MFG: MAJESTIC RIDES MFG.
NAME: MUSIC EXPRESS
TYPE: NON-KIDDIE

MUSIK EXPRESS

PASSENGER CAPACITY: 14 CARS, 3 PERSONS / CAR, 42 PERSONS MAXIMUM CAPACITY

SPEED: MAX RPM 14

DAILY PRE-OPENING INSPECTION

All 6 main trailer blocking points are secure.
All blocking points on the trailer frame are secure and snug.
All purlins, X bracing are keyed - inspect keys and diaper pins for excessive ware and replace if in question.
Running track secured, bolts tight and keyed.
All walkboards are R-keyed.
All (14) tubs pinned and R-keyed, 3 pins/tub.
Sweeps pinned and R-keyed, sweep spreaders pinned and R-keyed.
Exit, entrance steps and platform secured, blocked and pinned.
Wind brace cables attached and snug.
All removable scenery, pinned and scenery plugs secure.
Sign and scenery braces secured and pinned.
4 main posts on the trailer have 2 pins/post and - R-keyed.
All safety cables on crane rail and center starburst are secure.
Crane rail hoist is secured or removed.
Lead in cord is properly installed and tight connections.
Check all power before line is turned on. 220v 3 Ph.
Check that authorized or unauthorized personnel are not under ride.
Make sure battery is charged and hooked up. (Lap bar circuit)
Make sure safety rules are clearly visible.

OPERATION OF RIDE

1. Perform pre-opening inspection.
2. Load patrons in a orderly fashion 3 riders/car.
3. Check all lap bars for proper function and are securely latched.
4. Inspect walkboards. No person should be left on walkboards during ride operation.
5. Do not exceed 14 RPM.

RIDE OPERATOR POSITION & FUNCTION

1. Operator must be familiar with daily inspection ride maintenance, operator manual, and ride function.
2. During normal operation 1 attendant recommended. (capacity operation 2 attendants)
   1st operator - seat patrons, perform safety check, operate ride.
   2nd operator - assist patrons entering and exiting ride during busy periods a third operator should be present to assure safety and smooth operation.

P.O. BOX 128, 4536 S. R. 7 - NEW WATERFORD, OHIO 44445
PHONE 330/457-2447 OR 457-7280 • FAX 330/457-7490

GENERAL SAFETY PROCEDURES

1. No smoking or open flames.
2. All patrons loose articles must be secured.
3. All lap bars secured and latched.
4. No food or drinks.
5. Largest person on outside of seat.
6. Maintain a balanced load.

EMERGENCY PROCEDURES

1. Follow all emergency shut down procedures.
2. Ensure that the ride can not restart.
3. Evacuate passengers in a quick and safe manner.

PROCEDURE FOR AN INCIDENT

1. Follow emergency shut down procedure.
2. Alert all safety, first aid, or other emergency personnel immediately.
3. Clear the area of any persons not affected of the incident.
4. Assist and make way for any emergency personnel.
5. Fill out accident report.

MUSIK EXPRESS CHECK LIST

Listed below is a check list of areas that need to be checked to see if done correctly.

___ 1. All 6 main blocking points on trailer are secure.

___ 2. Hydraulics are down and snug.

___ 3. Hydraulic controls are unplugged.

___ 4. All blocking points on up-rights are snug and secure.

___ 5. All purlins are R keyed.

___ 6. All X bracing R keyed.

___ 7. All running track bolts are tight and R keyed.

___ 8. All walk boards are secure.

___ 9. All fence is in proper place and R keyed.

___ 10. All 14 tubs pinned and R keyed (3 pins per Tub).

___ 11. Exit step and platform are blocked and pinned.

___ 12. Entrance steps are pinned and secure.

___ 13. Wind brace cables attached to the base of the ride.

___ 14. All corner scenery is pinned and R keyed. Do not walk on scenery wires.

___ 15. All plugs for the scenery are secure.

___ 16. All braces for the scenery are secure.

___ 17. Three support tubes for top are in place.

___ 18. Check for braces and keys for front sign.

___ 19. The four main white posts have two pins per post and they are keyed.

___ 20. Crane rail can be left up while ride is running. Check for safety cables.

___ 21. Secure hoist so it won't move.

Majestic Mfg ORIGINATORS OF THE SCOOTER™

Following is a list of the rides that we manufacture as well as the height requirements that you requested. .

MID-SIZE CARS

TM 900 Scooter	29" not driving/passenger	40" - 50" without adult and driving
TM 1400 Scooter	30" with adult	48" without adult and driving
TM 1800 Euro Scooter	30" with adult	48" without adult and driving
TM 1800 Scooter	30" with adult	48" without adult and driving
TM 2100 Scooter	30" with adult	48" without adult and driving
TM 2700 Scooter	30" with adult	48" without adult and driving
Quadzilla	30" with adult	42" without adult
Musik Express	30" with adult	50" without adult

BUMPER CAR SPECIFICATIONS

Full size car	29" with adult	48" without adult
Mid-size car	29" not driving	40" driving
Mini car	29" not driving	36" driving

Respectfully,

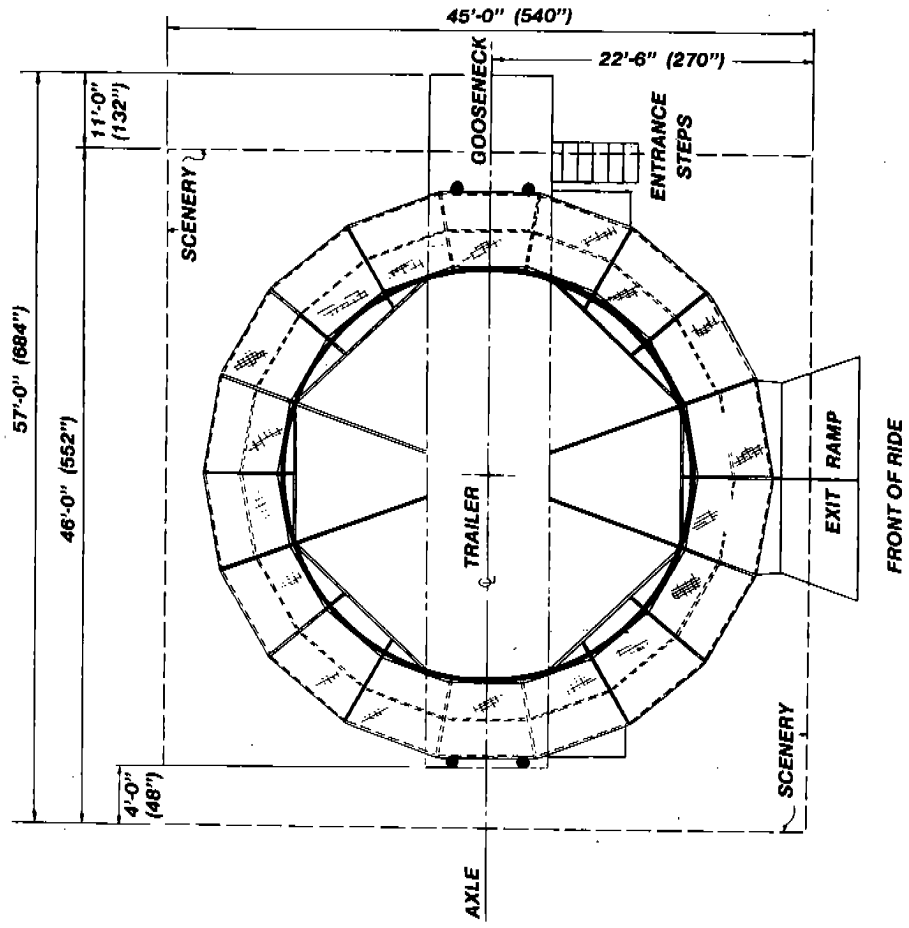
MAJESTIC MANUFACTURING, INC.

Vince Kudler

VK/ls

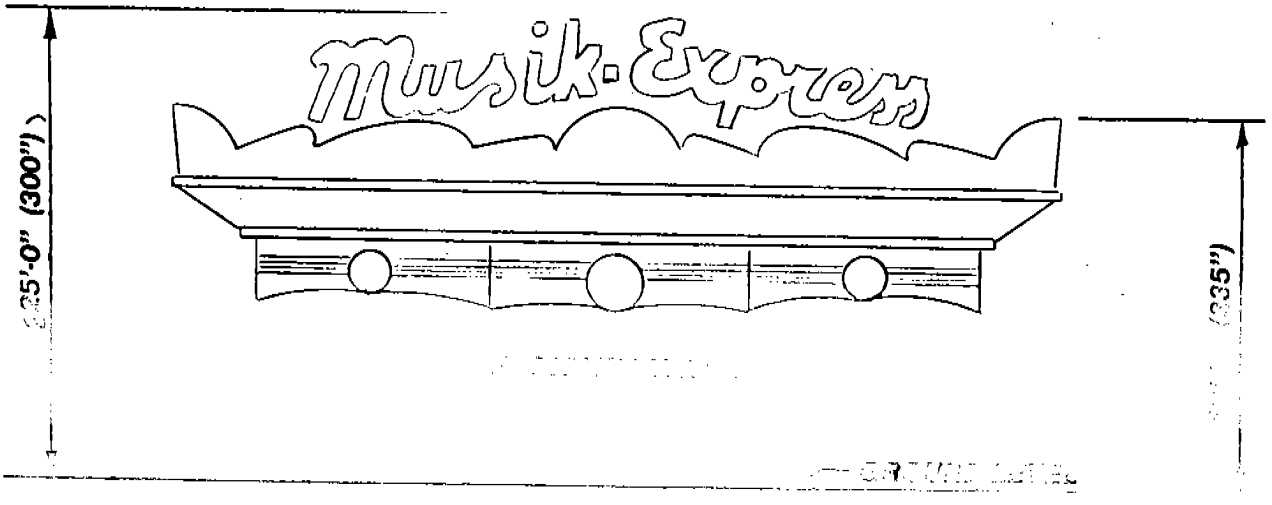
Specifications
Musik-Express

One Trailer Tandem 53' x 102"
Wt. 55,000 lbs.
Air Ride Suspension
42 Total Capacity
14f Cars - One Piece
Lap bar with safety interlock on each car - operator controlled
A.C. Electric Drive Motors
On Sweeps 65 KW
4,000 Turbo Lights
2 Strobe Lights
3 Push Buttons for Increase Speed, Max RPM 14
Folding Scenery - Aluminum
Roof Unfolded on Ground, raised by hydraulics
Aluminum Track and Platforms
4 - 6 Hour Set Up
3 - 4 Hour Tear Down



Musik-Express, the newest addition to Majestic's line-up of rides, has dazzling lights and scenery with the added feaure of a powerful sound system. With a Himalayan design, it is self-contained and completely portable. It can be setup and moved with the same ease and cost effectiveness of all our quality rides. It also features a state-of-the-art sound system, containing four powerful, full-range speakers, that will keep your clientele surrounded by the sounds of their favorite hits.

Musik-Express consists of 14 one-piece fiberglass cars, with a total capacity of 42. Parents and children will feel secure as each car is equipped with a hydraulically operated lap bar and safety interlock. Quality stainless steel and aluminum construction guarantees operation for years to come with minimal maintenance and repairs.



TO THE OWNER AND OPERATOR

This manual contains information concerning the operation maintenance and safety of your new MAJESTIC MUSIK EXPRESS building. It should be carefully read before attempting to operate you MUSIK EXPRESS. You will find many helpful pointers which will assist you in obtaining the performance in which it was designed for.

MAJESTIC INC.

Majestic Inc. makes note of warranty or claims arising from the use of this manual and the owner operator assumes complete responsibility for any decisions made or actions taken based on information obtained from using this booklet.

BE CAREFUL 

This symbol is used throughout this manual whenever personal safety is involved. Take time to be careful for you and the safety of you patrons.

IMPROVEMENTS

Majestic Inc. is continually striving to improve its products and therefore reserves the right to make improvements when it becomes practical and feasible to do so, without incurring any obligations or responsibility to make changes or additions to Musik Expresses sold previously.

TABLE OF CONTENTS

WARRANTY

DATE OF DELIVERY	10-10-97
DATE OF MANUFACTURE	3-17-97
RIDE SERIAL NUMBER	ZA92S28B160D59011
MODEL NUMBER	S2AP16ME
NUMBER OF CARS	14
TYPES OF CARS	Tubs
COLOR OF CANVAS	Yellow, Purple

1. All parts manufactured by seller are held under warranty for a period of 6 months (except tires, hydraulics, electrical, battery, ect. which comes under each manufacturer's own warranty).

2. The purchaser will pay for any service charge for making service calls and/or transporting the equipment to the place where the warranty work is done.

3. This warranty does not cover depreciation or damage caused by normal wear, accident, improper maintenance, improper protection in storage or improper use. Normal maintenance and service replacement cost will be borne by the purchaser.

4. Seller shall not be liable for loss, damage or expenses directly or indirectly arising from improper use of the ride.

5. Under these conditions all such parts and materials will be invoiced to the customer upon shipment by us of required replacement parts. Full credit will be allowed on such parts subject to the following conditions:

   A) if they are returned to us, freight PREPAID within a period of fifteen (15) days after date of invoice.

   B) after our examination of said parts they provide to our satisfaction that such defects did exist. This is our sole obligation under the warranty

MUSIK EXPRESS SAFETY PRECAUTIONS

Prior to each day of operation of the Musik Express, the owner/operator MUST do the following:

1. Inspect under every tub all three pins and safety keys.

2. Inspect every drive wheel and running wheel. All wheels should have NO play on the shaft.

3. Inspect all connections on the aluminum drive track.
   A) Check for nuts and bolts to be tight.
   B) Safety keys on bolts.

4. Inspect every lap bar to see that they work properly. They must:
   A) Latch down securely
   B) Not raise when ride is running
   C) All safety placards are visible

5. Center hub should be inspected for:
   A) All sweep pins secure and safety keyed
   B) Safety cable in place

6. Inspect all pins on outboard sweeps that secure cross steel members under tubs.

7. Exit gates and entrance gates installed and working properly.

8. Inspect all steps and ramps for proper blocking.

9. Inspect under ride for:
   A) Individuals, workers, maintenance personnel, ect.
   B) Loose articles, clothing, purses, ect.
   C) Blocking is all secure.

10. Always test or run the ride each day without customers to check for proper speed. Recommended speed is 14 RPM MAX.

MAJESTIC SALES, INC. 4536 SR 7 NEW WATERFORD, OHIO 44445
PHONE [illegible]-457-2447 FAX [illegible]-457-7490

regulations set forth by ASTM Standards on Amusement Rides and Devices as sponsored by ASTM committee F-24 on Amusement Rides and Devices. Fourth Edition 1992
P.C.N. 03-624092-47

SAFETY INFORMATION

PLEASE TAKE TIME TO READ ALL SAFETY INFORMATION

Unsafe operating practices and improper use of this equipment on the part of the operator can result in injuries. Observe the following safety precautions.

1. Proper blocking for trailer and purlings is essential for safe operation. NOTE: when setting on soft or sandy ground always use a plywood base for blocking. 3/4 plywood base recommended for trailer is 1' x 2'. 1' x 1' plywood base recommended for purlings. Always block purling where feet are on purling.

2. Never unhook tractor from ride UNTIL all air is out of air bags.

3. When attaching or removing tractor from trailer NEVER fully extend hydraulic cylinders, always use mechanical jacks for extended periods.

4. Proper size safety keys and all pins is important.
   - A. Post
   - B. Rafters
   - C. Purlings
   - D. Racking
   - E. Extension Arms
   - F. Scenery
   - G. Ramps and Walkways
   - H. Sweep Arms

5. NEVER have customers run to or from the Musik Express Ride.
   NOTE: Aluminum walkways are slippery when wet.

6. NEVER operate Musik Express without everyone having the safety bar in the down position.

7. Always operate Musik Express at a safe speed. Recommended speed is <u>14 RPM MAX</u>.

8. The Musik Express building trailer is 53'-0" long, 13'-5-1/2" in height: extreme caution is needed when negotiating corners and low overpasses.

9. A) All Majestic Musik Express rides currently being manufactured are equipped with maxi trailer brakes. It is still advisable to block trailer wheels when unit is parked.
   B) Block wheel of sweeps during installation and dismantling.

10. Walking on scenery is not recommended.

11. After ride is erected a visual inspection is needed to insure all pins and safety keys are in place. (NOTE:

Ride must use all proper pins with safety key in their proper locations).

12. To insure safety, the hydraulic switch located with the hydraulic pump should be in the off position while ride is in operation.

13. Gates must be in use while ride is in operation.

14. NEVER have operator ride on back of cars while ride is in operation.

15. Extreme Caution is needed in high wind when handling scenery or canvas.

16. NEVER stand on sweeps when ride is in operation.

17. NEVER work in or around center when ride is in operation unless power has been turned off.

18. NEVER operate ride until all previous passengers have left the ride and exit gate has closed completely.

19. Safety is an ongoing process, every operator must use their own judgement for safety due to constant changes in conditions. We at Majestic are always receptive to better ways to improve the safety of our Musik Express rides.

THANK-YOU

RESERVOIRS

1. USE RECOMMENDED FLUID:
   Fill reservoir with the approved fluid as specified on the label next to fill hole (See hydraulic fluid section).
2. CORRECT FILLING AND OPERATING PROCEDURE
   A. Fill reservoir to within 1/2" from the top with all the cylinders in the fully retracted position.
   B. Operate unit several times starting with short cylinder strokes and increasing length with each successive stoke.
   C. Recheck oil level often and add as necessary to keep pump from picking up air.
   D. After system is completely "bled" collapse all cylinders, check oil level in reservoir, and install the filter/breather plug provided.
   NOTE: Do not use a solid plug or a fill cap without a filter/breather element or damage will be caused to pump and/or reservoir.
3. PROBLEMS ASSOCIATED WITH THE RESERVOIR
   A. Clear oil flowing out of fill hole usually points to either one of the following:
      1) Cylinders were not fully collapsed when reservoir was filled.
      2) Reservoir is too small for cylinders total stroke.
   B. Foamy oil flowing out of the fill hole points to the following:
      1) Air is present in the system; that is, cylinders and fluid lines. The response usually is "spongy" and the cylinder moves with "jerking" motion.
      2) There is no drop tube or "down spout" on the return line so that the oil is not returning to the bottom of the reservoir.
      3) The return oil velocity is excessive; to correct add a flow control valve to slow velocity, increase size of "down spout," add a diffuser, or use a larger reservoir to increase depth of oil above the end of the return tube.
      4) The reservoir is too small to supply the volume of oil required by the cylinders and the pump picks up air when the oil level drops below the suction pick up tube.
      5) Damage to pump seal (See Pump Section).
   C. Water in the oil
      Water can enter the reservoir through the fill hole if the unit is left outdoors or washed with high pressure washer. Protect the unit, whenever possible, and change oil regularly to minimize problems. In cold weather the water will freeze and the pump will not work until the ice melts.
4. *FILTERS*
   All hydraulic controls have suction filters which must be cleaned periodically or whenever flow is slow or sluggish.

Some filters can be washed in cleaning solvent and blown dry with compressed air, those which cannot be cleaned properly should be replaced. External high pressure filters may be added to the system for added protection and ease of cleaning.

5. *TIPS AND COMMENTS*

A) In most cases the reservoir is made to be mounted either vertically or horizontally and improper mounting will not allow it to be fill to capacity.

B) On units with a remote reservoir try to mount it above the pump whenever possible to "flood" the inlet.

C) One of the functions of the reservoir is to keep the oil in the proper temperature range. If the reservoir cannot dissipate enough heat increase the size in order to bring the oil temperature down to the proper level (See Hydraulic Section).

TEST EQUIPMENT

The following is a list of the test equipment required to troubleshoot D.C. powered hydraulic systems.

1. *PRESSURE GAUGE:* 0-5000 PSI pressure gauge., preferably glycerine filled, is a very valuable and relatively inexpensive tool for checking pressure in the various sections of the circuit.

2. *D.C. TEST LIGHT:* A test light is simply a light bulb which has one end connected by a wire to an alligator clip and the other end connected to a metal probe. It is used to check the electrical circuit when the battery is connected to the system. The alligator clip is grounded and the light glows when the probe comes in contact with a "HOT" electrical component. They are easily obtained from automotive jobbers or discount stores.

3. *CONTINUITY LIGHT:* A continuity light is like a test light but contains its own battery power source. It is used for testing electrical circuits when the components are not connected to a battery. They are easily obtained from discount stores or electrical jobbers at modest cost.

4. *VOLT METER:* A D.C. volt meter, as used in the automotive repair business, is a good investment for troubleshooting problems that are related to low voltage. They are used in two ways; First: one probe is grounded while the other is used to probe the "HOT" leads, the meter shows the voltage available at the point where the second probe is connected; Second: they can be used to measure a voltage drop in a wire, one probe is connected to one end and the remaining to the other end, the reading is the voltage drop.

5. *OHM METER:* An ohm meter is used to measure resistance and is a very useful tool when working on wire circuits and solenoid coils. On some coils the wire resistance is up to a level where a D.C. test light might show an open circuit and it really is not so. An infinite meter reading on any test shows that the circuit is open. A coil test, however, will always show some value of resistance but it must not be infinite. All tests conducted with an ohm meter must be done with the battery disconnected from the system.

6. *ASSORTED HOSES, HIGH PRESSURE FITTINGS:* These can be used to connect and/or isolate certain parts of a hydraulic circuit to a pressure gauge or a shutoff valve for diagnosing hydraulic problems.

7. *HIGH PRESSURE SHUTOFF VALVE:* The shutoff valve can be used to choke off oil flow so that a "false" load can be put on the

pump and other components. With the valve installed it can be slowly shut off while the equipment listed above records the data for making a proper diagnosis.

HYDRAULIC FLUID

1. *THE PURPOSE OF OIL:* The main purpose of hydraulic fluid is to transfer power from the pump to the actuators but it must also perform many other tasks which are critical to a well designed system. First, the oil must have good lubricity or be "slippery" so that the friction will be as low as possible to keep metal to metal wearing at a minimum. Second, the viscosity or "thickness" must be in the proper range at the operating temperature so that unwanted leakage will be at a minimum, but will still allow the oil to lubricate the close fitting parts in the system. (Oil that is too thin will leak past seals, valve spools, and the gears; oil that is too thick will not flow properly and cause the pump to cavitate or starve). Third, the oil must be compatible with the seals used in the system. Fourth, there should also be additives in the oil to slow down the effects of rust, oxidation (oxygen in the air combining with the oil to form sludge) foaming, and water settling to the bottom of the reservoir, Fifth, the oil must be able to pour or flow at the lowest expected temperature so that the oil can reach or get into the pump. For all of the reasons just listed, standard hydraulic fluid was found in most cases, to be the best readily available fluid for the job in most climate conditions.

2. *SELECTING FLUIDS FOR APPLICATIONS OUTSIDE OF THE STANDARD TEMPERATURE RANGE:* When looking for fluids that can be used in the place of standard hydraulic fluid or for applications where the operating temperature is outside of the range, the following specification should be discussed with your local oil distributor:

A. Fluid must be compatible with Buna-N sealing compounds.
B. The pour Point must be below the lowest anticipated temperature that will be encountered.
C. It should contain Rust and Oxidation inhibitors as well as other detergent type inhibitors.
D. The Viscosity (SUS) should lie between 80 as a minimum and 375 as a maximum in the operating range, with the ideal viscosity near 200 SUS.
E. The viscosity index should be as high as possible. As an example, standard hydraulic fluid has the following specifications as listed by most oil manufacturers.
   a) Viscosity (SUS)
      100 F.....185 to 205
      210 F.....45 to 55
   b) Pour Point.....-45 F to -35 F
   c) Viscosity Index.....145 to 165

CHECK LIST

Listed below is a check list of areas that need to be checked to see if done correctly.

___ 1. **All 6 main blocking points on trailer are secure.**

___ 2. **Hydraulics are down and snug.**

___ 3. **Hydraulic controls are unplugged.**

___ 4. **All blocking points on up-rights are snug and secure.**

___ 5. **All purlins are R keyed.**

___ 6. **All X bracing R keyed.**

___ 7. **All running track bolts are tight and R keyed.**

___ 8. **All walk boards are secure.**

___ 9. **All fence is in proper place and R keyed.**

___ 10. **All 14 tubs pinned and R keyed (3 pins per Tub).**

___ 11. **Exit step and platform are blocked and pinned.**

___ 12. **Entrance steps are pinned and secure.**

___ 13. **Wind brace cables attached to the base of the ride.**

___ 14. **All corner scenery is pinned and R keyed. Do not walk on scenery wires.**

___ 15. **All plugs for the scenery are secure.**

___ 16. **All braces for the scenery are secure.**

___ 17. **Three support tubes for top are in place.**

___ 18. **Check for braces and keys for front sign.**

___ 19. **The four main white posts have two pins per post and they are keyed.**

___ 20. **Crane rail can be left up while ride is running. Check for safety cables.**

___ 21. **Secure hoist so it won't move.**

SET UP PROCEDURE AND MAINTENANCE SCHEDULE

1. Pull ride on location choose a site as level as possible.

2. Removing tractor: It is important to raise the front mechanical jacks until weight is 95% off tractor springs then remove tractor.

3. Leveling: Place a builders level on the trailers gooseneck and rear trailer frame. Using the hydraulic jacks raise trailer to 42" high measuring from ground to top of trailer deck (this dimension may vary due to levelness of ground). Level ride in an even plane (hydraulic controls located in side panel, second up from axle as shown in Fig. 1).

Fig.1

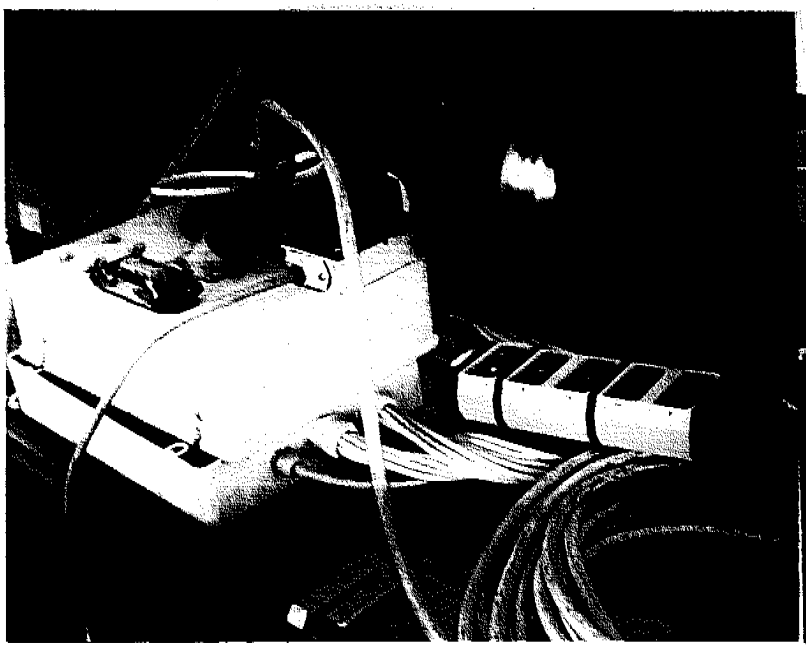
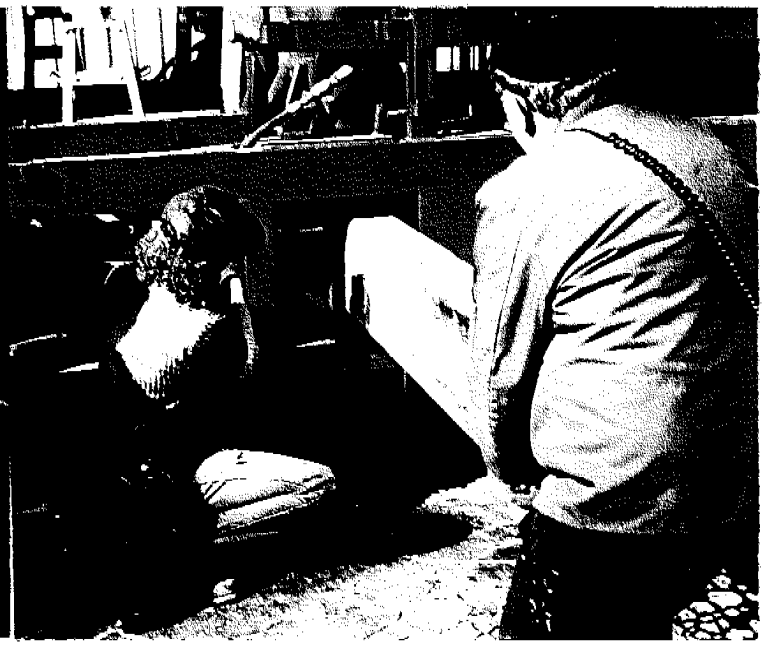


Fig.2



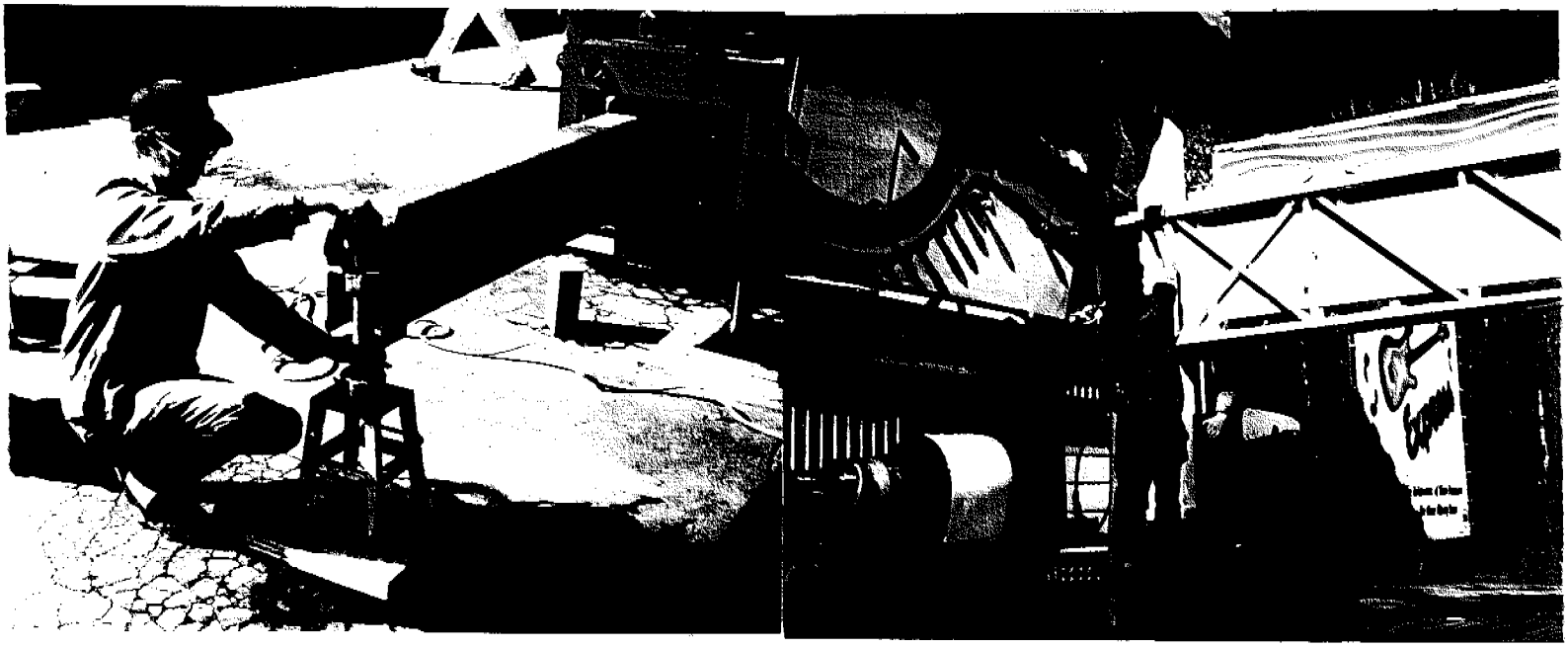
4. Manually pull out each of the four (4) mechanical stabilizer jacks. Pin and safety key each in place as shown in fig. 2. Locate stand with blocking and screw ball joint into stand cup (there must be plenty of grease on ball end). Turn jam nut down on threads until "hand tight" against stabilizer arm as shown in Fig. 3.
Using turning bar, insert into hole just above ball joint. Turn clockwise until completely tight.

5. Remove all excessive components that may be in the way of setting up the scenery (fence purlings walkway supports).

6. A) Using main hydraulic cylinders, raise top of canvas section approx. two feet (2') and then raise scenery hydraulics approx. six inches (6"). This is to give clearance for setting up scenery.

B) Remove safety pins holding scenery in place, rotate side scenery on hinge to be perpendicular with trailer. At this point place removable section in place as shown in Fig. 4. Repeat with rear of ride.

Fig. 3 Fig. 4



7. A) Using the nylon rope provided, pull front and rear scenery out and into position as shown in Fig. 5. NOTE: Operator setting up ride must use caution when pulling out front and rear scenery. Binding or high winds could cause damage.

B) Pin sides and end scenery together as shown in Fig 5A.

C) Pin and safety key scenery cross bracing into place. NOTE: At this point, height of scenery should be readily accessible with a ten foot (10') ladder.

8. A) Remove safety pin from scenery and gently lower until in place as shown in Fig. 6. EXTREME CAUTION SHOULD BE TAKEN IN HIGH WINDS.

B) Lift front of scenery and assemble stabilizing bars in place.

C) Assemble sign bracket as shown in Fig.7. Slide sign onto extension bracket arms and pin in place.

D) Carefully lift sign up and into place as shown in Fig. 8. Install cross bracing at all appropriate locations around scenery. Pin and safety key in place as shown in Fig. 8A.

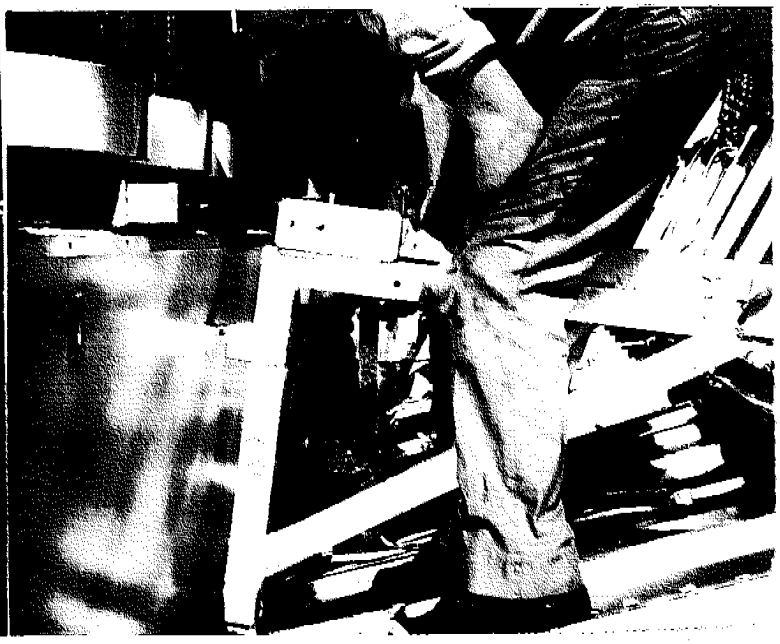
9. Rotate star light scenery out from trailer and fasten into place. Make sure each arm of the star in fastened securely and that all pins and safety keys are in place.

Fig. 5

Fig. 5A

Fig. 6

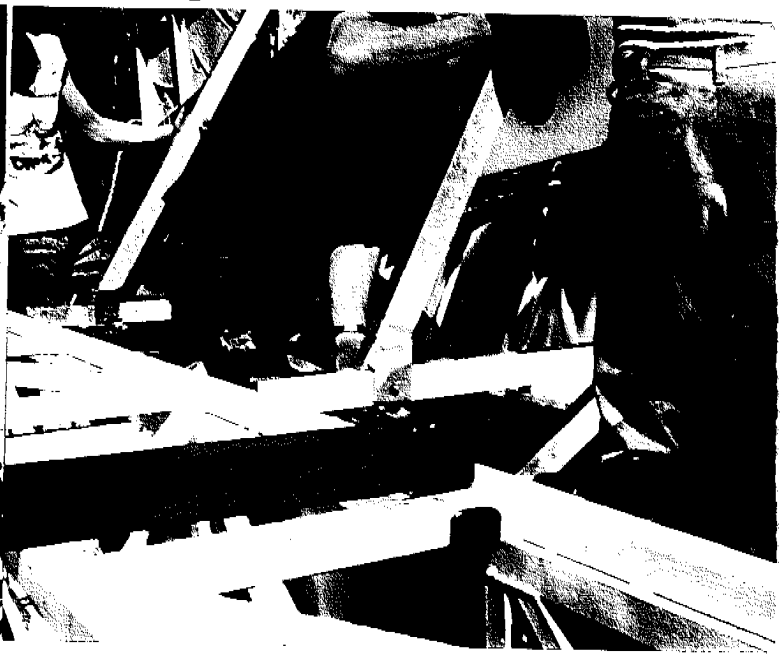
Fig. 7



10. A) Assemble front and rear purlins, use proper blocking to assure that each section of purlin is on the same plane as the trailer as shown in Fig. 10.
B) Install each walkway support in it's proper holder then pin and safety key in place.

Fig. 8

Fig. 8A



C) Install walkway support spreaders between supports.
D) Install cross braces between walkway supports

11. A) Unroll canvas guidewires and attach to brackets that are shown in Fig. 8. Raise canvas roof to maximum height then pin stabilizer bars into place as shown in Fig. 10A.
B) Extend canvas to it's full length as shown in Fig. 11.

Fig. 9

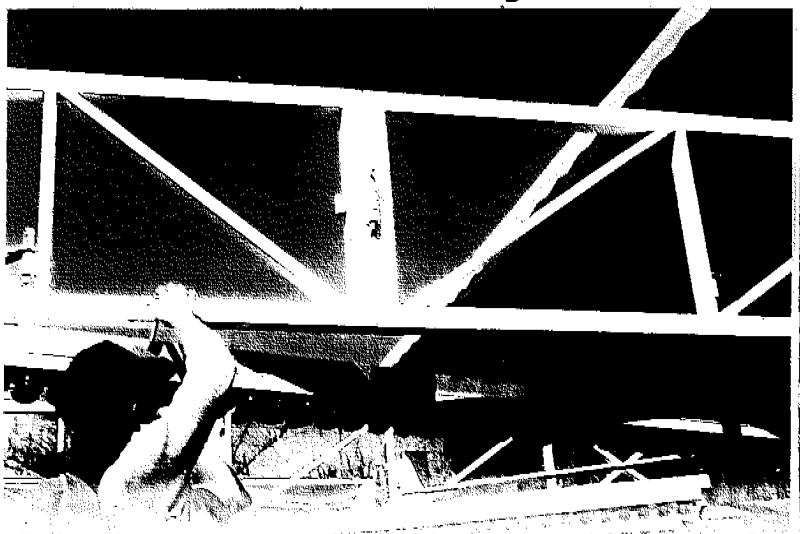
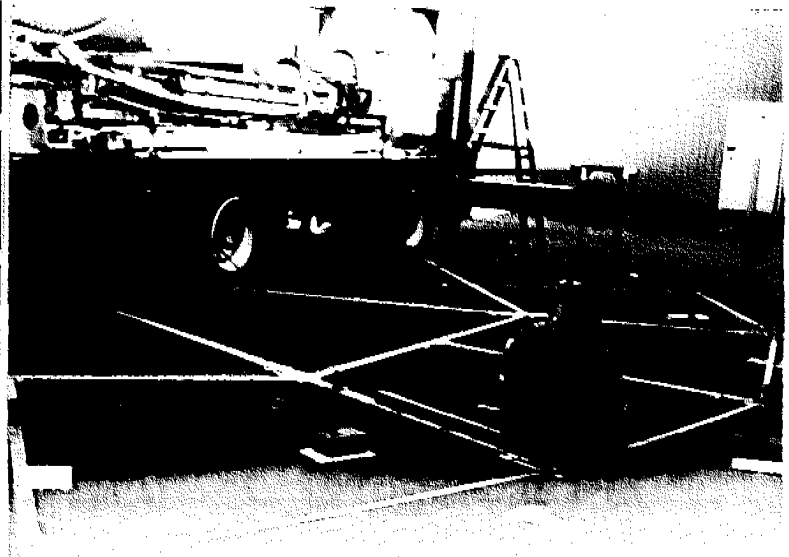


Fig. 10



12. Assemble track to walkway support. Bolt sections of track together. Each connection must use the maximum quantity of bolts possible and each bolt must use one lock washer behind the nuts.

13. Assemble the entrance and exit steps. Assure that each brace and step are firmly seated or pined in place.

14. ASSEMBLY OF THE WALKWAY
Begin with the walkway section numbered 6/7 and proceeding counter-clockwise until complete.

Fig. 10A

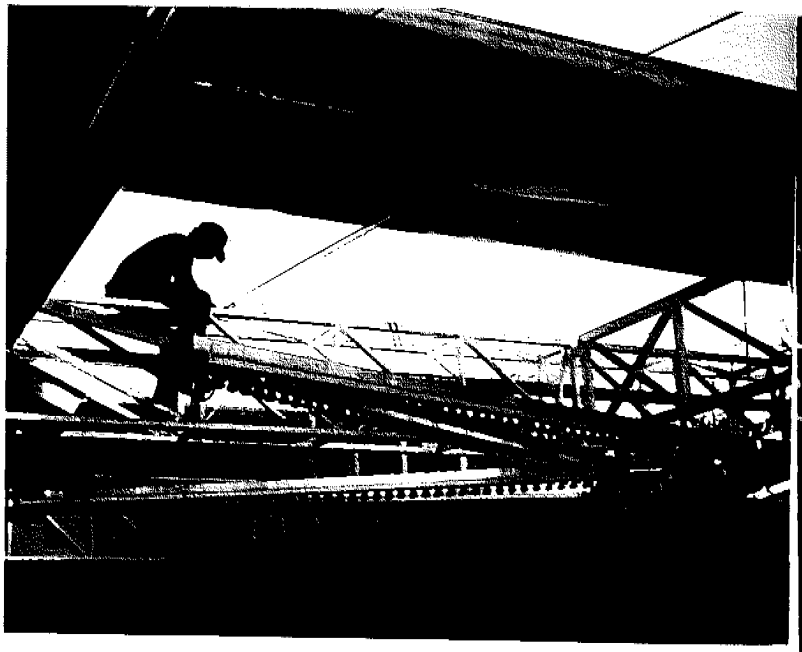
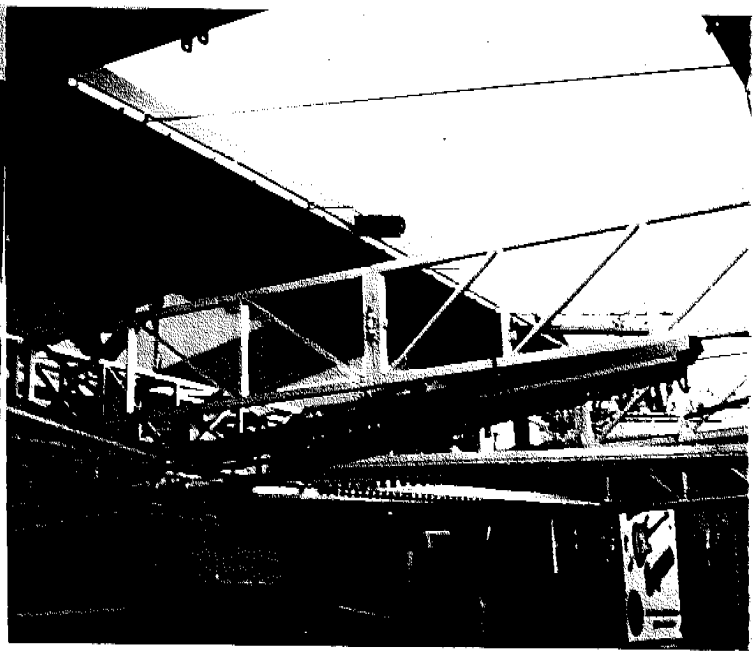


Fig. 11



15. A) Using the sweeps dolly as shown in Fig. 12, roll sweep onto the track and into place.
B) Remove dolly (blocking may be needed under the sweep wheel to raise the dolly enough to remove it from the sweep).
C) Pin sweep into it's proper place as shown in Fig. 13 (if needed, oil pin lightly to make insertion easier. Never grind or file).
D) Block wheel to keep from putting undo stress on pin.
E) Upon pinning of second sweep, remove sweep spreaders from rack and position as shown in Fig. 14. Repeat steps A, B, C, and D until all sweeps and spreaders are in place.
D) Remove blocking from wheel of sweep.

16 Insert spreader, hold down pin thru holder and polyurathane sleeve. Safety key in place as shown in Fig. 15. Repeat on all areas where spreaders are attached.

Fig. 12

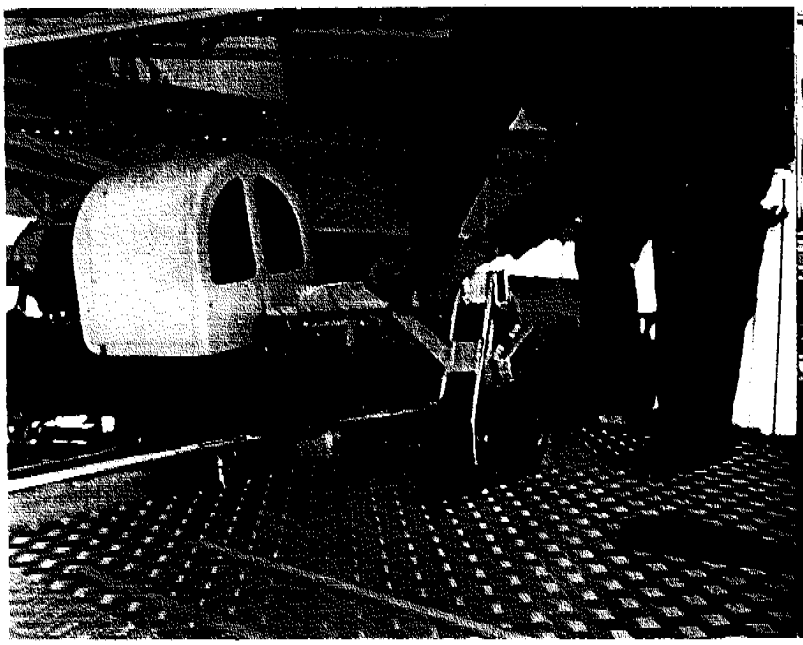


Fig. 13

Fig. 14

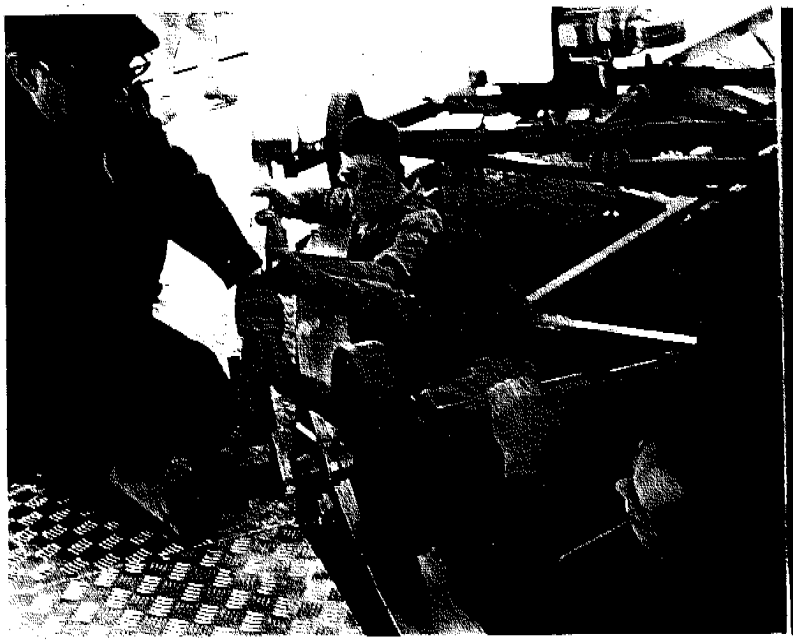
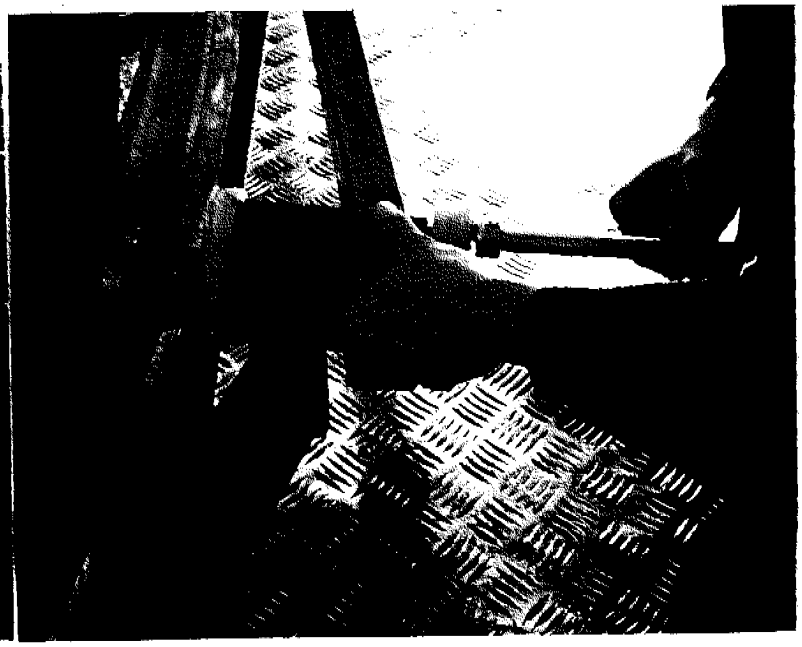


Fig. 15



17. Assemble center light fountain as shown in Fig. 16. Install light rows and connect wiring to electrical box shown. Repeat until all light rows are in place.

18. Make a visual inspection of all scenery electrical connections. If any are not connected, do so at this time.

19. A) Raise scenery structure. Raise scenery until the lower hole clearly shows on the four large guide posts.
    B) Insert the four pins that have a ground flat surface on one edge. Lower scenery until the four main posts are touching pin flats.
    C) Insert four large pins thru the post's upper holes and safety key in place.

20. A) Carefully remove cars from racks using overhead crane.
    B) Place cars on corresponding sweep (number stamped on sweep is directly in relation to number on car).
    C) Pin and safety key in place. Repeat until all cars are in place.

Fig. 16

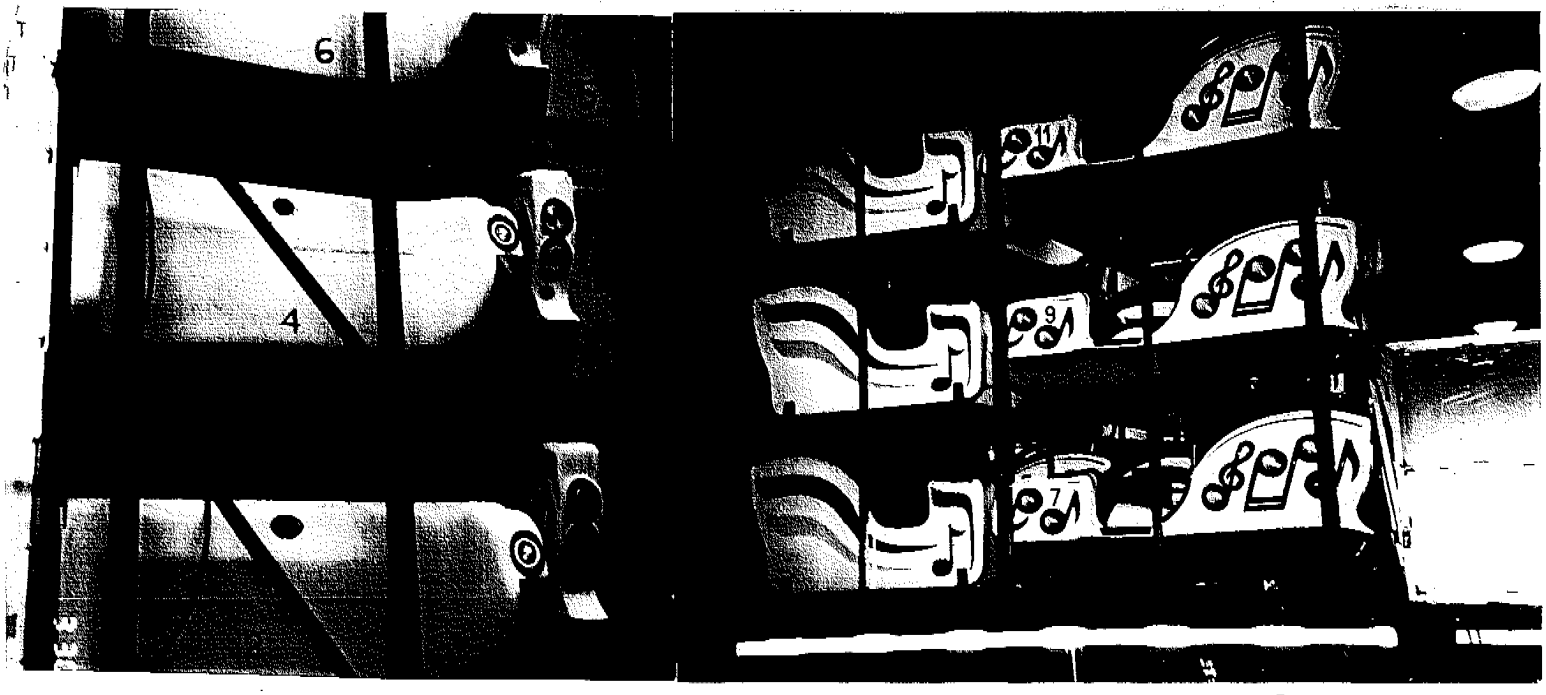
21. Assemble control house, slide back and side frames on the track and hinge pin together in place. Add roof and pin securely to side and rear frames.

22. Install fence. Start with number 6/7 and continue clockwise around back side of ride. Pin and safety key each piece in place as you proceed. For front of ride, including entrance and exit, begin with fence number 5. Axle side gooseneck to exit begin with number 20 then pin and safety key each fence section.

23. Visually inspect after erection of ride. This must be done to ensure that following are completed:
    A) Proper blocking is used
    B) All pins and safety keys are in place
    C) All bolt/nut fasteners are secure
    D) Ride stabilizer arms described in section #5 are securely in place (ground settling)
    E) Structural integrity of the entire building is within regulations set forth by ASTM Standards on Amusement Rides and Devices as sponsored by ASTM committee F-24 on Amusement Rides and Devices. Fourth Edition 1992 P.C.N. 03-624092-47.

TRAILER RACKING FOR MUSIK EXPRESS

1. Rack all Tubs as shown in photo. Before racking last 2 cars you must install the steel X Bracing for support and Strength.



After all cars are racked, remove crane rail. You can not lower roof with crane rail in position.

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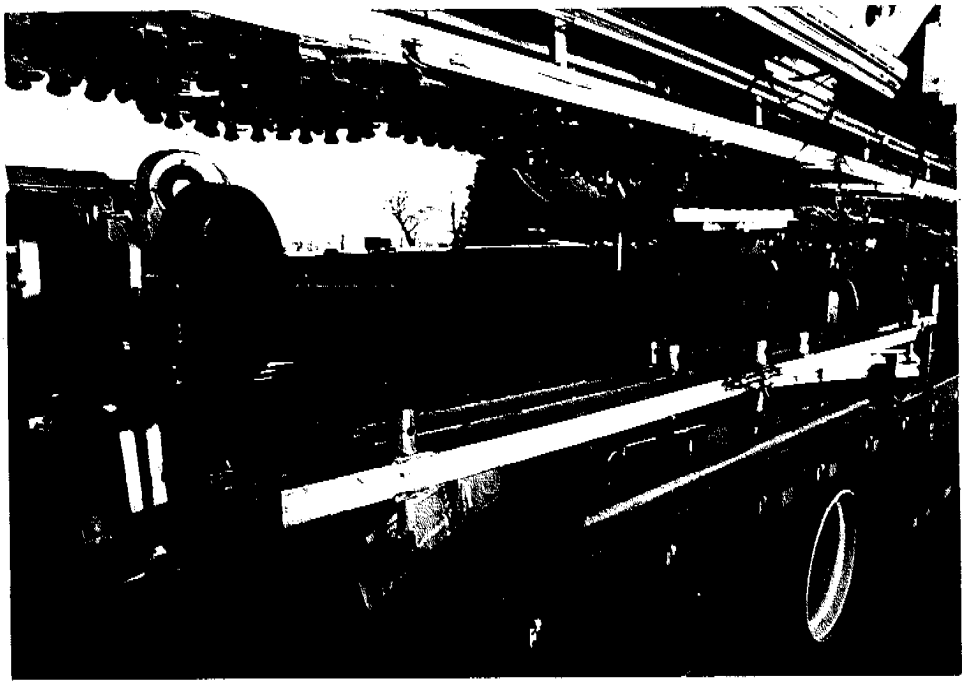
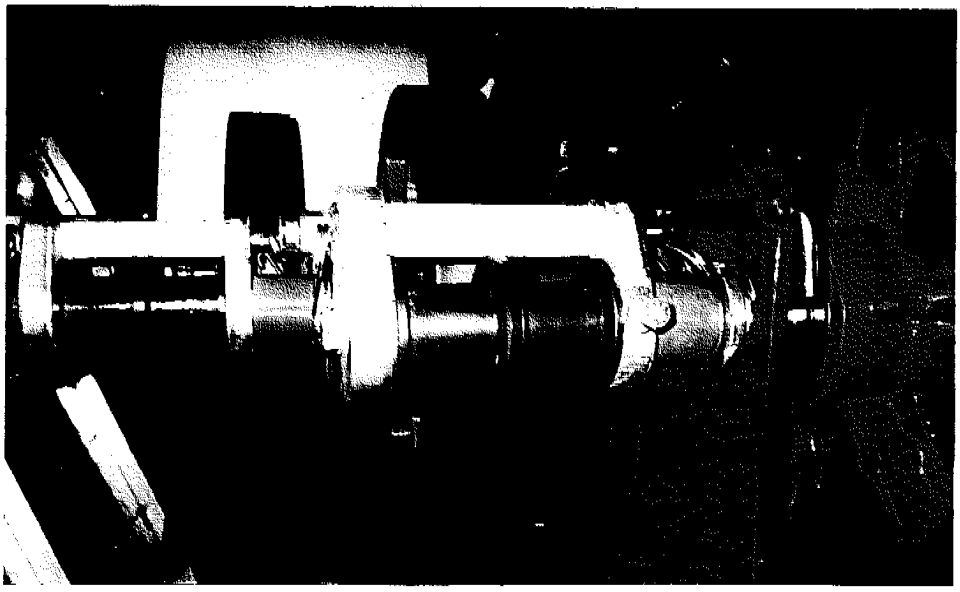
TRAILER RACKING FOR MUSIK EXPRESS

2. After all cars are racked, position sweep number 7 toward gooseneck pin and secure number 14. Sweep toward axle end.



3. Install all 4U brackets for sweep supports. Remove sweep spreader. Pull pins and fold sweeps.



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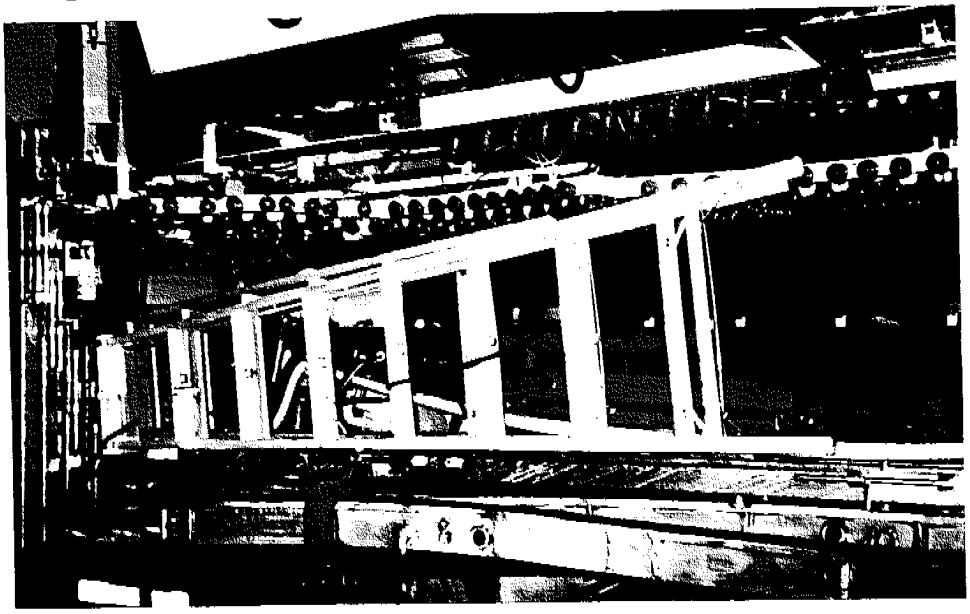
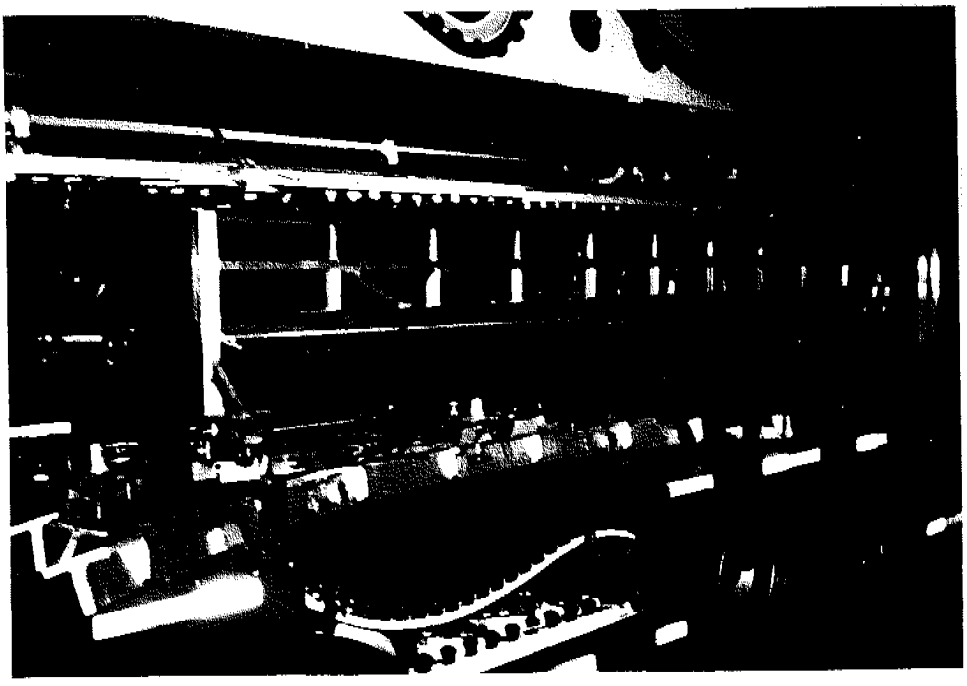
TRAILER RACKING FOR MUSIK EXPRESS

4. Unbolt aluminum drive track. Rack all track with corresponding numbers welded on steel supports.



5. Rack center light fountain as shown in photo.



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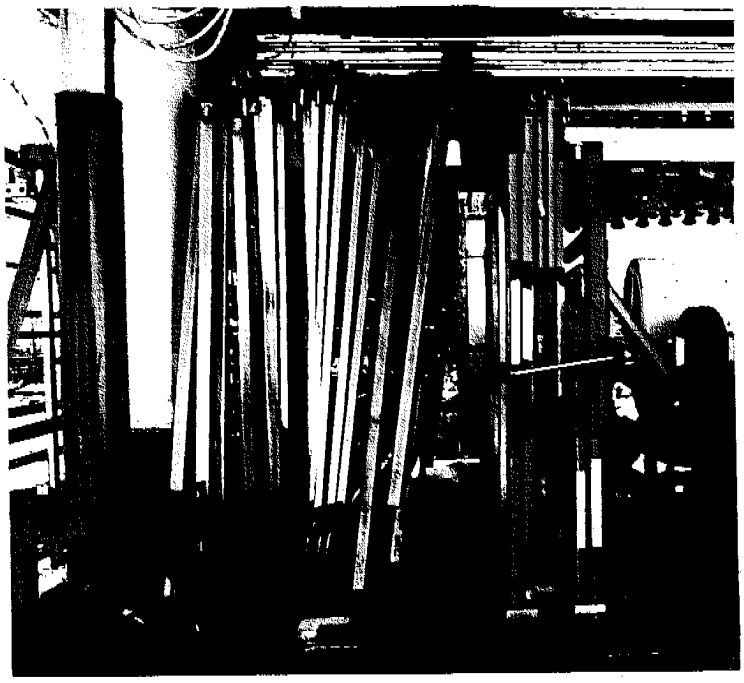
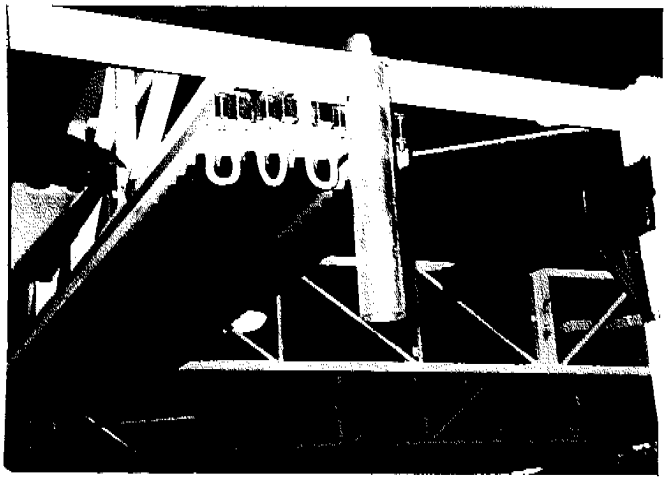
TRAILER RACKING FOR MUSIK EXPRESS

6. At this point with the <u>CRANE RAIL REMOVED</u> from ceiling. Pull all of the pins lower roof to a point so all fences and painted front panels can be reached.



7. Fold and pin lighted star to center of ride.



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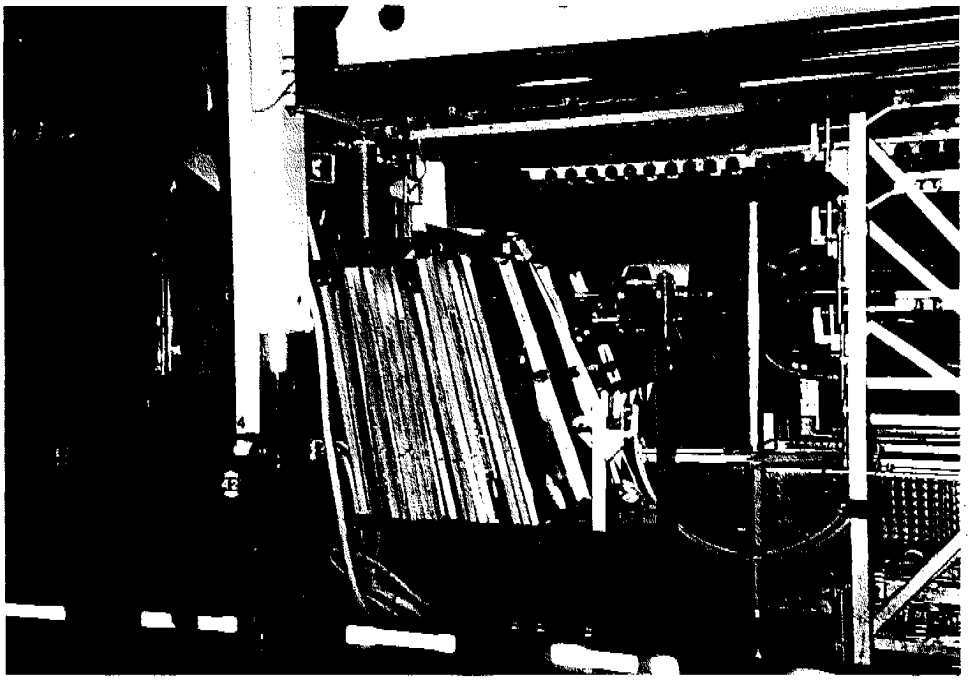
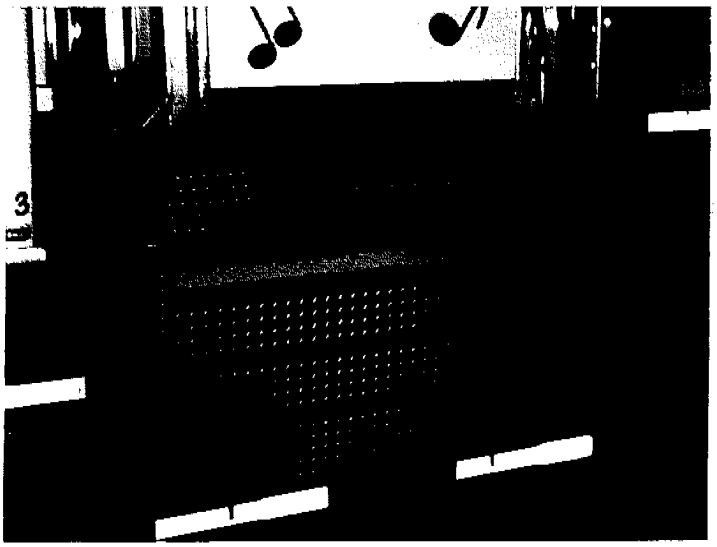
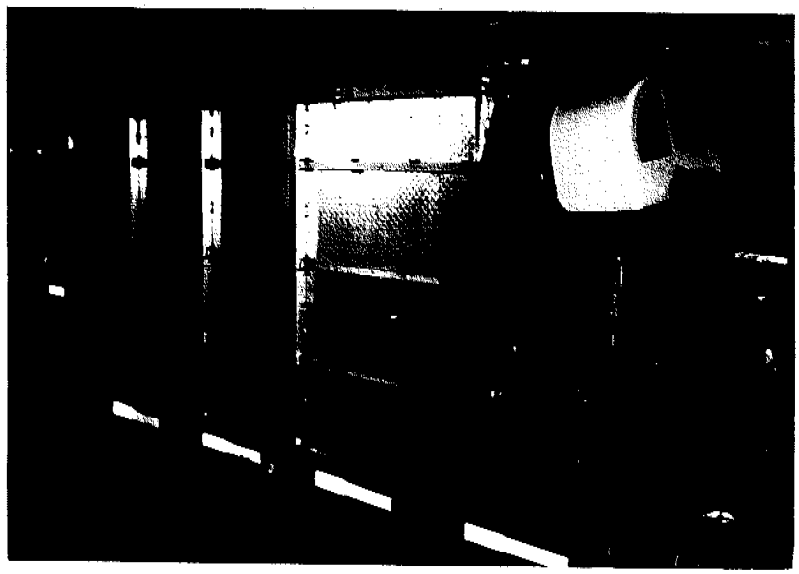
TRAILER RACKING FOR MUSIK EXPRESS

8. All footboards can now be racked. Place aluminum rack into position and stand up all footboards (largest ones first).



9. Rack entrance and exit steps as shown. Ramp platforms to be positioned upright at approximately center of trailer as shown.





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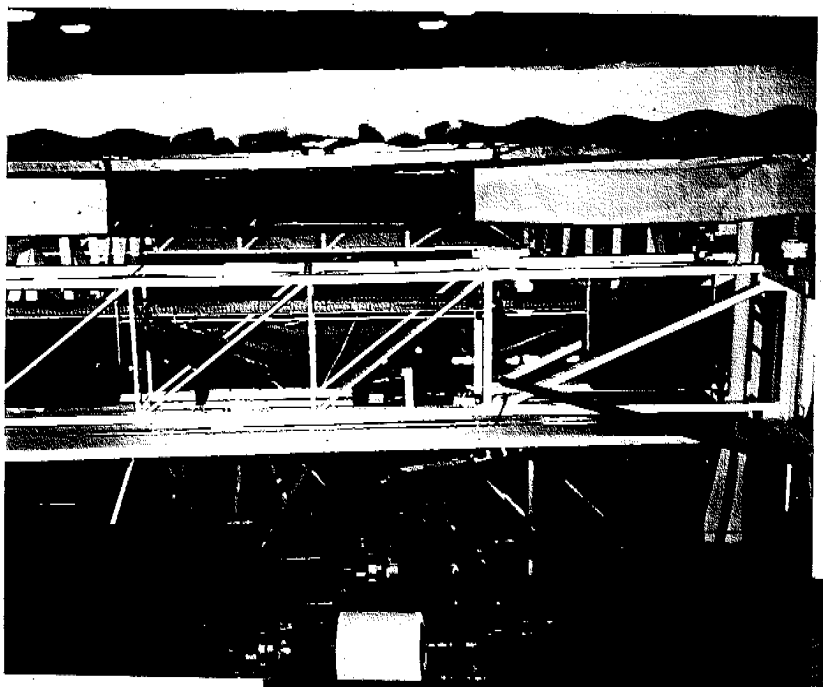
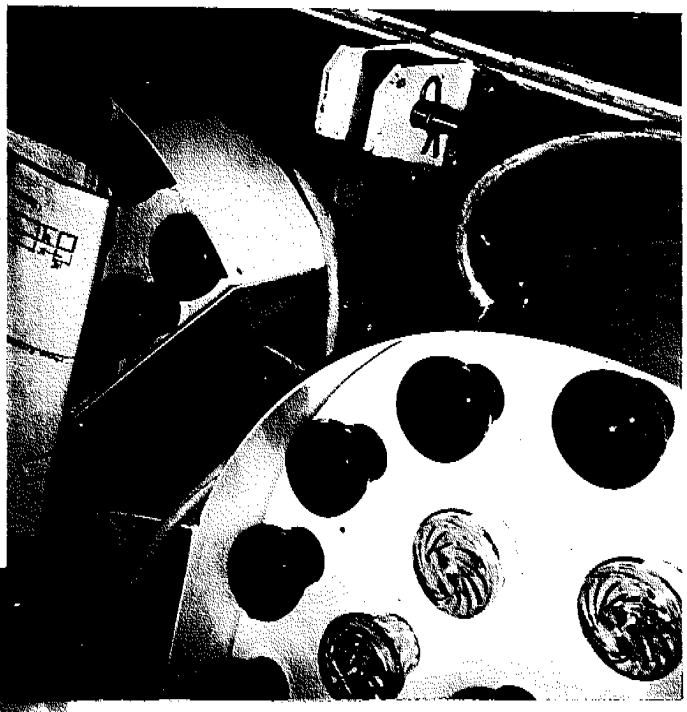
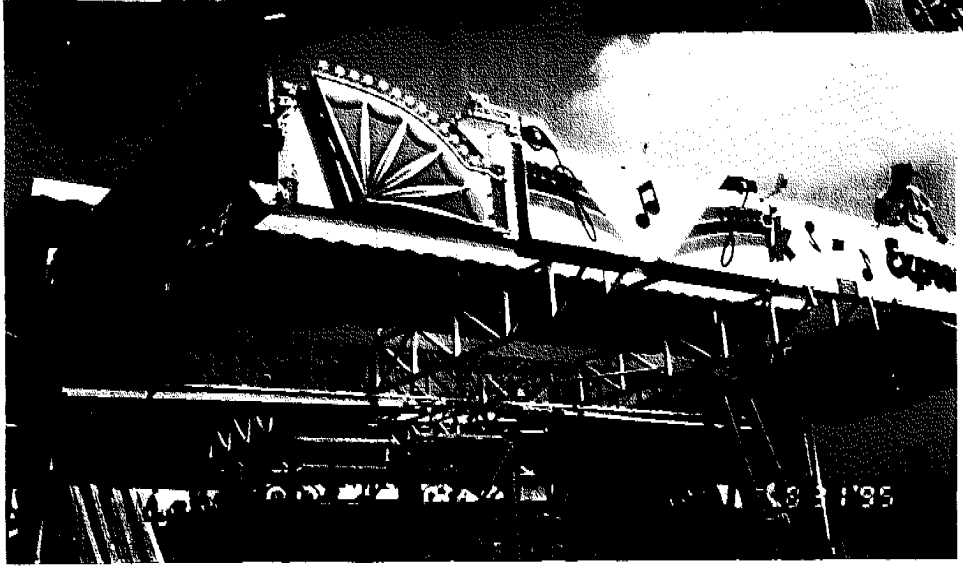
TRAILER RACKING FOR MUSIK EXPRESS

10. Folding entire roof.

Roll up canvas first. Disconnect all steel cables and place them on top of canvas. Lower the sign and pin. Remove and rack on rear panels 3 large corners and starbursts.







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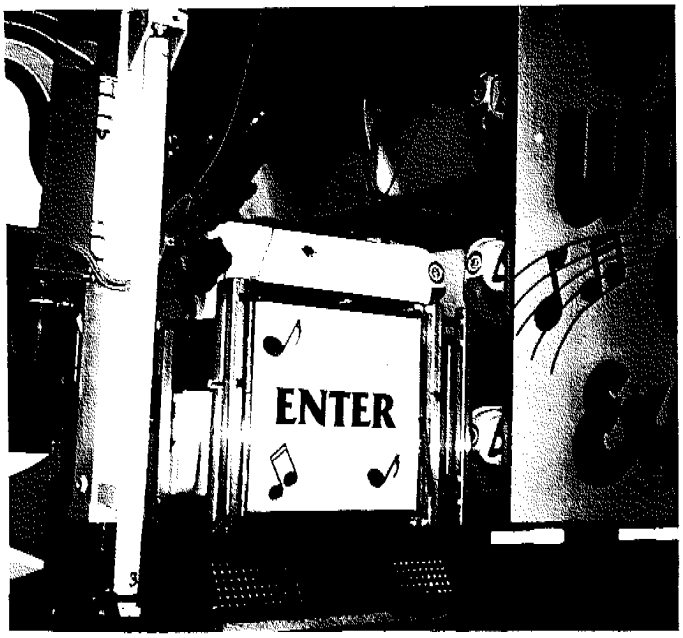
TRAILER RACKING FOR MUSIK EXPRESS

11. Fold front and back scenery then lower top until all of the posts touch steel blocks on base of column.



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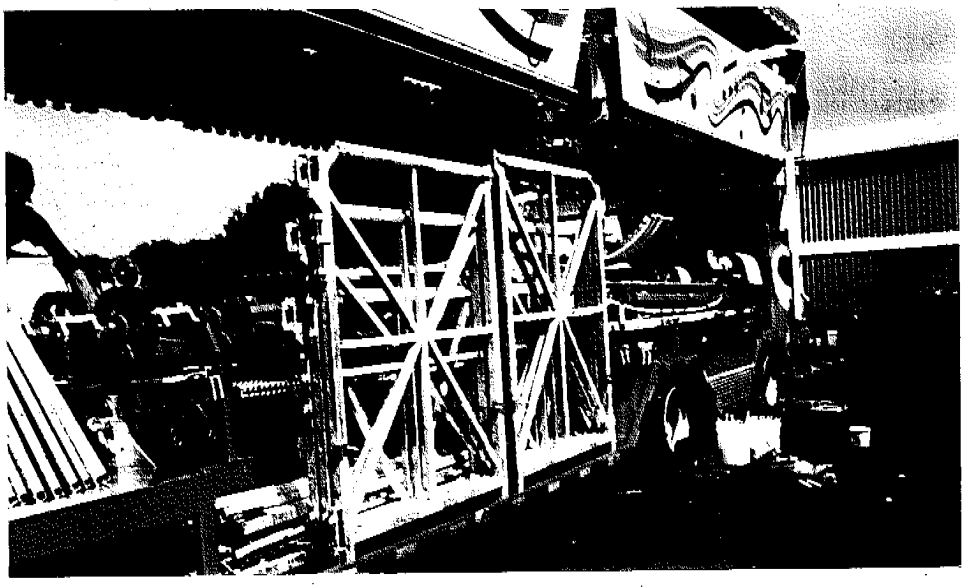
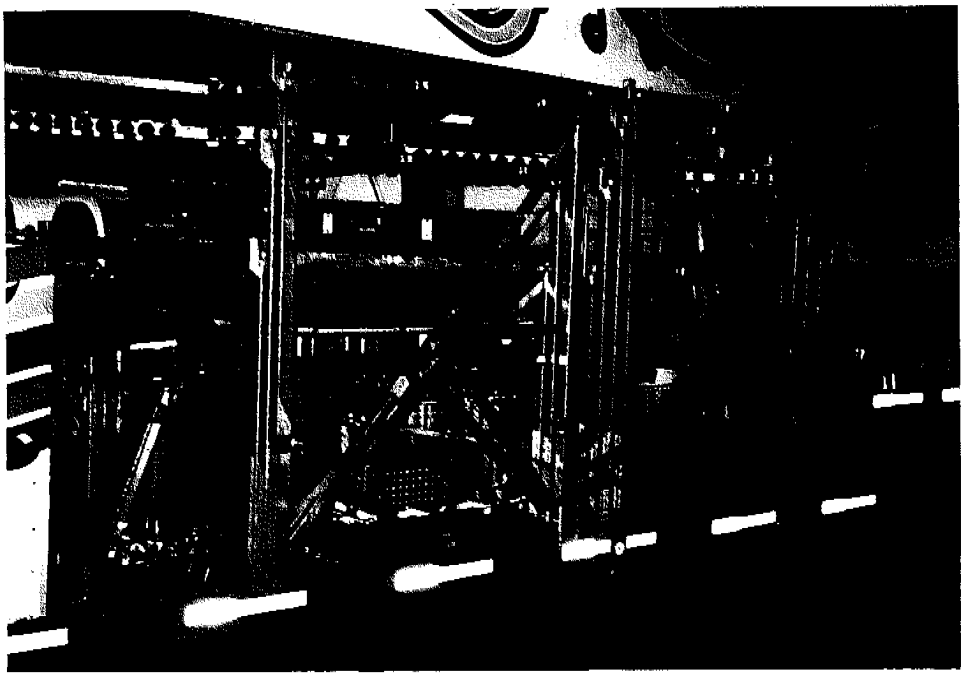
TRAILER RACKING FOR MUSIK EXPRESS

12 All uprights and steel base can be placed in position. All long purling at rear of trailer. IMPORTANT ALL TALL UPRIGHTS MUST BE IN THE PROPER POSITION. Because damage could occur when lowering the roof.





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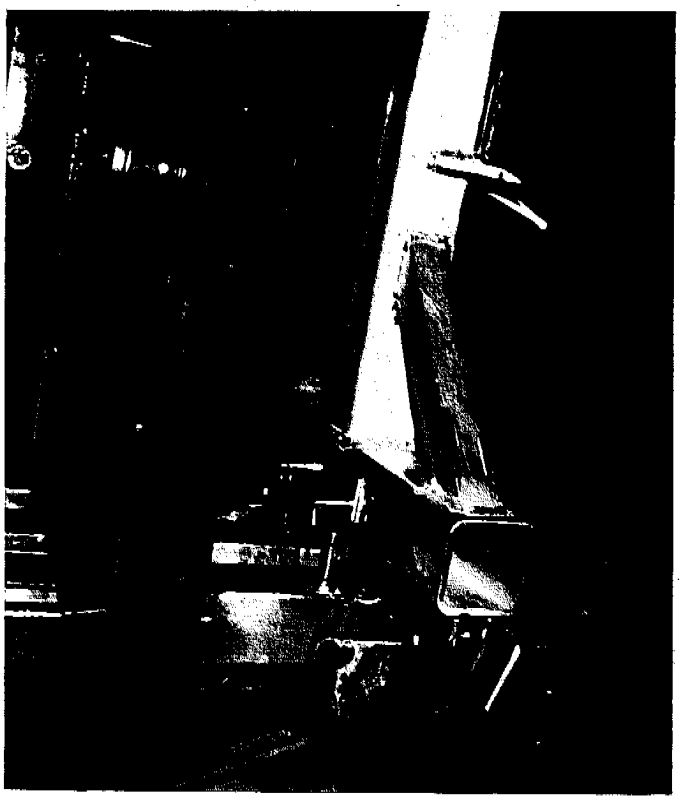
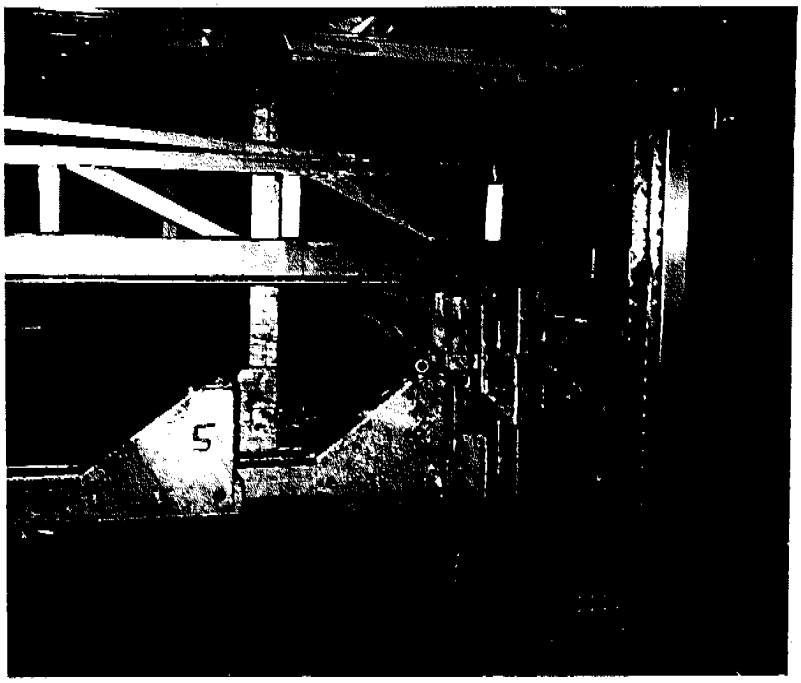
13 CRANE RAIL RACKING

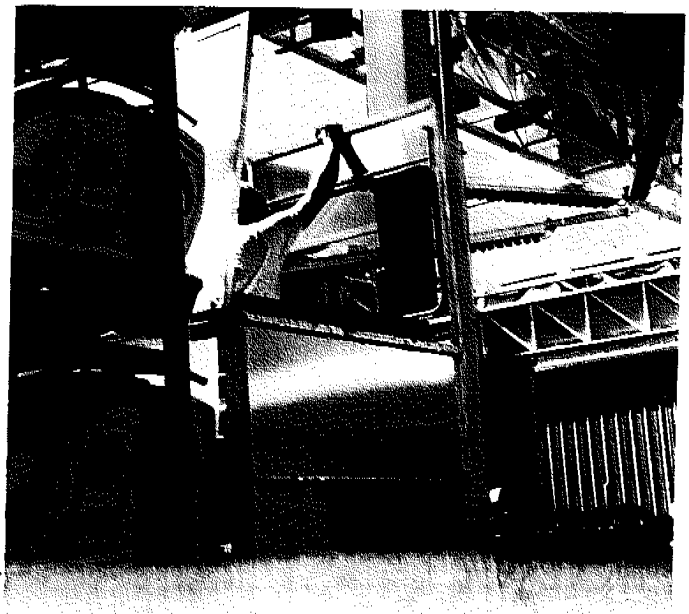
As shown in the photo, crane rail is racked on passenger side of trailer over the steel purlings. Make sure all pins and safety keys are attached before transit.





14 CONTROL BOOTH RACKING

Remove doors and roof. Disassemble, fold and pin rear stationary section. Remove sides, fold and rack along with doors and roof in center of trailer.



TRAILER RACKING FOR MUSIK EXPRESS

15. VERY CRITICAL

Prior to transit of Musik Express, both 5/16" x 8' safety cables must be attached to all 4 swing out rafters. This is a back-up safety requirement if the steel brackets would fail. Attach as shown in both photos.

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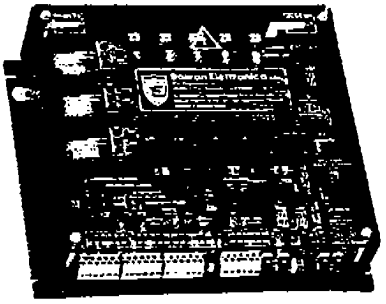
INSTRUCTION MANUAL

CODE 280R



Rowan Elettronica srl

Via Fogazzaro, 67 - 36030 CALDOGNO (VICENZA) - ITALY
TEL.: 444 - 905566
FAX :444 - 905593

24/11/94

CODE 280R

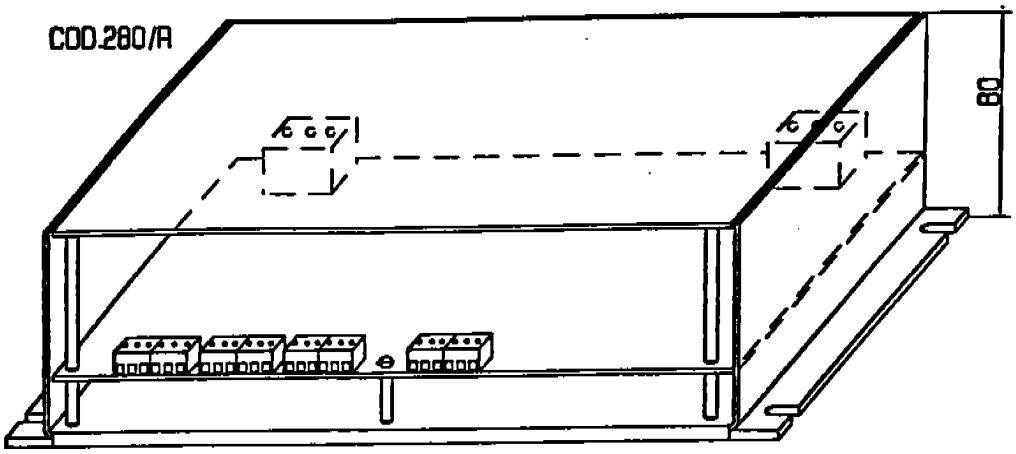
BIDIRECTIONAL DRIVE FOR [illegible]

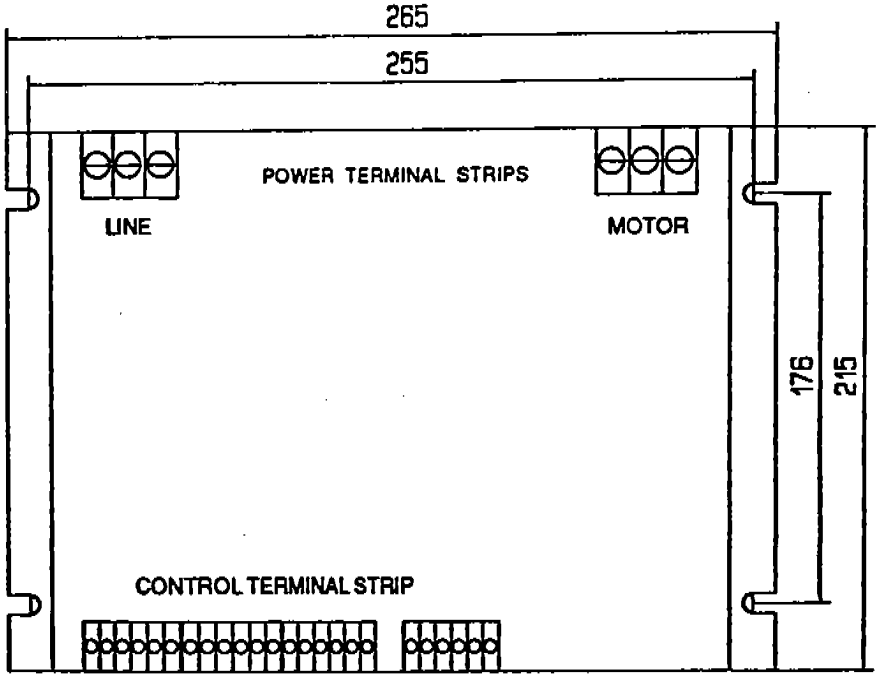
TECHNICAL CHARACTERISTICS

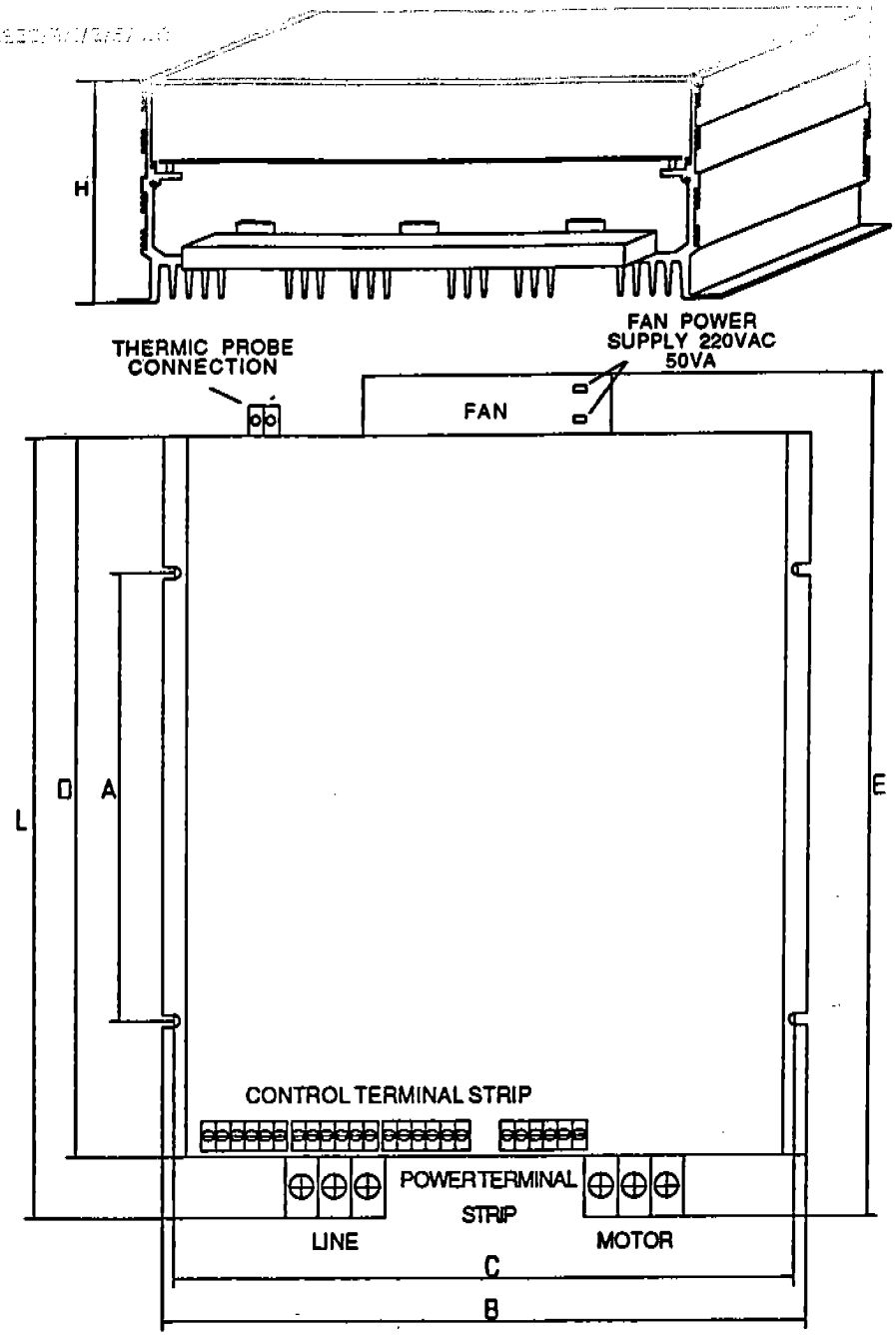
- Range of drives up to a maximum power of 70 Hp/51Kw (380V).
- Selectable standard supply voltage 220/380VAC -15% +10% 50/60 Hz. Other supply voltages available on request: 240-415-440-460 VAC.
- Set-up for controlling the speed of Rowan 2-4-6 pole motors, equipped with tachometer dynamo type 20 VDC at 2800 rpm.
- Control of speed and rotation sense by potentiometer or signal reference DC ±10V.
- Maximum speed control precision ±0.1% referred to maximum speed and for load variations from zero to rated value.
- Operation with acceleration and deceleration ramp adjustable separately via internal trimmers or external potentiometers.
- Facility to activate an adjustable slow speed by pure contact or NPN transistor open collector.
- Torque limitation adjustable externally by potentiometer or 0 ± 10VDC signal.
- All inputs/outputs are galvanically insulated from high voltage and connectable with PLCs, programmable logic boards, etc.
- Output for connection of zero relay with 24VDC max. 50mA coil.
- Protections: 0.5A fuses for driving circuit protection.
- LED indicating the following operation status: power on - motor run - phase failure - zero relay intervention - slow speed activated - Right/Left rotation.
- Code 280R model in aluminium container low version.
- Code 280R/1/2/3/4/5 in extruded aluminium container equipped with cooling flaps.
- Code 280R/3/4/5 equipped with cooling fan and thermal probe with contact opening at 80°C.
- Operating temperature -15°C/+60°C.
- Immunity to power mains noise in conformity to IEC standard 801.4 class 4 (max. class expected).
- Polycarbonate top guard with silkscreen printed diagram for operation control and calibration.
- Level of protection IP 10.
- Plug-in type terminal strip for input/output control connection interchangeable with previous Code 280 model.

OPERATING PRINCIPLE

Code 280R series drive is a tachometer feedback three-phase voltage regulator using controlled diodes (SCR) driven by phase-limiting system. The voltage that powers the motor is the result of an analog process which maintains the speed constant, through the differential control between the reference value as an actual speed value, picked up by the tachometer generator, and the one set by the potentiometer or external analog voltage. The result obtained by the combination of this system with the Rowan three-phase motor is an extremely silent and uniform constant torque and speed system, from zero to the maximum speed of the motor. The fact that controlled diodes (already overdimensioned) were adopted for the power portion enhances reliability in the case of overvoltages or overcurrents. Speed and rotation sense of the motor are determined respectively by the value and polarity of the reference signal with a max. range of ±10VDC. Functioning extends to all 4 dials; the matching motor is able to generate a driving torque and a braking torque in both rotation directions with a starting torque up to 3 times the rated torque. The system code 280R + Rowan motor is therefore particularly suited for fast movements (e.g. axes control) also when large inertial loads are driven, and without requiring any external device such as the braking resistors typical of frequency controls for normal asynchronous motors and DC motor drives.

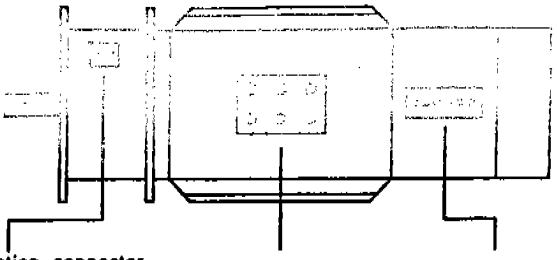

COD.280/R
80


265
255
POWER TERMINAL STRIPS
LINE
MOTOR
176
215
CONTROL TERMINAL STRIP



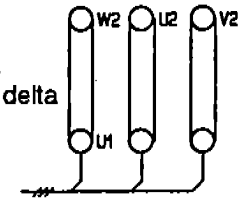
- Models 280R/1/2 are without fan and thermal probe.
- Model 280R/4 and 280R/5 are equipped with 2 cooling fans (100VA).

CODE	H	B	L	A	C	D	E
280R/1	150	265	310	200	257	280	
280R/2	150	265	315	200	257	280	
[illegible]	[illegible]	[illegible]	315	200	257	280	360
			[illegible]	[illegible]	57	350	435



Power terminal strip connection:
Even if it passes through speed control actuation, the connection remains as a normal motor, therefore if the motor "nameplate" rating states:

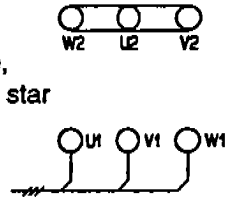
MOTOR 220△/ 380⅄



with 220V line, connection is delta type

from actuation terminals U1-V1-W1

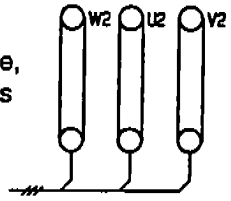
MOTOR 220△/ 380⅄



with 380V line, connection is star type

from actuation terminals U1-V1-W1

MOTOR 380△/ 660⅄

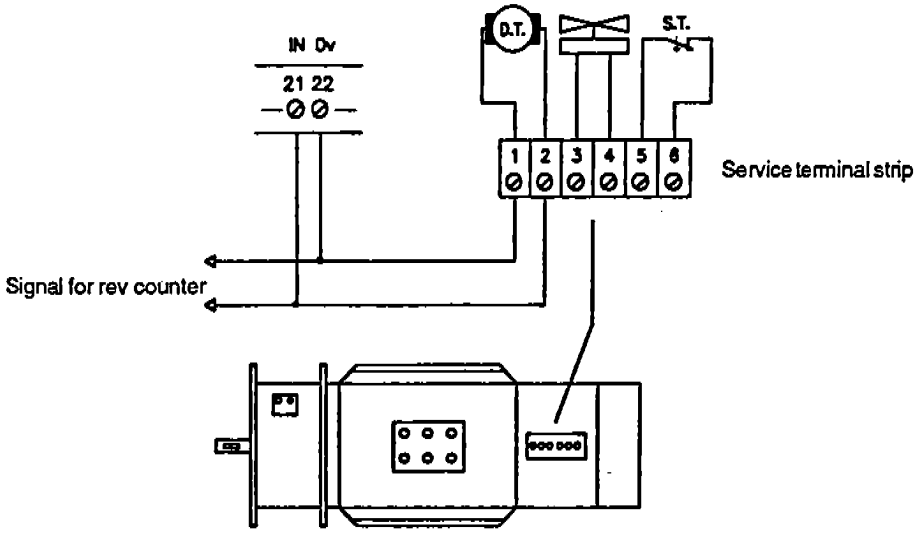


with 380V line, connection is delta type

from actuation terminals U1-V1-W1

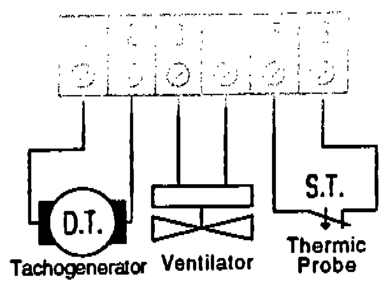
In case of replacement of the 6-wire connection board with the 3-wire type, Rowan motor connection must be delta.

TACHOMETER DYNAMO CONNECTION



- Perform connection with shielded cable.
- Dynamo generates direct current voltage of 20VDC at 2800 rpm of motor.
- The dynamo signal is directly proportional to motor speed, and can be used as a reference signal for the analog/ digital rev counters, interface boards, etc.
- The dynamo signal may be charged for a max. of 10mA.

If the dynamo signal does not arrive or is inverted, the motor revolves at max. speed without complying with the rev control signal at terminal clamp 15. With positive speed reference at 15, the dynamo signal at terminal clamp 21 is positive (same correspondence for negative speed signal).



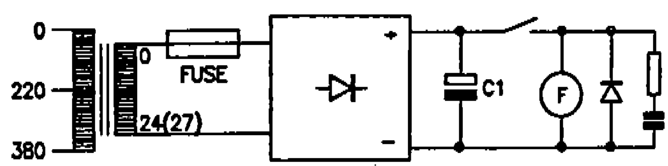
1-2 TACHOMETER GENERATOR: from these terminals it is possible [illegible] of the tachometer [illegible] a direct voltage [illegible] the motor speed; for this reason, [illegible] the drive for speed control, it can be used for analog revelation counters, display counters or other servomechanisms, provided that the overall loading does not exceed 3Kohm (max current 10 mA). **It is always necessary, to avoid interferences, to connect the tachometer generator with screened cable, above all if cables are long and run close to power cabling.**

3-4 VENTILATOR: it is necessary to supply these terminals with 220VAC for the separated ventilation of motor; make sure that this voltage is present also when the motor is not running, in order to guarantee max cooling efficiency. Some Rowan motors of great power are equipped with 3-phase centrifugal ventilators, which must be supplied directly at the terminal strip of ventilator motor. As for the power absorbed by cooling fans, see table on page 4.

5-6 THERMIC PROBE: it is a N.C. contact which opens when the temperature of motor windings exceeds 150°C, safety limit corresponding to H class (180°C). It is used as emergency for the switching off of run remote control switch. The max capacity of this contact is 1A - 230VAC. (Rowan motor MEC 63 0,15 HP is not equipped with Thermic Probe; for this reason terminals 5-6 are not present in its service terminal board).

BRAKE CONNECTION

On request, ROWAN motors can be provided with electromagnetic brake. In this case the motor must be constructed expressly with lengthened motor shaft and the brake is mounted on the front part, supported by a bell which reproduces the normal flanging conditions.



There are 2 different types of brakes:

- **DIRECT BRAKE:** in this case it is necessary to supply the brake to block the motor shaft. This kind of brake is suitable for precision stops. Its efficiency can be increased by using ROWAN card cod. 210, which oversupplies it at the stop improving its precision.
- **SAFETY SPRING BRAKE:** in this case it is necessary to remove supply from the brake to block the motor shaft. It is used as safety brake in case of lack of main power supply, with suspended loads as overhead travelling cranes, cranes etc.

Both brakes operate with direct voltage 24VDC, and are supplied through the single terminal or connector placed on the front brake-bearing bell. It is always advisable to connect a diode or a R/C in parallel with the brake, above all when near to equipments that are particularly sensitive to disturbances. As for the power absorbed by brakes see table on page 4.

In case a transformer with secondary 24VDC is used, it is necessary to insert a levelling condenser C1 dimensioned for the power of the brake; when the condenser is not present, a transformer with secondary 27 VAC must be used.

recommended protection fuses

	HP	KW	HP	KW	A	Kg	NR	AR
280R	2	1,5	4	3	20	2,1		
280R/1	6	4,5	10	7,5	40	5,8		
280R/2	7,5	5,5	14	10	50	5,9		
280R/3	17	12,5	30	22	100	6,1	1	1
280R/4	25	18,5	45	33	160	10,2	2	1
280R/5	40	30	70	51	250	13	2	1

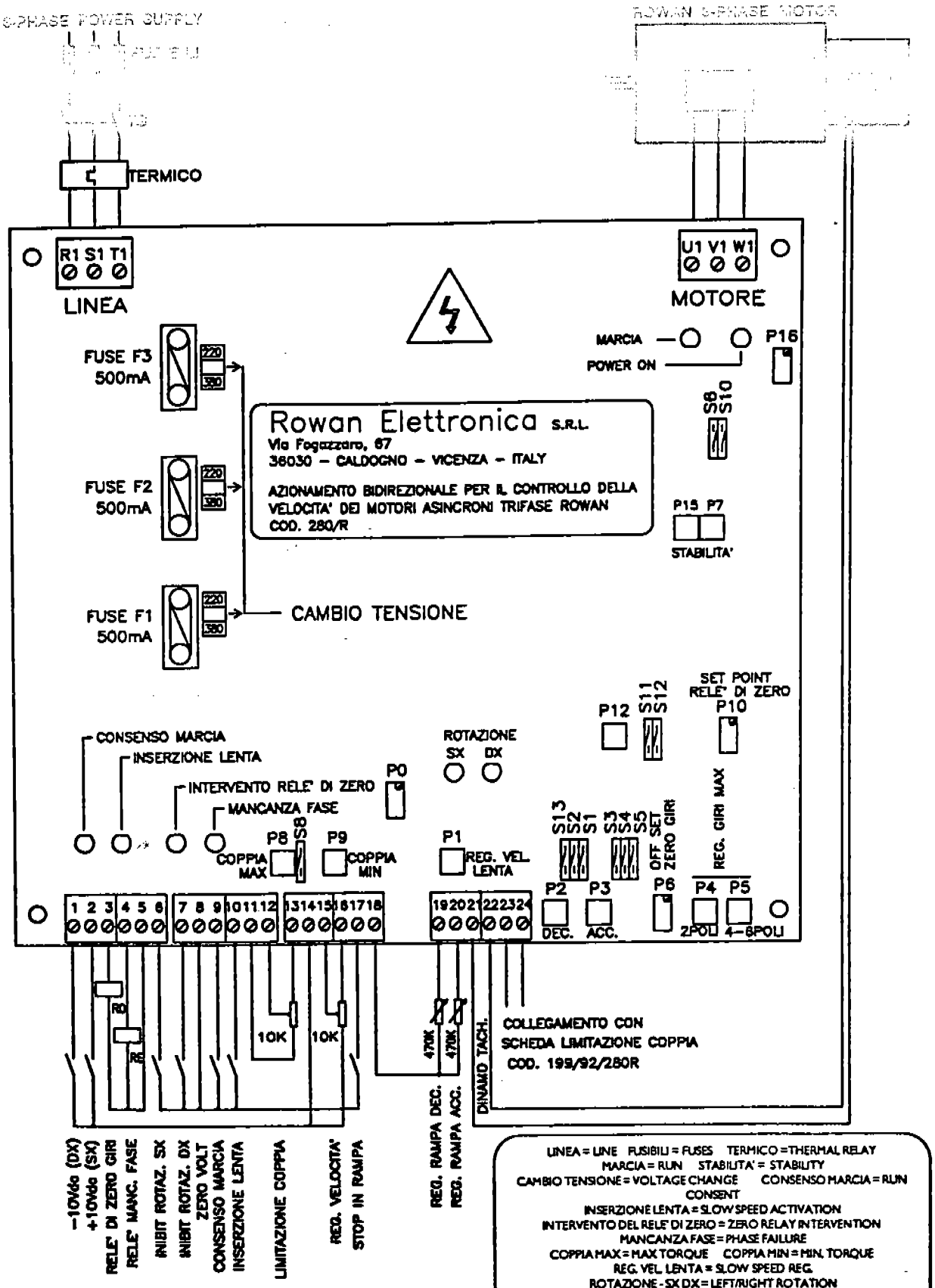
Table for rating of overload cut-out and power absorbed by motor cooling fan

Calibrate the overload cut-out for a current of 30% above the rated one. Consumption data of motors with line voltages 240-415-440-460V may be proportionally obtained from the table below which shows current absorption of motors with line voltage 380V.

MOTOR POWER		MEC SIZE	MOTOR RATED CURRENT		COOLING FAN POWERS	
			220V	380V	AXIAL	CENTRIF.
HP	KW		A	A	VA	VA
0,15	0,11	63	1,6	0,9	16	40
0,25	0,18	71	1,9	1,1	16	40
0,5	0,37	80	3,1	1,8	16	40
1	0,75	90	6	3,5	19	55
2	1,5	100	11	6,5	40	55
2,5	1,85	90L	14	8	*	100
3	2,2	112	16	9	40	100
4	3	112L	21	12	40	100
6	4,5	132	31	18	40	100
7,5	5,5	132L	41	24	40	100
10	7,5	160	52	30	100	200
14	10,5	160L	72	42	*	200
18	13,2	200	95	55	*	1000 3ph
25	18,5	200L	110	62	*	1000 3ph
30	22	250	129	70	*	1000 3ph

Table of power absorbed by 24VDC brake

MOTOR	SPRING BRAKE		DIRECT BRAKE	
	TORQUE	ABSORPTION	TORQUE	APSORPTION
	Kgm	W	Kgm	W
63	0,4	20	0,75	11,5
71	0,4	20	0,75	11,5
80 - 90L	0,8	25	1,5	16
90	1,6	30	3	21
100	1,6	30	3	21
112 - 112L	1,6/3	30/40	3	21
132-132L-160L	8	55	12	38
160	8	55	12	38
200 - 200L	15	65	24	45



Caution: Connections to terminal clamps 1-2-11-12-13-14-15-16-17-18-19-20-21-22-23-24 are to be performed with shielded cable and braiding to ground.

LINEA = LINE FUSIBILI = FUSES TERMICO = THERMAL RELAY
MARCIA = RUN STABILITA' = STABILITY
CAMBIO TENSIONE = VOLTAGE CHANGE CONSENSO MARCIA = RUN CONSENT
INSERZIONE LENTA = SLOW SPEED ACTIVATION
INTERVENTO DEL RELE' DI ZERO = ZERO RELAY INTERVENTION
MANCANZA FASE = PHASE FAILURE
COPPIA MAX = MAX TORQUE COPPIA MIN = MIN. TORQUE
REG. VEL. LENTA = SLOW SPEED REG.
ROTAZIONE - SX DX = LEFT/RIGHT ROTATION
OFF SET ZERO GIRI = ZERO REV. OFF-SET
REG. GIRI MAX = MAX SPEED REGULATION
SET POINT RELE' DI ZERO = ZERO RELAY SET POINT
DEC. = DECELERATION ACC. = ACCELERATION
RELE' DI ZERO GIRI = ZERO REV RELAY
INIBIT. ROTAZ SX (DX) = INHIBITION LEFT/RIGHT ROTATION
LIMITAZIONE COPPIA = TORQUE LIMITATION
REG. VELOCITA' = SPEED REGULATION
STOP IN RAMPA = STOP WITH RAMP
REG. RAMPA ACC. (DEC.) = ACC.(DEC) RAMP REGULATION
DINAMO TACH. = TACHOMETER GENERATOR
COLLEGAMENTO CON SCHEDA LIMITAZIONE COPPIA COD. 199/92/280R = CONNECTION WITH TORQUE LIMITATION BOARD CODE 199/92/280R

DESCRIPTION OF LED INDICATORS

speed reference indicates that the motor is in rotation is developing a braking torque.

L2 **LEFT Rotation** (Rotation sense of motor rotating field):
Illuminated with positive speed reference indicates that the motor is rotating left. Illuminated with negative speed reference indicates that the motor in right rotation is developing a braking torque.

L3 **Zero relay intervention**: illuminated indicates the energisation of the zero relay connected to terminal clamps 3-5.

L4 **Power on**: illuminated indicates power supply flowing through the board and driving circuits.

L5 **Run consent**: illuminated indicates closure of contact on terminals 9-8 and therefore consent to motor start. When off it indicates static zero-setting of board controls and voltage to the motor.

L6 **Phase failure**: permanent illumination of this led during operation or after resuming voltage supply subsequent to the intervention of an overload protection, indicates the failure of a phase on the power supply line R1-S1-T1 (the three phases must be balanced and with a voltage value within ± 10% of the one set with voltage changers). If the power supply is correct, inspect the on-board fuses F1-F2-F3.
- Pulsing illumination of led L6 during operation, indicates the presence of disturbances in the power line or an excessive deformation of the power supply wave form, due to the insertion of deforming loads.
- Illumination of led L6 only has a diagnostic function and does not imply lock-up of the board.

L7 **Slow speed activation**:
Illuminated indicates that the contact between terminal clamps 10-8 for consent to slow rotation is closed. In this case the motor passes from the speed set by potentiometer or external signal ± 10VDC, to an independent speed, preset with trimmer P1; speed change takes place with the ramps set by trimmers P2-P3. Slow rotation direction is determined by polarity of the reference voltage present at terminal clamp 14 and available at terminal clamps 1-2.

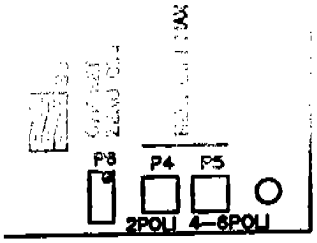
L8 **Run**:
Illuminated indicates the presence of voltage to the motor.
When off it indicates opening of run consent contact.

DESCRIPTION OF TRIMMERS

P0 Ramp offset (AUTHORISED PERSONNEL ONLY).
P1 Slow speed regulation (see page 10).
P2-P3 Acceleration/deceleration ramp regulation (see page 11).
P4-P5 Maximum speed regulation (see page 9).
P6 Rev zero offset regulation (see page 9).
P7 Stability regulation (see page 16).
P8 Maximum torque limitation regulation (see page 12).
P9 Minimum torque limitation regulation (see page 12).
P10 Zero relay SET-POINT regulation (see page 14).
P12 Zero Rev hysteris area regulation (AUTHORISED PERSONNEL ONLY).
P15-P16 Stability regulation (see page 16).

DESCRIPTION OF MICROSWITCHES

S1-S2 Internal/external ramp regulation switching (see page 11).
S3 Ramp regulation field switching (see page 11).
S4 Transient end bend activation (see page 15).
S5 Motor polarity adaptation (see page 9).
S6 Stability/response regulation (see page 16).
S8-S10-S11-S12-S13 Torque control set-up (see page 12).



OFF SET ZERO GIRI = ZERO REV OFFSET
REG. GIRI MAX = MAX SPEED REG.

INTERNAL CALIBRATION OF MAXIMUM SPEED

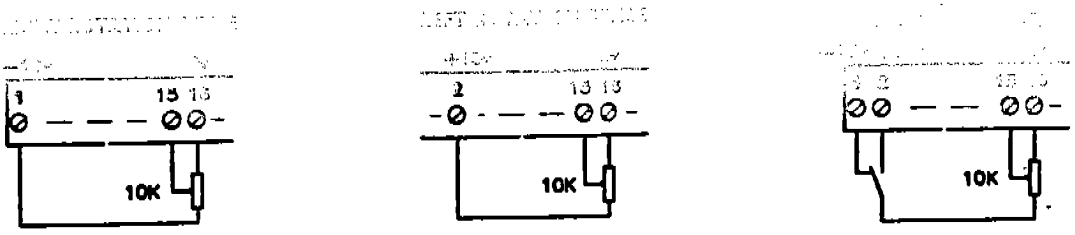
This calibration is performed beforehand during testing for 2-pole and 4-pole motors, and is to be adjusted by the installing technician only in the case of a 6-pole motor, double polarity motor, or if the board has been miscalibrated; in case adjustment is needed, proceed as follows:

- Feed a +10VDC or -10VDC signal to terminal clamp 15.
- If the motor is a 2-pole one (S5 open) tune **P4** for a max. speed of **2800 rpm** (20VDC tachometer dynamo).
- If the motor is a 4-pole one (S5 closed) tune **P5** for a max. speed of **1400 rpm** (10VDC tachometer dynamo).
- If the motor is a 6-pole one (S5 closed) tune **P5** for a max. speed of **800 rpm** (5.7VDC tachometer dynamo).
- If the motor is a double polarity one (S5 open) tune **P4** for a max. speed at 2-poles of **2600 rpm** (18.5VDC tachometer dynamo); for this usage it is necessary to connect a 10 Kohm 0,5W resistance in series to the positive terminal of speed reg. 10Kohm potentiometer; the before mentioned resistance must be short-circuited when the motor is connected for 2 pole operating.
- P4-P5 increase speed when turned clockwise.

Beware not to exceed maximum speed when calibrating, as this may cause current overabsorption in the motor even when loadless, and at any rate would cause a delay in response time.

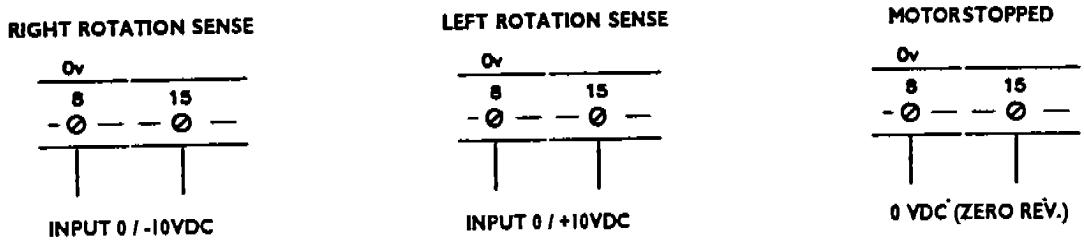
ZERO REV OFFSET CALIBRATION

- Feed zero volt to terminal clamp 15 or close stop in ramp.
- Tune P6 until the motor stops.



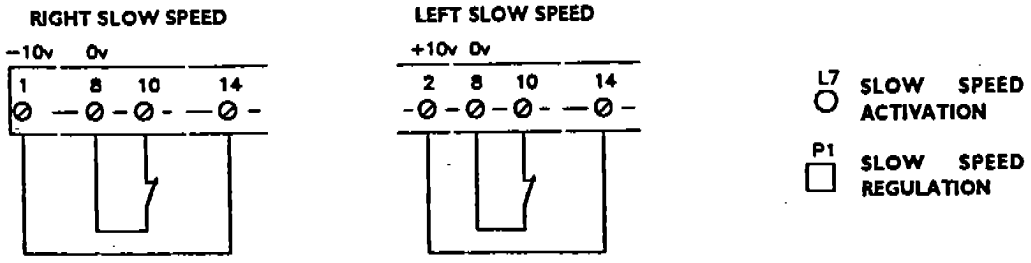
- The load on terminal clamps 1-2 must not exceed 5mA.
- The optimum value of the potentiometer is 10 KOhm (min. 3 KOhm - max. 100 KOhm).
- Carry out the connection with shielded cable.

REGULATION OF SPEED VIA EXTERNAL ±10VDC SIGNAL



- Input 15 has load resistance > 50 KOhm and can be driven by interface boards, positioner instruments, PLCs, computers with guarantee of galvanic insulation from high voltage.
- Carry out the connection with shielded cable.

INTERNAL REGULATION AND ACTIVATION OF SLOW SPEED

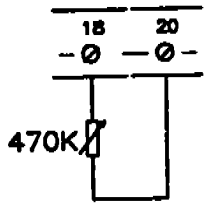


- Slow speed activation may be implemented also with an NPN OPEN COLLECTOR transistor (2.5mA 12VDC).
- The slow speed command excludes speed setting at terminal clamp 15.
- Closure of the contact is displayed by L7 *slow speed activation led.*
- Slow speed can be regulated by trimmer P1 until 70% of motor max. speed; turn clockwise to increase speed.
- The shift from the speed set to slow speed and vice verse is controlled by the acceleration/deceleration ramps set with P3/P2.

Ramp internal regulation

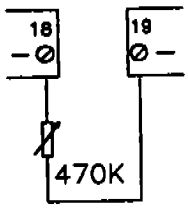
- [illegible] S2;
- [illegible] ramp (turned clockwise increases ramp time);
- [illegible] acceleration ramp (turned clockwise increases ramp time);
- S3 open fixes the regulation range of the ramp from a min. of 0.05 sec to a max. of 1 sec.
- S3 closed fixes the regulation range of the ramp from a min. of 1 sec to a max. of 25 sec.

Acceleration ramp external regulation



- carry out the connection with shielded cable and as near as possible to the drive;
- open microswitch S2;
- trimmer P3 is in series with the external potentiometer;
- with S3 open and P3 at max., ramp external regulation from 1 sec to 2 sec;
- with S3 closed and P3 at max., ramp external regulation from 25 sec to 50 sec;
- with P3 at minimum, acceleration ramp external regulation range equal to ramp internal regulation.

Deceleration ramp external regulation

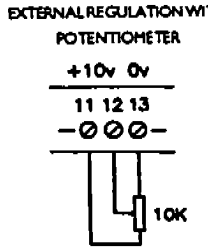


- carry out the connection with shielded cable and as near as possible to the drive;
- open microswitch S1;
- trimmer P2 is in series with the external potentiometer;
- with S3 open and P2 at max., ramp external regulation from 1 sec to 2 sec;
- with S3 closed and P2 at max., ramp external regulation from 25 sec to 50 sec;
- with P2 at minimum, acceleration ramp external regulation range equal to ramp internal regulation.

MAXIMUM VOLTAGE LIMITATION TO ROWAN MOTOR WINDINGS

Internal regulation

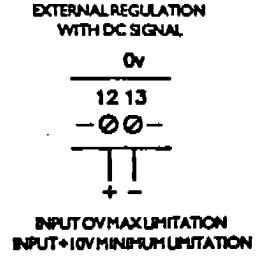
- to insert internal regulation of the limitation close S8 - S10 - S12 - S13 and open S11;
- P8 regulates the maximum voltage in the motor (max. 100% line voltage);
- P9 regulates the minimum voltage (standard regulation at zero);
- P8 - P9 turned clockwise increase voltage.



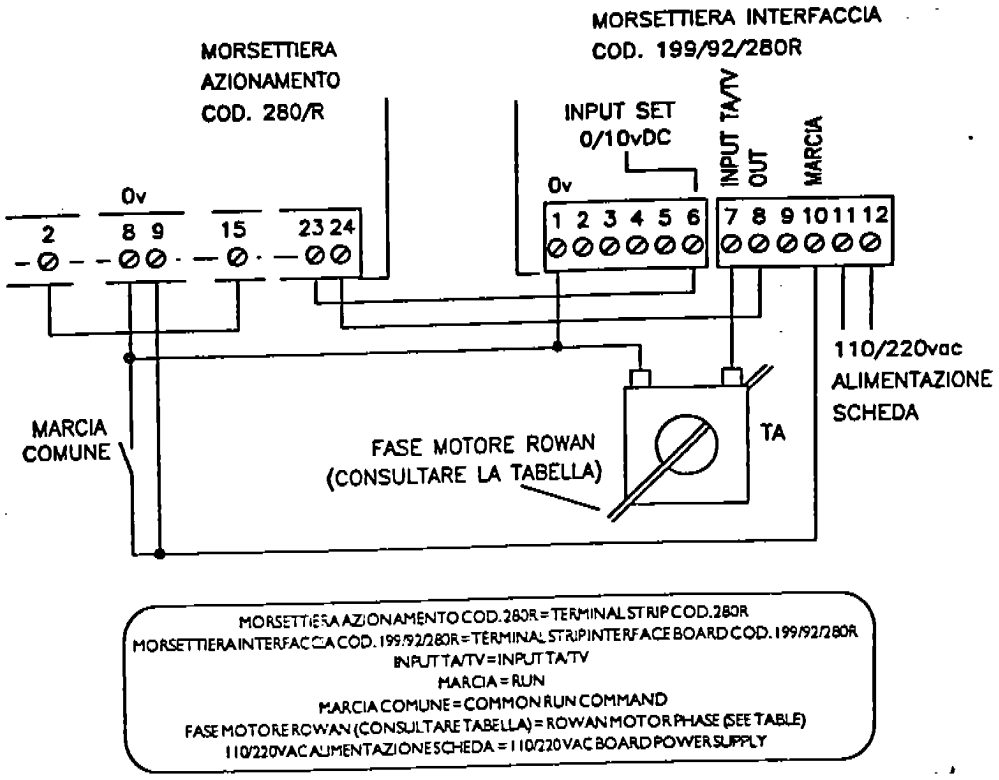
External regulation with potentiometer or with DC signal:

- carry out the connection with shielded cable;
- to insert external regulation of the limitation close S10 - S12 - S13; open S8 - S11;
- the optimum value of the potentiometer is 10 KOhm (min. 3 KOhm - max. 100 KOhm).
- input 12 has load resistance of 50 KOhm and can be driven by interface boards, PLCs, computers with guaranteed high voltage insulation. The regulation range of the external potentiometer or DC signal is determined by trimmer P8 (max.) and P9 (min.).

This type of regulation is used to limit the maximum motor torque with rotor stalled as in the case of positive stoppage upon mechanical stall or when using the motor as dynamic friction. This limitation, if maintained also during normal rotation, greatly penalises the motor torque at high speed. Should you need to limit the maximum torque keeping the same value throughout the whole motor speed range or when using the motor as a dynamic clutch, use the amperometric feedback torque control described in the next paragraph.



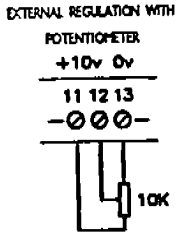
To limit the current and therefore the torque of Rowan motor at any speed, use the code 199/92/280R and related amperometric transformer type 4VAC 0.2A at full scale supplied by Rowan Elettronica.



MORSETTIERA AZIONAMENTO COD.280R = TERMINAL STRIP COD.280R
MORSETTIERA INTERFACCIA COD. 199/92/280R = TERMINAL STRIP INTERFACE BOARD COD. 199/92/280R
INPUT TA/TV = INPUT TA/TV
MARCIA = RUN
MARCIA COMUNE = COMMON RUN COMMAND
FASE MOTORE ROWAN (CONSULTARE TABELLA) = ROWAN MOTOR PHASE (SEE TABLE)
110/220VAC ALIMENTAZIONE SCHEDA = 110/220 VAC BOARD POWER SUPPLY

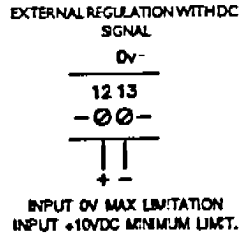
Internal regulation

- to insert internal regulation of the limitation close S8 - S1 - and open S10 - S12 - S13;
- P8 regulates the maximum current to the motor (max. twice rated current);
- P9 regulates the minimum current (standard regulation at zero);
- P8 - P9 turned clockwise increase current.



External regulation with potentiometer or with DC signal:

- carry out the connection with shielded cable;
- to insert external regulation of the limitation close S11 and open S8 - S10 - S12 - S13;
- the optimum value of the potentiometer is 10 KOhm (min. 3 KOhm - max. 100 KOhm).
- input 12 has load resistance of 50 KOhm and can be driven by interface boards, PLCs, computers with guaranteed insulation from high voltage.
- the regulation range of the external potentiometer or DC signal is determined by trimmer P8 (max.) and P9 (min.).

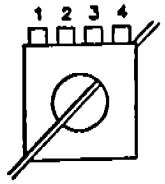


Code 199/92/280R Interface board set-up

The board 199/92/280R is already set and pre-calibrated to be combined with the code 280R drive and therefore does not need any calibration. At any rate it is preset with all its microswitches closed. For further information on its operation, consult the relevant manual or Rowan Elettronica srl.

The Amperometric Transformers (TA) supplied by Rowan Elettronica are of two types:

151/110
WITH ONE WIRE CROSSING
plug 1-2 = 25A max. output
plug 1-3 = 50A max. output
plug 1-4 = 100A max. output

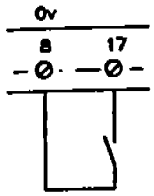


150/150
WITH ONE WIRE CROSSING
plug 1-2 = 200A max. output
plug 1-3 = 300A max. output
plug 1-4 = 400A max. output

- The following table has been drawn up to obtain the maximum current of ROWAN motor (twice the rated current) with 10VDC torque regulation signal. To limit maximum current to a lower value, regulate trimmer P8 on the code 280R board anti-clockwise.
- During functioning with stalled rotor (winders/unwinders) the maximum current of the Rowan motor cannot be greater than 80% of its rated current.

ROWAN MOTOR	VOLTAGE V	MAX CURRENT A	AMPEREMETRIC TRANSF. TYPE	TA PLUGS	WIRE CROSSINGS
63	220	3,2	151/110	1–2	8
0,15 HP	380	1,8	151/110	1–2	14
71	220	3,8	151/110	1–2	6
0,25 HP	380	2,2	151/110	1–2	11
80	220	5,6	151/110	1–2	5
0,5 HP	380	3,2	151/110	1–2	8
90	220	12	151/110	1–2	2
1 HP	380	7	151/110	1–2	4
100	220	22	151/110	1–2	1
2 HP	380	13	151/110	1–2	2
90L	220	32	151/110	1–4	3
2,5 HP	380	18	151/110	1–4	5
112	220	32	151/110	1–4	3
3 HP	380	18	151/110	1–4	5
112L	220	42	151/110	1–3	1
4 HP	380	24	151/110	1–2	1
132	220	66	150/150	1–2	3
6 HP	380	38	150/150	1–2	5
132L	220	82	150/150	1–4	5
7,5 HP	380	48	151/110	1–3	1
160	220	110	151/110	1–4	1
10 HP	380	64	151/110	1–4	2
160L	220	144	150/150	1–3	2
14 HP	380	84	150/150	1–4	5
200	220	190	150/150	1–2	1
18 HP	380	110	151/110	1–4	1
200L	220	220	150/150	1–2	1
25 HP	380	124	150/150	1–3	2
250	220	258	150/150	1–3	1
30 HP	380	140	150/150	1–3	2

- The run command can be also obtained with a NPN OPEN COLLECTOR transistor (2.5mA 12VDC).
- A closed contact allows motor rotation in acceleration ramp until the set speed is reached, and illuminates pilot lamp L5 *run consent*.
- An open contact statically removes voltage from the motor (if the motor is rotating it will not brake), zero sets the ramps and excludes the other commands.
- Connect with shielded cables especially in case routes are long and/or running close to power cabling.

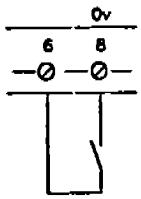


Ramp stop command

- Carry out the connection with shielded cable.
- A closed contact causes motor deceleration from the set speed to zero revs, with the ramp determined by trimmer P2.
- An open contact allows motor rotation until set speed, with the ramp determined by trimmer P3.
- The ramp stop command can be performed only with a pure contact.

Exclusion of braking action

- Exclusion commands can be made also with NPN OPEN COLLECTOR transistor (0.4mA 12VDC).
- Exclusion of the braking action is active by closed contact.
- Connect with shielded cables especially in case routes are long and/or running close to power cabling.

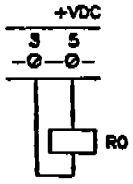


Exclusion of braking action with speed reference on terminal clamp 15 **POSITIVE**

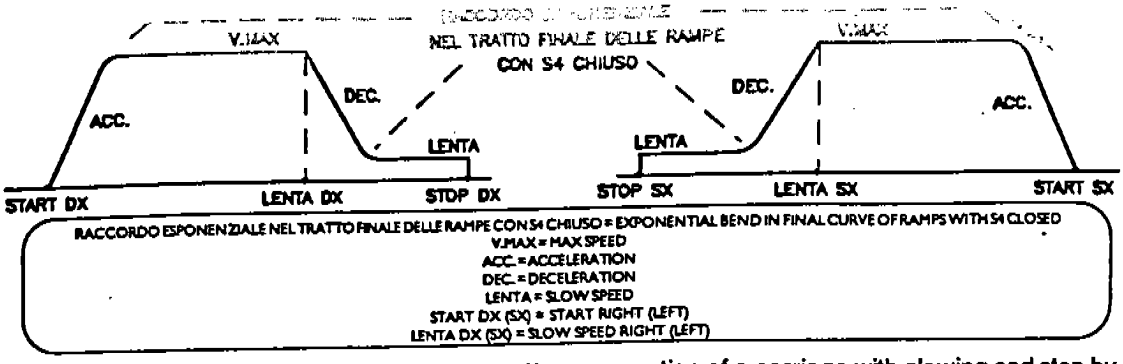
Exclusion of braking action with speed reference on terminal clamp 15 **NEGATIVE**

RELAY DRIVING OUTPUTS

Zero relay



- Output for a relay with coil 24VDC 50mA max.
- The zero relay is excited when the motor exceeds the speed threshold set with trimmer P10.
- The trimmer P10 (zero relay set point) sets zero relay intervention level in a speed range of motor from 30 rpm to 1400 rpm.
- Relay energisation is indicated by LED L3 (zero relay intervention).
- The zero relay can be used for the automatic release of the run remote control switch with stopped motor.
- When driving a Rowan motor with 2 polarities, the zero relay can be used for automatic exchange of polarity.

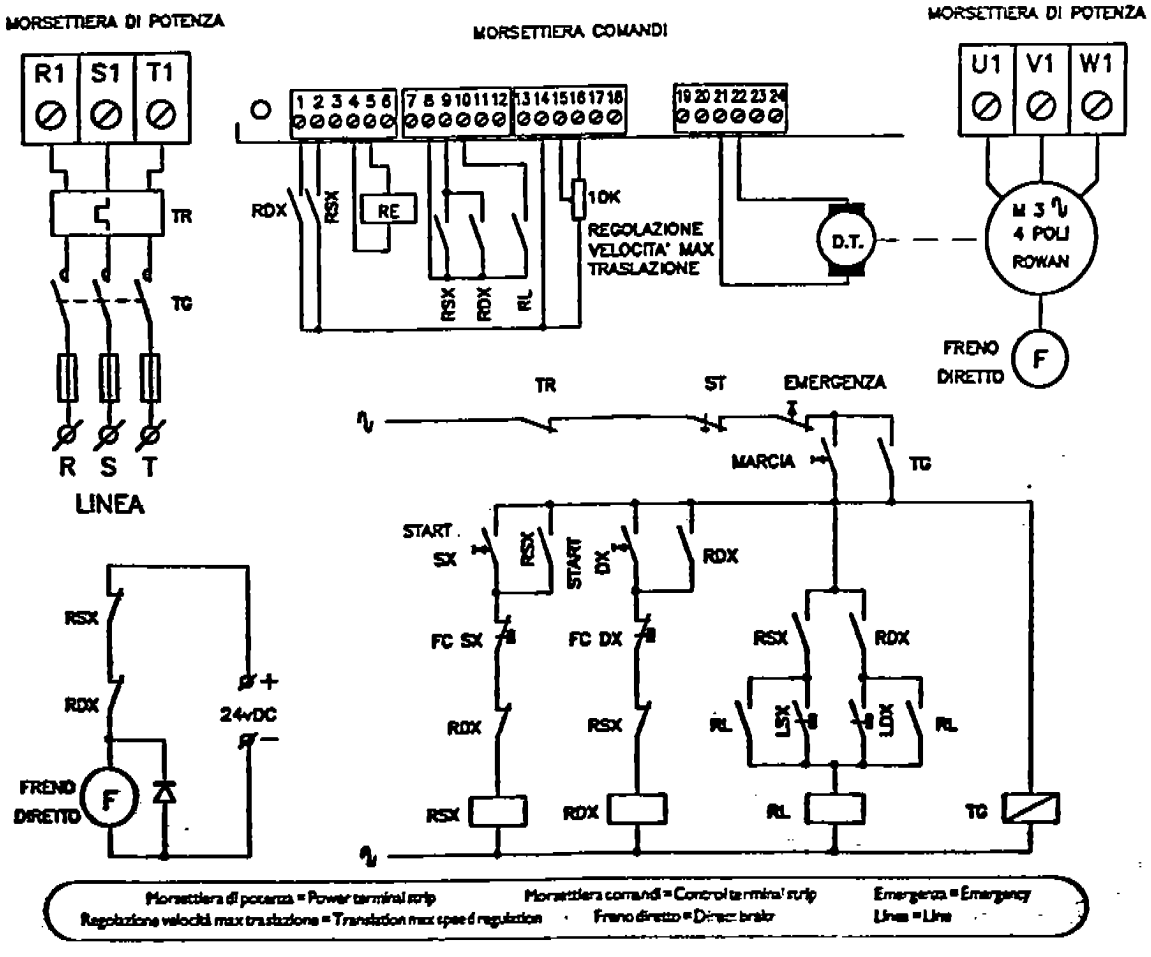


The above is a general diagram representing forward/reverse motion of a carriage with slowing and stop by limit switch or proximity sensors. The acceleration/deceleration ramps are calibrated by trimmers P2-P3. The maximum speed is determined by the speed reg. external potentiometer and slow speed by trimmer P1. In this case microswitches are to be positioned as follows:

Internal ramp regulation	S1 - S2 closed
Fast ramps 0.05 - 1 sec	S3 open
Deceleration with exponential bend	S4 closed
4 pole motor	S5 closed
Soft response	S6 closed
Ext. torque reg. excluded	S8 - S11 - S12 open/ S13 - S10 closed

The emergency assembly with opening contacts comprises:
overcurrent protection (TR);
the motor temperature thermal sensor (ST) (and eventually the thermal sensor of the board);

FCSX = LEFT stop limit switch	LSX = LEFT slow speed limit switch
FCDX = RIGHT stop limit switch	LDX = RIGHT slow speed limit switch



SUPPRESSION OF OSCILLATIONS

Some degree of oscillation may take place during motor rotation as a result of the type of load and mechanical transmission adopted. This may happen in transmission systems having mechanical backlash between rotating parts, or created with belts that are not sufficiently rigid. In code 280R board there are various ways to stabilise these oscillations; in case of necessity you are recommended to proceed as below instructed:

- close microswitch S6. This will decrease rev control precision. Rev variation from loadless to loaded passes from 2 rpm to 15 rpm; the command is less precise but also less critical. The speed of response to the load variations remains unchanged (proportional regulation).
- Regulate trimmer P7 clockwise. This lengthens speed control response times. The motor reacts with delay to load variations, whereas speed control precision remains unchanged (integral regulation).
- Regulate trimmer P15 clockwise and open microswitch S6. This will further delay motor response times to load variations and also decreases speed control precision (integral/proportional regulation).
- Regulate trimmer P16 clockwise. This regulation is very effective in stabilising fast oscillations that arise when the transmission between motor and load (especially inertial type) is driven by belts that are not rigid enough. It does not penalise speed control precision, while it delays motor response times but with a passing band different from the regulations of P7 - P15.
- Combine the effects of S6 - P7 - P15 - P16 in order to bring about speed control that it is as stable, fast and precise as possible. ***Note: Trimmer P16 is not present in first series code 280R boards.***

- If during motor rotation or with the motor stopped (zero speed reference), rotation LEDs RT/LT continue to blink alternately, regulate trimmer P12 counter-clockwise in order to further widen the inert window between pull and brake.

STANDARD SET-UP

The code 280R series boards leave Rowan laboratory tested and set-up as follows:

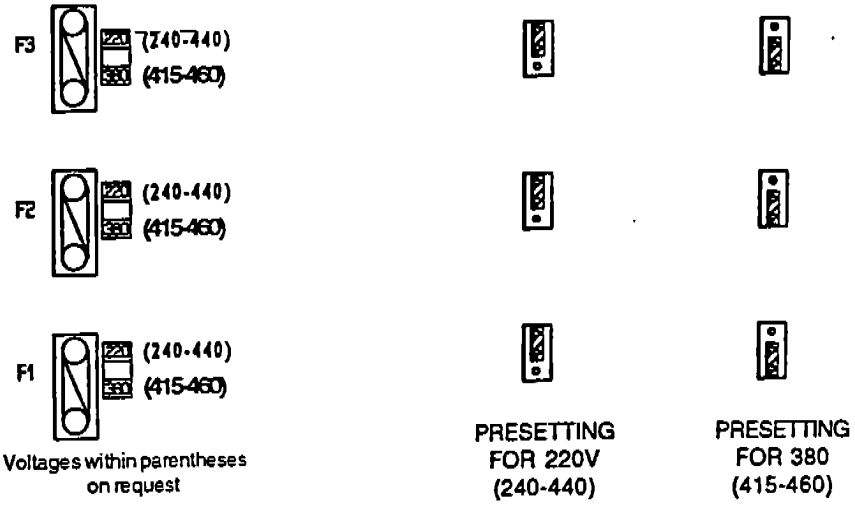
- power supply set for 380VAC	(see voltage change)
- 4-pole motor	S5 closed
- internal ramp reg.	S1 - S2 closed
- fast ramps range 0.05 sec - 1 sec	S3 open
- torque limitation excluded	S8 - S11 - S12 open/ S10 - S13 closed
- linear deceleration	S4 open
- normal feedback	S6 closed

Calibration

- max. speed 1400 rpm
- slow speed 100 rpm
- acceleration/deceleration ramps 1 sec
- P7 trimmer calibrated for stable response with loadless motor
- P15 and P16 regulated fully counter-clockwise (max. response speed)
- zero relay action at 30 rpm of motor
- P8 calibrated for max. motor torque
- P9 calibrated for zero torque

Before powering the board

1) Firstly set up the 3 voltage changers according to the power supply as below illustrated:



2) Consult the table on page 4 to choose the protection fuses.
3) Refer to motor rating to determine:
   - type of connection star/delta (see page 5);
   - motor overcurrent protection value (page 4);
   - board set-up or max. speed calibration according to motor poles (page 9);
   - connection of motor service terminal strip and power supply rating for fan and brake (page 4).
4) Choose the internal/external acceleration/deceleration ramp range (page 11).
5) If you use torque limitation consult page 12.
6) Choose the type of speed control (page 10).
7) Regulate the potentiometer or DC signal for zero speed (zero Volts reference voltage at terminal clamp I5).
8) Close 'run consent' between 8-9 (otherwise the board is not enabled).

Feed power supply to board

The motor must be stationary. Illumination of L4 power-on LED indicates the flow of voltage supply to driving circuits; RUN, RUN CONSENT and LT or RT rotation LEDs must illuminate.

Turn the potentiometer or increase DC signal; the motor must follow the regulation in increase or in decrease with the acceleration/deceleration ramps set.

If it does not follow the regulation but revolves at max. speed, it means that:
- with L3 illuminated, it is necessary to invert tachometer dynamo polarity (invert wires at terminal clamps 21 - 22).
- with L3 off, the tachometer dynamo signal does not reach terminal clamps 21 - 22, therefore inspect the connections to the motor service terminal strip.

If instead the motor does not follow speed regulation and remains idle, check that:
- the regulation signal is present at terminal clamp 15;
- ramp stop contact is not closed;
- slow speed at zero revs is not activated;
- motor is not mechanically blocked;
- phase failure L6 LED is illuminated (see page 8).

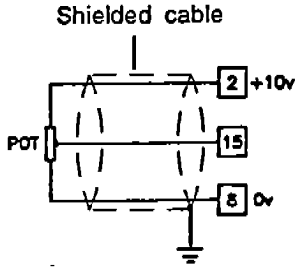
If everything is in order make sure that max. speed is reached in both rotation directions by supplying a reference voltage of -10V (RIGHT rotation) or +10V (LEFT rotation) to terminal clamp I5, if necessary fine adjusting the maximum value with trimmers P4 (2 pole motors) or P5 (4-6 pole motors) (see page 9).

Be sure not to exceed the maximum regulation as this could cause motor overdissipation and [illegible], and would in any case cause a delay in response times; referring to the tachometer dynamo voltage, at maximum speed for every motor you will have:
20VDC at 2800 rpm for a 2-pole motor
10VDC at 1400 rpm for a 4-pole motor
5,7VDC at 800 rpm for a 6-pole motor

- If with zero speed reference the motor tends to rotate, regulate zero revs OFFSET with P6 (page 9).
- Motor rotation should correspond to the lighting of L8 LED Run which indicates that voltage is present in the windings.
- Check that consumption is balanced in all three phases and that it does not exceed motor rating in continuous operation.
- Check illumination of L3 LED (zero relay action) for the speed levels determined by trimmer P10 (min. 30 rpm max. 1400 rpm).
- Take motor to maximum speed and close slow speed activation contact: led L7 should illuminate. The motor, with deceleration ramp set by P2, must reach a slow speed that can be regulated with trimmer P1.
- Each time that the motor shaft is accelerated with respect to the speed set, due to the effect of an inertial load, board code 280R automatically changes rotation direction of rotating field (RIGHT/LEFT rotation LED lighting exchange); in this way a sufficient voltage for the development of a braking torque that can keep the speed constant, is supplied to the motor. If you want to avoid motor braking consult page 14.
- If there are oscillations during motor rotation consult page 16.

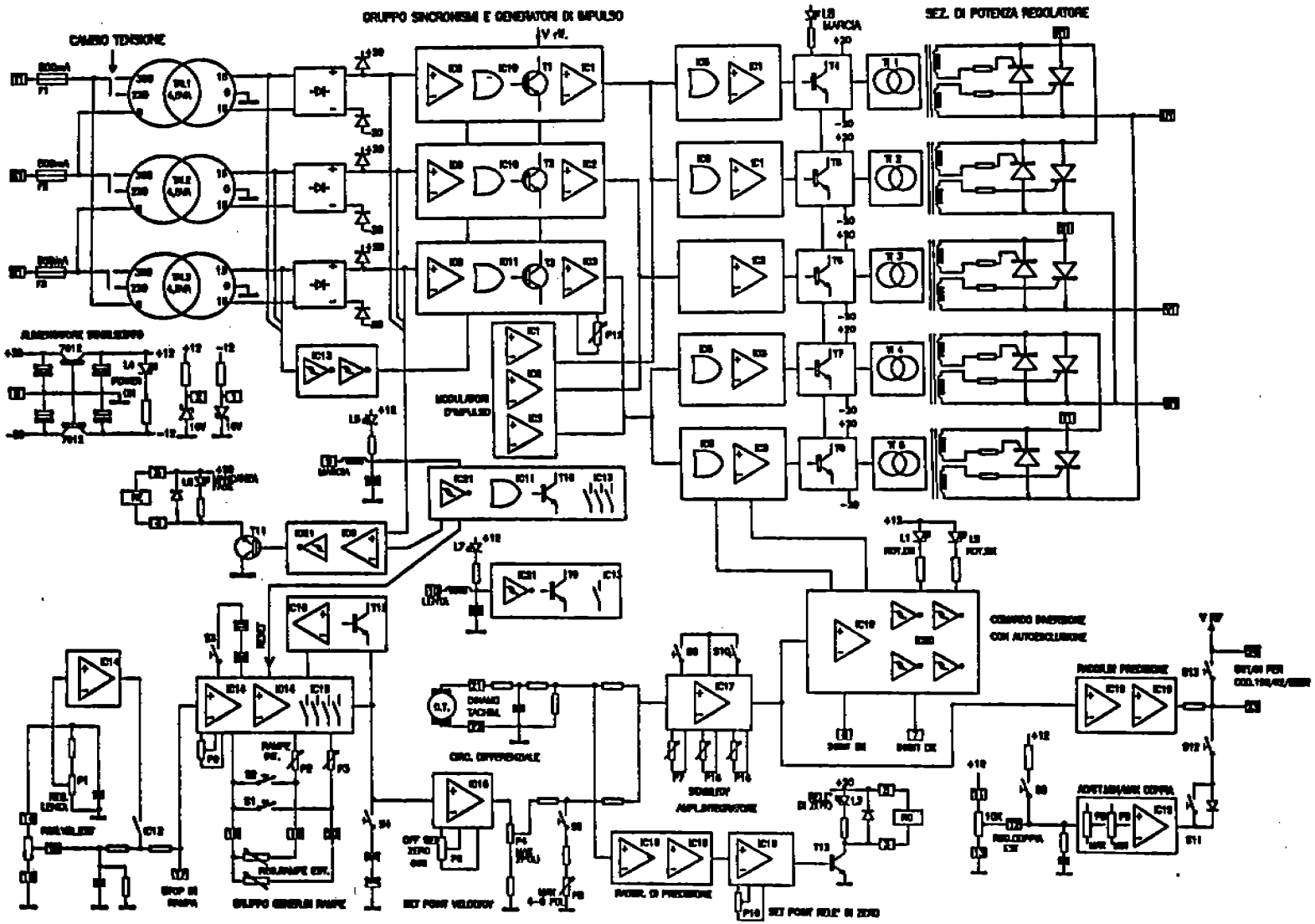
INSTRUCTIONS FOR CORRECT USE OF CODE 280R DRIVE

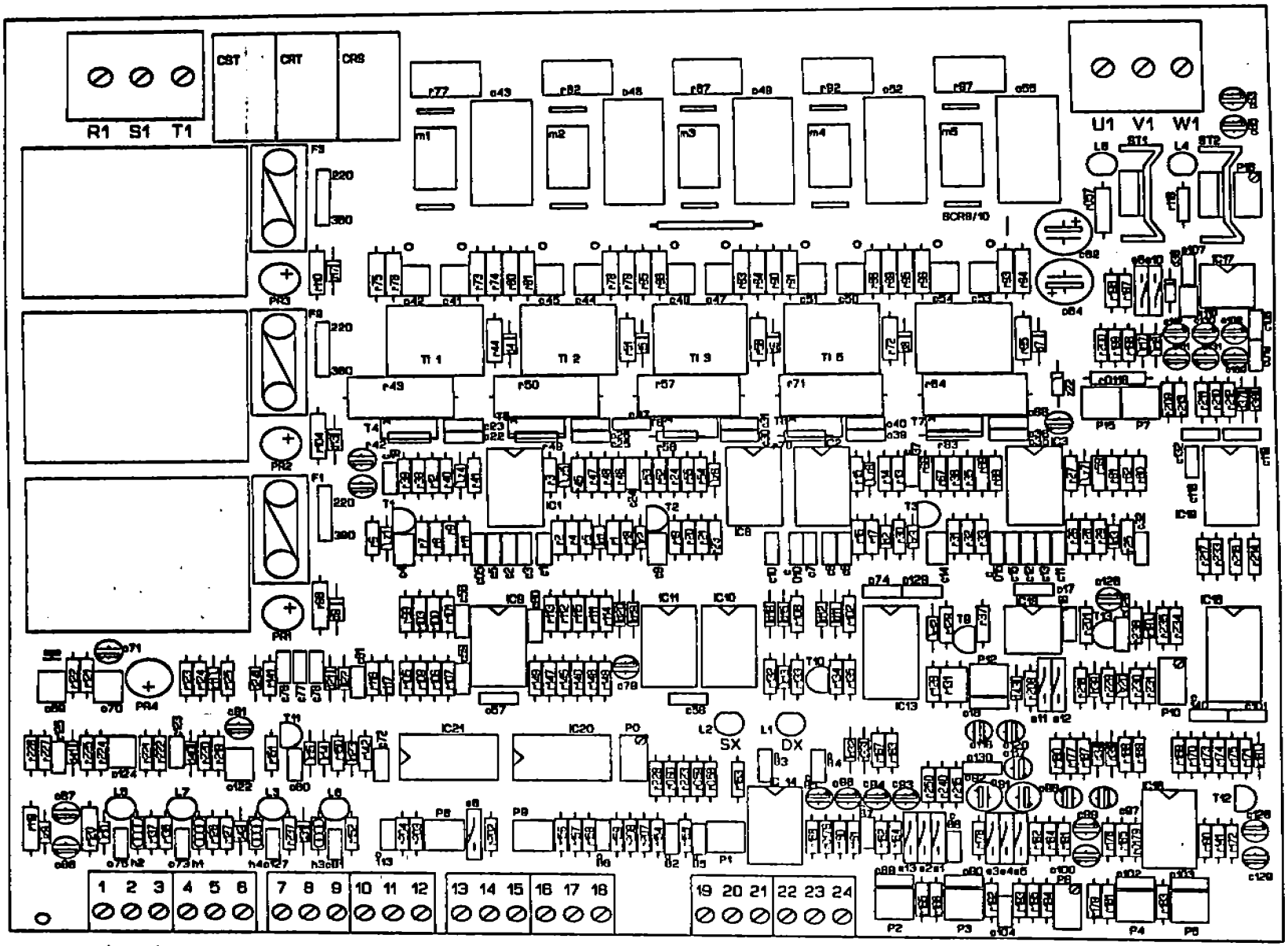
- Code 280R board is equipped with three 0.5A fuses (F1-F2-F3) for protection of the driving circuit. As for power amperometric protection use external fuses against short circuits (see page 4) and a thermal switch, calculated for a current in excess by 30% of the rated current.
- The board has been designed to work with line disturbances equivalent to Class 4 of the IEC standards 801.4. In any case use shielded cables for all board control signals, and avoid the passage of these wires close to power cables. Connect the cable braid to ground only at one side and not to the negative of the board (terminal clamp 8 zero Volts), as shown in the example:



- Use relays with suitable contacts for low currents in order to select potentiometers or DC signals; do not use electromagnetic switch auxiliary contacts for this type of operation.
- Code 280R series boards work properly with temperatures between -15°C to +60°C inside their container and the panel housing them; temperatures outside this range can causes malfunctions, speed control deviations, and if temperatures are particularly high, may even cause breakdown; you are therefore recommended to install the boards away from heat sources and ventilate the control panel if the temperature in the environment is particularly high.
- Models code 280R/3/4/5 are equipped with fans to be fed separately with 220V, and a thermal probe. The thermal probe is a contact (1A 230VAC) which opens when cooler temperature exceeds 80°C; it must be used to cut out the power supply electromagnetic switch while leaving the fan on.

Note: the electronic regulations by phase partialising system generates harmonics (3th and 5th) which cause phase shift on mains power supply; it will therefore be the user's care to evaluate its entity and eventually to provide for by a fitting re-phasing proportional to the load.


GRUPPO SINCRONISMI E GENERATORI DI IMPULSO
SEZ. DI POTENZA REGOLATORE
CAMBIO TENSIONE
ALIMENTATORE STABILIZZATO
MODULATORE D'IMPULSO
COMANDO INVERSIONE CON AUTOESCLUSIONE
GRUPPO GENERALE RAMPE
CIRC. DIFFERENZIALE
AMPLIFICATORE
REGOLAZ. DI PRESSIONE
SET POINT VELOCITY
SET POINT RELE' DI ZERO


R1 S1 T1
CST
CRT
CRS
U1 V1 W1
SX
DX
1 2 3
4 5 6
7 8 9
10 11 12
13 14 15
16 17 18
19 20 21
22 23 24

Motors "ROWAN" are expressly manufactured to be driven by electronic cards with tachometer for feed-back and are particularly suitable, because of their intrinsic characteristics, for functioning with repeated starts and dynamic brakings.
As they have no brushes, they require little maintenance. The maintenance mainly concerns the bearings and the replacement of the tachometer generator, which may anyway occur after at least 5000 hours' work.

Replacement of bearings or tachometer generator
Whenever it is necessary to disassemble the motor for bearing replacement, proceed as follows:
1- remove the screws from the rear ventilator-protecting shield or from the cochlea ventilator. Remove the ventilator after disconnecting its wires from the service terminal board;
2- remove the tachometer generator;
3- take out the rigid stays and remove the rear shield;
4- take out the front shield together with the rotor connected to it;
5- whenever it is necessary to remove the front bearing, take the screws of the anti-dust protection off and remove the Seger ring (if present) on the shaft;
6- take out the shaft from the bearing;
7- remove the Seger ring (if present) which keeps the bearing close to the shield;
8- take the bearing off and replace it with one of the same kind - of the type Z C3 greased with high temperature grease;
9- the rear bearing must be of the type 2RS C3.
If necessary, replace the tachometer generator while re-assembling the motor.

Air gap adjustment of spring- or direct brakes
If a spring brake is installed on the front part and it is necessary to adjust the air gap, proceed as follows:
1- remove the bolts that fasten the brake-bearing bell to the motor;
2- take out the bell and the brake from the shaft;
3- remove the screws that fasten the brake to the bell;
4- take out the brake wires from the terminal board;
5- take out the brake itself from the bell.
At this point it is possible to perform the regulation by adjusting the 3 bolts till you obtain an air gap between 0,2 and 0,3 mm.
If the brake is provided with an anti-dust ring, remove it to reach the 3 regulation bolts. The spring brake is usually furnished set for max braking torque, which can be reduced by unscrewing the proper ring up to a maximum of 40%; be careful not to unscrew it to much and cause it to go out of its seat.

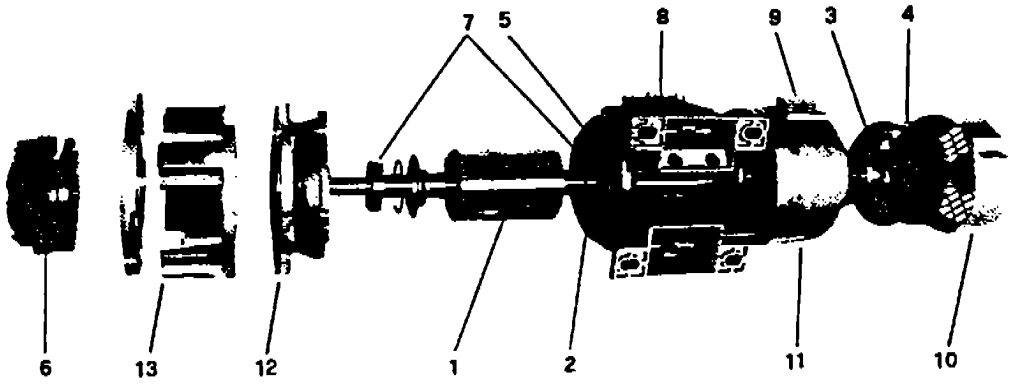
In case a direct brake is installed, it is not necessary to disassemble it, but it is enough to control the air gap (max 0,3 mm) with a thickness-meter through the side openings and, if necessary, to correct it by loosening the fixing screw on the brake-bearing hub.

ROWAN motors need continuous ventilation and it is therefore necessary that all internal and external air passages are free of obstructions and it is necessary to ensure sufficient air changing. In case they are used in particularly severe conditions, ROWAN motors, normally IP 43, can be equipped with anti-dust filter up to a protection degree IP 53; in this case it is necessary to check the filter cleanliness and the ventilation efficiency more frequently.
It is possible to reach higher protection degrees up to IP 54 with particular protecting arrangements performed by the customer during installation or up to IP 55 by supplying a completely closed motor diminished of 50% as for the power.

The motor (except 0,15hp mec 63 motor) is provided with a **thermic probe** inserted in the windings that is adjusted for intervention at 150°C (the windings of ROWAN motors are of H class with working limit temperature of 180°C). This thermic probe supplies a normally closed contact which opens at 150°C and must be used to remove the power from the motor (by means of the remote control switch) in case of over-temperature. The probe max load is 1A - 230 VAC.
In case of over-temperature intervention of the probe, it is necessary to verify the following:
- the functioning of the cooling fan;
- the correct passage of the air flow;
- the absorption of the motor; if it is beyond the rated values, it may be caused by an excessive loading or worn-out bearings;

The **statoric winding** is of the kind used for asynchronous three-phase or single-phase motors; it is manufactured with particular care with H class insulation; it can be made, in case of necessity, by any winding builder, provided that he respects the winding [illegible] which can be supplied by our technical office.

1 Massive rotor for high-sliding
2 Winding
3 Tachometer generator (type 20VDC 2800rpm)
4 Ventilator
5 Safety thermic probe
6 Brake
7 Bearings
8 Motor windings connection board
9 Service terminal board (tach.generator-ventilator-thermic probe)
10 Ventilator-protecting shield
11 Rear shield
12 Front shield
13 Brake bearing-bell



ROWAN motors work properly with temperatures ranging from -15° to +60°; higher ambient temperatures could provoke working anomalies and, if excessive, breakdowns. It is therefore necessary to locate them far from heat sources and provide a minimum air changing.