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PROVIDING INDUSTRIAL EQUIPMENT SOLUTIONS SINCE 1987

MERLIN MT SERIES

MT1000

MT2000

MT3000

Operator's Manual

Version 1.3

August 2014

P/N 60-0128

Read This First

Proper Equipment is an important factor in occupational safety but only one of many. The Merlin Light Curtain meets the applicable National Electric Code (NEC), Underwriters Laboratories (UL) and Canadian Standards Association (CSA) requirements for equipment. The Merlin Light Curtain is also intended to perform a function governed by the Occupational Safety and Health Act (OSHA) and meets the requirements of OSHA and ANSI (American National Standards Institute) but, Whether a particular Merlin installation does in fact meet all applicable requirements depends upon how Merlin units are applied, installed, operated, and maintained. These are factors beyond the control of the equipment manufacturer. Every effort has been made to provide complete application, installation, operation and maintenance instructions in this manual. Effective use of this information to provide full compliance with OSHA and ANSI regulations is the responsibility of the equipment purchaser and / or user.

WARNINGS

The Light Curtain may not prevent access to all hazardous motions. Additional safeguarding or guards may be necessary to prevent access over, under or around the Light Curtain or from other areas of a particular machine, not protected by a Light Curtain. The following labels are located on the Merlin control box and should be kept in readable condition.

Replace these labels if necessary with:

Merlin *Warning* Label – P / N 28-451

Merlin *Safety Instructions* Label - P/N 28-452

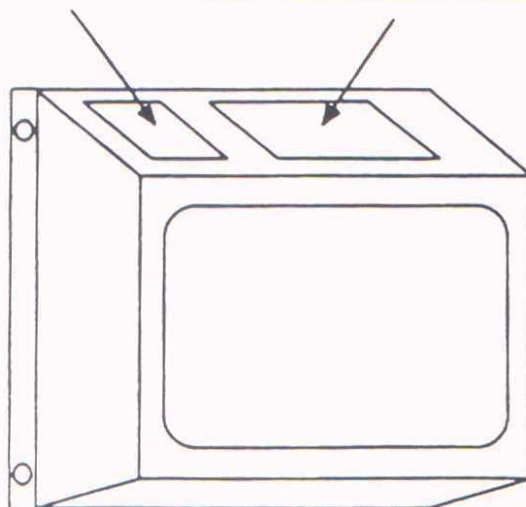
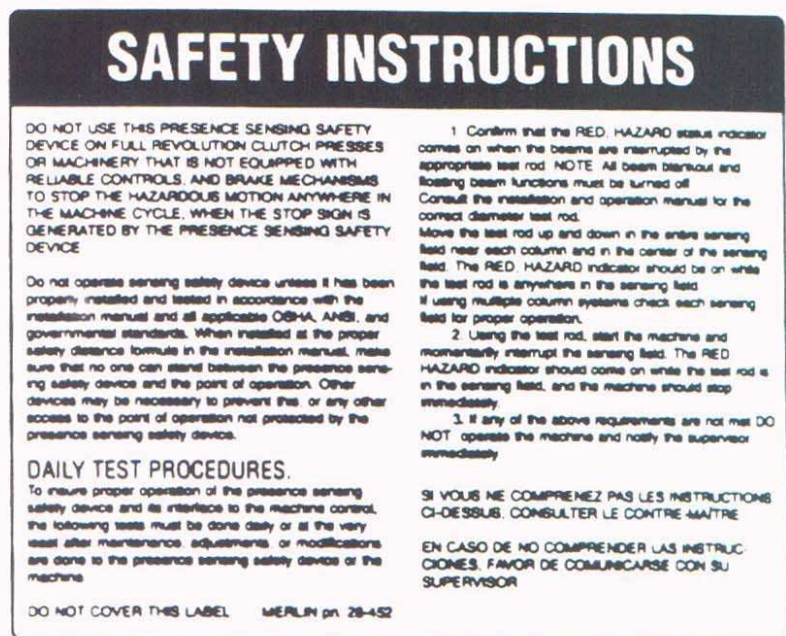
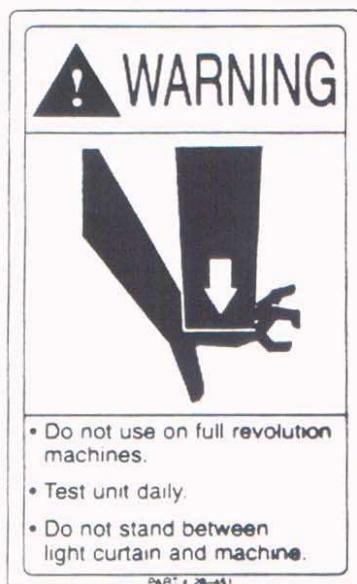
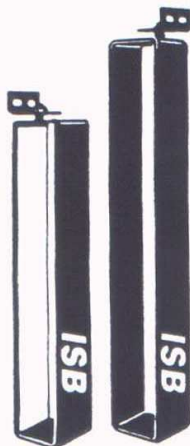


Fig. # 1

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QUICK TOUR:



ISB MIRRORS
ISBM - 12
ISBM - 18
ISBM - 24
ISBM - 30

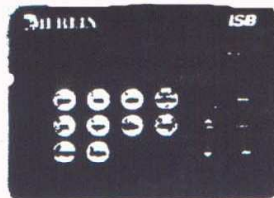


Shock Mount
#34 - 301



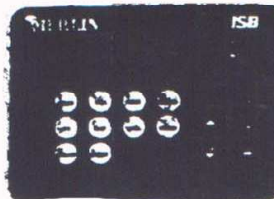
MERLIN 1000

The MERLIN 1000 is the most basic light curtain of the #1 light curtain product line. Where applications do not require advanced features found with the MERLIN 2000 or MERLIN 3000 systems, this unit would prove to be your most cost effective compromise. Status indicator on both the control transmitter column, optional manual reset.



MERLIN 2000

More advanced features including:
Blanking limits - Blanked beam identification,
Blanking - Auto - Manual, Floating beams,
an eight character LED display, 16 key membrane key pad
Password protection, Diagnostic fault codes



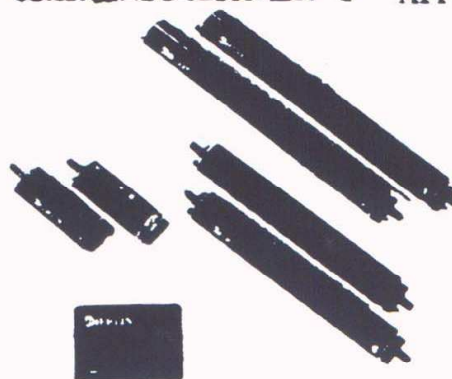
MERLIN 3000

The most advanced of the ISB light curtains.
In addition to the features of the MERLIN 2000,
MERLIN 3000 offers: Programmability, 40 character fluorescent display, English language message and fault displays,
Programmable beam blankout system, Program capacity for 200 jobs.



MERLIN

IN MULTIPLE
COLUMN
APPLICATION



MERLIN can also be arranged in multiple columns in any configuration using different column lengths or beam spacing. Only one control is needed to run up to 144 beams. Sealed extruded aluminum columns withstand water or oil penetration and have quick disconnect cables.

INTRODUCTION

How it Works

The Merlin Light Curtain is a solid state electro-optical switch intended for use as a control device on production machines. Merlin generates and monitors a totally invisible network of closely spaced, pulsed infrared light beams between separate Transmitter and Receiver Units. Output contacts, when energized, will remain closed as long as equipment conditions are normal and the entire network of light beams remains intact. They will open whenever one or more of the beams is interrupted or in its power source.

Safety Features

Pulsed infrared rays, digital monitoring circuitry, and self, supervisory design make the Merlin insensitive to ambient light, smoke, oil vapors, temperature, changes, line voltage fluctuations and the proximity of moving persons or objects. No external influence can delay or prevent contact when a beam is interrupted. Any single component failure of the Merlin itself will also open the contacts. Ambient influences that do not actually interrupt an infrared beam will not cause nuisance machine shutdowns.

Where and How it is Used

Designed to protect operators of hazardous equipment such as punch presses, press brakes, and injection molding machines, the Merlin Light Curtain when used with a reliable control system can lead to a more ergonomic and productive machine. Intrusion of any part of the operator's body (or any object) into the hazardous area guarded by the infrared screen immediately signals the machine to stop. Benefits include protection of pass-by personnel as well as operators, reduced operator fatigue, and increased productivity.



WARNING

DO NOT USE THIS PRESENCE SENSING SAFETY DEVICE ON FULL REVOLUTION CLUTCH PRESSES OR MACHINERY THAT IS NOT EQUIPPED WITH RELIABLE CONTROLS, AND BRAKE MECHANISMS TO STOP THE HAZARDOUS MOTION ANYWHERE IN THE MACHINE CYCLE, WHEN THE STOP SIGNAL IS HENERATED BY THE PRESENCE SENING SAFETY DEVICE.

EQUIPMENT DESCRIPTION

General

Merlin Light Curtain System consists of a control box, a set of transmitter and receiver columns and 2 cables.

It is designed to meet NEMA 12, oil tight requirements. The columns are constructed of rugged aluminum extrusions with built-in shock mounts. Shock mounts are available for the control box if heavy shock exists.

Object Sensitivity

The Merlin units are available in 0.5 inch beam spacing and 1.0 inch beam spacing. This changes the object sensitivity of the sensing field. The object sensitivity is the size of an object that when placed any place in the sensing field of the Light Curtain will cause the unit to go into a hazard condition. This assumes that no forms of blanking are activated. Objects smaller than the size stated as the object sensitivity will interrupt beams when placed directly in line with a beam, but will fit between beams allowing a safe output condition. The object sensitivity can be tested by using a rod with a diameter equal to the object sensitivity rating of the Light Curtain.

The object sensitivity for Merlin units with 0.5 inch beam spacing is 0.87" (22 mm) and the object sensitivity with 1" beam spacing is 1.5" (38 mm), see pg. 27 for testing information.

Modular Design

The Merlin units are designed with a modular construction. The control box is common to all columns. The control box automatically senses the column size eliminating any setup adjustments. The cables are interchangeable to the transmitter and the receiver columns. The columns are usable on all 3 model control boxes: MT1000, MT2000, MT3000.

Equipment Inventory

Standard Systems:

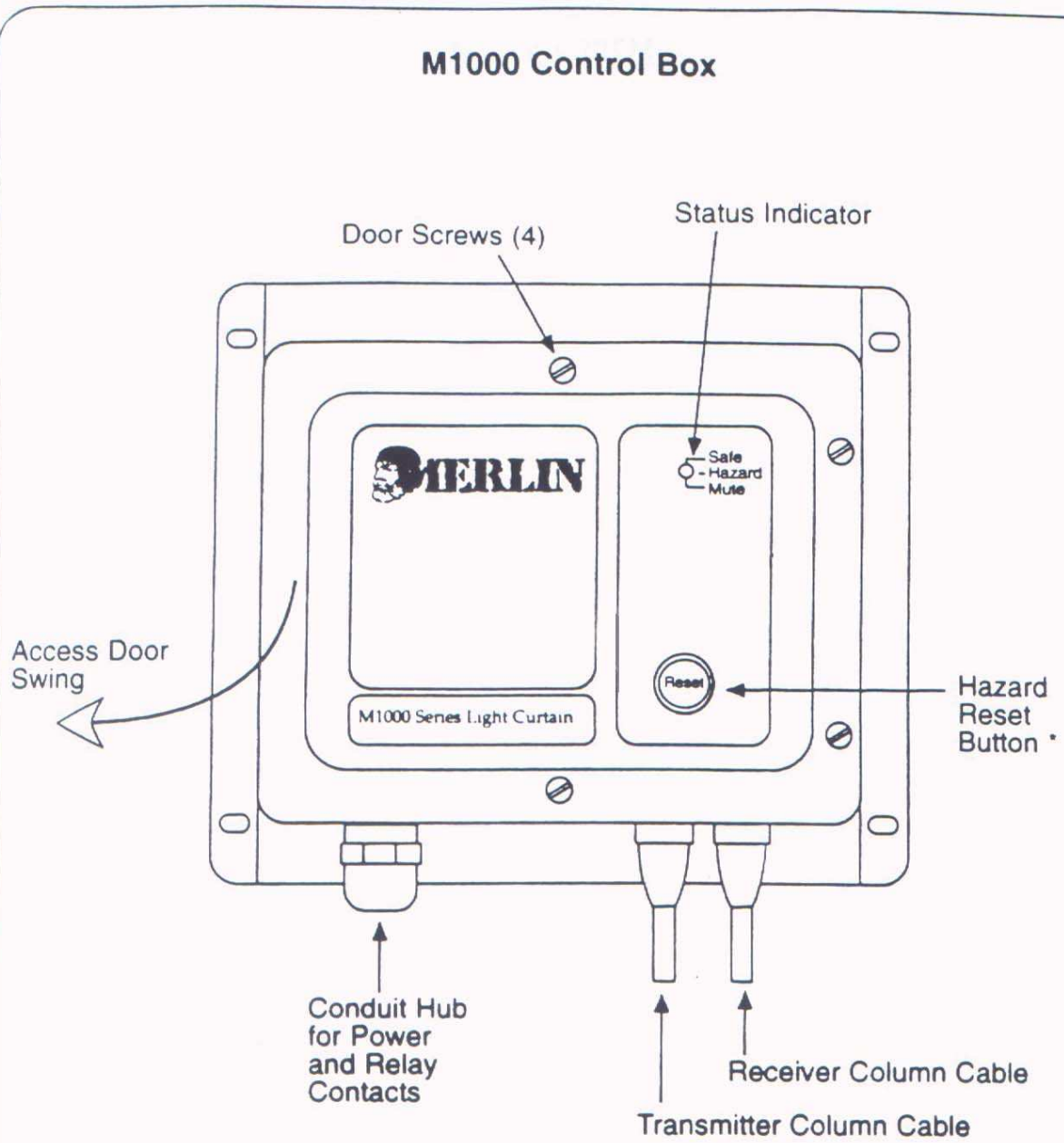
- Control unit
- Set of columns TX, RX
- Two cables
- Operator manual

Other Items:

- Remote Learn Button
- Remote Learn Foot Switch
- Mirrors
- Pedestals
- Side Guards
- Two (2) Snubber devices

If any items ordered are missing immediately contact the factory or the Distributor from whom the equipment was purchased. If damage from shipping is evident, immediately file a claim with the shipping company.

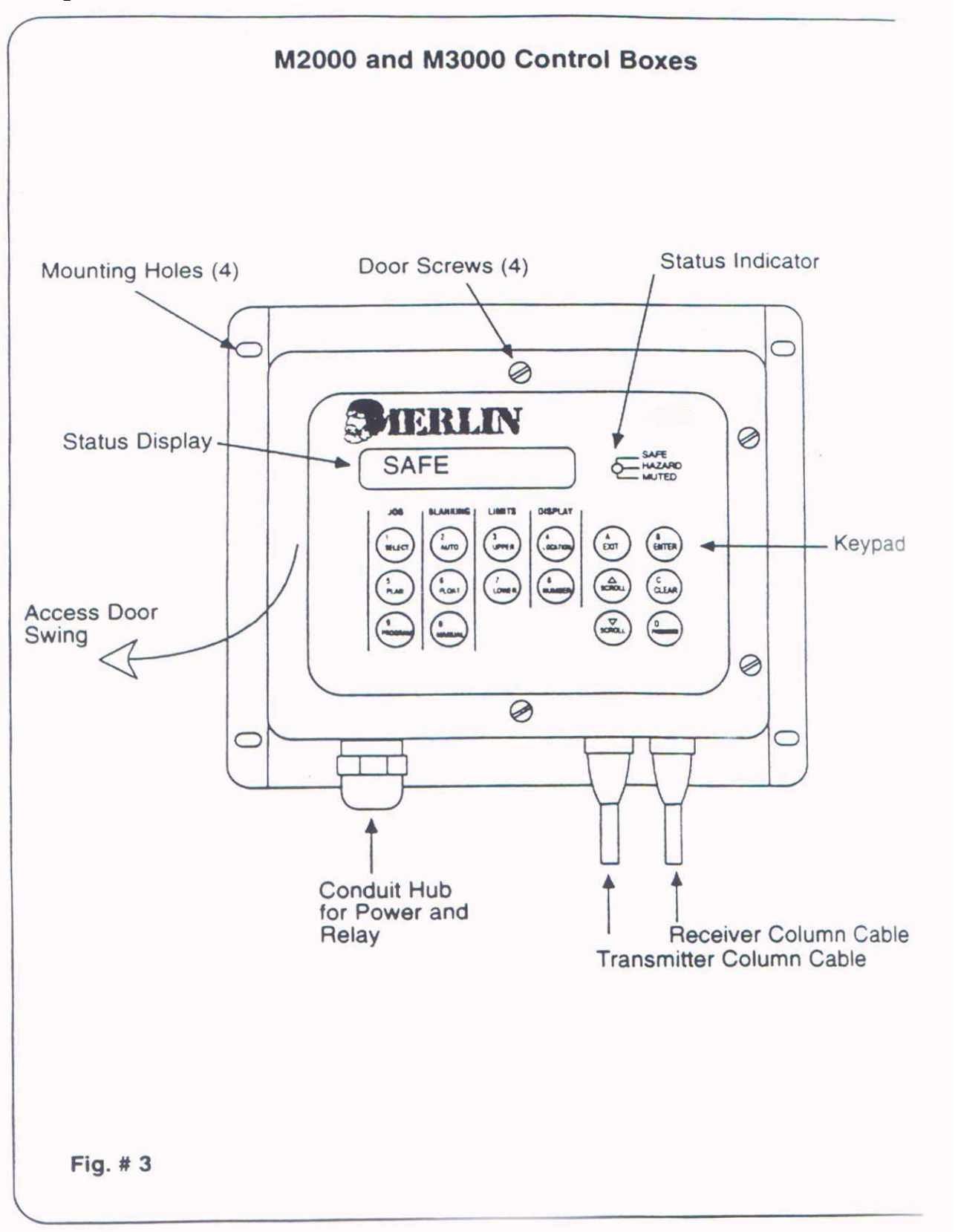
EQUIPMENT DESCRIPTION



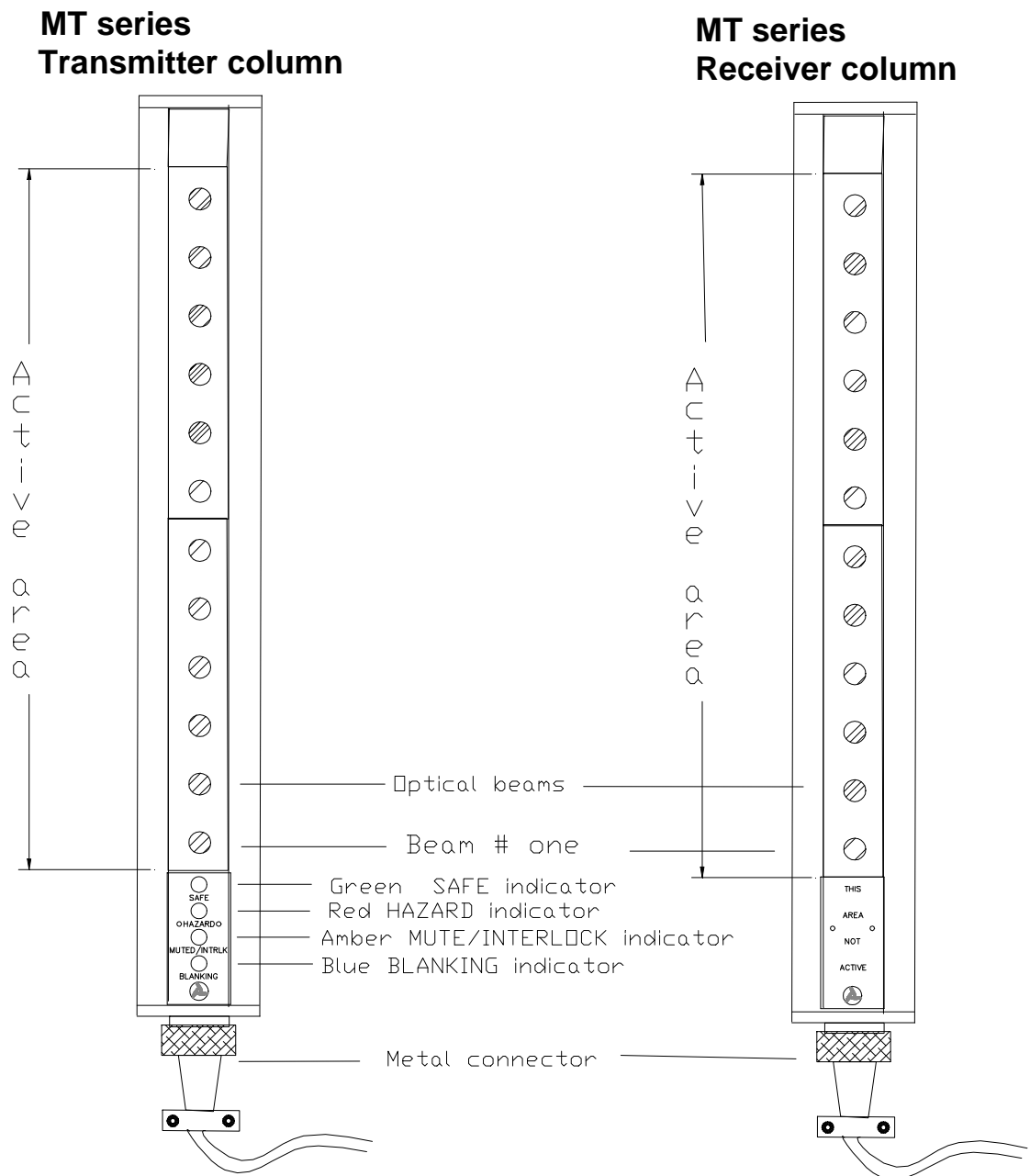
* Optional

Fig. # 2

EQUIPMENT DESCRIPTION

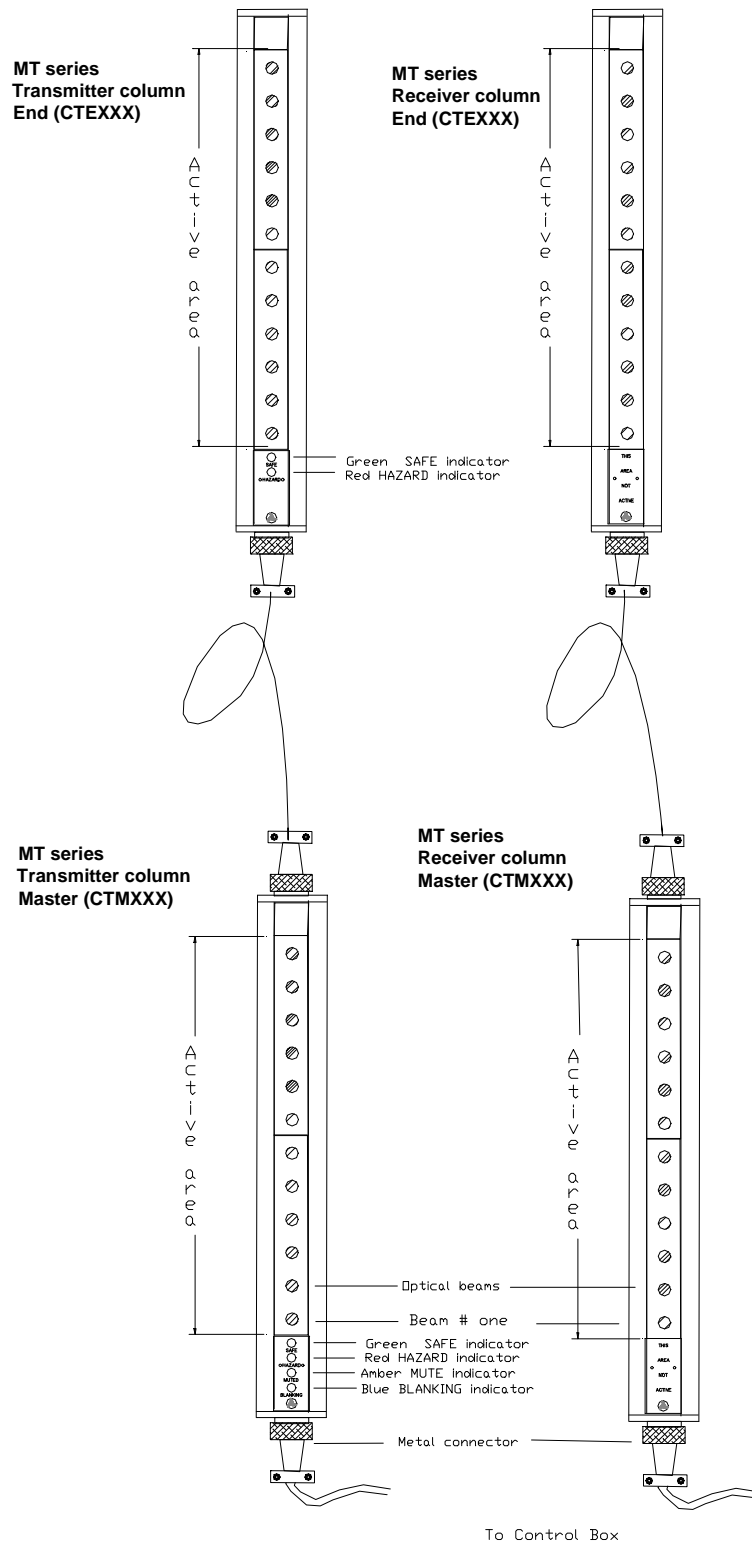


EQUIPMENT DESCRIPTION

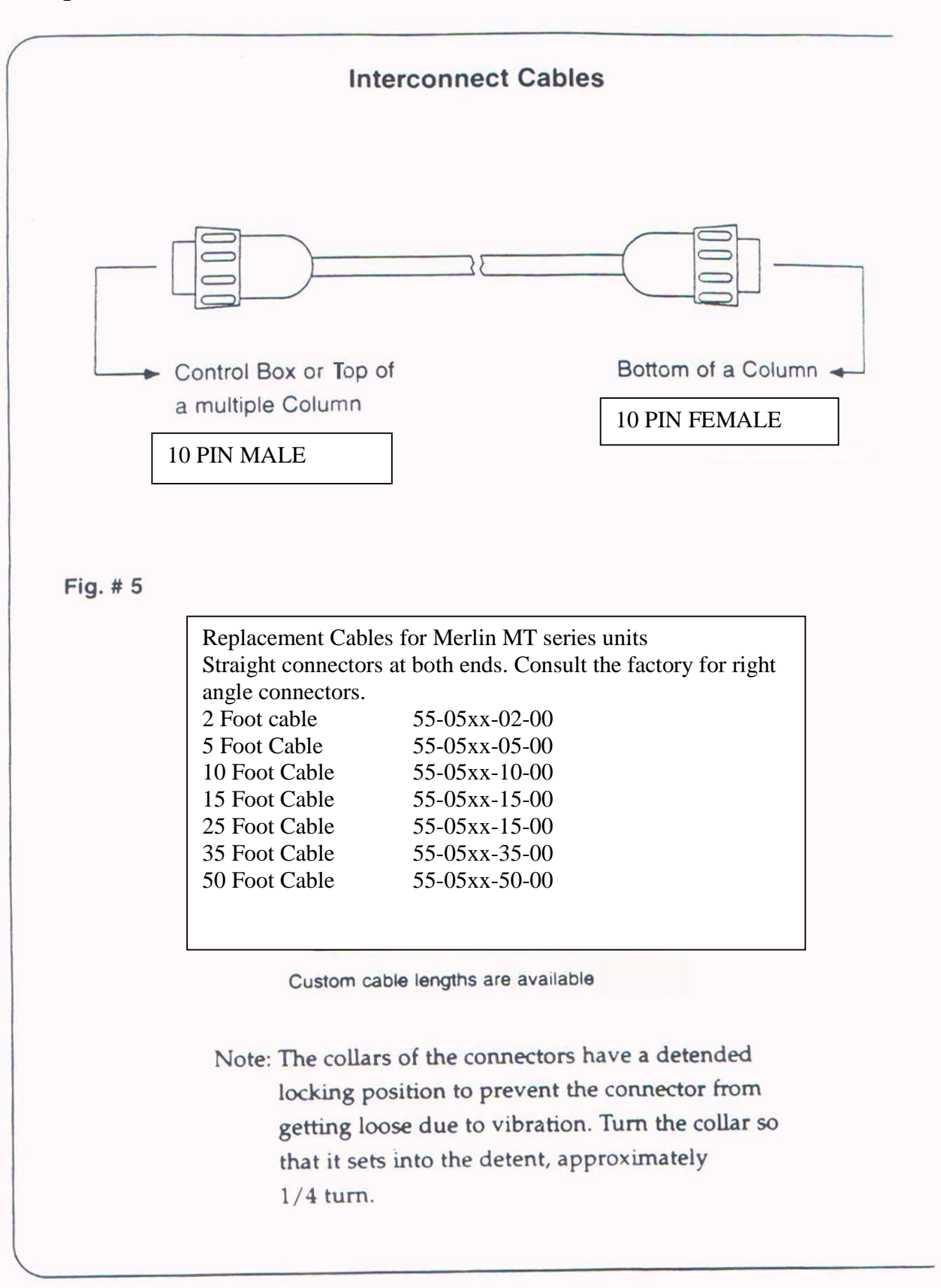


EQUIPMENT DESCRIPTION

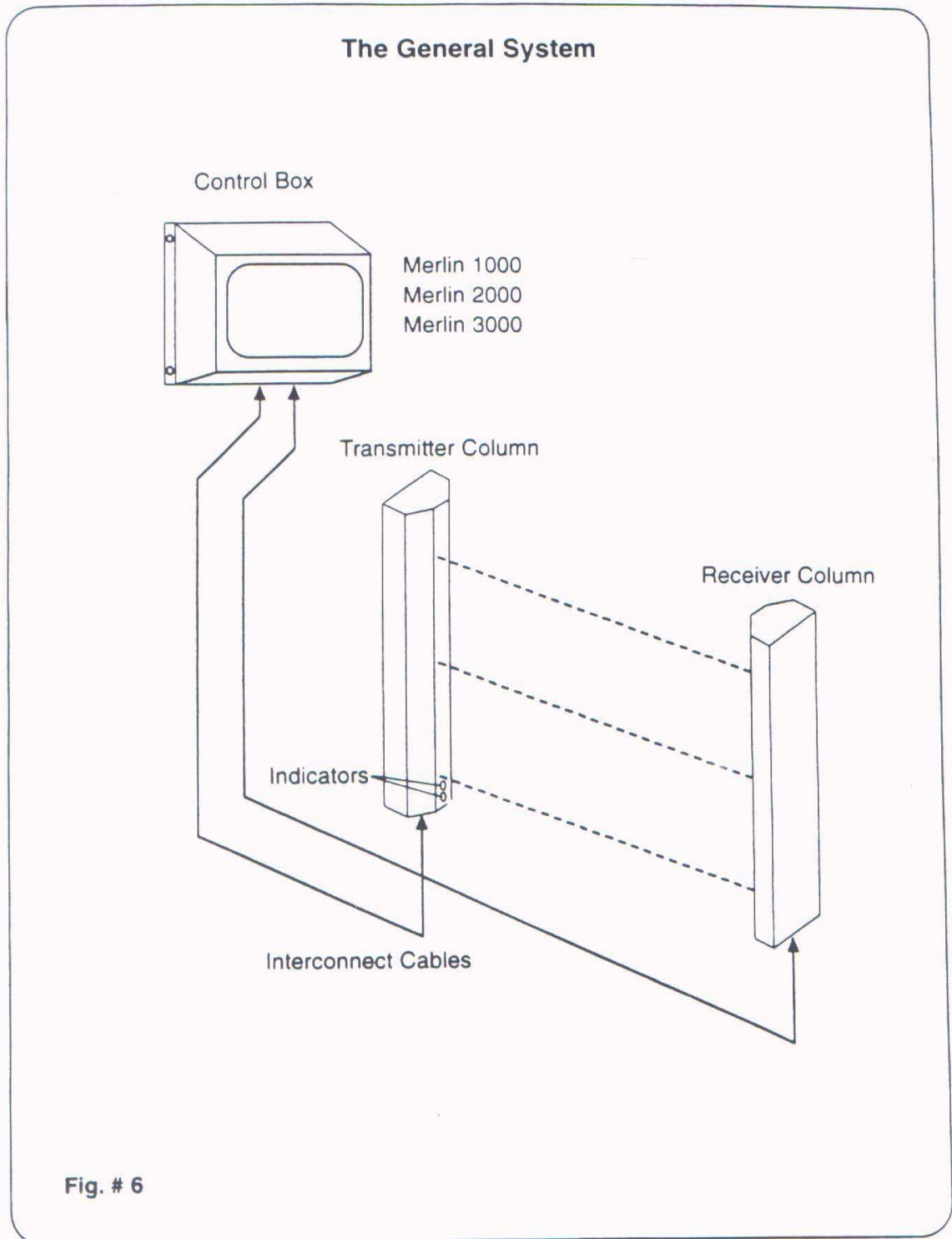
Sample Multiple Column Arrangement



EQUIPMENT DESCRIPTION



EQUIPMENT DESCRIPTION



GENERAL SPECIFICATIONS

Electrical

| | |
|----------------|--|
| Input Power | 120VAC (50 or 60 Hz) Optional 220 VAC |
| Consumption | 60 W (fused @ ½ A) |
| Output Circuit | Two captive-contact relays, self checking |
| | rated at 125 VA |

Relay Ratings

| | |
|----------------|------------------------------|
| Output Circuit | 4 A @ 220 VAC fused @ 3 A |
| Alarm / Status | 5 A @ 220 VAC |

Control Box

| | |
|--------------|---|
| Indicators | Safe Green LED Hazard Red LED Muted Yellow LED |
| Construction | 14 gage steel NEMA 12 or NEMA 4 |
| Dimensions | <u>9.5"</u> high by <u>11"</u> wide by 241.3mm 279.4mm <u>6.75 deep</u> (inches) 171.4mm |

Columns

| | |
|--------------|--|
| Construction | Extruded aluminum NEMA 12 or NEMA 4 with quick disconnects |
| Dimensions | <u>1.75"</u> deep by <u>2.1"</u> wide 44.4mm x 53.3mm . Lengths in <u>6 inch</u> increments 152.4mm up to <u>96 inches</u> 2438.4mm |

Columns

| | |
|---------------|---|
| Indicators TX | Safe Green LED Hazard Red LED Muted Yellow LED Blanking Blue LED |
| RX | Beam indicators Red LED |

General

| | |
|-----------------------|---|
| Infrared Light Source | Solid state diodes Narrow beam divergence |
| Object Sensitivity | 0.87" (22 mm) or 1.5" (38 mm) |
| Temperature Range | 0 to 70° C |
| Mounting Brackets | Includes shock mounts |
| Scanning Range | <u>25 feet</u> standard or 7.6m <u>For 1" beam spacing</u> optional to <u>50 feet</u> 15.2m |
| Self Checking | Every 8 milliseconds |
| Response Time | Less than 27 milliseconds |

GENERAL OPERATING INSTRUCTIONS

Depending on the Merlin model you have purchased, there are numerous ways of indicators signaling the status of the unit.

Basic common indicators:

Machine Run- “Green Light” located on both the transmitter column as well as all Merlin units. The controls for the 2000 and 3000 models will also indicate this condition by indicating the word SAFE on the read out. This condition indicated that the sensing field is not obstructed by any object and the units are in normal operating condition.

Machine Stop- “Red Light” this condition is displayed when an active beam is interrupted; a component failure has been detected. In this condition the two normally open output contact relays will prevent machine operation.

Machine by-pass- “Amber Light” located in the transmitter column; and the control box when lit, indicates the output of the light curtain has been muted by the Merlin control. This is a common practice accepted by OSHA in the non-hazardous portion of a machine cycle i.e. the upstroke of a press or a press brake.

Beam Blank-out- “Blue Light” located on the transmitter column will turn on to indicate that one or any number of beams are being blanked during the operation of the light curtain.

NOTE: Merlin has taken all necessary measures technologically feasible to insure that no unnecessary portion of the light curtain will be blanked without proper authorization. If and when blanking is required, read section C or section D and be sure to instruct the proper use of blanking to all concerned.

Beam Indicators Red Leds are located in the receiver column adjacent to each beam. They indicated when a beam is blocked or misaligned.

Slave Relay Monitor (OPTIONAL)

If the load for the output relays is greater than their capacity then a slave relay must be used. The slave relay monitor checks that the slave relay correctly follows the output relays. Improper slave relay operation causes the alarm relay to activate and the light curtain to go into hazard mode.

Manual Reset (All Models)

This feature prevents the machine from restarting after a hazard has occurred. Then the light curtain must “see” a safe condition and you must press the manual reset switch to continue. See fig. 14.

Alarm Relay (Optional)

The alarm relay functions in one of two modes:

Alarm mode – internal light curtain faults are reported. These faults include columns disconnected / failed or output relay failures.

Status mode – the alarm relay contacts follow the output relay contacts. This can signal remote indicators or other devices.



NOT FOR SAFETY USE

Auto Column Configuration (All)

Intelligent columns automatically report their size and beam spacing to the control making installations foolproof.

INSTALLATION INFORMATION

This section must be read by a qualified installer. Improper installation may jeopardize the level of protection provided by Merlin units. It is important that the installer as well as the user comply with all installation requirements, i.e. safe mounting distance, additional guarding requirements, proper wiring to existence control as well as analyzing control failure modes in their existing controls.

1) Calculate the minimum safety distance required to install the Merlin unit. If additional guarding is required, try to incorporate the additional guards with the proper operation of the Merlin units and make sure that people can not locate themselves in an unprotected position, see examples below.

2) Check the control of the existing machine to insure it has reliable controls and that a stop signal from the Merlin unit can not be overridden by a failure within the control of the machine itself or that it can not be allowed to operate without the proper operation of the Merlin unit.

3) Connect the unit to the machine.

4) Test the unit and the machine for proper operation and response according to the instruction provided in section A, page 27.

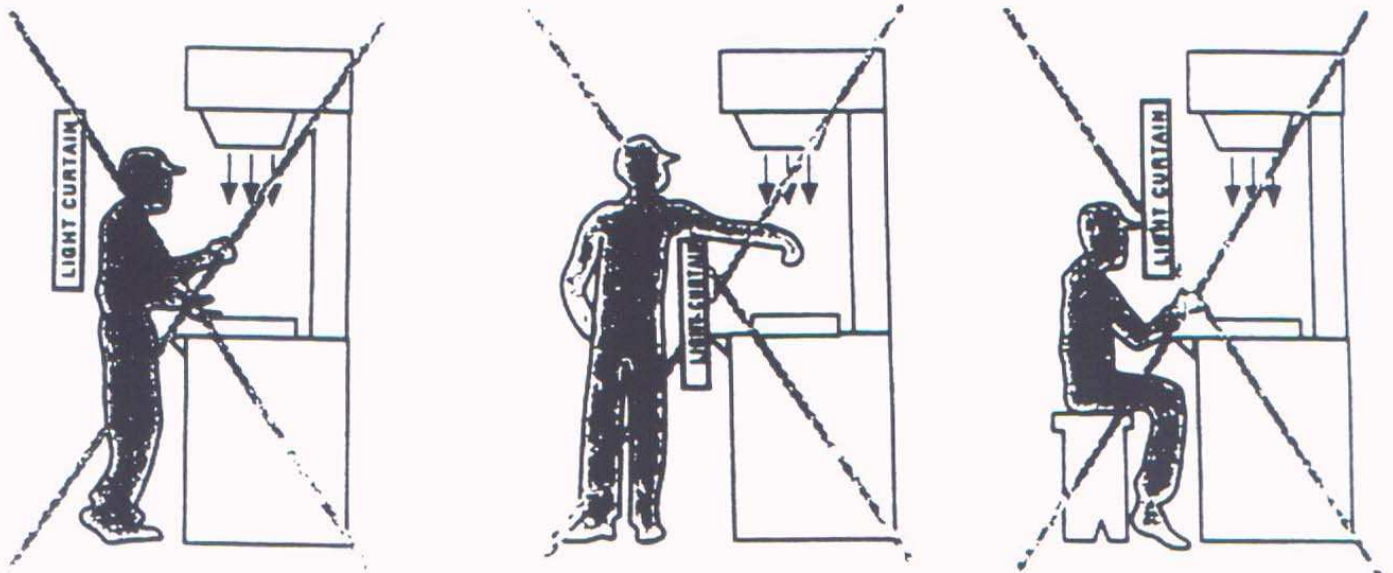


Fig. # 7

MECHANICAL INSTALLATION

The Merlin Units are designed to withstand the normal shock and vibration found on punch presses and press brakes. If a particular application has heavy shock due to thick plate blanking or stainless steel blanking shock mounting the control box is recommended. Your Merlin Light Curtain was ordered with specific cable lengths, which means that the approximate location of the control box with respect to the column locations has already been determined. Locate the cables and check the lengths. Remember the cables are universal for either the transmitter or the receiver.

First determine the correct location for the transmitter and receiver columns. The distance between the beam barrier plane and hazardous machine operating point must be given careful consideration in planning Merlin installation. As a basic rule of thumb, this distance should never be less than 12 inches, but machine geometry, area layout, machine shutdown response time plus the 27 millisecond Merlin response time, and possible personnel motions all enter into the calculation of a safe minimum distance. The barrier must be far enough away from hazardous machine points to ensure that even when moving under unusual stress, no part of an operator's or passerby's body can reach a machine danger point before machine motion stops.

Safety Distance Formulas

OSHA states the safety distance as:

$$D_s = 63 \times T_s$$

Where D_s = safety distance (inches)

63 = the hand speed constant
(inches/second)

T_s = stopping time of press at approximately 90 degrees of crankshaft rotation (seconds). The Light Curtain and control response times should be included in T_s .

For Metric Measurement:

$$D_m^s = 1600 \times T_s$$

D_m^s = Safety Distance (mm)

1600 = is the hand speed constant (mm/sec)

T_s = Stopping time in seconds

MECHANICAL INSTALLATION

The A.N.S.I. formula as stated in A.N.S.I. B11.1©1988 for Mechanical Power Presses.

$$Ds = K \times (Ts + Tc + Tr + Tbm) + Dpf$$

Merlin recommends using this A.N.S.I. formula for added safety. The total stopping time of the press should include the total response time of the light curtain, the response time of the interface, the response time of the control system, and the time it takes the press to cease slide motion.

Ds = Safety distance

K = The hand speed constant = 63 inches per second.

Ts = The stop time of the press measured from the final de-energized control element, usually the air valve.

Tc = The response time of the press control. If using a Merlin press control the response time is 0 seconds.

Tr = The response time of the light curtain. The Merlin response time is less than 27 milliseconds.

TBM = The additional stopping time allowed by the stopping performance monitor before it detects stop time deterioration.

DPF = The added distance due to the penetration factor as recommended as recommended in fig. 8. The minimum object sensitivity is stated by the manufacturer. If beam blank outs or floating beam features are used, these figures should be added to the object sensitivity figure before using the chart below.

Note: Ts + Tc are usually measured by a stop time measuring device.

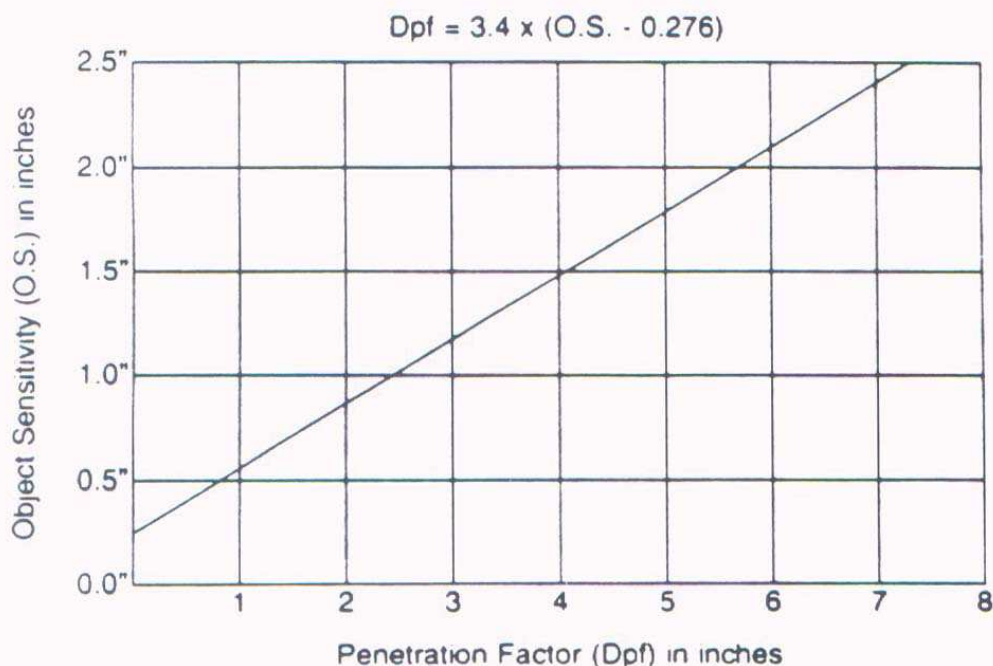


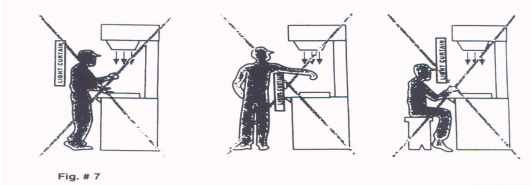
Fig. # 8

MECHANICAL INSTALLATION



WARNING

CARE MUST BE TAKEN TO PREVENT AN OPERATOR OR OTHER PERSON FROM STANDING BETWEEN THE PLANE OF PROTECTIVE BEAMS IN THE LIGHT CURTAIN AND THE HAZARDOUS MOTION AT THE POINT OF OPERATION. IF THE CALCULATED SAFETY DISTANCE AND MACHINE GEOMETRY WOULD ALLOW THIS, SOME ADDITIONAL SAFEGUARDING OR GUARDS WILL BE NEEDED. EITHER MECHANICAL RAILS OR AN ADDITIONAL HORIZONTAL LIGHT CURTAIN ARE POSSIBLE WAYS TO PREVENT AN UNSAFE CONDITION.



When a minimum safe barrier distance has been established, investigate the Unit mounting possibilities. Wherever possible, Transmitter and Receiver Units should be mounted directly on the machine frame or on rugged mounting adapters attached to the machine frame. Where conditions dictate a separate mounting stand, be sure it is very solidly built. The objective in all cases is to keep relative motion between Transmitter and Receiver Units to a minimum. The Units themselves are highly resistant to shock and vibration, but if shock and vibration are allowed to significantly affect Transmitter and Receiver optical alignment, nuisance shutdowns may result. Merlin offers a variety of mounting brackets and pedestals for installing the Merlin Light Curtains. Custom built brackets are available for OBI presses and press brakes. Standard brackets for straight side presses

and brackets for up acting hydraulic press brakes are also available. In establishing final Transmitter and Receiver Unit locations, be sure there is no possibility of access to a machine danger point from over, under, or around the ends of the Merlin beam barrier. Especially where a separate mounting stand is used for Merlin Units, it may be necessary to close peripheral spaces with fixed shields or screens. It may be necessary to interlock these peripheral guards if they are easily removable. The Transmitter Unit is intended for mounting at the left hand side of the machine, and Receiver Units on the right. Make sure that indicator lights are visible to the operator. The connectors are designed to come out the bottom of the columns. When planning the column mounting location leave room for the cable and connectors. Finally, check all current OSHA, state and local safety requirements that pertain to the specific application to be sure the intended barrier location will satisfy them. The construction and use of presence sensing device is covered by OSHA 1910.217 paragraph (c) (3) (iii).



WARNING

DO NOT USE THIS PRESENCE SENSING SAFETY DEVICE ON FULL REVOLUTION CLUTCH PRESSES OR MACHINERY THAT IS NOT EQUIPPED WITH RELIABLE CONTROLS AND BRAKE MECHANISMS TO STOP THE HAZARDOUS MOTION ANYWHERE IN THE MACHINE CYCLE. WHEN THE STOP SIGNAL IS GENERATED BY THE PRESENCE SENSING SAFETY DEVICE...

MECHANICAL INSTALLATION

Columns

Drill and tap 1 / 4 - 20 or M 6 holes (see pg. 19 fig. 10) or drill clearance holes and use bolts and nuts for mounting. Mechanically the two columns should be close to parallel. Mount one side and secure in place. Using a string, locate the position to mount the second column by pulling the string tight so that it just touches the side of the secured column, and then move the second column so that it just touches the string. Mark the location for the mounting holes. Adjustments for final unit alignment have been built into the mounting brackets. If care is taken to get the initial mechanical mounting close, the final alignment should not be a problem.

Control Box

Two items must be considered for the location of the control box. 1) The cable lengths to the Transmitter and Receiver columns. 2) The accessibility and operator visibility of the control, especially if it is a Merlin 2000 or 3000 system. When a location has been determined, drill and tap 4 holes 1 / 4 - 20 or M 6 holes for mounting the box.

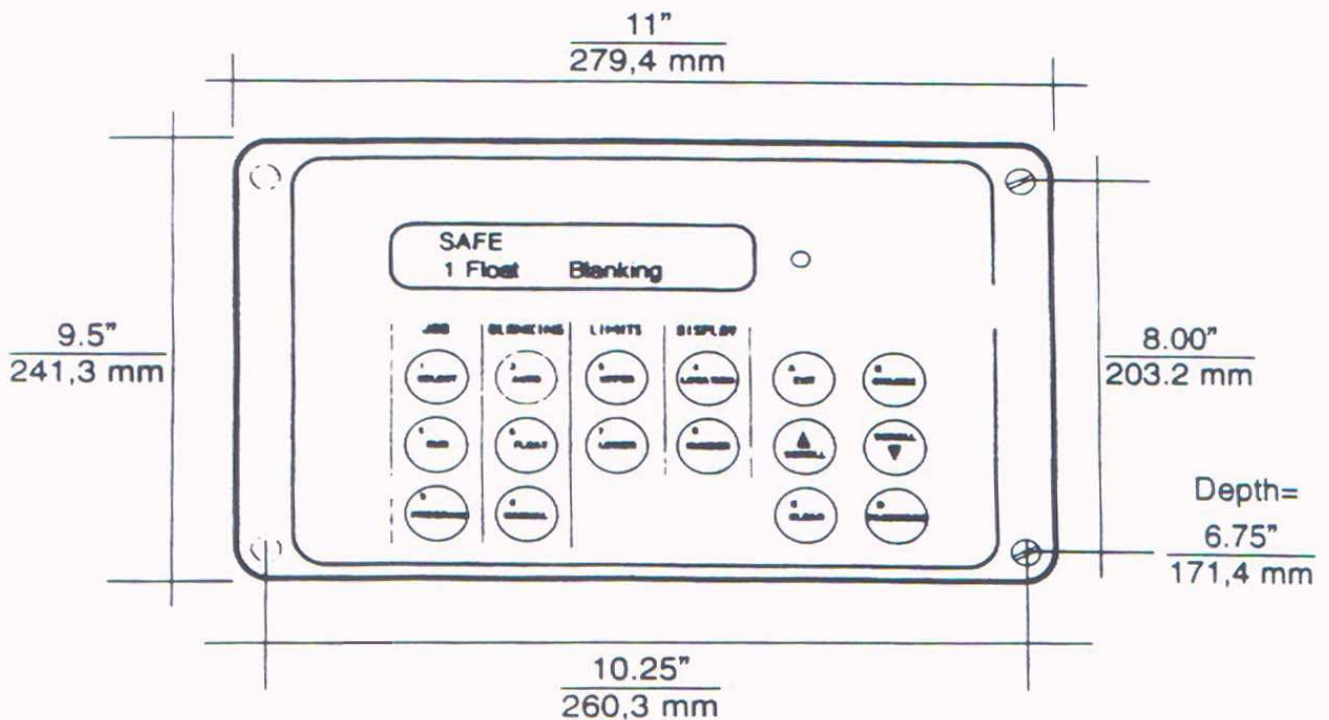
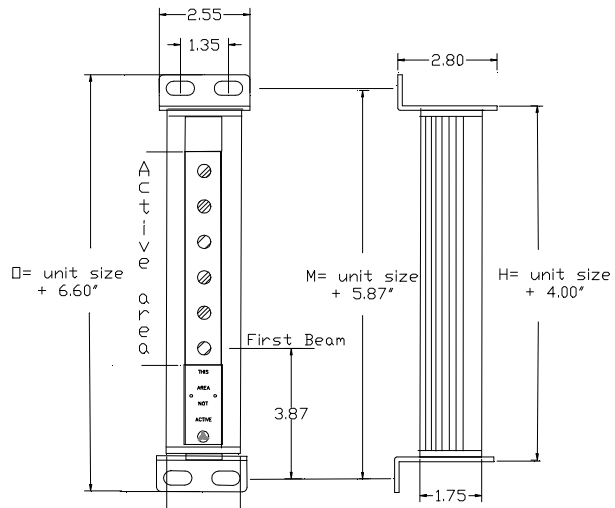
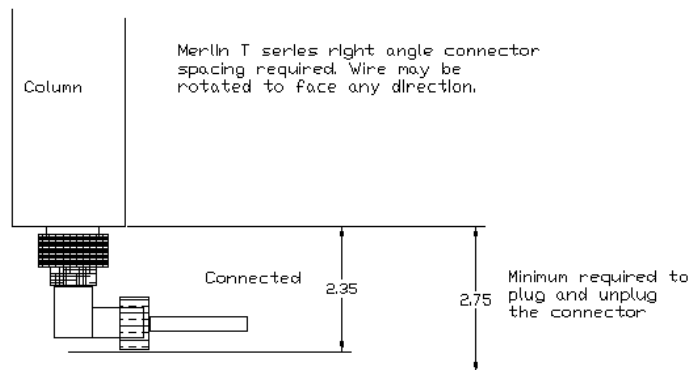
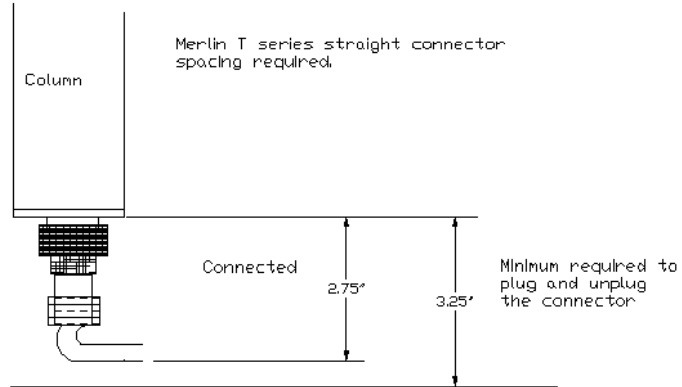


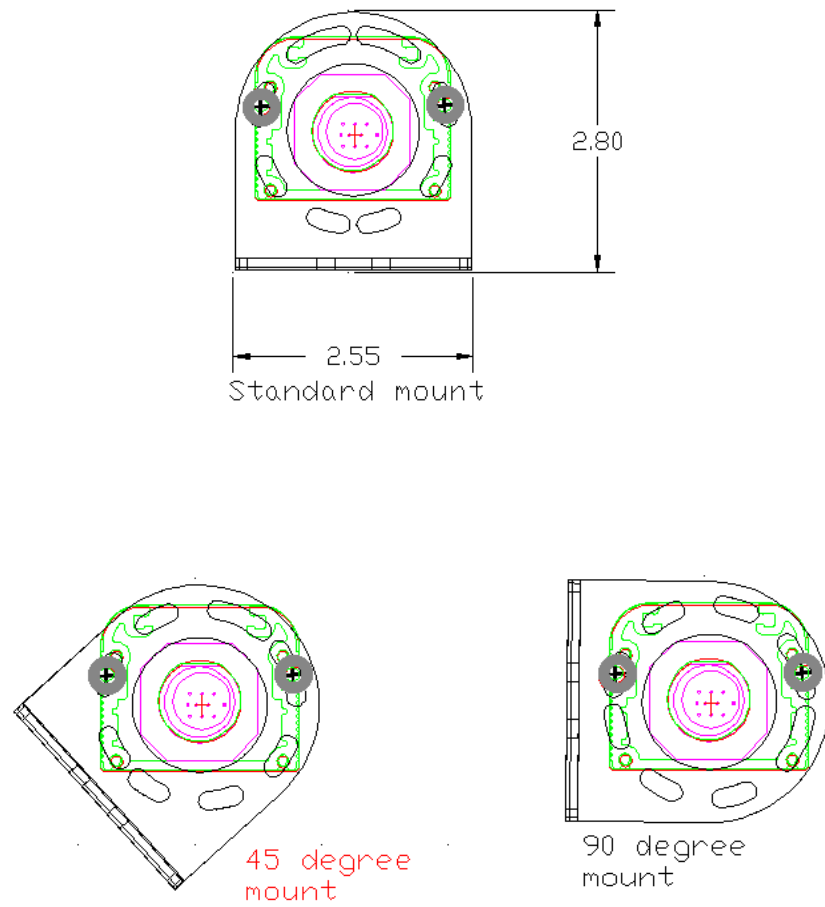
Fig. # 9

MECHANICAL INSTALLATION



Merlin T series mounting dimensions
 H = overall height
 M = mounting bolts center to center





The new MT universal mounting bracket allows the column to be mounted at “0” degrees and plus and minus “45” and “90” degrees as shown above.

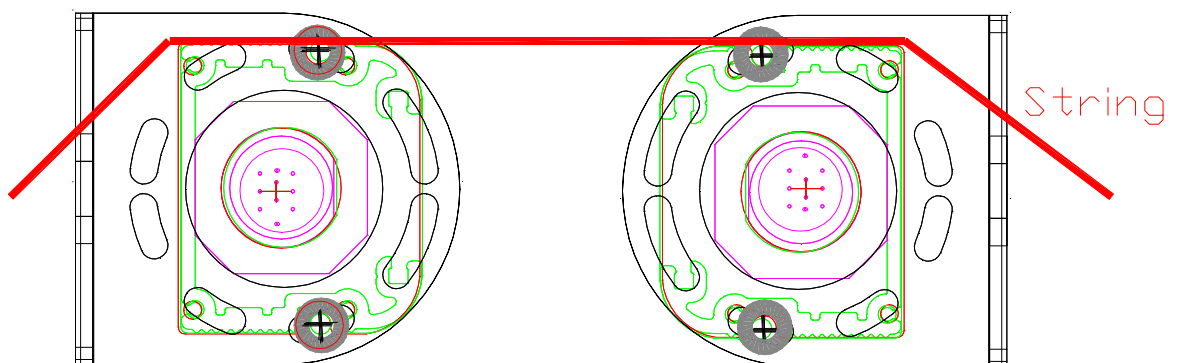
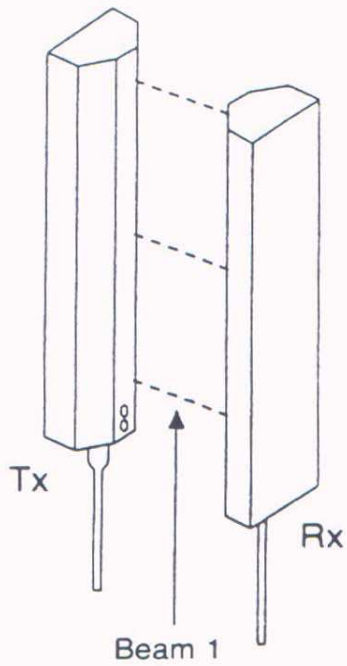


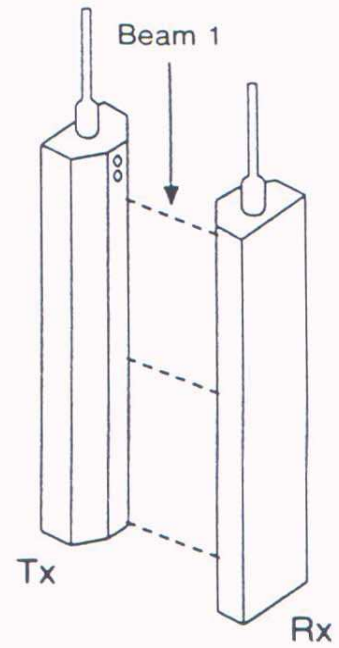
Fig. 10

MECHANICAL INSTALLATION

Correct Column Mounting



or



Incorrect Column Mounting

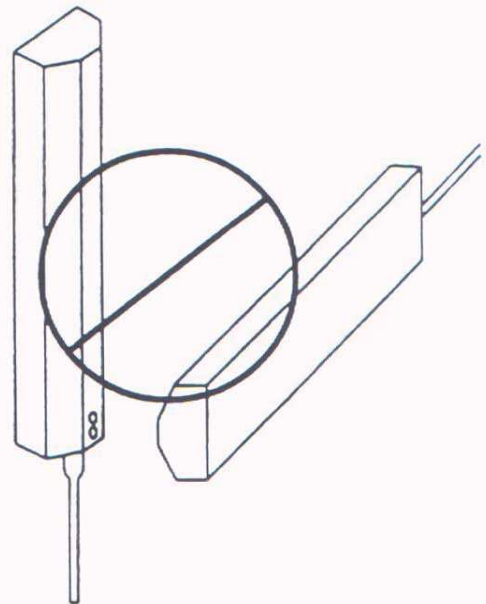
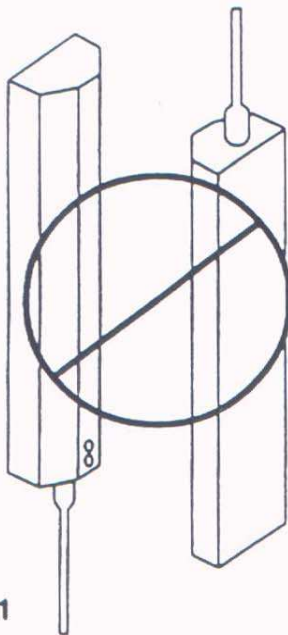


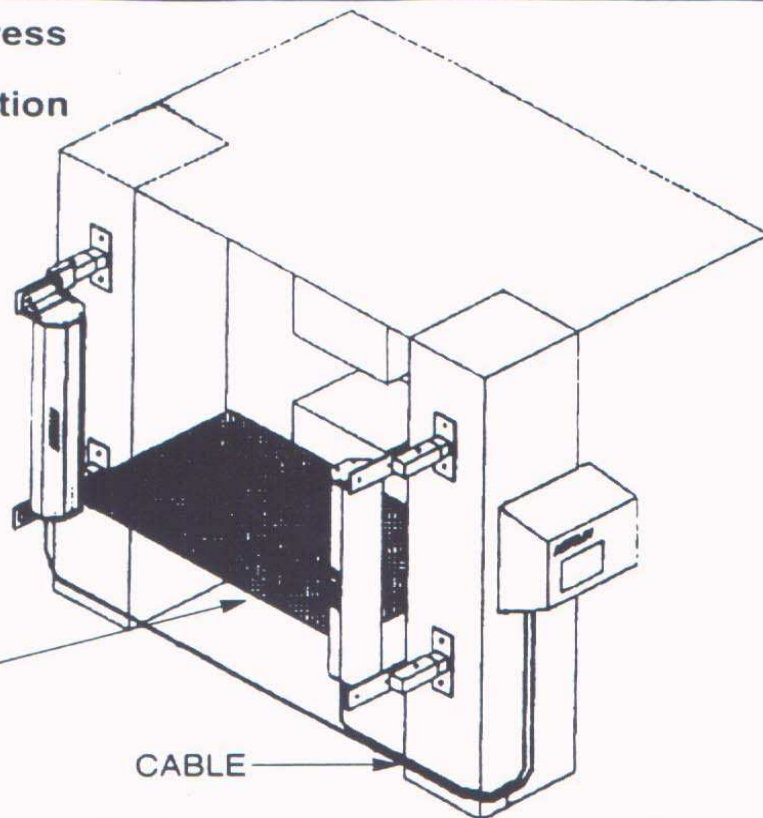
Fig. # 11

Straight Side Press
Mounting suggestion

Protect against
standing inside
the light curtain
if it is possible

CABLE

Fig. # 12

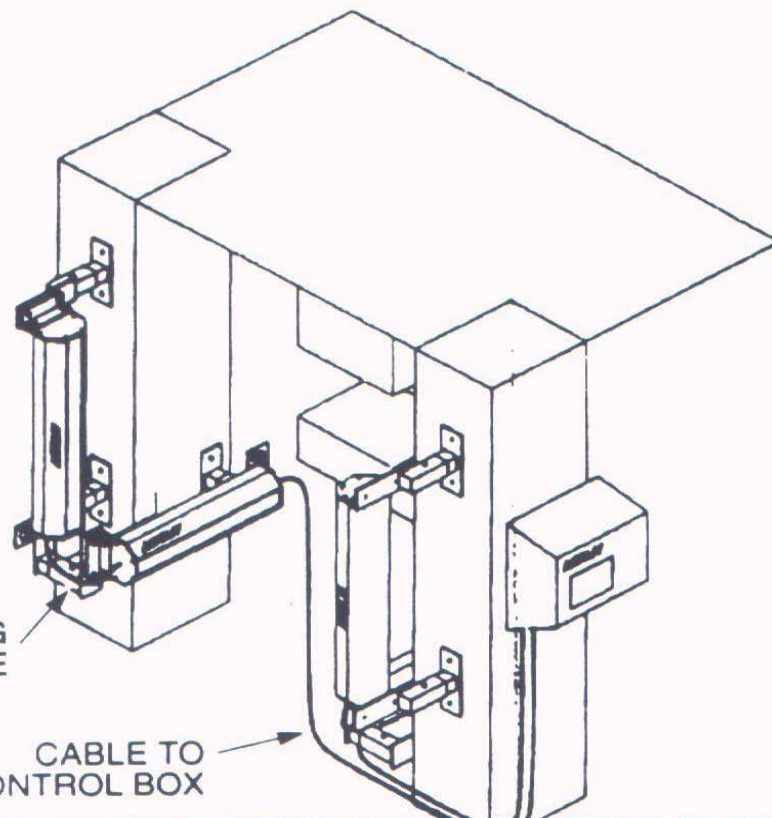


Multiple column
mounting on
large straight
side presses.

INTERCONNECTING
CABLE

CABLE TO
CONTROL BOX

Fig. # 13



ELECTRICAL INSTALLATION



WARNING

BEFORE DOING ANY WIRING, BE SURE TO TURN ALL POWER OFF AND FOLLOW APPROPRIATE LOCK OUT/TAG OUT REGULATIONS.



WARNING

ON MECHANICAL POWER PRESSES, DO NOT USE THE TOP STOP CIRCUIT, AS THIS DOES NOT CAUSE AN IMMEDIATE STOP.

120 VAC input power and the output contact wiring need to be connected from the machine control to the Merlin control box. Sealtite or conduit recommended, but be sure to conform to all national or local applicable electrical codes. Various wiring methods for interfacing the output contacts into the machine control exist, for the different types of controls currently used on machinery. Determine the type of control to be interfaced to and follow the appropriate wiring section. If any question exists about which interface wiring should be used, consult the factory for assistance.

AC input power wiring to the Merlin requires 120 or 220 VAC + 10% - 15% at 50 or 60 cycles and will draw appropriately 1 / 2 A. Run wires for the AC input, AC hot, neutral or ground, to the correct terminals of TB2 on the wiring plate assembly of the control box. (See fig. 14)

Output contact wiring

Two individual isolated relay contacts are used to stop the machine when the Light Curtain beams are interrupted. These must be wired into the control so that an immediate stop occurs when the contacts open.

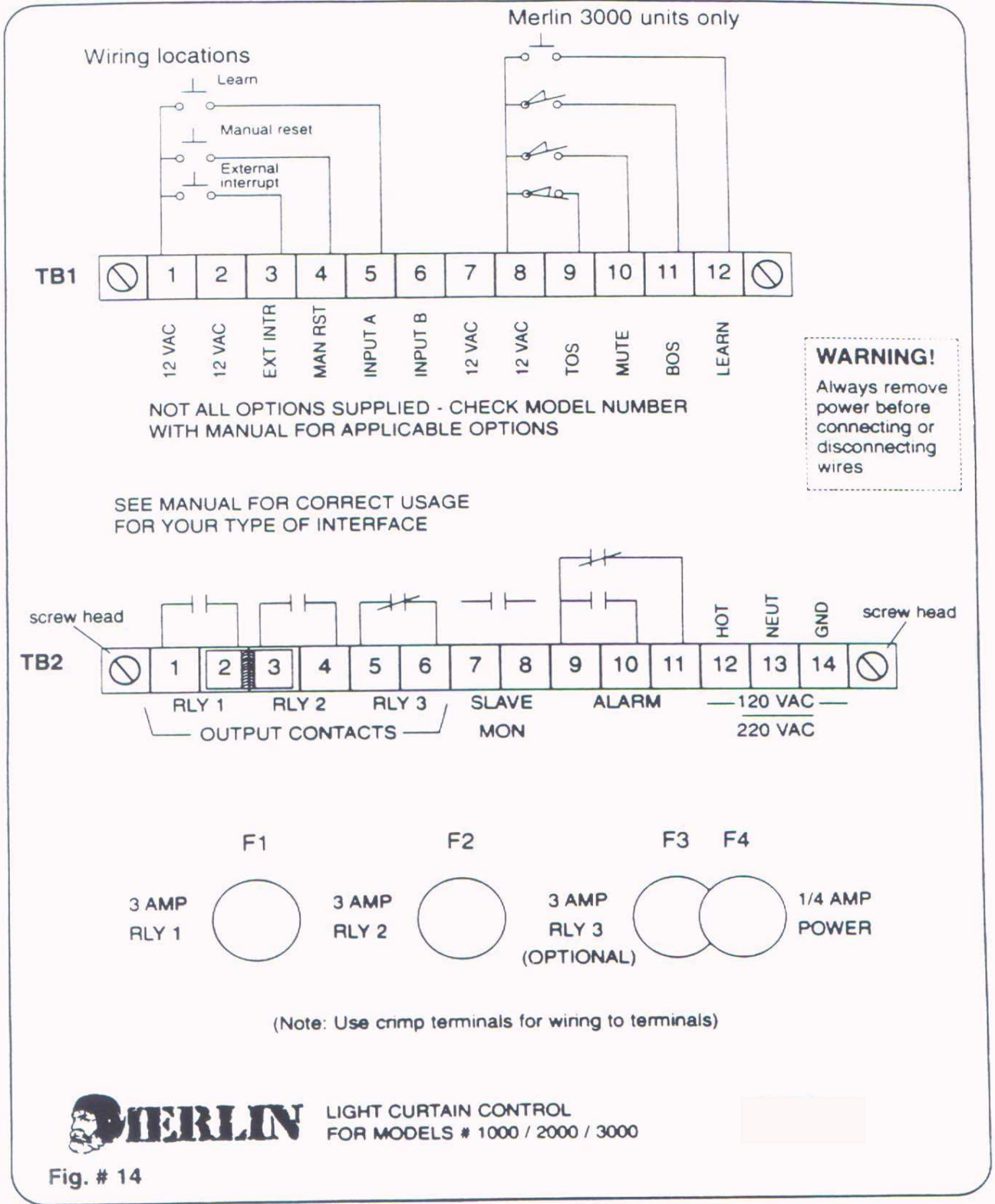
Two basic types of control circuits are found on most machines.

- Relay logic
- PLC (Programmable logic controller)

Relay logic machine controls

The Merlin Unit is shipped with the two output contacts jumpered together (terminals 2, and 3,) so that the contacts are in series. Leave the jumper in place and use terminals 1 and 4 for wiring into the stop circuit. Select a location in the circuit that will disengage the clutch and apply the brake whenever the light curtain is interrupted. The interruption of the light curtain should cause an immediate stop and require that all operating activators be released and re-actuated after the light curtain is no longer interrupted before motion can be restarted. Make sure that the light curtain works in all modes of operation; i.e. hand, foot, single inch and continuous. For assistance in connecting the light curtain into the machine control circuit call the factory for help. See fig. 15. Go to initial start up on page 27.

ELECTRICAL INSTALLATION



ELECTRICAL INSTALLATION

Typical Relay Logic Machine Connection

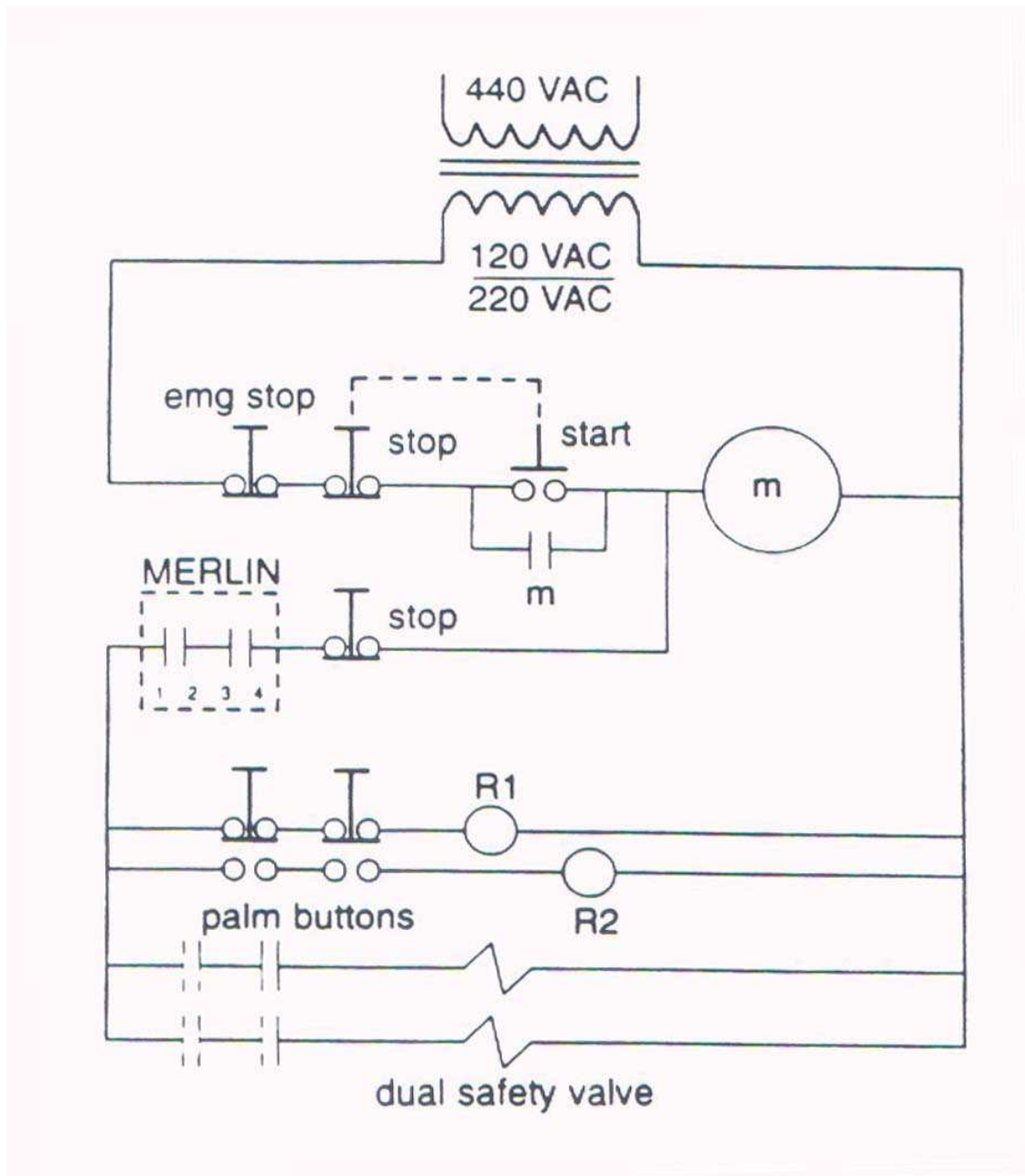


Fig. # 15

ELECTRICAL INSTALLATION

Programmable logic controllers. (PLC's)

When interfacing a light curtain to a PLC special precautions must be taken. The Merlin output contacts are used separately therefore the jumper that is installed between terminals 2 and 3 must be removed. There are two methods of connecting a light curtain to a PLC. The first method is preferred but if this cannot be done use the second method.

1. Generally one input of the PLC machine control is designed to monitor a light curtain signal. Connect one output contact for the Merlin, terminals 1 and 2 to this input. See figure 16 for example. The second Merlin contact, terminals 3 and 4 should be connected in the power feed for the output module that controls the clutch/brake or the up/down solenoid valves of the machine. This will remove power directly from the final devices that controls machine motion. Go to initial startup on page 27.

2. When one contact cannot be wired into the output module to control the final device that controls motion, two separate inputs to the PLC should be used. Remove the jumper between terminals 2 and 3 on the terminal block. The PLC must be programmed to use two separate inputs for the light curtain and must check each input for correct operation. The program must compare the two inputs such that they

must always both be in the same state. Anytime the program finds a disagreement in the state of the two inputs the control should latch in an off state and indicate a fault exists in the monitoring of the light curtain. This will check for interface faults in the PLC inputs and the interface faults. See figure 16 for example. Consult the factory for assistance for the correct wiring. Go to initial startup on page 27.

Transmitter and Receiver Column Cables

Always connect and disconnect these cables when the power to the Merlin Unit is off.



CAUTION:

DO NOT ROUTE THE CABLES IN CLOSE PROXIMITY TO HIGH VOLTAGE ON THE MACHINE.

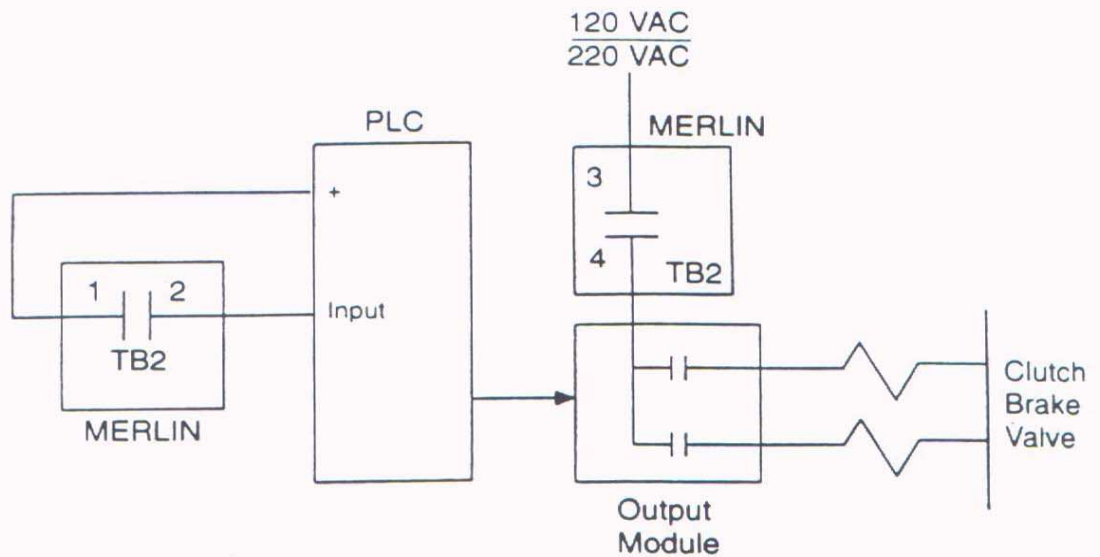
Route the cables so that they will not easily be damaged by the handling of parts or the installation and removal of dies. Secure in place with tie wraps or other appropriate devices.

Note: The collars of the connectors have a detented locking position to prevent the connector from getting loose due to vibration. Turn the collar so that it sets into the detent, approximately 1 / 4 turn.

The female end goes to the bottoms of the columns. See page 10 to order replacement cables.

ELECTRICAL INSTALLATION

PLC Light Curtain Wiring - Method 1



PLC Light Curtain Wiring - Method 2

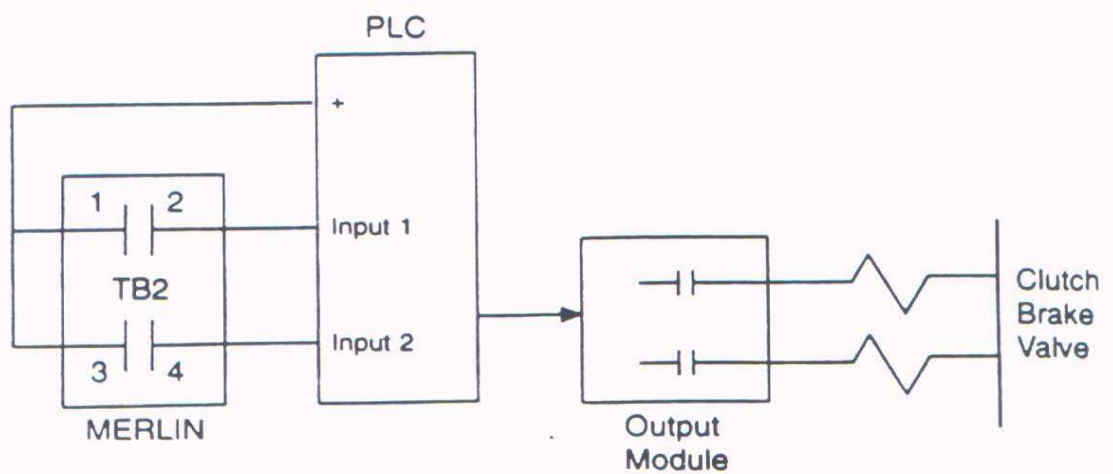


Fig. # 16

ELECTRICAL INSTALLATION

ⓘ IMPORTANT

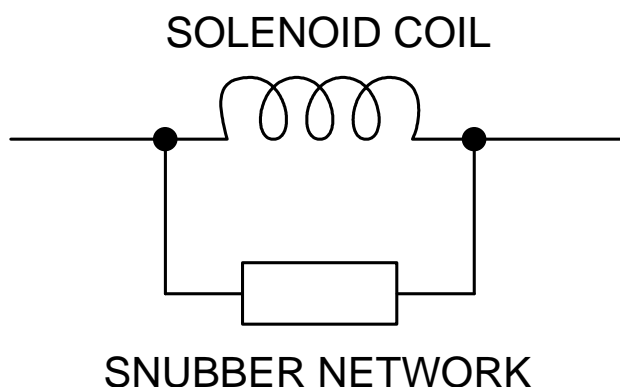
Snubber network installation:

Every Merlin includes two (2) noise suppressors devices called “Snubber” networks.

Dual safety valves can create rather large electrical spikes. In order to prevent electrical nuisance problems, both suppressor devices need to be installed on the dual safety valve solenoid coils. They should be installed physically as close to the valve as possible, rather than in the control enclosure.

One suppressor device **MUST** be installed at **EACH** solenoid coil of the dual safety valve, no matter the solenoid coil voltage used (high or low voltage).

The following diagram shows the connection of the snubber device to the solenoid coil :



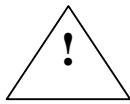
If you need assistance, please call Merlin technical support for help.

UNIT TESTING

Initial Startup

After completing the installation check that machine motion will not start if a beam is interrupt in all modes of operation, single, inch, continuous, auto, etc...

Using a test rod or other device check to see that when running in each mode the machine will stop when in the hazardous part of the cycle when any light beams are interrupted, check for object sensitivity.



WARNING

DO NOT OPERATE THIS PRESENCE SENSING SAFETY DEVICE UNLESS IT HAS BEEN PROPERLY INSTALLED AND TESTED IN ACCORDANCE WITH THE INSTALLATION MANUAL AND ALL APPLICABLE OSHA, ANSI, AND GOVERNMENTAL STANDARDS. WHEN INSTALLED AT THE PROPER SAFETY DISTANCE AS DETERMINED BY THE STOP-PING TIME AND SAFETY DISTANCE FORMULA IN THE INSTALLATION MANUAL, MAKE SURE THAT NO ONE CAN STAND BETWEEN THE PRESENCE SENSING SAFETY DEVICE AND THE POINT OF OPERATION. OTHER DEVICES MAY BE NECESSARY TO PREVENT THIS, OR ANY OTHER ACCESS TO THE POINT OF OPERATION NOT PROTECTED BY THE PRESENCE SENSING SAFETY DEVICE.

Daily test procedures

To insure proper operation of the presence sensing safety device and its interface to the machine control, the following tests must be done daily or at the very least after maintenance, adjustments, or modifications are done to the presence sensing safety device or the machine.

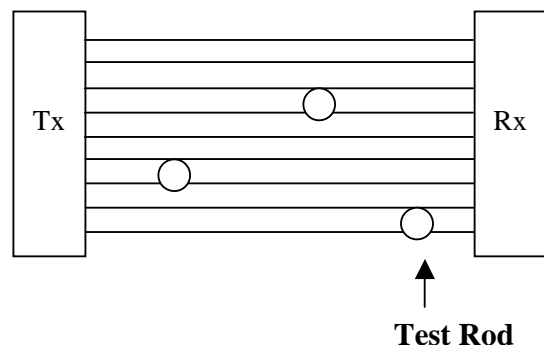
1. Confirm that the RED, HAZARD status indicator comes on when the beams are

interrupted by the appropriate test rod.

NOTE: All beam blankout and floating beam functions must be turned off. Move the test rod up and down the entire sensing field near each column and in the center of the sensing field. The RED, HAZARD indicator should be on while the test rod is anywhere in the sensing field. If using multiple column systems check each sensing field for the proper operation.

2. Using the test rod, start the machine and momentarily interrupt the sensing field. The RED HAZARD indicator should be on while the machine should stop immediately.

3. If any of the above requirements are not met DO NOT operate the machine and notify the supervisor immediately.



Test Rod size: Diameter.

For 1" Beam Spacing = 1.5" (38 mm)

For 1/2" Beam Spacing = 0.87" (22 mm)

ELECTRICAL INSTALLATION OPTIONS

Alarm/Status output relay

The alarm / status output relay can function in one of two ways.

1. The **alarm mode** will cause a change of state in the output contacts when an internal fault is detected within the Merlin or when the slave relay monitor is used and a fault occurs.
2. The **status mode** creates an additional set of contacts that will follow the state of the main output relays. This can be used for additional remote indicators or other functions.

DIP switch 3 determines the operation of the alarm / status output contacts. Off selects the alarm mode. On selects the status mode. Use terminals TB2- 9, 10, and 11 on the output terminal block for this signal. Be sure to adhere to the limitations of the contact rating for this output.



CAUTION:

THIS OUTPUT IS FOR AUXILIARY USE ONLY AND IS NOT CHECKED FOR CONTACT FAILURE. DO NOT USE THIS CONTACT FOR PRIMARY LIGHT CURTAIN OUTPUT WIRING.

See troubleshooting Section for DIP switch location.

Slave relay monitor

This option exists to monitor a slave relay for proper operation. If the load to be controlled by the light curtain exceeds the specifications of the main output contacts, a slave relay will need to be used. This **must be a safety relay, which has positively guided output contacts so that a contact failure can be detected.** One contact of the slave relay is connected back to the Merlin unit for monitoring. If the slave relay fails to follow the output contacts an alarm signal is generated by the alarm / status output relay to indicate the fault. This must be connected into the control in a different location to inhibit machine motion, or connected to signal a fault controlling and alarm device such as a light or audible signals.

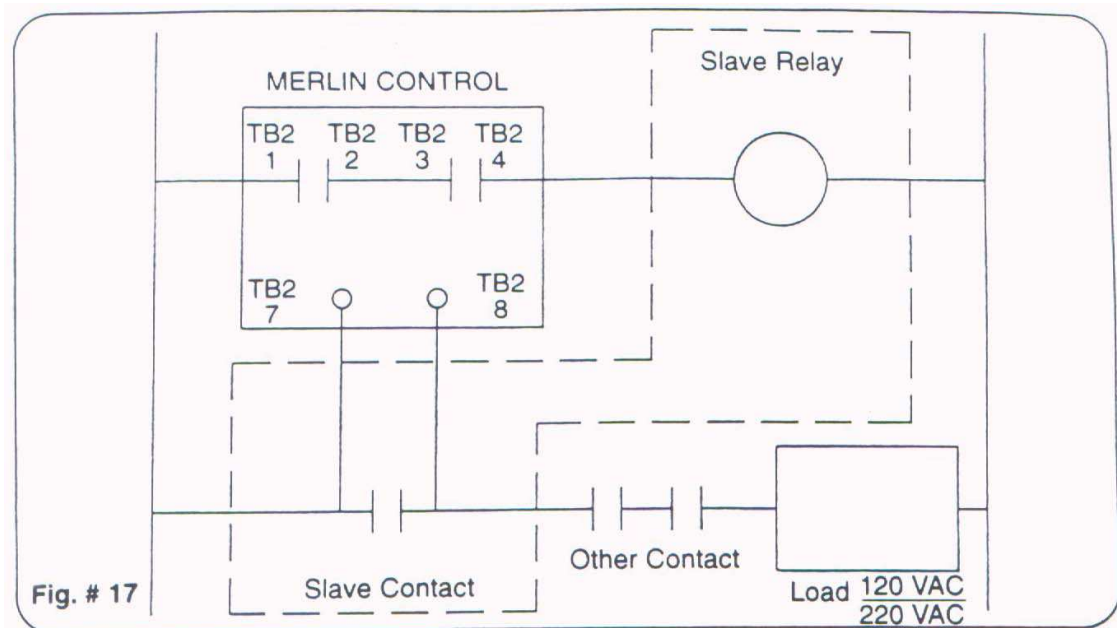
The Allen Bradley 700P series is one safety relay with positively guided contacts.

Consult the factory for assistance in using the slave relay monitor or alarm / status.

External interrupt option.

This option is standard on all units. It will force the output contacts to open to satisfy a check of the light curtain. To use this mode connect a normally open contact to TB1-1 and TB1-3, see fig. 14.

SLAVE RELAY MONITOR OPTION



Install the slave contact first in line with TB2-7 connected to 120 VAC HOT.

When a heavy-duty relay is used to control the load the relay can be monitored for proper operation. Connect as shown. Dip switch #2 needs to be on, to enable the check. If the slave contact does not open within 128 msec. after the Merlin output contact opens a relay fail message will appear on MT2000 series units and the Merlin output will remain open. Also the alarm relay will activate if set in the alarm mode. (DIP sw. #3 off)

ELECTRICAL INSTALLATION OPTIONS

Manual Reset:

The Merlin control can be programmed to latch in an "off" state each time the light

curtain is interrupted. DIP switch #1 "on" selects manual reset and "off" selects auto reset. To activate manual reset set Dip switch #1 to "on".

Connect a normally open contact of a switch to terminals 1 and 4 of TBI on the wiring plate. A key operated switch may be used to supervise the reset function. Activate the reset switch to reset the output to the closed (safe) state when no beams are interrupted.

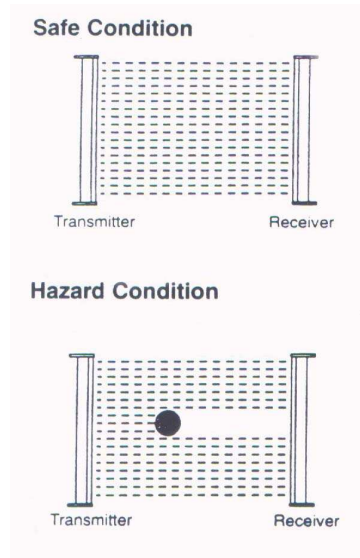
On Merlin 1000 units an optional reset button mounted on the door of the control is available on Merlin 2000 and 3000 units the clear key will reset the output.

Merlin offers pre-wired remote switches in boxes with wire and armor cable protection. Consult the factory.

See troubleshooting section. For DIP switch location.

GENERAL OPERATION – STATUS INDICATORS

The status indicators always show the light curtain condition. One indicator is located on the control box front panel, the other on the Tx column.



Green Safe Indicator ON

No beams are blocked and the light curtain allows the machine to operate. Green Blinking – manual reset needed.

Red Hazard Indicator ON

One or more beams are blocked, and the light curtain prevents the machine from operating, or internal fault.

Yellow Muted Indicator ON

One or more beams are blocked and the light curtain CANNOT prevent the machine from operating. Causes:

- Muted by mute input on M 3000 series.
- Cables disconnected or swapped.

Blue Blanking Indicator ON

One or More beams are blanked. It is on when using:

- Auto blanking.
- Manual blanking.
- Floating beams.
- Jobs.

It is located on the Tx column only.

Red Beam Indicator ON

Each Beam has a Red LED adjacent to the beam in the Receiver column. The LED will be on when the beam is blocked or misaligned. **NOTE:** These indicators are an aid for aligning the columns. The control logic is more sensitive than the Red LED's, therefore with marginal alignment the Red LED may be off while the control logic does not have enough steady signal to accept the beam as good.

MT1000 THE CONTROL BOX

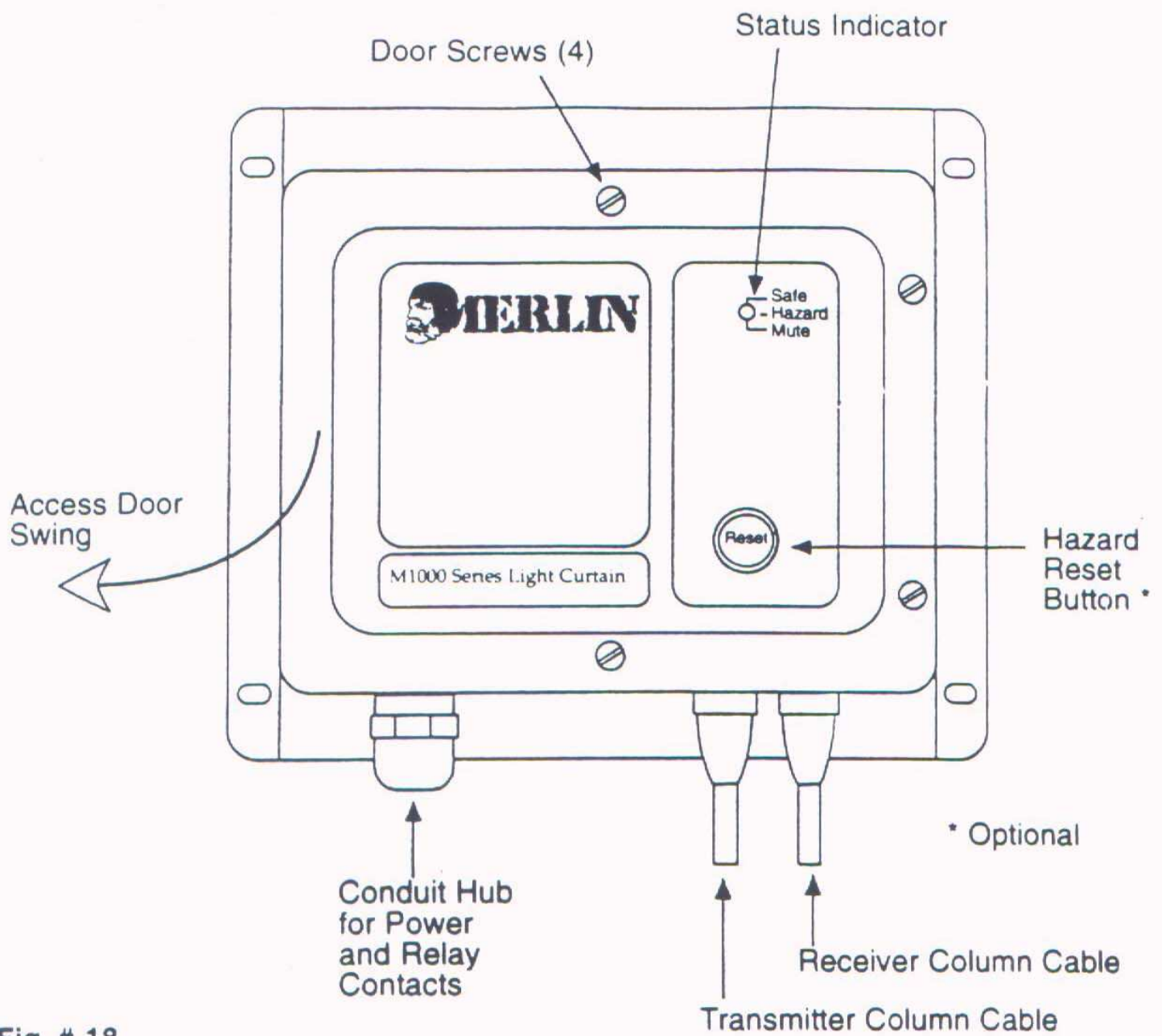


Fig. # 18

Merlin Default Password
FOR MT2000 and MT3000 SERIES

1 9 1 4

**In order to control access to the Merlin features
this password should be supervised. Remove this
page for safekeeping.**

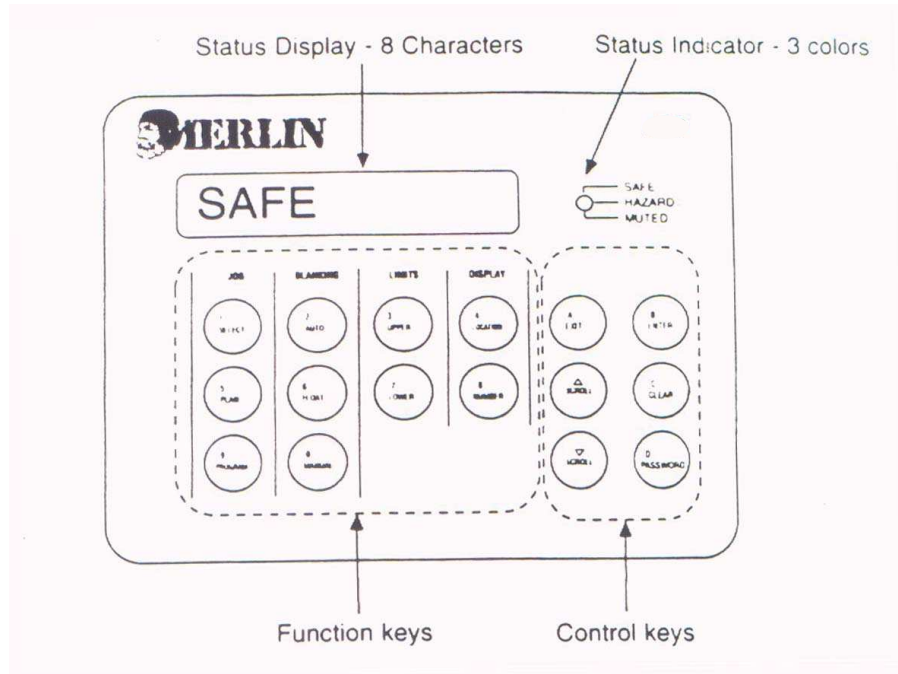
Merlin Default Password
FOR MT2000 and MT3000 SERIES

1 9 1 4

**In order to control access to the Merlin features
this password should be supervised. Remove this
page for safekeeping.**

MT2000 FUNCTION AND CONTROL KEYS

1-



2-

JOB FUNCTION KEYS

SELECT – Picks a job to run or program.
RUN - Runs a selected preprogrammed job
PROGRAM – Learns a blanking setup.

BLANKING FUNCTION KEYS

AUTO – Learns blanking setup.
FLOAT – Activates and selects floating beams.
MANUAL – Selects and blanks specific beams.

LIMIT FUNCTION KEYS

UPPER– Sets blanking or float upper limits
LOWER-Sets blanking or float lower limits

DISDLAY FUNCTION KEYS

LOCATION- Shows broken beam location and number.
NUMBER- Allows number entries from keypad.

CONTROL KEYS

EXIT – Quit any function.
ENTER- Acknowledge or change something.
SCROLL- Display more choices from a list
CLEAR- Reset or cancel a numeric choice.
PASSWORD- To control access to certain functions.

3 – THE STATUS DISPLAY

The status display appears when no function is selected. It provides detailed information about the light curtain condition.

No Beams Broken – Safe



Nothing = No Functions
B = Auto or Manual Blanking
F# = Floating Beams
J = Job Running

No beams are blocked, and the status indicator is *green*.

Output – Open – Hazard



Total number of blocked beams

One or more beams are blocked, and the status indicator is *red*.
Also indicates Beams that are blanked and not blocked.

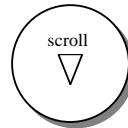
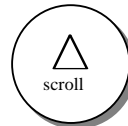
To view a list of all Broken-Beam Locations



Press the **LOCATION** key. The display shows the first beam in the list.

Press the **SCROLL UP** or **SCROLL DOWN** key to view more beams in the list.

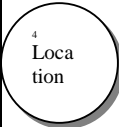
Broken beam list = 9 items



A vertical list of beam status information. The list is shown on a screen with a light background. The list items are: last = 28 9, next = 25 8, next = 24 7, next = 20 6, Beam = 19 5, next = 18 4, next = 17 3, next = 15 2, first = 14 1. The item "Beam = 19 5" is highlighted with a blue box. Up and down arrows are shown to the left of the list.

| | |
|------------|---|
| last = 28 | 9 |
| next = 25 | 8 |
| next = 24 | 7 |
| next = 20 | 6 |
| Beam = 19 | 5 |
| next = 18 | 4 |
| next = 17 | 3 |
| next = 15 | 2 |
| first = 14 | 1 |

To Return to the Total Broken-Beam Display

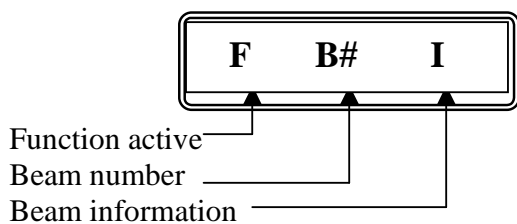


Press the **LOCATION** key. The display shows:



4- FUNCTION DISPLAYS

Function displays generally consists of an abbreviated description followed by a beam number and, possible, other beam information.



To Begin Any Function

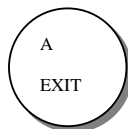


Press the desired *yellow* or *green* function key.

To Quit Any Function



Press the desired *yellow* or *green* function key.



or press the exit key

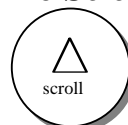
All functions automatically time-out or quit after about 10 seconds if no keypad activity unless the time out has been turned off in the Password in the Password section.

5- HOW TO SELECT BEAMS

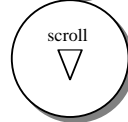
Many functions require that a particular beam be selected. When a function is first begun, the beam number is one of the following:

- Last one previously selected.
- At the middle of the column.
- At a limit point.

To Select a New Beam Number



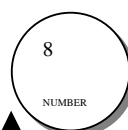
Press the **SCROLL UP** key to increase the number or the **SCROLL DOWN** key to decrease the number.



To Quickly Scroll the Beam Numbers

Hold down either **SCROLL** key continuously

To Enter a Number Directly



Press the **NUMBER** key. The display changes to the number function:

Number
0 - 9



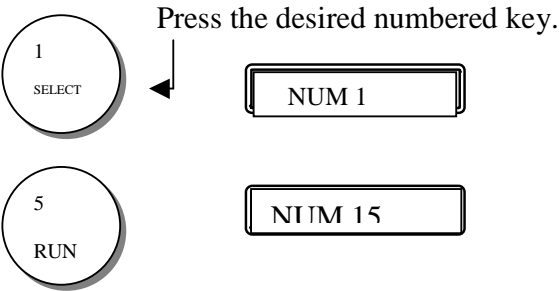
This function allows the number located the to left function keys to be used.

continued

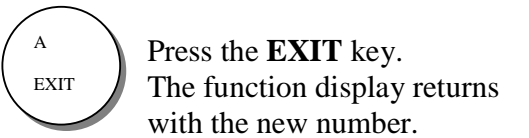
5- HOW TO SELECT BEAMS

continued

To Enter a Number

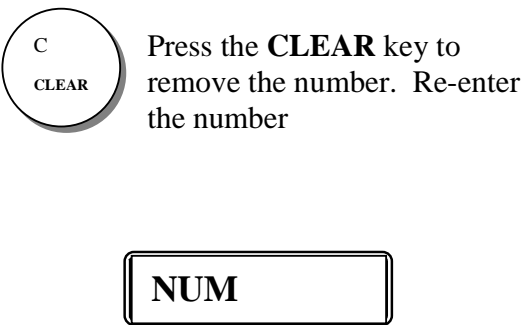


To Accept the Number



If the number is out of range for a particular function, it will not be accepted or displayed.

To Correct a Wrong Entry

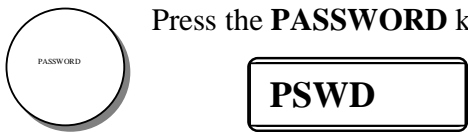


6- ENTERING THE
PASSWORD FUNCTION

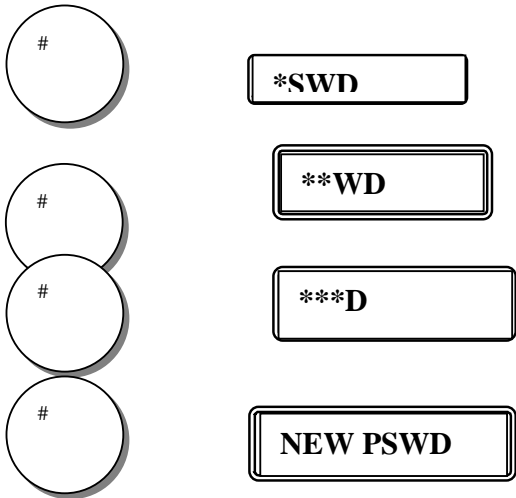
The features available in the Password Function allow:

- A user Password to be entered
- Locking & unlocking of Functions
- Time out ON/ OFF selection

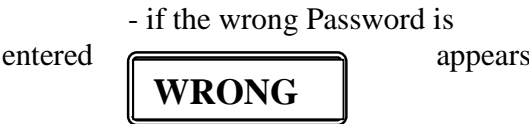
To enter the Password Function
Press the **PASSWORD** key



Use the Default Password to
access this function.



appears if correct



To enter a NEW PASSWORD
-Press ENTER



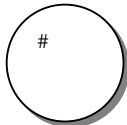
6- ENTERING THE PASSWORD FUNCTION

continued

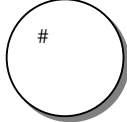
Enter the 4 digit **USER PASSWORD**. Do not use the **PASSWORD** key.



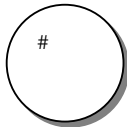
***SER PSW**



****ER PSW**



*****R PSW**



****** EXIT**

Press EXIT

The Default Password or the New User Password will allow access to the Password Function or Locked Functions.

To lock or unlock (Open) Functions scroll to the desired Function.

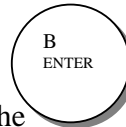
Run, Job, AB (Auto Blanking), MB (Manual Blanking), Lim (Limits), FLT (Floating Beam).

RUN OPEN

or

RUN LOCK

appears



Use the key to toggle the function from LOCKED to OPEN.

When a Function is Locked and Access is attempted.

PSWD

appears

Enter either 4 Digit Password for direct access to the locked function.

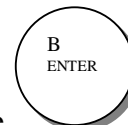
To set the Time-out Function scroll to

TIME OFF

or

TIME ON

display



Use the key to toggle the Time-out ON / OFF

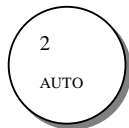
Press EXIT to leave the Password Function

7 – AUTO BLANKING FUNCTION

Auto blanking will “learn” a combination of blocked beams caused by tool holders, conveyors, or jigs. At least 4 Beams must Remain unblocked.

To Use Auto Blanking

Complete your set-up; the light curtain goes into a hazard condition, if one or more Beams are blocked.



Press the **AUTO** key.



The light curtain goes into a safe condition. The display shows that blanking is on. The blue blanking-light in the Tx column goes on.



If no beams are blocked and the AUTO key is pressed, the display briefly shows:



Nothing can be “learned”. Complete your set-up before using auto blanking.

If auto blanking does not work and the following display appears

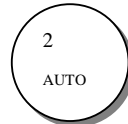


The blanking limits are preventing auto blanking from working. Change either your set-up or the limit points (See *Set Limit Points*).

4 Beams must remain active.

To Remove Auto Blanking

Clear your set-up; the light curtain returns to a hazard condition.



Press the **AUTO** key.

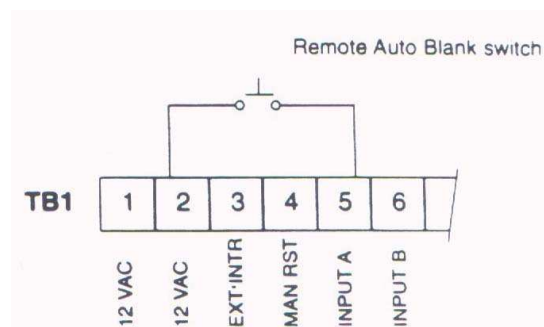
The light curtain goes into a safe condition. The display briefly shows:



The blue blanking-light in the Tx column turns off. The status display returns.



Remote Auto Blanking is possible by connecting a switch to the input terminal on TB1 to input A from 12 VAC TB1-1 or TB1-2 to TB1-5.



8- MANUAL BLANKING FUNCTION

Manual blanking will allow a combination of blocked beams caused by tool holders, conveyors, or jigs. Unlike the auto blanking, each beam must be individually selected and then blanked using the keypad.

To Use manual blanking

Complete your set-up; the light curtain goes into a hazard condition. If one or more Beams are blocked, use the location function to determine which beams are being blocked, then go to manual blanking.



Press the **MANUAL** key.
The display shows:

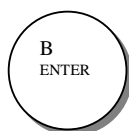


Beam Number ———→
Beam Status ———→
ON = normal BK = Blanked

To select the beam number

Press the **SCROLL** keys or use the **NUMBER** key function (*See How to Select Beams*).

To Blank a Beam



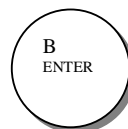
Press the **ENTER** key to change the beam status from ON (normal) to BK (blanked).
The display shows:



NOTE: If blanking does not work *and* the following display appears, blanking limits are exceeded. Reconsider your setup or change the limit points (see *Limit Points*).



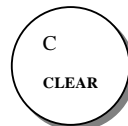
To Unblank a Beam



Press the **ENTER** key to change the beam status from BK (blanked) to ON (normal).
The display shows:



To Unblank all Beams



Press the **CLEAR** key. All beam return to the ON or unblanked status. The display shows:



To Complete Manual Blanking

Select and blank all necessary beams until the light curtain goes into a safe condition and the status indicator goes *green*. The largest number of blankable beams is the total-column number less 4. Press **EXIT** or **MANUAL** key to quit the manual blanking function.

9- FLOATING BEAM FUNCTION

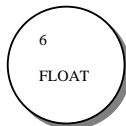
The floating beam function allows one or more beams to be blocked with no fixed location. That is, they “float” about the guarded area.

You can float up to:

- 1 beam with a 1-inch beam spacing.
- 3 beams with a 1/2-inch beam spacing.

Each floating beam is independent from another. They are active only within the float limit-points. Using floating beams increases the minimum object-sensitivity. Floating beams can be used with auto or manual blanking and with jobs. Figure 19 shows a typical application on press brakes.

To View / Change Floating Beams in Use



Press the **FLOAT** key. The display shows:



0, 1, 2, 3

To Select the Number of Beams

Press the **SCROLL** keys or use the **NUMBER** key function (See *How to Select Beams*).

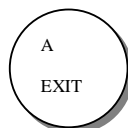
To Remove All Floating Beams



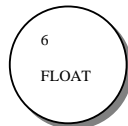
Press the **CLEAR** key. All floating beams are off. The display shows:

FLOAT 0

To Quit Floating Beams Function



Press the **EXIT** key or the **FLOAT** key. The display shows the number of floating beams used.

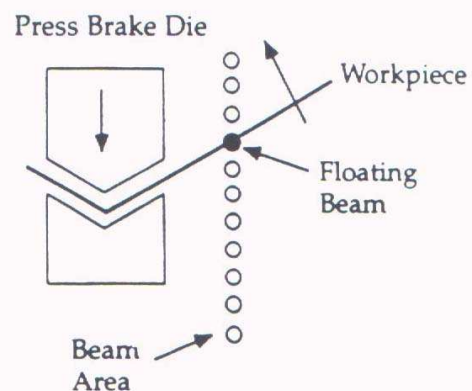


SAFE F1

To Set Float Limit Points

See *Limit Points*.

Figure 19

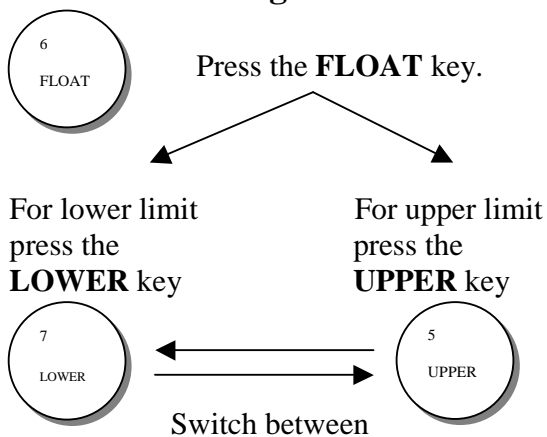


The floating beam allows the workpiece to pass thru the beam area during the bend without shutting down the machine.

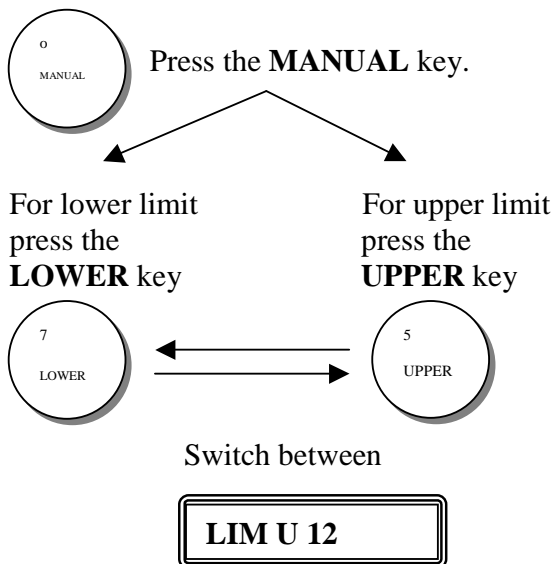
10- LIMIT POINTS

Limit points restrict beam blanking to selectable upper and lower points in the guarded area. Floating and blanking functions are independently adjustable.

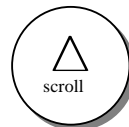
To View Floating Beam Limits



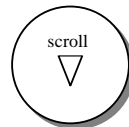
To View Manual or Auto Blanking Limits



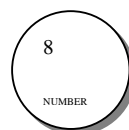
To Change the Limit Points



Press the **SCROLL** keys or use the **NUMBER** key function (See *How to Select Beams*).



When selecting the limit points, it is important to understand that the beam number limit displayed is considered a blankable beam.



Example 1:

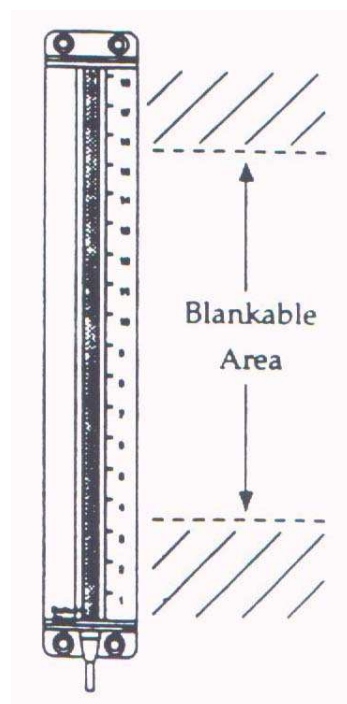
LIM L 4

Set the lower limit to beam 4. All beam numbers from 1 to 3 cannot be blanked.

Example 2:

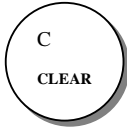
LIM U 15

Set the upper limit to beam 15. All beam numbers from 16 to the top of the column cannot be blanked.



10- LIMIT POINTS *continued*

To Quickly Set the Lower Limit to its Minimum



Press the **CLEAR** key.
The lower limit is set to beam number 1. The display shows:

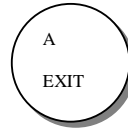
LIM L 1

To Quickly Set the Upper Limit to its Maximum

Press the **CLEAR** key.
The upper limit is set to the total number of beams. The display for an 18 inch column with 1 inch beam spacing column shows:

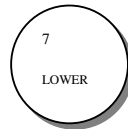
LIM U 18

To Quit All Limit Points



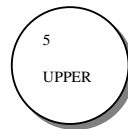
Press the **EXIT** key.

or



Press the **LOWER** key if lower limits last used.

or



Press the **UPPER** key if the upper limit last used.

11- JOB FUNCTION

The job function lets you save one blanking setup and assign it to a fixed job number. Like auto blanking, one key press “learns” a blanking setup. However, unlike auto blanking, the job function saves the blanking setup for as long as you need it. You can save and recall up to 16 jobs. Also, each job can be reprogrammed easily.

To use the job function:

1. Select one of the jobs (1-16).
2. Program (learn) the blanking set-up.
3. Run the job.

To Select a Job

Press the **SELECT** key.
The display shows:

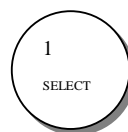
Press the **SCROLL** keys or use the **NUMBER** key function (See *How to Select Beams*).

Jobs with a ready status (RD) are clear and can be programmed. Jobs with a programmed status (PR) have been programmed previously; they can be reprogrammed (see below).

To Program

A Job that is Ready

Complete your blanking setup; the light curtain goes into a hazard condition.

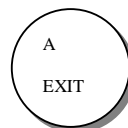


Press the **PROGRAM** key.

The job is now programmed, and the light curtain goes into a safe condition. The display now shows:



JOB 10 PR



Once the job is programmed, press the **EXIT** key.

NOTE: If programming does not work and the following display appears, blanking limits are preventing the programming from working. Reconsider your setup or change the limit points (see *Limit Points*).



OVER LIM


Now program, following the instructions given above in *A job that is ready*.

Or

Press the **EXIT** key to just clear the job.

11- JOB FUNCTION continued

To Run the Job

 Press the **RUN** key. The display briefly shows the job selected.


RUN 10

The status display then returns, showing that a job is running.

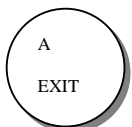
SAFE J

Job Running _____

To Stop Running the Job

 Press the **RUN** key. The display shows the job selected.

RUN 10

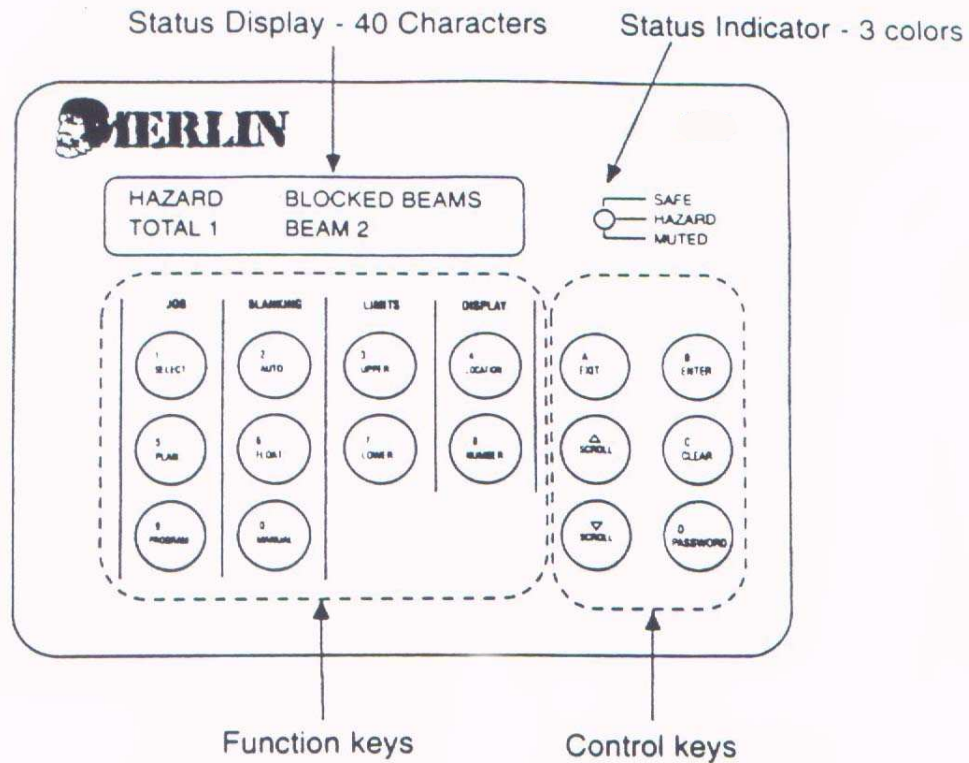
 Now press the **EXIT** key.

The status display returns, showing no job running.

SAFE

MT3000 FUNCTION AND CONTROL KEYS

1-



2- JOB FUNCTION KEYS

SELECT-Picks a job to run or program.
 RUN-Runs a selected preprogrammed job.
 PROGRAM-Learns a blanking setup.

BLANKING FUNCTION KEYS

AUTO – Not available.
 FLOAT – Activates and selects floating beams.
 MANUAL – Not available.

LIMIT FUNCTION KEYS

UPPER – Lets blanking or float upper limits.
 LOWER – Sets blanking or float lower limits.

DISPLAY FUNCTION KEYS

LOCATION – Shows broken beam location or total number.
 NUMBER – Shows unit version and size information.

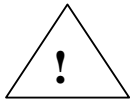
CONTROL KEYS

EXIT – Quit any function.
 ENTER – Acknowledge or change something.
 SCROLL – Display more choices from a list.
 CLEAR – Reset or cancel a numeric choice.
 PASSWORD – To control access to certain functions.

MERLIN 3000 SERIES

3- VERSION 3.0

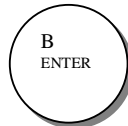
The Merlin 3000 series unit is designed for Press Brake operations especially where programmable back gauge systems are used. The Merlin light curtain is useful when the part to be bent is large enough to extend into the light curtain beams. It can be taught the profile of the part when making the first part. The part profile pattern can then be run from temporary memory and / or stored for future use. Only the bottom three inches can be permanently blocked. This allows for a work support table or arm. The rest of the beams are not permanently blocked.



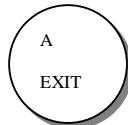
WARNING

WHEN USING BEAM BLANK OUT FUNCTIONS, CARE MUST BE TAKEN TO TRAIN THE OPERATORS IN THE CORRECT METHOD TO HOLD PARTS SO THAT BOTH HANDS ARE OUTSIDE THE LIGHT CURTAIN PLANE AND KEPT AT A SAFE DISTANCE.

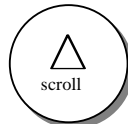
General information about using the Merlin keypad:



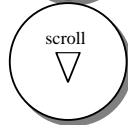
- used to access menu items.
- used to enter numeric changes made to particular items.
- used to toggle functions on / off.



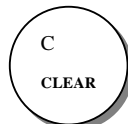
- used to exit out of functions.



- used to scroll through menu items.



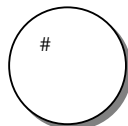
- used to change numeric values.
- used to scroll through a program.



- used to clear numeric values.
- used for manual reset.
- used to clear bumping information.



- used to access setup information.



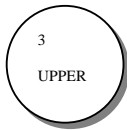
- numeric keys have dual functions. When numeric entries are valid the numeric function is active, otherwise the main label is active.

MAIN FEATURES OF THE MERLIN 3000 SYSTEM:

4- LIMITS

These functions are used to display the current limits of the blanking and floating beam features and to make changes to the limits.

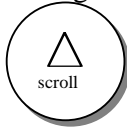
To display current limits.



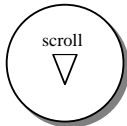
Press the **UPPER** key

This shows the current floating limit, xx.

Changes the second line to.



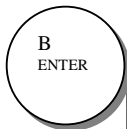
Press the **SCROLL** key



This shows the current blanking limit, xx.

To correct limits.

If changes are needed, when at the correct item, FLOAT or BLANK



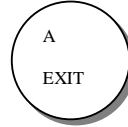
Press the **ENTER** key

**EDIT UPPER FLOAT
BEAM XX 1 to XX**

current limit

maximum range

Use the scroll keys to change the current setting or use the numeric keys to enter the limit.



Press the **EXIT** key.

To leave this function, repeat the above procedure for the lower limits.

5- DISPLAY

When the unit is in a safe condition the location function will show the last beam(s) that caused the last hazard condition. When the unit is in a hazard condition the location function will show the current beam(s) not being satisfied. A beam is not satisfied if it is blocked or not aligned, or if it has been blanked and is not blocked.

To use location key.

When in a safe condition.



Press **LOCATION** key.

**LAST LOCATIONS Y
X X X X X**

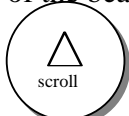
Y Shows the total number of beams not satisfied.

X Shows the individual beams not satisfied.

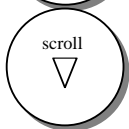
When in the hazard state the following is displayed and updated as the beam conditions change.



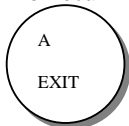
If more than 5 beams are causing the hazard condition, use the **SCROLL** to view all of the beams causing the hazard state.



Press **SCROLL** key



To return to the previous display.



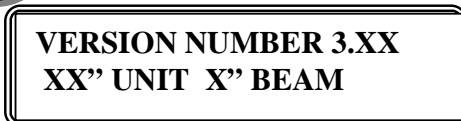
Press **EXIT** key

† To view the unit version number

and the unit size and beam spacing information without removing power to the unit.



Press **NUMBER** key



This key can also be used to reinitialize the display should it get locked up for any reason.

6- BLANKING

Auto

Auto blanking is not available on Merlin 3000 units.

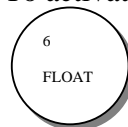
Manual

Manual blanking is not available on MERLIN 3000 units.

Float

The floating beam mode allows one beam in 1" units and three beams on 1/2" units to be set to float. This means that 1 to 3 beams may be blocked without causing a hazard condition. Blocking more than the allowed number will cause the output to of open, stopping the machinery being controlled. If limits are set for the floating beams the floating function only works within the limits. Interrupting any number of beams outside the limit will cause a hazard condition.

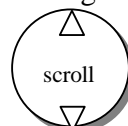
To activate floating beam(s),



Press **FLOAT** key



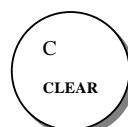
To change the number of floating beams.



Press **SCROLL** key

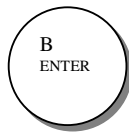
or

To reset the floating function to zero.



Press **CLEAR** key

To activate the change.



Press **ENTER** key

When in a safe mode the display will indicate floating in the second line.

1 FLOATING BEAM

When in the create or run modes floating is indicators by a small “f” after the word safe.

CREATE JOB SAFE f
Or
RUN # _____ SAFEf

Note: It must be remembered that using floating beams increases the object sensitivity of the sensing field.

7- PASSWORD

- USED TO LOCK AND UNLOCK FUNCTIONS.
- USED TO CHANGE THE USER PASSWORD.
- USED TO SET TIMEOUT FUNCTIONS.
- USED TO TEST INPUTS.
- USED TO RESET THE SYSTEM WHEN REQUIRED.

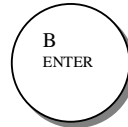
To access the above functions



Press **PASSWORD** key

and enter the four digit default password or the user password if one was previously created.

Use the scroll keys to select the desired function and

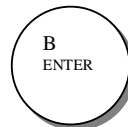


Press **ENTER** key

8- LOCK FUNCTIONS

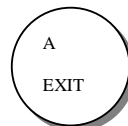
Floating beam function;
Setting limits;
Job mode;

These functions can be locked or unlocked (left open). Scroll to the desired function.



Press **ENTER** key

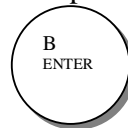
To lock or unlock the function. If locked, the Merlin control will prompt the user for the password if access to the function is attempted. When done with the lock mode



Press **EXIT** key

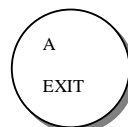
Edit password

User password selection.



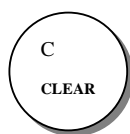
Press **ENTER** key

To edit the user password, enter a new user password >_ _ _ _ <. You must enter all four digits. Do not use the



Press **EXIT** key

or the



Press **CLEAR** key

in the user password.

SET FUNCTION TIMEOUT

-----Timeout for display reset.

This timeout determines the amount of time allowed in between key entries. If no key entry is detected within the timeout the display and mode being used are cancelled and the SAFE or HAZARD display is shown. Four choices are available.



| | |
|-------------------|-----------------------|
| Timeout is none | - no timeout |
| Timeout is short | - =15 second timeout |
| Timeout is medium | - =50 second timeout |
| Timeout is long | - =100 second timeout |

TEST INPUTS

-----This mode is used to test the eight “8” possible external input signals.

-----EXT-INTR--External interruption;
Active on.

-----MAN RESET – Manual reset; Active on.

-----INPUT A ----- Aux. Input A;

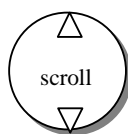
-----INPUT B ----- Aux.input B;

-----TOS -----Top of stroke; Active off;

-----MUTE ----- Mute point; active on.

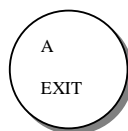
-----BOS -----Bottom of stroke; active on.

-----LEARN-----Remote learn; Active on.



Press **SCROLL** key

To the input to be tested. “ON” indicates that the switch is closed and “OFF” indicates that the switch is open.



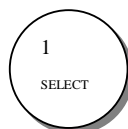
Press **EXIT** key

To leave this mode.

9- JOB MODE

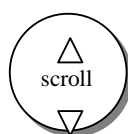
This mode is used to select the various functions related to created and running jobs.

*Note: programming blanking in the job mode is useable.



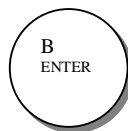
Press **EXIT** key

This key brings up the job menu from which you can select from the following six job functions. Use the **SCROLL** keys



Press **SCROLL** key

To select and



Press **ENTER** key

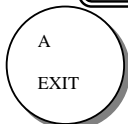
To access a particular function.

- Create Job
- Store Job
- Recall Job
- Bumping Job
- Erase Job
- Job Info

JOB INFO

When Job information is selected the number of jobs stored and the total number of jobs that can be stored will be displayed.

X JOBS OUT OF 243



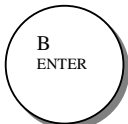
Press **EXIT** key

To return to the Job menu.

BUMPING JOB

This function is used when processing a part whose position is difficult to determine or whose position tends to change from stroke-to-stroke. The blanking pattern is taught when the part is in place, and automatically resets at the top of the stroke. Using a remote learn foot switch makes it easy to set the blanking pattern each stroke. The program key may also be used to teach the blanking pattern needed.

To access this mode.



Press **ENTER** key

**BUMPING JOB SAFE
PROGRAM / LEARN**

Position the part in place and

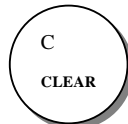


Press **PROGRAM** key

or the remote learn button.

**BUMPING JOB SAFE
CLEAR / CYCLE PRESS**

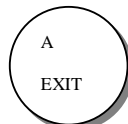
When cycling the press brake, the TOS (top of stroke) input will cancel the blanking pattern or pressing



Press **CLEAR** key

will cancel the blanking pattern.

See page 52 for more information on running jobs, muting, etc.

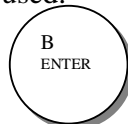


Press **EXIT** key

To leave this mode.

CREATE JOB

To create a job either temporarily or to be stored in memory, the same procedure is used.

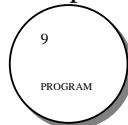


Press **ENTER** key

at **CREATE JOB**

**CREATE JOB SAFE
STEP 1 READY**

Insert the part into place for the first bend or step.

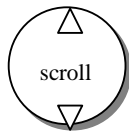


Press **PROGRAM** key

or the remote learn switch. Each step **must be** programmed even if no beams are blocked if the part is flat.

**CREATE JOB SAFE
STEP 1 PROGRAMMED**

Cycle the press brake or



Press **SCROLL** key

To advance to step 2.

**CREATE JOB SAFE
STEP 2 READY**

With the part in position for the second bend

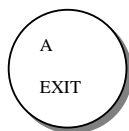


Press **PROGRAM** key

or the remote learn switch.

**CREATE JOB SAFE
STEP 2 PROGRAMMED**

Repeat the above procedure for the number of steps required. When done



Press **EXIT** key

You can now choose to store the job into memory or just run it from temporary memory. It can be stored into memory anytime before power is turned off or a new job is created.

STORE JOB

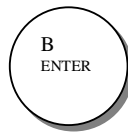
To store a job

Press **SCROLL** key

to *STORE JOB* in the menu and

Press **ENTER** key

Enter a job number from 1 to 8 digits, then



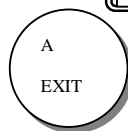
Press **ENTER** key

Note; Job number 1 is different from job number 10000000 is different from job number 00000001 etc.

**JOB # _ _ _ _ _
SAVING NOW**

This message appears momentarily, then you will be back at the job menu. If the job number already exists a message will appear.

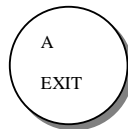
JOB EXISTS * EXIT



Press **EXIT** key

to return to the job menu. Select other job functions or leave the job mode.

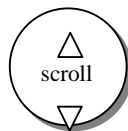
To leave the job menu



Press **EXIT** key

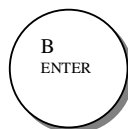
RECALL JOB

To recall a job when in the job select menu



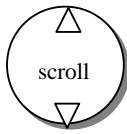
Press **SCROLL** key

to the RECALL JOB function and



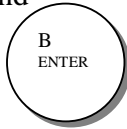
Press **ENTER** key

**RECALL JOB
NUMBER X**



Press **SCROLL** key

through the existing job numbers to the desired job or enter the correct job number and



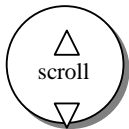
Press **ENTER** key

**JOB # XXXX
RECALLING**

Selected job has now been placed in the temporary memory location so that it can be run.

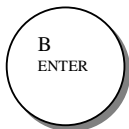
ERASE JOB

You can erase on or all jobs in memory. Be sure that you want to erase a job before entering into this mode. To erase one or more jobs from memory



Press **SCROLL** key

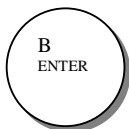
through the job select menu until you are at **ERASE JOB**.



Press **ENTER** key

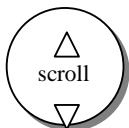
**ERASE JOB MENU
> ONE JOB?**

You can



Press **ENTER** key

to select this option or

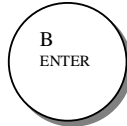


Press **SCROLL** key

to;

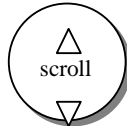
**ERASE JOB MENU
> ALL JOBS?**

and select this option by



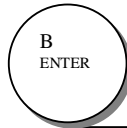
Pressing **ENTER** key.

If you wish to erase one job, after pressing **ENTER** key.



Press **SCROLL** key

through the job numbers or enter the numeric job number that you wish to erase.

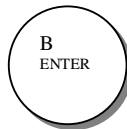


Press **ENTER** key

**JOB # XX
JOB NOT FOUND * EXIT**

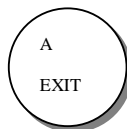
will appear if the job does not exist. If the job does exist;

**ERASE JOB
ARE YOU SURE? * ENTER**



Press **ENTER** key

to erase the job or



Press **EXIT** key

to cancel the erase mode.

RUNNING JOB

When running jobs, either step jobs or bumping jobs, input signals are required for TOS (top of stroke), MUTE (1/4" position), and the BOS (bottom of stroke) functions.

NOTE: The top of stroke position assumes a down acting press brake. This is the ram open position and would be the bottom position on an up acting press brake. The TOS and BOS signals would therefore be reversed for an up acting brake.

TOS

This signal is active off. The input is off or open at the top of the stroke and generally closed elsewhere.

MUTE

This signal is active on. This is the point at which the light curtain is muted or bypassed to allow the part to bend up through various beams of the light curtain. This must be set for each set-up to be where the die is no more than 1/4 inch open.

BOS

This signal is active on. This signal enables the MERLIN to step the program when the next TOS signal is received. If the bend is not made and the ram is returned to the top, the program will not step if the BOS signal was not received.

NOTE: If a separate BOS signal is not available, the mute & BOS inputs need to be connected together.

See wiring section for the proper connections for these inputs.

MUTE: The mute function mutes or bypasses the light curtain making it insensitive to obstructions in the sensing field. It is very important that the set-up be done carefully so that the muting occurs when the die is 1/4 inch or less open. The muting is initiated when the mute input is activated and stays in the mute mode until the TOS input cancels it. Two separate timeouts will also deactivate the mute mode if the TOS signal is not received. The mute mode will timeout one hundred (100) seconds after starting if the mute input is left on, or ten (10) seconds after the mute signal goes off, whichever occurs first.

The mute function is indicated by the status LED in the front panel changing to AMBER and by a mute message on the display. The mute function is active in the RUN, CREATE, BUMPING and standard SAFE / HAZARD modes of operation.

Merlin

Recommended procedures for making parts on press brakes.

WARNING: Never place your hands or arms in the blanked out area of a light curtain while operating the press brake.

There are basically two types of parts, small parts and large parts that are processed on a press brake equipped with a light curtain. Small parts do not extend out into the plane of the light curtain beams, and large parts do extend into the plane of the light curtain beams.

CAUTION: OPERATORS MUST ALWAYS BE TRAINED IN THE PROPER PROCEDURES FOR SAFE OPERATION OF PRESS BRAKES.

Whenever possible the recommended procedure to process the parts whether small or large is to fixture the part in place so that it does not have to be held at all, or cycle the press brake to the point at which the die is no more than $\frac{1}{4}$ inch open without the part in the die area. This is often referred to as the stroke stop point. With the press brake stopped at this point, insert the part into position. The light curtain can be muted at this point so the part if small can be held as necessary, and if the part is large the light curtain will not interfere with the process because it can be muted.

By using the above procedure the hazardous portion of the cycle is protected by the active light curtain and the actual process of bending the material is not hampered by the light curtain because it can be muted from the point at which the die is $\frac{1}{4}$ inch or less open, through the bending portion back to the open position.

Some light curtains require external muting devices to bypass the protection provided by the light curtain at the $\frac{1}{4}$ inch point while others have built in muting features. The **MERLIN 3000** series has the muting function built into the light curtain.

WARNING: The muting of the light curtain must be adjusted for each set up so that muting does not occur before the $\frac{1}{4}$ inch point.

The **MERLIN 3000** light curtains also have additional features which assist in the processing of large parts on press brakes.

In all cases the part should be held with both hands outside the plane of the light curtain during the hazardous portion of the cycle.

FLOATING BEAM FEATURE:

The floating beam feature allows one or more beams to be blocked without the output of the light curtain opening. This feature is useful when holding a large flat part in the plane of the light curtain. The part may twist or bend slightly possibly blocking a beam. The floating beam feature allows the part to move in and out of the beam without shutting down the press brake.

PROGRAMMABLE BLANKING:

Many large parts are processed completely without putting the part down or changing the set up. This is most often done when using automatic back gauges to reposition the material stops so multiple bends can be processed. When this is done it is quite common that a flange bent on a previous step will extend through the plane of the light curtain blocking one or more beams on a subsequent step. Again, if the part can be inserted at the $\frac{1}{4}$ inch position the programmable blanking feature is still not needed. If the flange is relatively small the floating beam feature may be enough to allow operation to continue. When it is not enough the programmable beam blank out feature will allow operation of the press brake with the part in place.

WARNING: Never place your hands or arms into the area where beams are blanked out during the hazardous portion of the cycle.

The programmable blanking feature will allow the light curtain to learn the shape of the part the first time the part is made.

There after the light curtain will blank out the correct beams for each step of the part to allow it to be in the path of the light curtain beams. The beams that are blanked out exactly match the shape of the part. The light curtain will not go to a safe state unless the blanked out beams are blocked by the correct shape of the part.

The only beams that can be permanently blocked in the standard program are the bottom three inches of the light curtain to allow for tables or support arms. The other beams that are blanked out must be active momentarily between strokes to allow the next blanking pattern to be recalled.

Up to 16 steps can be programmed for each part on the **MERLIN**.

When using the programmable blanking feature it is helpful to activate the floating beam feature after programming the entire part to allow slight mis-positioning of the part without creating a stop signal.

CAUTION: NEVER PLACE YOUR HANDS OR ARMS INTO THE DIE AREA OF THE PRESS BRAKE. WHEN ONE OR MORE BEAM(S) IS NOT ACTIVE KEEP BOTH HANDS OUTSIDE THE PLANE OF THE LIGHT CURTAIN BEAMS. BLANKED BEAMS ARE ONLY FOR THE PART TO BE IN POSITION.

Follow the procedures in the manual to check for the proper operation of the light curtain prior to operating the press brake and / or after every set up.

The light curtain must be mounted at the correct safety distance as per the safety distance formula considering no beams are blanked out.

If you have any questions concerning the correct use of the programmable light curtain features call Merlin technical support for assistance.

Troubleshooting

| Symptom | CHECK / CAUSE |
|---------|---------------|
|---------|---------------|

| General for all models | |
|--|--|
| No hazard or safe indication. | <ul style="list-style-type: none"> • Input wiring to correct terminals. • Input fuse. • Proper voltage. |
| Hazard indication only. | <ul style="list-style-type: none"> • Proper alignment of TX and RX. • Separation distance RX to TX excessive. • Proper cable connections to TX and RX. • Cable connector locking ring not in detent. • Relay failed. (M2000 and M3000 units have a relay failure message). • On multiple column systems master columns, (RX and TX) must be first from the control, Model # CMxxx. |
| Safe indication but machine won't run. | <ul style="list-style-type: none"> • Output wiring at TB2-1,2,3,4. • Fuses for Relay 1 and 2. • Relay out of it's socket. |
| Occasional blinks to hazard. | <ul style="list-style-type: none"> • Marginal alignment of TX and RX. • Cable connector locking ring not in detent. • Vibration of mounting brackets causing misalignment. • RX or TX cable close to high voltage. • Marginal connection on opto boards in columns. |
| | |
| | |

| Merlin 1000 | |
|--|--|
| Unit works but LED on door doesn't. | <ul style="list-style-type: none"> • Wiring harness to door unplugged. |
| Unit goes to hazard when interrupted and stays in hazard. Power down/up resets unit. | <ul style="list-style-type: none"> • Relay contacts worn or sticking. Replace relays. |
| Unit doesn't work, blue and amber leds in TX column on. | <ul style="list-style-type: none"> • TX and RX cables swapped. |
| | |

Merlin 2000 and 3000 common symptoms

Merlin 2000 standard messages are “**SAFE** and **HAZD #**”. The number after HAZD indicates the total number of beams not satisfied.

Pressing the “Location” button when in the Hazard state, changes the display to show “**BEAM #**”. The number shows which beams are not satisfied starting at the first (closest to the control box) beam. Using the “Scroll” buttons allows viewing of all of the beams not satisfied.

Merlin 3000 standard messages are “**SAFE and HAZARD Blocked Beams, Total # Beams #**” The total number and which ones not satisfied are shown.

Beams are not satisfied if they are blocked and not blanked, or if they are not blocked when blanked.

If the number of beams indicated as not satisfied equals the total number of beams the unit may be completely mis-aligned or the TX cable and or connector may be loose, off or damaged.

| Merlin 2000 and Merlin 3000 | |
|--|---|
| Unit works but LED and display on door doesn't. | <ul style="list-style-type: none"> Wiring harness to door unplugged. |
| Unit goes to hazard when interrupted and stays in hazard. Relay fail message. Power down/up resets unit. | <ul style="list-style-type: none"> Relay contacts worn or sticking. Replace relays. |
| Blanking functions not working properly. | <ul style="list-style-type: none"> Limits are set wrong. Too many beams trying to be blanked. Blanked beams must remain blocked. |
| Floating function not working properly. | <ul style="list-style-type: none"> Limits are set wrong. Floating function used for another beam that is blocked and not blanked or one that is blanked and not blocked. |
| Cannot access blanking, floating or job functions. | <ul style="list-style-type: none"> Function locked in password section. Auto and manual blanking not available on Merlin 3000 units. |
| Display gets lost or partial messages. | <ul style="list-style-type: none"> Output wiring close to display when door closed. Noise interference. Install suppressor on AC input terminals. Defective program chip on display board. |
| Key pad doesn't work, display does. | <ul style="list-style-type: none"> Key pad wire harness disconnected from PC Board on door. Bad program chip on display board. |
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Merlin 3000

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| No muting at ¼ " point. | <ul style="list-style-type: none"> • Mute input signal not on. • Top input signal not on. (TOS is active off, at the top/open position). <p>Use <i>Test Inputs</i> mode in password to check input status.</p> |
| Unit won't step through program created. | <ul style="list-style-type: none"> • Missing BOS signal. • Part? displayed. Permanent beam blockage above allowable beam point. The standard program allows only the bottom 3 inches to be permanently blocked. <p>Look for table or part support arms too high.</p> |
| Won't learn beam blockage. | <ul style="list-style-type: none"> • Limits are set wrong. • Too many beams blocked. • Not in the create mode. |
| Stays in hazard at one or more steps. | <ul style="list-style-type: none"> • One or more beams not satisfied; either blocked when it shouldn't be or not blocked when it should be. • Turn on floating function to allow minor part misplacement. |
| Remote learn doesn't work. | <ul style="list-style-type: none"> • Remote input not coming on. <p>Use <i>Test Inputs</i> mode in password to check input status.</p> |
| | |

Display messages including error messages and their causes;

Most of the messages that appear during normal functions are not listed here because they are easily understood. Refer to the manual for help.

Merlin 2000

| | |
|----------|---|
| SAFE | All beams satisfied. Output contacts closed. |
| HAZD # | # = the number of beams not satisfied, Output contacts open. |
| SAFE B | Auto or manual blanking active with all beams satisfied. |
| SAFE F1 | Floating blanking active. |
| SAFE BF1 | Auto or manual blanking active with all beams satisfied. Floating blanking active. |
| FAIL RLY | Failed relay. One relay failed or sticking when outputs open. |
| NO COLU | No column. This indicates that the RX column is not being sensed. Cables may be swapped. |
| FAIL CLM | Column failed. Generally a problem in the RX column. |
| WRONG | This indicates the wrong password was entered. |
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Merlin 3000

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|--|---|
| SAFE | All beams satisfied. Output contacts closed. |
| HAZARD Blocked Beams Total # Beams # | Total number of beams not satisfied is shown with the beam number(s) scrolling. Output contacts open. |
| SAFE by Muting | Output contacts closed. Unit is muted. Blocking beams will <u>not</u> open the output contacts or stop the machine. |
| WAIT | This indicates that the RX column is not being sensed. Cables may be swapped. |
| Relay Failure # _ Contacts | Failed relay. One relay failed or sticking when outputs open. |
| Noise Retry Noise Error | Very marginal beam alignment when Learning a blanking pattern. Try realigning the TX, RX columns. |
| Shutdown by External | The output contacts are forced open when the External interrupt input is activated on by the machine control. |
| Step 0 Ready | The CREATE mode was not properly exited. Enter into and exit from the CREATE mode. Should say "Step 1 Ready" when creating a new program. |

Recommended spare parts/ Replacement parts

MTC1000 -Merlin 1000 T Series Control Box
MTC2000 -Merlin 2000 T Series Control Box
MTC3000 -Merlin 3000 T Series Control Box

Replacement Cables:

| | |
|--------------|--------|
| 55-5xx-02-00 | 2 ft. |
| 55-5xx-05-00 | 5 ft. |
| 55-5xx-10-00 | 10 ft. |
| 55-5xx-15-00 | 15 ft. |
| 55-5xx-25-00 | 25 ft. |
| 55-5xx-35-00 | 35 ft. |
| 55-5xx-50-00 | 50 ft. |

| | |
|--------|--------------|
| 22-222 | Output Relay |
|--------|--------------|

INFARED SECURITY BARRIERS

WARRANTY

Merlin warrants the products it manufactures to be free from defects in material and workmanship provided these defects are not caused by abuse, accident, or neglect, and agrees to correct by repair or replacement of the part, or parts, any such defect disclosed on examination by us and which development under normal installation, use and service for a period of 3 years from the date of shipment to the original purchaser when the equipment is returned to our service facility. Normal wear on the relay output contacts is not covered under this warranty, as it is not considered a defect.

Merlin does not assume responsibility for unauthorized repairs to apparatus even though defective.

This warranty is in lieu of all other warranties expressed or implied, and no representative or person is authorized to assume for us any liability in connection with the sale of our products.

Merlin shall not be liable for consequential damages. All equipment returned to **Merlin** for warranty service must be sent prepaid.

Merlin will not accept collect freight shipments. Any equipment returned to out factory under this warranty shall be returned UPS, Ground or Truck prepaid. Authorization to return material must be first obtained from one of out branch offices, or from one of out Sales Department.

For additional information, repair or service, contact your local **Merlin** distributor or:

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