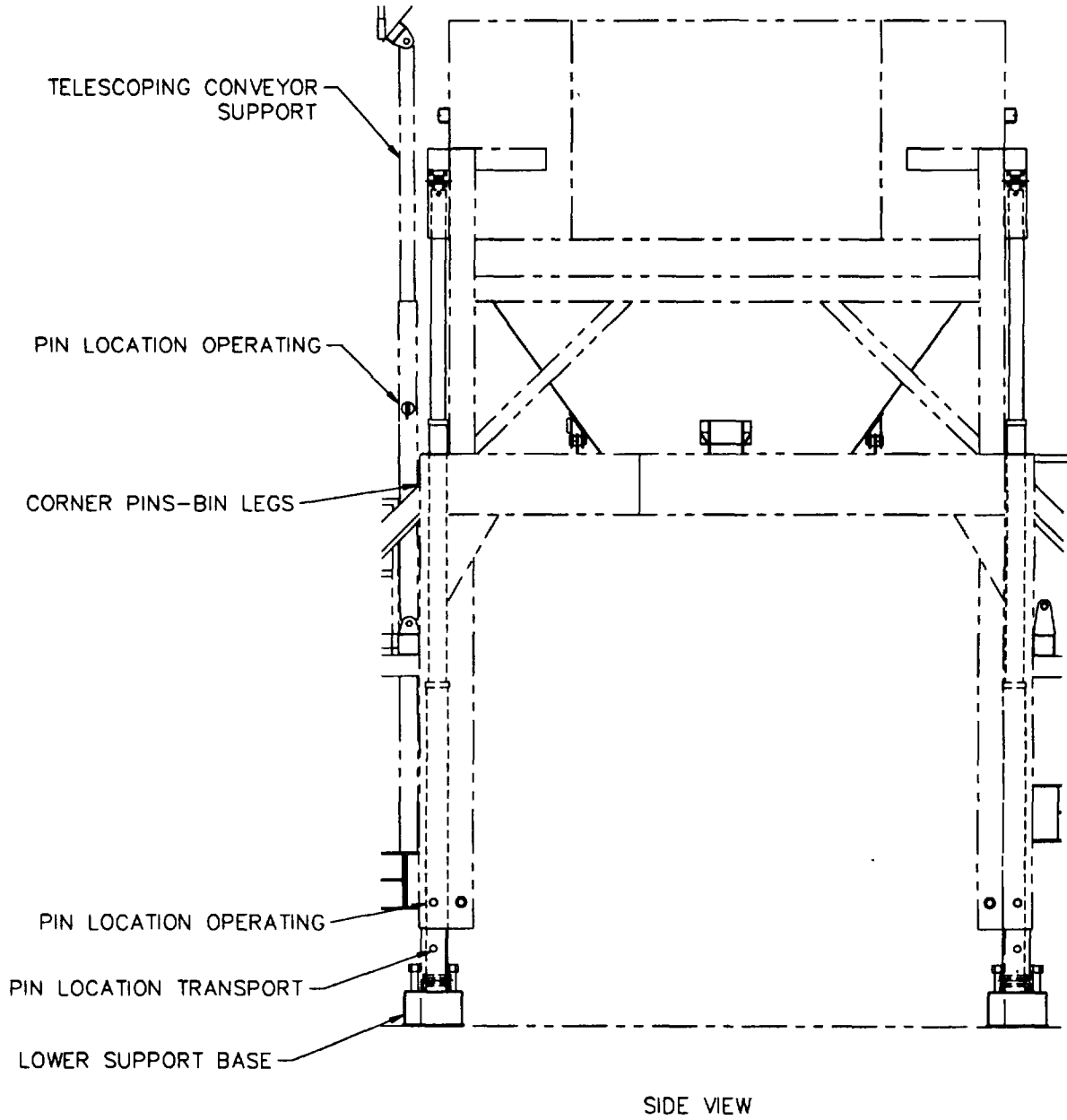


Figure 2-10. Surge Bin Pin Locations  
page 2-22



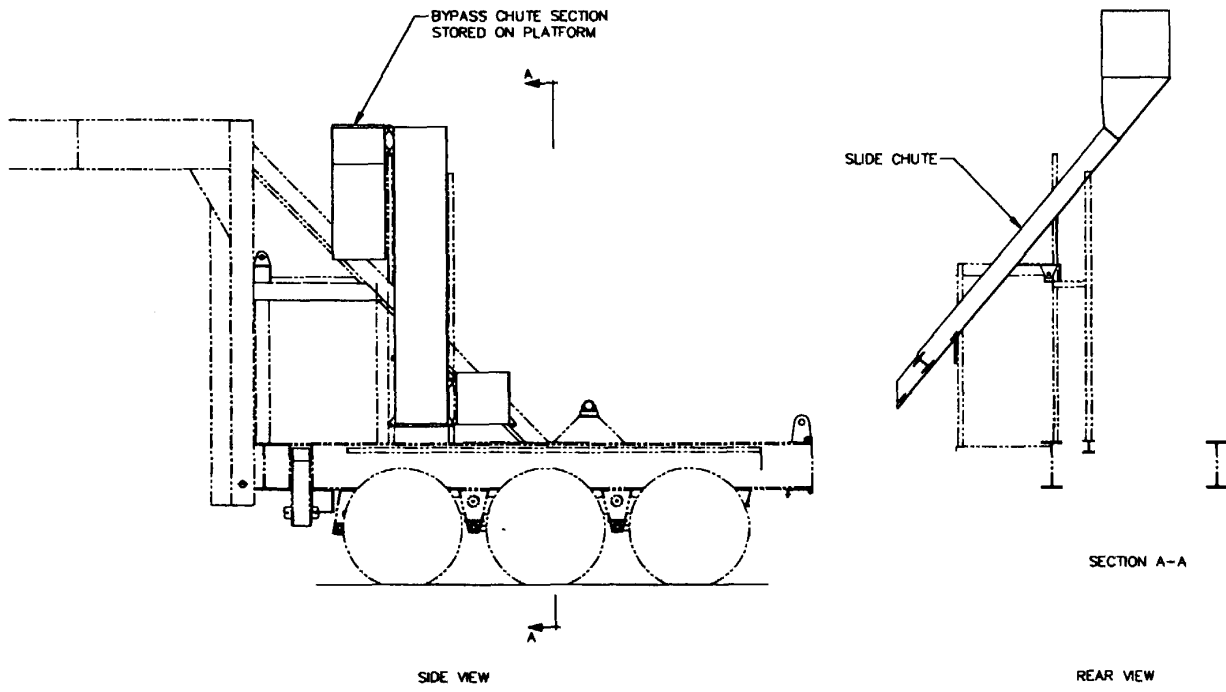


Figure 2-11. Surge Bin Bypass Chute  
page 2-23

## 6. Drum Mixer Set Up Procedures

(See Figures 2-1, 2-12, 2-13, 2-14 and 2-15)

The Drum Mixer must also be staked. Use the dimensions on Figure 2-1 and stake the right rear corner point of the trailer. Position the trailer with the discharge chute over the slat conveyor (see Figure 2-13 ). Keep the Drum Mixer parallel to the Control Van.

Item	Procedure
1	Position the drum mixer according to the site layout. The discharge chute must be centered above the slat conveyor. The overlap should be a minimum of three inches.
2	Disconnect the drum mixer from the transport tractor.
3	Lower the screw jacks.
4	Position the hydraulic power pack and connect the two hoses to lift jack valves.
5	Connect the power pack to the power cable and turn unit on.
6 jacks.	Operating the valves, raise the front end of the trailer by extending the front hydraulic levelling
7	Lower the four rear screw jacks. Install the pads.
8	Remove the bolts holding the landing jacks. This allows the landing jacks to slide up when lowering the front end of the drum mixer.
9	Extend the two rear hydraulic levelling jacks, raising the rear of the trailer.
10	Install two braces on each of the four rear screw jacks. These are stored for transport at the rear end of the drum mixer trailer.
11	Retract the rear hydraulic levelling jacks until the rear screw jacks support the drum mixer.
12	Retract the front hydraulic levelling jacks and lower the front of the drum mixer until the screw jacks are in contact with the ground.
13	Place a four foot level on the levelling pads located on the trailer and check that the unit is level both front to back and side to side.

Item	Procedure
14	If the trailer is not level raise the trailer with the hydraulic leveling jacks and adjust the screw jacks. Continue until the trailer is level side to side and at the proper angle end to end (level will indicate level if properly positioned on leveling pads).
15	Retract the hydraulic leveling jacks.
16	Disconnect the hydraulic power pack.
17	Remove the exhaust ducting support leg from the goose neck area of the trailer. Fold the upper exhaust plenum into position using a crane. Make sure that the seal on the flange is not damaged and is free from debris which would prevent it from sealing.
18	Install the bolts in the plenum flange and tighten them.
19	Install the ducting support leg onto the front of the trailer.
20	Remove the two sections of the ducting which are mounted on the front of the 200 kW generator trailer. Position them on the ground with the two flanges matched according to the markings.
21	Install the bolts checking to insure the seal is in tact and free from debris which may prevent a good seal.
22	Install the expansion joint onto the duct.
23	Use a crane to lift the assembled section of ducting into place on the front of the drum. The assembly rest on the support leg above the goose-neck and mates with the drum exhaust plenum. The expansion joint is positioned away from the drum and will attach to the bag house. Bolt the duct to the exhaust plenum.
24	Install the bolts and tighten.
25	Remove the bypass chute from transport position and install onto the feed chute.

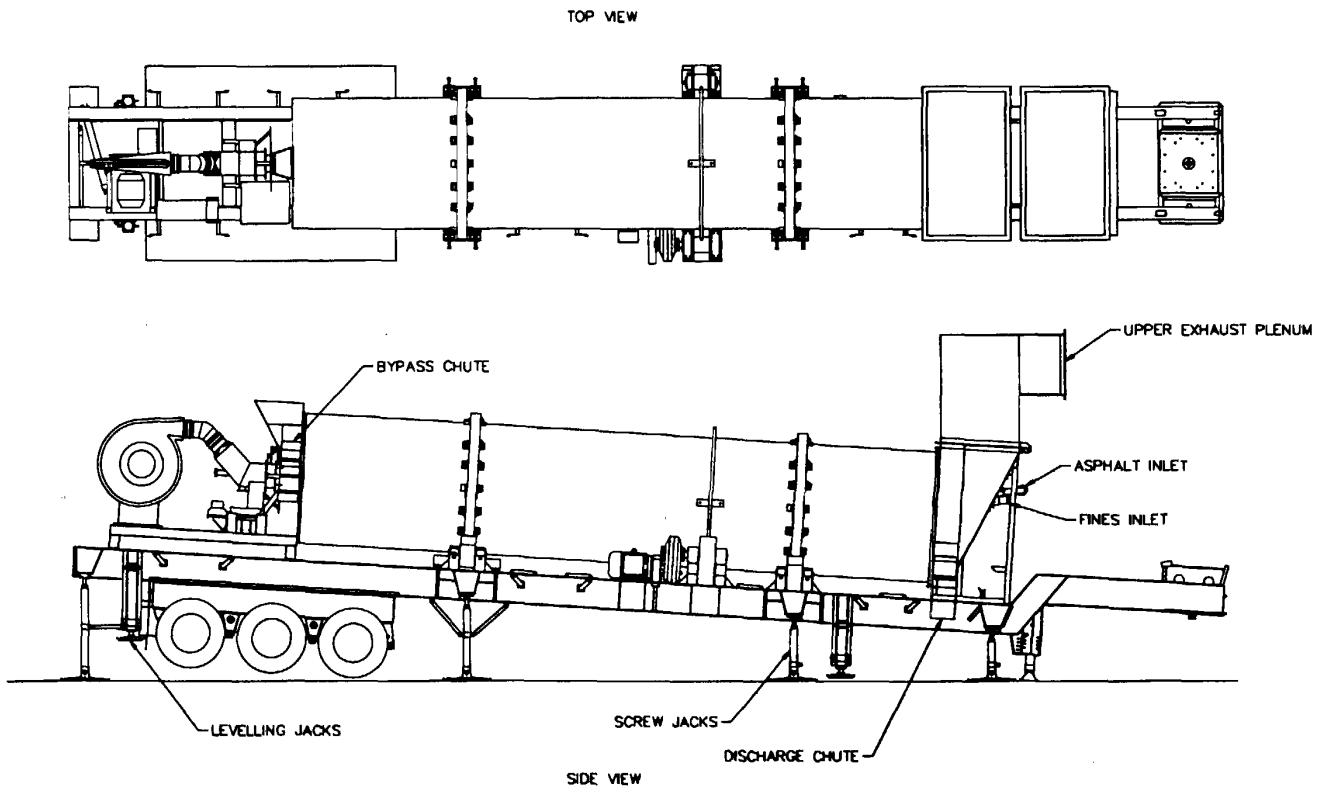
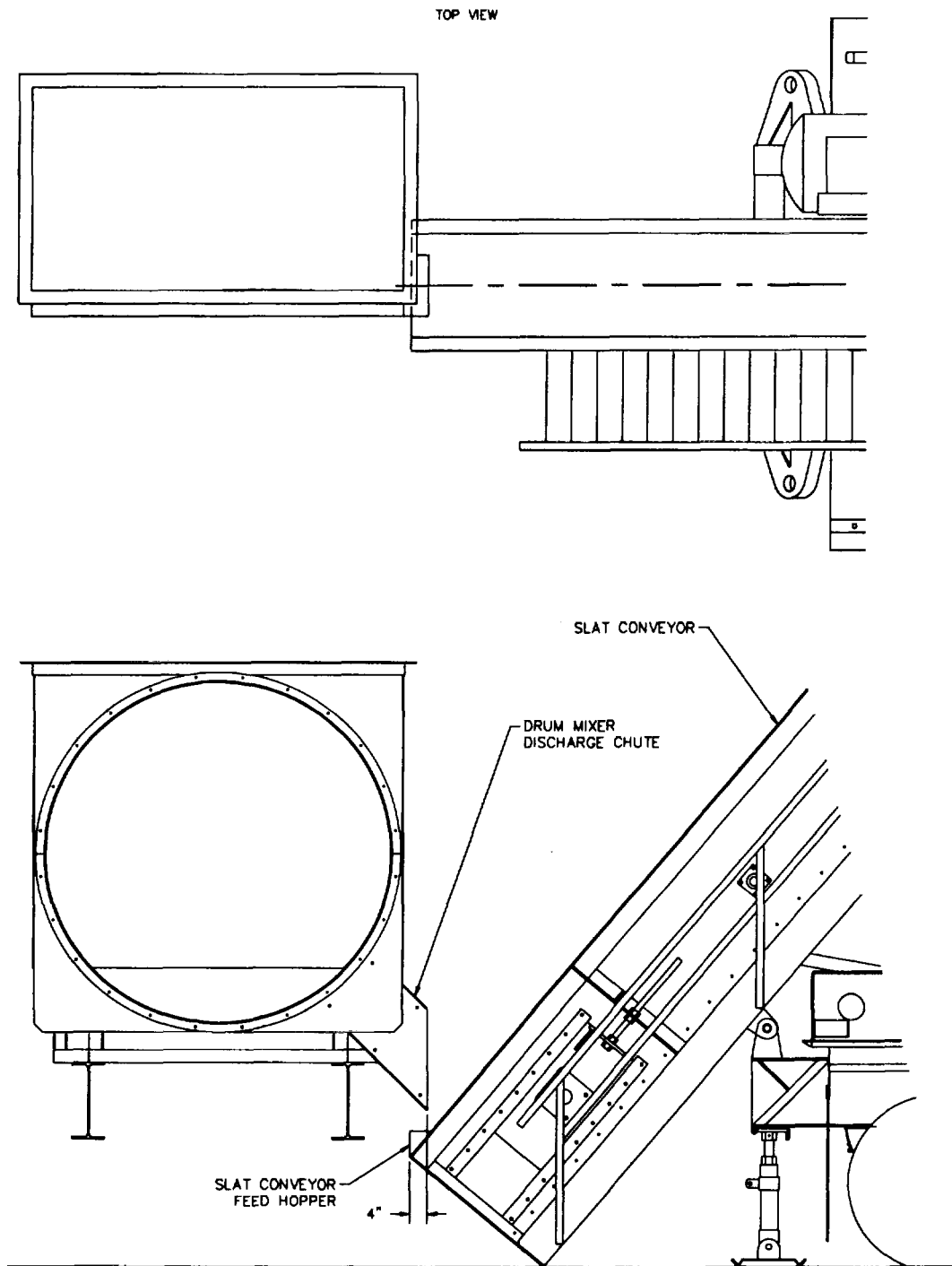


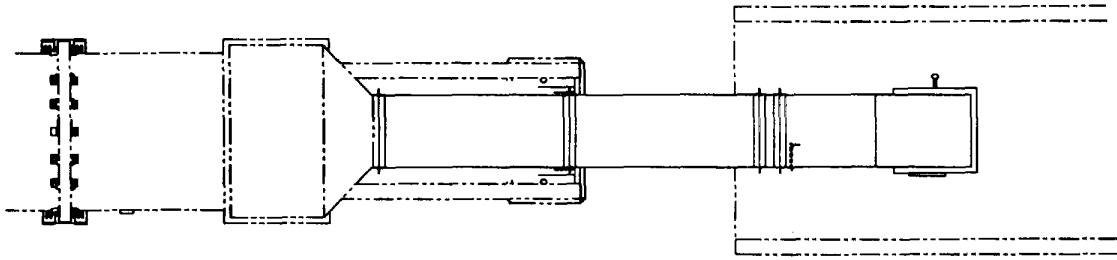
Figure 2-12 Drum Mixer



SIDE VIEW

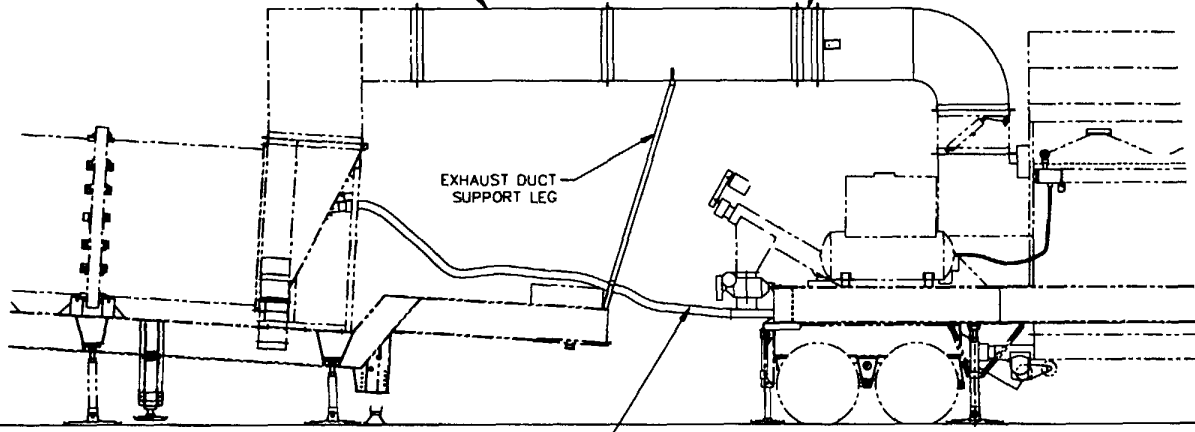
Figure 2-13 Drum Mixer Discharge Chute to Slat Conveyor  
page 2 - 27

TOP VIEW



EXHAUST DUCTING

EXPANSION JOINT



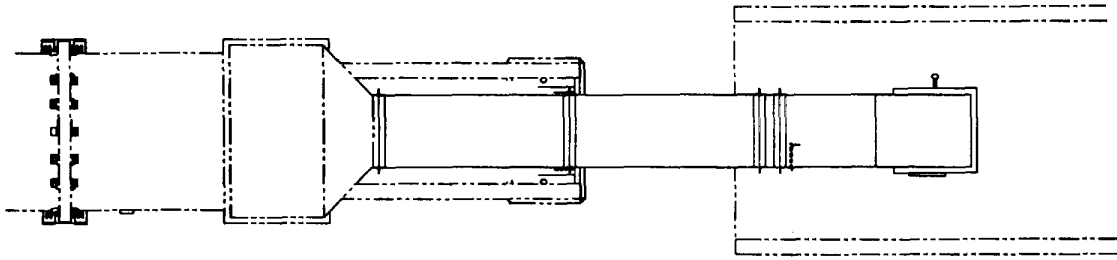
EXHAUST DUCT  
SUPPORT LEG

FINES RETURN HOSE

SIDE VIEW

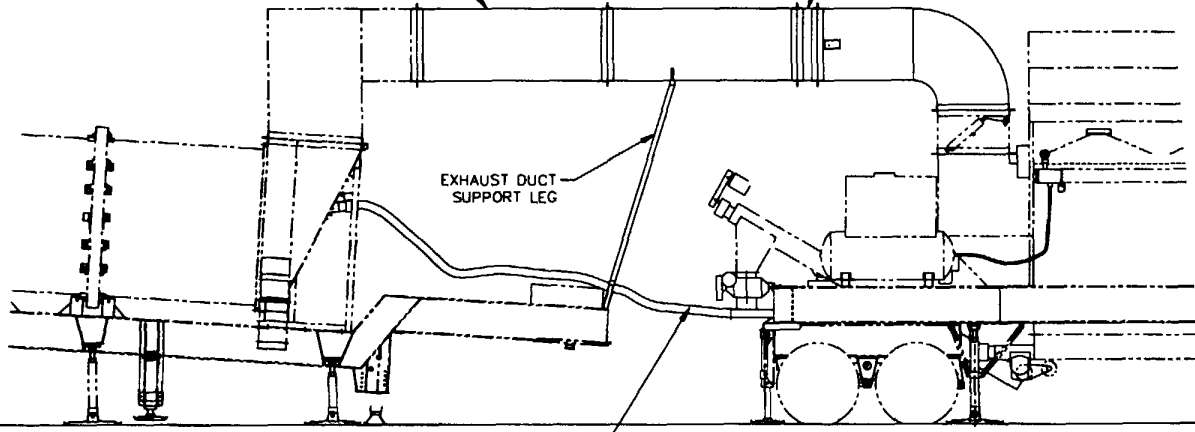
Figure 2-14 Drum Mixer Leveling  
page 2 - 28

TOP VIEW



EXHAUST DUCTING

EXPANSION JOINT



EXHAUST DUCT  
SUPPORT LEG

FINES RETURN HOSE

SIDE VIEW

Figure 2-15 Exhaust Ducting  
page 2 - 29

## 7. Baghouse Set Up Procedures (See Figures 2-1, 2-15 and 2-16)

Stake the Baghouse left hand front and rear corners according to Figure 2-1. Site along the Drum Mixer to keep the units in line. Use surveyors tape or colored rope between the two stakes. Back the Baghouse into position.

Item	Procedure
1	Remove the duct elbow section from the 200 kW generator trailer and install it onto the baghouse shutter door housing. Check the seal, install and tighten all the bolts.
2	Position the baghouse according to the site layout. Locate in line with drum mixer backing up unit until the drum duct and baghouse ductflanges meet. Install the bolts.
3	Disconnect the baghouse from the transport tractor.
4	Connect the hydraulic power pack.
5	Use the hydraulic leveling jacks to raise the baghouse.
6	Lower the four screw jacks and install pads.
7	Extend the screw jacks.
8	Retract the leveling jacks until the baghouse is supported on the screw jacks.
9	Check the chassis to see that it is level side to side and front to back.
10	If adjustment is required use the leveling jacks to raise the chassis and adjust the screw jacks as required.
11	Retract the leveling jacks.
12	Disconnect the hydraulic power pack.
13	Remove the stack from the transport position and install it onto the exhaust outlet. Check the seal and then connect with bolts.
14	Position the handrail and ladders into the operating position



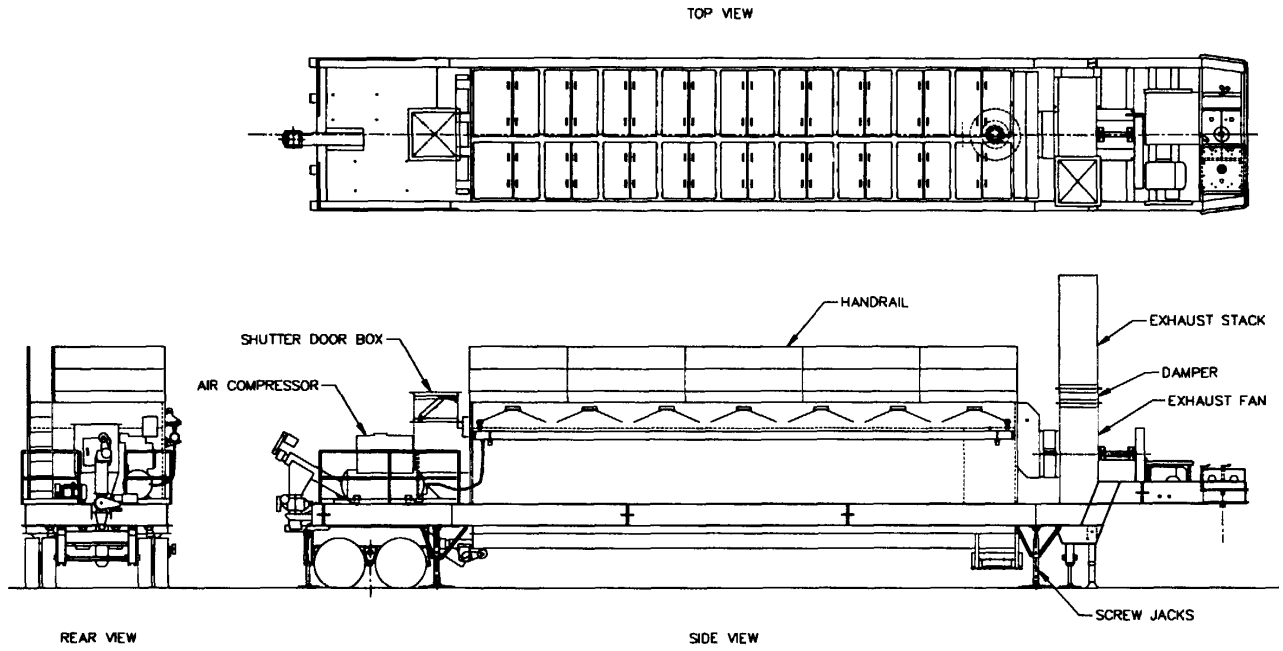


Figure 2-16 Baghouse  
page 2 - 31

**8 . Asphalt Tanker Set Up Procedures  
(See Figures 2-1, 2-17, 2-18 and 2-19)**

Position the Asphalt Tanker according to Figure 2-1. The jacketed asphalt pipe from the Asphalt Tanker to the Drum Mixer must join the two units. Position the tanker at a right angle to the Drum Mixer.

Item	Procedure
1	Position the asphalt tanker according to the site layout and at an angle of 900 to the drum mixer. The rear deck of the asphalt tanker should be 7 feet from the flange of the main frame on the drum mixer.
2	Disconnect the asphalt tanker from the transport tractor.
3	Connect the hydraulic power pack.
4	Use the hydraulic leveling jacks to raise the tanker.
5	Lower the screw jacks and install the pads.
6	Extend the screw jacks.
7	Retract the leveling jacks until the asphalt tanker is supported on the screw jacks.
8	Check the chassis to see that it is higher on the front than on the rear. See figure 2-18. Check the level side to side.
9	If adjustment is required use the leveling jacks to raise the chassis and adjust the screw jacks as required.
10	Retract the leveling jacks.
11	Disconnect the hydraulic power pack.
12	Connect the asphalt jacketed line from the asphalt meter to the drum mixer asphalt inlet. (The asphalt jacketed line is stored in the basket on the drum melter.) This is stored on the baghouse.
13	Connect the air line for the divert valve cylinder to the air compressor on the surge bin.
14	Remove the red overflow/vent pipe cap from the hot oil heater.
15	Install the two flexible steel hot oil lines to the asphalt jacket line. These are stored in the basket on the dedrummer.

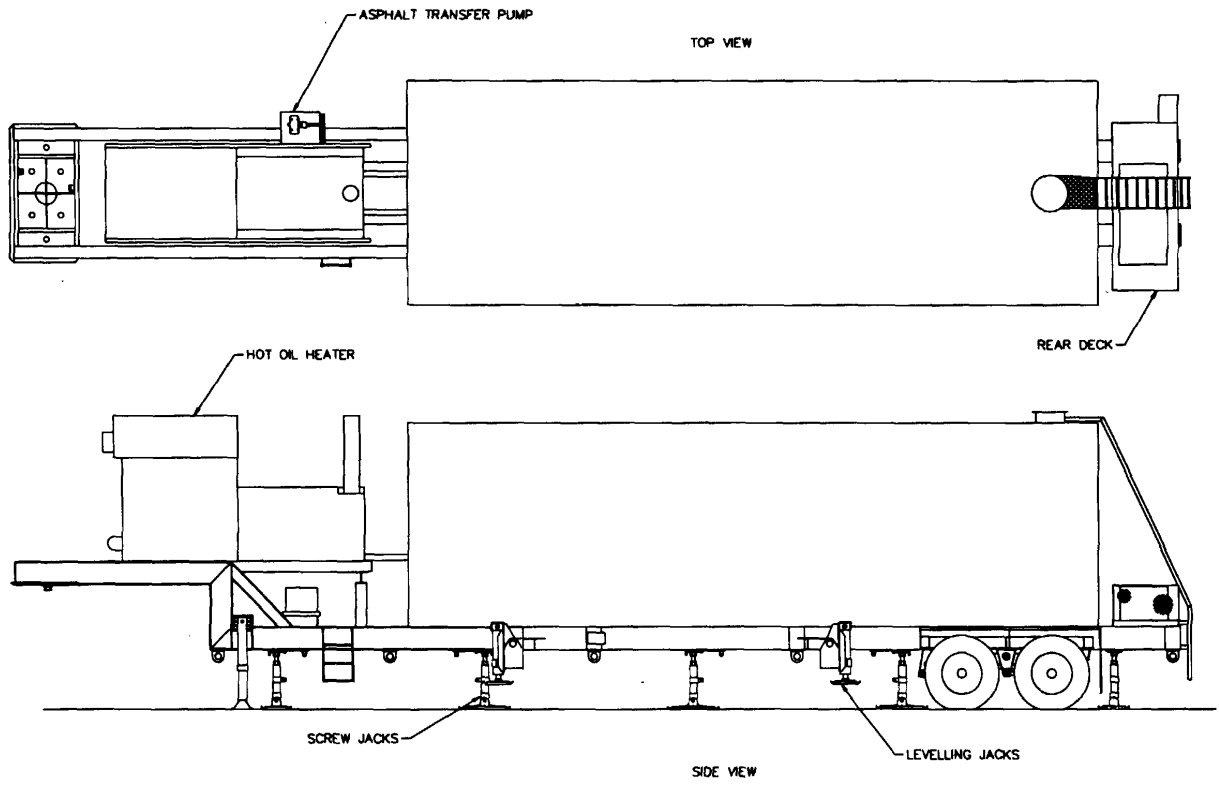


Figure 2-17 Asphalt Tanker  
page 2 - 33

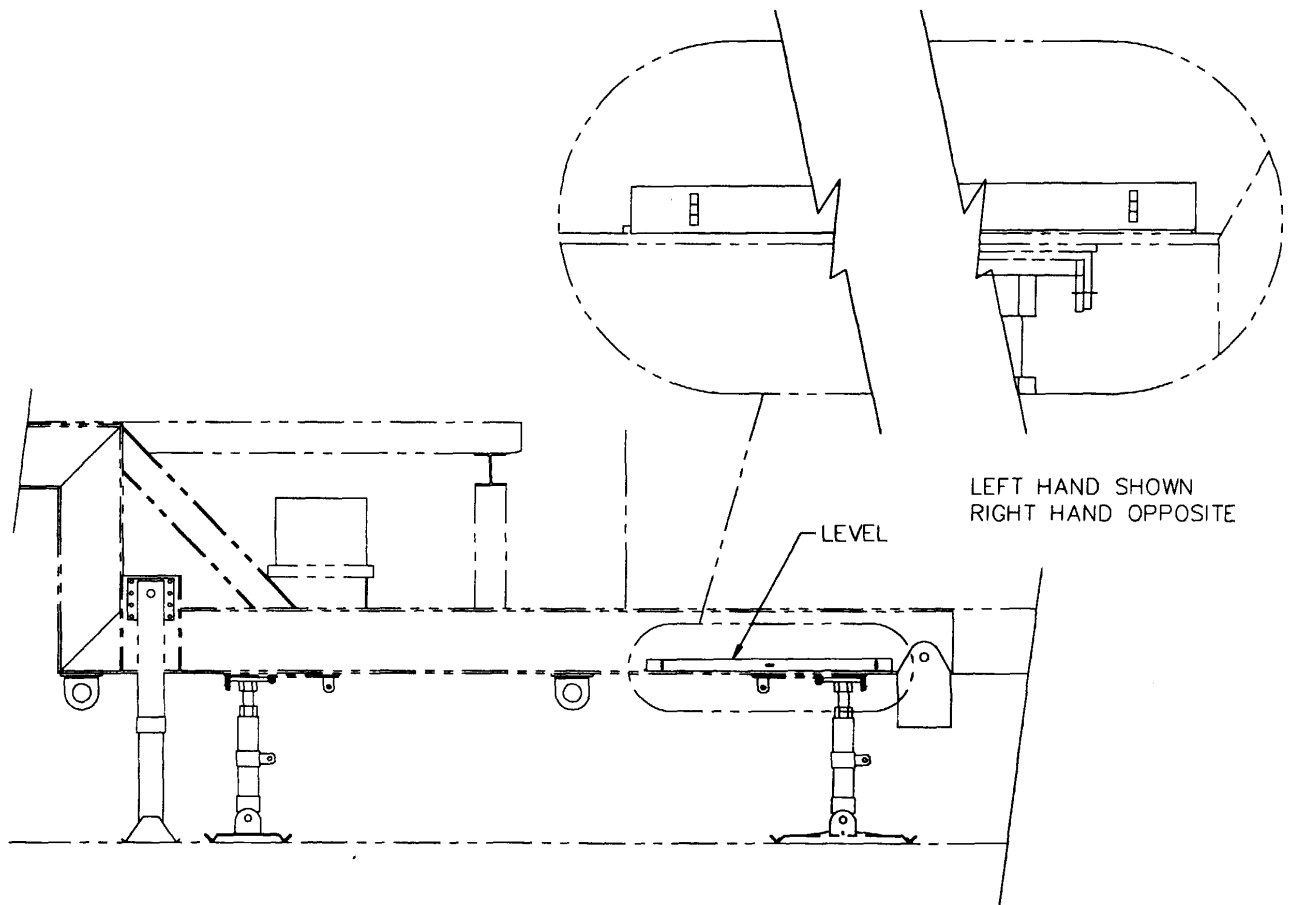


Figure 2-18 Asphalt Tanker Leveling  
page 2 - 34

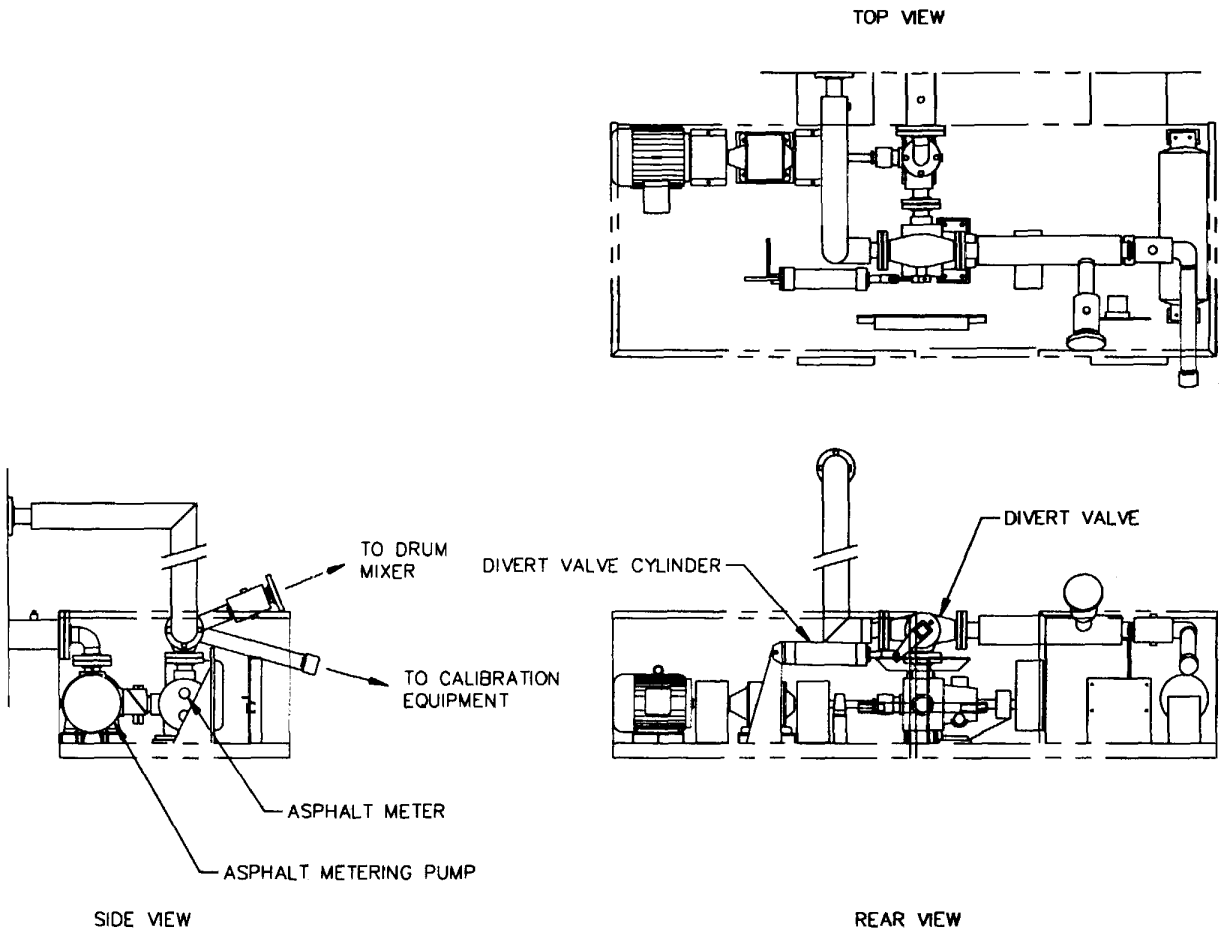


Figure 2-19 Asphalt Tanker Rear Deck  
page 2 - 35

## 9. Dedrummer/Melter Set Up Procedures (See Figures 2-1, 2-20 and 2-21)

The Dedrummer/Melter is positioned parallel to the Asphalt Tanker. The two sets of hot oil lines must be opposite each other.

Item	Procedure
1	Position the drum melter according to the site layout.
2 asphalt tanker.	Align the drum melter so that the two hot oil lines are in line with the hoses connected to the
3	Disconnect the drum melter from the transport tractor.
4	Connect the hydraulic power pack.
5	Use the hydraulic leveling jacks to raise the dedrummer.
6 pads.	Remove the transport strap from the rear screw jack pads. Lower all crew jacks and install the
7	Extend the screw jacks.
8	Retract the leveling jacks until the dedrummer is supported on the screw jacks.
9 the level side to side.	Check the chassis to see that it is lower on the front than on the rear. See figure 2-21. Check
10 as required.	If adjustment is required use the leveling jacks to raise the chassis and adjust the screw jacks
11	Retract the leveling jacks.
12	Disconnect the hydraulic power pack.
13	Connect the fuel line from the drum melter fuel tank to the asphalt tanker hot oil heater.
14	Connect the fuel line from the drum melter fuel tank to the drum mixer burner.
15 flanges.	Connect the two hot oil lines between the asphalt tanker and the melter by bolting the
16	Connect the asphalt transfer line from the drum melter to the tanker.
17	Raise the drum jib into working position by using a fork lift.
18	Install the chain hoist onto the trolley.

Item	Procedure
19	Open the valves for the hot oil to circulate. OPEN ONLY IF DRUM MELTER IS TO BE USED.

#### 10. Feed Conveyor Set Up Procedures (See Figures 2-1, 2-22 and 2-23)

The Feed Conveyor is positioned at a right angle to the Drum mixer. The critical point is the discharge hood to the Drum Mixer aggregate feed chute.

Item	Procedure
1	Position the feed conveyor according to the site layout.
2	With the feed conveyor still attached to the transport unit connect the hydraulic power pack to the valve bank on the rear of the trailer. Remove the two pins located in the square telescoping tubes supporting the conveyor. Extend the hydraulic cylinder to the end of its stroke using the hydraulic valve bank. Re-install the pins to prevent the cylinder from retracting.
3	Disconnect the hydraulic power pack.
4	Back the feed conveyor into position 60 inches from the chassis of the drum mixer, lining up the discharge box with the drum feed chute. At this distance the discharge chute may not appear to be directly over the feed box. This will happen when the chassis is in the operating position.
5	Extend the landing jacks and disconnect the feed conveyor from the transport unit.
6	Connect the hydraulic power pack to the feed conveyor. Lower the hydraulic jacks at the front of the trailer.
7	Remove all the bolts holding the landing jacks in position. The landing jacks are left in position and are free to slide up into the chassis as the front of the trailer is lowered.
8	Lower the four screw jacks into the operating position.
9	Remove the king-pin adapter box if it has been used to transport the unit (an alternative is to dig a hole under the front of the trailer with a loader and leave the adapter box attached to the trailer during mixing).

Item	Procedure
10	Lower the trailer on the hydraulic jacks until the trailer is resting on the front screw jacks. The landing jacks will slide up while the chassis is being lowered.
11	Check the trailer for level from side to side at both front and rear.
12	Adjust screw leveling jacks as necessary to obtain level indication. Raise and lower with hydraulic jacks.
13	Remove the two pins holding the telescoping section of the feed conveyor and retract the hydraulic cylinder until the center pin holes in the conveyor support structure are in line. Install the pins. The conveyor feed chute should now be directly over the drum mixer inlet chute.
14	Lower the feed conveyor into operating position. This is accomplished when the pin holes are in line with the pin holes on the conveyor support structure.
15	Position the hydraulic power pack and connect the two hoses to lift jack valves.
16	Install the pins. Use the pins removed from the storage position.
17	Raise the hydraulic legs.
18	Unbolt the top bolts in the four red transport plates of the screen deck. Rotate the red plate 450 and re-install bolts. Remove the two transport braces on the conveyor belt counter weight.



TOP VIEW

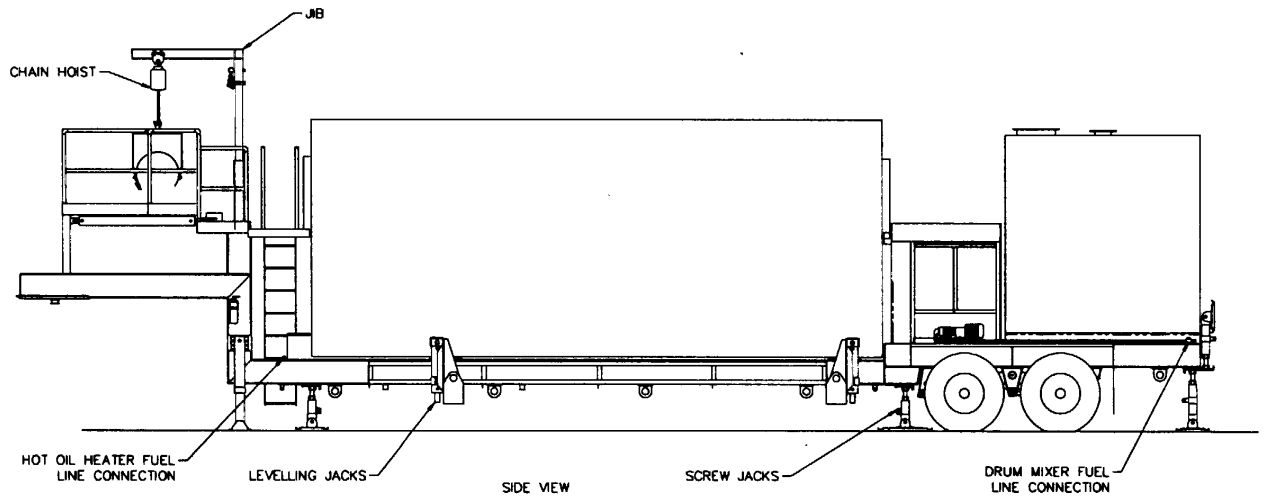
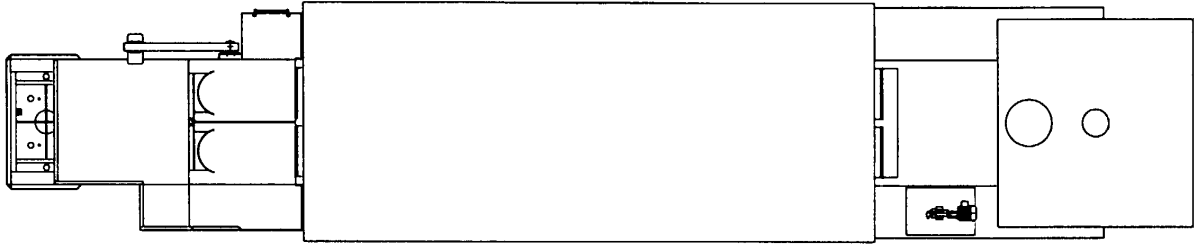


Figure 2-20 Dedrummer/Melter  
page 2 - 39

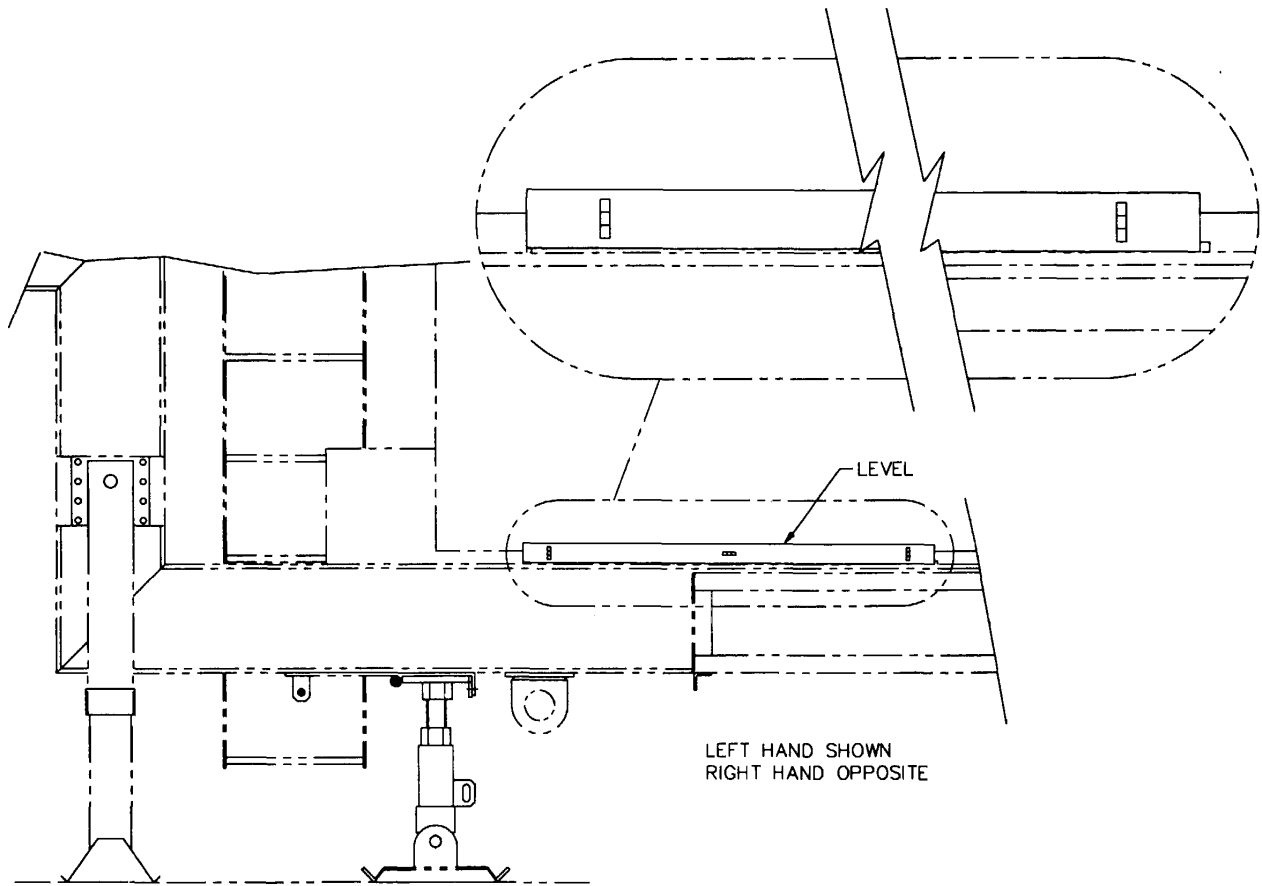


Figure 2-21 Dedrummer/Melter Leveling  
page 2 - 40

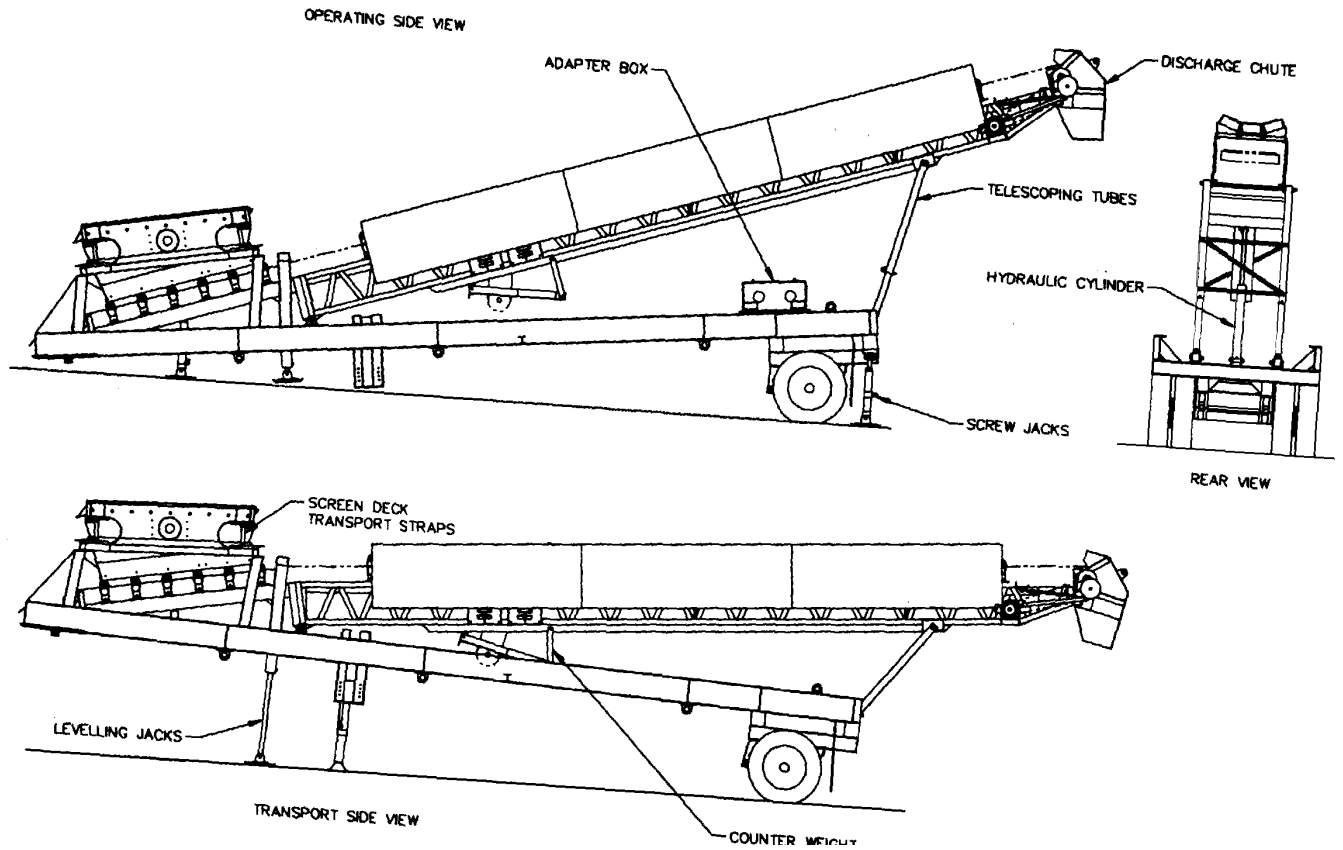


Figure 2-22 Feed Conveyor  
page 2 - 41

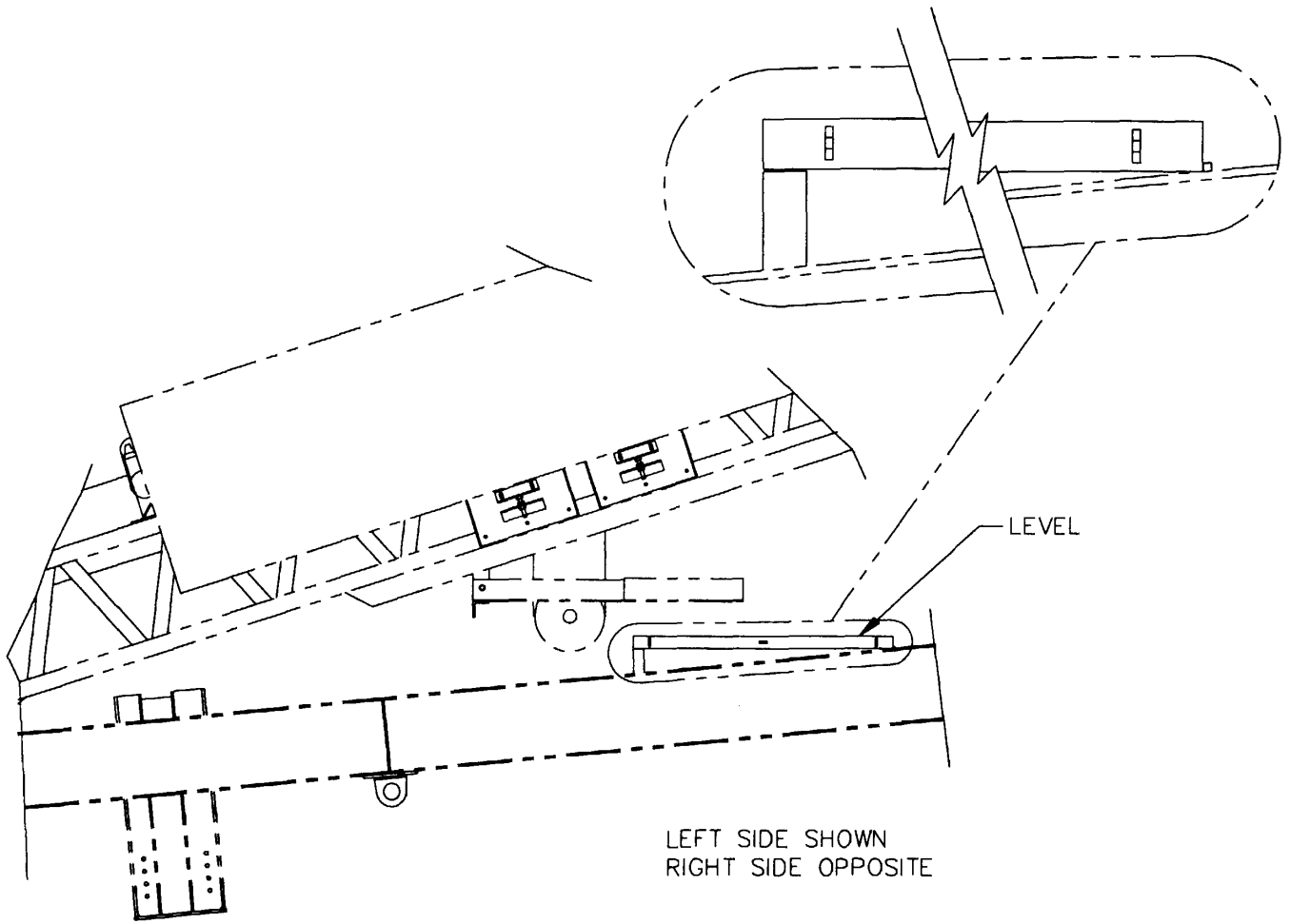


Figure 2-23 Feed Conveyor Levelling  
page 2 - 42

## 11. Four Bin Feeder Set Up Procedures (See Figures 2-1, 2-24, 2-25, 2-26, 2-27 and 2-28)

The Four Bin Feeder is positioned to discharge aggregate from the gathering conveyor discharge hood onto the top center of the scalping screen on the Feed Conveyor. See Figure 2-1 or Figure 2-2.

Item	Procedure
1 conveyor.	Position the four bin feeder according to the site layout leaving it 30 feet from the feed
2	Position the hydraulic power pack and connect the two hoses to the levelling jack valve.
3	Remove the two clips holding the wire rope (rear of the chassis) in the transport position.
4 the transport position.	Remove the four bolts (two at the top, two at the bottom) holding the gathering conveyor in
5 chassis.	Extend the upper hydraulic cylinders causing the gathering conveyor to swing away from the
6 conveyor has been fully extended.	Extend the lower hydraulic cylinders, alternate with the upper cylinders and continue until the
7 position.	Install conveyor locking pins on each side of the feed conveyor to hold it in the operating
8 necessary.) The gathering conveyor discharge will be directly over the upper section of the screen deck.	Position the four bin feeder according to the layout. (Disconnect the hydraulic power pack if
9	Disconnect the transport unit from the four bin feeder.
10	Using a crane, remove the discharge hood from the front of the chassis and install onto the gathering conveyor.
11	Raise the chassis by extending the hydraulic leveling jacks.
12	Position the five sets of screw jacks into the operating position and install the screw jack pads.
13 determine if the unit is level. Adjust the screw jacks as required until the chassis is level and fully retract the leveling jacks.	Retract the leveling jacks until the screw jacks support the chassis. Use a four foot level to
14	Disconnect the hydraulic power pack.

Item	Procedure
14	Disconnect the hydraulic power pack.
15 position.	Using a crane and slings, support the ramp plate and remove the two bolts holding it in
16	Lower the ramp plate until the two bolts can be re-installed.
17	Repeat this process on the remaining three plates.
18	Position the three ladders by removing the two bolts at the bottom of each and lifting the ladders until the bolts can be re-installed.
19	Raise the bin hopper extensions and bolt into the operating position.
20	Remove the two sections of the calibration tank from bins 1 and 2.
21	Install the belt tension wheel assembly. See figure 2-28. Adjust the belt tension as required on the conveyor screw adjustment at the tail pulley.
22	Build ramp with front end loader using site materiel or aggregates.

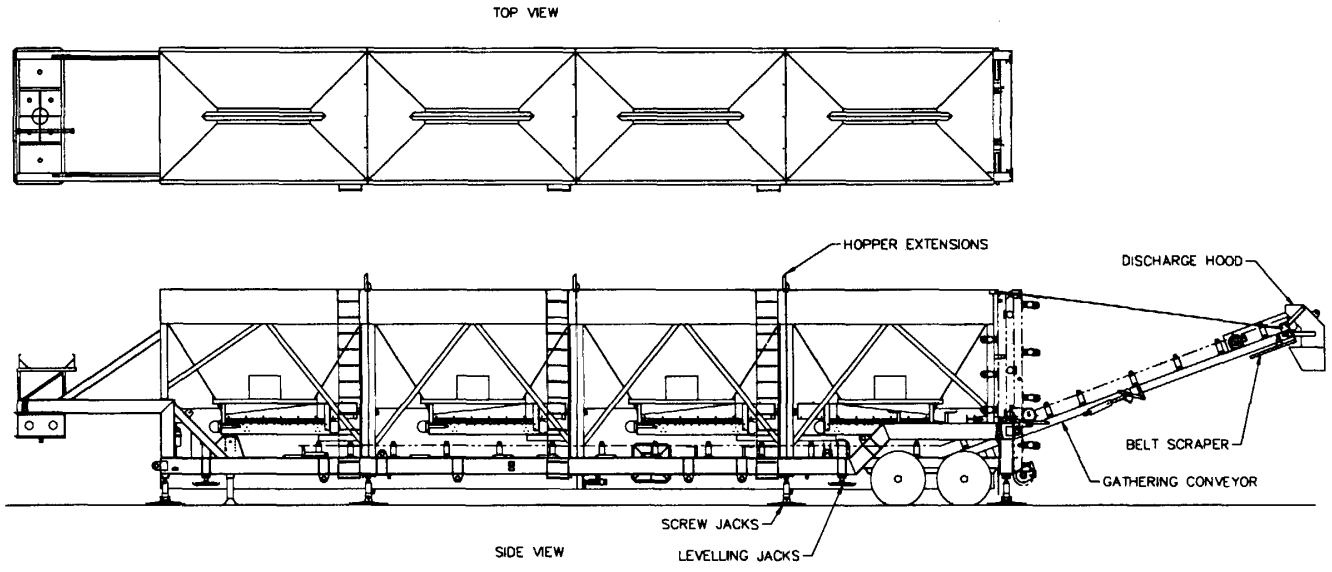


Figure 2-24 Four Bin Feeder  
page 2 - 45

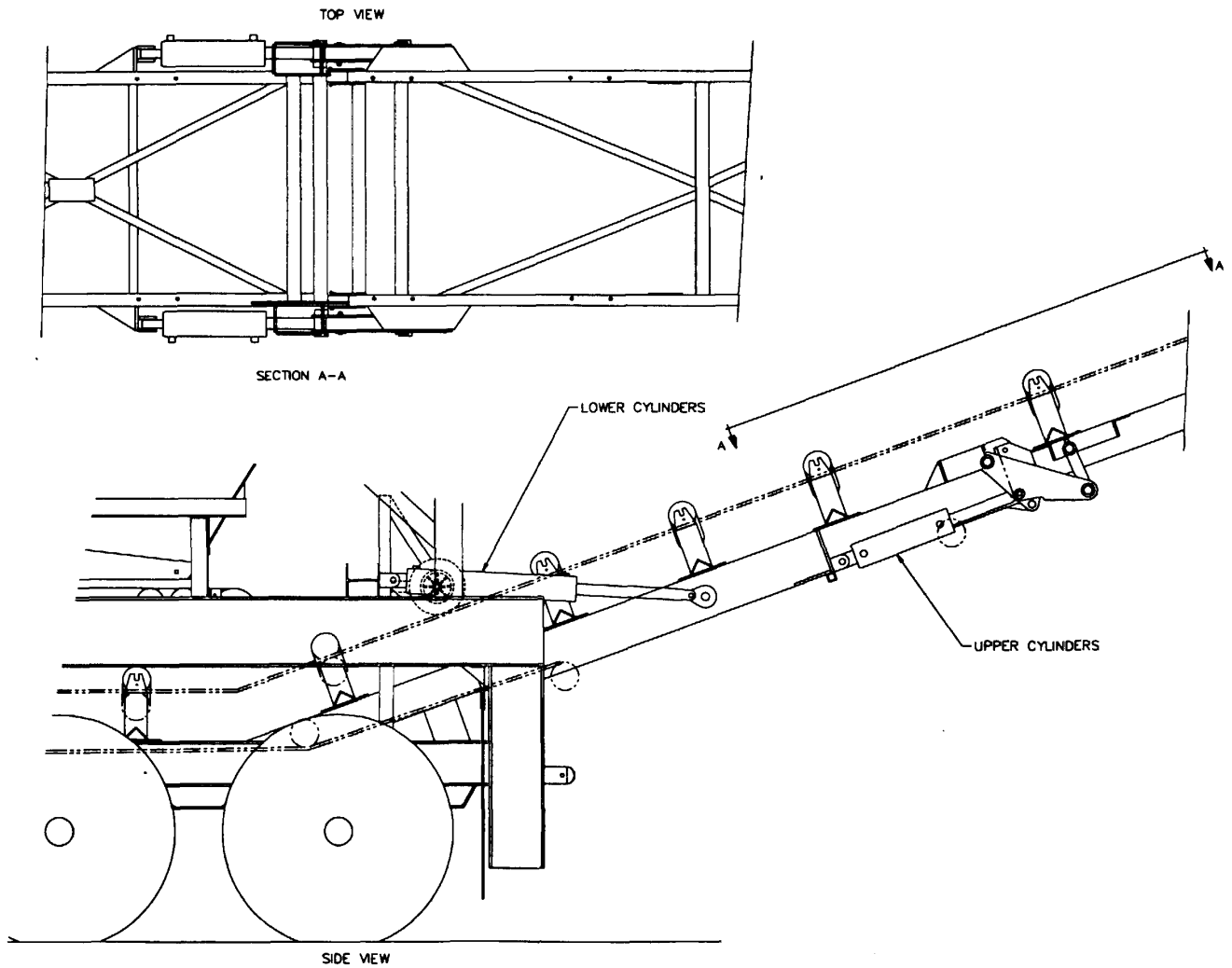


Figure 2-25 Gathering Conveyor Fold Section  
page 2 - 46



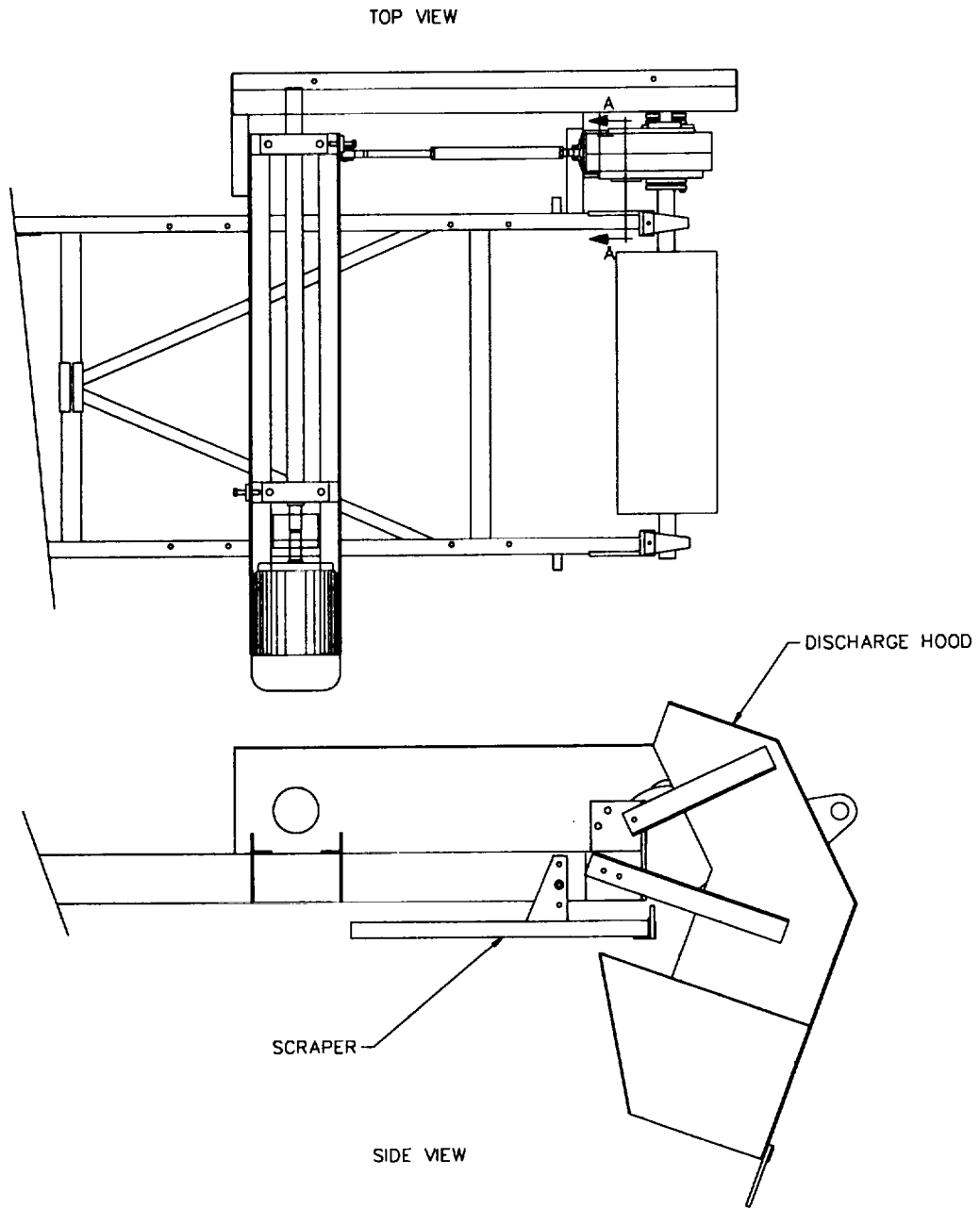
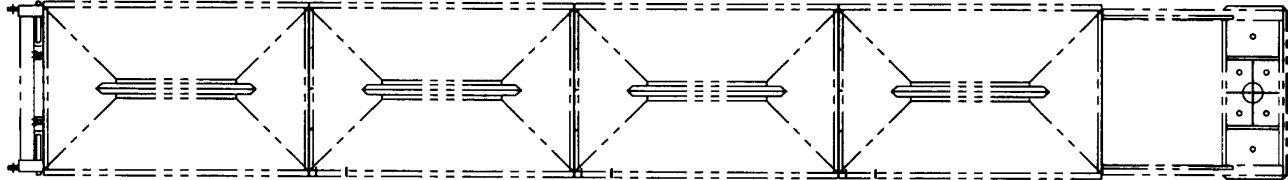
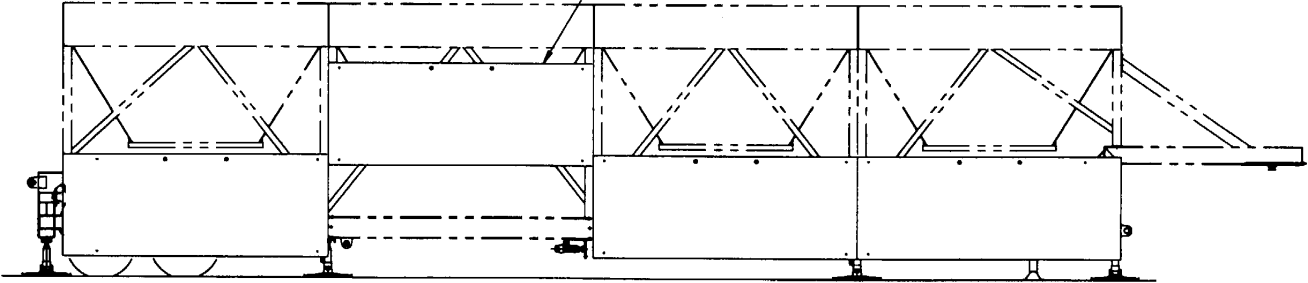


Figure 2-26 Discharge Hood/Scraper Installation  
page 2 - 47

TOP VIEW

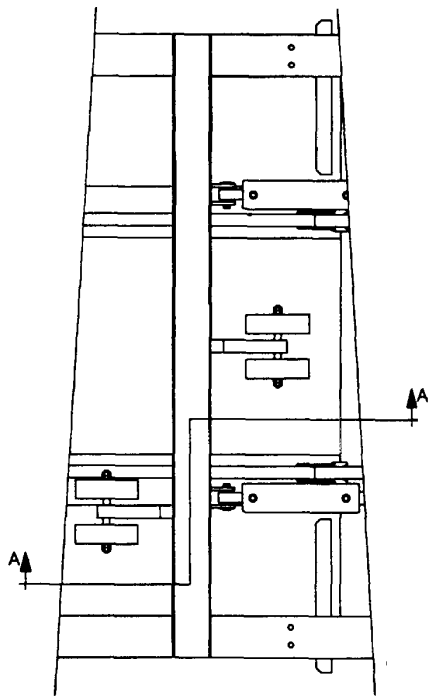


RAMP UP PLATES

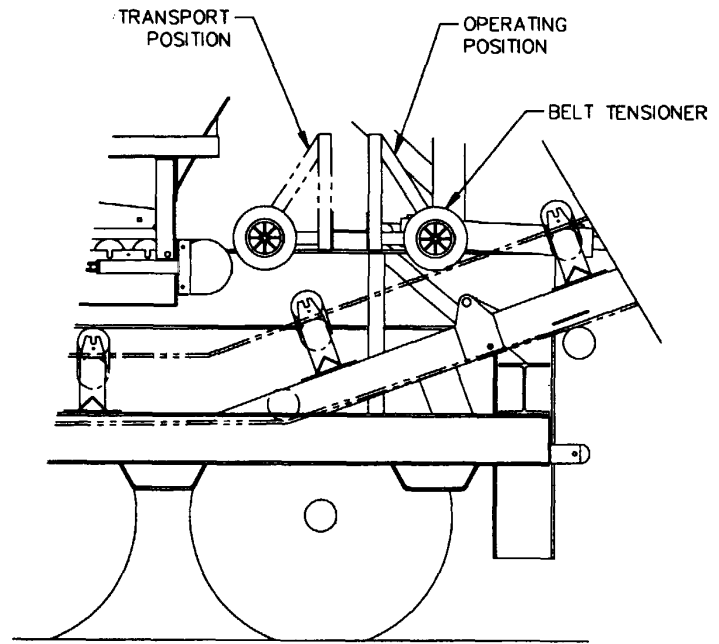


SIDE VIEW

Figure 2-27 Ramp Plates  
page 2 - 48



TOP VIEW



SECTION A-A

SIDE VIEW

Figure 2-28 Tension Wheel  
page 2 - 49

**12. Miscellaneous Set Up Procedures**  
**(See Figures 2-15, 2-29, 2-30, 2-31 and 2-32)**

Item	Procedure
1	Position the calibration tank as per the site layout Figure 2-29. The valve end should be positioned toward the asphalt tanker.
2	Assemble the upper portion of the tank frame to the lower portion and install the bolts and tighten. See Figure 2-30.
3	Unbolt the lower frame from the tank and suspend the tank on the chains provided. See Figure 2-30.
4	Remove the retainer bolts holding the test weights in position. See Figure 2-30.
5	The electrical power cables can be unwrapped from their transport storage positions and connected to the control van. The cables are to run parallel to each other in straight lines. See Figure 2-31. Lay out the power cables in the following order: Surge Bin (laid out and connected during surge bin set up) Baghouse Dedrummer/Melter Asphalt Tanker Drum Mixer Feed Conveyor Four Bin Feeder
6	The electrical control cables can be unwrapped from their transport storage positions and connected to the control van. These cables are to run parallel-to each other in straight lines. See Figure 2-32. Lay out the control cables in the same order as power cables.
7	Hydraulic power pack. Store this unit on or near the goose neck of the control trailer. It may be required for re-leveling of any equipment that settles during operation.
8	Install the fines blower hose (stored in the basket on the dedrummer) from the blower on the baghouse to the drum mixer. See Figure 2-15.

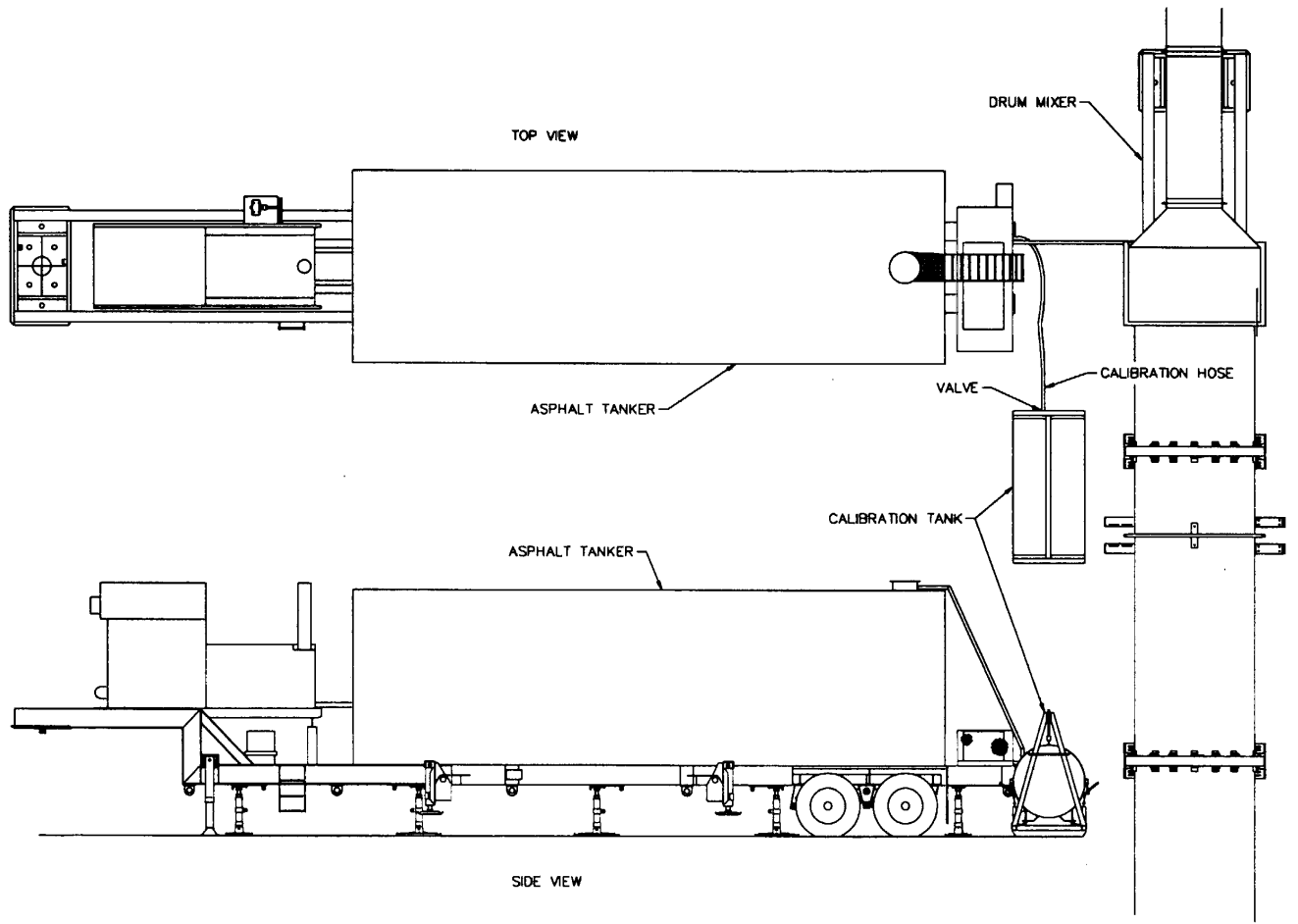


Figure 2-29 Calibration Tank Position  
page 2 - 51

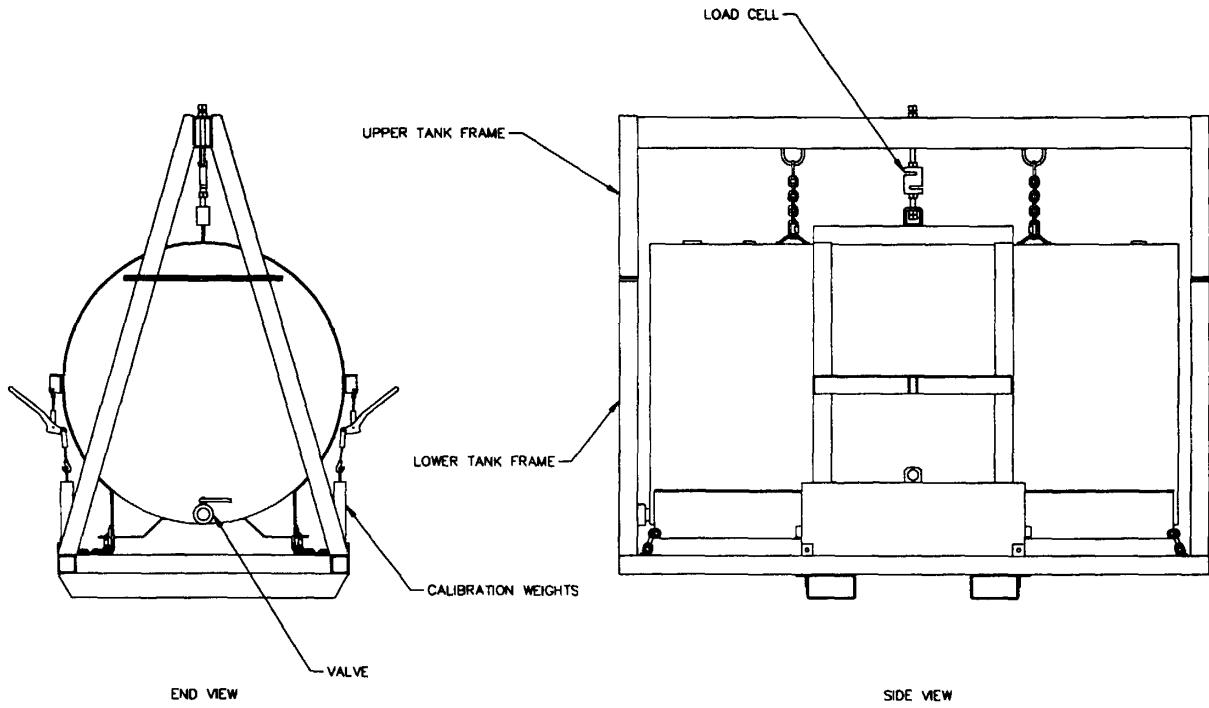


Figure 2-30 Calibration Tank  
page 2 - 52

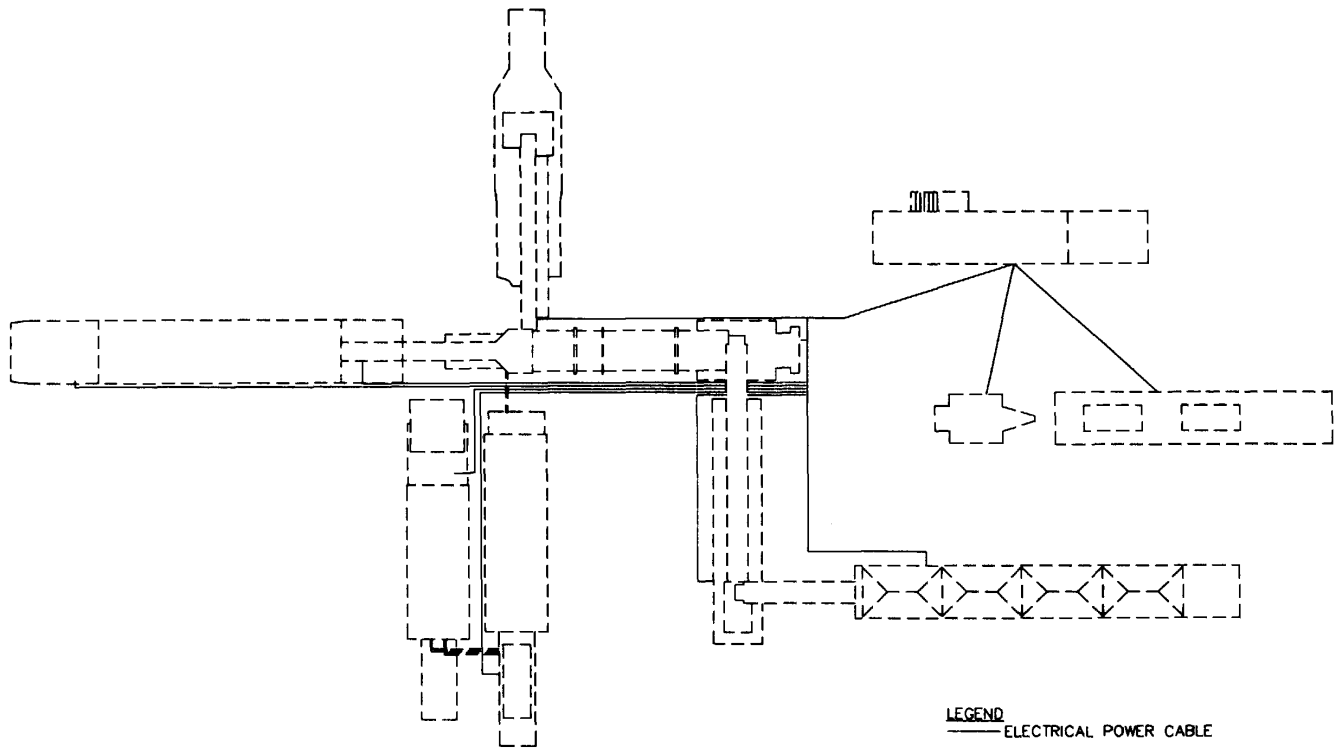


Figure 2-31 Electrical Power Cable Routing  
page 2 - 53

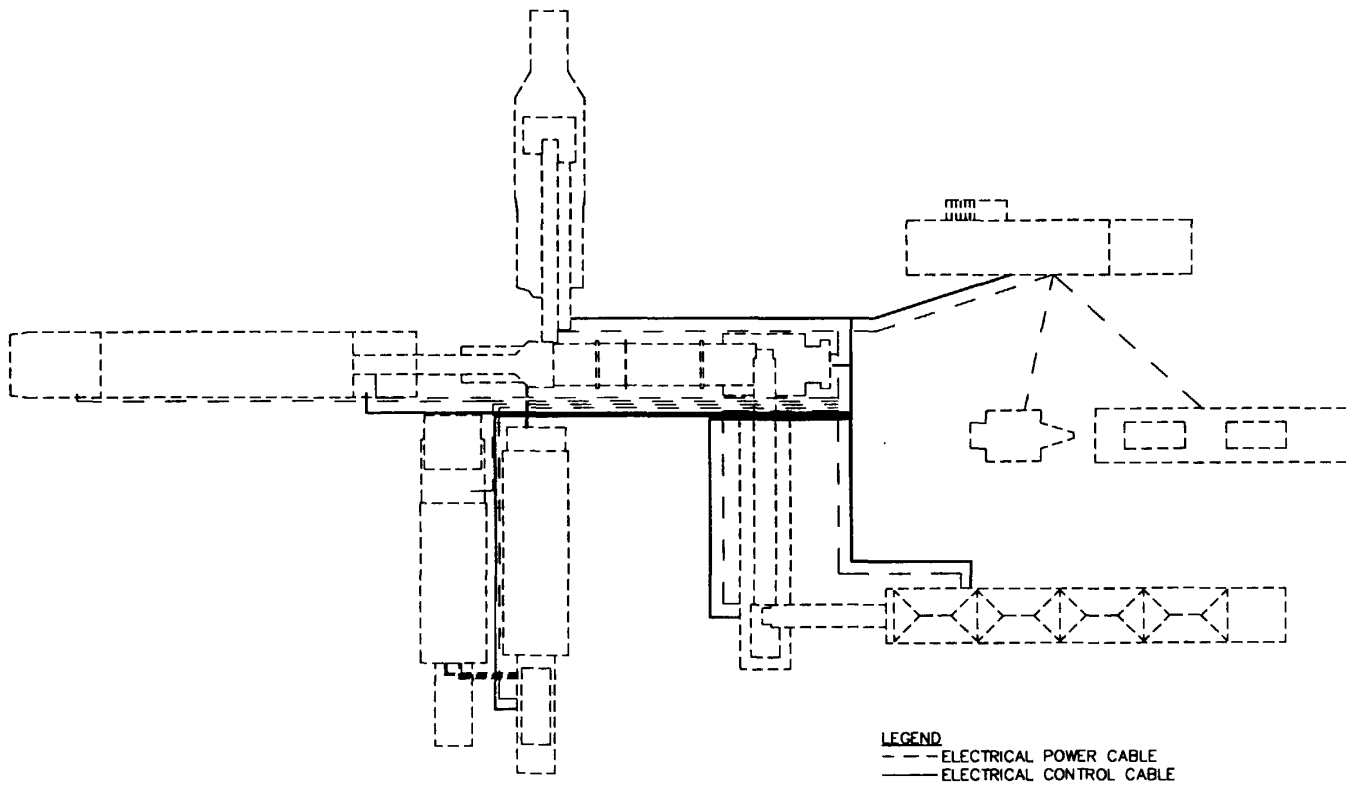


Figure 2-32 Electrical Control Cable Routing  
page 2 - 54



## 2-6. Plant Tear Down

The plant tear down procedures are basically the reverse of the set up procedures. The following procedures are to be used to tear down the M081 Asphalt Mixing Plant and prepare for relocation of the plant to another site.

### NOTE

The M081 Asphalt Mixing Plant is equipped with hardware storage boxes. Each component of the AMP has at least one of these boxes. They are intended to store hardware not used while the plant is operating but required when it is in the transport mode. They also serve to store hardware not required while in the transport mode but required when operating. Use these boxes for the Intended purpose. If hardware is required but not available on a component, check the hardware box to determine if the hardware has been stored there.

### CAUTION

Prior to transport and movement of the Individual trailers, all aggregate, fuel and asphalt should be removed from all tanks, bins and drums. The trailers may only be transported safely when empty of raw materiel and product.

### CAUTION

Do not stand behind or near equipment being moved or positioned. Account for all personnel before moving equipment.

### CAUTION

Do not stand under or near equipment being lifted or lacked. Clear the immediate area around equipment being raised or lowered into operating or transport position.

### CAUTION

Do not place heavy loads or drive over electrical power cables or control cables. These cables may sustain internal damage which could cause Injury.

### NOTE

Electrical power or control cables damaged internally may prevent operation of the plant

**1. Electrical Power Cables and Control Cables**  
**(See Figures 2-31 and 2-32)**

Item	Procedure
1	Determine if any components of the amp must be run prior to tear down of the plant. If not, proceed as follows:
2	<p>The electrical control cables can be unplugged from the control van and wrapped onto their individual transport support brackets. Complete this in the following order:</p> <p>Four Bin Feeder                      Feed Conveyor                      Drum Mixer                      Asphalt Tanker                      Baghouse</p>
3	<p>The electrical power cables can be unplugged from the control van and wrapped onto their individual transport support brackets. Complete this in the following order:</p> <p>Four Bin Feeder                      Feed Conveyor                      Drum Mixer                      Asphalt Tanker                      Dedrummer/Melter                      Baghouse</p>

**2. Four Bin Feeder Tear Down Procedures**  
**(See Figures 2-24, 2-25, 2-26, 2-27 and 2-28)**

The ramp must be removed prior to the tear down of the Four Bin Feeder

Item	Procedure
1	<p>All four hoppers must be empty. Remove all aggregate from the bins and belts. Select bypass on the drum interlock selector switch on the motor control panel. Position the drum bypass chute deflector plate so that aggregate bypasses the drum. Run the conveyors to empty the bins and belts. The aggregate will discharge out the calibration chute. Use the loader or a truck to collect the aggregate</p>

Item	Procedure
2	Disconnect all control and power cables from the control van. Wrap the cables onto the brackets provided.
3	Lower the hopper extensions into the horizontal position. Tighten the bolts to hold them in this position for transport.
4	Place the calibration tank in bin #1. Secure the tank to the brackets provided within the bin. Place the top A frame into bin #2 for transport. Fasten it to the brackets provided in the bin.
5	Lower the ladders into transport position and secure with bolts.
6	Remove the discharge hood from the feed conveyor at the head pulley by removing the bolts. Use a crane to remove the hood and store on the front of the trailer.
7	Remove the belt scraper and secure at the front of the trailer.
8	Using a crane remove the two bolts securing the ramp-up plates. Raise the plates into transport position. Raise the plates until the top is retained by tabs on the hopper legs. Secure with the bolts just removed. Repeat the process until all four plates are secured in the transport position.
9	Connect the hydraulic power pack.
10	Remove tension on the feed conveyor belt by adjusting the take-up at the tail pulley to obtain maximum belt slack.
11	Remove conveyor fold locking pins.
12	Remove tension on the support cable. Slowly retract the two lower cylinders by operating the gathering conveyor control valve (the conveyor will pivot at the trailer and the head end will be raised).
13	Using the fold cylinders mounted in the center of the conveyor, fold the conveyor downward. Do this slowly watching the head end to ensure the feed conveyor does not hit the screen deck or feed conveyor trailer.
14	Check to ensure the wire ropes used to support the conveyor when deployed will not interfere with the positioning the conveyor in the final stored position.
15	Slowly retract the lower cylinders alternate with the upper cylinders on the gathering conveyor and retract the conveyor.
16	When both sets of cylinders are nearly retracted, the conveyor frame will be at a point to fit between the transport lugs.

Item	Procedure
17	Secure the top set first by retracting the lower cylinders. If the chassis is not level the conveyor frame may not slide between these two tabs.
18	Push the conveyor frame sideways so that it will fit between the transport lugs. If unable to accomplish this the chassis may need to be levelled. Disconnect the hydraulic power pack from the conveyor control valve and connect it to the levelling jack control valve. Level the rear of the chassis so that the gathering conveyor will fit between the transport lugs. Re-connect the hydraulic power pack back to the gathering conveyor control valve.
19	After final position is obtained secure the conveyor into place with the four transport bolts.
20	Connect the power pack to the hydraulic level jacks.
21	Use the hydraulic levelling jacks to relieve pressure from the screw jacks.
22	Remove the base pads from the screw jacks and install in the transport position.
23	Position the screw jacks in the transport position.
24	Lower the trailer by retracting the levelling jacks.
25	Disconnect the hydraulic power pack.
26	Connect the transport tractor and move the four bin feeder as desired.

3. **Feed Conveyor Tear Down Procedures**  
(See Figure 2-22)

Item	Procedure
1	Ensure feed conveyor is empty of all aggregate.
2	Disconnect all control and power cables and store on brackets provided.
3	Secure the screen to the screen deck by using the red transport plates. Bolt the four plates into the transport position.
4	Locate the hydraulic power pack and connect the hydraulic lines to the conveyor control valve. Connect power cable and start the pump.
5	Disconnect the conveyor by removing the pins securing the conveyor to the support structure.

Item	Procedure
6	Raise the conveyor to maximum height with the hydraulic cylinder.
7	Using the hydraulic lifting jacks raise the trailer so that all weight is removed from the screw jacks. Remove the pads and store the pads and the legs.
8	Raise the front of the trailer using the levelling jacks.
9	Bolt the landing jacks into the transport position.
10	Retract all levelling jacks.
11	Disconnect the hydraulic power pack.
12	Connect the transport tractor to the trailer and pull the feed conveyor forward until the conveyor can be lowered without hitting the drum mixer.
13	Locate the hydraulic power pack and connect the hydraulic lines to the conveyor. Connect power cable and start the pump.
14	Lower the conveyor into transport position and secure.
15	Replace the fifth wheel adapter if the adapter is to be used.
16	Disconnect the hydraulic power pack.
17	Connect the transport tractor and move the feed conveyor as desired.

**4. Dedrummer/Melter Tear Down Procedures (See Figure 2-20)**

Item	Procedure
1	Remove all asphalt from drum meter tank. The asphalt should be transferred to a suitable transport vehicle.
2	Remove all diesel fuel from drum meter fuel tank. The fuel should be transferred to a suitable transport/storage vehicle.
3	Disconnect the power cables and store on brackets provided.
4	Close all hot oil valves on both ends of lines connecting the drum meter and the asphalt tanker.

Item	Procedure
5	<p>Disconnect the hot oil transfer lines. Use a five gallon pail to collect liquid in the lines.</p> <p style="text-align: center;"><b>CAUTION</b></p> <p><b>Ensure there is no pressure on the line and that protective clothing is worn. Cover the joints with a protective cover (heavy canvas blanket or similar materiel) as the joint is opened. The blanket will deflect any oil pressure and protect the operator. This operation is best done after the system has cooled.</b></p>
6	<p>Disconnect the asphalt feed line. Use a five gallon pail to collect liquid in the line.</p> <p style="text-align: center;"><b>CAUTION</b></p> <p><b>Ensure there is no pressure on the line and that protective clothing is worn. Cover the joints with a protective cover (heavy canvas blanket or similar materiel) as the joint is opened. The blanket will deflect any liquid asphalt pressure and protect the operator. This operation is best done after the system has cooled.</b></p>
7	<p>Disconnect the fuel line from the fuel tank to the asphalt tanker hot oil heater.</p>
8	<p>Disconnect the fuel line from the fuel tank to the drum mixer burner.</p>
9	<p>Remove the chain hoist from the jib trolley and secure in storage box.</p>
10	<p>Use a fork lift and lower the jib into transport position. Remove the pin located in the support post and reinstall in the lowered transport position.</p>
11	<p>Connect the hydraulic power pack and raise the trailer using the levelling jacks so that the weight is removed from the screw jacks.</p>
12	<p>Remove the pads from the screw jacks and stow the pads and legs in the transport position. Install the strap on the rear screw jack pads that prevent them from turning.</p>
13	<p>Lower the chassis onto the landing jacks in the transport position.</p>
14	<p>Fully retract the levelling jacks and disconnect the hydraulic power pack.</p>
15	<p>Stow hot oil transfer lines, asphalt lines, fuel lines and air lines in the basket provided on the side of the chassis.</p>
16	<p>Connect the transport tractor and move the drum melter as desired.</p>

Item	Procedure
<p><b>NOTE</b>                      The basket on this chassis is used to store connecting hoses and pipes during movement. Complete the plant tear down before moving this component away from the immediate vicinity.</p>	

**5. Asphalt Tanker Tear Down Procedures  
 (See Figure 2-17)**

Item	Procedure
1	Remove all asphalt from asphalt tank. The asphalt should be transferred to a suitable transport/storage vehicle.
2	Disconnect all control and power cables and store on brackets provided.
3	Disconnect the air line from the divert valve. Store this line on the baghouse.
4	Disconnect the asphalt feed line.
5	Disconnect the asphalt jacketed line from the asphalt tank to the drum mixer. Disconnect the heat transfer hoses to the jacketed line.
<p><b>CAUTION</b>                      Ensure there is no pressure on the line and that protective clothing is worn. Cover the joints with a protective cover (heavy canvas blanket or similar material) as the joint is opened. The blanket will deflect any liquid asphalt pressure and protect the operator. This operation is best done after the system has cooled.</p>	
6	Connect the hydraulic power pack and raise the trailer using the levelling jacks so that the weight is removed from the screw jacks.
7	Remove the pads from the screw levelling legs and stow the pads and legs in the transport position.
8	Lower the chassis onto the landing jacks in the transport position.
9	Fully retract the levelling jacks and disconnect the hydraulic power pack.
10	Stow hot oil transfer lines, asphalt lines, fuel lines and air lines in the basket provided on the side of the drum meter.

Item	Procedure
11	Install the red pipe cap onto the overflow/vent pipe on the hot oil heater.
12	Connect the transport tractor and move the asphalt tanker as desired.

**6. Baghouse Tear Down Procedures  
(See Figure 2-16)**

Item	Procedure
1	Remove any dust from the system by purging the system prior to shut down.
2	Disconnect all control and power cables and store on brackets provided.
3	Disconnect the blower hose from the drum mixer and from the baghouse. Store in the basket on the drum meter.
4	Remove the exhaust stack from the exhaust blower and store on the chassis gooseneck for transport.
5	Remove the rubber seals from the joint and store for transport in the control van. (Wipe clean prior to storage.)
6	Disconnect the expansion joint from the baghouse exhaust elbow. Leave the expansion joint attached to the drum mixer duct.
7	Remove the duct elbow and store on the generator trailer for transport.
8	Remove the rubber seals from the joint and store for transport in the control van. (Wipe clean prior to storage.)
9	Lower the handrail around the top of the baghouse into the transport position.
10	Connect the hydraulic power pack and raise the trailer using the levelling jacks so that the weight is removed from the screw jacks.
11	Remove the pads from the screw jacks and stow the pads and position the legs in the transport position.
12	Lower the chassis onto the landing jacks in the transport position.
13	Fully retract the levelling jacks and disconnect the hydraulic power pack.
14	Raise the rear platform ladder into the transport position.
15	Connect the transport tractor and move the baghouse as desired.



**7.Drum Mixer Tear Down Procedures**  
**(See Figures 2-12 and 2-15)**

Item	Procedure
1	Disconnect all control and power cables and store on brackets provided.
2	Using a crane remove the bypass chute and store for transport.
3	Using a crane to support the exhaust duct, remove the bolts at the plenum.
4	Lift the section of exhaust duct to the ground. The two pieces of steel duct can be unbolted. They both get stored on the generator trailer for transport.
5	Remove the rubber seals from the duct joints and store for transport in the control van. (Wipe clean prior to storage.)
6	Remove the ducting support leg and store.
7	Disconnect the exhaust plenum and rotate into the transport position. Secure with bolts.
8	Remove the rubber seals from the duct joints and store for transport in the control van. (Wipe clean prior to storage.)
9	Connect the hydraulic power pack. Connect power cable and start pump motor.
10	Raise the trailer using the hydraulic levelling jacks so that the weight is removed from the screw jacks.
11	Remove the pads from the screw jacks and stow the pads and legs in the transport position.
12	Bolt the landing jacks into the operating position. Extend the jacks to their maximum length.
13	Fully retract the hydraulic levelling jacks lowering the trailer. The trailer will be supported by the wheels and landing legs.
14	Disconnect the hydraulic power pack.
15	Connect the transport tractor and move the drum mixer as desired.

**8. Surge Bin Tear Down Procedures  
(See Figures 2-8, 2-9, 2-10 and 2-11)**

Item	Procedure
1	Ensure all aggregate mix has been removed from the slat conveyor, surge bin and batcher.
2	Using a crane, tilt the bypass chute into the transport position and install the bolt in the bottom of the chute.
3	Remove the bolts holding the top section of the chute and lower this into the transport position on the platform. Bolt for transport.
4	Remove feed hopper onto the rear of the main chassis for transport.
5	Start the surge bin hydraulic system.
6	Remove the four corner pins holding the hopper in the operating position (extend the hydraulic cylinders slightly to remove the weight off the pins).
7	Lower the bin by operating the center and right control valve levers simultaneously. Carefully observe the cylinder retraction to ensure that the bin is lowering equally at all four corners.
8	When the bin has been lowered to the transport position, reinsert the four corner pins.
9	Open the front and rear bin doors.
10	Remove the platform handrail and store for transport.
11	Remove the conveyor handrail sections that must be removed for transport (at the head end and where the conveyor steps fold.)
12	Fold the conveyor steps and bolt for transport.
13	Remove the top pins from the upper telescoping conveyor support structure.
14	Remove the two conveyor support pins from their location at the rear of the chassis (use the conveyor hydraulic lift cylinders to remove the pressure on these pins).
15	Use the left side hydraulic control lever and retract the conveyor lift cylinders by pushing the lever.
16	The conveyor will slowly pivot around its support and lower into the transport position. (Closely observe movement of conveyor to ensure nothing obstructs the operation.)

Item	Procedure
17	Re-install the two conveyor support pins into their location at the rear of the chassis.
18	Reconnect the air brake lines and transport light cables that have connections in the drive through area. These hoses and cables are stored on the lower position of the chassis.
19	Bolt the feed hopper onto the rear of the main chassis for transport.
20	Fold all ladders for transport.
21	Extend the landing jacks to their maximum.
22	Position the hydraulic power pack and connect the hoses to the levelling jack valve.
23	Using the hydraulic power pack extend the levelling jacks raising the chassis off the ground.
24	Remove the pads from the screw jacks and store the pads and legs in the transport position.
25	Adjust the screw jacks on the front and rear support bases by raising the jacks.
26	Fully retract the hydraulic levelling jacks.
27	Disconnect the hydraulic power pack.
28	Using the surge bin hydraulic system, slightly extend the two rear cylinders mounted on rear support base enough to remove the two pins holding the support base the main chassis.
29	Retract the two rear cylinders until the pins can be reinserted. Lock the pins in place by re-inserting the clip pins.
30	Slightly extend the two front cylinders mounted on front support base enough to remove the two pins holding the support base to the main chassis.
31	Retract the two front cylinders until the pins can be re-inserted. Lock the pins in place by re-inserting the clip pins.
32	Disconnect all control and power cables and store for transport.
33	Connect the transport tractor and move the surge bin as desired.

**9. Hydraulic Power Pack Tear Down Procedures**  
 (See Figure 2-3 and 2-7)

Item	Procedure
1	Secure the power cable on the unit.
2	Store on the control van goose neck.

**10. Generator Trailer Tear Down Procedures**  
 (See Figure 2-5)

Item	Procedure
1	Turn generator off.
2	Remove the power cables from the motor control centers #1 and #2. Store the cables on the generator trailer.
3	Remove the ground wires connected from the generators to the ground rods. Remove ground rods.
4	Raise the trailer using the landing legs so that the weight is removed from the screw levelling legs.
5	Remove the pads from the screw levelling legs and stow the pads and legs in the transport position.
6	The trailer will be supported by the wheels and landing legs.
7	Connect the transport tractor and move the generator trailer as desired

**11. Standby Generator Tear Down Procedures**

Item	Procedure
1	Turn generator off.
2	Remove the power cable from the motor control center. Remove the other end of the cable at the 60 kW generator. Store the cable on the generator trailer.
3	Remove the ground wire connected from the generator to the ground rod. Remove ground rod.

Item	Procedure
4	Raise the two rear support legs.
5	Connect the transport vehicle and move the generator trailer as desired.

## 12. Control Van Tear Down Procedures (See Figure 2-3)

Item	Procedure
1	Remove the computer monitor, keyboard and printer and store in storage boxes.
2	Remove the air filter element from the ECU. Store in the MCC room for transport.
3	Install the transport cover onto the ECU.
4	Remove the stairs and store on the control van trailer goose-neck.
5	Remove the ground wire connected from the control van to the ground rod. Remove ground rod.
6	Raise the trailer using the landing legs so that the weight is removed from the screw jacks.
7	Remove the pads from the screw jacks and stow the pads and legs in the transport position. Install the strap preventing the rear screw jack pads from turning.
8	The trailer will be supported by the wheels and landing legs.
9	Connect the transport tractor and move the control van as desired.

The M081 Asphalt Mixing Plant is in the transport mode. Prior to movement of the plant or any components a Movement PMCS must be completed. See section 3-4 of this manual.

### 2-7. Plant Movement

1. All components of the Asphalt Mixing Plant are portable and each component (except the tow dolly) is mounted on its own semi-trailer for easy transport by road. The tow dolly is a tandem axle transport unit with a fifth wheel plate (50" height) mounted to its frame. This unit has a tow-eye and hitch for transport. Table 2-1 shows equipment compatibility with government truck tractors (prime movers).

Table 2-1. Equipment Compatibility

Component	M915	M915A1	M915A2	M916	M916A1	M920
Four Bin Feeder	Y	Y	Y	Y	Y	Y
Feed Conveyor	Y	Y	Y	Y	Y	Y
Drum Mixer	Y	Y	Y	Y	Y	Y
Surge Bin	Y	Y	Y	Y	Y	Y
Baghouse*	N	Y*	Y*	N	Y*	Y
Asphalt Tanker	Y	Y	Y	Y	Y	Y
Drum Melter	Y	Y	Y	Y	Y	Y
Control Van	Y	Y	Y	Y	Y	Y
200kW Generator Trailer	Y	Y	Y	Y	Y	Y
60kW Generator Trailer**	Y	Y	Y	Y	Y	Y
Tow Dolly**	Y	Y	Y	Y	Y	Y
U = Unknown N = No Y = Yes *BAGHOUSE: M915A1/M915A2, SHIFT 5TH WHEEL TO AFT POSITION. M916A1 5TH WHEEL MUST BE IN M172A1 TRAILER POSITION. **DOLLY AND 60KW GENERATOR TRAILER USED WITH TOWING PINTLE						

The Asphalt Mixing Plant is marine transportable on LCU-2000 class and larger vessels.

**2. Sectionalization**

The asphalt mixing plant is sectionalized into ten components prior to road transport.

Disassembly of the M081 Asphalt Mixing Plant in readiness for transport will require a maximum of 100 man hours.

Reassembly of the M081 Asphalt Mixing Plant will require a maximum of 100 man hours.

The following special equipment is required in order to sectionalize the M081 Asphalt Mixing Plant:

1. One 12-1/2 ton mobile crane
2. One 6000 lb rough terrain forklift
3. One truck tractor (refer to Table 2-1)

Sectionalization is accomplished during the tear down of the asphalt mixing plant. Tear down is complete when the plant is ready for transport. No further sectionalization is required.

### **3.Special Materials Handling Equipment (MHE)**

The following equipment will be required for marine transportation:

- 1.Slings
- 2.Tie down cables or chains
- 3.Spreader bars (one set provided with the AMP)
- 4.Blocking for kingpins
- 5.Wheel chocks

### **4.Speed Requirements**

The maximum towed speed for all components is as follows:

- 1.Paved roadway - 40 miles per hour over smooth hard surfaced primary highways.
- 2.Unpaved roadway - 10 miles per hour.

### **5.Over Dimensional Trailers**

The M081 Asphalt Mixing Plant includes trailers which may exceed the allowable length or width. Prior to movement obtain any necessary permits or approvals required to move the trailer.

Ground clearance in some trailers may be restricted. Inspect prior to movement and transport those trailers with additional care.

## **II. PREPARING TO PRODUCE**

### **2-8. Electrical Power Supply**

The M081 Asphalt Mixing Plant is powered by two primary 200 kW generators and one standby 60 kW generator. During mixing operations power is required from both primary generators.

The standby generator is used during non operational periods. It provides power to the hot oil heater to maintain the liquid asphalt at operational temperatures. It also provides 110 volt power to the plant. This permits dedrumming operations to be performed during the plant down period. This generator is also utilized during set up and tear down.

**-Standby Generator Operation**

**NOTE**

**Complete the control van and standby generator set up procedures before proceeding.  
See section 2-5.**

Item	Procedure
1	Start the 60 kW generator - follow procedures recommended on operator's instruction plate mounted on the generator. Perform PMCS as required in the generator manuals.
2	Motor control center #2 - turn main breaker OFF.
3	Motor control center #2 - turn alternate main breaker OFF.
4	Motor control center #2 - remove interlock key from main breaker and install key and unlock alternate main breaker.
5	Motor control center #2 - turn alternate main breaker ON.

**NOTE**

**Standby power is now available:**

**Switching from Standby Generator to Primary Generators**

Item	Procedure
1	Start the two 200 kW Primary Generators - follow procedures recommended on operator's instruction plate mounted on the generators. Perform PMCS as required in the generator manuals.
2	Stop all equipment being powered through MCC #2.



Item	Procedure
3	Motor Control Center #2 - turn alternate main breaker OFF.
4	Motor Control Center #2 - remove interlock key from breaker unit and install key and unlock main breaker.
5	Motor Control Center #2 - remove interlock key from breaker unit and install key and unlock main breaker.
6	Motor Control Center #1 - turn main breaker ON.

**NOTE**

**Power is now available to the complete plant**

**Switching from Primary Generators to Standby Generator**

Item	Procedure
1	Start the 60 kW Generator - follow procedures recommended on operator's instruction plate mounted on the generator. Perform PMCS as required in the generator manuals.
2	Stop all equipment being powered through MCC #2.
3	Motor Control Center #2 - turn main breaker OFF.
4	Motor Control Center #2 - Remove interlock key from main breaker and install key and unlock main breaker for standby generator.
5	Motor Control Center #2 - turn alternate main breaker ON.

**NOTE**

**Power is now available.**

**Utility (Line) Power**

The plant may be operated on utility power. This requires main service of 600 amps 480 volt three phase. Two sub feeders from the main service rated at 300 amps full load can be connected to the two motor control centers.

Phase rotation must be: L1-A, L2-B, L3-C industry standard Black, Red, Blue phasing.

Grounding of MCC #1 and MCC #2 by NEMA standards.

**2-9. Operator Controls**

The operator’s controls are contained on four panels and one monitor in the control van. The four panels are labeled as "A", "B", "C" and "D". The content of these four panels are listed below and are sequenced from left to right and top to bottom.

<u>Reference</u>	<u>Label or Position</u>	<u>Figure</u>
A	Feeder Panel	2-33
B	Motor Control Panel	2-34
C	Corner Panel	2-35
D	Burner Control Panel	2-36

**Panel "A" - Feeder Panel**

#	Control	Indicator	Function
1		Feeder 1: percent speed	Indicates relative feed rate.
2		Feeder 2: percent speed	Indicates relative feed rate.
3		Feeder 3: percent speed	Indicates relative feed rate.
4		Feeder 4: percent speed	Indicates relative feed rate.
5		Asphalt Metering Pump: percent speed	Indicates relative asphalt pump speed.
6	Feeder 1	Green when running	manual - off- auto.
7	Feeder 2	Green when running'	manual - off - auto.

#	Control	Indicator	Function
8	Feeder 3	Green when running	manual - off - auto.
9	Feeder 4	Green when running	manual - off - auto.
10	Asphalt Metering Pump		Asphalt pump feeder - Manual, Auto.
11	Ratio Bin 1		Bin 1 feeder speed adjustment.
12	Ratio Bin 2		Bin 2 feeder speed adjustment.
13	Ratio Bin 3		Bin 3 feeder speed adjustment.
14	Ratio Bin 4		Bin 4 feeder speed adjustment.
15	Asphalt Pump		Asphalt pump speed adjustment.
16	Lamp Test	Lights	Test control panel lights.
17	Initiate Vibrator Bin 1	Green when running	Starts vibrator Bin 1.
18	Master Speed		Adjusts all V.F. drive speeds.
19	Initiate Vibrator Bin 3	Green when running	Starts vibrator Bin 3.
20		Green when forward	Indicates asphalt pump flow direction.
21		Amber when reverse	Indicates asphalt pump flow direction.
22	Horn		Turns alarm horn on.
23	Initiate Vibrator Bin 2	Green when running	Starts vibrator Bin 2.
24	Initiate Vibrator Bin 4	Green when running	Starts vibrator Bin 4.
25	Asphalt Metering Pump		Forward - Off - Reverse.

#	Control	Indicator	Function
26	Alarm Silenced	Red during alarm condition	Indicates alarm condition.
27		Amber in divert mode	Indicates asphalt diverted to asphalt tanker.
28		Green in drum mode	Indicates asphalt flow to drum mixer.
29	Power		Control panel: off- on.
30	Feed Conveyor	Amber when running	On (top), off (bottom).
31	Scalping Screen	Amber when running	On (top), off (bottom).
32	Gathering Conveyor	Amber when running	On (top), off (bottom).
33	Divert		Auto-Divert-Drum.

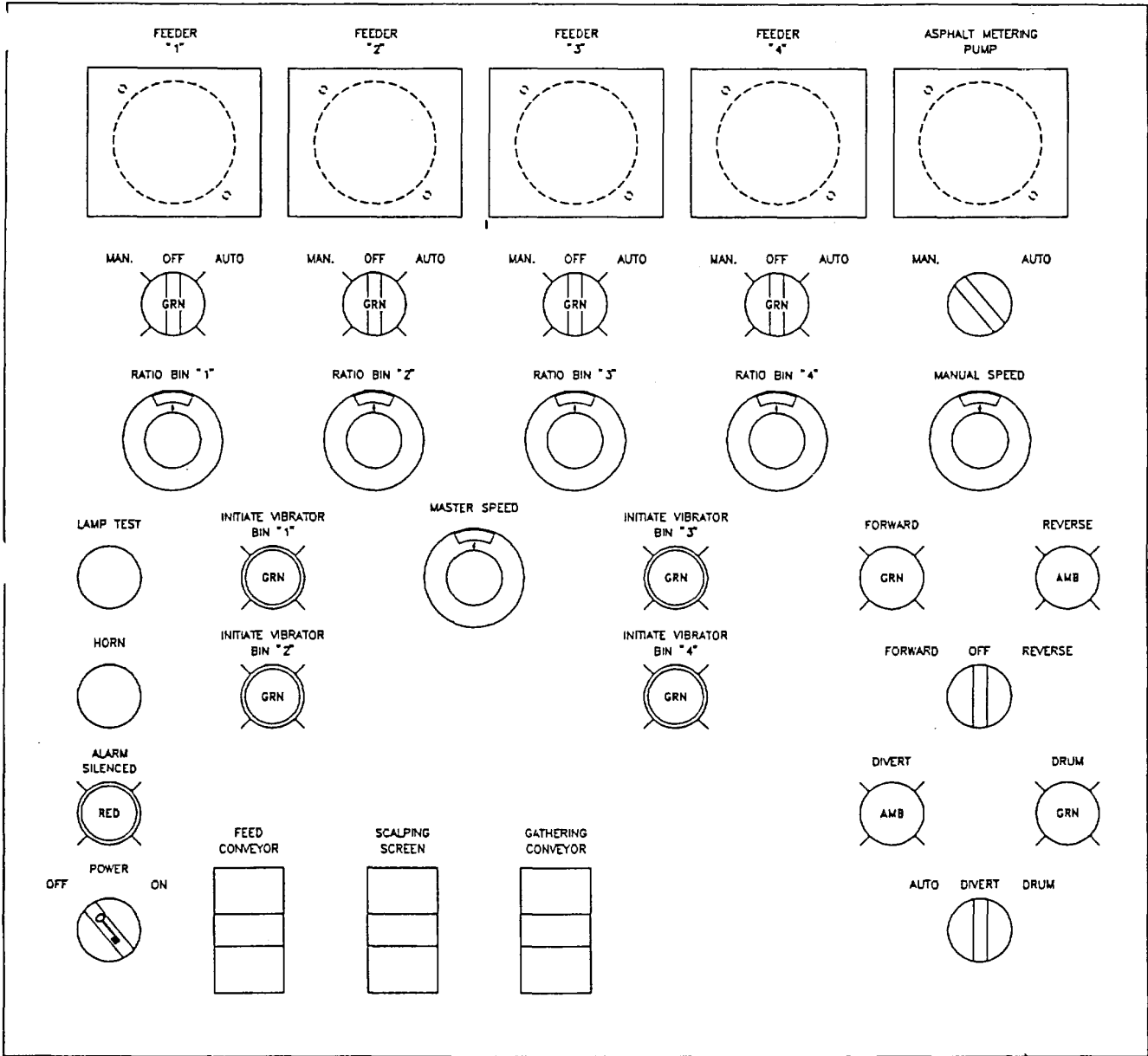


Figure 2-33 Feeder Panel (Panel A)

**Panel 'B'- Motor Control Panel**

#	Control	Indicator	Function
1	Drum Drive	Indicates percent motor load.	
2	Exhaust Fan	Indicates percent motor load.	
3	Hot Mix Conveyor	Indicates percent motor load.	
4	MCC #1	Indicates frequency of power input to motor control center #1.	
5	MCC #2	Indicates frequency of power input to motor control center #2.	
6	Drum Drive	Amber when On (top), off (bottom). running	
7	Exhaust Fan	Amber when On (top), off (bottom). running	
8	Hot Mix Conveyor	Amber when On (top), off (bottom). running	
9	Baghouse Fines Blower	Amber when On (top), off (bottom). running	
10	MCC #1	Motor control center input voltage. Voltage	
11	MCC #2	Motor control center input voltage. Voltage	
12	Baghouse Airlock	Amber when On (top), off (bottom). running	
13	Baghouse Discharge Incline Screw	Amber when On (top), off (bottom). running	
14	Baghouse Transfer Screw	Amber when On (top), off (bottom). running	
15	Baghouse Hopper Screws	Amber when On (top), off (bottom). running	

#	Control Indicator	Function	
16	Steady green when main power	Power source - 200 kW generator.	
17	Flashing green auxiliary power	Power source - 60 kW generator.	
18	Red when bin full	Surge bin high level.	
19	Amber when bin level is low	Surge bin low level.	
20	Baghouse Clean Green when running	Manual - Off - Auto.	
21	Red when baghouse air low	Low air pressure indicator.	
22	Red when surge bin air low	Low air pressure indication.	
23	Surge Bin Heat Blue when heat on	Activates surge bin heater: off - on.	
24	Green when batcher open	Indicates batcher is open.	
25	Batcher Open - Auto - Close.		
26	Batcher Amber when closed	Indicates batcher is closed.	
27	Drum Interlock Red when interlock bypassed	Normal - Bypass.	
28	Baghouse Air Green when running	Turns air compressor: off - on.	
29	Surge Bin Air Green when running	Turns air compressor: off - on.	

#	ControlIndicator	Function	
30	Drop Out	Selects drop out gate: open - close.	
31	Green when open	Indicates open discharge gate.	
32	Discharge Gate	Open - Close - Open.	
33	Amber when closed	Indicates closed discharge gate.	



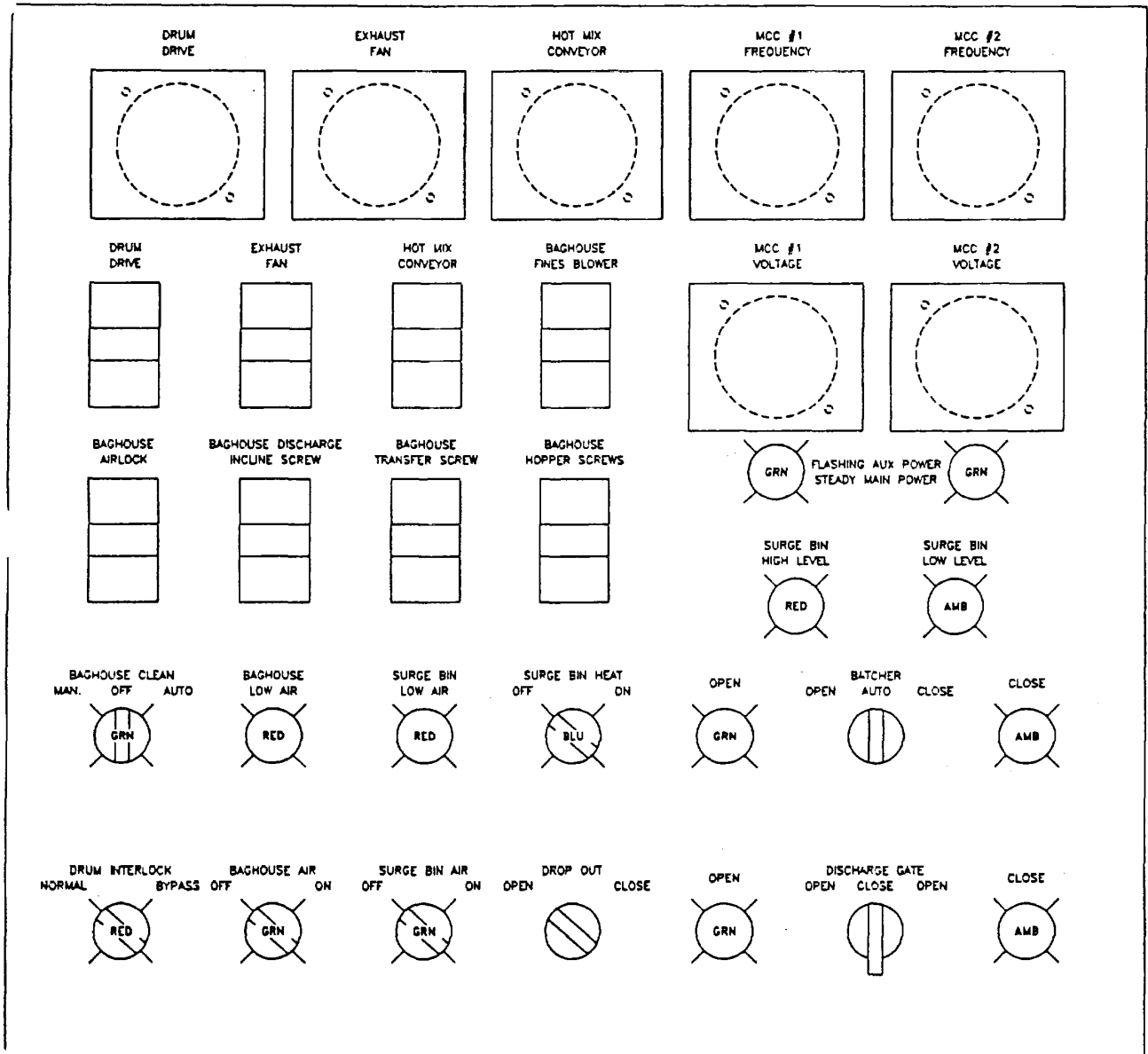


Figure 2-34 Motor Control Panel (Panel B)

**Panel "C" - Comer Panel**

#	Control Indicator	Function
1	Oil heater inlet fluid temperature	Indicates temperature of heat transfer fluid returning to heater.
2	Oil heater outlet fluid temperature	Indicates temperature of heat transfer fluid leaving heater.
3	Baghouse differential pressure	Indicates pressure differential between baghouse inlet and outlet.
4	Emergency Stop	Shuts down complete plant.

**Panel 'D' - Burner Control Panel**

#	Control Indicator	Function
1	Burner Fan running	Amber when On (top), Off (bottom).
2	Fuel Pump running	Amber when On (top), Off (bottom).
3	Exhaust Shutter open	Green when indicates exhaust shutter is open.
4	Exhaust Shutter	Open - Closed - Auto.
5	Exhaust Shutter closed	Red when indicates exhaust shutter is closed.
6	Baghouse exhaust temperature inlet	Indicates exhaust temperature entering baghouse.

#	Control Indicator	Function
7	Baghouse exhaust temperature outlet	Indicates exhaust temperature exiting baghouse.
8	Amber when stack selected	Indicates stack has been selected as burner control mode.
9	Control Mode Stack - materiel.	
10	Amber when materiel selected	Indicates materiel has been selected as burner control mode.
11	Red when high temperature limit exceeded	Indicates baghouse temperature out of tolerance.
12	Flame Meter	Indicates strength of pilot flame.
13	Stack Control Displays temperature, set point, function	Controller - indicator of burner firing rate based on stack temperature.
14	Materiel Control Displays temperature, set point, function	Controller - indicator of burner firing rate based on materiel temperature.
15	Damper Control Displays static burner pressure at burner, set point, function	Controller - indicator of static pressure at burner and controls exhaust gas flow by opening/closing damper.
16	Amber when limits closed	Indicates burner is enabled.
17	Amber when complete	Proves safety limits achieved, burner purge may fire.

#	Control Indicator	Function
18	Green when pilot on	Indicates pilot flame is on.
19	White when main flame proved	Drum burner is on.
20	Red when reset required	Indicates reset of flame relay required.
21	Damper White when manual auto. selected	Indicates damper controlled manual - manual auto. selected
22	Amber when damper hold	Indicates damper is in a constant damper hold setting.
23	Power Off- On	
24	Limits Set limits set	Yellow when Energizes the limits hold circuit.
25	Pilot	Starts pilot flame.
26	Main Flame	Main flame off - start.
27	Alarm Silence alarm condition	Red when Depress to shut off alarm.
28	Damper Open damper opening	Green when Opens damper when in manual and damper is indicates damper is opening.
29	Damper Close damper closing	Green when Closes damper when in manual and damper is indicates damper is closing.

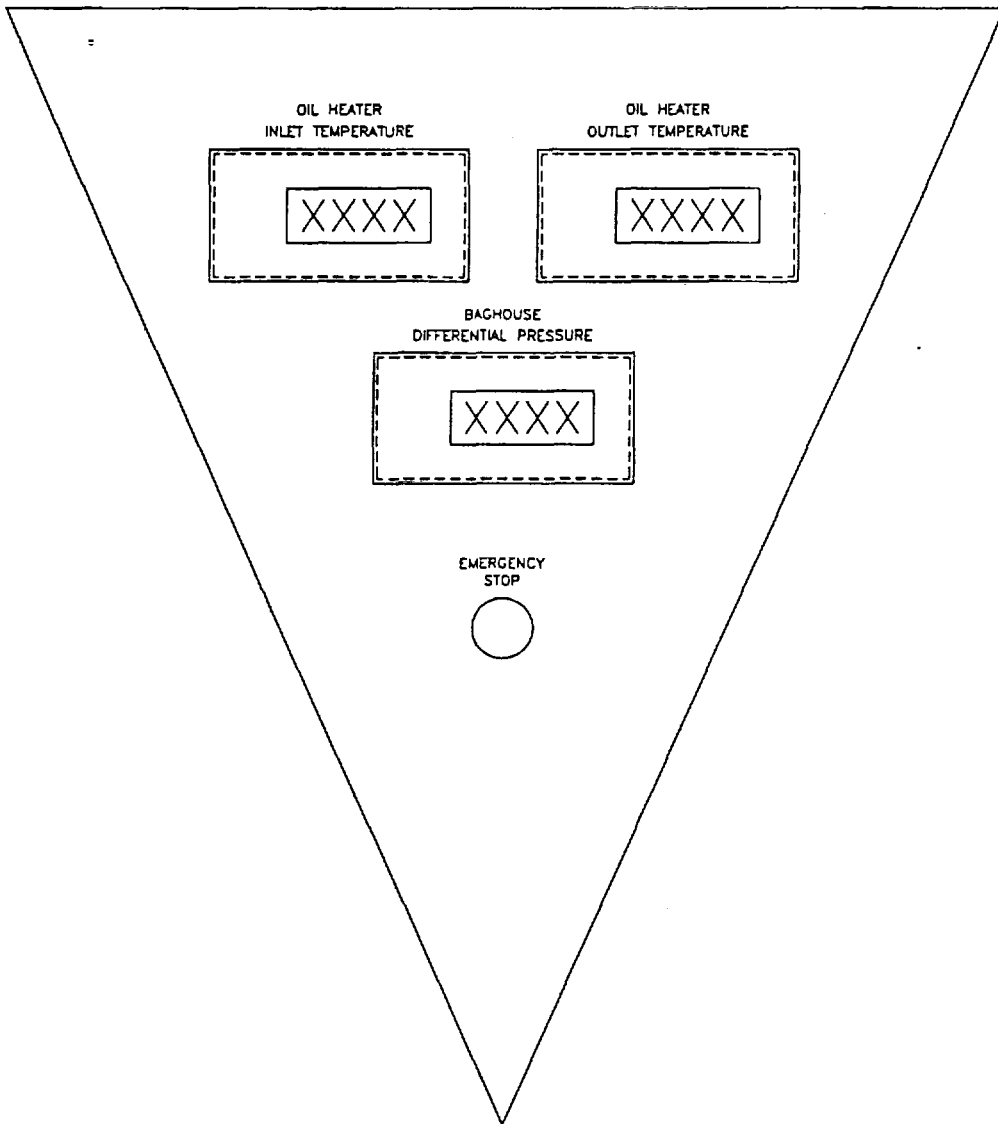


Figure 2-35 Corner Panel (Panel C)

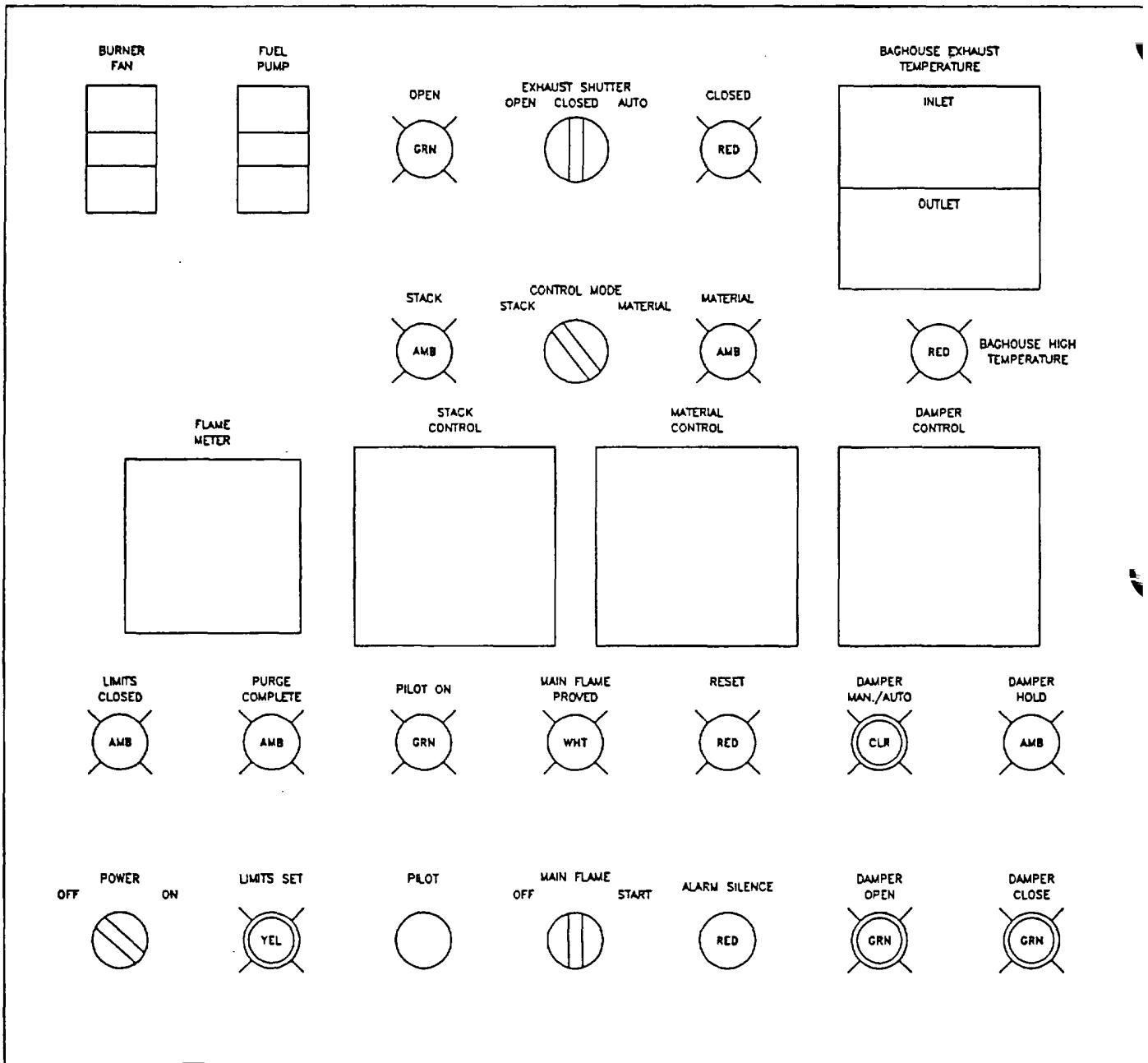


Figure 2-36 Burner Control Panel (Panel D)

The remaining operator’s controls are displayed on the monitor. Access to input information to the monitor is provided by a keyboard. The monitor prompts the operator for input data or for data required to be displayed. The operator initiates the activity by pressing "ESC", the (escape) key on the keyboard. The monitor and keyboard are components of the Blending Controller. Additional operating instructions are contained in section III, Operating Procedures and in appendix F, Blending Controls.

A printer is included to provide a hard copy record of the operation of the plant. It provides a production rate record, information on the quality of the mix and a raw materiel usage record. Additional information on the operation of the printer is contained in appendix F, Blending Controls and in the Maintenance manual.

**2-10 Training Mode**

The MO81 Asphalt Mixing Plant controls have an operator training mode. To access this training mode proceed as follows:

Item	Procedure
1	Provide electrical power to MCC #2. See section 2-8.
2	Feeder panel-turn <u>Power</u> key to the ON position.
3	Feeder panel lower cabinet-open door to access the Data Table Access Module (DTAM).
4	DTAM panel-PRESS F(9). This accesses the control configuration.
5	DTAM panel-PRESS 9123. This is the training code.
6	The control panel is now in the training mode. Proceed with plant training operation. See sections 2-13, 2-14, 2-15, 2-16, 2-17, 2-18 and 2-19.

To exit the training mode proceed as follows:

Item	Procedure
1	Feeder panel lower cabinet-open door to access the DTAM.
2	DTAM panel-PRESS F(9). This accesses the control configuration.
3	DTAM panel-PRESS 0011. This is the operation code.

Item	Procedure
4	The control panel is now in the operation mode.
5	Select <u>Power</u> key to the OFF position.

**2-11 Calibration**

The Asphalt Mixing Plant must be calibrated after movement of the plant. The operator must be familiar with section 2-9 before proceeding with calibration.

Preventative Maintenance Checks and Service must be performed before operating the Asphalt Mixing Plant. Complete the "after" Movement PMCS and the "before" Operation PMCS. See section 3-4.

The aggregate scale and blending controller are both supplied by Systems Equipment Corporation. Additional calibration information can be obtained by reading appendix F. The Asphalt Mixing Plant requires calibration to assure the components are in fact feeding the amount of product being displayed on the control panel. The two items that require this are the Asphalt Metering Pump and the Aggregate Scale. These two components control the blend of the hot mix. Calibration is required and/or recommended as follows:

1. After movement of the plant.
2. When:
  - raw materials change
  - aggregate source changes.
  - asphalt cement source changes.
  - type of aggregate changes.
  - type of asphalt cement changes.
3. When hot mix testing repeatedly indicates a discrepancy between the test results and the plant controls.
4. When truck scale weighing of product indicates a significant difference in the total production than is indicated by the controls.



**1. Aggregate Scale Calibration**

Item	Procedure
1	Check the initial feeder calibration prior to starting.
2	If it has not been set previously, enter the feeder rate of 50 tons per hour onto the monitor for each feeder.
3	Set the control gates on the feeders to a five inch opening.
4	This puts the feed rate for calibration purposes at an approximate value suitable for calibrating the aggregate scale.
5	Weight the truck to be used. Follow the instructions regarding truck weighing that appear in appendix E.
6	Inspect the feed conveyor.
7	Verify that all pulleys and return rolls are clean and free from material build up.
8	Inspect the belt to see that it is clean and free from material build up.
9	Remove build up from on any of these components prior to beginning calibration.
10	Check the belt to see that it is trained and running centered on the pulleys and idlers.
11	If not, train belt prior to calibrating.
12	Inspect counter weight on gravity take-up. Remove any material build up prior to calibration.
13	Feeder panel-select DIVERT on the <u>Auto/Divert/Drum</u> selector switch.
14	Motor control panel-select BYPASS on the <u>Drum Interlock</u> selector switch.
15	Feeder panel-press START on the <u>Feed Conveyor</u> button. This belt should run for at least fifteen (15) minutes prior to calibrating.
16	Back a truck up to the bypass chute on the drum mixer (the extension to the chute must be installed if not already in place).
17	Place the deflector gate so that the aggregate falling into the chute is directed into the truck box.
18	(Be prepared to shovel the material from the back of the truck box to the front if necessary.)

Item	Procedure
19	Keyboard-press ESCAPE, formulas (2), edit (00) ENTER.
20	Keyboard-enter the following calibration formula: -Go to Mix 10- -Total A/C 0.0% A/C -1 Vir 50.0% Agg -2 Vir 50.0% Agg
21	Press ESC.
22	Feeder bins one and two will be the ones used to calibrate the scale. The percent moisture in the materiel being used to calibrate should be zero. Verify this on the screen.
23	Obtain a stable belt scale zero as follows: -The monitor should be displaying the main screen -Keyboard-press ESCAPE to display the options window. -Utilities (8) -Calibration -Meters -Rates by a average value (2), the average tons per hour will be calculated. Allow this to continue for 180 seconds. -Correct average readings (9), "actual values" will be displayed. The non zero value will be displayed. Correct this by entering zeros into the "actual values". -Repeat this procedure as required until the zero has stabilized and reads less than "0.10" tons per hour. -This completes the zero correction. -Press ESCAPE returning to the calibration screen. -Press aggregate scales by sample (4).
24	Keyboard -Press parameters (4) -Enter the mix number that will be used for test purposes. -Enter 100 tph -Enter 60 seconds for each 2 tons that can be loaded into the truck -Press ESCAPE -Press clear (00) -The tons totalizer is now set to 0.
25	Feeder panel-press START on the <u>Scalping Screen</u> button.
26	Feeder panel-press START on the <u>Gathering Conveyor</u> .
27	Feeder panel-select AUTO on the four <u>Feeder</u> switches.

Item	Procedure
28	Keyboard-start test (6).
29	Selected feeders will start after a short delay.
30	The feeders will continue to run until the time selected has elapsed.
31	Wait until all materiel has crossed the scale and entered the truck.
32	Feeder panel-press STOP on the <u>Feed Conveyor</u> .
33	Send the truck to be weighed.
34	Upon return, enter the correct net weight of the aggregate.
35	Keyboard-correct totals (9).
36	Enter the net weight recorded at the truck scale.
37	Press ENTER.
38	Press ESCAPE.
39	Press error calculator (8).
40	Enter the weight of the unloaded truck.
41	Enter the gross weight of the load.
42	Press ENTER.
43	ESCAPE to enter values.
44	Press ESCAPE and screen print (9) and verify that the span has changed to a new value.
45	Repeat this procedure until the aggregate scale error is 1/2 of one percent or less.
46	Scale calibration has now been completed, proceed with feeder calibration if required.

**2. Feeder Calibration**

Item	Procedure
1	If feed rate from any one bin is to exceed the 50 tons per hour selected during aggregate scale calibration the following changes must be made.
2	Open the bin gate on all feeders that will feed greater than 50 tons per hour.
3	The gates should be raised (opened) one inch per 10 tph. (i.e.-a 7 inch opening will result in an expected maximum feed rate from the bin of approximately 70 tph).
4	Do not select a greater feed rate than the expected maximum. -Keyboard press ESCAPE -utilities (8), calibration (6), feeder rates (8). -edit (00) -enter the expected maximum feed rate for the bin being calibrated -ESCAPE -By aggregate sample (4)
5	Select feeder (1), enter feeder number to be calibrated.
6	Do these 3 in sequence starting with feeder one.
7	Enter feeder 1.
8	ESCAPE.
9	Set test parameters (4).
10	Enter the anticipated flow rate at the normal plant production rate for the bin selected. (i.e. mix design requires 40% course aggregates and asphalt production rate of 150 tph the selected feeder for the course materiel will feed 60 tph).
11	Enter the moisture content for the materiel to be metered from this bin.
12	Enter the test time interval. (It is recommended that this interval should not be less than six minutes and need not exceed 15 minutes.)
13	Press START for the following motors: Feed Conveyor Scalping Screen Gathering Conveyor

Item	Procedure
14	Select <u>Drum Interlock</u> switch to BYPASS.
15	ESCAPE.
16	Clear (00), clear (00).
17	Start test (6).
18	The feeder selected will start and run for the selected time interval.
19	At the end of the test and after all aggregate has crossed the scale.
20	Correct totals (9).
21	The correction has been effected to the expected flow rate.
22	Enter actual tons as displayed by "virscale".
23	Error calculator (8).
24	Enter indicated tons from "measured feeder totals by control".
25	Enter virscale value in the actual.
26	The percent error will be displayed.
27	Repeat this process until the error is less than one half of one percent.
28	Proceed with the remaining feeders.
29	Return to the main feeder calibrations screen which should be displaying the expected maximum flow rate of each bin.
30	Print a record of these values.

**3. Asphalt Pump Calibration Procedures**

This procedure is performed when there is asphalt in the tanker, at operating temperature, and the hot oil heater is circulating transfer fluid through the jacketed lines and pumps.

Item	Procedure
1	Position calibration tank on level ground half way between the asphalt tanker and the feed conveyer (no further than fifteen feet from the metering pump). (See figure 2-29).

Item	Procedure
2	Install load cell assembly (stored in control van) onto the location provided on the tank support structure. Plug load cell cable CBLO13 into plug J13 on control van plug box.
3	Remove transport chains retaining the calibration tank so that it is supported by the load cell and clear of the support structure.
4	Install 2 inch asphalt line (stored in the basket on the drum mixer) between calibration tank connection and the quick coupler at the metering pump.
5	To calibrate tank, open manual square head plug valve to calibration. Close square head plug valve to drum mixer.
6	Feeder panel select <u>DIVERT</u> on Divert valve. Select <u>MANUAL</u> on <u>Asphalt Metering Pump</u> . Select <u>FORWARD</u> on <u>Asphalt Metering Pump</u> . Adjust speed to 50% on <u>Asphalt Meter</u> . Confirm approximate asphalt flow rate of 5.5 tons per hour.
7	Open feeder panel lower door to expose calibration scale panel mounted on inside of door. (See figure 2-37).
8	Press on/off button. Scale should read identification DF2000 and display a numerical value.
9	Press zero and scale will automatically zero. (See Maintenance manual for more information).
10	Suspend known weight to the calibration tank (one on each side of calibration tank frame).
11	Verify scale digital display reads accurately the known weight (within + or one pound). If scale does not read accurately proceed to set new span.
12	Calculate and compare sample weight with computer test weight. If in error, on keyboard, select error calculator (8), enter requested values as prompted. Record results on calibration sheet. Select correct totals (9), enter calibrated weight from calibration sheet. Press ESCAPE.
13	Press 13, press select, display flashes 1 and returns to original weight reading, enter the correct (known) weight and press enter.
14	Remove calibration known weight.
15	Check zero. Re-zero if necessary.
16	Re-apply weight. Repeat steps 11 through 14. Repeat as often as necessary.

Item	Procedure
17	When scale calibration is complete, press 99, press select.
18	On keyboard press ESCAPE, utilities (8), calibration (6), meters (5), a/c meter by sample (6), clear (00), clear (00), set test parameters (4).
19	Enter parameters as follows: -6.0 tons per hour -Weight per gallon of asphalt as per refinery delivery slips -900 seconds test time.
20	Feeder panel-select AUTO on <u>Asphalt Metering Pump</u> speed control
21	Feeder panel-select DRUM on until <u>Divert</u> calibration scale shows an increasing weight. Immediately select AUTOMATIC on <u>Divert</u> valve switch.
22	Record weight shown on calibration scale as "starting weight" on calibration sheet. (See figure 2-38 for sample)
23	Clear totalizer on screen by entering clear (00), clear (00).
24	Keyboard-press ESCAPE, start test (6), divert valve will move to DRUM position. Pump will transfer oil at requested tons per hour.
25	Screen-verify tons per hour rate is as requested (6 tph), timer is counting down, a/c total (ton) is counting.
26	Calibration scale-monitor display weight does not exceed capacity of tank (approximately 4, 500 pounds).
27	Upon completion of test sample (900 seconds), divert valve will return to DIVERT. Manually switch <u>Divert</u> valve to DIVERT.
28	Record weight shown on calibration scale as "end weight" on calibration sheet.
29	Record a/c total from screen to calibration sheet.
30	Feeder panel-select REVERSE on the <u>Asphalt Metering Pump</u> , select DRUM on <u>Divert</u> valve. Select MANUAL on <u>Speed Control</u> and increase speed to 100%, tank is being emptied of asphalt.
31	Continue this process until 100 to 200 pounds remain on the calibration scale.
32	Feeder panel-select OFF on the <u>Pump</u> , AUTOMATIC on the <u>Divert</u> valve, select FORWARD on the <u>Pump</u> .

Item	Procedure
33	Calculate and compare sample weight with computer test weight. If in error, on keyboard, select error calculation (8), enter requested values as prompted. Record results on calibration sheet. Select correct totals (9), enter calibrated weight from calibration sheet. Press ESCAPE.
34	Repeat calibration procedure starting with 20 through 32. Repeat this process until asphalt meter is within one half of one per cent.
35	Upon completion of testing, empty calibration tank completely.
36	Clean out hose by sucking approximately 2 or 3 gallons of cleaning product through the hose into the asphalt tank. Close valves on tanker. Remove hose and store. Cap inlet to calibration tank and outlet on asphalt tanker.



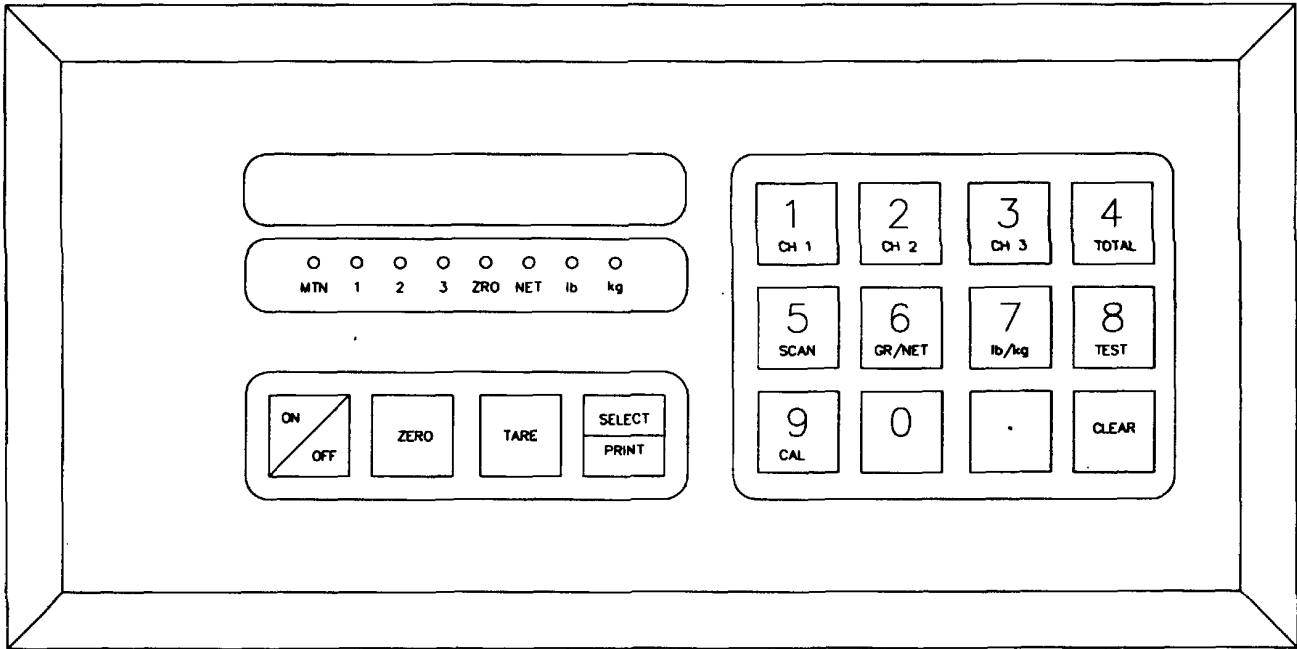


Figure 2-37 Calibration Scale Panel





Project:		From:	To:
Pit Name:		Location:	
Project Manager:			District:
Contractor:			Plant:

**BELT SCALE CALIBRATION**

AA ZERO SETTING	A SPAN SETTING	B TOTALIZER READING		D NET WEIGHT B - C t	E TRUCK SCALE WT. OF AGGREGATE		G ELAPSED TIME s	H PROD. RATE 1.8 E/G	I % ERROR	
		B FINAL t	C INITIAL t		F NET lb	F E/2000 t			E F x 100	

**CALIBRATION OF TEST WEIGHTS**

A INITIAL t	B FINAL t	C TOTALIZER COUNT		E ELAPSED TIME s	F TOTALIZER PROD. RATE 1.8 D/E	G AGG. METER READING t/h	H WEIGHT ADDED TO SCALE
		C NET WEIGHT t	D 2000 C lb				

Figure 2-39 Aggregate Scale Calibration Sheet

**WRT**  
EQUIPMENT LTD.

<b>Project:</b>	<b>From:</b>	<b>To:</b>
<b>Pit Name:</b>	<b>Location:</b>	
<b>Project Manager:</b>	<b>District:</b>	
<b>Contractor:</b>	<b>Plant:</b>	

**MASTER SETTING:**

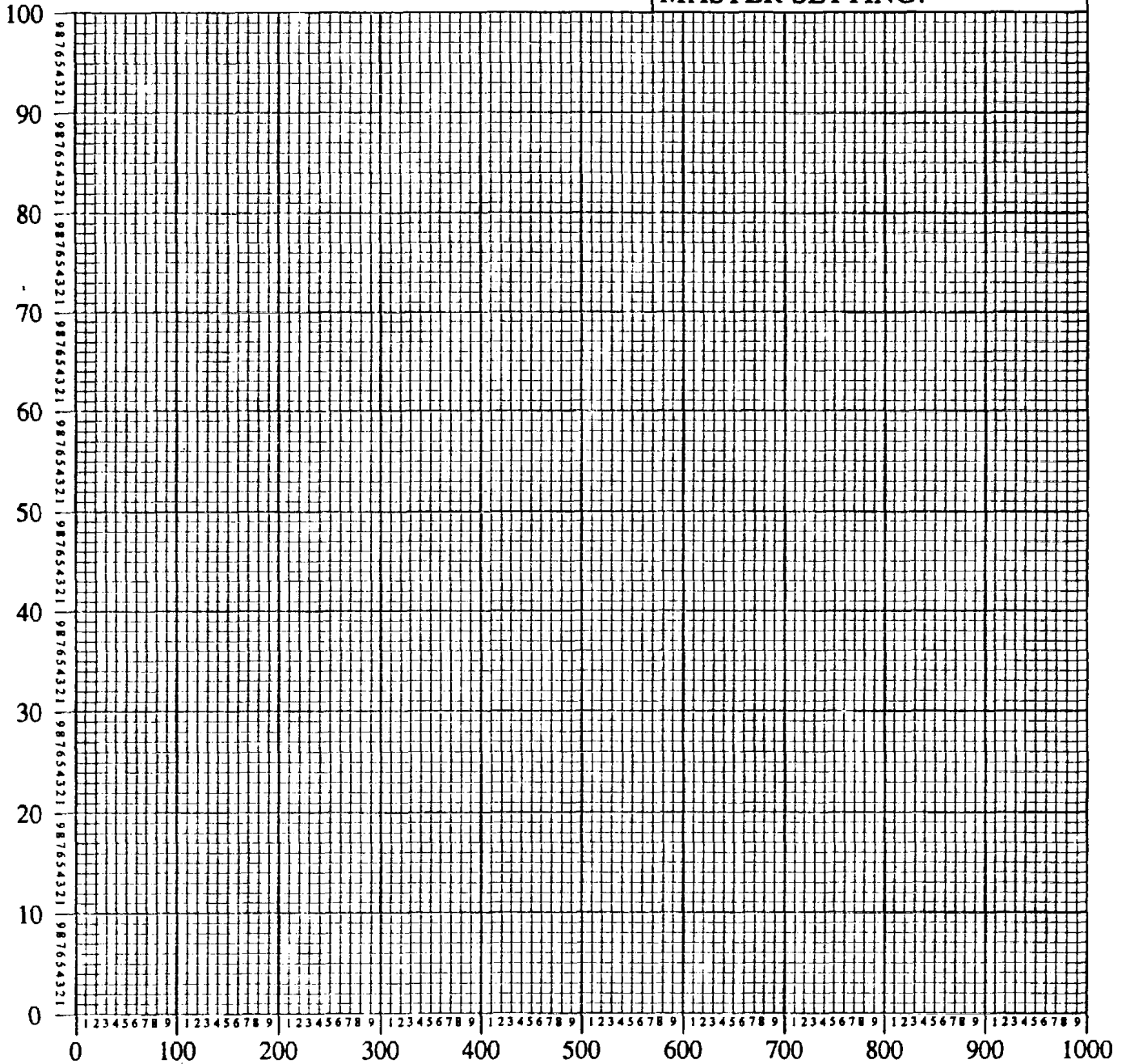


Figure 2-40 Feeder Calibration Sheet

**III. OPERATING PROCEDURES**

**2-12 Operation Under Usual Conditions**

This section presents operating instructions for the M081 Asphalt Mixing Plant. It is essential that all operators become thoroughly familiar with the location and proper use of controls, instruments, accessories and safety equipment, as well as the particular handling characteristics of the AMP. Operating instructions are contained in sections 2-13 through 2-20. These instructions are divided into the following categories:

- Plant Start Up
- Increasing Plant Production
- Decreasing Plant Production
- Hot Shut Down
- Hot Start
- Shut Down
- Surge Bin Operation
- Dedrummer/Melter Operation

**NOTE**

**Before and during all operations of the Asphalt Mixing Plant, the operator will monitor the plant for leaks, materiel spillage and other indicators of a possible malfunction. In the event an operating malfunction occurs perform a normal plant shut down or a corrective action as listed in section 2-21.**

**In the event a personnel threatening emergency occurs, the operation shall be discontinued immediately. An emergency stop (RED) button is located in the comer panel and is intended for this situation.**

The M081 Asphalt Mixing Plant is a portable asphalt mixing facility. It is necessary to complete a number of steps prior to full plant operation. The steps required are as follows:

- |                             |                   |
|-----------------------------|-------------------|
| "After" Movement PMCS       | See section 3-4.3 |
| Plant Set Up                | See section 2-5   |
| "Before" Operation PMCS     | See section 3-4.1 |
| Asphalt Pump Calibration    | See section 2-11  |
| Aggregate Scale Calibration | See section 2-11  |
| Plant Start Up              | See section 2-13  |
| "During" Operation PMCS     | See section 3-4.1 |

After plant movement requires the above to be completed methodically and carefully. Shifting of plant components or damage to them may occur during transportation and not be visible until plant operation. The set up on a plant site may result in components not properly supported or positioned with the result that the plant may not operate correctly. Monitor the components carefully while completing the above procedures and correct any problems before full plant production is attempted. Before proceeding with production of asphalt hot mix, the operator should be familiar with the operation of the surge bin. See section 2-19 for instructions.

**2-13 Plant Start Up**

**NOTE**

Operation of the plant is much easier if the plant is started at the same production rate each time. If a high or lower production rate is desired, the increase and decrease procedures should be used after the initial start up is accomplished. The initial start up is established at the rate of 80 tons per hour.

**NOTE**

In the "Operation" column of the following tables the control switches or buttons are shown underlined. This corresponds to the labels on the control panel. The function to be performed by the switch or button is indicated in CAPITAL letters.

**NOTE**

Refer to Figures 33-36 to aid in locating controls on panels.

**Plant Start Up**

No.	Panel	Value	Operation
1	MCC 1 MCC 2		Turn main breakers OFF.
2			Start the two 200 kW generator sets as per the manuals.
3			Bring the generator sets to 460 volts-60 cycle.
4			Close main contacts on the two generator sets.
5	A		Feeder panel-confirm Power key is OFF.

No.	Panel	Value	Operation
6	MCC 1 MCC 2		Turn ON main breakers on MCC 1 and MCC 2
<b>NOTE</b> <b>110 Volt power should be available in the control house.</b>			
7	B	460 volts 60 hertz	Motor control panel--verify on the motor control panel that the MCC 1 and MCC 2 voltage and frequency are indicating correct voltage and frequency.
8	Asphalt Tanker		On asphalt tanker panel for hot oil heater turn selector switch to PUMP and verify pressure gauge on system is 15 psi.
9	Asphalt Tanker		Check asphalt temperature gauge to see if heat is required.
10	D		Burner control panel-verify the Power selector switch is OFF.
<b>NOTE</b> <b>Inside alarms at start up can be silenced on the feeder panel using the ALARM SILENCE push button (Panel A)</b>			
11	A		Feeder panel-turn <u>Power</u> key ON-the outside warning horn will sound after a brief delay.
12	D		Burner control panel-turn <u>Power</u> selector switch to ON, and PRESS the <u>Alarm Silence</u> button to shut off the alarm.
13	D		Burner control panel-select <u>Exhaust Shutter</u> switch to AUTO position.
14	A, B, D		Check panels for flashing lights (and alarm condition) and rectify this condition.
15	C	AST +25° F	Corner panel-check hot oil temperatures on the corner panel. These should read-inlet temperature within 25° of asphalt storage temperature. See step 9.

No.	Panel	Value	Operation
<p><b>NOTE</b></p> <p><b>The outlet temperature is controlled by the hot oil heater</b></p>			
16	C		Corner panel-the outlet temperature should be greater than the inlet temperature if heater is operating.
<p><b>NOTE</b></p> <p><b>As the asphalt temperature reaches the desired temperature the inlet and outlet temperatures will be within a degree or two of each other. The heater will automatically cut-off. (Comer Panel)</b></p>			
17	A		Feeder panel-select DIVERT on the <u>Divert Switch</u> .
18		A	Feeder panel-select FORWARD on the <u>Asphalt Metering Pump</u> .
19	A		Feeder panel-select MANUAL on the manual auto selector switch <u>Asphalt Metering Pump</u> .
20	A		Feeder panel-adjust speed on the dial indicator to approximately 50% <u>Manual Speed</u> .
21	Screen		Verify pump is pumping asphalt by checking the monitor.
22	Screen		This will appear in the second information line from the top (it reads asphalt).
23	Screen	260 to 300°F	The temperature of the asphalt will be displayed in the last column.
24			Circulate asphalt for a minimum of 10 minutes to warm up pump and valves.
25	Visual Check		Verify that the batcher gate is open.
<p><b>NOTE</b></p> <p><b>The main gate should be closed (visual check).</b></p>			
26	B		Motor control panel-turn <u>Surge Bin Air compressor</u> and <u>Baghouse Air compressor</u> to the ON position.



No.	Panel	Value	Operation
<p style="text-align: center;"><b>NOTE</b></p> <p>Switch will illuminate and when the compressor reaches the high pressure set point, the motor will stop and the light will go out. This will light only when the compressor is running. When air pressure is up and the compressor shuts off the light will go out. This confirms that the air pressure switch is working. (Panel B)</p>			
27	B		Motor control panel-depress the START button on the <u>Hot Mix Conveyor</u> (the light will illuminate after a short delay).
28	B		Motor control panel-check hot mix conveyor load meter to verify loading of the conveyor motor.
<p style="text-align: center;"><b>NOTE</b></p> <p style="text-align: center;">This motor will draw high amps until the slat is warmed up.</p>			
29	B		Motor control panel-depress START on the <u>Drum Drive</u> (the light will illuminate after a short delay).
30	A		Feeder panel-depress the START button on the <u>Feed Conveyor</u> (light will illuminate immediately).
<p style="text-align: center;"><b>NOTE</b></p> <p style="text-align: center;">These units should run for a minimum of 15 minutes to warm up both conveyors.</p>			
31	B		Motor control panel-turn the <u>Surge Bin Heat</u> selector switch to ON (the light will illuminate).
32		B	Motor control panel-press the START button on the <u>Exhaust Fan</u> (the light will illuminate after short delay).
<p style="text-align: center;"><b>NOTE</b></p> <p>Observe the ammeter to verify the amperage draw (light will illuminate after a short delay). (Panel B)</p>			
33	B		Motor control panel-press the <u>Baghouse Fines Blower</u> START button (light will illuminate).

No.	Panel	Value	Operation
34	B		Motor control panel-press the <u>Baghouse Airlock START</u> button (light will illuminate).
35	B		Motor control panel-press the <u>Baghouse Discharge Incline Screw START</u> button (light will illuminate).
36	B		Motor control panel-press the Baghouse <u>Transfer Screw START</u> button (the light will illuminate).
37	B		Motor control panel-press the <u>Baghouse Hopper Screws START</u> button (all four screws will start).
<p><b>NOTE</b>  <b>A steady illuminated light will indicate that all four screws are running. A flashing light indicates that one or more did not start. (Panel B)</b></p>			
38	B		Motor control panel-select AUTO on the <u>Baghouse Clean</u> switch (light will illuminate when cleaning is in progress during mixing process).
39	D		Burner control panel-press START on <u>Fuel Pump</u> (light will illuminate).
40	D	< 300° F	Burner control panel-observe the stack temperature is below the high (alarm) set point <u>Stack Control</u> .
41	D		Burner control panel-if "limits" are closed PRESS <u>Limits Set</u> (this button will light).
<p><b>NOTE</b>  <b>The purge process has been activated and the air in the drum and baghouse is being exhausted.</b></p>			
42	D		Burner control panel-upon completion of the purge, the purge complete light will illuminate.
43	D		Burner control panel-DEPRESS the <u>Pilot</u> button and hold until the pilot is on (approximately 5 to 10 seconds-the pilot on light will illuminate).

No.	Panel	Value	Operation
44	D		Burner control panel-select STACK on <u>Control Mode</u> .
45	D		Burner control panel-select <u>Main Flame START</u> and release (this is a momentary contact switch-main fire will ignite after a delay of approximately 15 seconds and <u>Main Flame Proved</u> light will illuminate).
46	D	< 300°F	Burner control panel-select MANUAL on <u>Stack Control</u> (this will indicate the temperature of the exhaust air exiting the drum mixer).
47		D	Burner control panel-manually increase burner firing rate by depressing the UP ARROW on the <u>Stack Control</u> .
48	D	250° F	Burner control panel-maintain the temperature at approximately 250° by increasing or decreasing (depress the UP-DOWN ARROW on the <u>Stack Control</u> ) the burner firing rate for approximately 15 to 20 minutes.
49	D	200° F	Burner control panel-monitor the <u>Baghouse Exhaust Temperature</u> on the display (when it reaches a temperature of 200° the preheat is complete).
50	B		Motor control panel-reject material in the surge bin into a truck or front end loader.
51	B		Motor control panel-select OPEN on the <u>Discharge Gate</u> (the open light will illuminate).
52	B		Motor control panel-select CLOSE when the bin is empty.
53	B		Motor control panel-set <u>Batcher</u> to the AUTO position (the gates will close and then cycle open and closed. <u>Open</u> and <u>Close</u> lights will illuminate).
54	A		Feeder panel-select AUTO on the <u>Asphalt Metering Pump</u> switch

No.	Panel	Value	Operation
55	A		Feeder panel-select AUTO on the <u>Divert switch</u> (verify that the Divert light continues to be illuminated).
56	A		Feeder panel-select AUTO on the four <u>Feeder switches</u> .
57	A		Feeder panel-press START on the <u>Scalping Screen</u> button (the light will illuminate).
58	A		Feeder panel-press START on the <u>Gathering Conveyor</u> button (the light will illuminate).
59	Keyboard		Keyboard-press ESCAPE, select targets (1), enter starting feed rate-80 tons per hour, press ENTER.
60	Screen		Select desired mix formula (this must be pre-determined and entered into the controller), ENTER.
61	A, B, D		Check all control panels to verify all motors are running (no flashing lights).
62	Keyboard		Keyboard-press ESCAPE the feeders will start in sequence.
63	A		Feeder panel-verify that the selected feeders are running.
64	A		Feeder panel-check the feeder selector switch lights.
65	D		Burner control panel-when material begins to enter drum, slowly increase burner firing rate by depressing the UP ARROW on the <u>Stack Control</u> .
66	D	300° F	Burner control panel-increase until stack control reads approximately 300°.
67	D		Burner control panel-maintain at this temperature by increasing (UP ARROW) or decreasing (DOWN ARROW) the burner firing rate on the <u>Stack Control</u> .

No.	Panel	Value	Operation
68	A		Feeder panel-verify that the <u>Divert</u> light switches from divert (amber) to drum (green) after preset time delay.
69		Visual Check	Verify initial mix quality by having field man observe mix as it discharges from the drum mixer.
70	B		Motor control panel-if mix is unacceptable in appearance turn selector switch on the <u>Drop Out</u> gate to the OPEN position.
71	B		Motor control panel-when mix appears to be satisfactory select CLOSE on the <u>Drop Out</u> gate switch.
72	B		Motor control panel-monitor hot mix conveyor loading condition on the <u>Hot Mix Conveyor</u> indicator.
<p><b>NOTE</b></p> <p><b>Hold plant production rate at this tonnage for 15 to 30 minutes.</b></p>			
73	D		Burner control panel-as stack temperature stabilizes near 3000 select AUTO on the <u>Stack Control</u> .
74	Screen	300° F	Verify control indicates set point value in lower screen (300°).
<p><b>NOTE</b></p> <p><b>Burner is now on automatic temperature control and will maintain set point.</b></p>			
<p><b>NOTE</b></p> <p><b>Monitor the following:</b></p>			
75	D	Mix Specific	Burner control panel-monitor materiel discharge temperature on the <u>Materiel Control</u> display (it should be at the required temperature for the mix).

No.	Panel	Value	Operation
76	D	+/-5° F	Burner control panel-adjust materiel temperature, if temperature is out of tolerance by more than 50, by adjusting the set point on the <u>Stack Control</u> by the number of degrees that the materiel is in error.
77	D	-.25 to -.50 in.	Burner control panel-verify that the <u>Damper Control</u> is maintaining a static pressure at the burner face of approximately negative .25 to negative .50 inches.
<b>NOTE</b>			
<b>If static pressure is out of tolerance select MANUAL by depressing Damper Manual/Auto switch (light will illuminate-to show manual position). (Panel D)</b>			
78	D	-.25 to	Burner control panel-to obtain a negative -.50 in. pressure of greater value open damper by PRESSING the Damper Open button to arrive at proper static pressure. Opening the exhaust damper will decrease back pressure. After the proper pressure is obtained return <u>Damper</u> switch to AUTO.
79	C	< 6.0 in	Corner panel- <u>Baghouse Differential Pressure</u> monitor this in conjunction with the <u>Damper Control</u> . Baghouse differential pressure should not exceed approximately 6.0 in. If it is above this value, bag efficiency has decreased and needs to improve. Lower production rate to allow baghouse to clean and become more efficient. Differential pressure may decrease after a period of time.
80	B	60+/-1	Motor control panel-monitor the frequency meters on a regular basis. They should read 60 hertz + or-1 (not required when on utility power).
81	B		Motor control panel-surge bin loading. Alarm will sound and red light on <u>Surge Bin High Level</u> will flash when bin is nearing capacity.

No.	Panel	Value	Operation
82	Screen		Screen-confirm flow rate of aggregate and asphalt. If increased production rate is required increase plant production rate in 20 ton increments at 10 minute intervals.

"During" Operation PMCS (see section 3-4.1) should be performed while the plant is being started. Shifting, misalignment or damage may have occurred to components during transportation or set up. Monitor the plant operation closely during this period. Do NOT proceed to increase plant production if problems are observed. Shut down the plant (see section 2-18) and correct all problems before proceeding.

**2-14 Increasing Plant Production**

No.	Panel	Value	Operation
1	Keyboard	100 example	Keyboard-press ESCAPE, targets (1), 100 ENTER, ESCAPE (the new production rate only should now be 100 tons).
2	A		Feeder panel-monitor the feeders to verify that the feed rate increases.
3	D		Burner control panel-monitor the stack temperature when the increased aggregate reaches the drum. If the temperature decreases, slowly increase the burner firing rate on the Stack Control by pressing the UP ARROW on the Stack Control.
4	D		Burner control panel-monitor stack temperature in upper screen of stack control (should be 3000). Verify set point value, in lower screen, is 300°. Burner is still on automatic temperature control and will maintain set point.
5	Screen		Screen-monitor asphalt tons per hour to see that an increase does occur and that the mix is within tolerance (if it is not within tolerance an alarm should sound).

No.	Panel	Value	Operation
6	Screen		Screen-repeat monitoring process at 10 minute intervals until desired production rate has been reached.

The M081 Asphalt Mixing Plant is rated at 150 tons per hour. This production rate is determined by a number of significant factors. The production rate of the plant may be increased as long as the mix being produced is within tolerance and the components of the AMP are not overloaded. As the production rate approaches 150 tons per hour and subsequently exceeds it, the monitoring of the plant controls and mechanical operation must be intensified.

If problems occur at the higher production rate:

Decrease plant production. See section 2-15

Shut down plant production. See section 2-18

Implement corrective steps to control the operating malfunction. See section 2-21.

**2-15 Decreasing Plant Production**

No.	Panel	Value	Operation
1	Keyboard	80 example only	Keyboard-press ESCAPE, targets (1), 80 ENTER, ESCAPE (the new production rate should now be 80 tons).
2	A		Feeder panel-monitor the feeders to verify that the feed rate decreases.
3	D		Burner control panel-monitor the stack temperature when the decreased aggregate reaches the drum. If the temperature increases, slowly decrease the burner firing rate by pressing the DOWN ARROW on the Stack Control.
4	D		Burner control panel-monitor stack temperature in upper screen of Stack Control (should be 300°). Verify set point value, in lower screen, is 300°. Burner is still on automatic temperature control and will maintain set point.



No.	Panel	Value	Operation
5	Screen		Screen-monitor asphalt tons per hour to see that a decrease does occur and that the mix is within tolerance (if it is not within tolerance an alarm should sound).
6	Screen		Repeat monitoring process at 5 minute intervals until desired production rate has been reached.

**2-16 Hot Shut Down**

The hot shut down procedure allows the operator to cease plant production without discharging the materials being processed through the plant. A shut down of this nature should only be performed if the plant will be restarting (hot start, see section 217) within a short (fifteen minute) period. Implement this procedure when the surge bin is full and trucks will be loading hot mix shortly or if a minor adjustment or correction must be made that will require only a few minutes.

A hot shut down procedure should not be performed if the plant will not be producing within fifteen minutes.

If it is not possible to continue production within a short period of time, perform a normal shut down, see section 2-18.

**NOTE**

**Failure to perform this procedure within the time stated may result in damage to the equipment and cause the asphalt mix in the drum to become hard and plug the drum mixer.**

No.	Panel	Value	Operation
1	D		Burner control panel-select <u>Main Flame</u> switch and turn to OFF.
2	D		Burner control panel-silence burner alarm by PRESSING <u>Alarm Silence</u> switch.

No.	Panel	Value	Operation
3	B		Motor control panel-press STOP button on <u>Drum Drive</u> . This will cause the drum, feed conveyor, scalping screen, gathering conveyor, and all selected feeders to stop and pilot lights to extinguish.
4	A		Feeder panel-verify that the <u>Divert</u> valve light switches from drum to DIVERT.
5	B		Motor control panel-press STOP button on <u>Exhaust Fan</u> . This will cause the following motors to stop. The baghouse fines blower, airlock, discharge incline screw, transfer screw, and the hopper screws. These pilot lights will be extinguished.
6	D		Burner control panel-press STOP on the <u>Burner Fan</u> button.

**2-17 Hot Start**

This procedure is used after a hot shut down has been performed. Plant production is resumed at the rate set prior to the hot shut down.

No.	Panel	Value	Operation
1	B		Motor control panel-press START on the <u>Exhaust Fan</u> button.
2	D		Burner control panel-press START on the <u>Burner Fan</u> button.
3	D		Burner control panel-select MANUAL on the <u>Stack Control Manual/Auto</u> .
4	D		Burner control panel- <u>Limits Closed</u> will illuminate, indicating that the exhaust fan, burner fan, and fuel pump are running. Stack temperature is below the high (alarm) set point.
5	D		Burner control panel-if limits is closed, PRESS <u>Limits Set</u> and button will light .

No.	Panel	Value	Operation
<b>NOTE</b> <b>The purge process has been activated and the air in the drum and baghouse is being exhausted.</b>			
6	D		Burner control panel-upon completion of the purge, the <u>Purge Complete</u> light will illuminate.
7	D		Burner control panel-DEPRESS the <u>Pilot On</u> button and hold until the pilot lights--approximately 5 to 10 seconds (pilot on light will illuminate).
<b>NOTE</b> <b>Burner panel-confirm on flame meter a signal of 1.5 to 2 micro amps (Panel D)</b>			
No.	Panel	Value	Operation
8	D		Burner control panel-select <u>Control Mode</u> to STACK.
9	D		Burner control panel-select <u>Main Flame START</u> and release (this is a momentary contact switch).
10	D		Burner control panel-main fire will ignite in approximately 15 seconds (Main Flame Proved light will illuminate).
11	D		Burner control panel-monitor stack temperature on <u>Stack Control</u> (this will indicate the temperature of the exhaust air exiting the drum mixer).
12	D		Burner control panel-manually increase burner firing rate on the burner by depressing the UP ARROW on <u>Stack Control</u> . Slowly (20 to 30 seconds) continue to increase the burner firing rate and the temperature until the stack control reaches 2500.

No.	Panel	Value	Operation
13	B A A A A A D		-START the following motors as quickly as possible in the following order:  Motor control panel- <u>Drum Drive</u> -f Feeder panel- <u>Feed Conveyor</u> Feeder panel- <u>Scalping Screen</u> Feeder panel- <u>Gathering Conveyor</u> Feeder panel-verify the selected feeders start automatically Feeder panel-verify divert valve returns to <u>Drum position</u> Burner control panel-select AUTO on the stack controller by pressing MANUAL/AUTO.

**NOTE**

**Monitor the mix discharging the drum to verify that it is acceptable.**

**NOTE**

**Reject any unacceptable mix by selecting OPEN on the Drop Out selector switch (Panel B).**

No.	Panel	Value	Operation
14	B		Motor control panel-START the following baghouse motors:  <u>Fines Blower</u> <u>Airlock</u> <u>Discharge Incline Screw</u> <u>Transfer Screw</u> <u>Hopper Screw</u>

**NOTE**

**Monitor to the standard start up procedures.**

**2-18 Shut Down**

**NOTE**

In a personnel emergency the plant may be shut down by **PRESSING** the Emergency Stop (red) button on the corner panel. This will stop all equipment operations.

**NOTE**

**At a production rate of 80 tons per hour proceed as follows:**

No.	Panel	Value	Operation
1	Keyboard		Press ESCAPE-targets (1), zero (0), ENTER, ESCAPE
<p><b>NOTE</b> Feeders will shut down in order.</p>			
<p><b>NOTE</b> Monitor aggregate rate-it will decrease to zero as the last of the aggregate crosses the scale (Panel A).</p>			
2	D	250°	Burner control panel-lower set point on stack control to 250°.
3	D		Burner control panel-monitor stack temperature on stack control to ensure that it does not exceed 300°.
4	D		Burner control panel-turn <u>Main Flame</u> switch to OFF if the temperature does not exceed 300°.
5	A		Feeder panel-monitor divert valve to see that it returns to divert after the asphalt shut down time delay has elapsed.
<p><b>NOTE</b> Monitor hot mix exiting drum and reject any unacceptable mix by selecting OPEN on the <u>Drop Out</u> selector Switch. (Panel B)</p>			
6	D		Burner control panel-continue to operate burner at 250° stack temperature for 5 minutes.
7	D		Burner control panel- <u>Main Flame</u> selector switch to OFF.
8	D		Burner control panel-press STOP on <u>Burner Fan</u> button (light will extinguish).

No.	Panel	Value	Operation
9	D		Burner control panel-press STOP on <u>Fuel Pump</u> button (light will extinguish).
10	B		Motor control panel-press STOP on <u>Exhaust Fan</u> button (light will extinguish).
<p><b>NOTE</b> The baghouse fines blower, airlock, discharge incline screw, transfer screw and hopper screws will stop and pilot light will extinguish.</p>			
<p><b>NOTE</b> Baghouse bag cleaning will cycle for a 5 minute period prior to shutting off.</p>			
11	B		Motor control panel-press STOP button on Hot Mix Conveyor (conveyor will stop after a 30 second delay). This will cause the drum, feed conveyor, scalping screen, and gathering conveyor to stop and pilot lights to extinguish.
12	B		Motor control panel-select OPEN on the <u>Batcher</u> switch.
13	B		Motor control panel-select OFF on the <u>Surge Bin Heat</u> switch.
14	B		Motor control panel-select OPEN on the <u>Discharge Gate</u> switch when the bin is empty.
15	B		Motor control panel-select OPEN on the <u>Batcher</u> switch.
<p><b>NOTE</b> Proceed with the following steps only after the surge bin has been emptied. For operation of the surge bin see section 2-19.</p>			
16	B		Motor control panel-select OFF on the <u>Surge Bin Air</u> switch.
17	B		Motor control panel-select OFF on the Baghouse Air switch.
18	A		Feeder panel-select <u>Asphalt Metering Pump</u> REVERSE then MANUAL (motor should run at 50% speed on the meter. Adjust on <u>Manual Speed</u> if necessary )

No.	Panel	Value	Operation
19	A		Feeder panel-select <u>Divert</u> valve to DRUM.
<b>NOTE</b> <b>Monitor asphalt flow rate on process screen. When rate returns to zero proceed as follows:</b>			
20	A		Feeder panel-select <u>Divert</u> switch to DIVERT.
21	A		Feeder panel-select OFF on the <u>Asphalt Metering Pump</u> switch.
22	A		Feeder panel-turn <u>Power</u> key switch to OFF.
23			Motor control room-select OFF on the two Main Breakers (one on each panel).
<b>NOTE</b> <b>Shut down the two 200 kW generators (not necessary if operating on commercial power).</b>			

Upon completing a plant shut down perform a "after" Operation PMCS.

**2-19 Surge Bin Operation**  
**(Power switch must be in "ON" position)**

No.	Panel	Operation
1	B	Motor control panel-turn Surge Bin Air to ON.
2	B	Motor control panel-turn Surge Bin Heat to ON.
3	B	Motor control panel-turn Batcher to AUTO when mixing.
4	B	Motor control panel-turn Discharge Gate to CLOSE when mixing.
5	B	Motor control panel-Surge Bin Low Level light indicates a minimum volume of mix in bin.
6	B	Motor control panel-Surge Bin High Level light indicates a maximum volume of mix in bin.

No.	Panel	Operation
7	B	Motor control panel-turn <u>Discharge Gate</u> to OPEN to discharge mix into trucks.
8	B	Motor control panel-turn <u>Discharge Gate</u> to CLOSE to cease loading.
9	B	Motor control panel-when plant production has ceased, turn <u>Batcher</u> to OPEN.
10	B	Motor control panel-when bin is empty, turn <u>Discharge Gate</u> to OPEN (maintain position on switch).
11	B	Motor control panel-turn <u>Surge Bin Air</u> to OFF.
12	B	Motor control panel-turn <u>Surge Bin Heat</u> to OFF.
13	B	Motor control panel-turn <u>Power</u> switch to OFF.

## 2-20 Dedrummer/Melter Operations

The Dedrummer/Melter serves three purposes. On this chassis is a fuel storage tank and fuel pump. This system provides fuel to the hot oil heater and to the burner on the drum mixer. The second purpose is to provide a method of liquefying asphalt cement supplied to the asphalt mixing plant in drums. The third purpose is to provide additional asphalt cement storage for the AMP.

### CAUTION

**High heat and noxious fumes may be emitted from the dedrummer tank during operation. Use protective clothing and wear a respirator while working on the dedrummer platform.**

### CAUTION

**The drums of asphalt cement weigh approximately 550 pounds each. Rotate the drums carefully using two people to perform the task.**

Asphalt cement supplied in drums will in most cases be at ambient temperature. In order to bring this asphalt to a liquid state suitable for pumping the following procedures should be followed:



Item	Procedure
1	Connect the two heat transfer lines and the asphalt transfer line from the asphalt tanker to the dedrummer. See section 2-5.
2	Open the valves on either side of these lines allowing the heat transfer fluid to circulate through the dedrummer. The asphalt transfer line will be open and will permit pumping of asphalt cement from the dedrummer to the asphalt tanker.
3	Raise jib and install electric hoist on to the trolley. See section 2-5.
4	Position the hydraulic power pack beside the goose neck of the trailer on the left hand side and connect the hoses to the control valve for the drum feed cylinder.
5	Plug the power cable for the electric hoist and the power cable for the hydraulic power pack into the control van.
6	Unlatch the two doors at the discharge (rear) end of the dedrummer tank.
<p style="text-align: center;"><b>Note</b></p> <p><b>The hot oil heater on the asphalt tanker must be running. Use a temperature set point of 3500 on the heat transfer controller mounted on the hot oil heater. This higher temperature will maintain the heat transfer fluid at a higher temperature and will compensate for the heat required to raise the temperature of the asphalt cement in the drums. Allow the temperature of the dedrummer to rise to at least 250° prior to feeding drums into the unit This temperature is checked on the dial thermometer mounted on the front wall of the dedrummer tank.</b></p>	
7	Use the chain hoist and the drum rotator to lift the drums up to the platform or use a forklift to raise the drums to platform height.
8	Remove the lid from the drum.
<p style="text-align: center;"><b>NOTE</b></p> <p><b>Item number 8 may be performed prior to lifting to the platform.</b></p>	
9	Using the hoist, lift the drum six to eight inches and with the drum rotator turn the drum upside down.
10	Using the jib and the chain hoist, position and lower the drum into the drum feed system.
11	Open the doors to the dedrummer.
12	Start the hydraulic power pack motor by turning the breaker switch mounted on the pack to the ON position.

Item	Procedure
13	Using the hydraulic control valve mounted on the left hand side of the platform, extend the drum feed cylinder pushing the drum into the tank. (One or two drums may be pushed in at one time).
<p><b>NOTE</b></p> <p><b>The drum will not go all the way into the tank. Proceed with the next one or two drums and place them in the drum feed system. Extend the hydraulic cylinder and the first two drums will be pushed all the way into the tank and the second one or two will protrude slightly.</b></p>	
14	Continue this process as long as required.
15	At one to two hour intervals, transfer the liquid asphalt from the dedrummer tank to the asphalt tanker by running the asphalt transfer pump mounted on the front of the asphalt tanker. Open the valve to the asphalt tank and select the asphalt pump switch to the ON position. Run the pump for as long a period as required to empty the dedrummer tank.
16	Select OFF on the asphalt pump switch and close the valve to the asphalt tank.
17	The empty drums will exit the doors at the rear of the tank.
<p><b>Note</b></p> <p><b>If the drums are not empty of asphalt when they exit the dedrummer tank, they are not hot enough. Correct this by increasing the set point temperature of the hot oil heater (caution: do not exceed 4000) or increase the time that the drums are in the tank.</b></p>	
18	Upon completion of the dedrumming operations, pump all asphalt cement from the dedrummer tank, close the four valves to the hot oil lines connecting the dedrummer and the asphalt tanker. Allow the dedrummer to cool before attempting to remove the last of the empty drums from the tank.
19	On the hydraulic power pack, select the breaker to the OFF position.

## 2-21 Operating Malfunctions

The following are some of the malfunctions which may be encountered during the, operation of the plant. Specific steps are provided for the operator to control the malfunction. It is important that these steps be followed to avoid damage to the equipment and to avoid a hazardous situation for personnel.

**1. Batcher Fails To Open**

The batcher gate on the surge bin when in the automatic mode (selected when in production) is time controlled by the PLC. An "open" time and a "closed" time have been input (see Maintenance manual for additional information). The gate cycles open and then closed continuously while the plant is producing. Failure of the gate to open when signaled could cause the plant to shut down with hot mix in the components. This could result in damage to the equipment if the hot mix cools and hardens.

No.	Panel	Operation
1	B	Motor control panel-set <u>Batcher</u> to the OPEN position.
2	Visual Check	Verify batcher gate opens, if it fails to open, proceed as follows.
3	B	Motor control panel-press STOP button on <u>Hot Mix Conveyor</u> .
4	D	Burner control panel-select OFF on the <u>Main Flame</u> selector switch.
5	A	Feeder panel-verify that the <u>Divert</u> light switches from Drum to DIVERT.
6	B	Motor control panel-press STOP button on <u>Exhaust Fan</u> .
7	D	Burner control panel-press STOP button on <u>Burner Fan</u> .
<p><b>NOTE</b> Correct the problem.</p>		

**2. Hot Mix Conveyor Fails**

No.	Panel	Operation
<p><b>NOTE</b></p> <p><b>The following will stop: drum, feed conveyor, screen, gathering conveyor and feeders</b></p>		

No.	Panel	Operation
1	D	Burner control panel-select OFF on the <u>Main Flame</u> selector switch.
2	A	Feeder panel-verify that the <u>Divert</u> light switches from Drum to DIVERT.
3	B	Motor control panel-press STOP button on <u>Exhaust Fan</u> .
4	D	Burner control panel-press STOP button on <u>Burner Fan</u> .
<b>NOTE</b> <b>Correct the problem.</b>		

**3. Drum Stops**

No.	Panel	Operation
1	D	Burner control panel-select OFF on the <u>Main Flame</u> selector switch.
2	A	Feeder panel-verify that the <u>Divert</u> light switches from Drum to DIVERT.
3	B	Motor control panel-press STOP button on <u>Exhaust Fan</u> .
4	D	Burner control panel-press STOP button on <u>Burner Fan</u> .
<b>NOTE</b> <b>Correct the problem.</b>		

**4. Aggregate Feed Conveyor Stops**

No.	Panel	Operation
<b>NOTE</b> <b>Perform normal shut down (see section 2-18).</b>		
<b>NOTE</b> <b>Correct the problem.</b>		

**5. Burner Stops**

No.	Panel	Operation
1	B	Motor control panel-press STOP button on <u>Drum Drive</u> .
2	A	Feeder panel-verify that the <u>Divert</u> light switches from Drum to DIVERT.
3	B	Motor control panel-press STOP button on <u>Exhaust Fan</u> .
4	D	Burner control panel-press STOP button on <u>Burner Fan</u> .
<p><b>NOTE</b> Correct the problem.</p>		

**6. Divert Failure**

No.	Panel	Operation
1	A	Feeder panel-select DRUM on the Divert selector switch.
<p><b>NOTE</b> Perform a normal shut down (see section 2-18).</p>		
<p><b>NOTE</b> Correct the problem.</p>		

**7. Divert Failure-Does Not Go To Divert**

No.	Panel	Operation
1	A	Feeder panel-select DIVERT on the <u>Divert</u> selector switch.
2	A	Feeder panel-verify that the <u>Divert</u> light switches from Drum to DIVERT.
<p><b>NOTE</b> If the valve does not switch to the divert position.</p>		
3	A	Feeder panel-select OFF on the <u>Asphalt Metering Pump Forward-Off-Reverse</u> selector switch. <b>page 2-123</b>

No.	Panel	Operation
<b>NOTE</b> Perform a hot shut down (see section 2-16)		
<b>NOTE</b> Correct the problem.		

**8. Baghouse Inlet Gas Temperature Exceeds 400°**

No.	Panel	Operation
1	D	Burner control panel-select OFF on the <u>Main Flame</u> selector switch.
2	D	Burner control panel-select CLOSED on the <u>Exhaust Shutter</u> selector switch.
3	A	Feeder panel-select DIVERT on the <u>Divert</u> selector switch.
4	B	Motor control panel-press STOP button on <u>Exhaust Fan</u> .
5	D	Burner control panel-press STOP button on <u>Burner Fan</u> .
6	B	Motor control panel-select OPEN on the <u>Drop Out</u> selector switch.
<b>NOTE</b> Continue to feed aggregate through the plant to lower the plant temperature monitored on the Stack Control (Panel D). At a temperature of 3250 proceed as follows:		
7	Key	Press ESCAPE-targets (1), zero (0), ENTER, ESCAPE.
<b>NOTE</b> Continue a normal plant shut down rejecting aggregate passing through the drum at the drop out gate in the hot mix conveyor.		
<b>NOTE</b> Correct the problem.		

9. Burner Puff Back (Front of Drum)

No.	Panel	Operation
1	Visual Check	Verify exhaust shutter is fully open.
2	D	Burner control panel-verify static pressure reading at negative .25 to negative .50 inches on the <u>Damper Control</u> .
3	D	Burner control panel-if it is out of tolerance select manual by depressing <u>Damper</u> MAN/AUTO (light will illuminate to show manual position).
4	D	Burner control panel-open damper to obtain a negative static pressure of greater value by DEPRESSING the <u>Damper Open</u> button.
5	D	Burner control panel-monitor static pressure on the <u>Damper Control</u> . Adjust as required.
6	C	6CCorner panel-check <u>Baghouse Differential Pressure</u> . It should NOT exceed 6.0 inches. If reading is greater than 6.0 proceed with the next step.
<p><b>NOTE</b> Decrease plant production (see section 2-15)</p>		
7	B	Motor control panel-verify <u>Baghouse Clean</u> switch is set to AUTO.
9	B	Motor control panel-verify <u>Baghouse Air</u> switch is turned to ON.
<p><b>NOTE</b> If problem persists perform a normal shut down.</p>		
<p><b>NOTE</b> Correct the problem.</p>		

**10. Drum Fire**

No.	Panel	Operation
1	D	Burner control panel-select OFF on <u>Main Flame</u> selector switch.
2	A	Feeder panel-select DIVERT on the <u>Divert</u> selector switch.
3	D	Burner control panel-select CLOSED on <u>Exhaust Shutter</u> selector switch.
4	B	Motor control panel-press STOP button on <u>Exhaust Fan</u> .
5	D	Burner control panel-press STOP button on <u>Burner Fan</u> .
<p><b>NOTE</b>                      Continue to feed aggregate through the plant to extinguish the fire. DO NOT OPEN <u>Drop Out</u> gate. If fire continues proceed as follows:</p>		
6	Key	Keyboard-press ESCAPE, targets (1), 175, ENTER, ESCAPE to increase aggregate flow.
7	Visual Check	Monitor hot mix in conveyor and surge bin for flames. CheckContinue feeding aggregate into hot mix until flames extinguished.
<p><b>NOTE</b>                      Continue a normal plant shut down.</p>		
<p><b>NOTE</b>                      Correct the problem.</p>		

**11. Personnel Emergency**

No.	Panel	Operation
1	C	Corner Panel-PRESS Emergency Stop button.
<p><b>NOTE</b>                      Electrical power Is Interrupted at the two motor control centers and to all equipment. Generators will continue to run (electric power cables to control van are live).</p>		
2	MCC	To restore power turn on main breakers on motor control center 1 and 2.



## CHAPTER 3

## MAINTENANCE INSTRUCTIONS

## I. LUBRICATION INSTRUCTIONS

## 3-1 Lubrication Instructions

The lubrication section illustrates and lists items of the M081 Asphalt Mixing Plant which require lubrication checks and service. Detailed lubrication instructions are listed for each major assembly of the asphalt mixing plant.

1. Electric motors should never require re-lubrication, motors are pre-lubricated for life. Factory grease is Chevron SRI, which is a polyuria grease that conforms to MIL-G-3545C. In the event that re-lubrication is necessary, (bearing replacement) the same grease, or compatible, should be used. Alternately, the existing grease could be replaced with a non-polyuria grease. Select a grease specified for electric motors (suggest Precision EMB or equivalent).
2. NTN ball bearings are sealed and greased for extended life with SHELL Alvania No. 3 by bearing manufacturer. In event that they do require re-lubrication Alvania No. 3 (or compatible Lithium based NLGI #3 grease) should be used, (DOD-G-24508, and NLGI #2, may be sufficient).

**NOTE**

**Grease all sealed bearings sparingly to ensure seals are not damaged. If seal is broken by evidence of large grease leak, grease more often or replace.**

3. Other bearings require a Lithium NLGI #2 grease; suggest Petro-Canada Precision EP-2 or a Lithium NLGL #2 grease that meets DOD-G-24508.
4. A general multipurpose grease can be used on pivot points, kingpin (only if required), and suspension instead of Precision EP-2 if desired. Precision EP-2 (DOD-G-24508), is specified to reduce the number of lubricant products required for maintenance.
5. For high temperature bearings (drum drive and trunnion) Precision EP-2 is still compatible, however military grease DOD-G-24508 must be used instead of DOD-G-24508.

- 6. MIL-L-17331 is suggested for a compressor requiring 100 to 150 CST viscosity non-detergent oil.
- 7. VV-P-216 Penetrating oil (can be obtained in spray can should be used in areas where grease would trap dust and present problems).

**NOTE**

**Hinge points Include screw jacks, landing jacks, leveling jacks, air cylinders and any other pin components that rotate with use.**

*Table 3-1. Lubrication Instructions*

**1. Control Van**

<b>I t e m</b>	<b>Description</b>	<b>Lubricant</b>	<b>Lubricant Temperature Range</b>	<b>Period</b>
1	WHEEL BEARINGS (Axles) (1) each side each axle	GEARLUBE TOS 80W90 (MIL-L-2105 80W/90; GO - 80/90) Oil Cup	-65° F to 275° F	100 hours
2	LANDING JACK (5) (3) gear side (2) other side	GREASE-PRECISION EP- 2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
3	SUSPENSION CAMSHAFT (2) each side SLACK ADJUSTER (1) each side	GREASE-PRECISION EP- 2 (DOD-G 24508) Grease Gun	32° F to 225° F	100 hours
4	SCREW JACKS	Oil, PENETRATING (VV-L- 216) Spray Can	-32° F to 225° F	As Req.
5	HINGE POINTS	Oil, PENETRATING (VV-L- 216) Spray Cam	-32° F to 225° F	As Req.
6	UPPER FIFTH WHEEL KINGPIN	GREASE-PRECISION EP- 2 (DOD-G-24508) Grease, Hand	32° F to 225° F	100 hours

2. Drum Mixer

Item	Description	Lubricant	Lubricant Temperature Range	Period
7	WHEEL BEARINGS (Axles) (1) each side each axle	GEARLUBE TOS 80W90 (MIL-L-2105 80W/90; GO-80/90) Oil Cup	-65° F to 275° F	100 hours
8	LANDING JACK (5) (3) gear side (2) other side	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F TO 225° F	100 hours
9	SUSPENSION CAMSHAFT (2) each side SLACK ADJUSTER 91) each side	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F TO 225° F	100 hours
10	SCREW JACKS (8)	Oil, PENETRATING (VV-L216) Spray Can	-32° F TO 225° F	As Req.
11	HINGE POINTS	Oil, PENETRATING (VV-L-216) Spray Can	-32° F TO 225° F	As Req.
12	UPPER FIFTH WHEEL KINGPIN	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Hand	32° F TO 225° F	100 hours
13	DRUM DRIVE-Chain Oil	GEARLUBE TOS 80W90 (MIL-L-2105 80W/90; GO-80/90) Oil Cup	-65° F to 275° F	As Req.
14	DRUM DRIVE-Gear Reducer (1)	SAE 40 OIL, R & O INHIBITED, NO EP ADDITIVE, (MIL-L-2104 GRADE 40, OE-HDO-40) Oil Cup	15° F to 250° F	2 years
15	DRUM DRIVE-Bearings (4)	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F TO 225° F	100 hours
16	TRUNNION WHEEL-Bearings (8)	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F TO 225° F	100 hours

<b>I t e m</b>	<b>Description</b>	<b>Lubricant</b>	<b>Lubricant Temperature Range</b>	<b>Period</b>
17	GUIDE WHEEL-Bearings (4)	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours

### 3. Surge Bin

<b>I t e m</b>	<b>Description</b>	<b>Lubricant</b>	<b>Lubricant Temperature Range</b>	<b>Period</b>
18	WHEEL BEARINGS (Axles) (1) each side each axle	GEARLUBE TOS 80W90 (MIL-L-2105 80W/90; GO- 80/90 Oil Cup	-65° F to 275° F	100 hours
19	LANDING JACK (5) (3) gear side (2) other side	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
20	SUSPENSION CAMSHAFT (2) each side SLACK ADJUSTER (1) each side	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
21	SCREW JACKS (8)	Oil, PENETRATING (VV- L-216) Spray Can	-32° F to 225° F	As Req.
22	HINGE POINTS	Oil, PENETRATING (VV- L-216) Spray Can	-32° F to 225° F	As Req.
23	UPPER FIFTH WHEEL KINGPIN	GREASE-PRECISION EP-2 (DOD-G-24508) Grease, Gun	32° F to 225° F	100 hours
24	BATCHER CLAM GATE PIVOT (2)	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
25	SLAT CONVEYOUR DRIVE CHAIN (1)	GEARLUBE TOS 80W90 (MIL-L-2105 80W/90; GO- 80/90) Oil Cup	-65° F to 275° F	8 hours
26	SLAT CONVEYOUR GEAR REDUCER	ULTIMA EP230 OR SHELL OMALA 220 (MIL- L-2105 80W90; GO- 80/90) Oil Cup	-65° F to 275° F	2 years

27	SLAT CONVEYOR HEAD SHAFT-Bearings (2)	GREASE-PRECISION EP-2 (DOD-G-24508) Grease, Gun	32° F to 225° F	100 hours
28	SLAT CONVEYOR TAIL SHAFT-Bearings (2)	GREASE-PRECISION EP-2 (DOD-G-24508) Grease, Gun	32° F to 225° F	100 hours
29	SLAT CONVEYOR IDLER SHAFT-Bearings (10)	GREASE-PRECISION EP-2 (DOD-G-24508) OR SHELL ALVANIA NO.3 (LITHIUM BASED NLGI #3 DOD-G-24508) Grease, Gun	32° F to 225° F	100 hours
30	HOPPER CLAM SHELL GATE PIVOT (4)	GREASE-PRECISION EP-2 (DOD-G-24508) Grease, gun	32° F to 225° F	100 hours
31	SLAT CONVEYOR MOUNT PIVOT POINT (2)	GREASE-PRECISION EP-2 (DOD G-24508) Grease, Gun	32° F to 225° F	100 hours
32	AIR COMPRESSOR (1)	SCF 100 (MIL-L-17331: GRADE 1) SCF 150 (MIL-L-17331: GRADE 1)	40° F TO 80° F 40° F to 125° F	100 hours
33	AIR LUBRICATOR	ARDEE 32 (MIL-H-46001: GRADE 1)	40° F to 125° F	100 hours
34	HYDRAULIC RESERVOIR (1)	HARMONY AW32 (MIL-H-46001 GRADE 1)	40° F to 125° F	As Req.

4. Baghouse

<b>I t e m</b>	<b>Description</b>	<b>Lubricant</b>	<b>Lubricant Temperature Range</b>	<b>Period</b>
35	WHEEL BEARINGS (Axles) (1) each side each axle	GEARLUBE TOS 80W90 (MIL-L-2105 80W/90; GO-80/90) Oil Cup	-65° F to 275° F	100 hours

36	LANDING JACK (5) (3) gear side (2) other side	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
37	SUSPENSIO CAMSHAFT (2) each side SLACK ADJUSTER (1) each side	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
38	SCREW JACKS (8)	Oil, PENETRATING (VV-L-216) Spray Can	-32° F to 225° F	As Req.
39	HINGE POINTS	Oil, PENETRATING (VV-L-216) Spray Can	-32° F to 225° F	As Req.
40	UPPER FIFTH WHEEL KINGPIN	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
41	ROTARY BLOWER-Bearings (2)	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
42	ROTARY BLOWER-GEAR HOUSE (1)	GEARLUBE TOS 80W90 (MIL-L-2105 80W/90; GO-80/90) Oil Cup	-65° F to 275° F	100 hours
43	EXHAUST FAN-Bearings (2)	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
44	EXHAUST STACK LOUVRE-Bearings (8)	SHELL ALVANIA NO. 3 (DOD-G-24508) Grease, Gun	32° F to 225° F	100 hours
45	EXHAUST SHUTTER Bearings (2)	SHELL ALVANIA NO. 3 (DOD-G-24508) Grease, Gun	32° F to 225° F	100 hours
46	AIR COMPRESSOR	SCF 100 SCF 150 (MIL-H-4601: GRADE 3)	40° F to 125° F	100 hours
47	ROTAR AIRLOCK CHAIN	GEARLUBE TOS 80W90 (MIL-L-2105 80W/90; GO-80/90) Oil Cup	40° F to 125° F	8 hours

48	ROTARY AIRLOCK GEAR REDUCER	SHELL OMALA 460 (MIL-L-2105 85W140: GO-85/140 SHELL OMALA 680 (MIL-L-2105 85W140: GO-85/140)	32° F TO 225° F	100 hours
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**5. Dedrummer/Melter**

<b>I t e m</b>	<b>Description</b>	<b>Lubricant</b>	<b>Lubricant Temperature Range</b>	<b>Period</b>
49	WHEEL BEARINGS (Axles) (1) each side each axle	GEARLUBE TOS 80W90 (MIL-L-2105 80W/90; GO-80/90) Oil Cup	-65° F to 275°	100 hours
50	LANDING JACK (5) (3) gear side (2) other side	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
51	SUSPENSION CAMSHAFT (2) each side SLACK ADJUSTER (1) each side	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
52	SCREW JACKS (8)	Oil, PENETRATING (VV-L-216) Spray Can	-32° F to 225° F	As Req.
53	HINGE POINTS	Oil, PENETRATING (VV-L-216) Spray Can	-32° F to 225° F	As Req.
54	UPPER FIFTH WHEEL KINGPIN	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
55	ELECTRIC HOIST GEAR BOX (1)	TEXACO MEROPA NO. 320 (MIL-L-2105 85W/140 GO-85/140)	-32° F to 225° F	As Req.
56	ELECTRIC HOIST HOOK	Oil, PENETRATING (VV-L-216) Spray Can	-32° F to 225° F	As Req.
57	FUEL PUMP	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours

## 6. Asphalt Tanker

Item	Description	Lubricant	Lubricant Temperature Range	Period
58	WHEEL BEARINGS (Axles) (1) each side each axle	GEARLUBE TOS 80W90 (MIL-L-2105 80W/90; GO-89/90) Oil Cup	-65° F to 275° F	100 hours
59	LANDING JACK (5) (3) gear side (2) other side	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
60	SUSPENSION CAMSHAFT 92) each side SLACK ADJUSTER (1) each side	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
61	SCREW JACKS (8)	Oil, PENETRATING (VV-L-216) Spray Can	-32° F to 335° F	As Req.
62	HINGE POINTS	Oil, PENETRATING (VV-L-216) Spray Can	-32° F to 335° F	As Req.
63	UPPER FIFTH WHEEL KINGPIN	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
64	HOT OIL HEATER PUMP BEARINGS	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	-22° F to 320° F	100 hours
65	ASPHALT METERING PUMP-Bearings (1)	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
66	ASPHALT TRANSFER PUMP-Bearings (1)	SHELL ALAVANIA NO. 3 (DOD-G-24508) Grease Gun	32° F to 300° F	100 hours
67	ASPHALT METERING PUMP GEAR REDUCER	SHELL OMALA NO 220 (DOD-L-2105 80W/90, GO-80/90) Oil Cup	32° F to 300° F	100 hours



68	ASPHALT METER-Bearing (1)	SHELL ALVANIA NO. 3 (DOD-G-24508) Grease Gun	32° F to 300° F	100 hours
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## 7. Feed Conveyor

<b>I t e m</b>	<b>Description</b>	<b>Lubricant</b>	<b>Lubricant Temperature Range</b>	<b>Period</b>
69	WHEEL BEARINGS (Axles) (1) each side each axle	GEARLUBE TOS 80W90 (MIL-L-2105 80W/90; GO-80/90 Oil Cup	-65° F to 275° F	100 hours
70	LAND JACK (5) (3) side (2) other side	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
71	SUSPENSION CAMSHAFT (2) each side SLACK ADJUSTER (1) each side	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
72	SCREW JACKS (8)	Oil, PENETRATING (VV-L-216) Spray Can	-32° F to 225° F	As Req.
73	HINGE POINTS	Oil, PENETRATING (VV-L-216) Spray Can	-32° F to 225° F	As Req.
74	UPPER FIFTH WHEEL KINGPIN	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
75	CONVEYOR GER REDUCER (1)	SAE 40 OIL, R& O INHIBITED, NO EP ADDITIVE, (MIL-L-2104 GRADE 40, OE-HDO040) Oil Cup	15° F to 250° F	100 hours
76	SCREEN-Bearings (2)	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours

77	TAIL SHAFT -Bearings (2)	SHELL ALVANIA NO. 3 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
78	HEAD SHAFT-Bearings (2)	SHELL ALVANIA NO. 3 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
79	TAKE UP PULLEY-Bearings (2)	SHELL ALVANIA NO. 3 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
80	BEND PULLEY-Bearings (4)	SHELL ALVANIA NO. 3 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours

**8. Four Bin Feeder**

<b>I t e m</b>	<b>Description</b>	<b>Lubricant</b>	<b>Lubricant Temperature Range</b>	<b>Period</b>
81	WHEEL BEARINGS (Axles) (1) each side each axle	GEARLUBE TOS 80W90 (MIL-L-2105 80W/90; GO-80/90) Oil Cup	-65° F to 275° F	100 hours
82	LANDING JACK (5) (3) gear side (2) other side	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
83	SUSPENSION CAMSHAFT (2) each side SLACK ADJUSTER (1) each side	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
84	SCREW JACKS (8)	Oil, PENETRATING (VV-L-216) Spray Can	-32° F to 225° F	As Req.
85	HINGE POINTS	Oil, PENETRATING (VV-L-216) Spray Can	-32° F to 225° F	As Req.
86	UPPER FIFTH WHEEL KINGPIN	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours

87	BELT FEEDER HEADSHAFT-Bearings (8)	SHELL ALVANIA NO. 3 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
88	BELT FEEDER GEAR REDUCER	SAE 40 OIL, R& O INHIBITED, NO EP ADDITIVE, (MIL-L-2104 GRADE 40, OE-HDO040) Oil Cup	32° F to 225° F	100 hours
89	GATHERING CONVEYOR TAIL SHAFT-Bearings (2)	SHELL ALVANIA NO. 3 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
90	CONVEYOR HINGE (2)	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
91	GATHERING CONVEYOR HEAD SHAFT-Bearings	SHELL ALVANIA NO. 3 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
92	GATHERING CONVEYOR HEAD SHAFT-Bearings	SHELL ALVANIA NO. 3 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
93	GATHERING CONVEYOR GEAR REDUCER (1)	SAE 40 OIL, R& O INHIBITED, NO EP ADDITIVE, (MIL-L-2104 GRADE 40, OE-HDO040) Oil Cup	32° F to 225° F	100 hours
94	FOLD LINKAGE (4)	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
95	BELT FEEDER TAIL SHAFT-Bearings (8)	SHELL ALVANIA NO. 3 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
96	FLOW SWITCH ASSEMBLY BEARINGS (8)	SHELL ALVANIA NO. 3 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours

**9. Dolly**

<b>I t e m</b>	<b>Description</b>	<b>Lubricant</b>	<b>Lubricant Temperature Range</b>	<b>Period</b>
97	WHEEL BEARINGS (Axles) (1) each side each axle	GEARLUBE TOS 80W90 (MIL-L-2105 80W/90; GO- 80/90) Oil Cup	-65° F to 275° F	100 hours
98	SUSPENSION CAMSHAFT (2) each side SLACK ADJUSTER (1) each side	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
99	LANDING LEG	Oil, PENETRATING (VV- L-216) Spray Can	-32° F to 225° F	As Req.
100	HINGE POINTS	Oil, PENETRATING (VV- L-216) Spray Can	-32° F to 225° F	As Req.

**10. Generator Trailer**

<b>I t e m</b>	<b>Description</b>	<b>Lubricant</b>	<b>Lubricant Temperature Range</b>	<b>Period</b>
101	WHEEL BEARINGS (Axles) (1) each side each axle	GEARLUBE TOS 80W90 (MIL-L-2105 80W/90; GO- 80/90) Oil Cup	-65° F to 275° F	100 hours
102	82	LANDING JACK (5) (3) gear side (2) other side	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F
103	SUSPENSION CAMSHAFT (2) each side SLACK ADJUSTER (1) each side	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours
104	SCREW JACKS (8)	Oil, PENETRATING (VV- L-216) Spray Can	-32° F to 225° F	As Req.

105	HINGE POINTS	Oil, PENETRATING (VV-L-216) Spray Can	-32° F to 225° F	As Req.
106	UPPER FIFTH WHEEL KINGPIN	GREASE-PRECISION EP-2 (DOD-G-24508) Grease Gun	32° F to 225° F	100 hours

**11. Hydraulic Power Pack**

<b>I t e m</b>	<b>Description</b>	<b>Lubricant</b>	<b>Lubricant Temperature Range</b>	<b>Period</b>
107	HYDRAULIC FLUID	HARMONY AW-32 (MIL-H-46001 GRADE 1)	40° F to 125°	100 hours

**II. PREVENTIVE MAINTENANCE PROCEDURES**

**3-2 Preventive Maintenance Checks and Service (PMCS)**

This chapter provides instructions for inspection, servicing, lubrication and maintenance and repair of the M081 Asphalt Mixing Plant. All procedures can be performed by personnel using common tools and equipment. All servicing and maintenance must be performed at specified intervals for optimum performance and minimum down time.

Personnel should refer to the accompanying TM 5-3895-374-24 for information on servicing and repair procedures. Table 3-3 Unit PMCS lists periodic inspections and service to be conducted and the specific intervals at which they should be performed. Intervals should be adjusted accordingly for extremes of temperature or other adverse operating conditions.

**3-2.1. Operation PMCS**

**CAUTION**

**Do not attempt to perform any service to the equipment while it is operating. The equipment is to be shut down for ALL service. During operation of the plant perform VISUAL inspection only.**

Table 3-2. Operation PMCS

<b>I T E M</b>	<b>B E F O R E</b>	<b>D U R I N G</b>	<b>A F T E R</b>	<b>Assembly</b>	<b>Inspection</b>	<b>Not Ready If</b>	<b>Not Mission Capable If</b>
1	*		*	Control Van	Equipment settling or shifting	Not supported by all screw jacks	
2	*				Electrical cables secure	Loose cables	
3	*				Ground cable secure.	Loose or missing	
4	*		*	Drum Mixer	Equipment settling or shifting.	Not supported by all screw jacks	
5	*				Electrical cables secure	Loose cables	
6	*	*			Drive assembly for alignment.		
7	*				Support rollers for uneven wear.	Drum not supported by all rollers or obvious misalignment	
8		*			Fan, noise and vibration.		
9		*			Any unusual noise or vibration		
10	*	*			Gear reducer, oil leaks		
11	*				Drum seals	Leaks affecting air flow through drum	
12	*	*	*		Fuel seals at burner	Fuel leaking	

<b>I T E M</b>	<b>B E F O R E</b>	<b>D U R I N G</b>	<b>A F T E R</b>	<b>Assembly</b>	<b>Inspection</b>	<b>Not Ready If</b>	<b>Not Mission Capable If</b>
13	*				Chain oiler, oil level		
14	*				Control cables secure		Loose cables
15	*		*		Loose hardware		
16	*		*	Surge Bin	Equipment settling or shifting	Not supported by all screw jacks	
17	*				Electrical cables secure	Loose cables	
18	*				Slat conveyor loose or damaged slats	Not conveying materiel or leaking materiel	
19	*				Hydraulic system		
20	*	*			Gear reducer, oil leaks		
21	*				Drive belts	Loose, cracked or damaged belts	
22	*		*		Drain water from air tank		
23	*				Air line oiler for oil		
24	*				Check propane tank level		
25	*	*			Air system for leaks		
26	*				Air compressor air filters		
27	*				Air compressor oil		

I T E M	B E F O R E	D U R I N G	A F T E R	Assembly	Inspection	Not Ready If	Not Mission Capable If
28			*		Slat conveyor chains and slats sprayed with release agent		
29			*		Asphalt mix build up around conveyor or bypass chute		
30	*				Control cables secure		Loose cables
31	*		*		Loose hardware		
32	*		*	Baghouse	Equipment settling or shifting	Not supported by all screw jacks	
33	*				Electrical cables secure	Loose cables	
34	*				Ducts secure, expansion joint secure, seals secure	Bolts loose and or fabric torn	
35	*				Drive belts	Loose, cracked or damaged belts	
36	*	*			Conveyor augers run true. Check for shaft warble.		
37	*	*			Gear reducer, oil leaks		
38	*	*			Blower, noise and vibration, v-belts	Unusual vibration, loose, cracked or damaged belts	



<b>I T E M</b>	<b>B E F O R E</b>	<b>D U R I N G</b>	<b>A F T E R</b>	<b>Assembly</b>	<b>Inspection</b>	<b>Not Ready If</b>	<b>Not Mission Capable If</b>
39	*				Air compressor v-belts	Loose, cracked or damaged belts	
40			*		Drain water from air tank		
41	*				Blower air filter		
42	*				Air compressor air filter		
43	*		*		Augers clear of dust		
44	*		*		Vane feeder discharging materiel	Vane feeder plugged	
45	*		*		Shutter door closed	Closed	Closed
46	*				Water in exhaust fan		
47	*				Control cables secure		Loose cables
48	*		*		Loose hardware		
49	*		*	Dedrummer/ Melter	Equipment settling or shifting	Not supported by all screw jacks	
50	*		*		Fuel level (site gauge)		Tank empty
51	*				Electrical cables secure	Loose cables	
52	*				Hoist (if used)	Missing or damaged	
53	*				Drum rotator (if used)	Missing or damaged	
54	*				Boom (if used)	Missing or damaged	
55			*		Fuel strainer		

<b>I T E M</b>	<b>B E F O R E</b>	<b>D U R I N G</b>	<b>A F T E R</b>	<b>Assembly</b>	<b>Inspection</b>	<b>Not Ready If</b>	<b>Not Mission Capable If</b>
56	*				Fuel connection tight		
57	*		*		Loose hardware		
58	*		*	Asphalt Tanker	Equipment settling or shifting	Not supported by all screw jacks	
59	*				Hot oil heater secure and heating oil level adequate (site gauge)	Low oil level	
60	*				Electrical cables secure	Loose cables	
61	*				Pump v-belt	Loose, cracked or damaged belts	
62			*		Drain water from air tank		
63	*				Fuel connections tight		
64	*				Asphalt lines secure		
65	*				Heating oil lines secure		
66	*		*		Asphalt level		Tank empty
67	*				Control cables secure		Loose cables
68	*		*		Loose hardware		
69	*		*	Feed Conveyor	Equipment settling or shifting	Not supported by all screw jacks	
70	*				Electrical cables secure	loose cables	
71	*				Screen secure, springs not broken	Broken spring(s)	

<b>I T E M</b>	<b>B E F O R E</b>	<b>D U R I N G</b>	<b>A F T E R</b>	<b>Assembly</b>	<b>Inspection</b>	<b>Not Ready If</b>	<b>Not Mission Capable If</b>
72	*				Conveyor belt, damage	Leaking aggregate	
73		*			Conveyor belt runs true	Belt not centered	
74		*			Conveyor idlers rotate freely	Rocks prevent rotation	
75	*	*			Gear reducer, oil leaks		
76	*				Drive v-belt	Loose, cracked or damaged belts	
77	*	*			Check screen for plugging		
78	*		*		Scale assembly clear of aggregate		
79	*				Counterweight assembly clear of aggregate		
80	*				Screen drive clear of aggregate		
81	*				Screen box free to move		
82	*				Control cables secure		Loose cables
83	*		*		Loose hardware		
84	*		*	Four Bin Feeder	Equipment settling or shifting	Not supported by all screw jacks	
85	*				Electrical cables secure	Loose cables	

I T E M	B E F O R E	D U R I N G	A F T E R	Assembly	Inspection	Not Ready If	Not Mission Capable If
86	*				Conveyor belts damaged	Aggregate leaks	
87	*	*			Conveyor belts run true	Not centered on rollers	
88		*			Conveyor idlers rotate freely	Rocks prevent rotation	
89	*	*			Gear reducer, oil leaks		
90	*				Drive v-belts	Loose, cracked or damaged belts	
91	*	*			Aggregate available		Not available
92	*				Flow switches free to move		
93	*	*			Conveyor belt tension adequate	Conveyor belt slipping	
94	*	*			Aggregate build up under conveyor	Conveyor belt contacting spillage	
95	*				Control cables secure		Loose cables
96	*		*		Loose hardware		
97	*			Generator Trailer	Complete PMCS for both generators - see generator manual		
98	*		*		Fuel level in generators		
99	*				Ground cables secure		
100	*		*	Standby Generator	Fuel level in generator		

<b>I T E M</b>	<b>B E F O R E</b>	<b>D U R I N G</b>	<b>A F T E R</b>	<b>Assembly</b>	<b>Inspection</b>	<b>Not Ready If</b>	<b>Not Mission Capable If</b>
	101	*				Ground cable secure	
	102	*			generator manual	Complete PMCS for generator - see	
	103	*			Tow Dolly	Tow dolly secure	
	104	*			Hydraulic Power Pack	Hydraulic power pack oil level	

3-2.2. Movement PMCS

**NOTE**

The (After) Operation PMCS and Tear Down Procedures should be completed prior to the performance of this Movement PMCS.

**CAUTION**

All aggregate, mix or fuel should be removed from the equipment prior to transport.

Table 3-3 Movement PMCS

<b>I T E M</b>	<b>B E F O R E</b>	<b>D U R I N G</b>	<b>A F T E R</b>	<b>Assembly</b>	<b>Inspection</b>	<b>Not Ready If</b>	<b>Not Mission Capable If</b>
1	*			Control Van	Tires for air pressure and damage		

I T E M	B E F O R E	D U R I N G	A F T E R	Assembly	Inspection	Not Ready If	Not Mission Capable If
2	*				Brakes for proper adjustment and operation		
3	*				Trailer lights for damage and proper operation		
4	*				Drain air brake tanks		
5	*				Loose materiel which may blow off during transport		
6	*				Stowed items are secured		
7	*	*			Wheel nuts are tight, oil in wheel hubs, hub cap plugs secure.		
8	*				Adapter box bolts are tight		
9	*				Stowed items inside control van are secure		
10	*				All panel doors closed and secured		
11	*				Inside door closed		
12	*				Outside electrical connection covers are closed and secured		
13	*				Drum Mixer Tires for air pressure and damage		
14	*				Brakes for proper adjustment and operation		

I T E M	B E F O R E	D U R I N G	A F T E R	Assembly	Inspection	Not Ready If	Not Mission Capable If
15	*				Trailer lights for damage and proper operation		
16	*				Drain air brake tanks		
17	*				Loose materiel which may blow off during transport		
18	*				Stowed items are secured		
19.	*	*			Wheel nuts are tight, oil in wheel hubs, hub cap plugs secure.		
20	*				Adapter box bolts are tight		
21	*				Electrical cables secured in transport position		
22	*				Hydraulic leveling jacks are fully retracted		
23	*				Screw jacks and pads secured		
24	*			Surge Bin	Tires for air pressure and damage		
25	*				Brakes for proper adjustment and operation		
26	*				Trailer lights for damage and proper operation		
27	*				Drain air brake tanks		

I T E M	B E F O R E	D U R I N G	A F T E R	Assembly	Inspection	Not Ready If	Not Mission Capable If
28.	*				Loose materiel which may blow off during transport		
29.	*				Stowed items are secured		
30.	*				Wheel nuts are tight, oil in wheel hubs, hub cap plugs secure		
31.	*				Adapter box bolts are tight		
32.	*				Electrical cables secured in transport position		
33.	*				Hydraulic leveling jacks are fully retracted		
34.	*				Screw jacks and pads secured		
35.	*			Baghouse	Tires for air pressure and damage		
36.	*				Brakes for proper adjustment and operation		
37.	*				Trailer lights for damage and proper operation		
38.	*				Drain air brake tanks		
39.	*				Loose materiel which may blow off during transport		
40.	*				Stowed items are secured		



I T E M	B E F O R E	D U R I N G	A F T E R	Assembly	Inspection	Not Ready If	Not Mission Capable If
41.	*				Wheel nuts are tight, oil in wheel hubs, hub cap plugs secure		
42.	*				Adapter box bolts are tight		
43.	*				Electrical cables secured in transport position		
44.	*				Hydraulic leveling jacks are fully retracted		
45.	*				Screw jacks and pads secured		
46.	*				Exhaust stack securely bolted for transport		
47.	*				Ladder to rear platform is in transport position		
48.	*				Handrail is folded down for transport		
49.	*			Dedrummer/ Melter	Tires for air pressure and damage		
50.*					Brakes for proper adjustment and operation		
51.	*				Trailer lights for damage and proper operation		
52.	*				Drain air brake tanks		
53.	*				Loose materiel which may blow off during transport		

I T E M	B E F O R E	D U R I N G	A F T E R	Assembly	Inspection	Not Ready If	Not Mission Capable If
54.	*				Stowed items are secured		
55.	*	*			Wheel nuts are tight, oil in wheel hubs, hub cap plugs secure		
56.	*				Adapter box bolts are tight		
57.	*				Electrical cables secured in transport position		
58.	*				Hydraulic leveling jacks are fully retracted		
59.	*				Screw jacks and pads secured		
60.	*				Fuel tank is empty		
61.	*				Asphalt tank is empty		
62.	*				Fuel lines have been capped		
63.	*			Asphalt Tanker	Remove empty drums from tank		
64.	*				Tires for air pressure and damage		
65.	*				Brakes for proper adjustment and operation		
66.	*				Trailer lights for damage and proper operation		
67.	*				Drain air brake tanks		

I T E M	B E F O R E	D U R I N G	A F T E R	Assembly	Inspection	Not Ready If	Not Mission Capable If
68.	*				Loose materiel which may blow off during transport		
69.	*				Stowed items are secured		
70.	*				Wheel nuts are tight, oil in wheel hubs, hub cap plugs secure		
71.	*				Adapter box bolts are tight		
72.	*				Electrical cables secured in transport position		
73.	*				Hydraulic leveling jacks are fully retracted		
74.	*				Screw jacks and pads secured		
75.	*				Asphalt tank is empty		
76.	*				Hot oil heater overflow cap has been installed		
77.	*				Fuel line to heater has been capped		
78.	*			Feed Conveyor	Tires for air pressure and damage		
79.	*				Brakes for proper adjustment and operation		
80.	*				Trailer lights for damage and proper operation		
81.	*				Drain air brake tanks		

I T E M	B E F O R E	D U R I N G	A F T E R	Assembly	Inspection	Not Ready If	Not Mission Capable If
82	*				Loose materiel which may blow off during transport		
83	*				Stowed items are secured		
84	*	*			Wheel nuts are tight, oil in wheel hubs, hub cap plugs secure		
85	*				Adapter box bolts are tight		
86	*				Electrical cables secured in transport position		
87	*				Hydraulic leveling jacks are fully retracted		
88	*				Screw jacks and pads secured		
89	*			Four Bin Feeder	Tires for air pressure and damage		
90	*				Brakes for proper adjustment and operation		
91	*				Trailer lights for damage and proper operation		
92	*				Drain air brake tanks		
93	*				Loose materiel which may blow off during transport		
94	*				Stowed items are secured		

I T E M	B E F O R E	D U R I N G	A F T E R	Assembly	Inspection	Not Ready If	Not Mission Capable If
95	*	*			Wheel nuts are tight, oil in wheel hubs, hub cap plugs secure		
96	*				Adapter box bolts are tight		
97	*				Electrical cables secured in transport position		
98	*				Hydraulic leveling jacks are fully retracted		
99	*				Screw jacks and pads secured		
100	*				Bins and conveyor belts are empty of aggregate		
101	*				Gathering conveyor is secured for transport		
102	*				Four ramp up plates are secure and in transport position		
103	*				Bin extensions have been folded for transport		
104	*			Generator Trailer	Ladders are lowered to transport position		
105	*				Tires for air pressure and damage		
106	*				Brakes for proper adjustment and operation		

I T E M	B E F O R E	D U R I N G	A F T E R	Assembly	Inspection	Not Ready If	Not Mission Capable If
107	*				Trailer lights for damage and proper operation		
108	*				Drain air brake tanks		
109	*				Loose materiel which may blow off during transport		
110	*				Stowed items are secured		
111	**				Wheel nuts are tight, oil in wheel hubs, hub cap plugs secure		
112	*				Adapter box bolts are tight		
113	*				Electrical cables secured in transport position		
114	*				Screw jacks and pads secured		
115	*				Exhaust ducting securely bolted for transport		
116	*				Generator PMCS completed		
117	*	*		Dolly	Tires for air pressure and damage		
118	*				Brakes for proper adjustment and operation		
119	*				Drain air brake tanks		

I T E M	B E F O R E	D U R I N G	A F T E R	Assembly	Inspection	Not Ready If	Not Mission Capable If
120	*	*			Wheel nuts are tight, oil in wheel hubs, hub cap plugs secure		

**APPENDIX A**

**REFERENCES**

**A-1. Scope**

This appendix lists Army regulations, forms, field manuals, and other publications which may apply to Operator, Unit, Direct Support and General Support Maintenance for the Asphalt Mixing Plant (AMP).

**A-2. Department of the Army Pamphlets**

Consolidated Index of Army Publications and Forms	DA PAM 25-30
The Army Maintenance Management System (TAMMS)	DA PAM 738-750

**A-3. Forms**

U.S. Army Accident Investigation Report	DA Form 285
Equipment Operator's Qualifications Record (except aircraft)	DA Form 348
Recommended Changes to Equipment Manuals	DA Form 2028-2
Recommended Changes to Publications and Blank Forms	DA Form 2028
Organization Control Record for Equipment	DA Form 2401
Equipment Inspection and Maintenance Worksheet	DA Form 2404
Maintenance Request	DA Form 2407
Preventive Maintenance Schedule and Record	DA Form 314
DOD Fire Incident Report	DD Form 2324
Report of Discrepancy (ROD)	DD Form 364
Product Quality Deficiency Report	
	DD Form 358

**A-4. Field Manuals**

NBC Contamination Avoidance	FM 3-3
NBC Protection	FM 3-4
NBC Decontamination	FM 3-5
Field Behavior of NBC Agents	FM 3-6
First Aid for Soldiers	FM 21-11
Visual Signals	FM 21-60



**A-5. Technical Bulletins**

Occupational and Environmental Health: Hearing Conservation	TB MED 501
Color, Marking, and Camouflage Painting of Military Vehicles,	
Construction Equipment and Materiel Handling Equipment	TB 43-0209
Department of the Army Technical bulletin Warranty Program	
for Asphalt Mixing Plant	TB 5-3895-374-14

**A-6 Technical Manuals**

Use and Care of Hand Tools and Measuring Tools	TM 9-243
Administrative Storage	TM 740-90-1
Procedures for Destruction of Tank-Automotive Equipment	
to Prevent Enemy Use	TM 750-244-6
Destruction of Equipment to Prevent Enemy Use	TM 43-0002-24
Unit, Direct Support and General Support Maintenance Manual	
for the Asphalt Mixing Plant	TM 5-3895-374-24
Operator's Manual for the Asphalt Mixing Plant	TM 5-3895-374-10
Parts Manual for Asphalt Mixing Plant	TM 5-3895-374-24P

**A-7. Other Publications**

Army Medical Department Expendable/Durable Items	CTA 8-100
Expendable/Durable Items (Except Medical, Class V, Repair	
Parts, and Heraldic Items)	CTA 50-970
Training Management Skills, Unit Development	TC 25-7

**APPENDIX B**

**COMPONENTS OF THE END ITEM**

**I. INTRODUCTION**

**B-1 Scope**

This appendix lists Components of the End Item for the M081 Asphalt Mixing Plant to help you inventory the items for safe and efficient operation of the equipment.

**B-2 General**

The Components of End Item (COEI) listing is for information purposes only, and is not authority to requisition replacements. These items are part of the M081 Asphalt Mixing Plant. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Items of COEI are removed and separately packaged for transportation or shipment only when necessary.

**B-3 Explanation of Columns**

The lists contain 5 columns. The columns are:

- Column 1     Item #. Item number is for reference only within the table.
- Column 2     NSN, identifies the national stock number of the item to be used for requisitioning purposes.
- Column 3     Description and Useable on Code. Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the Commercial and Government Entity Code (CAGE) (in parentheses) and the part number.
- Column 4     U/i. Unit of issue indicates how the item is issued for the National Stock Number shown in column 2 (NSN).
- Column 5     Qty. Req'd. Indicates the quantity required.

II. COMPONENTS OF END ITEM

Item #	NSN	Description and Useable On Code	U/	Qty. Req'd
B-1		CHAIN HOIST (0W697) Part #AP EFS005S-15	ea	1
B-2		DRUM LIFTER MANUAL TILT (3AB03) Part #AP 10-987-38	ea	1
B-3		SPREADER BAR (3AB03) Pan #51-452-18	ea	2

**APPENDIX C  
BASIC ISSUE ITEMS (BII)**

**I. INTRODUCTION**

**C-1 Scope**

This appendix lists Basic Issue Items (B5I) for the M081 Asphalt Mixing Plant to help inventory the items for safe and efficient operation of the equipment.

**C-2 General**

The Basic Issue Items are essential items required to place the M081 Asphalt Mixing Plant in operation, operate it and to do emergency repairs. Although shipped separately packaged, BII must be with the Asphalt Mixing Plant during operation and when it is transferred between property accounts. This list provides authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE.

**C-3 Explanation of Columns**

The lists contain 5 columns. The columns are:

- Column 1     Item #. Item number is for reference only within the table.
- Column 2     NSN, identifies the national stock number of the item to be used for requisitioning purposes.
- Column 3     Description. Identifies the item name followed by a minimum description when needed. The last line below the description is the Commercial and Government Entity Code (CAGE) (in parentheses) and the part number.
- Column 4     U/I. Unit of issue indicates how the item is issued for the National Stock Number shown in column 2 (NSN).
- Column 5     Qty. Req'd. Indicates the quantity required.

II. BASIC ISSUE ITEMS (BII)

Item #	NSN	DESCRIPTION	U/I	QTY
1		3/4" Pneumatic Hose Assembly (COMM) Part # 51-452-65	EA	1
2		Fines Return Hose- 4" Diameter (COMM) Part # 51-452-53	EA	1
3		Hoist (COMM) Pan # 51-451-44	EA	1
4		Wrench - Screw Jack (3AB03) Part # 51-401-89	EA	1
5		Inter-vehicular Cable (COMM) art # AP 53-450-04	EA	9
6		1/2" Fuel Hose (COMM)	EA	1
7		1 1/4" Fuel Line (COMM)	EA	1
8		2" Flexible Stainless Steel Hose (COMM)	EA	2
9		Flange Caps (COMM) Part # MP 51-100-12	EA	6
10		Ducting Gasket Kit (COMM) Part # 51-926-02	EA	5
11		Discharge Ducting Gasket (COMM) Part # 51-976-01	EA	1
12		Asphalt Calibration Hose - 2.5' (COMM) Part # 51-452-40	EA	1
13		2" Flexible Stainless Steel Hose - 24" EA (COMM)	1	
14		Jacketed Pipe Assembly (COMM) Part # MP 51-402-32	EA	1
15		2" Flexible Hose - 42" (COMM)	EA	1
16		Drum Lifter <sup>Manual</sup> Tilt (3AB03) Part # AP 10-987-38	EA	1
17	5120-00-240-1411	Pipe Wrench, 4" Opening (COMM)	EA	1

Item #	NSN	DESCRIPTION	U/I	QTY
18	5120-00-230-6385	1/2" Drive Ratchet (COMM)	EA	4
19	5120-00-189-7932	9/16" Socket 1/2" Drive (COMM)	EA	4
20	5120-00-235-5870	11/16" Socket 1/2" Drive (COMM)	EA	4
21	5120-00-189-7985	3/4" Socket 1/2" Drive (COMM)	EA	4
22	5120-00-189-7935	15/16" Socket 1/2" Drive (COMM)	EA	4
23	5120-00-189-7914	1 1/8" Socket 1/2" Drive (COMM)	EA	4
24	5120-00-228-9507	9/16" Open/Box End Wrench (COMM)	EA	4
25	5120-00-228-9509	11/16" Open/Box End Wrench (COMM)	EA	4
26	5120-00-228-9510	3/4" Open/Box End Wrench (COMM)	EA	4
27	5120-00-228-9513	15/16" Open/Box End Wrench (COMM)	EA	4
28	5120-00-228-9516	1 1/8" Open/Box End Wrench (COMM)	EA	4
29	5120-00-264-3796	12" Open End Adjustable Wrench (Crescent) (COMM)	EA	2
30		18" Open End Adjustable Wrench (Crescent) (COMM)	EA	2
31		Leveling Jack Wrench (3AB03)	EA	1
32	5975-00-878-3191	Ground Rod Assembly (7P200)	EA	4
33		4' Level (Magnetic Base) (COMM)	EA	1
34		Leak Detection Kit (Ultraviolet Inspection Lamp with Carrying Case)	EA	1

**APPENDIX D  
ADDITIONAL AUTHORIZED ITEMS**

**D-1 Scope**

This appendix lists additional items that are authorized for the support of the M081 Asphalt Mixing Plant.

**D-2 General**

This list identifies items that do not have to accompany the Asphalt Mixing Plant and do not have to be turned in with it. These items are authorized by CTA, MTOE, TDA, or JTA.

**D-3 Additional Authorized Items**

The following is a descriptive list of the additional items required to support this equipment:

1. Coveralls
2. Safety Boots
3. Work Gloves
4. Insulated Work Gloves
5. Hard Hat
6. Safety Glasses with Side Shields
7. Hearing Protection

**APPENDIX E**  
**EXPENDABLE/DURABLE SUPPLES AND REQUIREMENTS LIST**

**I. INTRODUCTION**

**E-1 Scope**

This appendix lists expendable and durable items required to operate and maintain the M081 Asphalt Mixing Plant. This listing is for information only and is not authority to requisition the listed items. These items are authorized by CTA 50-790, Expendable/Durable Items or CTA 8-100, Army Medical Department Expendable/Durable Items.

**E-2 Explanation of Columns**

This list contains 5 columns. The columns are:

- Column 1     Item #. This number is for reference only within the table.
- Column 2     Level. This column identifies the lowest level of maintenance that requires the item.
- Column 3     NSN. This is the national stock number assigned to the item which you can use to requisition the item.
- Column 4     Item Name, Description, CAGE (Commercial and Government Entity Code) and the pat number This provides the other information you need to identify the item.
- Column 5     U/M. This unit of measure code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.



II. EXPENDABLE/DURABLE SUPPLES AND REQUIREMENTS LIST

Item #	Level	NSN	Description	U/M
1	C		GEARLUBE TOS 80W90 (MIL-L-2105 80W/90; GO - 80/90)  1 qt. can - 5 gal. can 55 gal. drum	qt. gal. gal.
2	C		OIL, PENETRATING (VV-L-216)  8 oz. can	oz.
3	C		SAE 40 OIL, R & O INHIBITED, NO EP ADDITIVE, (MIL-L-2104 GRADE 40, OE-HDO-40)  1 qt. can 5 gal. can 55 gal. drum	qt. gal. gal.
4	C		GREASE - PRECISION EP-2 (DOD- G-24508) Grease Gun  14 oz. cartridge	oz.
5	C		SCF 100 (MIL-L-17331 GRADE 1) SCF 150 (MIL-L-17331 GRADE 1)  1 qt. can 5 gal. can	qt. gal.
6	C		ARDEE 32 (MIL-H-46001 GRADE 1)  1 qt. can 5 gal. can	qt. gal.

Item #	Level	NSN	Description	U/M
7	C		SHELL OMALA 460 (MIL-L-2105 85W140) GO-85/140 SHELL OMALA 680 (MIL-L-2105 85W'40) GO-85/140  1 qt. can 5 gal. can	qt. gal.
8	C		TEXACO MEROPA NO. 320 (MIL-L-2105 85W/140 GO-85/140)  1 qt. can 5 gal. can	qt. gal.
9	C		OIL, FUEL, DIESEL DF-2 REGULAR (VV-F-800)  bulk	gal.
10	C		OIL, FUEL, DIESEL DF-1 WINTER (VV-F-800)  bulk	gal.
11	C		BIO SLIP, ASPHALT RELEASE AGENT  55 gal. Drum	gal.
12	C		PROPANE  20 lb. tank 100 lb tank	lb. lb.
13	C		SCF 100 (MIL-H-4601 GRADE 3) SCF 150 (MIL-H-4601 GRADE 3)  1 qt. can 5 gal. can	qt. gal.
14	C		FLUORESCENT LEAK DETECTION POWDERS (GREEN & ORANGE)  1 gal. Can	gal.

**APPENDIX F**

**BLENDING CONTROLLER OPERATING INSTRUCTIONS**

**F-1. General**

This appendix lists the operating instructions for the Blending Controller. These instructions should be used in conjunction with Chapter 2 (Operating Instructions) of this manual.

**NOTE**

**Appendix F is vendor commercial data. Within the instructions are repeated references to Appendices A G. These Appendices are located within Appendix F not elsewhere in the manual**



**MODEL ADP**

**Asphalt Drum Mix**

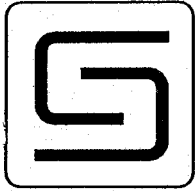
**Process Computer**

**Users Manual**



**SYSTEMS** EQUIPMENT CORPORATION

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# SYSTEMS

P.O. Box 19  
Waukon, Iowa 52172  
Telephone: (319) 568-6387

TM 5-3895-374-10

Sept. 8, 1988

Dear Customer:

SYSTEMS Equipment Corporation is proud of the products it manufactures and services. The PEACEKEEPER series Drum Mix Plant Computer is the finest equipment of its kind. A great deal of thought was put into the design of this product so we could offer you equipment that reliably addresses your need and is simple and easy to operate.

A computer based control system can offer the user many advantages. Improved proportioning accuracy, proper time sequencing of events, data recordation, alarm and deviation annunciation, and simplification and quantification of calibrations are all realistic results from the use of this technology. When properly implemented, all these things can be done in a manner that makes an operator's life easier, not more difficult.

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Sincerely,

Orrin Grangaard, President  
SYSTEMS Equipment Corporation

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SYSTEMS Equipment Corporation  
PO Box 19  
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The computer program is written by SYSTEMS personnel entirely in assembly language. The annotated source code is the proprietary product of SYSTEMS Equipment Corporation and is not available to the customer. The final program is assembled by computer from this source code and is virtually unintelligible without the original annotated source code. The assembled machine language code is stored in electrically programmable read-only-memories within the computer and cannot be read or altered without special electronic equipment.

Printed copies of all user installed calibration values and user selected operational options are available from the plant operator. A copy should be made at the time the installation is certified. This copy then becomes the master plant certification record and unauthorized changes in these values' should invalidate the certification.

SYSTEMS Equipment Corporation will promptly respond to all questions regarding this equipment, its accuracy or suitability. Please contact the company at the address shown above.

Orrin Grangaard, President  
SYSTEMS Equipment Corporation

Sept. 06, 1988

A C M E Construction Corporation				
		dTPH	%err	%wet
4 2 0 TPH	VirScale	347	2.0	3.0
	RapScale	55	-1.7	2.9
	+Asphalt	18.3	+ .0	303 F
5				
mix		dTPH	%agg	%wet
4.8	1 Vir	62	15.4	4.5
%mA/C	2 Vir	123	30.8	3.0
282 F	3 Vir	154	38.5	2.5
307 T	4 Rap	61	15.4	2.9
Targets		400 TPH	Mix #	5
Asphalt Spray		08/20/88		486 15:54

Figure 0.0

Figure 0.0

MAIN OPERATING SCREEN

..... INTRODUCTION

A typical Main Operating Screen is shown in Figure 0.0. From this screen the operator can monitor the complete drum mix process. The current rates, blends, moistures, temperatures, and other parameters are updated and displayed every second. The computer may also be monitoring and annunciating any errors in the asphalt RUN/DIVERT valve position, alarms from the aggregate no flow switches, or out of tolerance differences between target and actual measured material flows.

The Main Operating Screen is divided into five distinct display areas:

- 1-MIX .....  
Measured and calculated values pertaining to the finished mix at the moment in time and at the point in the drum where the liquid ..... asphalt is being added.
- 2-SCALES .....  
The current rates of aggregates and liquids being measured by calibrated devices such as the conveyor scale(s) and asphalt meter.
- 3-FEEDERS .....  
The current and instantaneous aggregate rates from each of the aggregate feeders, their blends and moistures.
- 4-INFORMATION .....  
Status and error displays including the current position of the asphalt RUN/DIVERT valve, the current time and date, and as needed, a stopwatch and out of tolerance error messages.
- 5-OPTIONS .....  
This display of the operating options available to the operator can be turned on and off by alternately hitting the ESCape key. When in view this display overwrites the FEEDER blend and moisture displays.



A C M E Construction Corporation				
		dTPH	%err	%wet
4 2 2 TPH 5 mix 4.8 %mA/C 294 F 591 T	VirScale	342	+ .9	3.0
	RapScale	62	+ .1	2.9
	+Asphalt	18.1	+ .0	307 F
		dTPH	%agg	%wet
	1 Vir	62	15.4	4.5
	2 Vir	123	30.8	3.0
	3 Vir	154	38.5	2.5
	4 Rap	62	15.4	2.9
Targets		400 TPH	Mix #	5
Asphalt Spray			08/20/88	224 15 42

Figure 0.1

Figure 0.1

The area of the Main Operating Screen devoted to the display of those parameters relating to total mix is shown in Figure 0.1.

The top line, in double size numbers, shows the rate at which total mix is being produced at the current time and at that point in the drum where the liquid asphalt is being added. It should be remembered that this is the TOTAL mix including all aggregates, liquid asphalt, and any liquid additives or fillers.

The second numeric line, also double size, shows the mix number that was used in formulating the mix that is now being produced at the point of liquid asphalt injection. Because of the time it takes for aggregates to get from their feeders to the point of injection, the mix number shown here WAS the current target mix number at some PREVIOUS time and, if a six change is being made on the fly, Ray not be the same as the CURRENT target six number.

The third numeric line displays the measured liquid asphalt blend for the mix currently being produced at that point in the drum where the liquid asphalt is being added. Note that this number is the percent of total oil in the finished product and does include both the new oil added by the asphalt pump and metering unit and, for recycle systems, any reclaimed oil derived from the reclaimed material. A user option is provided to blend asphalt either on the basis of total six or on the basis of aggregate only. This is provided to accommodate different requirements in different states. The blend option chosen is described by the label printed directly under the number which is either XmA/C for percent asphalt based on total mix or XaA/C for percent asphalt based on total aggregate.

The fourth numeric line shows the current mix temperature as measured at the discharge of the drum. When this measurement is slaved from the burner control system, its response time and accuracy is limited by that system.

The fifth numeric line shows the accumulated tons of total mix that have passed the point of oil injection since the plant operator switched to the current six number being produced. This total is commonly referred to as the mix IN PROCESS total. The computer keeps track of the total mix produced for each of the available mix formulas and for this mix IN PROCESS. When the mix number being produced changes, the IN PROCESS total is added to the total for that particular mix formula and the IN PROCESS total is reset to zero.

A C M E Construction Corporation				
		dTPH	%err	%wet
4 2 2	VirScale	342	+ .9	3.0
	RapScale	62	+ .1	2.9
TPH	+Asphalt	18.1	+ .0	307 F
5				
mix		dTPH	%agg	%wet
4.8	1 Vir	62	15.4	4.5
%mA/C	2 Vir	123	30.8	3.0
294 F	3 Vir	154	38.5	2.5
591 T	4 Rap	62	15.4	2.9
	Targets	400 TPH	Mix #	5
Asphalt				224
Spray			08/20/88	15 42

Figure 0.2

Figure 0.2

..... SCALES information display

The area of the Main Operating Screen devoted to the display of those instantaneous measurements being made by calibrated devices is shown in Figure 0.2.

Information in this display area is arranged in rows and columns. Each row corresponds to a separate device, a belt weigh scale, a meter, etc. Each data column corresponds to a different measurement or calculated value.

The top line shows values associated with the virgin aggregate weigh scale. Column one shows the current aggregate rate in dry tons per hour (dTPH). Column two shows the error or difference in percent between the measured and target virgin aggregate rates. Column three shows the percent moisture correction being applied to the weigh scale output to arrive at the DRY rate shown in column one.

Line two shows values associated with the recycle aggregate weigh scale. Column one shows the current aggregate rate in dry tons per hour (dTPH). Column two shows the error or difference in percent between the measured and target recycle aggregate rates. Column three shows the percent moisture correction being applied to the weigh scale output to arrive at the DRY rate shown in column one. NOTE: For systems without a separate recycle scale, line 2 will be blank.

Line three shows the output of the asphalt metering system. Column one shows the current asphalt rate in tons per hour. The asphalt error shown in column two is the difference in the target percent of total oil and the actual current total oil. Column three displays the liquid asphalt temperature. If displayed in parenthesis, the temperature has been manually entered into the computer by the operator. If not in parenthesis, the temperature is being read automatically.

A C M E Construction Corporation				
		dTPH	%err	%wet
4 2 2 TPH 5 mix 4.8 %MA/C 294 F 591 T	VirScale	342	+ .9	3.0
	RapScale	62	+ .1	2.9
	+Asphalt	18.1	+ .0	307 F
		dTPH	%agg	%wet
	1 Vir	62	15.4	4.5
	2 Vir	123	30.8	3.0
	3 Vir	154	38.5	2.5
	4 Rap	62	15.4	2.9
Targets		400 TPH	Mix #	5
Asphalt Spray			08/20/88	224 15 42

Figure 0.3

Figure 0.3



NOTE: This computer is compatible with many different types of feeder control and measuring equipment. Not all of the following options will apply to any given equipment.

See also the section on FEEDER OPTIONS.

Volumetric Determined by Desired Rate \_\_\_\_\_

If the rate is shown in parenthesis, i.e. (xxx), then the rate is not measured but is the desired rate as determined from the target rate and mix formula. All calculations based on bin rate such as material usage totals and material blends are calculated from this derived value. This is the most basic operational scheme and no simpler backup option is provided. If the rate shown is not in parenthesis, it is the rate as actually measured by the equipment described on the FEEDER OPTIONS sheet. The material total accumulated for this bin is calculated from this measured rate.

Volumetric Measured by Motor Tach \_\_\_\_\_

This scheme uses a tachometer mounted directly on the feeder drive motor. Most usually this is a pulse pickup and 'gear' mounted on the motor 'C' face. The output of this tach is assumed to be directly proportional to the volumetric output of the feeder. This approach assumes there is no slippage in the drive or feeder belt. This scheme sometimes uses the Desired Rate approach as a backup option.

Volumetric Measured by Tailshaft Tach \_\_\_\_\_

Some systems use a tachometer mounted on the feeder tail shaft. This tachometer measures the feeder belt speed and not the motor speed so is unaffected by minor drive and feeder belt slippage. To operate properly it is important that the tachometer be mounted securely to the tailshaft, be properly restrained from extraneous movement and run smoothly without excessive wobble. This scheme often uses the Desired Rate approach as a backup option.

Weighed by Feeder Mounted Scale \_\_\_\_\_

Some systems incorporate a belt conveyor scale directly in the feeder belt and constantly weigh the feeder output. To convert this weight signal to tons per hour a feed belt speed pickup is also required. This speed pickup may be either motor mounted or tailshaft mounted. This scheme usually has some other simpler approach as a backup option.

Weighed by Feed Bin Collector Belt Scale\_\_\_\_\_

Some systems incorporate a number of belt conveyor scales in the collector belt under the feed bins. A single speed pickup off the collector belt tailshaft is used to measure belt speed. The output of the feeder furthest from the drum is measured by the furthest weighbridge. The second furthest weighbridge measures the actual material output of both the first and second bins and so forth. The computer calculates the measured output of each bin from the measured value of its weighbridge minus the measured value of the previous weighbridge. This scheme usually has some other simpler approach as a backup option.

Recycle Weighed by Recycle Scale Conveyor\_\_\_\_\_

Some systems, using a single recycle bin, interlock the bin and its scale conveyor so that the desired bin output is periodically compared to the actual measured scale value and appropriately corrected. Most usually the feeder information display will be the Desired Rate, shown in parenthesis, and the recycle scale information display will, of course, be the actual measured rate. Other measuring techniques may be employed for specialty feeders proportioning antistrip, rejuvenator, water, line or some other additive. Special options are covered in the appendix to this manual.



-CAUTION REGARDING VOLUMETRIC-RATES-

When rates are determined volumetrically, the calculated blends and the totals the computer derives from these rates are based on feeder speed in revolutions per minute and on the user specified calibrations relating feeder speed and material flow. Actual material flow is not measured and rates are therefore accurate only if:

- (a) calibrations are accurate at the actual feeder speed
- (b) material is in the feed bins and its flow from the feeder is not restricted
- (c) the drive train between the motor and the feeder is not slipping
- (d) the correct material moisture is entered into the computer.

The %err column for the virgin and recycle scales displays the difference between the measured combined aggregate at the scale and the target volumetric aggregate request. If the system were perfect and there were no volumetric errors this %err would be zero. Deviations from zero are therefore deviations from perfect and reflect the uniformity of the materials and the material delivery system. Conversely, if the displayed Xerr value is relatively constant, it can be expected that the material delivery system and the resulting aggregate blend is relatively constant.

NOTE: This Xerror value is often the first indication of problems with the aggregate proportioning system.

This computer system provides a method for the operator to establish alarm limits for the xerr values. When the error exceeds these limits, the applicable %err value will flash and the 'horn' will beep. If desired, automatic plant shutdowns can be connected to respond to persistent errors. For further information see the section on Alarm Limits & Shutdowns.

A C M E Construction Corporation				
		dTPH	Xerr	Xwet
4 2 2	VirScale	342	+ .9	3.0
TPH	RapScale	62	+ .1	2.9
	+Asphalt	18.1	+ .0	307 F
5				
mix	dTPH		Xagg	Xwet
4.8	1 Vir	62	15.4	4.5
XmA/C	2 Vir	123	30.8	3.0
294 F	3 Vir	154	38.5	2.5
591 T	4 Rap	62	15.4	2.9
Targets		400 TPH	Mix #	5
Asphalt				224
Spray			08/20/86	15 42

Figure 0.4

Figure 0.4

.....INFORMATION display/divert valve

The bottom area of all screens is reserved for the display of status messages, timers, warnings and current time and date.

The asphalt valve status display is shown in Figure 0.4.

At the left edge of the information area is a two line display defining the position of the liquid asphalt RUN/DIVERT valve. The possible messages are:

'Asphalt Spray' ---- liquid asphalt is being injected into the drum, i.e., the asphalt valve is in the RUN position.

'asphalt divert' --- liquid asphalt is being returned to its storage tank, i.e., the asphalt valve is in the DIVERT position.

'divert locked' --- the asphalt valve is in the DIVERT position and the computer cannot cause this valve to switch to the run position.

'asphalt error' --- the asphalt valve is not in the same position expected by the computer.

A C M E Construction Corporation				
		dTPH	%err	%wet
0	VirScale	0	off	3.0
	RapScale	0	off	2.9
TPH	+Asphalt	18.1	0.0	306 F
5				
mix		dTPH	%agg	%wet
0.0	1 Vir	0	0.0	4.5
%A/C	2 Vir	0	0.0	3.0
294 F	3 Vir	0	0.0	0.0
609 T	4 Rap	0	0.0	0.0
	Targets	400 TPH	Mix #	5
asphalt	-Motors OFF-			351
divert	-HOLD-	08/20/88		15:44

Figure 0.5

Figure 0.5

The alarm annunciator display is shown in Figure 0.5.

During normal operation this area is usually blank. Possible messages in this area include:

- '-Motors OFF- -HOLD' --- The virgin feeder collector belt is off so it is assumed all motors are off, i.e., the process is not running.
- 'FeederOverspeed ' --- The target rate requires a feeder to run at greater than its maximum speed. During this message the feeder speed is limited to its maximum so insufficient material is being delivered and corrective measures should be taken.
- 'Material Feed ERROR' -- The feeder no flow alarm indicates a lack of material flow.
- 'SHUTDOWN STARTED' -- A deviation exceeds the user established limit and the process will automatically stop if the alarm continues to persist uninterrupted for the shutdown time established by the user for this condition.
- 'A/C Pump Overspeed' --- The target asphalt rate requires the asphalt pump to run at greater than its maximum speed. During this message, the pump speed is limited to its maximum so insufficient material is being delivered and corrective measures should be taken. This message applies only to pump's driven by variable speed electric motors.
- 'Fines Inject Error' --- The fines delivery systems is not running when needed by the mix formula in effect.

A C M E Construction Corporation					
		dTPH	%err	%wet	
4 2 2 TPH	VirScale	342	+ .9	3.0	
	RapScale	62	+ .1	2.9	
	+Asphalt	18.1	+ .0	307 F	
5					
mix 4.8 %A/C 294 F 591 T			dTPH	%agg	%wet
	1	Vir	62	15.4	4.5
	2	Vir	123	30.8	3.0
	3	Vir	154	38.5	2.5
	4	Rap	62	15.4	2.9
Targets		400 TPH	Mix #	5	
Asphalt Spray				224	
		08/20/88		15:42	

Figure 0.6

Figure 0.6

The time and date display are shown in Figure 0.6 at the right of the Information display area.

The date shown is in the form month/day/year, MM/DD/YY. To the right of the date is the current time. 'Military' time is used so that 1PM is shown as 13:00, one hour past noon. The clock does NOT continue to run when the computer is turned off so that the operator must reset the time whenever the computer is turned on. When running, the colon (:) in the time display flashes on/off on alternate seconds. In the unlikely event that the colon does not flash it is certain that a computer failure has occurred and operation should cease immediately.

Directly above the clock is a three digit stopwatch. This stopwatch starts counting whenever the target rate or target mix number is changed and continues running for 500 seconds after a change. After 500 seconds, the stopwatch is blanked from the screen. This stopwatch is provided as a convenience to the operator to assist him in monitoring those events that occur when a target change is made, i.e., divert valve switching, mix appearing at the discharge, mix change reaching the silo, etc.

USER INTERACTIVE DISPLAYS

..... INTRODUCTION

The Main Operating Screen continuously displays the measured and calculated operation values for the system. As such the computer requires no input from the user and can be thought of merely as a set of system meters useful in monitoring plant performance. At other times it is necessary for the operator to directly control the system through the computer. The operator 'communicates' with the computer through numerical data entered at the keypad. Data such as aggregate moistures, the desired target production rate, the density of the liquid asphalt cement, calibration numbers, etc., etc., can be entered in this manner. The computer uses a system of interactive displays to simplify this process.

In this computer the first interactive display is the OPTIONS menu which can be turned on and off from the Main Operating Screen by alternately hitting the ESCape key. This OPTIONS subscreen is called a menu because it presents thee user with a series of tasks from which the user can make a selection. The menu shows the available tasks and the keystroke or keystrokes that will direct the computer to proceed with the selected task. Note that the first option in all interactive displays is to ESCape from the selected task to the immediately previous screen. This option is always offered before any data can be entered or changed so that the new operator should not fear investigating the various displays available. When a task selection is made the computer will respond with new list of continuation options and will display all information necessary to the selected task.

The interactive display process is a communication scheme where the user is prompted on the display as to what options are available; a selection is made and a new list of options displayed; another selection is made and a new set of directions displayed; etc., etc. As the operator selects from the displayed options he 'moves forward' through the prompted directions to accomplish the desired task. To 'move backward' through the list, one step at a time, the user selects the ESCape option. Hitting the ESCape key often enough will always return the operator to the Main Operating Screen.

Because all communication with the computer is through the keypad, the user should carefully read the section of this manual on DATA ENTRY. The combination of common sense, interactive display, and friendly keyboard make data entry as obvious and as foolproof as possible but the operator should always remember that WYSIWYG - what you see is what you get.





<ESC>

The area of the Main Operating Screen devoted to the display of those program continuation options available to the user is shown in Figure 0.7. Note that the OPTIONS menu display overlays the FEEDER blend and moisture displays and is available alternately with these displays on alternate strikes of the ESCape key. A continuation option can be selected from EITHER screen display by striking its associated key. The options and their associated selection keys include:

The Continuation Options are:

<u>OPTION</u>		<u>Key</u>	<u>Description</u>
ESCape		ESC	ESCape, that is, return to the immediately previous display.
Edit	Targets	1	Display the screen containing the target aggregate rate, target mix number and, if in divert, the liquid asphalt recirculation rate. From this screen any or all of the values can be edited, i.e. changed.
	Formulas	2	Display the screen containing the current target mix formula. From this screen one can edit this or any other mix formula.
	Material	3	Display the screen containing the current material specifications. From this screen one can edit these specifications.
Mix	Produced	5	Display the screen showing the total mix produced for each of the mix formulas and for the IN PROCESS mix.
Material	Used	6	Overlay a display of the material totals used or measured by each feeder, scale or meter.
Utilities		8	Display other continuation options available to the user.
Demand	Print	9	Cause the printer to terminate a record interval, calculate, and print the results.

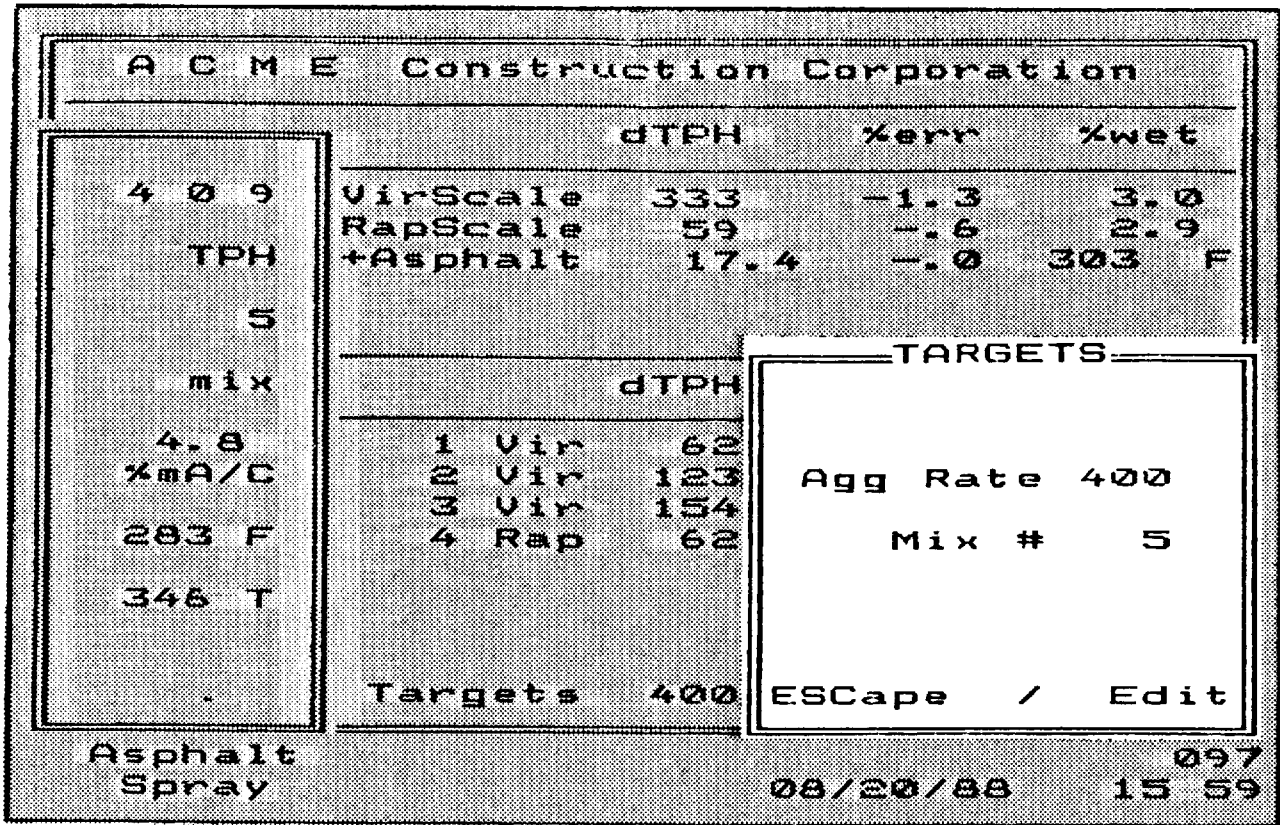


Figure 1.0

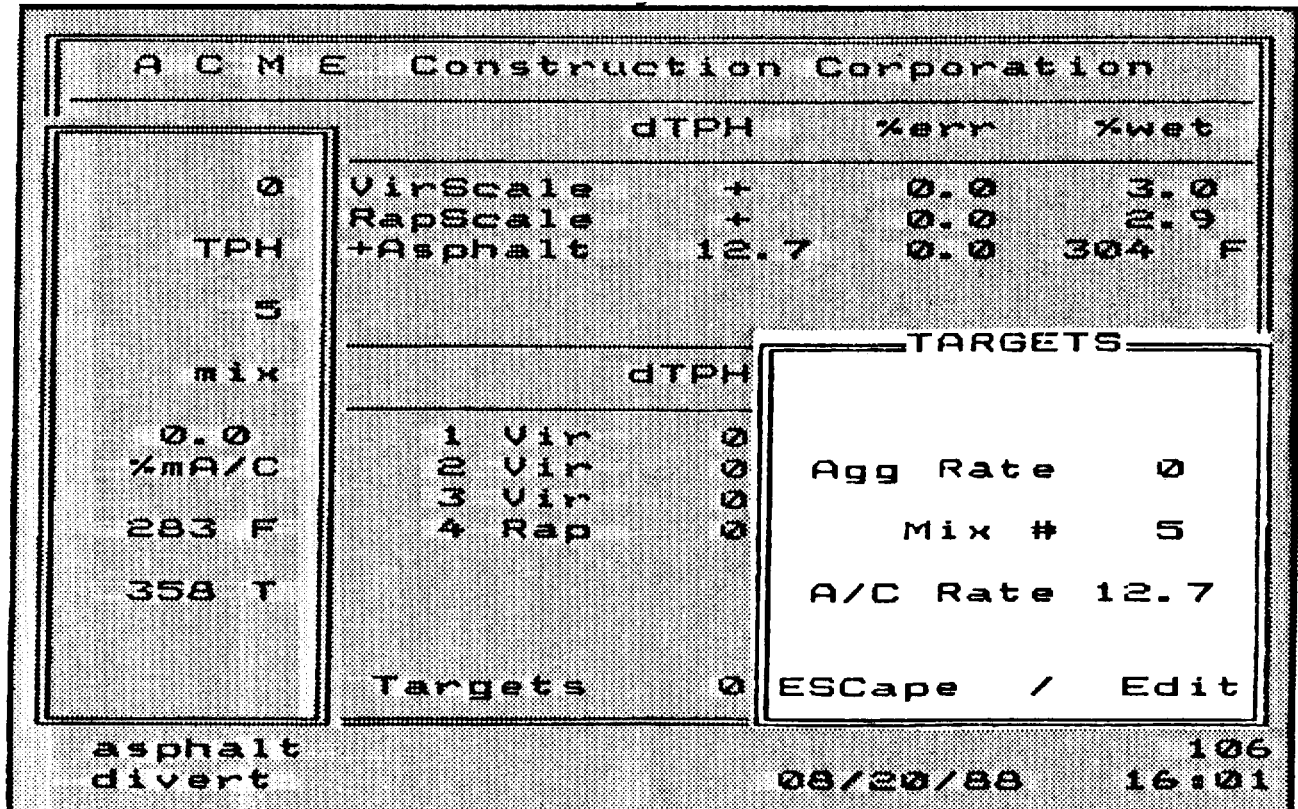


Figure 1.1

options .....EDIT TARGETS display  
<1>

The Edit Targets subscreen is shown in Figure 1.0 and Figure 1.1. Note that this screen overlays a small portion of the lower right hand corner of the Main Operating Screen.

As shown at the bottom of the TARGETS subscreen the user can either strike the ESCape key to return to the Main Operating Screen or can edit, i.e. alter or change, the target Agg(regate) Rate, target Mix # or, if the asphalt valve is in the divert position, the liquid asphalt recirculation rate. Values on the screen are edited in the usual manner as described in the DATA ENTRY section of this manual.

Changes made to the target Agg(regate) Rate or target Mix # will not be implemented by the computer until the ESCape key is struck and then only if the process is not in MOTORS-OFF-HOLD. If changes are made, the on screen stopwatch will also start on ESCape. Changes to the liquid asphalt recirculation rate are made immediately on data entry.

To start the feeders the user should-

- 1- ENTER the desired Aggregate rate
- 2- ENTER a Mix # that describes the desired formula
- 3- ENTER the approximate starting asphalt rate
- 4- Wait until ready to start the feeders
- 5- strike ESCape to start the feeders in sequence.

To stop the feeders the user should-

- 1- ENTER a desired Aggregate rate of 0 or ENTER a Mix # that requests no (0) material from every feeder
- 2- Wait until ready to stop the feeders
- 3- Strike ESCape to stop the feeders in sequence

To change the feed rate the user should-

- 1- ENTER the new value of the desired Agg(regate) rate  
NOTE: This is the dry TPH rate of the aggregate only.
- 2- Wait until ready to phase in the new rate
- 3- strike ESCape to cause the feeders to change in sequence to the new rate.

To change to a different Mix formula the user should-

- 1- ENTER the new Mix number desired
- 2- Wait until ready to phase in the new mix number
- 3- strike ESCape to cause the feeders to change in sequence to the new mix formula.

When entering data, remember WHAT YOU SEE IS WHAT YOU GET!

A C M E Constructio		MIX FORMULA	5
4 1 7	Total A/C	4.80	%mA/C
TPH	@	8.62	lb/gal at 60F
5			
mix	1 Vir	15.4	%Agg
4.8	2 Vir	30.8	
%mA/C	3 Vir	38.5	
294 F	4 Rap	15.4	
4013 T	A/C Tons	+ .0	
	Mix Tons	4	
		ESCAPE	
		Edit	.00
		GoTo Mix	5
Asphalt Spray		08/20/88	11:23

Figure 2.0

A C M E Constructio		MIX FORMULA	5
4 1 2	Total A/C	4.80	%mA/C
TPH	@	8.62	lb/gal at 60F
5			
mix	1 Vir	15.4	%Agg
4.8	2 Vir	30.8	
%mA/C	3 Vir	38.5	
293 F	4 Rap	15.4	
4020 T	A/C Tons	+ .0	
	Mix Tons	4	
		ESCAPE	
		Edit	.00
		GoTo Mix	5
Asphalt Spray	page F - 27	08/20/88	054 11:23

Figure 2.1

options .....EDIT FORMULAS display  
<2>

The Edit Formulas subscreen is shown in Figure 2.0. Note that this screen overlays most of the Main Operating Screen. The MIX Information and INFORMATION displays remain visible and data on the plant operation continues to be updated every second in these areas.

The mix formula number is displayed in the upper right corner of the formula 'card'. It is shown in double size numbers. On entering this option from the Main Operating Screen, the mix formula shown will be the current target mix number.

Within the main part of the formula 'card' are the desired blends of the mix components. They are:

- Total A/C ----- The percent liquid asphalt in the finished mix. The label after the value is %mAC for oil specified as a percentage of total mix OR %aAC for oil specified as a percentage of total aggregate.
- @ ----- The density of the liquid asphalt in pounds per gallon at 60 degrees F.
- Feeder(s) ----- The percentage by dry weight of each feeder specified as a percentage of the total aggregate only.
- A/C Tons ----- A computer maintained record of the total tons of A/C used in this mix since totals were last cleared. This total does NOT include A/C used in the mix IN PROCESS.
- Mix Tons ----- A computer maintained record of the total tons of mix made of this formula since totals were last cleared. This total does NOT include mix IN PROCESS total.

The continuation options shown in Figure 2.1 are:

<b>OPTION</b>	<b>KEY</b>	<b>DESCRIPTION</b>
ESCape	ESC	Return to the Main Operation Screen.
Edit	.00	Gain access to the data on the formula currently displayed so data can be changed. Access is gained by keying the access code .00 ENTER. Access can not be obtained if the DATA KEY is in the DATA LOCKED position.
GoTo Mix	(##)	Allows the user to change the formula displayed on the screen to a different numbered formula by ENTERing the formula number desired.

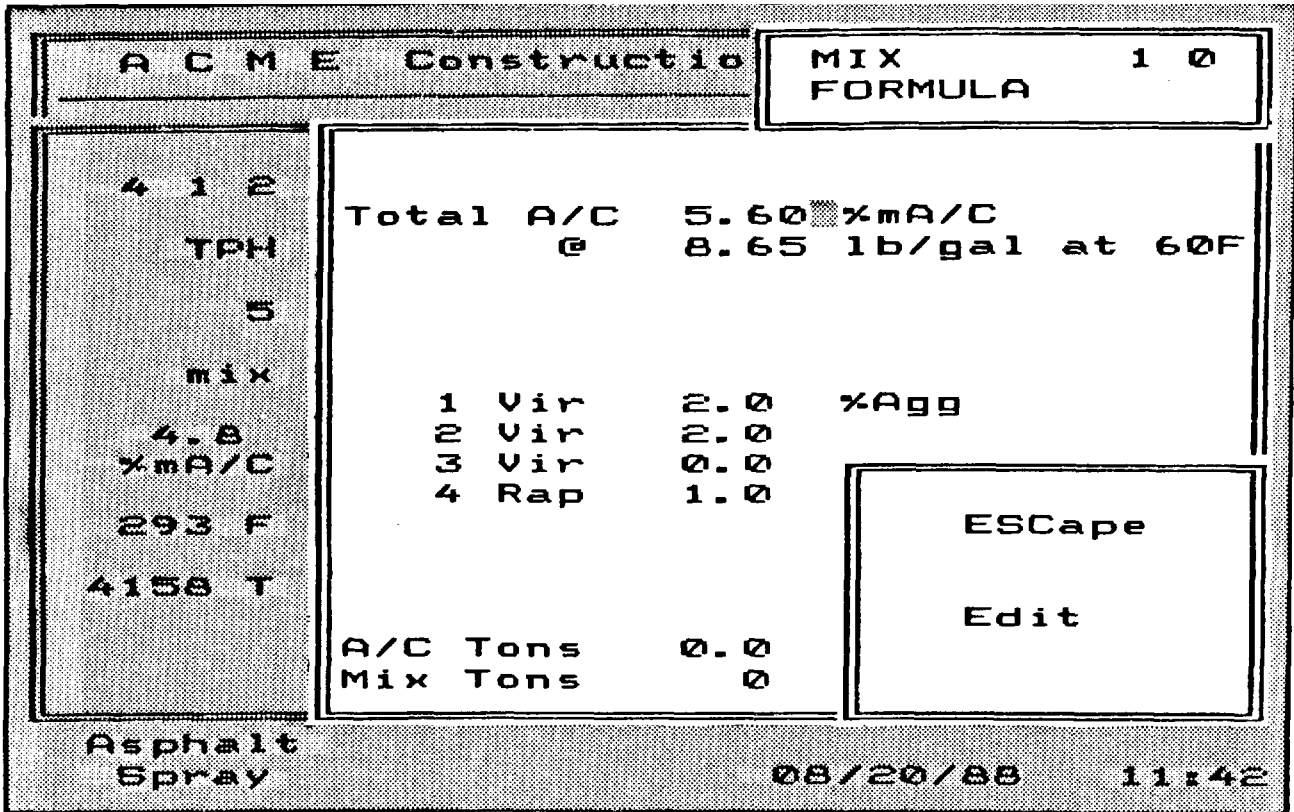


Figure 2.2

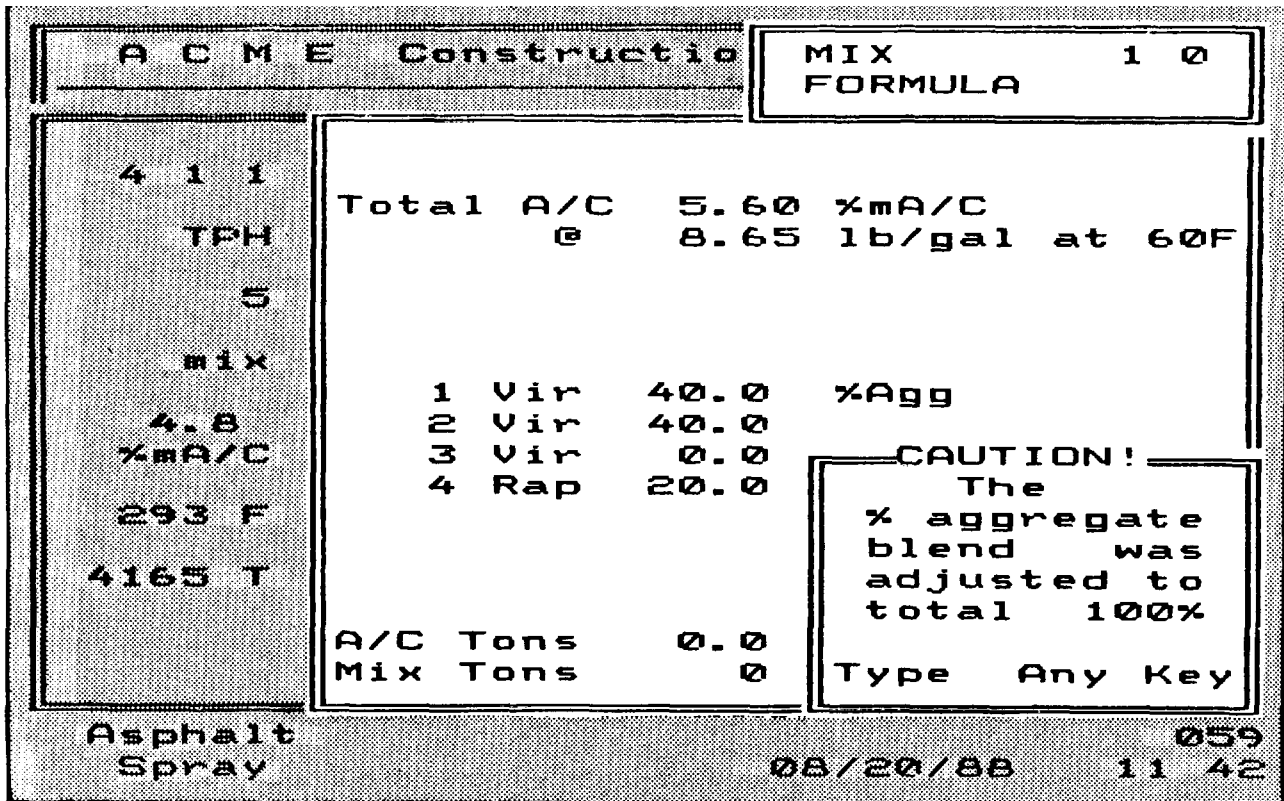


Figure 2.3

options . . [optional mix number] . . edit formulas .....EDIT mix formulas  
<2> [opt. mix (## enter)] <.00 enter>

On access to the edit formula option the flashing data entry cursor will appear after the value shown for total A/C. The options continuation list will change and the screen will appear as shown in Figure 2-2.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
Escape	ESC	Return to the previous display.
Edit	(all)	Edit the values shown on the screen in the usual manner using techniques and features described in Appendix A of this manual.

Values entered in the formula for aggregate feeder blends can be entered in any units desired. Blend values for each feeder can be entered in "Tons of each component per batch", "the TPH rate of each component at plant capacity", "the percent of each component in the total mix", or "the percent of each component in the total aggregate". In Figure 2.2 a formula has been entered requesting 5.6X oil at 8.65 lb/gal and 2 parts of aggregate each from bins 1 and 2, no aggregate from bin 3 and 1 part of RAP.

After the data is entered, the user keys ESCape to exit the editing process. At this point a warning label appears in the lower right corner of the screen as shown in Figure 2.3. This warning advises the user that the computer has, if necessary, recalculated the aggregate values so that they are specified as a percent of total aggregate, i.e. the sun of all aggregate blends totals 100X. The formula entered in Figure 2.2 as 2 parts bin 1, 2 parts bin 2 and 1 part bin 4 now appears in Figure 2.3 adjusted to 100%, i.e. 40x bin 1, 40% bin 2 and 20X RAP. In making this recalculation, the computer maintained the same relative ratios between all the aggregate components entered by the user so the formula shown should be identical to the users formula except shown on a different basis. Hit any key to see the final formula.

Remember WHAT YOU SEE IS WHAT YOU GET!

CAUTION --- Mix formulas can be edited while mix is being produced. If the mix number being edited is not being made at any point in the process, then there will be no adverse or unexpected results. If, however, the mix number being edited is currently being made, the changes entered will be effected immediately and without much opportunity for review. Changes will not be time sequenced into place. The current target mix number can be edited, and often is, but should be done quickly, carefully and preferably in small amounts.



A C M	MATERIAL PARAMETERS	Corporation
4 1 4 TPH 5 mix 4.8 %mA/C 296 F 4005 T	RAP Oil 3.5 %rA/C A/C Temp 306 F (measured)  1 Vir 4.5 %wet 2 Vir 3.0 3 Vir 2.5 4 Rap 2.9	<div style="border: 1px solid black; padding: 5px; margin: 10px 0;">                     ESCape                 </div> Edit .00
Asphalt Spray	08/20/88	443 11 22

Figure 3.0

options .....EDIT MATERIAL display  
<3>

The Edit Material Parameter subscreen is shown in Figure 3.0. Note that this V screen overlays most of the Main Operating Screen. The MIX Information and INFORMATION displays remain visible and data on the plant operation continues to be updated every second in these areas.

Shown on the Material display are the following parameters:

- Rap Oil xx.x %rA/C ..... (Optional)...The percent of reclaimed asphalt pavement that is reclaimable asphalt cement.
- A/C Temp xxx F (measured) ..... The pumping temperature of the liquid asphalt as measured automatically every second,  
or A/C Temp xxx F (entered) or as manually entered by the user.
- 1 Vir xxx.x %wet ..... The moisture of the aggregate in the first virgin feed bin.
- 2 ..... NOTE: The moistures for subsequent feed bins are similarly shown.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Return to the Main Operating Screen.
Edit	.00	Gain access to the data shown so that one or more of the parameters can be changed. Access cannot be obtained if the DATA KEY is in the DATA LOCKED position.

A C M	MATERIAL PARAMETERS	Corporation
4 2 2	RAP Oil 3.5 %rA/C	
TPH	A/C Temp 303 F (measured)	
5		
mix		
A.B	1 Vir 4.5 %wet	
%rA/C	2 Vir 3.0	
283 F	3 Vir 2.5	ESCAPE  Edit
366 T	4 Rap 2.9	
Asphalt Spray		083 08/20/88 16:11

FIGURE 3.1

options. . edit material ..... EDIT material parameters  
 <3> <.00>

On access to the edit parameter option, the flashing data entry cursor will appear after the first entry on the parameter sheet. The continuation options list will change and the screen will appear as shown in Figure 3-1.

The Continuation Options are:

OPTION	KEY	DESCRIPTION
ESCAPE	ESC	Return to the previous display.
Edit	(all)	Edit the values shown on the screen in the usual manner using techniques and features described in Appendix A of this manual.

**NOTE:** When the A/C temperature indicates that it is being (measured) automatically, the temperature cannot be changed manually. A manual value can be entered but it will not be used by the computer and the measured value will be redisplayed on ESCaping from the edit mode.

The belt scales measure the actual wet weight of the aggregate entering the dryer. A moisture correction is applied to this measurement to correct for the weight of the moisture that will be lost in the dryer. The amount of correction being applied is shown in the SCALES information display in the "x wet" column. This value has been calculated by the computer based on the individual component moistures entered on this Material Parameters sheet and the relative amount of each material specified by the current mix formula.

**NOTE:** If aggregate moistures are specified on an individual basis the computer will calculate the correct combined moisture for any selected formula based on the proportioning of the aggregates as defined by the formula being used. If individual moistures are not taken and only the combined moisture is known for a given aggregate blend, this combined value should be entered for each of the aggregates making up the combined sample and should be remeasured and reentered each time the aggregate blend or formula is changed.

A C M			CURRENT MIX PRODUCTION			
			Mix#	Tons	Mix#	Tons
4	1	3	0	0	10	0
	TPH		1	0	11	0
	5		2	0	12	0
	Mix		3	0	13	0
4.8			4	1251	14	0
XmA/C			5	4	15	0
294 F			6	0	16	0
3997 T			7	0	17	803
			8	428	18	0
			9	0	19	0
			Mix In Process # 5			3996
			Mix Total			6482
						ESC
Asphalt						382
Spray		08/20/88				11 21

Figure 5.0

options..... MIX PRODUCED display  
(5)

The Mix Produced subscreen is shown in Figure 5.0. Note that this screen overlays most of the Main Operating Screen. The MIX information and INFORMATION displays remain visible and data on the plant operation continues to be updated every second in these areas.

The mix totals from each of the twenty mix formulas are tabulated in the two columns of ten formulas each. The Mix number In Process and its total is also shown. The sum of all twenty formula totals and the In Process mix total is shown in the lower right corner as the Mix Total.

**NOTE:** The totals shown in this display are not redrawn as they are updated so that the display is actually a frozen 'snapshot' of the totals at the time the display was drawn. Hitting any numbered key causes the display to be redrawn with the updated totals.

The Continuation Option is:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCAPE (Update)	ESC (any)	Return to the Main Operating Screen. Update the totals.

A C M E Construction C			MATERIAL USE	
			Tons	
dTPH				
4 1 1	VirScale	327	3250.8	
TPH	RapScale	67	680.8	
5	+Asphalt	17.3	164.51	
mix	dTPH			
4.8	1 Vir	62	576	
%A/C	2 Vir	123	1151	
293 F	3 Vir	154	1441	
3919 T	4 Rap	62	573	
Targets 400 TP				
Asphalt Spray			ESC	
			285	
			08/20/88	
			11:18	

Figure 6.0

options ..... MATERIAL USED display  
<6>

The Material Use subscreen is shown in Figure 6.0. Note that this screen overlays the right third of the Main Operating Screen. All data on plant operation continues to be updated every second on the entire screen. The totals shown within the Material Use subscreen are also updated every second.

The tonnage shown is aligned on the display with the device to which it corresponds. For example, the VirScale tonnage is shown to the right of the VirScale dTPH rate display. In like manner the volumetric tonnage delivered by each feeder is shown.

**NOTE:** Feeder totals are calculated from the feeder rate signal in use. For feeder rates deduced from the desired target value the accumulated total is the desired target total and is not a measured value. For volumetrically measured rates the accumulated total is in volumetric tons. For weighed rates the accumulated total is in weighed tons.

All usage is in tons accumulated since the totals were last cleared to zero.

The Continuation Option is:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCAPE	ESC	Return to the Main Operating Screen.



A C M E Construction Corporation				
		dTPH	xerr	xwet
4 1 3	VirScale	331	-2.0	3.0
	RapScale	67	1.3	2.9
TPH	+Asphalt	17.6	+ .0	306 F
5				
mix				
4.8				
xmD/C				
295 F				
3940 T				
		dTPH	UTILITIES	
	1 Vir	62	ESCApe	
	2 Vir	123	T1	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ESCape                       Edit                 </div>
	3 Vir	154	C1	
	4 Rap	62	Re	
			Ca	
			Us	
	Targets	400		
Asphalt				457
Spray			08/20/88	11 19

Figure 8.0

options..... UTILITIES Menu  
 <8>

The Utilities Menu subscreen is shown in Figure 8.0. Note that this screen overlays a small portion of the lower right hand corner of the Main Operating Screen. All operating data on the visible portion of the Main Operating Screen continues to be updated every second.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCAPE	ESC	Return to the Main Operating Screen.
Time & Date	2	Set the current time and date for the system.
Clear Totals	3	Display the CAUTION screen from which ALL totals can simultaneously be set to zero.
Recordation	4	Display the Menu that allows the selection of recordation (i.e. printer) options.
Calibration	6	Display the Menu that directs the user to the displays of the system calibration values and then to the computer assisted calibration procedures.
User Options	8	Display the current list of user options. From this screen one can change the options selected.

A C M E Construction Corporation				
		dTPH	xerr	xwet
4	1 3	VirScale	331	-2.0 3.0
		RapScale	67	1.3 2.9
	TPH	+Asphalt	17.6	+ .0 306 F
	5			
	mix			
	4.8			
	xmD/C			
	295 F			
	3940 T			
		dTPH	UTILITIES	
	1 Vir	62	ESCAPE	
	2 Vir	123	T1	
	3 Vir	154	C1	
	4 Rap	62	Re	
			Ca	
			Us	
	Targets	400	Edit	
Asphalt				457
Spray			08/20/88	11 19

Figure 82.0

options. . utilities ..... TIME & DATE display  
 <8>      <2>

The Time & Date subscreen is shown in Figure 82.0. Note that this screen overlays the previous screen with the current continuation options allowed and causes the data entry cursor to appear within the INFORMATION display area at the current date.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Return to the immediately previous display.
Edit	(all)	Edit the date and time shown on the screen in the usual manner using the techniques and features described in Appendix A of this manual.

The clock does not continue to run when the computer is turned off so that the operator must enter the current time and date whenever the computer is turned on. The computer does not increment the date when the time passes 24: 00 (midnight) nor does the computer check to see if the date entered is possible.

The clock will be set to the time entered when the ESCape continuation option is selected.

A C M E Construction Corporation					
		dTPH	%err	%wet	
4	1	VirScale	334	-1.2	3.0
		RapScale	67	1.3	2.9
	TPH	+Asphalt	17.7	+0	306 F
	5				
	mix				
	4.B				
	%M/C				
	296 F				
	3948 T				
		dTPH			
	1	Vir	62		
	2	Vir	123		
	3	Vir	154		
	4	Rap	62		
		Targets	400		

**CAUTION**

To clear ALL  
Mix Produced  
and ALL  
Material Used  
totals to 0.0

Key in .00

ELSE ESCape

Asphalt  
Spray

08/20/88 11 19

Figure 83.0

options. . utilities ..... CLEAR TOTALS display  
(8> (3>

The Clear Totals subscreen is shown in Figure 83.0. Note that this screen overlays the previous menu. The CAUTION shown allows the user to safely ESCape without clearing totals if that is desired or to go ahead and clear ALL totals by entering the access code <.00>.

The DATA key must be in the open position, i.e. not locked, for the access code to be allowed.

The Continuation Options are:

OPTION	KEY	DESCRIPTION
ESCape	ESC	Return to the previous display.
(CLEAR)	.00	Clear ALL totals to zero immediately. The DATA key must be unlocked.

**NOTE:** For best record keeping, the plant operator should establish the habit of daily clearing the totals JUST PRIOR to the start of making mix. This insures that any totals accumulated during belt scale testing, emptying or recalibrating of bins, or caused by any other reason are not included as a part of the record of mix made. Accurate totals provide a convenient cross check of daily production such as:

- asphalt total versus physical tank inventory
- mix produced total minus reject material versus mix shipped
- Vir Scale total versus the sum of all virgin feed bin totals
- Rap Scale total versus the sum of all recycle feed bin totals

A C M E Construction Corporation					
		dTPH	%err	%wet	
4	1 2	VirScale	327	-2.9	3.0
	TPH	RapScale	67	1.3	2.9
	3	+Asphalt	18.3	+2.2	306 F
	mix	dTPH			
	5.0	1 Vir	62		
	%A/C	2 Vir	123		
	293 F	3 Vir	154		
	3957 T	4 Rap	62		
		Targets	400		

RECORDATION	
ESCape	
Print...	
Cal Screens	.00
Mix Formulas	1
Automatic	
Print Options	9

Asphalt			067
Spray		08/20/88	11 20

Figure 85.0

options. . utilities ..... RECORDATION menu display  
<8> <5>

See also Appendix D for samples of automatic recordation printouts.

The Recordation menu subscreen is shown in Figure 85.0. Note that this screen overlays the previous screen with the continuation options allowed for tasks related to recordation or printing.

Whenever the plant is recalibrated or is certified for use, the calibration sheets should be reprinted. With a printer the operator can make a single selection from the RECORDATION menu and print out all calibration display screens. The screen printouts are exact copies of each screen so that the printed record can be compared with the actual screen without the need to interpret the meaning of the data.

This menu also allows the operator to print a single 8 1/2 x 11 sheet of paper with all twenty mix formulas. Along with providing a permanent record of the formulas, this printout provides a convenient place for the operator to keep track of the English language names that correspond to the numbered mix formulas.

The automatic data recordation feature can be customized by the user. The data to be printed and the interval between automatic printouts can be specified on the Automatic Print Options selection sheet.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCAPE	ESC	Return to the previous display.
Print Cal Screens	.00	Print all calibration display screens. The DATA key must be unlocked.
Print Mix Formulas	1	Print all twenty mix formulas.
Automatic Print Options	9	Display the current automatic, periodic, recordation options. From this screen any of the options can be edited.



A C M E Construction Corporation		Mix Formulas		08/20/88	00:49		
Mix#	%A/C lb/gal	1 Vir	2 Vir	3 Vir	4 Rep Totals		
0	0.00	8.62	0.00	0.00	0.00	0	
1	0.00	8.62	0.00	0.00	0.00	0	
2	0.00	8.62	0.00	0.00	0.00	0	
3	0.00	8.62	0.00	0.00	0.00	0	
4	6.10	8.62	40.00	20.00	40.00	0.00	1251
5	4.80	8.62	15.38	30.77	38.46	15.38	4
6	0.00	8.62	0.00	0.00	0.00	0.00	0
7	0.00	8.62	0.00	0.00	0.00	0.00	0
8	5.30	8.62	50.00	50.00	0.00	0.00	428
9	0.00	8.62	0.00	0.00	0.00	0.00	0
10	5.60	8.65	40.00	40.00	0.00	20.00	0
11	0.00	8.62	0.00	0.00	0.00	0.00	0
12	4.80	8.62	83.33	0.00	0.00	16.67	0
13	0.00	8.62	0.00	0.00	0.00	0.00	0
14	0.00	8.62	0.00	0.00	0.00	0.00	0
15	0.00	8.62	0.00	0.00	0.00	0.00	0
16	0.00	8.62	0.00	0.00	0.00	0.00	0
17	5.60	8.62	57.14	28.57	0.00	14.29	803
18	0.00	8.62	0.00	0.00	0.00	0.00	0
19	0.00	8.62	0.00	0.00	0.00	0.00	0
-----							
Mix# 5 in Process					3695		
-----							
Total Mix Produced					6180		

Figure 851.0

options. . utilities..... recordationMIX FORMULA printout  
<8> <5>

An example printout of the twenty (20) mix formulas is shown in Figure 851.0

The data in this mix formula printout is arranged in a table of rows and columns. Each row displays one mix design formula. Blank space is available at the left of each formula for the operator to hand write in the actual name by which he commonly knows this numbered mix. The column descriptions are shown at the top of the table of data.

The totals printed are the mix formula totals accumulated since all totals were last cleared to zero.

As a matter of good record keeping, the user may elect to print the sheet of all Mix Formulas and mix totals at the end of each day and immediately after any changes are made to the design of any mix formula(s).

AUTOMATIC RECORDATION OPTIONS	
1-Individual MOISTURES	are printed
2-Individual RATES	are printed
3-Individual TOTALS	are not printed
4-Individual BLENDS	are printed
5-ERROR OCCURRENCES	are printed
8-Record printed every 15 Min (0=off)	
OPTIONS: ESCape / Change Line #	
Asphalt Spray	08/20/88 11 20

Figure 859.0

options. . utilities . . recordation ..... AUTOMATIC PRINT OPTIONS display  
<8>    <5>    <9>

The Automatic Print Options display is shown in Figure 859.0. Note that even though this display overwrites the entire Main Operating Display, the plant operation and data gathering continues uninterrupted.

Lines 1 through 5 define the user selected print status for five different process parameters. By editing this display the user can specify whether any or all of these parameters are to be printed as a part of the data recordation format.

Line 8 on the display is the recordation interval. If this interval is set to 0 Minutes, the automatic recordation of plant data is turned off.

All recordation is turned off if the printer is not turned ON or if the printer Select light on the printer front panel is OFF.

**NOTE:** None of the settings in this display or of the printer affect the computer control of the plant operation. The plant is always being controlled by the computer even during the time when it appears the computer is busy printing.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Return to the previous display.
Edit	.00	Gain access to the displayed data so that it can be changed. The DATA key must be unlocked.
Print	9	Print this screen display. The printer must be turned ON and SELECTed.

AUTOMATIC RECORDATION OPTIONS	
1-Individual MOISTURES	are printed
2-Individual RATES	are printed
3-Individual TOTALS	are not printed
4-Individual BLENDS	are printed
5-ERROR OCCURRENCES	are printed
8-Record printed every 15 Min (0=off)	
OPTIONS: ESCape / Edit .00 / Print 9	
Asphalt Spray	08/20/88 11:20

Figure 859.1

options . . utilities. . recordation. . auto print options .....EDIT PRINT Options  
<8>        <5>        <9>        <.00>

The Automatic Print Options display in the EDIT mode is shown in Figure 859.1. The only apparent difference from the previous display is in the continuation options display. The flashing edit cursor is shown in the continuation options window following the option to Change Line # ?.

All lines in the Automatic Print Options display with the exception of line #8 have only two possible states; the described line will be or will not be printed. Changing the recordation option shown on any numbered line is done by keying in the corresponding line number. For example, successive strikes of the '3' key cause the "Individual TOTALS" to be or not to be printed as part of the automatic options.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Return to the previous display.
Change Line #	1-7	Cause the corresponding line to be or not to be printed in the automatic recordation format.
Change Line #	8	Allow the automatic recordation interval to be changed.

Line #8 allows the user to set the desired frequency of the automatic printout. After 'changing line #8', the cursor appears after the displayed recordation interval shown in line #8. The user can then change the interval as desired. A value of zero (0) minutes will cause the automatic feature to be turned off. Demand prints will still be allowed. Automatic print intervals of 0 to 60 minutes are allowed.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Return to the previous display.
Edit	(all)	Edit the time interval using the techniques and features described in Appendix A of this manual.

A C M E Construction Corporation				
		dTPH	%err	%wet
4 2 0	VirScale	336	- . 5	3 . 0
TPH	RapScale	66	1 . 0	2 . 9
5	+Asphalt	17.9	- . 0	303 F
mix				
4.8				
%A/C				
283 F				
458 T				
		dTPH		
		1 Vir	62	ESCaPe
		2 Vir	123	Alarm Limits 2
		3 Vir	154	Time Delays 3
		4 Rap	62	Meters 5
		Targets 400		Feeder Rates 8
Asphalt				
Spray				
		08/20/88		16 24

Figure 86.0

options . . utilities ..... CALIBRATION display  
<8> <6>

The Calibration menu subscreen is shown in Figure 86.0. Note that this screen overlays the previous menu with the continuation options allowed for calibration and system configuration tasks.

Some process control systems are calibrated with screwdriver, voltmeter, and stopwatch and leave the operator with no certain knowledge of the exact settings for current or previous calibrations. This computer is calibrated through the keypad so that all calibrations are numeric values that can be printed and kept for reference. Consistency of values from calibration to calibration indicate system stability. Unauthorized changes to calibrations can quickly and certainly be determined by comparison with the printed and dated calibration record. For most cases, the entire computer could be replaced and after installing the 'old' calibration values would be in tolerance.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Return to the previous display.
Alarm Limits	2	Display the screen containing the user selected alarm tolerances and the time for a continuous out of tolerance condition to cause plant shutdown. From this screen all values can be edited.
Time Delays	3	Display the screen containing the user measured process timing intervals. Each time interval is the time required for a material to reach the point of liquid asphalt addition as measured from the point at which the material is controlled. From this screen all values can be edited.
Meters	5	Display the screen containing the zero and span calibration values for all 'meters'. From this screen all values can be edited. From this screen various computer assisted calibration procedures can be selected.
Feeder Rates	8	Display the screen containing the span calibration values for the feeders. From this screen all values can be edited. From this screen various computer assisted calibration procedures can be selected.





options . . utilities . . calibration .....ALARM LIMITS display  
 <8>      <6>      <2>

The Alarm Limits & Shutdown interval display is shown in Figure 862.0 Note that even though this display overwrites the entire Main Operating Display, the plant operation and data gathering continues uninterrupted.

This display shows the current process deviations that are allowed before alarms are annunciated. Also shown are the time intervals during which a continuous alarm must persist before automatically causing the process to be halted. If any time interval is set to 0 seconds, that particular alarm is disabled, will never annunciate, and can never shut down the process. The maximum shutdown interval is 255 seconds.

The alarm limit for either the virgin or recycle scale is shown in per cent of total aggregate request. Deviations of plus or minus the limit shown are allowed. For example, at a target aggregate rate of 200 dTPH and 20% recycle, a 5% recycle scale error would be annunciated if the actual recycle rate was 30 TPH (15% of 200 TPH) or 50 TPH (25% of 200 TPH).

The alarm limit for A/C Blend is the difference between the target A/C value in percent and the actual measured A/C value in per cent. Again, the allowable deviation is plus or minus the percentage shown. For example, at 200 TPH of virgin aggregate a target of 5%mA/C requires 10.5 TPH of A/C. At 9.9 TPH the added A/C is 4.7x and the deviation is - 0.3%mA/C. At 11.2 TPH, the added A/C is 5.3x and the deviation is +0.3%mA/C.

The Divert Error does not need a limit value. It is the time during which the RUN-DIVERT valve is not in the expected position.

The Feeder Error also does not need a limit value. It is the time during which the low aggregate alarm switch or some other means indicates that inaccurate delivery of aggregate is probably occurring.

The Continuations Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Return to the previous display.
Edit	.00	Gain access to the data shown so that one or more of the parameters can be changed. Access cannot be obtained if the DATA KEY is in the DATA LOCKED position.
Print	9	Print this screen display. The printer must be turned ON and SELECTed.

ALARM LIMITS & SHUTDOWNS		
Parameter Monitored	Alarm Limit	Time to Shutdown
VirScale	10.0 %	30 sec
RapScale	5.0 %	120 sec
A/C Blend	+ .30 %	5 sec
Divert Error		10 sec
Feeder Error		30 sec

OPTIONS: ESCape / Edit .00 / Print 9

Asphalt Spray 08/20/88 213 16 36

Figure 862.1

options . . utilities . . calibration . . alarm limits ..... EDIT ALARM Limits  
 <8>            <6>            <2>            <.00>

The Alarm Limits and Shutdowns display in the EDIT mode is shown in Figure 862.1The only apparent difference from the previous display is in the continuation options display. The flashing edit cursor is initially shown following the Virgin scale deviation limit value.

**NOTE:** When not required by governing specification some users will not physically connect the computer hardware that actually shuts down the process. When this is done, alarms will be annunciated but corrective action or shutdown will be left to the plant operator. Alarm annunciations cannot be silenced.

Remember

- no errors are annunciated or shutdowns can occur if the Time to Shutdown is set to 0 seconds, i.e. turned off.
- actual values deviating from the desired target values by more than plus or minus the limit value are annunciated.
- maximum time to shutdown is 255 seconds.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCAPE	ESC	Return to the previous display.
Edit	(all)	Edit the values shown on the display using the techniques and features described in Appendix A of this manual.

PROCESS DELAY INTERVALS			
VirScale	65	sec	-NOTE-
RapScale	25	sec	
1 Vir	90	sec	Material travel time is measured from the device to the point of asphalt addition
2 Vir	87	sec	
3 Vir	86	sec	
4 Rap	36	sec	
OPTIONS: ESCape / Edit .00 / Print 9			
Asphalt			321
Spray		08/20/88	16 37

Figure 863.0

options . . utilities . . calibration ..... PROCESS DELAYS display  
 <8>            <6>            <3>

The display of Process Time Delays is shown in Figure 863.0 Note that even though this display overwrites the entire Main Operating Display, the plant operation and data gathering continues uninterrupted.

A **-NOTE-** is shown on the display defining the time interval measurement expected by the process computer. Each delay interval is the length of time that it takes for material to reach that point in the system where the liquid asphalt is being added. For scales it's the time it takes a rock to travel from the scale to the point of asphalt injection. For a feeder it's the time it takes for material to travel from the feeder to the point of asphalt injections.

The feeders can be numbered in any sequence although the delays for each virgin feeder must be more than the Vir Scale delay. Likewise, the delays for each recycle feeder must be more than the Rap Scale delay. That is, the process computer assumes that the virgin (recycle) scale is physically located between the virgin (recycle) feeders and the point of A/C injection.

With correctly set intervals there will be negligible material rejected on startup or shutdown and no major scale errors indicated during production rate change.

Generally, once the rates are determined, they will not need to be redone unless there is a massive change in material moisture, or a change in drum slope.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCAPE	ESC	Return to the previous display.
Edit	.00	Gain access to the displayed data so that it can be changed. The DATA key must be unlocked.
Print	9	Print this screen display. The printer must be turned ON and SELECTed.

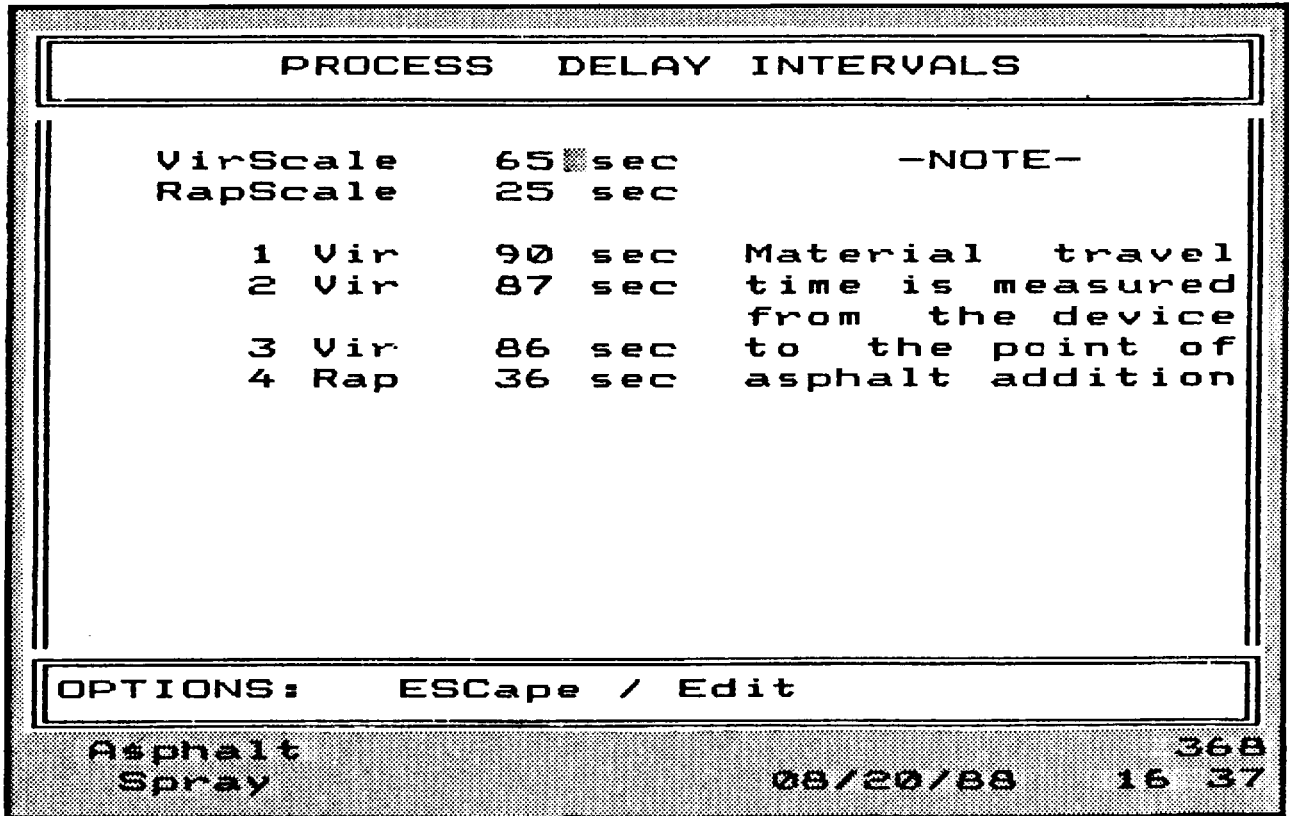


Figure 863.1

options . . utilities . . calibration . . time delays ..... EDIT PROCESS Delays  
<8><6><3><.00>

The display of Process time Delay Intervals in the EDIT Rode is shown in Figure 863.1The only apparent difference from the previous display is in the continuation options display. The flashing edit cursor is initially shown following the first time interval data entry.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Return to the previous display.
Edit	(all)	Edit the data shown in the usual manner using the techniques and features described in Appendix A of this manual.



Actual interval measurement is usually done in two parts. First material is run from the furthest bin and the time for this material to travel between bins is measured and recorded. The travel time from the furthest bin to the scale can also be measured and recorded. Next, the travel time of material from the scale to the point of asphalt injection is estimated. This interval is hard to accurately measure as it is affected by materials, rates, burner air etc. Often it is easier to estimate this number and correct it under actual operating conditions.

For example: (in this example Bin 1 is the furthest bin) Actual material travel times are measured as follows:

Bin 1 to Bin 2 = 3 seconds Bin 1 to Bin 3 = 4 seconds Bin 1 to Vir Scale = 25 seconds

Assume Vir Scale to A/C = 70 seconds

Then

Vir Scale to A/C = 70 sec.  
 Bin 1 to A/C = Bin 1 to Scale + Scale to A/C = 95 sec.  
 Bin 2 to A/C = Bin 1 to A/C - Bin 1 to Bin 2 = 92 sec. Bin 3 to A/C = Bin 1 to A/C - Bin 1 to Bin 3 = 91 sec.

Enter these numbers in the computer. Now suppose on making actual mix some 5 seconds worth of material must be rejected because it was not coated. This happens when material actually gets to the point of A/C injection before expected. All time intervals should be shortened by 5 seconds because the A/C injection point is 5 seconds closer than thought.

The new values would then become:

Vir Scale to A/C = 70 - 5 = 65 sec. Bin 1 to A/C = 95 - 5 = 90 sec.  
 Bin 2 to A/C = 92 - 5 = 87 sec. Bin 3 to A/C = 91 - 5 = 86 sec.

The rules are:

On normal startup-if reject has too little oil shorten all intervals-if reject has too much oil lengthen all intervals

On normal cleanout/shutdown-if reject has too much oil -shorten all intervals-if reject has too little oil lengthen all intervals

Using the above rules the operator should be able to reach the point of having negligible waste at both startup and shutdown because of incorrect oil content.

METER CALIBRATIONS			
	zero	span	
VirScale	14264	499.2	ESCAPE
RapScale	14226	500.0	Edit .00
A/C meter		1000.0	Calibrate...
A/C Temp	14400	571.0	Rates by
Mix Temp	14400	571.0	Avg Value 2
			Agg Scales
			by Sample 4
			A/C meter
A/C Slew	4.00	TPH/sec	by Sample 6
VirBelt	187.4	pps ref.	Screen
RapBelt	187.0	pps only	Print 9
asphalt			419
divert			08/20/88 17:40

Figure 865.0

options.....utilities.....calibration .....METER CALIBRATIONS display  
<8>                   <6>                   <5>

The Meter Calibrations display is shown in Figure 865.0Note that even though this display overwrites the entire Main Operating display, the plant operation and data gathering continues uninterrupted.

The Continuation Options are:

<u>OPTIONS</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Return to the previous display.
Edit	.00	Gain access to the data shown so that one or more of the parameters can be changed. Access cannot be obtained if the DATA KEY is in the DATA LOCKED position.
<u>Calibrate</u> Rates by Avg Value	2	Display a running average of current actual readings from each scale and meter. From this screen the operator can elect to run a 6 minute timed scale check with automatic printout or automatically adjust zero or span values to known average values.
Avg Scales by Sample	4	Go to the procedure for calibrating aggregate scales to the measured weight of a sample load.
A/C meter by Sample	6	Go to the procedure for calibrating the asphalt meter to the measured weight of a sample load.
Screen Print	9	Print this screen display. The printer must be ON and SELECTed.

METER CALIBRATIONS			
	zero	span	
VirScale	14264	499.2	ESCape
RapScale	14226	500.0	
A/C meter		1000.0	
A/C Temp	14400	571.0	
Mix Temp	14400	571.0	
A/C Slew	4.00	TPH/sec	Edit
VirBelt	187.6	pps ref.	
RapBelt	187.0	pps only	
asphalt			465
divert			08/20/88 17:40

Figure 865.1

options .....utilities ..... calibration .....meters ..... EDIT METER Calibrations  
 <8>                    <6>                    <5>                    <.00>

The Meter Calibrations display in the EDIT mode is shown in Figure 865.1The only apparent difference from the previous display is in the continuation options display. The flashing edit cursor is initially shown following the Virgin scale zero calibration value.

The aggregate belt scale speed is shown in pps (pulses eer second) at the bottom of the display. This data is shown as measured by the speed pickup and cannot be edited.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Return to the previous display.
Edit	(all)	Edit the values shown on the screen in the usual manner using the techniques and features described in Appendix A of this manual.

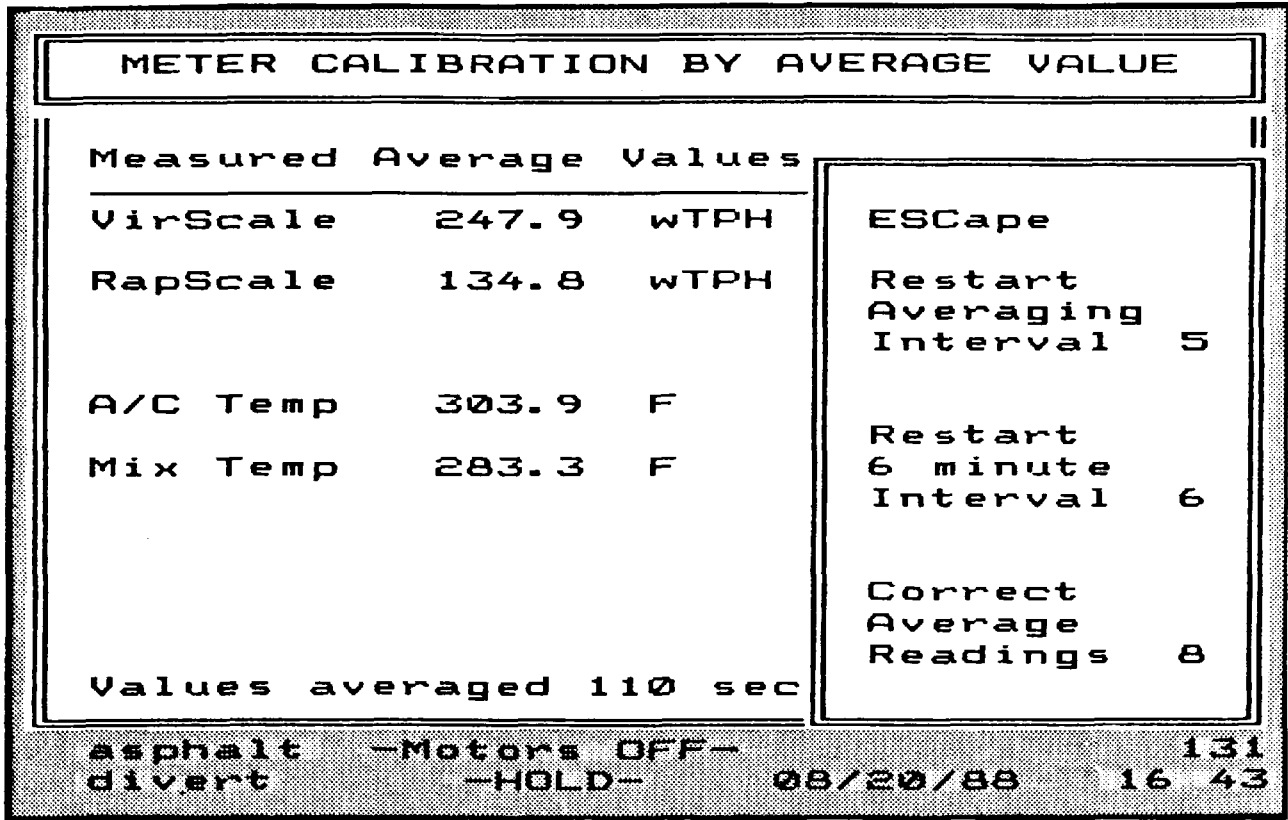


Figure 865.2.0

options .....utilities ..... calibration .....meters ..... EDIT METER Calibrations  
 <8>                      <6>                      <5>                      <2>

The Meter Calibration by Average Value display is shown in Figure 8652.0 Note that even though this display overwrites the entire Main Operating Display, the plant operation and data gathering continues uninterrupted.

**WARNING:** This screen does NOT lock out the A/C. The use of test weights or chains on the virgin scale will simulate a virgin aggregate rate that may cause the asphalt value to switch to the RUN position. To avoid this the operator could:

- or                      A) Go to MOTORS-OFF-HOLD B) Switch to DIVERT-LOCK C) Turn off the asphalt pump
- D) Turn off the air to the RUN/DIVERT valve

This screen displays a running average of the current values of certain meters and scales. The length of time during which the averages have been accumulating is shown at the bottom of the screen. Erratic signals can be accurately measured by averaging over a sufficiently long interval.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u> _____
ESCape	ESC	Return to the previous display.
Restart Averaging Interval	5	Restart the averaging calculation and the averaging time interval. Averaging will proceed from this instant until stopped by the user.
Restart 6 Minute Interval	6	Restart the averaging calculation and the averaging time interval. At the end of 360 seconds the averaging process will be momentarily frozen at its 6 min. value and a summary scale report will be printed if the printer is ON and SELECTed.
Correct Average Readings	8	Freeze the averaged measured data and allow the operator to enter actual data values. If the actual and measured values are different, the computer will correct the appropriate zero or span calibration value.

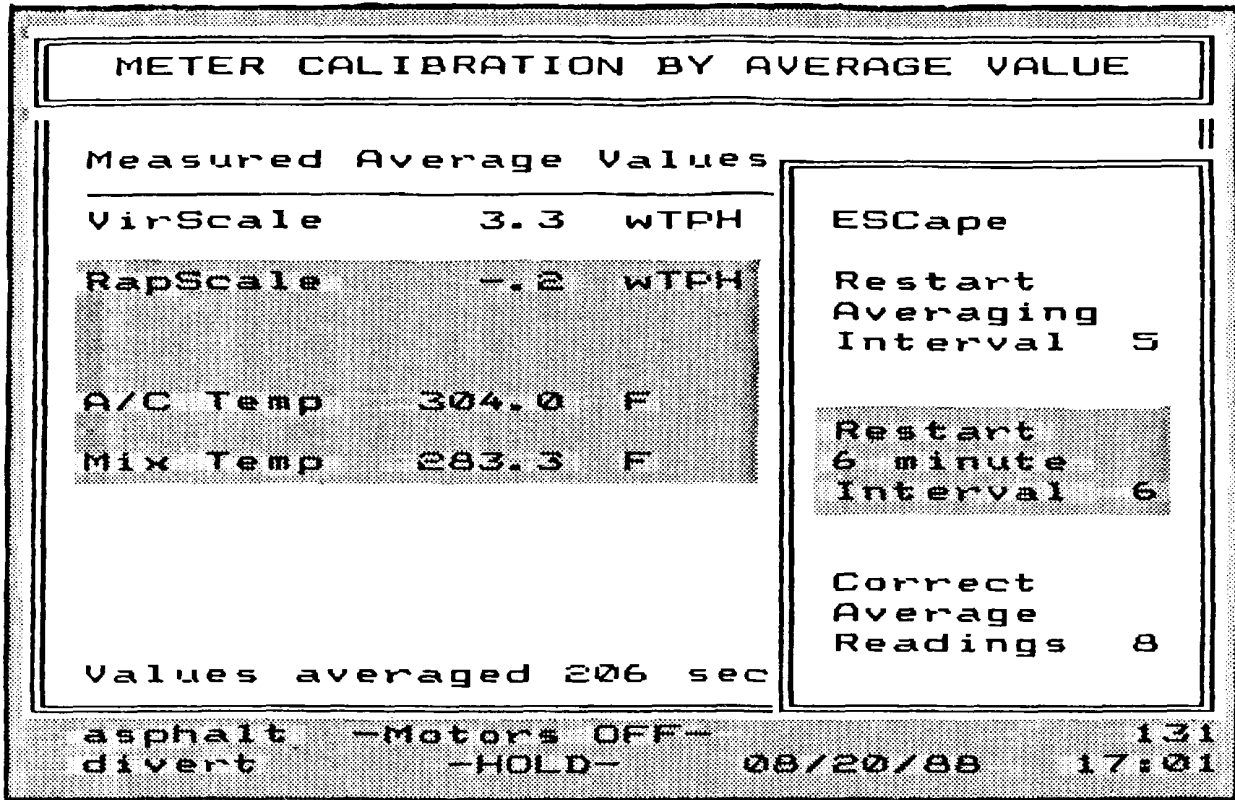


Figure 8652.1

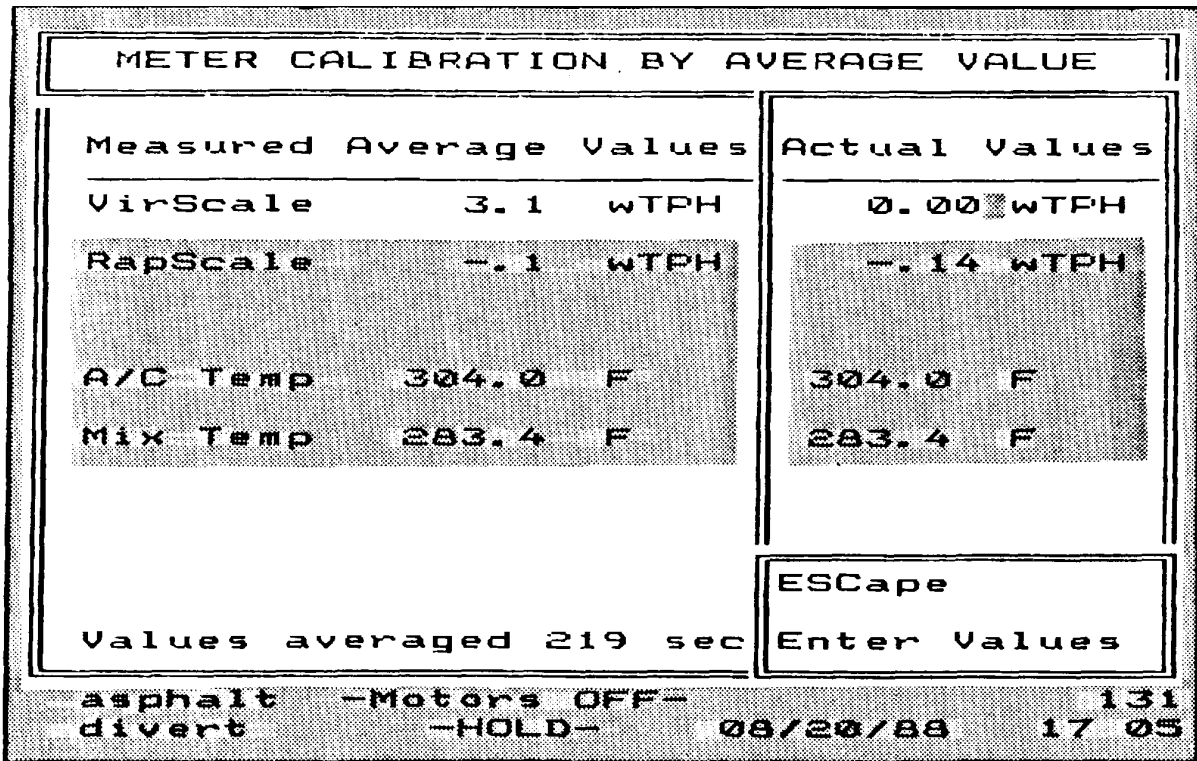


Figure 8652.2



## CORRECTING A ZERO READING

The following procedure is given for a belt scale. With the computers built in belt scale auto zero capability, this procedure may never be required. The sequence describe might be applicable to the zero adjustment of other meters.

- 1) Print a current copy of the Meter Calibration values. (keystrokes 8659)
- 2) Start the belt scale. Run it empty for a minimum of 15 minutes or as long as necessary to establish a stable reading.
- 3) Select the METER CALIBRATION BY AVERAGE VALUE display (keystrokes 8652). See Figure 8652.1 Place the asphalt switch in the DIVERT LOCKED position!
- 4) Restart the averaging interval by selecting Option 5. If the belt scale is stopped and restarted or material falls on the belt or anything else causes an erratic signal during the averaging interval, the averaging process should be restarted by selecting Option 5.
- 5) Let the data average for greater than 180 seconds and until the displayed rate is stable.
- 6) Select Option 8 to Correct Average Readings if the measured rate is non-zero. See Figure 8652.2
- 7) Select and change to zero (0) the actual values of only those meters (scales)for which this test applies.
- 8) Verify that no other zero or any span numbers have changed from the data printed in Step 1.
- 9) As necessary verify the new zero by repeating this procedure starting at Step 3.

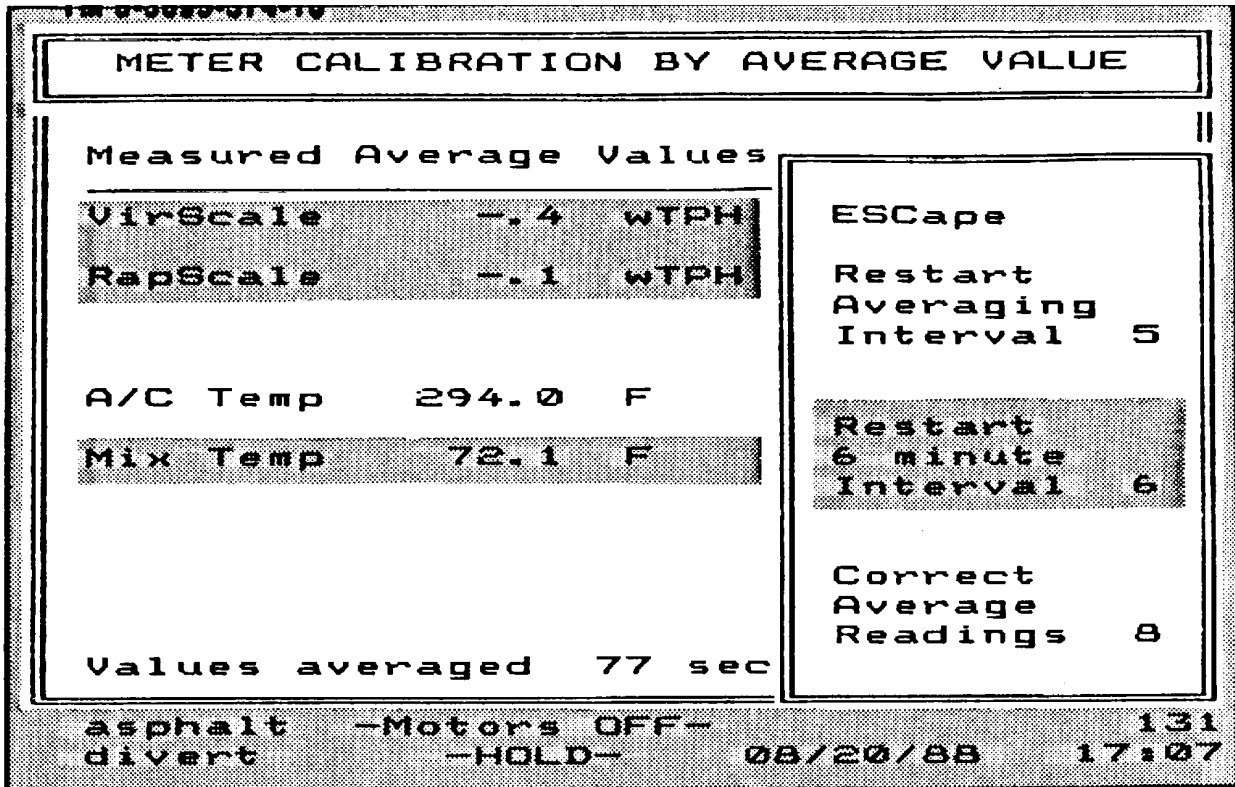


Figure 8652.3

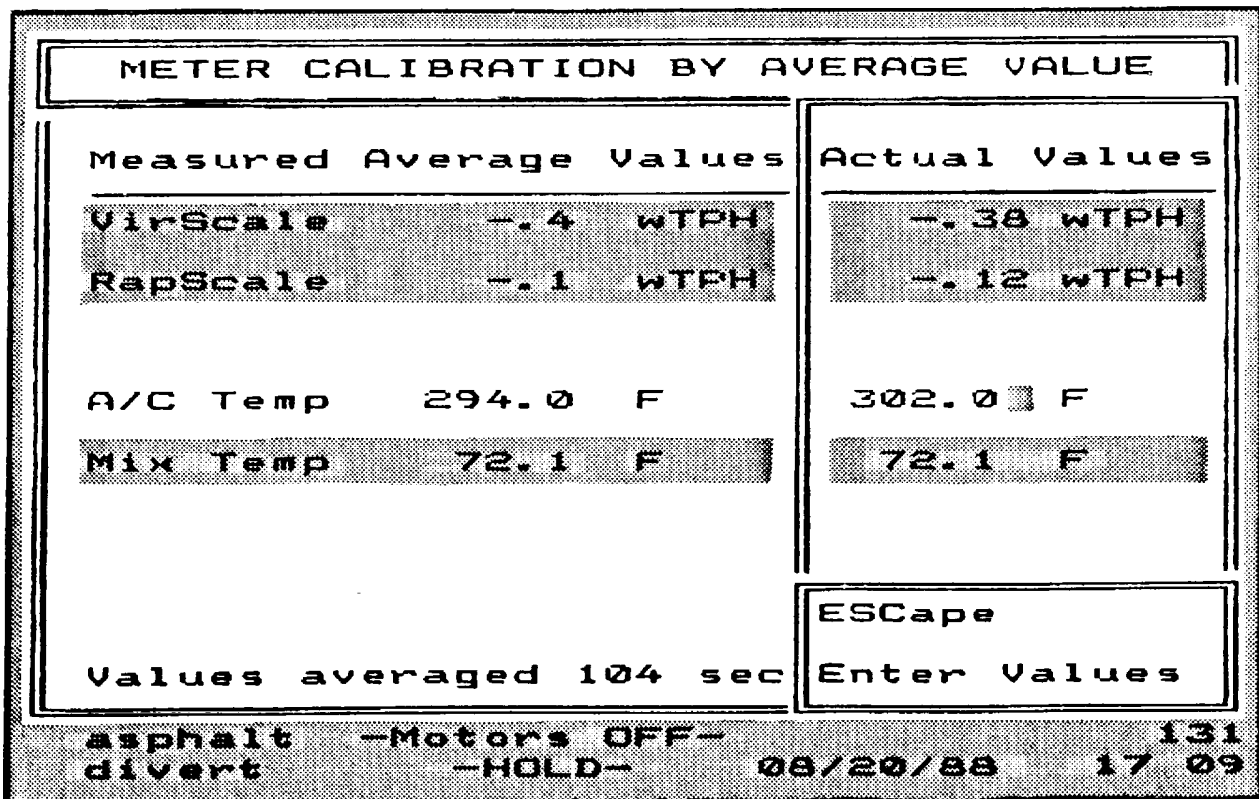


Figure 8652.4

## CALIBRATION to a KNOWN VALUE

The following procedure is given for the A/C temperature probe. It could also apply to a conveyor belt scale where test weights are lowered to cause a known equivalent aggregate rate.

- 1) Print a current copy of the Meter Calibration values (keystrokes 8659)
- 2) Place the temperature probe in a liquid of known temperature  
or  
Obtain a stable belt scale zero. Lower the test weights.
- 3) Select the METER CALIBRATION BY AVERAGE VALUE display (keystrokes 8652) See Figure 8652.3
- 4) Restart the averaging interval by selecting Option 5. If for any reason the test does not remain under constant conditions, correct the inconsistency and restart the measurement interval by selecting Option 5.
- 5) Let the data average until the displayed value is stable. See Figure 8652.4
- 6) If calibration is desired, select Option 8 to Correct Average Readings, otherwise ESCape or return to Step 4.
- 7) Select and Enter the actual known value(s) for only those meters for which this test applies.
- 8) Verify that no other span or any zero numbers have changed from the data printed in Step 1.
- 9) As necessary, verify the new span calibration by repeating this procedure starting at Step 3.

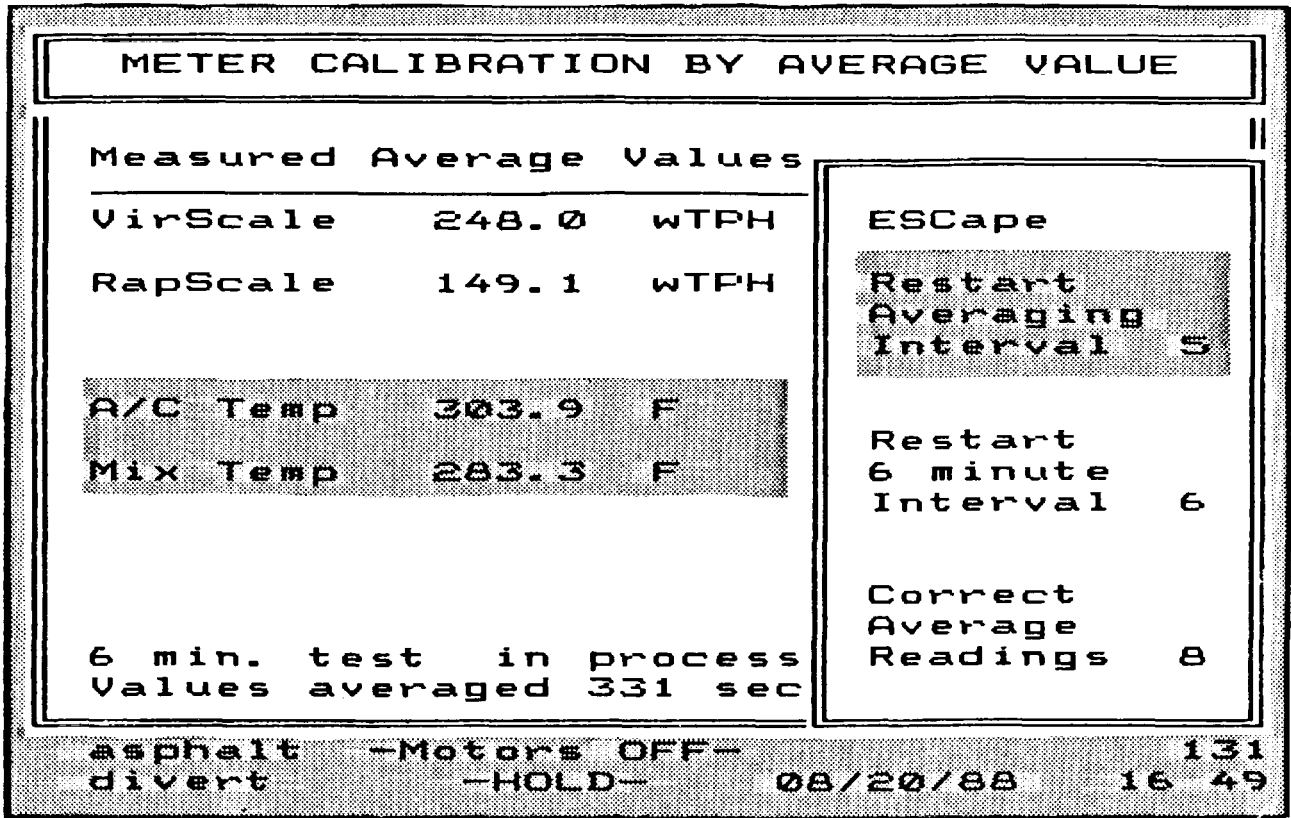


Figure 8652.5

### 6-MINUTE TIMED VERIFICATIONS

The 6-minute timed scale test provides a convenient method for verifying belt scale calibrations under controlled conditions. The operator controls the start of the test. During the following 6-minute interval, the average equivalent aggregate rate, accumulated tons and average belt speed is measured for each scale. This data is automatically printed at the end of the interval.

NOTE: Belt speed is printed because the equivalent rate and totals determined by test weights is directly proportional to belt speed. On generator supplied plants, belt speed is proportional to generator frequency.

- 1) Start belt conveyors, run empty for at least 15 minutes and verify or establish a stable zero reading.
- 2) Select the METER CALIBRATION BY AVERAGE VALUE display (key strokes 8652). See Figure 8652.5
- 3) Optional: Restart the 6-minute Interval by selecting Option 6. At the end of 6 minutes a record verifying zero will be printed.
- 4) Place the asphalt switch in DIVERT LOCKED position! Lower the test weights on the scale.
- 5) Restart the 6-minute Interval by selecting Option 6. At the end of 6 minutes a record of the equivalent aggregate rate will be printed. See Figure 8652.6. Verify this data is (within allowable tolerance) equal to the values recorded during scale certification.

NOTE: Left unattended, the computer will continue to repeat these 6-minute tests and printouts.

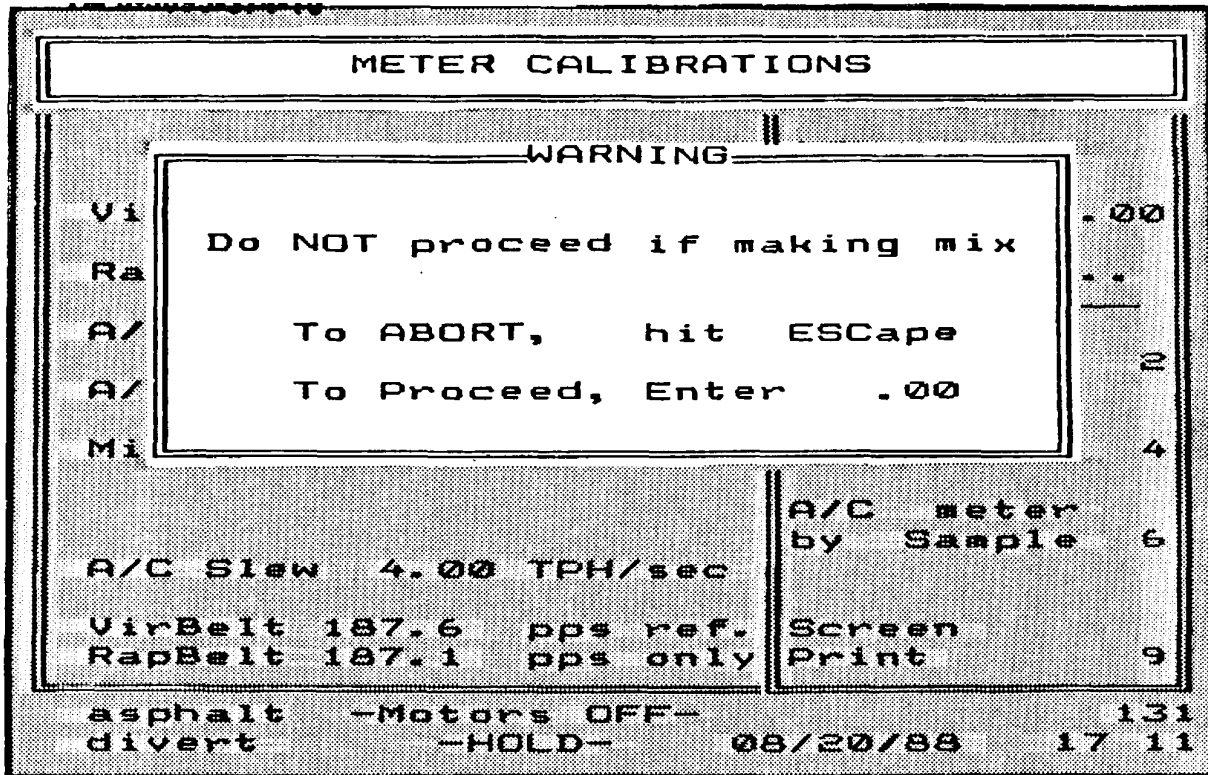


Figure 8654.0

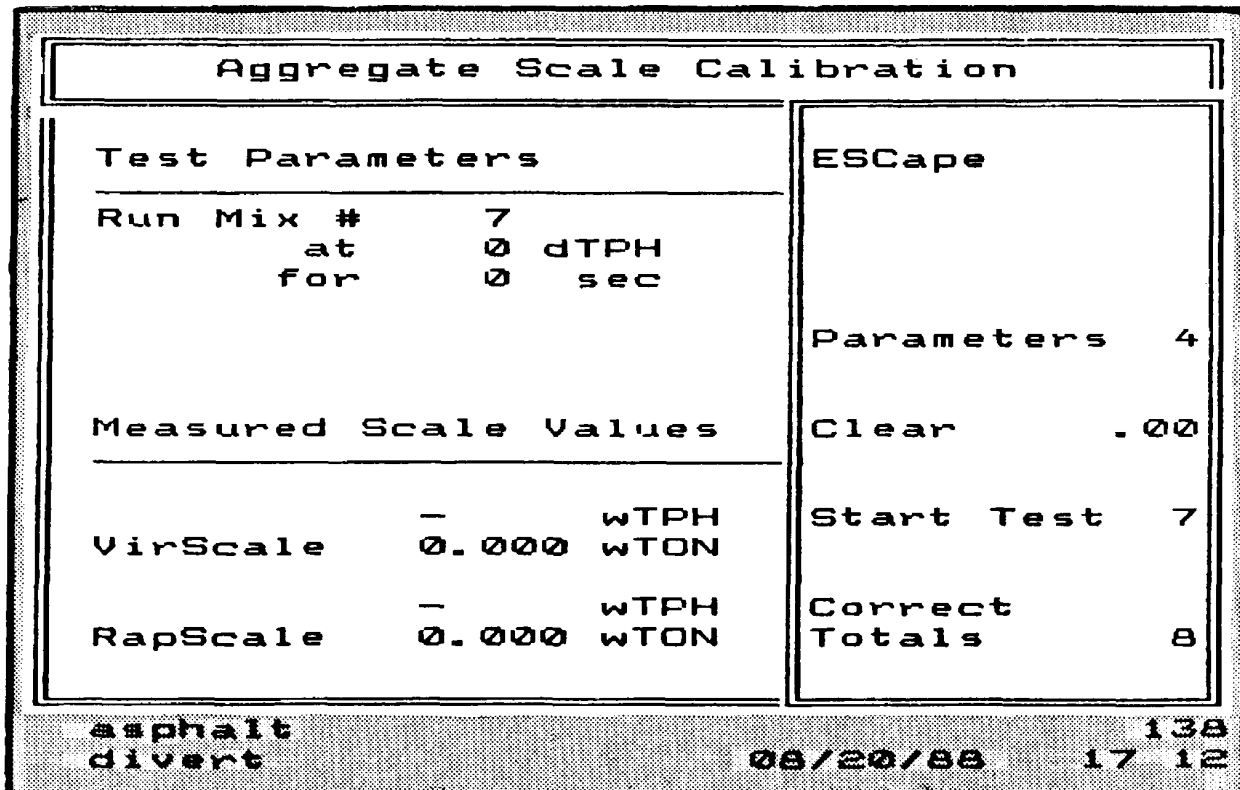


Figure 8654.1

options .....utilities..... calibration ..... meters ..... Aggregate Scales by Sample  
 <8>                    <6>                    <5>                    <4>

Calibration of the Aggregate Scales by weighed load Sample is one of the procedures that can not be run while making mix. On selecting this procedure the WARNING display shown in Figure 8654.0 will be shown. Note that even though this warning is displayed, the plant operation and data gathering continues uninterrupted.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Return to the previous display. There has been and will be no interrupting of plant operation.
(Access)	.00	Interrupts plant operation. Diverts A/C. Gain access to the aggregate scale calibration procedure displayed in Figure 8654.1

The calibration display of Figure 8654.1 is a single form containing all the information necessary to calibrate the virgin (or recycle) conveyor scale by weighed loads.

The upper left portion of the display shows the Test Parameters. The desired combination of bins that will run during this test is specified by the parameter MIX #. The rate at which the scale will be calibrated is determined by the rate parameter shown in dTPH. The length of time the feeders will run can be preset with the time interval parameter shown in seconds.

The Measured Scale Values are displayed in the lower left portion of the display. These are the totalizer displays of instantaneous rate and accumulated wet tons.

The actual procedure is defined by the continuation options in the order shown.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Return to the previous display.
Parameters	4	Enter Test Parameter data.
Clear	.00	Clear all totals.
Start Test	7	Run the selected Mix.
Correct Totals	8	Enter recalibration data.

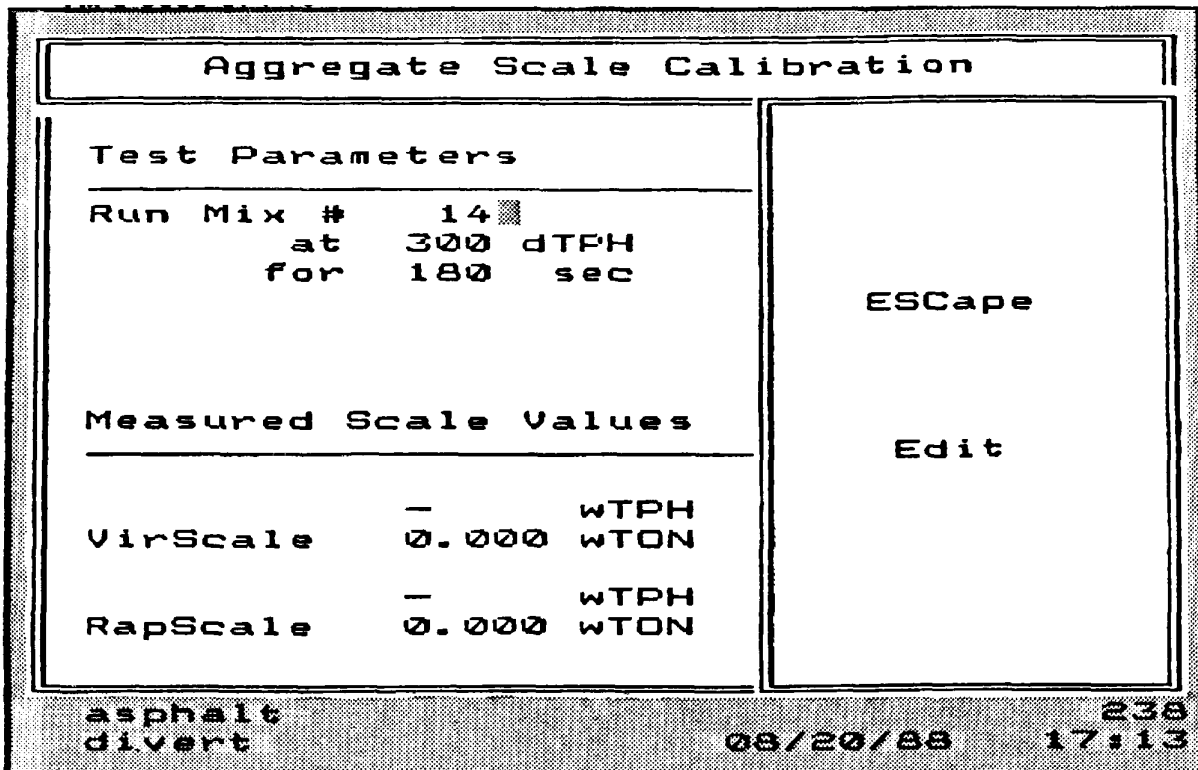


Figure 8654.2

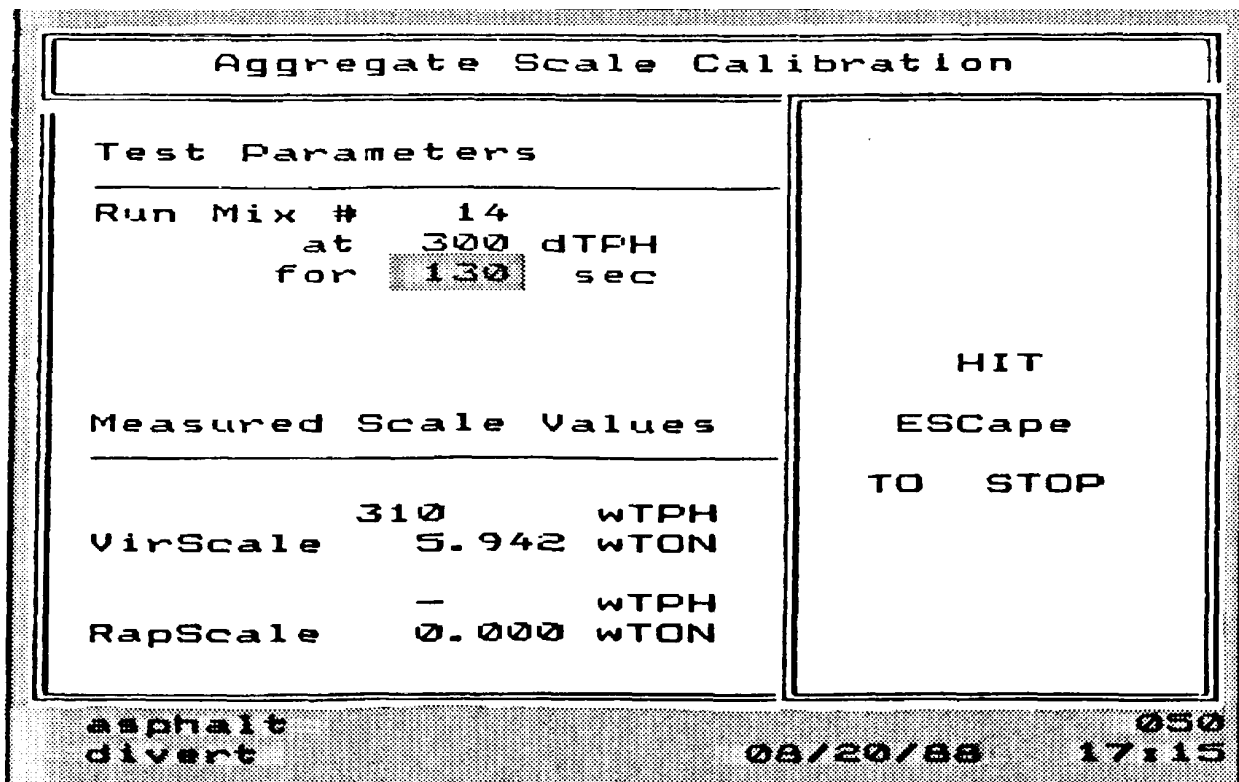


Figure 8654.3



.....Aggregate Scale Calibration

In the weighed load procedure, actual material is run across the belt scale and collected in a truck. The truck is then weighed and its net weight compared to the belt scale totalizer. Corrections are made as necessary until the net truck and belt scale weights are equal.

The following procedural steps are concerned primarily with operation of the computer and assume that the operator has made ready the proper equipment. See also Appendix G.

- 1) Run the equipment until it will respond stably and uniformly.
- 2) Set up an unused formula for one or more feeders to supply the desired test aggregates at rates up to the maximum plant capacity.
- 3) Print a current copy of the meter calibration values. (keystrokes 8659)
- 4) Obtain a stable belt scale zero.
- 5) Go to the Aggregate Scale Calibration display. (keystrokes 8654.00)
- 6) Select Option 4 to set the desired Test Parameters. See Figure 8654.2

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Return to the previous display.
Edit	(all)	Enter the test parameters shown.

Specify the mix # set up in Step 2 above. Specify the desired test rate. Specify a desired test interval that will fill the sample truck or a large value and manually stop the test when desired. ESCape when all the desired test Parameters have been entered.

- 7) Select Option .00 to display the CAUTION screen from which the totalizers can be zeroed. Zero all totals.
- 8) When ready to start the test, first verify that the displayed scale rate is near zero and that the totalizer is exactly zero.
- 9) Select Option 7 to start the feeders. See Figure 8654.3

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Stop the feeders in timed sequence.

The test interval will decrement every second. When this time interval reaches zero the feeders will stop automatically. The feeders will be stopped or started in timed sequence.

Aggregate Scale Calibration			
<b>Test Parameters</b>		ESCAPE	
Run Mix #	14	Enter Actual Totals	
at	300 dTPH		
for	0 sec		
Measured Scale Values		Actual Totals	
VirScale	14.472 wTON	15.890 wTON	
RapScale	0.000 wTON	0.000 wTON	
asphalt		08/20/88	188
divert			17 19

- 10) After the truck is filled, verify that the displayed rate returns to very nearly zero and the totalizer has stopped accumulating. If this is not the case, there may be scale problems that will affect the validity of the calibration. The most common problem is a buildup of material on the conveyor belt during the test.
- 11) Weigh the aggregate in the truck. Compare this actual weight with the measured scale weight shown on the display. If the measured scale weight is within tolerance and recalibration is not required the user can ESCape from this procedure or return to Step 3 and run a subsequent test.
- 12) Select Option 8 to recalibrate the scale to the actual weight. See Figure 8654.4If the user enters an actual total different from the displayed measured total, the belt scale span calibration value will automatically be recomputed so that, if the test could be repeated exactly, the measured total would now equal the actual total entered.
- 13) As necessary, verify the new span calibration by repeating this procedure starting at Step 3.
- 14) Upon satisfactory calibration, verify that no other span numbers have changed from the original data printed in Step 3.

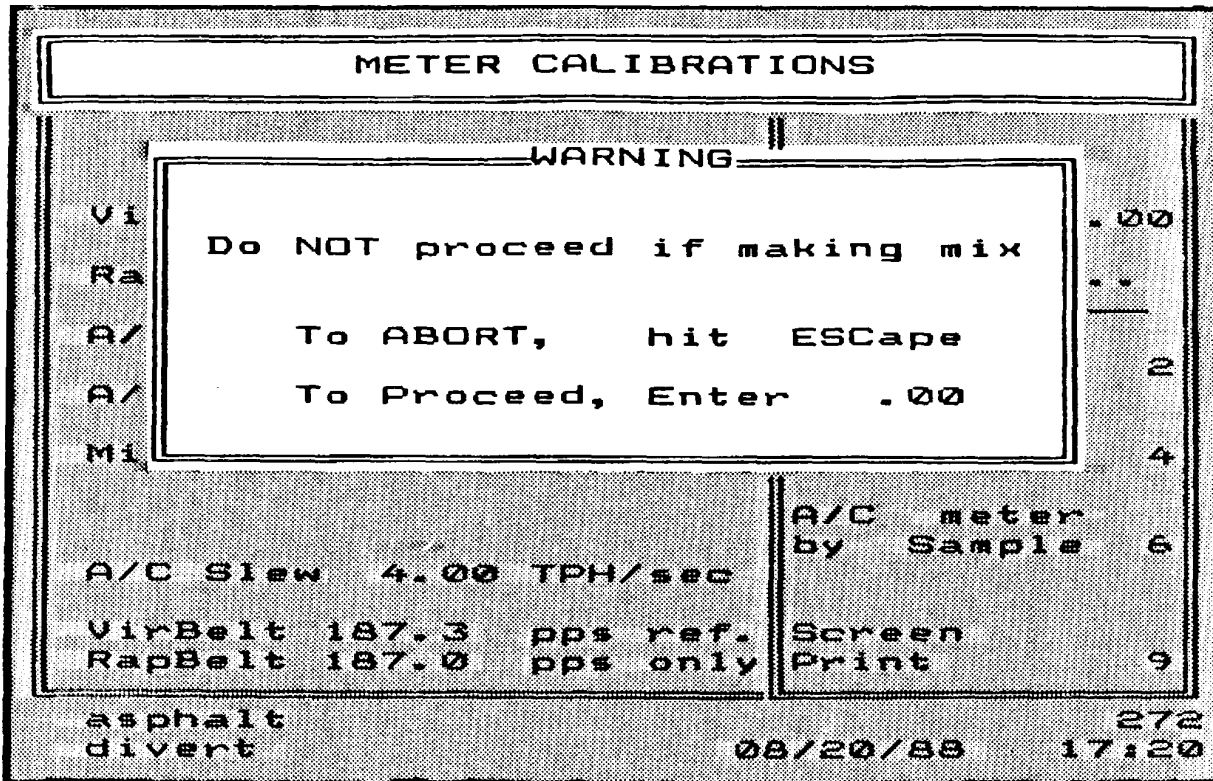


Figure 8656.0

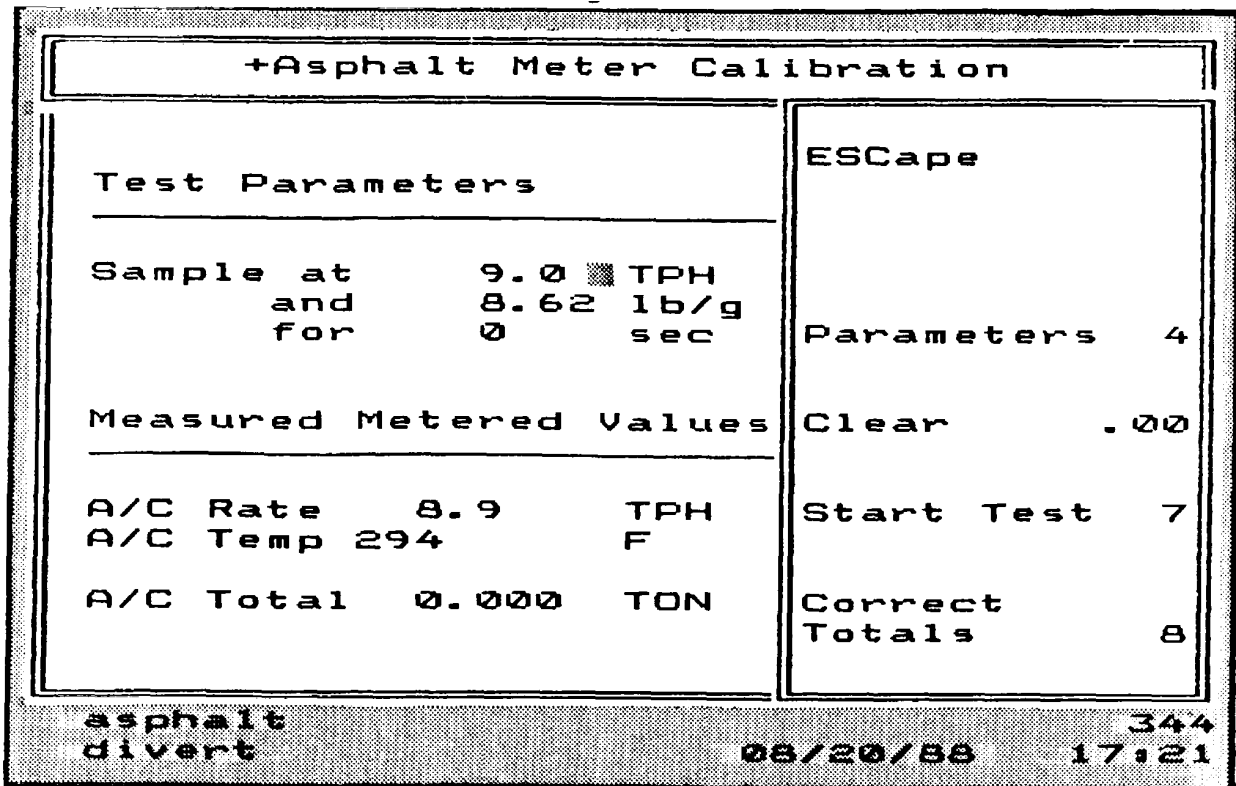


Figure 8656.1

options.....utilities.....calibration.....meters .....AC Meter by Sample  
 <8>                   <6>                   <5>                   <6>

Calibration of the Asphalt Meter by weighed load Sample is one of the procedures that can not be run while making mix. On selecting this procedure the WARNING display shown in Figure 8656.e will be shown. Note that even though this warning is displayed, the plant operation and data gathering continues uninterrupted.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCAPE	ESC	Return to the previous display. There has been and will be no interrupting of plant operation.
(Access)	.00	Interrupts plant operation. Gain access to the asphalt meter calibration procedure displayed in Figure 8656.1

The calibration display of Figure 8656.1 is a single form containing all the information necessary to calibrate the asphalt meter by weighed loads.

The upper left portion of the display shows Test Parameters. The desired rate at which the asphalt is recirculated and will be pumped is specified by the first parameter in TPH. The density of the sample asphalt is specified by the second parameter in lb/gal (at 600F). The length of time the divert valve will be switched to the RUN, ie sample, position can be preset with the time interval parameter shown in seconds.

The Measured Meter Values are displayed in the lower left portion of the display. These are the display of the instantaneous pumping rate, the asphalt temperature, and the accumulated wet tons.

The actual procedure is defined by the continuation options in the order shown.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCAPE	ESC	Return to the previous display.
Parameters	4	Enter Test Parameter data.
Clear	.00	Clear all totals.
Start Test	7	Switch the divert valve to the RUN position.
Correct Totals	8	Enter recalibration data.

+Asphalt Meter Calibration		
Test Parameters		
Sample at	6.5	TPH
and	8.62	lb/g
for	3000	sec
Measured Metered Values		
A/C Rate	6.5	TPH
A/C Temp	294	F
A/C Total	0.000	TON
		ESCAPE
		Edit
asphalt		497
divert	08/20/88	17 23

Figure 8656.2

In the weighed load procedure, actual material is pumped into an appropriate tank truck. The truck is then weighed and its net weight compared to the indicated computer total. Corrections are made as necessary until the net truck and indicated computer weights are equal.

The following procedural steps are concerned primarily with operation of the computer and assume that the operator has made ready the proper equipment and that the asphalt line between the RUN/DIVERT valve and the drum mixer has been replumbed to the sample truck for this test, or that other suitable and safe means of obtaining the sample have been planned for. See also Appendix G.

**WARNING:** Liquid asphalt at typical handling temperature is extremely dangerous and this procedure must not be attempted by anyone not trained, qualified or comfortable with the procedure, the equipment and the personnel involved.

- 1) Circulate the asphalt for at least thirty (30) minutes to assure product uniformity.
- 2) Print a current copy of the meter calibration values. (keystrokes 8659)
- 3) Go to the +Asphalt Meter Calibration display. (keystrokes 8656.00)
- 4) Select Option 4 to set the desired Test Parameters. See Figure 8656.2

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Return to the previous display.
Edit	(all)	Enter the test parameters shown.

Specify the desired test pumping rate. Specify the actual material density. Specify a desired test interval that will fill the sample truck and result in a sample large enough to allow it to be weighed with sufficient accuracy. ESCape when all the desired test Parameters have been entered.

- 5) Select Option .00 to display the CAUTION screen from which the totalizers can be zeroed. Zero all totals.

+Asphalt Meter Calibration		
Test Parameters		
Sample at	6.5	TPH
and	8.62	lb/g
for	573	sec
Measured Metered Values		
A/C Rate	6.6	TPH
A/C Temp	294	F
A/C Total	4.379	TON
HIT ESCAPE TO STOP		
Asphalt Spray	08/20/88	011 17 33

Figure 8656.3

+Asphalt Meter Calibration		
Test Parameters		ESCAPE
Sample at	6.5	TPH
and	8.62	lb/g
for	0	sec
		Enter Actual Total
Measured Metered Values		Actual Total
A/C Meter	5.419 TON	5.302 TON
asphalt divert	08/20/88	187 17:37

Figure 8656.4



- 6) When ready to start the test, verify all safety precautions and alert all personnel.
- 7) Select Option 7 to switch the divert valve to the RUN position. See Figure 8656.3

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Switch the divert valve to the DIVERT position.

The test interval will decrement every second. When this time interval reaches zero the divert valve will automatically switch to the DIVERT position.

- 8) After the sample is taken, verify that the computer totalizer has stopped accumulating.
- 9) Weigh the asphalt in the truck. Compare this actual weight with the metered weight shown on the display. If the metered weight is within tolerance and recalibration is not required the user can ESCape from this procedure or return to Step 4 and run a subsequent test.
- 10) Select Option 8 to recalibrate the meter to the actual weight. See Figure 8656.4If the user enters an actual total different from the displayed metered total, the A/C meter span calibration value will automatically be recomputed so that, if the test could be repeated exactly, the metered total would now equal the actual total entered.
- 11) As necessary, verify the new span calibration by repeating this procedure starting at Step 2.
- 12) Upon satisfactory calibration, verify that no other span numbers have changed from the original data printed in Step 2.

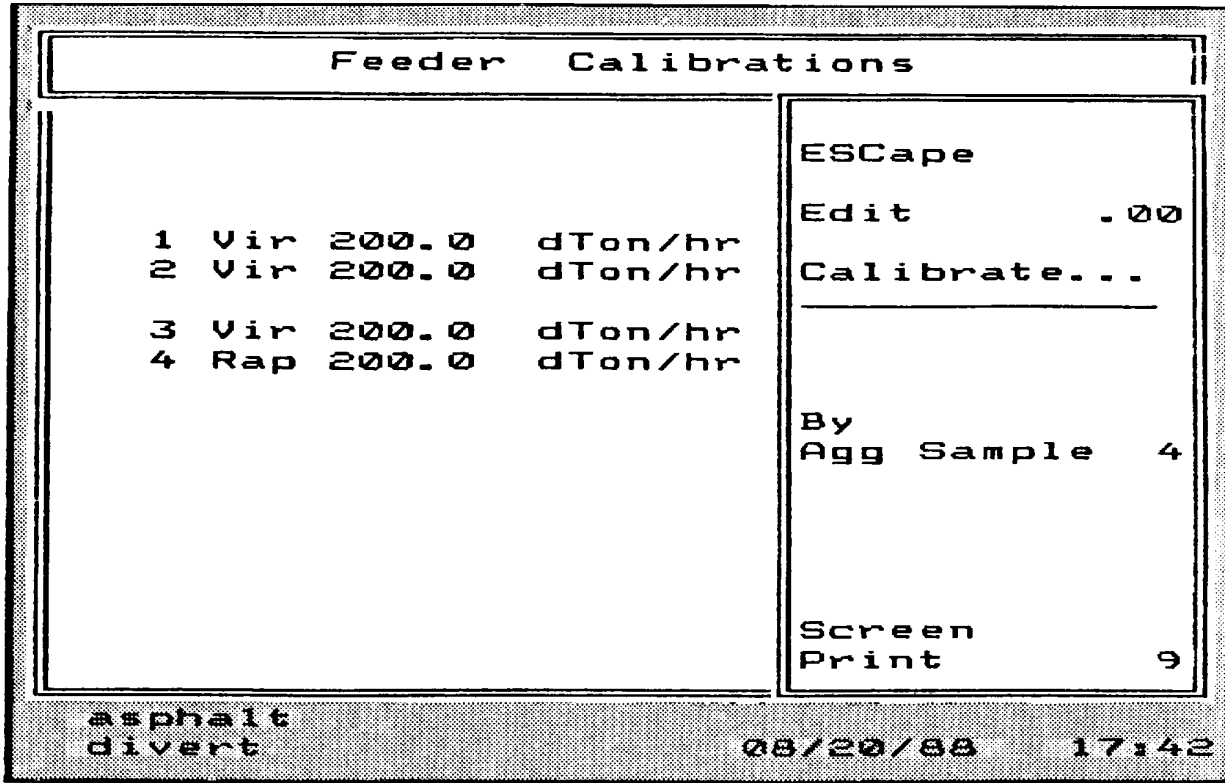
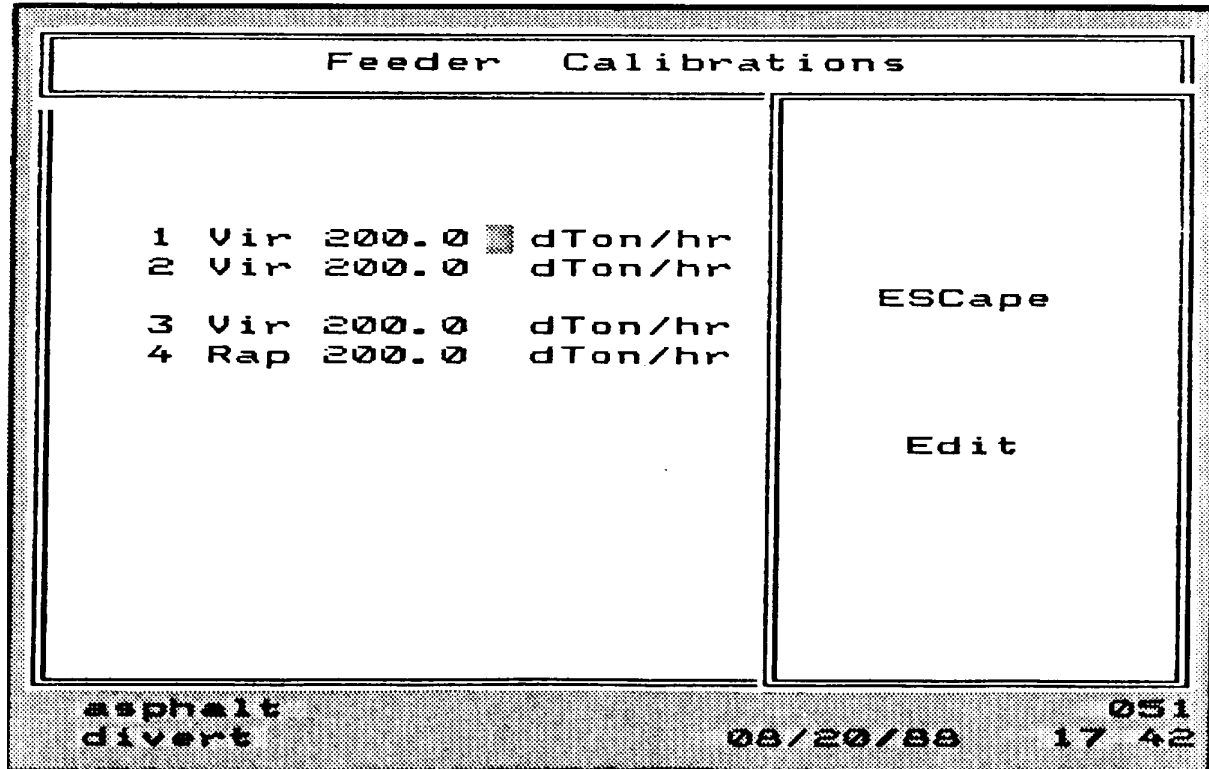


Figure 8656.0

Figure 8656.1



options.....utilities.....calibration.....Feeder Rates .....Feeder Calibration  
 <8> <6> <5> <8>

The Feeder Calibrations display is shown in Figure 8658.0 Note that even though this display overwrites the entire Main Operating Display, the plant operation and data gathering continues uninterrupted.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCAPE	ESC	Return to the previous display.
Edit	.00	Gain access to the data shown so that one or more of the parameters can be changed. Access cannot be obtained if the DATA KEY is in the DATA LOCKED position.
<u>Calibrate.....</u>		
By Agg Sample	4	Go to the procedure for calibrating feeders to the measured weight of a material sample.
Screen Print	9	Print this screen display. The printer must be ON and SELECTed.

The display of Feeder Calibration values in the EDIT mode is shown in Figure 8658.1 The only apparent difference from the previous display is in the Continuation Options display. The flashing edit cursor is initially shown following the first calibration value.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCAPE	ESC	Return to the previous display.
Edit	(all)	Edit the data shown in the usual manner using the techniques and features described in Appendix A of this manual.

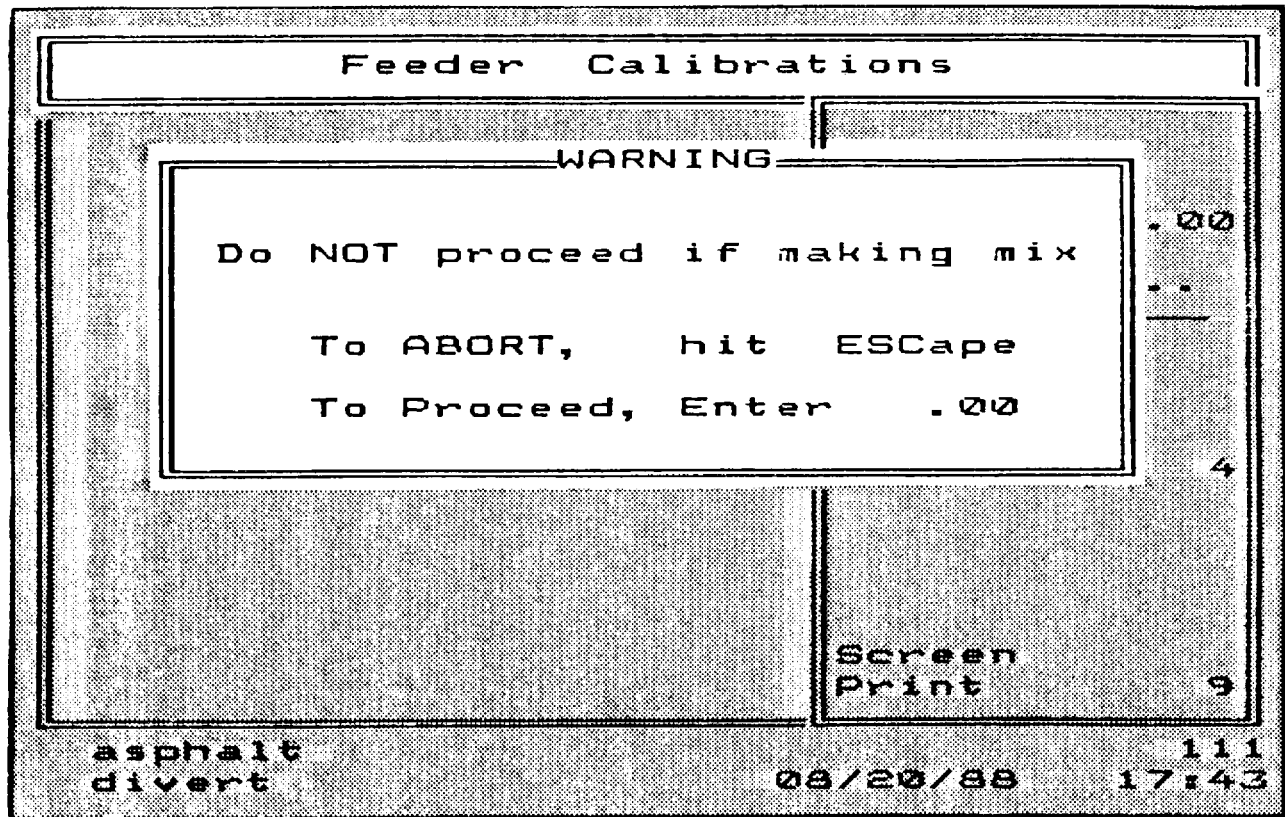


Figure 8684.0

options.....utilities.....calibration.....feeder rates .....Feeder by Sample  
<8>                   <6>                   <8>                   <4>

Calibration of the Feeders by weighed load Sample is one of the procedures that can not be run while making mix. On selecting this procedure the WARNING display shown in Figure 8684.0 will be shown. Note that even though this warning is displayed, the plant operation and data gathering continues uninterrupted.

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCAPE	ESC	Return to the previous display. There has been and will be no interrupting of plant operation.
(Access)	.00	Interrupts plant operation. Gain access to the feeder calibration procedure displayed in Figure 8684.1

WEIGHED LOAD CALIBRATION PROCEDURE			
VirScale	-	WTPH	0.000 WTON
RapScale	-	WTPH	0.000 WTON
Feeder Run Parameters			
RUN #	1	Feed Drive	ESCAPE
with	0.0	%Moisture	Parameters 4
at	0	%Max Speed	Clear .00
for	0	seconds	Start Test 6
Measured Feeder Totals			
Motor Tach	0.000	WTON	Correct Totals 8
asphalt divert		08/20/88	228 17 44

Figure 8684.1

options. . utilities. . calibration. . feeder rates..... Feeder by Sample  
<8>            <6>            <8>            <4>

The calibration display of Figure 8684.1 is a single form containing all the information necessary to calibrate the feeders by weighed loads.

The belt scale totalizer(s) are shown in the upper portion of the display. These scales can be used to calibrate the feeders if the scales have been calibrated and are known accurate at the rates at which the feeders are to be tested.

The center left portion of the display shows the feeder test parameters. The feeder to be tested is specified by its number. The moisture of the material to be tested should be accurately known and entered as item 2. Note, for maximum accuracy the material should be a uniform and representative material sample in both moisture and gradation. To maximize calibration accuracy the feeder calibration should be run at the feeders nominal operating speed. This speed selection is set in item 3 as 0 to 100x equal to 0 to maximum feeder speed. The length of time the feeder will run can be preset with the time interval parameter shown in seconds.

The measured feeder total(s) are shown at the bottom left of the display. The label associated with the total shown indicates the measurement technique being used, i.e. By Desired, Motor Tach, By Scale, etc. The actual procedure is defined by the continuation options in the order shown. The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCAPE	ESC	Return to the previous display.
Parameters	4	Enter Test Parameter data.
Clear	.00	Clear all totals.
Start Test	7	Start the selected feeder.
Correct Totals	8	Enter recalibration data.

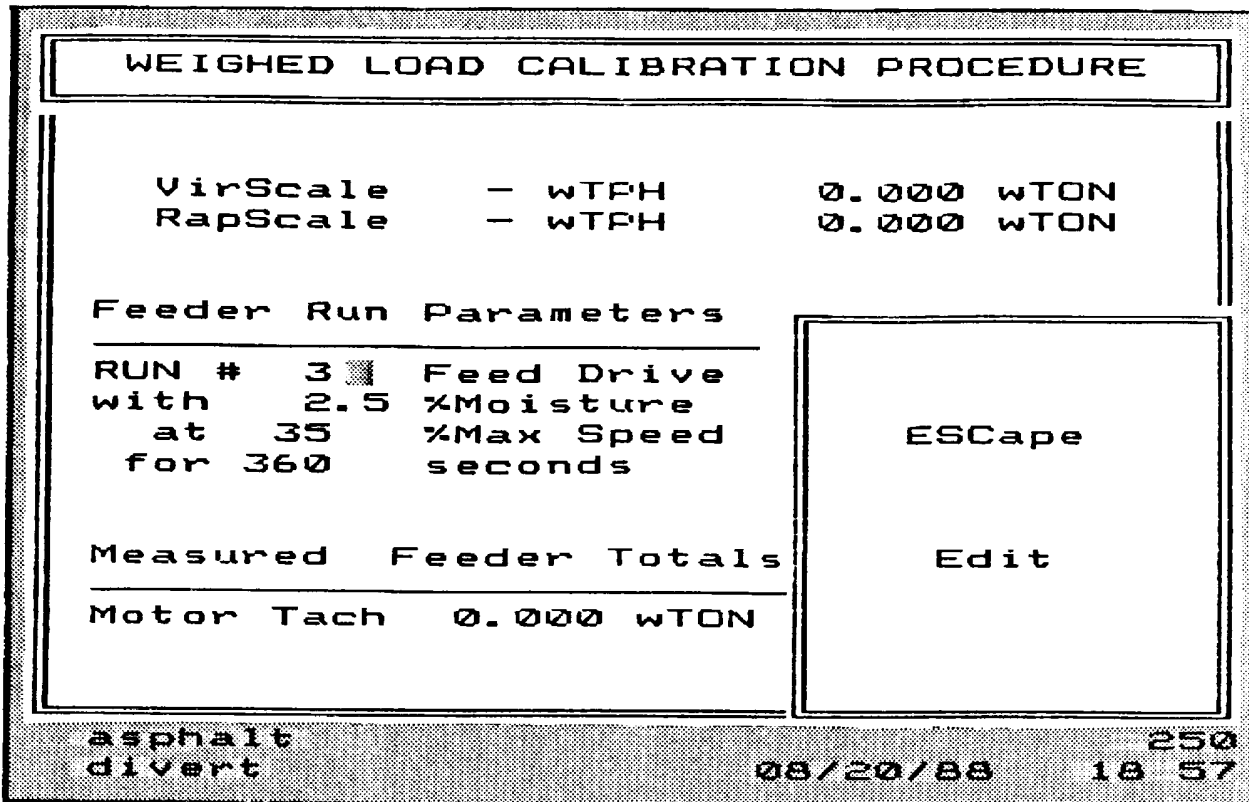


Figure 8684.2

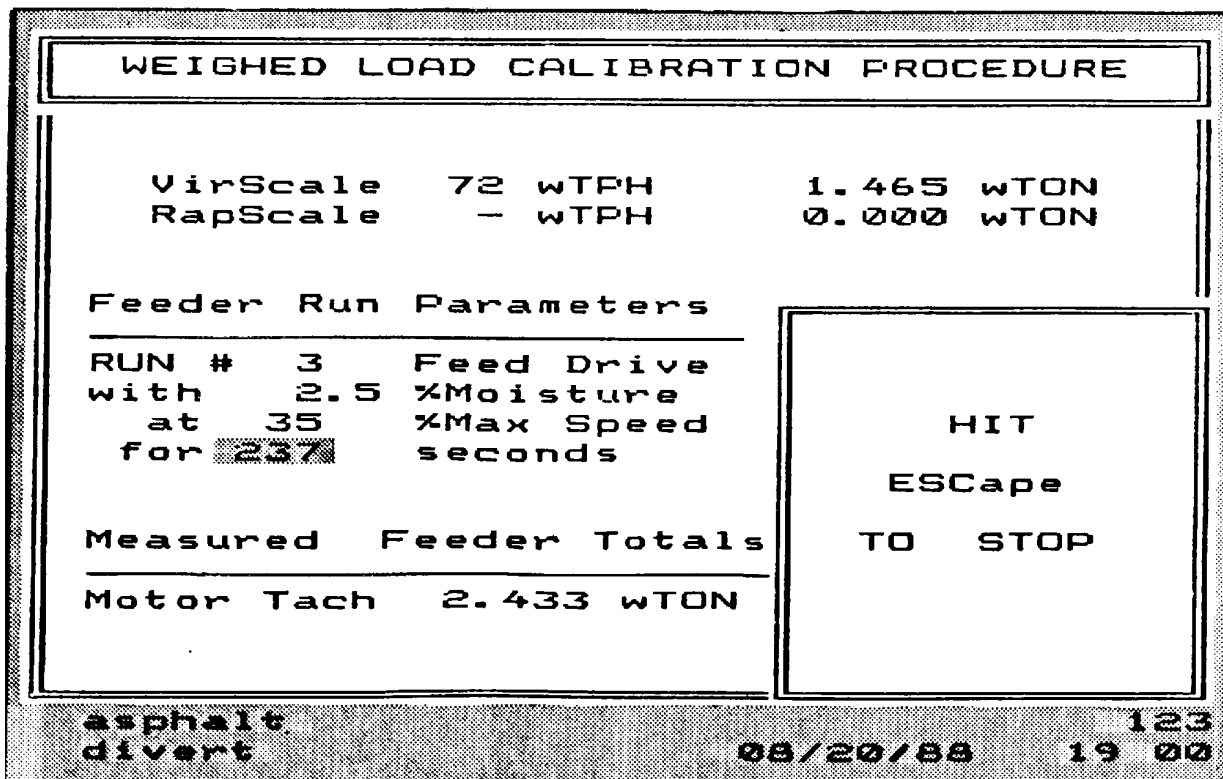


Figure 8684.3



..... Feeder Calibration

In the feeder sample procedure, actual material is weighed on a calibrated scale. The actual weight is then compared to the indicated computer total. Corrections are made as necessary until the actual weight and indicated computer weights are equal.

The following procedural steps are concerned primarily with operation of the computer and assume that the operator has made ready the proper equipment. See also Appendix G.

- 1) Place the Asphalt DIVERT LOCK in the LOCKED position for this entire test.
- 2) Fill the feeder with fresh material of uniform gradation and moisture.
- 3) Print a current copy of the feeder calibration values. (keystrokes 8689)
- 4) Go to the Feeder Calibration display. (keystrokes 8684.00)
- 5) Select Option 4 to set the desired Test Parameters. See Figure 8684.2

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Return to the previous display.
Edit	(all)	Enter the test parameters shown.

Select the desired feeder. Specify the moisture. Specify the desired test speed (0-100x). Specify a desired test interval that will allow results of sufficient accuracy. ESCape when all the desired test Parameters have been entered.

- 6) Select Option .00 to display the CAUTION screen from which the totalizers can be zeroed.
- 7) When ready to start the test, verify all safety precautions and alert all personnel.
- 8) Select Option 6 to start the selected feeder. See Figure 8684.3

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCape	ESC	Switch the feeder OFF immediately.

The test interval will decrement every second. When this time interval reaches zero the feeder will automatically stop.

WEIGHED LOAD CALIBRATION PROCEDURE									
VirScale	-	wTPH	2.735 wTON						
RapScale	-	wTPH	0.000 wTON						
<b>Feeder Run Parameters</b>									
RUN # 3 with 2.5 at 35 for 199	Feed Drive %Moisture %Max Speed seconds	ESCape  Enter Actual Totals							
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%; text-align: left;">Measured</th> <th style="width: 30%; text-align: left;">Feeder Totals</th> <th style="width: 30%; text-align: left;">Actual Totals</th> </tr> </thead> <tbody> <tr> <td>Motor Tach</td> <td>3.192 wTON</td> <td>2.735 wTON</td> </tr> </tbody> </table>				Measured	Feeder Totals	Actual Totals	Motor Tach	3.192 wTON	2.735 wTON
Measured	Feeder Totals	Actual Totals							
Motor Tach	3.192 wTON	2.735 wTON							
asphalt divert		08/20/88	028 19 05						

Figure 8684.4

- 9) After the sample is taken, verify that the computer totalizer has stopped accumulating.
- 10) Compare the actual sample weight with the measured weight. If the measured weight is within tolerance and recalibration is not required the user can ESCape from this procedure or return to Step 5 and run a subsequent test.

**NOTE:** If the belt scale is known to be accurate at the actual material WTPH test rate then the indicated belt total can be used as the actual sample weight. If the belt scale accuracy is unknown at the actual material WTPH test rate then the sample material should be collected in a truck and the net truck weight used as the actual sample weight.

- 11) Select Option 8 to recalibrate the feeder to the actual weight. See Figure 8684.4 If the user enters an actual total different from the displayed measured total, the feeder span calibration value will automatically be recomputed so that, if the test could be repeated exactly, the measured total would now equal the actual total entered.
- 12) As necessary, verify the new span calibration by repeating this procedure starting at Step 2.
- 13) Upon satisfactory calibration, verify that no other span numbers have changed from the original data printed in Step 3.

**NOTE:** Feeders must be calibrated with the actual material that will be used in that feeder. Each material/feeder combination must be calibrated.

USER SELECTED OPTIONS	
1-Virgin aggregate measured by	scale
2-Recycle aggregate measured by	scale
3-A/C temperature is measured by	probe
4-A/C blend is a % of total	mix

OPTIONS: ESCape / Edit .00 / Print 9

Asphalt  
Spray

08/20/88 16 33

Figure 88.0

options. . utilities..... USER OPTIONS display  
 <8>            <8>

The User Options display is shown in Figure 88.0 Note that even though this display overwrites the entire Main Operating Display, the plant operation and data gathering continue uninterrupted.

Lines 1 through 4 of the display shown define the user selected process options currently in effect. By editing this display the user can reconfigure these options.

The available options are:

- 1 - Virgin Aggregate measured by scale or by volume
- 2 - Recycle Aggregate measured by scale or by volume
- 3 - A/C temperature is measured by probe or entered by user
- 4 - A/C blend is a X of total mix or total aggregate

The Continuation Options are:

<u>OPTION</u>	<u>KEY</u>	<u>DESCRIPTION</u>
ESCAPE	ESC	Return to the previous display.
Edit	.00	Gain access to the options shown on the display so that they can be changed. Access can not be obtained if the DATA KEY is in the DATA LOCKED position.
Print	9	Print this screen display. The printer must be turned ON and SELECTed.

USER SELECTED OPTIONS		
1-Virgin	aggregate measured by	scale
2-Recycle	aggregate measured by	scale
3-A/C	temperature is measured by	probe
4-A/C	blend is a % of total	mix
OPTIONS:    ESCape / Change Line # ?		
Asphalt Spray	08/20/88	354 16:29

Figure 88.1

options. . Utilities. . Edit ..... EDIT User Options  
 <8><8><.00>

The User Options display in the EDIT mode is shown in Figure 88.1The only apparent difference from the previous display is in the continuation options display. The flashing edit cursor is shown in the continuation options window following the option to Change Line #?.

All lines in the User Options display have two possible states. Changing the state of any operational mode is done by keying in its corresponding line number. For example, successive strikes of the '1' key cause the method by which the Virgin aggregate is measured to switch between "measured by scale" and "measured by volume".

The Continuation Options are:

OPTION	KEY	DESCRIPTION
ESCape	ESC	Return to the Main Operating Screen.
Change Line #	1-4	Causes the mode of operation described on the corresponding lines to switch to its alternate mode.

.....Description of USER OPTIONS

Lines 1 and 2 define options applied to the aggregate scale conveyors. The alternative options are "measured by scale" or "measured by volume". The preferred mode, and possibly the only mode allowed by the governing quality control agency, is "by scale". This mode proportions the liquid A/C according to the weighed aggregate rate as measured by the aggregate scale. If the scale becomes inoperative, and if the operator is confident that the volumetric feeder calibrations are accurate, and if the operator is certain that these feeders are reliable and consistent in operation he may elect to ignore the scale and proportion the A/C according to the "aggregate measured by volume". Even in the "by volume" mode, the computer keeps track of the exact time sequence of events. The only difference in the entire process control is that instead of measuring a scale value the computer calculates and uses the desired target aggregate value that corresponds in time with the actual aggregate crossing the weigh scale.

**NOTE:** Do not use this backup mode of operation unless you fully understand the factors that can affect mix quality when proportioned volumetrically.

Line 3 defines the method by which the A/C temperature is acquired. The preferred mode of operation is "A/C temperature is measured by probe". In this mode the A/C temperature is automatically measured and may be used to continuously temperature compensate the asphalt meter. If the temperature sensing probe or circuitry becomes inoperative the user should elect to change to "A/C temperature is entered by user" at which point he will be allowed to enter the observed A/C tank temperature manually on the Material Parameters Display (option (3>)).If the asphalt meter is temperature compensated by the computer, this manually entered value will be used to effect the compensation. In the "entered by user" mode the A/C temperature display and printout will be shown in parenthesis to show the operator that the value is not measured but is entered by the user.

Line 4 defines the method by which the total asphalt in the mix is calculated. The most common method is to calculate such that "A/C blend is a % of total mix. Total mix includes virgin aggregate, recycle, any other additives and the added A/C. The alternate method of calculation is as "a % of total aggregate". Aggregate includes all the components of total mix except it does NOT include the added A/C. Therefore:

by mix:            %mA/C =  $\frac{(+A/C)}{\text{Virgin} + \text{Rap} + \text{Additives} + (+A/C)} \times 100$

by agg:            %aA/C =  $\frac{(+A/C)}{\text{Virgin} + \text{Rap} + \text{Additives}} \times 100$



APPENDIX A

## ..... DATA ENTRY

All data is entered on the systems keypad. This keypad consists of 16 data entry keys, a DATA LOCK key, a DIVERT LOCK key and a hidden error alarm. Both full travel and smooth face membrane keypads are available.

Two slightly different key entry formats are utilized. Continuation Options are selected by striking a single key while data entry requires the operator to select the data entry location, key in the data and finally strike the ENTER key to terminate the entry process.

Data Entry Format

The data displayed on any screen can be changed by the operator if one of the Continuation Options is EDIT. This option is selected by keying in the access code sequence .00 Access to the data can not be obtained if the DATA KEY is in the DATA LOCKED position. This data lock provides some security against unauthorized data access. Upon access to a data display, a flashing cursor will be displayed on the screen at the location where the user may enter data. This cursor is a flashing square box the size of a single character and is located at the right edge of the current data entry location. For displays with more than one data entry location this cursor can be moved to other data locations, without changing any of the data on the screen, by using the left (<-) and right (->) arrow keys. The left arrow key moves the cursor back (or left or up) through the data list whereas the right arrow moves the cursor forward (or right or down) through the data list.

The ENTER and ESCape keys have special significance during data entry. When the user strikes the ENTER key he instructs the computer to use the data value exactly as shown on the display. If a new data value has been keyed in, the new data value will be used. If the originally displayed data has not been changed ENTER will not change the data.

WYSIWYG -what you see is what you get-.

The ESCape key allows the user to escape directly and immediately from this display to the previous display. Any new data value in the process of being keyed but not ENTERed will NOT be used; the previous data value will be retained.

As a new data value is being keyed character by character, the left arrow (<-) can be used to delete the previous character entry. The left arrow can be thought of as a correction arrow.

The right arrow (->) will function exactly as the ENTER key.

The minus sign will not be recognized unless it is the first character entry.

Only one decimal point will be allowed per entry.

The user should not be intimidated by the keypad. The operation of this keypad, the ENTER, ESCape and arrow keys is highly intuitive. The computer will not allow the entry of unrecognizable key sequences. The operator is encouraged to experiment with all the keys until he is familiar with their functions and comfortable with their use.

Continuation Option Format

On each screen display is a list of the available Continuation Options. Each option listed is identified by a corresponding numeric value. Striking the key with that numeric value will cause the display to go to the corresponding listed option. In all cases, the ESCape key will return the user to the immediately previous option. It is not necessary to use the ENTER key in selecting options.

The user can go to any display while making mix. None of the screens will interfere with the process control except for certain calibration procedures. Adequate warning is given before entering a procedure that would effect the process control to allow the user to safely ESCape back to the Main Operating Display. The operator is encouraged to page through the various Continuation Options while making mix until he is confident in his understanding of the operation of the system, the options available and how to access those options.

APPENDIX B

.....DATA RANGE and PRECISION

All computations and variables stored within the computer are done in floating point. Floating point numbers have a precision of nine (9) digits and may be in the range of  $10^{-36}$  to  $10^{+36}$ . Even though numbers are often displayed on the screen or printed at the printer with less precision, the number is maintained in the computer with full 9 digit precision. For example:

<u>actual value</u>	<u>floating point value</u>
-.0935674281	-9.35674281X 10 <sup>-2</sup>
0.935674281	9.35674281X 10 <sup>-1</sup>
9.35674281	9.35674281
93.5674281	9.35674281X 10 <sup>1</sup>
-935.674281	-9.35674281X 10 <sup>2</sup>

APPENDIX C

.....DATA ROUNDING

Numerical data displayed on the screen or printed at the printer is rounded according to the following rule:

Internally, the computer processes data to nine (9) digits of precision. If a value is printed or displayed with less than 9 digit of precision, % ? the absolute value of the data display is increased by one least significant displayed digit if the most significant undisplayed digit is 5 or greater.

For example, if the precision of the display of %mA/C was programmed to be xx.x then:

6.40 %mA/C	is displayed	6.4 %mA/C
6.45	is	6.5
6.54	is	6.5
6.55	is	6.6

In the above example a display of 6.5% would imply a value greater than 6.45 and less than 6.55. Stated differently, a displayed value of 6.5% is a value of 6.5 +/-0.05.

APPENDIX D

..... NUMERIC CONVENTIONS

All numeric values displayed on the screen or printed at the printer are formatted by the program to be an appropriate number of digits with the decimal point appropriately located. The value displayed is rounded, as described in APPENDIX C. Certain conventions are rigorously followed regarding the display of values that do not 'fit' in the formatted space. They include:

<u>FORMAT</u>	<u>DISPLAY</u>	<u>DESCRIPTION of Display</u>
xx.x	+++	A positive value too large to 'fit' allotted space i.e. more positive than 99.9
xx.x	---	A negative value too large to 'fit' allotted space with its sign i.e. more negative than -9.9
xx.x	0.0	A value exactly equal to 0
xx	0	A value exactly equal to 0
xx.x	+0	A positive non zero number too small to display in the given format i.e. between 0 and 0.1
xx	+	A positive non zero number too small to display in the given format i.e. between 0 and 1
xx.x-	.0	A negative non zero number too small to display in the given format i.e. between 0 and -.1
xx	-	A negative non zero number too small to display in the given format i.e. between 0 and -1

APPENDIX E

NOMENCLATURE

Every attempt has been made to be consistent and definitive in the descriptions used. Nomenclature that may not be familiar to the new user includes:

NOMENCLATURE	DESCRIPTION or Meaning
A/C	liquid Asphalt Cement
+A/C	the A/C added to the mix by the asphalt pump and metering system
rA/C	the A/C reclaimed from reclaimed asphalt pavement (RAP)
mA/C	A/C whose content is based on the total mix
aA/C	A/C whose content is based on the total aggregate only
dTPH	the prefix 'd' signifies <u>dry</u> i.e. dry tons per hour
dTON	i.e. dry tons
wTPH	the prefix 'w' signifies <u>wet</u> i.e. wet tons per hour
wTON	i.e. wet ton
(298)	parenthesis indicate that the value shown is the desired value, entered by the user, and is not a measured value
Rap	<u>Recycled asphalt pavement</u> , i.e. reclaimed coated aggregate
Vir	<u>Virgin uncoated aggregate</u>
pps	belt speed pickup pulses per second
lb/g	liquid density in pounds per gallon
sec	time measured in <u>seconds</u>
ESC	the key marked ESC for <u>ESCAPE</u>
Vol	this material is measured by <u>volume</u> , not by scale or meter
F	suffix specifying temperature in degrees <u>F</u> ahrenheit
C	suffix specifying temperature in degrees <u>C</u> entigrade

MIX #	5	414 TPH	294 F	4.8 %A/C	[ 306 F	8.62 lb/gal	3.5 %A/C]	08/20/88	11:45
		VScale	RScale	+A/C		1 Vir	2 Vir	3 Vir	4 Rap
MOISTURE %		3.0	2.9			4.5	3.0	2.5	2.9
RATE dTPH		329	67	17.4		62	123	154	62
TOTAL TON		4776.1	994.5	244.7		859	1719	2150	857
BLEND %		83.1	16.9	4.2		15.4	30.8	38.5	15.4
No of ERRs		0	0	0		0	0	0	0
MIX #	5	413 TPH	294 F	4.8 %A/C	[ 306 F	8.62 lb/gal	3.5 %A/C]	08/20/88	12:00
		VScale	RScale	+A/C		1 Vir	2 Vir	3 Vir	4 Rap
MOISTURE %		3.0	2.9			4.5	3.0	2.5	2.9
RATE dTPH		338	67	17.4		62	123	154	62
TOTAL TON		4858.3	1011.2	249.0		875	1749	2180	872
BLEND %		83.1	16.9	4.2		15.4	30.8	38.5	15.4
No of ERRs		0	0	0		0	0	0	0
MIX #	5	334 TPH	294 F	4.8 %A/C	[ 306 F	8.62 lb/gal	3.5 %A/C]	08/20/88	12:15
		VScale	RScale	+A/C		1 Vir	2 Vir	3 Vir	4 Rap
MOISTURE %		3.0	2.9			4.5	3.0	2.5	2.9
RATE dTPH		250	48	13.2		46	92	116	46
TOTAL TON		383.8	81.2	20.0		59	118	148	59
BLEND %		83.8	16.2	4.2		15.4	30.8	38.5	15.4
No of ERRs		2	0	4		0	0	0	0
MIX #	5	312 TPH	294 F	4.8 %A/C	[ 306 F	8.62 lb/gal	3.5 %A/C]	08/20/88	12:30
		VScale	RScale	+A/C		1 Vir	2 Vir	3 Vir	4 Rap
MOISTURE %		3.0	2.9			4.5	3.0	2.5	2.9
RATE dTPH		251	48	13.2		46	92	116	46
TOTAL TON		383.8	81.2	20.0		59	118	148	59
BLEND %		83.8	16.2	4.2		15.4	30.8	38.5	15.4
No of ERRs		0	0	0		0	0	0	0
MIX #	5	271 TPH	294 F	4.8 %A/C	[ 306 F	8.62 lb/gal	3.5 %A/C]	08/20/88	12:45
MIX #	5	297 TPH	294 F	4.8 %A/C	[ 306 F	8.62 lb/gal	3.5 %A/C]	08/20/88	13:00
MIX #	5	258 TPH	294 F	4.8 %A/C	[ 306 F	8.62 lb/gal	3.5 %A/C]	08/20/88	13:15
MIX #	5	287 TPH	294 F	4.8 %A/C	[ 306 F	8.62 lb/gal	3.5 %A/C]	08/20/88	13:30
MIX #	5	257 TPH	294 F	4.8 %A/C	[ 306 F	8.62 lb/gal	3.5 %A/C]	08/20/88	13:45
		VScale	RScale	+A/C		1 Vir	2 Vir	3 Vir	4 Rap
MOISTURE %		3.0	2.9			4.5	3.0	2.5	2.9
RATE dTPH		211	35	11.0		39	77	94	39
TOTAL TON		5251.8	1081.2	269.0		947	1893	2368	944
BLEND %		89.6	14.4	4.1		15.4	30.7	38.5	15.4
No of ERRs		0	0	0		0	0	0	0
MIX #	5	256 TPH	294 F	4.8 %A/C	[ 306 F	8.62 lb/gal	3.5 %A/C]	08/20/88	13:49
		VScale	RScale	+A/C		1 Vir	2 Vir	3 Vir	4 Rap
MOISTURE %		3.0	2.9			4.5	3.0	2.5	2.9
RATE dTPH		+	+	10.6		0	0	0	0
TOTAL TON		5262.0	1083.4	270.6		948	1896	2372	947
BLEND %		0.0	0.0	11.5		0.0	0.0	0.0	0.0
No of ERRs		1	0	1		0	0	0	0
ACME Construction Corp 880816								PROCESS OFF	08/20/88 14:00
ACME Construction Corp 880816								PROCESS OFF	08/20/88 14:15
ACME Construction Corp 880816								PROCESS ON	08/20/88 14:20
MIX #	5	208 TPH	294 F	4.8 %A/C	[ 306 F	8.62 lb/gal	3.5 %A/C]	08/20/88	14:30
		VScale	RScale	+A/C		1 Vir	2 Vir	3 Vir	4 Rap
MOISTURE %		3.0	2.9			4.5	3.0	2.5	2.9
RATE dTPH		171	30	9.0		31	62	77	31
TOTAL TON		5291.0	1080.1	272.0		954	1908	2386	952
BLEND %		85.8	14.2	4.3		15.4	30.8	38.5	15.4
No of ERRs		0	0	0		0	0	0	0

Figure F1

## ..... AUTOMATIC PERIODIC RECORDATION

An example of the automatic periodic recordation, under various conditions, is shown in Figure FI. Referring to the portions of Figure FI marked A, B, C, D and E:

- REF. A: At 11:45 the computer printed a complete record including a line of average production data and a line for each of the available options, MOISTURE, RATE, TOTALS, BLEND, and Number of ERRors.
- REF. B: Before 12:15 the user selectable option to print TOTALS had been turned off by the operator so that the record at 12:15 is a complete record except for the TOTALS information.
- REF. C: Before 12:45 the user selectable options to print MOISTURE, RATE, TOTALS, BLEND and Number of ERRors have all been turned off so that the record at 13:15 is single line showing the basic production data. When no options are selected a typical workday, printed at 15 minute intervals, will fit on a single sheet of paper.
- REF. D: A standard data printout will be made every time the A/C valve switches from the RUN to the Divert position. This record marks by time and date the end of a production interval.
- REF. E: A Process On record will be printed every time the A/C valve switches from the Divert to the RUN position. This record marks by time and date the start of a production interval.

The basic production data printout appears as the first line in printout A, B and D, and as the only line in C. Included in this line of data is information about that mix being made at the point of asphalt injection. The record shows the mix number, average mix rate in TPH, average mix temperature, and the average percent of oil in the mix. In brackets is shown data pertaining to the A/C, i.e. average A/C temperature, A/C density, and percent A/C reclaimed from the RAP material. Also shown is the current date and time.

**NOTE:** The values printed for mix rate, mix temperature, percent of oil and the A/C temperature are the average values measured over the entire previous print interval.

Data optionally printed as in A, B, and D is arranged in a row and column format. Each row corresponds to one of the selected options. Each column corresponds to one of the devices from which measurements are taken. The data values printed are the current values at the instant the record is made.

**WARNING:** There are substantial time delays in the process. The instantaneous values may not relate to each other as expected except as the process is and has been stable.

The Number of ERRors, if printed, represents the number of seconds in the last print interval during which the devices exceeded the alarm tolerance specified in the Alarm Limit Calibration sheet. No errors will accumulate if the alarm is turned off.



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.....WEIGHED LOAD TEST SUGGESTIONS

The following suggestions are for belt scale calibrations although many of the ideas apply equally well to asphalt meter or other calibration procedures.

Accurate and repeatable calibration runs are possible. They do require an understanding of and appreciation for the details of the test. Basically the procedure is as follows:

- 1) Run the equipment until it will respond stably and uniformly.
- 2) Obtain a stable zero on the totalizer.
- 3) Run aggregate across the belt scale and directly into a truck.
- 4) Weigh the truck and calculate the net weight.
- 5) Compare the actual truck net weight and the indicated scale total weight. If the indicated weight is not in tolerance, readjust the scale span calibration value and repeat this test starting at Step 2.

Sometimes it does not seem this simple. Pitfalls to watch for include:

- |           |  |
|-----------|--|
| In Step 1 | -Often equipment does not stabilize until after it has been used for a while. This may especially be true of new equipment, rusty equipment or moist materials. Sometimes it is necessary to "waste" or disregard several truck loads of material in order to get the most stable results. Use material that is uniform. For aggregates this means material, preferably dry, of uniform moisture content and gradation. For dusts or fillers the material should be of uniform density, free flowing and free of clumps. For liquids this means uniform temperature and density. Liquids often must be "stirred" until uniformity is assured.  |
| In Step 2 | -Do not rush at this point. If calibrating at 100 TPH a 1 TPH zero error is 1%. This 1% is often a greater error than the maximum allowed. When repeating a test, material buildup on the belt will often change the zero. The answer may not be as simple as waiting for the belt to clear. After all, material will again build up on the belt during the test and create an error. The system can appear to calibrate and may even repeat, but only because the "calibration" value includes an equal and offsetting error. The best solution is to select material that does not stick to the belt. In the worst case, course material may need to predried and stockpiled for this calibration. |

APPENDIX G

## ..... WEIGHED LOAD TEST SUGGESTIONS

Wind is often a problem. If calibration tests are to be stable and repeatable the scale readings can not be erratic from any cause. Although each plant is different, a 1 TPH rate may be caused by only 1 lb. of wind pressure on the belt at the position of the weigh idler. Wind screens may help but may not protect against wind blowing directly down the belt. Top covers or tarps tied over the belt may be helpful. Calibration may have to be delayed until the wind subsides although most people recognize that this will not eliminate the errors that will be present on windy days of actual production.

Remember too, that the factors that cause errors when calibrating a belt scale also cause errors when calibrating feeders to the belt scale.

In Step 3 -All of the material that crosses the belt scale must be delivered to the truck. Ideally there is a useable divert mechanism at the end of the scale conveyor so that the truck can be loaded directly. All chutes between the scale and the truck should be clean before the sample is loaded and cleaned into the truck at the end of the sample.

It is generally not accepted practice to move the scale after calibration. If it's absolutely necessary to move the scale in order to calibrate, it should at least be at the same slope as it will be in its operating position. Again, this is not an accepted practice and should be avoided whenever possible.

Special precautions must be observed if the material must be run through the drum in order to load the truck. The most successful procedure is a midstream sample. In doing this each test must be done in exactly the same manner. The stockpile material must be uniform and as dry as possible. A stopwatch should be used to time out an exact 15 minute interval after the feeders stop at the end of a sample run. At exactly 15 minutes after the feeders stop, the drum and material hot elevator should be stopped. The silo, batcher etc. should be completely emptied and the truck then weighed. The first test at any given rate should be done precisely but the results ignored. If everything is constant, the material remaining in the system after this run will be the same amount remaining at the end of the next actual calibration run. To the extent that this is true, the calibration is therefore accurate and repeatable.

Obtain as large a sample as possible. Accurate belt scale calibration usually requires loads of at least 15 TONS. Asphalt meter calibrations to a 1% limit require loads of 1000 gallons if weighed on a truck scale with 20 lb. grads. For meter calibrations to 0.25x, loads of 4000 gallons are required. The effect of minor imperfections in the procedure or equipment can be minimized by the use of larger loads.

APPENDIX G

.....WEIGHED LOAD TEST SUGGESTIONS

- In Step 4        -All possible sources of weighing errors should be minimized. Make sure the truck is fully on the scale - split axle weighing should be avoided. Always pull the truck on the scale in the same direction. Mark the scale and insist the truck stop in identically the same location. Get a fresh tare weight for each load. Use the tare weight taken before the truck was loaded, not after the load was dumped. Try to account for and minimize fuel use.
  
- In Step 5        -Run at least three repetitions at the maximum production rate, three at the minimum production rate and three at the average production rate and expect all tests to be within the governing tolerance. If in tolerance data can not be obtained over the entire operating range, the scale weighbridge assembly most probably needs adjustment.

In all case, DO NOT TRUST ANYONE! Do everything, check everything and verify everything yourself. Double check every calculation and every operation. If any part of or person involved with any test procedure is changed the test should be restarted from the beginning. If anything can go wrong or if any dumb mistake can be made, it will be.

ABSOLUTE REPEATABILITY OF PROCEDURE, OF TECHNIQUE, AND OF CONDITIONS IS REQUIRED FOR REPEATABILITY OF RESULTS.

**APPENDIX G**

**PANASONIC DOT MATRIX PRINTER**

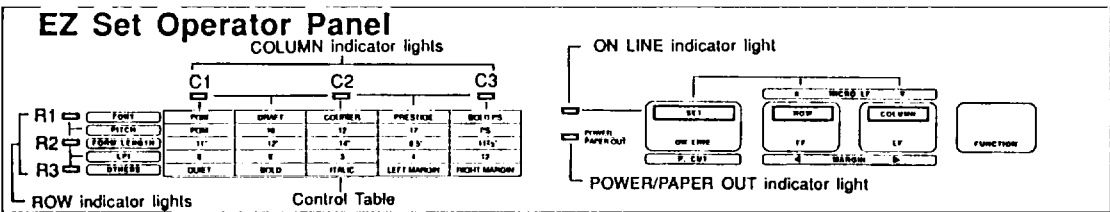
**G-1 General**

This appendix lists the "operation" and "set-up" instructions for the printer located in the control van. Refer to the Maintenance Manual TM 5-3895-374-24 for additional information.

KX-P1180i

Operation

Panasonic



(ON LINE)

The ON LINE switch is an alternate action switch which opens and closes the communication lines with the computer.

(FF)

Pressing the FF switch will advance the paper from its current location to the top of the next page.

(LF)

Pressing this switch will cause the paper to advance one line. Multiple line feeds can be accomplished by holding the switch down.

(ON LINE) + (FF)

Pressing the FF switch while pressing the ON LINE switch advances the paper one micro line (1/216").

(ON LINE) + (LF)

Pressing the LF switch while pressing the ON LINE switch reverses the paper one micro line (1/216").

Function Mode

**(FUNCTION)**  
Press this switch to enter/exit the function mode.

**(ROW)**  
Press this switch to advance the row position on the Control Table.

**Setting Font/Pitch/Form Length**

**(FUNCTION)** (Enter Function Mode)  
• ON LINE light blinks.

**(ROW)**  
• Press and release the ROW switch until the desired row position is selected.

**(COLUMN)**  
• Press and release the COLUMN switch to reach the desired selection.

**(SET)** (Enable Selection)

**(FUNCTION)** (Exit Function Mode)

**(COLUMN)**  
Press this switch to advance the column position on the Control Table.

**(SET)**  
Press this switch to set the condition on the Control Table.

**Setting and Releasing the Quiet mode**

**(FUNCTION)** (Enter Function Mode)  
• ON LINE light blinks.

**(ROW)**  
• Press and release the ROW switch until the bottom row light is lit.

**(SET)** (Turns Quiet Mode [the first Column light] ON=lit or OFF=blink)

**(FUNCTION)** (Exit Function Mode)

		COLUMN light								
		C1 C2 C3			C1 C2 C3			C1 C2 C3		
ROW light	Select Type	(ON)	(ON)	(ON)	(ON)	(ON)	(ON)	(ON)	(ON)	(ON)
R1 R2 R3	FONT	PGM	DRAFT	COURIER	PRESTIGE	BOLD	PS			
R1 R2 R3	PITCH	PGM	10cpi	12cpi	17cpi	PS				
R1 R2 R3	FORM LENGTH	11"	12"	14"	8.5"	11 <sup>2</sup> / <sub>3</sub> "				
R1 R2 R3	LPI	6	8	3	4	12				
R1 R2 R3	OTHERS	QUIET	BOLD	ITALIC	LEFT MARGIN	RIGHT MARGIN				

**(ON)** = ON  
**(OFF)** = OFF

**P. CUT**

This switch allows the perforation of the rear feed continuous paper to be raised to the tear bar for short tear capability.

**(FUNCTION)** (Enter Function Mode)  
• ON LINE light blinks.

**(ON LINE)**  
• Perforation raises to tear bar.  
Tear off the printed page by pulling toward you.

**(FUNCTION)** (Exit Function Mode)  
• Repositions the paper.

For more detailed information refer to the Operating Instructions Chapter 3.

**Memo Load (LOAD/PARK)**

This printer can use a single sheet or envelope without removing the continuous paper.

**To print on the single sheet**

1. Verify the Paper feed selector is in "T" position, power is ON.
2. Tear off the printed pages of the continuous paper.(see P.CUT)
3. Press the (FUNCTION) switch. Then, pull the paper bail lever to retract the continuous paper.
4. Set the paper feed selector to "F" position.
5. Insert a single sheet. Then, pull the paper bail lever to load.

**After printing on the single sheet**

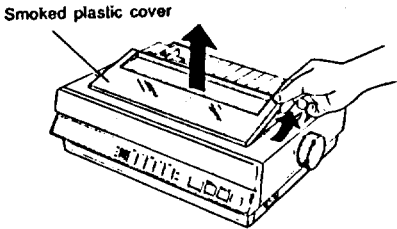
6. Remove the single sheet by pulling paper bail lever or press FF switch.
7. Set the paper selector to "T" position.
8. Pull the paper bail lever to reload the continuous paper.

# KX-P1180i

# Set up

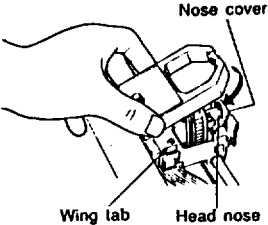
# Panasonic

### 1 Removing the printer cover

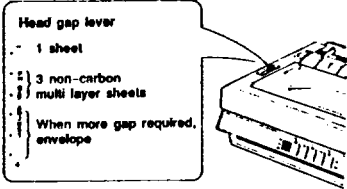


### 2 Mounting the ribbon cassette

The ribbon slips between the nose cover and head nose.



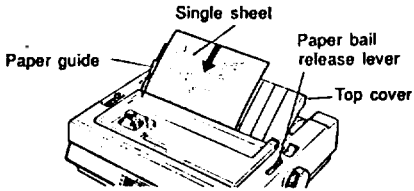
### 3 Adjusting the printhead gap



### 4 Installing the paper

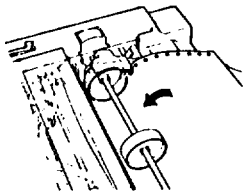
#### Single Sheet

- Paper Feed Selector is in the "F" position.
- Insert the paper behind the platen.
- Pull the paper bail release lever toward you.
- After the paper is in position, push the paper bail release lever toward the rear.



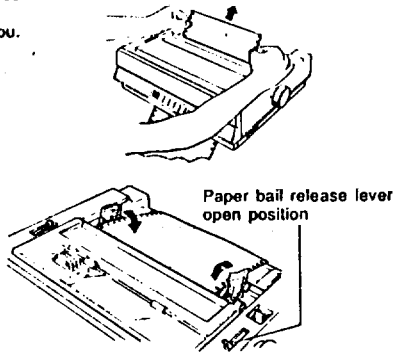
#### Fanfold Paper from Rear

- Paper Feed Selector is in the "T" position.
- Insert the paper so that the sprocket holes are aligned with the tractor pins.
- Pull the paper bail release lever toward you.



#### Fanfold Paper from Bottom

- Paper Feed Selector is in the "T" position.

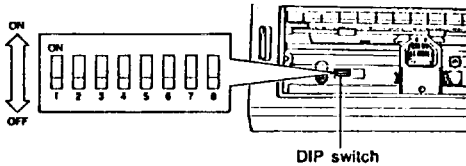


For more detailed information refer to the Operating Instructions Chapter 2.

## Setting the DIP Switches

Turn the power off before setting the DIP switches.

The DIP switches allow the user to set certain operating conditions of the printer.



#### International Character Set

SW6	SW7	SW8	INTERNATIONAL CHARACTER SET
OFF	OFF	OFF	USA
ON	OFF	OFF	FRANCE
OFF	ON	OFF	GERMANY
ON	ON	OFF	ENGLAND
OFF	OFF	ON	DENMARK 1
ON	OFF	ON	SWEDEN
OFF	ON	ON	ITALY
ON	ON	ON	SPAIN 1

#### DIP switch

SWITCH NUMBER	FUNCTION	ON	OFF
SW1	Printer Mode	IBM Mode (Proprinter II)	Standard Mode (FX-86/FX-800)
SW2	Skip Perforation	1 inch (25.4 mm) skip	No skip
SW3	Automatic LF	CR + LF	CR only
SW4	Cut Sheet Feeder (Option)	Installed	Not installed
SW5	7/8 bit	7 bit	8 bit
SW6	Character Set	SW1-ON: See IBM Proprinter II Character Set Chart	
SW7		SW1-OFF: See International Character Set Chart	
SW8			

#### When DIP SW1 is ON (IBM Mode)

SWITCH NUMBER	FUNCTION	ON	OFF
SW6	Character Set	Set 2	Set 1
SW7	Automatic CR	Causes Auto CR on LF, VT, ESC+J	Prevents Auto CR on LF, VT, ESC+J
SW8	Zero font	Zero slash #	Zero 0

By Order of the Secretary of the Army:

GORDON E. SULLIVAN  
General, United States Army  
Chief of Staff

Official:

  
MILTON H. HAMILTON  
Administrative Assistant to the  
Secretary of the Army  
04223

Distribution:

To be distributed in accordance with DA Form 12-25 E, Block 5252, requirements for TRF-3825-238-14 & P.





# THE METRIC SYSTEM AND EQUIVALENTS

## WEIGHT MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches  
 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches  
 1 Kilometer = 1000 Meters = 0.621 Miles

## WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces  
 1 Kilogram = 1000 Grams = 2.2 lb.  
 1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

## LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces  
 1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

## SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches  
 1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet  
 1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

## CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches  
 1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

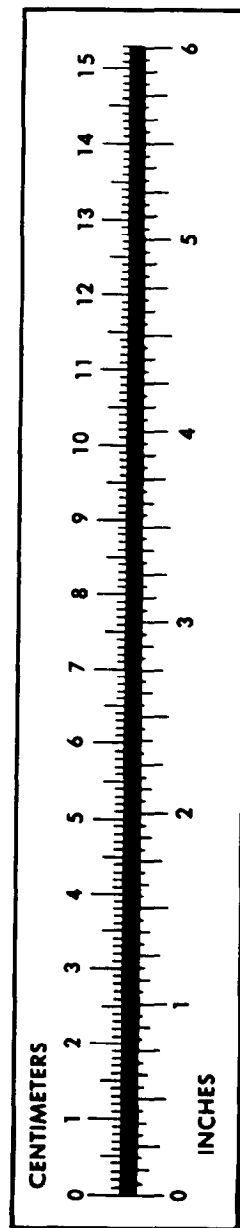
## TEMPERATURE

$5/9(^{\circ}\text{F} - 32) = ^{\circ}\text{C}$   
 212° Fahrenheit is equivalent to 100° Celsius  
 90° Fahrenheit is equivalent to 32.2° Celsius  
 32° Fahrenheit is equivalent to 0° Celsius  
 $9/5^{\circ}\text{C} + 32 = ^{\circ}\text{F}$

## APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
its	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
ometers per Liter	Miles per Gallon	2.354
ometers per Hour	Miles per Hour	0.621



**PIN: 072939-000**