# LESTER CONTROL SYSTEMS

# MICROPROCESSOR CONTROL

# TYPE MP-500

# TECHNICAL MANUAL

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# INTRODUCTION

This manual contains the application and user data, for the **MP-500** microprocessor based family of lift control systems.

The **MP-500** microprocessor system has been designed to provide a cost effective control solution to a wide range of lift applications. In order to provide a cost effective solution for high and low rise applications, two system frame sizes are available, namely the **MP-500** and the **MP-500e**.

The **MP-500e** system version is used for 'economy' applications comprising of upto 4 floors of single car (simplex) operation, using Automatic Push Button (APB), Down Collective, and Non-Selective Collective control modes.

The **MP-500** system version is used for all other applications upto 40 floors, including Full Collective, Duplex, and Group Supervisory systems upto 8 cars.

Special design consideration has been given to incorporate features to realise a cost optimised control system for the popular hydraulic lift market.

The **MP-500** system comprises essentially of two main printed circuit boards namely the **'CPU'** board, and the **'Input / Output'** board. This modular design has a number of advantages, including, high noise immunity, and attenuation of supply voltage transients, resulting in a robust design to cope with the electrically noisy lift environment, and easy compliance with the current EMC legislation.

The I /O Board has been designed to provide high noise immunity, and all inputs are fully isolated by opto-couplers. LED indication is provided for each input and output in order to assist fault diagnosis. The general inputs operate with 110V(ac), and call inputs operate on 24V(dc), and are individually fused to protect against damage caused by incorrect connections. Call pushes and their associated acceptance indicators can share a common connection in order to minimise site wiring for 24V(dc) indicator applications.

The CPU board mounts above the I/O board, and connects to it via a ribbon cable connector. The CPU board contains the 80C32 microprocessor control core components such as the microprocessor, EPROM, RAM, the conditioning selection switches, and the fault diagnosis LEDs.

A comprehensive fault logging diagnostic system is provided, and is permanently mounted on the CPU board. The diagnostic unit comprises of a 16x2 character liquid crystal display (LCD) and associated pushes to enable the recovery of the 200 most current faults, displayed in full text, together with the position of the lift, and the day of occurrence. All faults are supported with 10 year battery backed memory retention.

## CONTROL FEATURES

*Standard System Control Features*

- Full Collective (MP-500 only)
- Down Collective
- Non-Selective Collective
- A.P.B Control

*Power Control Options*

- Hydraulic Control
- Variable Frequency Control
- SCR Drive Control
- ACVV Control
- Polechanger / Two Speed Control
- Single Speed Control

*Hydraulic System Controls*

- Hydraulic Overtravel Sequencing
- Hydraulic Homing
- Hydraulic Relevelling Control
- Hydraulic Vane Sequence Check (via software control)
- Hydraulic Oscillation Control
- Hydraulic Star/Delta pump starting control

*Door Control Options*

- Manual Doors.
- Fully Automatic Doors.
- Swing Landing Doors & Power Car Door.
- Park Open Control. (software option)
- Door Nudging (software option)
- Differential Door Dwell Timings.
- Limited Landing Door Reopen

*Standard Service Features*

- Fire Control
- Service / Goods Control
- 110% Overload
- 90% Bypass (MP-500 only)
- Emergency Return (software option)
- Stuck Car / Landing Push Control
- Homing
- Out of service control

*Indicators*

- Direction Arrows (Collective controls only)
- Lift Overloaded Indicator
- Out of Service Indicator
- Position Indicators
- Car Call and Landing Call Accepted Indicators
- Fire Control Indicator
- Arrival Gong Control
- Hall Lantern Control (MP-500 only)

## SYSTEM CONFIGURATIONS

For single lifts upto 4 floors, not requiring Full Collective operation use **MP-500e** system comprising :-

1 x MP-500e CPU board
1 x MP-500e I/O board

For other controls upto 40 floors use **MP-500** system for each lift comprising :-

1 x MP-500 CPU board
1 x MP-500 MI/O board I/O upto 8 floors
1 x MP500 8FI/O for each block of 8 extra floors

For Duplex control use per lift equipment for each lift, plus 2 x MP-500 CAN boards.

For Group control use per lift equipment for each lift, plus 1 x MP-500 CAN board per lift plus MP-500 Despatcher (see separate data for details).

## CONTROL OPERATING MODES

The **MP-500e** system can support Automatic Push Button (APB), Down Collective, and Non-Selective Collective modes of control to call response. The **MP-500** can support these modes of call control plus Full Collective, Duplex, and Group Supervisory controls. The type of control mode must be established at the ordering and program stage of manufacture. There follows a brief description of each type of control mode option.

*Automatic Push Button Control (APB)*

**APB** control permits the response of the lift to one call at a time. Once a call is accepted, all other calls are inhibited, until the lift stops or opens its doors, to cancel the accepted call. Car Calls are given a timed response preference over Landing Calls.

When the lift cancels its call, a preference is established, whereby car calls are given the first opportunity to establish control of the lift, and a time delay later (normally approximately 6 secs.) the landing calls are permitted to establish control if no car call is registered.

**APB control** is usually used for goods, goods/passenger, and very light duty passenger lifts.

*Down Collective Control*

**Down Collective** control permits the control of Car Calls, and a Down Landing Call on each landing.

In general with Down Collective Control, landing calls are answered when the lift has an established down direction, and by-passed when the lift has an established up direction.
As calls are registered they are accepted and stored in the system until they are answered by the lift.

The first call registered will establish a preferred directional preference (either Up or Down).

Car Calls are responded to when the lift has either an UP or a DOWN directional preference.

When the lift is operating with an established UP directional preference, it will respond to the highest Down Landing Call at or above the lift's position, but only when all Car Calls for the established directional preference have been cancelled (other landing calls being stored and by-passed).

When the lift is operating with an established DOWN directional preference it will respond to Down Landing Calls at or below the lift's position.

**Down Collective control** is generally used where landing traffic above the main floor has a predominantly down flow, in applications such as accommodation dwellings, or certain multi-tenancy offices where no inter-floor traffic exists.

*Non-Selective Collective Control*

**Non-Selective Collective** control allows for the control of Car Calls, and a single non-directional Landing Call on each landing.
As calls are registered they are stored in the system until they are answered by the lift.

The first call registered will establish a preferred directional preference (either Up or Down).

Car Calls and Landing Calls are responded to when the lift has either an UP or a DOWN directional preference.

When the lift is operating with an established UP directional preference, it will respond to Car and Landing Calls at or above the lift's position.

When the lift is operating with an established DOWN directional preference it will respond to Car and Landing Calls at or below the lift's position.

**Non-Selective Collective control** is generally used in light duty passenger lifts where traffic above the main floor has a two way flow.

*Full Collective Control*
**Full Collective** control allows for the control of Car Calls, and an Up and a Down directional Landing Call on each landing.

As calls are registered they are stored in the system until they are answered by the lift.

The first call registered will establish a preferred directional preference (either Up or Down).

Car Calls are responded to when the lift has either an UP or a DOWN directional preference.

When the lift is operating with an established UP directional preference, it will respond to Car and UP Landing Calls at or above the lift's position, and to the highest DOWN landing call provided it is above the lift's position and is the highest call registered.

When the lift is operating with an established DOWN directional preference it will respond to Car and DOWN Landing Calls at or below the lift's position, and to the lowest UP Landing call provided it is below the lift's position and is the lowest registered call.

**Full Collective control** is generally used in medium / heavy duty passenger lifts where traffic flow is two way.

## SERVICES DESCRIPTION

*Service Control*

Service Control is selected by asserting the **SCS** input signal. When selected, the service control feature modifies the NORMAL lift control to operate only from the lift car as follows :-

1. Sets the Lift Out of Service Indicator output.
2. Inhibits landing call operation.
3. Parks with the doors open until a car call is registered.
4. Door closing operation is modified to be via constant pressure of a car call push (if the call push is released before the doors are fully closed then they will automatically re-open).
5. All registered car calls are cancelled on stopping, or door opening.

*Fire Control*

Fire Control is selected by asserting the **FCS** input signal. When selected, the fire control feature returns the lift to the selected Fire Floor and thereafter modifies the NORMAL lift control to operate only from the lift car under a special fireman's control operation as follows :-

1. Sets the Lift Out of Service Indicator output.
2. Inhibits landing call operation.
3. Door closing operation is modified to be via constant pressure of a Car Call push (if the call push is released before the doors are fully closed then they will automatically re-open).
4. Door opening operation is modified to be via constant pressure of the Door Open push (if the Door Open push is released before the doors are fully open then the doors reverse to completely close).
5. All registered car calls are cancelled on stopping or door opening.

The detailed operation of Fire Control varies greatly dependant on local requirements. A brief description of some of the types of operation are given as follows :-

*Standard Fire Control*

Standard Fire Control is as described above.

*BS5588 Fire Fighting*

BS 5588 Fire Fighting Operation is generally as described above, but in addition a standby emergency supply is available, and if power is lost to the lift then the lift absolute position is established within one floor of movement. This type of operation requires a floor position reset signal at every floor.

*Fire Return Control*

Fire Return Control is as 'Standard Fire Control' except that once the lift has returned to the Fire Return Floor it is prevented from restarting (options include the doors to be parked open or closed).

The Fire Control requirements must be established at the time of manufacture since all Fire Control functions are set in software.

*Machine Room Temperature*

If excess Machine Room temperature exists (via input **FAR**), the lift is slowed at the next floor and removed from service with its doors closed. On Hydraulic lifts a return to the bottom floor will follow.

*Load Weighing 90% Loaded*

90% load operation becomes effective when the **BPS** input is asserted. When 90% load is operated, the lift will by-pass landing calls, and will park with doors open if no car calls are present.

*Load Weighing 110% Overloaded*

110% overload becomes active when the lift is stationary, and the **OLS** input is asserted. When 110% overload is operated, the doors park open, and the **OLI** output is asserted. Car and Landing calls may be entered, but will be cancelled after a period if the overloaded condition remains.

*Prepare to Test Operation*

Prepare to Test Control is intended to give Service Personnel an effective and orderly solution to securing control of the lift car from the passengers, following which the lift may be run under control from the machine room with either the door operation inhibited or functional.

Prepare to Test Control becomes active when the **PPTT** DIL switch is operated on the CPU board. When operating on Prepare to Test landing calls are inhibited, and the lift will respond to car calls only. The **D_EN** DIL switch on the CPU board **enables** the door operation if switched **ON**, and **disables** the door operation if switched **OFF**.

Consider the lift is operational with passengers in the lift car. When the Prepare to Test switch is operated the Landing Calls become inhibited, and the lift will answer any car calls registered by passengers. After a period the lift car will eventually become idle with doors closed. The service personnel may then take control of the car with the choice to immobilise the door operation via the D_EN DIL switch.

*When using Prepare to Test always ensure the PPTT switch is returned OFF before leaving site (otherwise no lift service is available).*

*Homing Operation*

Homing Control is enabled providing the **H_EN** DIL switch on the CPU board is switched to **ON**. When homing is enabled the lift will park at the **main** floor (selected by software) when it has remained idle with no calls present for a predefined period (5 mins. for simplex applications, 5 secs. for multi-car applications).

*Car Top Test Control*

Car Top Test Control becomes active when **TR** input is de-asserted. During Car Top Test Control the operation of the lift is modified as follows :-

Car & Landing Calls are inhibited
Door Control is transferred to the control of the constant pressure Door Open and Door Close pushes on the car top.
Motion Control is transferred to the control of the constant pressure Up / Down and Run pushes on the car top.
All general controls such as Homing, Fire, Service Controls are inhibited.
The Out of Service Indicator is illuminated.

Thus control of the car is transferred to the exclusive control of the Engineer on the car top.

## LIFT IN SERVICE FUNCTIONS

*Lift In Service & Out of Service Indicators*

The MP-500 will drive an '**Out of Service**' output, which will only **extinguish** when the lift is considered to be in full operational service.

The Out of Service Indicator is illuminated under the following conditions :-

When the lift power supply is first initialised prior to selector reset operation.
When the lift is on Fire Control
When the lift is on Service Control
When the lift is on Test Control
When the lift is on Prepare to Test Control
When the lift has failed (doors stalled, lock failure, journey timer, etc.)

A **'Lift In Service'** indictor is situated on the CPU board. The **LIS** indicator is extinguished when the lift is out of service (due to failure, or independent services such as Service, Fire Controls). When the lift is Normal, but has not completed a successful motion and door sequence since being out of service, then the **LIS** indicator flashes. When the lift is normal, and a successful motion and door sequence has been established, then the **LIS** indicator will illuminate continuously, until a failure or Out of Service operation occurs.

*Auto Test Operation*

The **Auto Test** feature automatically inserts terminal floor car calls (i.e. Top and Bottom), 120 seconds after a fault condition, e.g. door open/close protection time, lock failure, failure to start, etc. This cycle will be repeated every 120 seconds up to a maximum of six attempts, or until the lift is back in service. After the sixth attempt, Auto Test will be inhibited until the system is returned to normal operation via passenger intervention (operation of a call).

*Confidence Report*

The operation of the doors and motion sequences are continuously monitored. If repeated faults causing disruption to lift service occur, associated with the motion or door functions, then the appropriate lack of confidence report will be logged and recorded to the fault logger. This should prompt the engineer to investigate the associated equipment. If the confidence tests detect system improvement then the appropriate **Confidence Gain** report is logged.

## ANTI-NUISANCE CONTROL

Some Anti-Nuisance features have been included in the **MP-500** control system, to help reduce passenger waiting times.

The features described below are only enabled during normal service operations, i.e. inhibited on independent controls such as Fire, Service Control, etc.

*Shutdown Control*
The **MP-500** control system will shutdown, and cancel any registered calls when the lift is delayed at a floor for 60 sec. This may be due to faulty door operations, or failure to start following any demand to move. When Shutdown, and where possible, the doors will be parked open, the out of service indicator will be illuminated, and all car and landing calls will be cancelled. Registration of a car call or landing call will attempt to restore the lift back into service. The Auto Test feature will also attempt to restore full lift operation within two minutes.

*Doors Held Car Call Dumping*
All car calls will be cancelled, when the Door Open Push or Safety Edge is held constantly for more than 20 seconds.

*Stuck Call Push Detection*
A Car or Landing Call will be recorded as stuck, 10 seconds after the system has attempted, and failed, to cancel the call.

A stuck call will cycle the doors and remain active for 90 seconds if no other call demand exists, then the stuck button call is ignored until the stuck condition has been removed.

*General Hydraulic Features*

In order to provide a cost effective solution for use with the increasing popularity of the Hydraulic lift installation the following features have been included :-

Star / Delta Contactor control
Relevelling control and safety monitor
Hydraulic Overtravel latching control

*Relevelling Control*

The Relevelling feature is included as standard within the **MP-500** Control System on all hydraulic lift applications.

The relevelling operations are continuously monitored. If a failure occurs within the relevelling operation, then the relevant fault is recorded and recovery action is initialised.

Features included to enhance the safety associated with relevelling operations are:-

*a) Relevelling Sequence*

The relevelling sequence is automatically initiated via the **MP-500** Control System, which can perform relevelling in the up or down direction depending upon operation of the up or down levelling vanes. To prevent the lift from hydraulic oscillations, the relevelling sequence will not be initiated or reinitiated until the lift has been idle for 3 seconds. During Relevelling operations the **'RLEV'** status indicator is illuminated. If a failure occurs within the relevelling operation then the '**RLEV'** fault indicator is illuminated, the fault is recorded, and recovery action is initialised.

Failures associated with relevelling can be categorised as :

1. Proximity switch malfunction.
2. Pump motor malfunction.
3. Hydraulic valve malfunction.
4. Hydraulic pressure malfunction.
5. Control circuit malfunction.

*b) Relevelling Time-out Timer*

The Hydraulic Relevelling time-out timer will time when the drive system fails to relevel the lift to floor level. This may be caused by failure of the lift hydraulic pump / valve unit, or its associated control circuit. These types of fault will cause the lift to remain in the levelling zone, but not reach floor level within a predictable time limit. This time to reach floor level is set generally to 20 seconds in software. If the relevelling exceeds this time, relevelling operations are suspended. An attempt to return the lift to the bottom floor is then made, since down operation could well be achievable (i.e. no pump motor operation is required).

*c) Relevelling Sequence Check (software controlled).*

Normally when the lift stops at floor level it will do so by energising both levelling vanes together, and releasing the relevel vane. Failure of the levelling vanes to operate correctly will cause the lift to stop by the release of both levelling vanes. This type of operation can be caused by an intermittent malfunction, or by a faulty proximity switch. If the proximity switch operation is unreliable, then the relevelling operation is potentially dangerous. The microprocessor program monitors the relevelling sequence, and keeps a record of occurrences when the lift stops out of level following a relevel operation. Each time the lift stops out of level a counter is incremented by eight. If the lift makes a successful relevelling operation to stop at floor level the counter is decremented by 1. If the counter reaches a count of 32 (caused by four

consecutive relevelling errors, or frequent levelling errors), a **relevel fault** is logged, and relevelling is suspended. Attempts will be made to return the lift to the **bottom** floor.

*d) Relevelling Safety Sequence Check via Limit Switch or Safety Proven Relays.*

The microprocessor relevelling monitor programme checks the relevelling operation in a non-interlocked way that enhances the safety of the system.

The primary safety of the relevelling operation **must** be controlled, either by, a **safety limit** (with **rip apart contact action**), or multiple channels of redundancy **interlocked safety relays** (see BS5655 Part 2).

For low rise, slow speed, low cost solutions the **safety limit** switch solution is anticipated to be used as standard.

However, the alternative solution of a relevelling monitor relays may be used, to check the levelling vane operation during normal journeys, using **interlocked safety relay** methods.

The **safety limit** or **interlocked** relay control methods **cannot** achieve the same sophistication as the **microprocessor** in areas used to assess **reliability**.

The **microprocessor** system **cannot** achieve the absolute **safety interlocking** results achieved by the **limit / interlocked safety relay** monitor.

It is the combination of both systems that is required to give the desired safety, reliability monitoring, and recovery procedures.

*e) Hydraulic Anti-Oscillation.*

During normal relevelling operation excessive relevelling cycles can be detected and recovery action taken. Excessive relevelling cycles can be due to overheating hydraulic oil, faulty hydraulic valve operation, or faulty proximity switches, all of which when left unattended can place the lift in a potentially dangerous condition. The number of relevelling cycles are monitored over a period of minutes. If the number of relevelling cycles is deemed excessive by the microprocessor programme, then the relevelling function is suspended. Attempts will be made to return the lift to the **bottom** floor.

*f) Hydraulic Homing*

The **MP-500** Control System will automatically home to the **lowest** floor level 12 minutes after the last **normal** lift movement. When the main homing floor is not the lowest floor level, the lift will home to the main homing floor after the standard homing time, usually 5 minutes. However, the control system will hydraulic home again to the **lowest** level after becoming idle for 12 minutes. Where possible on hydraulic lifts it is recommended that the **homing** floor is the **lowest** level served.

*g) Hydraulic Overtravel Limit Latching Operation*

If the lift overtravels the top floor to operate the top overtravel limit then **FAR** input to the **MP500** is operated.

Following operation of **FAR** input, the lift service is suspended, and the car is returned to the **bottom** floor level. The Hydraulic Fault is logged in the logger system and the '*Motion'* and *'Slow'* fault indicators are flashed on the CPU board.

The lift will remain 'latched' in this mode (as BS5655 Part 2 requirements) until the power is switched OFF (even if the lift moves to return the overtravel limit to its normal position).

Re-instatement of the power supply will commence NORMAL lift operation.

# *POWER SUPPLY DETAILS*

The power supply consists of two supply outputs, 5V DC for the logic and microprocessor operation, and 24V(dc) for the I/O and indicator operation..

The 5V(dc) smoothed and stabilised supply, used for the logic and microprocessor operation, is generated on the CPU board via a switch mode regulator, and 110/12V(ac) transformer.

The 24V DC capacitor smoothed supply for I/O and indicator operation, is sourced from an off board 15V(ac) transformer. The combined current capacity of the 24V DC supply is 8 Amps.

## POWER SUPPLY CONNECTIONS

| | |
|---|---|
| **110-1** | 110V(ac) supply input for CPU and Logic circuits |
| **110-2** | 110V(ac) supply input for CPU and Logic circuits |
| **15-1** | 15V(ac) supply input for 24V(dc) call I/O & indicator circuits |
| **15-2** | 15V(ac) supply input for 24V(dc) call I/O & indicator circuits |
| **24V** | 24V(dc) supply output for auxiliary I/O circuits |

## PSU FUSE ASSIGNMENTS

| *Fuse* | ***Size*** | *Fuse Function* |
|---|---|---|
| FS1 | **1A** | Protects CPU transformer 12V(ac) |
| 15V | **8A** | Protects I/O Transformer 15V(ac) |
| 24V | **2A** | Protects Auxiliary 24V(dc) output supply |
| PIF | **2A** | Protects Position indicator 24V(dc) supply |
| CAF | **2A** | Protects Car Call indicator 24V(dc) supply |
| LAF | **2A** | Protects Landing Call indicator 24V(dc) supply |
| CSF | **1A** | Protects Car Call input 24V(dc) supply |
| LSF | **1A** | Protects Landing Call input 24V(dc) supply |

# *I / O CONNECTIONS*

| Terminal | Function | Voltage |
|---|---|---|
| **LP_** | Landing Call Push Inputs (MP-500e only) | 24V(dc) |
| **CP_** | Car Call Push Inputs | 24V(dc) |
| **L_U** | Landing Up Call Push Input (MP-500 only) | 24V(dc) |
| **L_D** | Landing Down Call Push Input (MP-500 only) | 24V(dc) |
| **SPU** | Selector Step / Slow Up Input | 110V(ac) |
| **SPD** | Selector Step / Slow Down Input | 110V(ac) |
| **STU** | Stop Proximity Switch Up Input | 110V(ac) |
| **STD** | Stop Proximity Switch Down Input | 110V(ac) |
| **TFR** | Top Floor Reset Input | 110V(ac) |
| **BFR** | Bottom Floor Reset Input | 110V(ac) |
| **RUN** | Run Acknowledge Input | 110V(ac) |
| **DOC** | Door Open / Close Acknowledge Input | 110V(ac) |
| **RLU** | Relevel Up Input | 110V(ac) |
| **RLD** | Relevel Down Input | 110V(ac) |
| **OLS** | 110% Overload Input | 110V(ac) |
| **BPS** | 90% Bypass Input (MP-500 only) | 110V(ac) |
| **DOP** | Door Open Push Input | 110V(ac) |
| **SE** | Safety Edge Input | 110V(ac) |
| **FAR** | Overtravel / Machine Room Temperature Control | 110V(ac) |
| **FCS** | Fire Control Input | 110V(ac) |
| **G4** | Locks Input | 110V(ac) |
| **TR** | Test Control / Emergency Stop Input | 110V(ac) |
| **SCS** | Service Control Input | 110V(ac) |
| **SYN** | Synchronisation to 50Hz Input | 110V(ac) |
| **CA_** | Car Call Acceptance Outputs | 24V(dc) |
| **I_U** | Up Landing Call Acceptance Outputs (MP-500 only) | 24V(dc) |
| **I_D** | Down Landing Call Acceptance Outputs (MP-500 only) | 24V(dc) |
| **I_** | Landing Call Acceptance Outputs (MP-500e only) | 24V(dc) |
| **PI_** | Position Indicator Output | 24V(dc) |
| **FCI** | Fire Control Indicator Output (MP-500 only) | 24V(dc) |
| **TRI** | Test Control Indicator Output (MP-500 only) | 24V(dc) |
| **AGI** | Arrival Gong Indicator Output (MP-500 only) | 24V(dc) |
| **HLI** | Hall Lantern Indicator Control Output (MP-500 only) | 24V(dc) |
| **OSI** | Out of Service Indicator Output | 24V(dc) |
| **OLI** | Lift Overloaded Indicator Output | 24V(dc) |
| **IU** | Up Direction Arrow Indicator Output | 24V(dc) |
| **ID** | Down Direction Arrow Indicator Output | 24V(dc) |

| Terminal | Function | Voltage |
|---|---|---|
| **CAC** | Car Call Acceptance Supply +ve Common | 24V(dc) |

| | | |
|---|---|---|
| **LAC** | Landing Call Acceptance Supply +ve Common | 24V(dc) |
| **PIC** | Position Indicator Supply +ve Common | 24V(dc) |
| **LPF** | Landing Push Common (0V) | 24V(dc) |
| **CPF** | Car Push Common (0V) | 24V(dc) |
| **CF** | General Input Common (0V) | 24V(dc) |
| | | |
| **NX** | Input 0V Supply Common | 110V(ac) |
| **ET** | Supply Filter Earth | Earth |
| | | |
| **DO** | Door Open Pilot Relay Output | 110V(ac) |
| **DC** | Door Close Pilot Relay Output | 110V(ac) |
| **DOC** | Door Open / Close Pilot Relay Output Common | 110V(ac) |
| | | |
| **UPR** | Up Pilot Relay Output | 110V(ac) |
| **DNR** | Down Pilot Relay Output | 110V(ac) |
| **CUD** | Up / Down Pilot Relay Output Common | 110V(ac) |
| | | |
| **HSR** | High Speed Pilot Relay Output (normally open contact) | 110V(ac) |
| **HSC** | High Speed Pilot Relay Output Common | 110V(ac) |
| | | |
| **O12** | *Output (1) Pilot Relay (normally open contact) | 110V(ac) |
| **O11** | *Output (1) Pilot Relay Common | 110V(ac) |
| | | |
| **O22** | *Output (2) Pilot Relay (normally open contact) | 110V(ac) |
| **O21** | *Output (2) Pilot Relay Common | 110V(ac) |
| | | |
| **O33** | *Output (3) Pilot Relay (normally closed contact) | 110V(ac) |
| **O32** | *Output (3) Pilot Relay (normally open contact) | 110V(ac) |
| **O31** | *Output (3) Pilot Relay Common | 110V(ac) |

**Note** * Denotes relay outputs whose function changes according to the type of drive control used.

*Hydraulic Drive*

| | |
|---|---|
| **Output Relay (1)** | Pump Motor Control |
| **Output Relay (3)** | Relevelling Control |

*Polechanger Drive*

| | |
|---|---|
| **Output Relay (1)** | Low Speed Contactor Pilot Relay |
| **Output Relay (2)** | Low Speed Buffer Contactor Pilot Relay |

# ***CPU BOARD***

The **CPU Board** is fitted above the I/O board. It contains the 5V(dc) Power Supply, the main microprocessor core components, the System Conditioning DIL switches, the Diagnostic indicators, and a socket to interface to the optional Diagnostic LCD Unit.
Components worthy of note are :-

40 pin microprocessor
28 pin Battery backed RAM (left hand ic)
28 pin PROM (right hand ic) containing program

Always observe static handling precautions when handling ic's, and pcb's.

## L.E.D INDICATOR ASSIGNMENTS

| *Indicator* | *Function* |
|---|---|
| DJR | Double Journey fault indicator |
| PSU | Power Supply & watch-dog monitor indicator |
| LOOP | Program loop running indicator |
| LOCK | Lock failure indicator |
| DOOR | Door failure indicator |
| MOTION | Motion failure indicator |
| RELEV | Relevel failure indicator |
| SLOW | Slowing fault indicator |

Fault indicators will illuminate upon the occurrence of a fault, and will extinguish when the fault is cleared.

## DIL SWITCH FUNCTIONS

| *Switch* | *Function* |
|---|---|
| L_N | Lift number selection switch for Duplex operation |
| PPTT | Prepare to Test Control switch |
| H_EN | Homing enable switch |
| D_EN | Door ENABLE switch for Prepare to Test Control |
| DJR1-3 | Double journey time selection switches |
| SDT1-2 | Stop Delay Timer for Hydraulic and VVF Drives<br>Buffer timer selection switches for Polechanger Drives |
| DWL1-2 | Door dwell time selection switches |

## DIL SWITCH SETTINGS

**DOUBLE JOURNEY TIME**

Three DIL switches 'DJR1-3' offer the following double journey time options:-

| *DJR1* | *DJR2* | *DJR3* | *TIME* |
|---|---|---|---|
| off | off | off | 20 Sec |
| on | off | off | 30 Sec. |
| off | on | off | 40 Sec. |
| on | on | off | 50 Sec. |
| off | off | on | 60 Sec |
| on | off | on | 90 Sec |
| off | on | on | 120 Sec |
| on | on | on | 180 Sec |

**HOMING**

Operation of the H_EN DIL switch to the ON position will enable Homing to the programmed MAIN floor.

**STD TIME (Stop delay Timer for VVF, or Hydraulic)**

Two DIL switches 'SDT1-2' offer the following timer options for various drive applications:-

| *SDT1* | *SDT2* | *TIME* |
|---|---|---|
| off | off | 1 Sec |
| on | off | 2 Sec |
| off | on | 3 Sec |
| on | on | 4 Sec. |

The above settings are used to initialise the Buffer Timer for Polechanger applications.

**DOOR DWELL TIMES**

Two DIL switches 'DWL1-2' offer the following door dwell time options:-

| *DWL1* | *DWL2* | *TIME* |
|---|---|---|
| off | off | (t) Sec. |
| on | off | (t+2) Sec |
| off | on | (t+5) Sec |
| on | on | (t+10) Sec. |

*Where (t) identifies the standard Door Dwell time.*

*Notes:-* The Standard Door Dwell times are defined as below (i.e. DWL1 & DWL2 are both set to OFF):-

| | |
|---|---|
| Response to a Car & Landing Call | 7 Secs |
| Response to a Landing Call | 5 Secs |
| Response to a Car Call | 3 Secs |
| After a Door Open Push Operation | 4 Secs |
| After a Safety Edge Operation | 1 Sec |

**FAULT LED FUNCTIONS**

*LOCK FAULT*
If the **G4** input fails to make following the closing of the doors, or the lock input is opened during **MOTION** lift operation (not relevelling with open doors), a lock fault is logged. Logging of a Lock Failure illuminates the '**LOCK'** LED on the **CPU** board. The LED remains illuminated until the Lock input makes to clear the fault condition..

*DOOR FAULT*
If the doors fail to open or close following the appropriate **DO** or **DC** demand signal from the microprocessor system, (because of stalled motor, faulty motor, faulty contactor, faulty limit, etc.) then the Door Fault is logged. The logging of a door fault illuminates the '**DOOR'** LED on the **CPU** board. The LED remains illuminated until the doors are successfully closed.

*MOTION FAULT*
The microprocessor monitors the starting sequence via input **RUN** on the I/O board. If the **RUN** input does not operate within a short time following the microprocessor operation of a **UPR** or **DNR** start demand then a **Motion Fault** is logged. The logging of a Motion Fault illuminates the '**MOTION'** LED on the CPU board. The LED remains illuminated until the lift is successfully started.
Many conditions can cause a 'Motion Failure' but the common causes are:

A terminal limit not making contact in the lift shaft.
The run contact of a regulator, such as a VVF drive, not making.
A phase or thermistor fault (phase failure and reversal unit tripped).

The fault will be generated shortly after the lift has attempted to start.

*RELEVEL FAULT*
The Relevelling operation is carefully monitored by the microprocessor system (see Relevel Section), and if a malfunction is detected a Relevel Fault is logged. The logging of a Relevelling Fault will illuminate the '**RLEV'** LED on the **CPU** board. Once set the LED will remain illuminated until the Power Supply is switched off.

*SLOWING FAULT*
The microprocessor monitors the lift during its slowdown and stopping operations. If the lift does not commence a stopping sequence within approximately 15 seconds of slowdown initiation, then a **Slowing Fault** is logged. The logging of a Slowing Fault illuminates the '**SLOW'** LED on the **CPU** board. Once set the LED will remain illuminated until the lift starts a new journey.

*DOUBLE JOURNEY FAULT*
The microprocessor monitors the lift while executing its **moving** operation, via the '**RUN'** input. If the lift is moving through the shaft, and does not complete its journey, within the setting of the Journey Time (set by DIL Switches DJR1-3), then the **Journey Fault** is logged. The logging of the Journey Fault illuminates the '**DJR'** LED on the **CPU** board. Once set the LED will remain illuminated until the Power Supply is switched off.

*Note:* During Hydraulic Overtravel Latching Mode *'Motion'* and '*Slow'* leds flash,
**LCD DIAGNOSTICS UNIT**

The **MP-500** and **MP-500e** control family have the option of use with a Liquid Crystal Display Diagnostic unit which is mounted on the CPU board. When the LCD Diagnostic Unit is used the event logging functions become available enabling the last 200 faults occurring on the system to be recorded into battery backed RAM with 10 years power off memory retention.

The LCD Diagnostic comprises of a Liquid Crystal Display (2 lines of 16 characters), 4 pushes, and 4 switches, to give control of the following functions :-

Event recording in English text including position of lift, and logged days ago.
Event history recall of the last 200 events.
Action report giving the lifts current control sequence status detail.
Engineer visit logging.
Automatic system test sequencing
Call registration.

**NOTE:** *If the LCD Logger is to be added to the system ALWAYS switch OFF the power supply BEFORE inserting the LCD Logger into its socket on the CPU board.*

## EVENT LOGGER

The **Event Logger** keeps a record of the most current 200 events (mainly faults) occurring on the system. As events occur they are displayed for 20 seconds on the LCD in typical 2 line format :-

```
                    DOOR OPEN TIMER
                    p02  o01  d00   e10
```

The top line represents the event
'p' = position of the lift when event occurred
'o' = number of consecutive occurrences
'd' = number of days ago that the event occurred
'e' = the event identity code

When the LCD is idle it displays 'LESTER CONTROL SYSTEMS LIMITED' as standard but may be arranged to give any company name or message within the capability of the 2 lines of 16 character format of the LCD.

A list of the current Recorded Events are given on the next page.

## EVENT HISTORY PURGE

The events held in the event history are always the 200 most current events. However if the user wishes to clear all history and start afresh this may be achieved as follows :-

1. *Switch OFF the lift.*
2. *Continuously operate the top and bottom pushes together on the Diagnostic Unit while the power is restored.*
3. *Release the diagnostic pushes 5 sec after supply restoration.*

**EVENT IDENTIFICATION**

| *EVENT* | *FUNCTION* |
|---|---|
| POWER INITIATION | Power supply initiation (switch on) |
| LOCK TIP - MOVING | Lock tip while lift is moving |
| LOCK - STATIONARY | Lock open while lift stationary with doors closed |
| FAILURE TO START | Lift failed to start (UPR/DNR operated but no RUN) |
| STOP - NOT LEVEL | Lift stopped out of the STU/STD proximity zone |
| SHUTDOWN FAILURE | Lift failed to complete door / start cycle within 1 min |
| SELECTOR RESET | Selector required resetting to top or bottom floor |
| SLOW / LEVEL FAULT | Following slowdown lift failed to stop within 15 sec |
| JOURNEY TIMER | Lift moving for too long (time set by DIL switches) |
| DOOR OPEN TIMER | Door open protection timer (25 sec) |
| DOOR CLOSE TIMER | Door close protection timer (25 sec) |
| LOCK FAILURE | Locks repeatedly failed to make following door closure |
| RELEVEL FAULT | Faulty relevel sequence (repeated vane failure operation or timed) |
| RELEVEL WARNING | Relevel vane sequence error (may be intermittent) |
| OVERTRAVEL FAULT | Latched Overtravel Operation (cleared by power OFF) |
| 110% OVERLOAD | Lift 110% overload switch operated |
| USER DEFINED | User defined event option |
| RAM MEMORY FAULT | RAM found faulty during initiation check |
| LOGGER RAM PURGE | Logger RAM purged by user (cleared all events) |
| RAM CORRUPTION | RAM data vector range check error |
| COMMS. FAILURE | Communications to another lift failed |
| COMMS. RESTORED | Communications to another lift restored |
| DISPATCH FAILURE | Group Dispatcher operation failed |
| OPEN PUSH HELD | Door open push held (20 sec) |
| SAFE EDGE HELD | Safety edge held (20 sec) |
| STUCK CAR PUSH | Car push stuck or held for 10sec after cancellation |
| STUCK LDG PUSH | Landing push stuck or held for 10sec after cancellation |
| ENGINEER PRESENT | Engineer logged onto site |
| ENGINEER LEAVING | Engineer logged off of site |
| SERVICE VISIT | Service engineer visited site |
| EM-SUPPLY RETURN | Lift returned under Emergency Supply operation |
| PRIORITY SERVICE | Priority Service used |
| 1000 MOTION OPS | 1000 motion operations marker |
| 1000 DOOR OPS | 1000 door operations marker |
| AUTO-TEST CALL | Automatic Test Call Demand |
| AUTO-TEST FAIL | Lift failed to complete door/motion cycle for Auto-Test |
| MOTION FAILURE | Lift failed during moving (RUN released after starting) |
| DO-DC RELAY ACK | DOC input acknowledge failed for door operation |
| PROCESSOR RESET | Microprocessor reset due to fault |
| OTL / MROOM TEMP | Overtravel or Machine Room Temperature Control |

## EVENT HISTORY RECALL

The 200 most recently logged events held in the event history buffer memory may be recalled by the user as follows :-

1. *Set all DIL switches on Diagnostic board to OFF.*
2. *Set 'EVENT' DIL switch on Diagnostic board to ON.*
3. *The LCD will respond with 'EVENT HISTORY OPERATION MODE'.*
4. *The EVENTS may now be inspected by using the pushes on the Diagnostic board as follows :-*
   - *TOP — Set most recent history event (h01)*
   - *BOTTOM — Set least recent history event (h50)*
   - *NEXT DN — Step to next less recent history event*
   - *NEXT UP — Step to next more recent event*
5. *Return 'EVENT' DIL switch to OFF to EXIT History Mode.*

*Note: During History recall the 'h--' reference gives the position of the event in the History memory, h01 being most recent, h50 being oldest.*

## DIAGNOSTIC CALL REGISTRATION

Calls may be registered from the Diagnostic Unit as follows :-

1. *Set all DIL switches on the Diagnostic Unit to OFF.*
2. *Set 'CALL' DIL switch on Diagnostic board to ON.*
3. *The LCD will respond with 'CALL INSERTION OPERATION MODE'.*
4. *Calls may now be registered by use of the Diagnostic Pushes as follows :-*
   - *TOP — Top floor call*
   - *BOTTOM — Bottom floor call*
   - *NEXT UP — Call for next floor above the current lift position*
   - *NEXT DN — Call for next floor below the current lift position*
5. *Return 'CALL' DIL switch to OFF to EXIT call registration mode.*

*Note: Diagnostic Calls will not override independent services such as Fire Control.*

## DIAGNOSTIC TEST OPERATION

A Service Engineer or General Engineer may enter a marker in the Event History in order to identify a related visit. This may help identify events that have happened since the Engineers last visit to site, or remedial action.
To log an Engineers marker proceed as follows :-

1. *Set all DIL switches on the Diagnostic Unit to OFF.*
2. *Set 'TEST' DIL switch on Diagnostic board to ON.*
3. *The LCD will respond with 'TEST OPERATION MODE'.*
4. *Engineers may now use the Diagnostic Pushes as follows:-*
   - *TOP — Log an Engineer on site record*
   - *BOTTOM — Log a Service Visit record*
   - *NEXT UP — Log an Engineer leaving site record*
   - *NEXT DN — Log an Engineer leaving site record*
5. *Return 'TEST' DIL switch to OFF to EXIT test operation mode.*

## DIAGNOSTIC MONITOR OPERATING MODE

The user may enter **Diagnostic Monitor Mode** to reveal several aids to assist the site engineer. There are presently 6 main levels of Diagnostic Monitor Modes as follows :-

**Diagnostic Level 1**

In this Diagnostic Mode the LCD will give a continuous report on the current Status of the lift ie. 'Doors Open', 'Doors Opening', 'Doors Closing', 'Doors Closed', 'Doors Locked', 'Moving - HS', 'Slowdown', 'Levelling', 'Stopped', etc.

**Diagnostic Level 2**

Gives the features as 'Diagnostic Level 1', plus automatic calls are registered every 60 sec. to either the top or bottom floor dependent upon the current lift position.

**Diagnostic Level 3**

Gives the features as 'Diagnostic Level 1', plus automatic calls are registered in cyclic order to travel one floor every 60 seconds (serving all floors UP & then all floors down).

**Diagnostic Level 4**

Used to automatically register calls to each floor and check the absolute position reset for that floor in association with BS5588 Fire Fighting applications (see specific Fire Fighting data).

**Diagnostic Level 5**

Gives features as per Diagnostic Level 2 except call is registered 10 seconds after doors are closed.

**Diagnostic Level 6**

Gives features as per Diagnostic Level 3 except call is registered 10 seconds after doors are closed.

During Diagnostic Levels Fault Events are still recorded to the History Buffer, but are not displayed on the LCD. Diagnostic calls will not override independent operations such as Fire and Service Controls.

Diagnostic Monitor Operation may be entered by the following procedure :-

1. *Set all DIL switches on the Diagnostic Unit to OFF.*
2. *Set 'MONITOR' DIL switch on Diagnostic board to ON.*
3. *The LCD will respond with 'DIAGNOSTIC MODE dl=1', signifying that Diagnostic Level 1 is operating.*
4. *When the lift next make a change in its status then that status will be displayed, together with the current lift position and Diagnostic level*
4. *The Diagnostic Pushes may now initialise Diagnostic Levels as follows:-*

| | |
|---|---|
| *BOTTOM* | *Operate Diagnostic Level 1* |
| *NEXT UP* | *Operate Diagnostic Level 2* |
| *NEXT DN* | *Operate Diagnostic Level 3* |
| *TOP* | *Operate Diagnostic Level 4* |

*Note:*

*To enter 'level 5' operate and hold BOTTOM push, then operate and hold NEXT UP push, then release BOTTOM push, then release NEXT UP push.*

*To enter 'level 6' operate and hold BOTTOM push, then operate and hold NEXT DOWN push, then release BOTTOM push, then release NEXT DOWN push. Diagnostic Level selection is confirmed by 'dl=_' on LCD.*

5. *Return 'MONITOR' DIL switch to OFF to EXIT Monitor operation mode.*

## MICROPROCESSOR & CONTROL GEAR SEQUENCING

The microprocessor situated on the CPU board is responsible for the co-ordination of all the inputs / outputs associated with the surrounding control circuitry via the I /O board. It is therefore important to be able to understand the sequence of events associating the I/O board with the external equipment when fault finding.

### DOOR CONTROL SEQUENCE

The Door Control sequence is switched from the microprocessor via pilot relays DO and DC, to control opening and closing the doors respectively.
Operation of the DO or DC pilot relay, will result in the operation of the door control contactor DO or DC respectively, and this operation is verified by the microprocessor input DOC. When DOC input is set the microprocessor control will commence sequence functions such as stall protection and lock checking.

### NORMAL STARTING SEQUENCE

*Assuming the lift is at floor level with the doors closed and ready to accept a call. The Starting Sequence should typically function as described below:-*

1) A car / landing call is inserted.
2) The microprocessor accepts the call, and outputs a call accepted indicator.
3) The microprocessor will next energises the pilot relays UPR or DNR, (depending upon direction) and HSR, on the I/O board.
4) The microprocessor pilot relays operate to control the main lift controller relays / contactors (UP or DN and HSR).
5) A confirmation of the operation of the drive relays or contactors, via closure of the appropriate relay contacts, is then used to provide a feedback input to the microprocessor at the input RUN.

### SLOWING AND STOPPING SEQUENCE

*Assume the lift is travelling UP in High Speed (+UP,+HSR), and is approaching a floor where a call exists requiring the lift to slow. The Slowing and Stopping Sequence should typically function as described below:-*

1. The lift will approach the selector stepping vane (SPU) and increment the selector position to the floor corresponding to the call.
2. When the lift leaves the selector stepping vane HSR relay is released to commence slowdown (on the trailing edge of the vane).
3. The lift will continue to travel to floor level until the next STU vane is operated to initialise the stopping sequence via the release of UP relay.

### SELECTOR OPERATION

A Selector Reset switch is fitted at the Top & Bottom (TFR, BFR respectively) of the lift shaft. If the lift is stationary, or travelling in the appropriate direction, when the corresponding reset limit is operated, then the lift position is reset accordingly to the TOP or BOTTOM floor.
When the lift is travelling in the UP or DOWN direction, the selector position is correspondingly incremented or decremented, under control of the SPU or SPD proximity switch respectively.

## SWITCHING ONTO TEST OPERATION FOR THE FIRST TIME

*Installation state:-*

The Motor, Thermistors, Fan, Valves, and Brake etc. have been connected to the Control Panel.
The safety and lock circuits are in a state where the door contacts, emergency stops etc. are making contact providing continuity between terminals **OTL, G1, G2, G3,** and **G4**.
The wiring has been checked, and all cables are connected correctly.
The fuses are in their correct places, and of the correct size and type.
The lift is switched to **TEST** via the Car Top Control or manually by leaving the input **TR** open circuit.
Check there are no obstructions in the lift shaft.
Provisionally set the lift and door motor overloads.
Check that the car and landing doors are closed fully (if fitted at this stage).

The lift can now be switched on

Check the incoming three phase sequence is correct (PFRR relay is energised).
Check the led **TR** is extinguished, and **LOCK** is illuminated on the bottom I / O board.

The lift can be driven by making the following temporary connections:-

| | | | |
|---|---|---|---|
| To travel | UP | = | **TF** to **TU** |
| To travel | DOWN | = | **TF** to **TD** |

*The following checks should be made before continuing with moving the lift :-*

1) Check that the Emergency Stop buttons, Locks, and Safety circuit (if applicable), will stop the lift instantaneously shortly after the lift motor starts to rotate.

2) Run the lift and check that the motor (or pump) direction of rotation is correct.

3) Run the lift and check that the brake, ramp, and valve voltages are correct.

4) Check the door operation (if fitted) by using the car top control buttons to make contact between terminals :-

| | | |
|---|---|---|
| CLOSE | = | **DTF** and **DC** |
| OPEN | = | **DTF** and **DO** |

5) Check required selector stepping and levelling switches are in place, and are functional.

6) After Test operation move the lift to the lowest level possible, park with doors closed and switch off the control system.

## SWITCHING TO NORMAL OPERATION FOR THE FIRST TIME

*Installation state:-*

The lift is complete, and is to be operated normally for the first time. The tapehead, door operator, Emergency Stop buttons, locks, safety circuit, shaft switches, proximity and levelling signals, have been checked on TEST control as previously instructed and are operating correctly.
The pulsing and levelling signals are in the correct sequence as on the shaft and vane layout drawing.
The lift is at the lowest floor level with the reset signal energised.
The lift is switched onto NORMAL operation via the car top control, i.e. a connection should be made to terminal **TR**, also the lift should not be on any other form of independent service, i.e. Fire or Service control.
Ensure no shaft obstructions exist.

The lift can now be switched on and the following suggested test procedures can be carried out *:-*

1) Testing the selector stepping and levelling signals (STU/STD & SPU/SPD)
This can be achieved by placing calls to each floor in turn for both the UP and DOWN direction, ensuring correct selector stepping and stopping sequence. Correct any problems with the vanes before proceeding to the next stage.
Once correct , run the lift to the terminal floors in both directions to check vane operation.

3) Testing of Terminal limits and Slowing switches
Temporarily inhibit signals SPU,SPD,STU,STD (remove the associated terminal block wires, or disable the tapehead via its supply input).
Register a top car call (link CPF to CPn) (where n = top floor)
The lift is now forced to slow and stop via the terminal slowing and stopping limits.
Register a bottom car call (link CPF to CP1), and repeat the above process for the down direction.
Replace any connections temporarily removed.
Check all safety & emergency stop functions are working correctly.

## FAULT FINDING

If the lift system is not working correctly, the service Engineer must find the fault. The Microprocessor, and its associated circuitry helps the engineer in fault finding by signalling common faults such as door fault, start failure, relevel fault, slowing fault, journey fault (see section regarding *Fault LED Functions*).

When finding a fault on a lift the following checking procedure may assist.

CHECKING PROCEDURE

1) Check the 3 phase incoming supply to the controller.

2) Check motor overloads, circuit breakers, etc.

3) Check the various voltages at the Primary and Secondary of each transformer with respect to their terminals and not earth.

5) Check the voltage going into and out of each fuse on the Microprocessor Power Supply, and in the control panel, making sure they are the correct type, and visually inspect where possible for a blown fuse (avoid switching off if possible to check fuses as this may clear the problem, but it may return at a later date causing another callout).

6) LED **TR** (Safety Circuit) should be illuminated on the I/O Board, if not check live feeds in order to terminals **110V, OTL, G1, G2.**

7) LED **G4** (Lock Circuit) should be illuminated on the I/O Board when the doors are shut, if not check live feeds in order to terminals **G3, G4**.

8) Check that the following functions are NOT switched on, and the LEDs are not illuminated:- *(see descriptions of the service features)*

a) **OSI**, out of service indicator
b) **OLS & OLI**, illuminated when the lift is 110% overloaded.
c) **FAR**, illuminated when on Emergency Recall/Shutdown.
d) **SCS**, illuminated when on Service control.
e) **FCS**, illuminated when on Fire Control.
f) **SE, DOP**, are illuminated when the Safe Edge, or Door Open Button are activated, which may prevent the doors from closing.
g) Check the phase failure and reversal relay (**PFRR**) is operated.

If all circuits appear to be O.K, there is a possibility of a circuit, or coil fault on a relay, contactor, brake, ramp, or a hydraulic valve solenoid.
If further help is required whilst fault finding please make a note of the following before contacting Lester Control Systems :-

i) LED's that are illuminated.
ii) A full report of the state of the contactors and relays etc.
iii) A full report of the lift fault.

## COMMON FAULTS ON THE LIFT SYSTEM

*A) Lift car out of step with the controller*

i) When car stops at floor level both STU and STD must be illuminated.
ii) Proximity input SPU / SPD must pulse on and off between every floor.
iii) Check Tapehead unit / floor selection switches operate correctly.
iv) Check car / landing calls are being entered to the correct floors.

*B) Doors remain open and will not close*

i) Check safe edge, door open button, photocells are not operated.
ii) Check door open and close limits have correctly operated.
iii) Check Terminal limits (including reset limits).
iv) Check the lift is not 90% or 110% overloaded

*Note:*

Under 90% overload, the doors may only close via operation of a car call.
During Fire & Service controls, the lift doors park open, and will only close by a constant pressure car call.

*C) Doors closed lift will not run*

i) Check car and landing locks are made (LEDs **TR** and **G4** on the I /O board).
ii) Check door limits.
iii) Check shaft Terminal limits.
iv) Check the RUN feedback into microprocessor input.

*D) Lift stops in travel*

i) Lock tipped.
ii) Journey timer operated.
iii) Slowing switch incorrectly set.
iv) Lift slowed and stopped in mid travel, Tapehead / Proximity switch malfunctioning or set incorrectly.
*v)* Speed regulator fault.
*vi)* Phase faulty (also phase failure).

## DUPLEX OPERATION

When two lifts are inter-connected, to supply service to a common set of Landing Calls, the efficiency of the system in response to Landing Calls may be significantly increased, compared with two individually operated lifts.

In order to implement improvements to Landing Call response, it is necessary for each lift to know the status of the Landing Calls, their allocated lift, and the status of the both lifts. To achieve the transfer of this information from one lift to the other a high speed communications link is employed using a Computerised Area Network, commonly known as 'CAN'.

The CAN used with this Duplex system transfers data at the rate of 100k bits/sec via an opto-isolated serial data highway. The following data is transferred between the lifts :-

- Lift Position
- Lift Direction
- Lift Motion Status (starting, moving up/down, slowing, stationary)
- Lift Service Status (in or out of service)
- Lift Homing Status
- Call Status (car and allocated landing calls)
- Assistance Request
- Lift Load By-pass Status
- Call Cancel Request

The data is updated between lifts under interrupt control approximately twice per second.

The Landing Calls are connected into both lifts, in order to allow each lift to know the Landing Call Status.

In order to allow the allocation of the Landing Calls to the appropriate lift, a software program is installed in each lift microprocessor system. This program continuously calculates the nearness of each lift to each call, and allocates the nearest lift to the appropriate call, with due consideration for car calls and allocated landing calls.

Since the allocation of the nearest lift to Landing Calls, can under certain circumstances result in all calls being burdened to one lift, while the other remains idle, an additional control facet is used, whereby, if the number of calls designated to one lift exceeds a level (car and landing calls are included), then a request for assistance is passed to the other lift, in order to improve the Landing Call Response Time.

If a lift becomes fully loaded (LW90), or is removed from service (Fire, Service, or Lift Failure) then it will bypass landing calls, and allow all landing allocations to be assigned to the other lift.

When lifts become idle, they are included for Homing Allocation to the Main floor. The first available lift is allocated to the main floor. If both lifts are available for

homing, then the lift nearest to the Main Floor is selected for Homing Duty, and the other lift parks at its present floor. Once a lift becomes the Home car (parked at the Main floor), then it receives a penalty in its allocations to other floors, in order to encourage it to remain at the Main floor for use by potential passengers.

Certain LED Indicators are included in order to assist in Duplex System Fault Analysis as follows:-

*On MCPU board*

| | |
|---|---|
| CAN1 | Changes each time a correct CAN message is received |
| HOM | Flashes when lift is available for Homing. |
| | Continuously ON when lift is the Home Car at the Main floor. |
| NEXT | Illuminates when lift is Ground Next Car. |

*On MCAN board*

| | |
|---|---|
| TX | Flashes to indicate transmitted CAN data. |
| RX | Flashes to indicate received CAN data. |

*Verifying the Duplex Operation*

First ensure that both lifts are operating normally, and that the Landing Calls enter the correct corresponding terminals on each lift.

Ensure the DIL switches on the CPU are appropriately set as follows :-

| | |
|---|---|
| 'L_N' | Set to 'OFF' at 'A Lift', & 'ON' at 'B Lift. |
| 'HOM' | Set to 'ON' at both lifts. |
| 'PPTT' | Set to 'OFF' at both lifts. |
| 'D_EN' | Set to 'ON' at both lifts. |

With the Duplex communications loom connected LEDs 'TX' and 'RX' should be flashing on both lifts (showing serial data flow), and LED 'CAN1' should be pulsing regularly on each lift (showing correct data transfer).

Send one lift to the Main floor, and one lift to the top floor via a car call, and let the lifts fall idle. The should not move unless a call is registered.

Send the Main floor lift to the top floor via a car call. This should result in the lift that was at the top moving via a Homing Assignment to the Main floor.

Now send the new Main floor lift to the top floor after the lifts have fallen idle for a few seconds. This should result in the top floor lift moving to the Main floor under a Homing Assignment. Thus two way communications between lifts is confirmed.

Next try various Landing Calls, and verify that the correct car is assigned and responds (note a position bias does exist to hold the Main floor car at the Main floor), and that the call is cancelled upon arrival of the first lift.

Next try one lift at the Main Floor, and the 'free' car at one floor above the Main floor. Register several UP Landing Calls, and verify that, when more than 3 are registered the 'Home' car is called to assist.

Next try one lift at the Main Floor, and the ‘free’ car at the top floor. Register several DOWN Landing calls, and verify that, when more than 3 calls are registered the ‘Home’ car is called to assist.
Now place both lifts at the main floor, and let them fall idle and close their doors. Then register an UP and DOWN Landing call at the Main Floor. The ‘Home’ car should open its doors to show an UP direction and cancel the UP call, while the ‘Free’ car should open its doors to show a DOWN direction arrow and cancel the DOWN call.

Check by-pass and re-allocation of landing calls when one lift becomes fully loaded (LW90 operated).

Check registration and cancellation of each Landing Call in turn, for each lift. First place ‘A’ at Main floor, and take ‘B’ lift to each Landing Call in turn. Then place ‘B’ lift at Main floor, and take ‘A’ lift to each Landing Call in turn.

Prevent one lift from closing its doors while allocated to a landing call, and check that the allocation is transferred to the other lift following a ‘Shutdown Failure’ (allow 1 minute for ‘Shutdown’ time to envoke).

Switch one lift OFF, and ensure all calls are allocated to the remaining lift.
Ensure communications is re-established following switch ON.

Under this condition communications failure occurs and is reported via the LCD after 5 seconds. The “TX” and “RX” led’s will flash at approx. 1 sec intervals, and more brightly than when normal communications exists.

These checks are by no means extensive, but do ensure the fundamental verification of the Duplex facilities.

# EMERGENCY SUPPLY CONTROL

## INTRODUCTION

This supplement covers the application of the MP500 system when used in conjunction with a lift(s) requiring EMERGENCY SUPPLY CONTROL operation.

When the lift service to a building becomes more critical, (generally if Fire Fighting operation is required, or the lifts are in a group configuration, or the lift serves essential areas such as hospitals), then it is becoming common for the lift system to operate in conjunction with an Emergency Supply Standby Generator. This Standby Generator can have sufficient power support all lifts, but more often it can only power one lift.

It is becoming common for buildings to require a Fire Fighting lift(s) as detailed in BS5588 (see document for exact specification requirements), and all Fire Fighting lifts require a Standby Generator or Power Supply.

Note that only the lifts in the building connected to the 'Emergency' Power will need to be controlled, and some lifts may just be left idle where they stop during 'Emergency' Power operations.

Generally there is sufficient Emergency Supply Power available that only running of the main lift motor needs to be restricted, and door gears can be left to function normally without restriction on all lifts.

Some Hydraulic lifts may return to the bottom floor by operation of their down valve only in order to evacuate the hydraulic ram, thus using only limited power, which in the general scheme of Power consumption may be neglected in most circumstances.

There are many situations and solutions available to meet the requirements of 'Emergency Supply' operation, and the following is a summary of the more common options. Each solution is given an identity coding in order to make it clear exactly which solution the customer requires, since there are sizeable cost implications involved between various solutions. The type number code is identified as follows :-

**EMSUP.(x).(y).(z)**

'x' denotes the control mode of operation.

'y' denotes number lifts supported on Emergency Power by the generator.

'z' denotes number lifts to be powered at any one time by the generator.

Typical identity could be **EMSUP.(A).(3).(3)** which would identify a type 'A' control of 3 lifts where the standby generator can power all 3 lifts simultaneously.
Also identity **EMSUP.(B).(3).(1)** would identify a type 'B' control of 3 lifts where the standby generator can power only one lift at a time.

## EMERGENCY SUPPLY OPERATION TYPE 'A'

When the 'Emergency' power is established then all lifts connected to the 'EMERGENCY' power supply are automatically returned to a controlled floor in order to establish absolute selector reset.

For most lifts the return will be to the bottom floor, in order to establish absolute selector reset.

However for Fire Fighting Lifts, the return can be to the next floor in order to establish absolute selector reset. Therefore the lift will travel to the next floor if the lift is not on Fire Fighting operation, or left under control of the Fireman if the lift is on Fire Fighting operation.

There is no restriction upon the number of lifts operating at one time, and if the power is established to all 'Emergency' Power lifts simultaneously, then they will commence operating and may start simultaneously. Upon arrival at the control floor the lift is returned to 'normal' operation.

Generally there should be a minimum time lapse of 2 seconds between switching of supplies, in order to permit per lift control functions to be established. Normally this is not a problem when switching from 'Normal' power to 'Emergency' power, since the standby generator takes this time to run up. However transfer from 'Emergency' power to 'Normal' power can be virtually instantaneous. A delay energise Power Initiation Timer is normally fitted on the controller of each lift in order to establish a minimum of 2 seconds reset time for the power supervisory circuits.

No signal is necessary to the controller to differentiate between 'Normal' and 'Emergency' power operation.

This is the minimum cost system for Emergency Supply operation, from a controller viewpoint. However the standby generator must be capable of providing power to all lifts running possibly simultaneously.

## EMERGENCY SUPPLY OPERATION TYPE 'B'

When the 'Emergency' power is established then lifts connected to the 'EMERGENCY' power supply are automatically sequentially returned to a controlled floor in order to establish absolute selector reset.

For most lifts the return will be to the main floor, after travelling first to the bottom floor, in order to establish absolute selector reset.

However for Fire Fighting Lifts the return can be to the nearest floor in order to establish absolute selector reset. The lift will then either travel to the main floor if the lift is not on Fire Fighting operation, or left under control of the Fireman if the lift is on Fire Fighting operation.

There is a restriction upon the power supplied by the standby generator such that only one lift run at any one time.

As each lift arrives at the return floor it is shutdown, to park with its doors closed and prevented from starting.

Once the lift has returned and shutdown, the next lift in the sequence is returned and shutdown. If a particular lift fails to complete its return sequence within a pre-set time then it is shutdown where it stands, and is prevented from starting.

When all lifts have had the opportunity to return to the return floor, then one predetermined lift is offered for use by general passengers as the 'Duty' Lift.

If a Fire Fighting Lift exists then it should be the selected 'Duty' Lift.

The predetermined lift is selected for 'Duty Lift' operation, and its functionality is not checked, and no alternative lift is offered if this lift fails for any reason (even during the return sequence).

For this type of operation two control contacts are require. One contact is only closed when 'Normal' Power is available (open during 'Emergency' Power operation), and the other contact is only closed when 'Emergency' Power is available (open during 'Normal' Power operation).

## EMERGENCY SUPPLY OPERATION TYPE 'C'

When the 'Emergency' power is established, then lifts connected to the 'EMERGENCY' power supply, are automatically sequentially returned to a controlled floor in order to establish absolute selector reset.

For most lifts the return will be to the main floor, after travelling first to the bottom floor, in order to establish absolute selector reset.

However for Fire Fighting Lifts the return can be to the next floor in order to establish absolute selector reset. The lift will then either travel to the return floor if the lift is not on Fire Fighting operation, or left under control of the Fireman if the lift is on Fire Fighting operation.

There is a restriction upon the power supplied by the standby generator such that only one lift run at any one time.

As each lift arrives at the return floor it is shutdown, to park with its doors closed and prevented from starting.

Once the lift has returned and shutdown, the next lift in the sequence is returned and shutdown. If a particular lift fails to complete its return sequence within a pre-set time, then it is shutdown where it stands, and is prevented from starting, and will not be considered for 'Duty' Lift selection.

When all lifts have had the opportunity to return to the return floor, then the last lift to successfully complete a return sequence will be offered for use by general passengers as the ‘Duty’ Lift.

This lift should by choice be the Fire Fighting Lift.

The lift selected for ‘Duty’ Lift operation remains the ‘Duty’ Lift and its functionality is not checked, and no alternative lift is offered if this lift fails for any reason.

For this type of operation two control contacts are require. One contact is only closed when ‘Normal’ Power is available (open during ‘Emergency’ Power operation), and the other contact is only closed when ‘Emergency’ Power is available (open during ‘Normal’ Power operation).

## EMERGENCY SUPPLY OPERATION TYPE ‘D’

When the ‘Emergency’ power is established, then lifts connected to the ‘EMERGENCY’ power supply are automatically sequentially returned to a controlled floor in order to establish absolute selector reset.

For most lifts the return will be to the main floor, after travelling first to the bottom floor, in order to establish absolute selector reset.

However for Fire Fighting Lifts the return can be to the next floor, in order to establish absolute selector reset. The lift will then either travel to the return floor if the lift is not on Fire Fighting operation, or left under control of the Fireman if the lift is on Fire Fighting operation.

There is a restriction upon the power supplied by the standby generator such that only one lift run at any one time.

As each lift arrives at the return floor it is shutdown, to park with its doors closed and prevented from starting.

Once the lift has returned and shutdown, the next lift in the sequence is returned and shutdown. If a particular lift fails to complete its return sequence within a pre-set time then it is shutdown where it stands, and is prevented from starting, and will not be considered for ‘Duty’ Lift selection.

When all lifts have had the opportunity to return to the return floor, then the last lift to successfully complete a return sequence will be offered for use by general passengers as the ‘Duty’ Lift.

This lift should by choice be the Fire Fighting Lift.

The lift selected for ‘Duty Lift’ operation is periodically checked for successful operation by automatic call registration and sequence monitoring (doors and motion). Should the ‘Duty’ Lift fail, then it is shutdown where it stands and prevented from

starting. The Emergency Power is then transferred to an alternative lift which has returned successfully during the 'return sequence', and that lift takes over as the 'Duty' Lift. If a 'Duty' lift is on Fire Control operation it will remain as the 'Duty' Lift and keep the Emergency power while on Fire Control (even if it is considered failed).

For this type of operation two control contacts are require. One contact is only closed when 'Normal' Power is available (open during 'Emergency' Power operation), and the other contact is only closed when 'Emergency' Power is available (open during 'Normal' Power operation).

**SUPPLEMENT**

For simplicity the above sequence is described for one lift operating at a time on restricted Emergency Power.

If more than one lift can run simultaneously on Emergency Supply operation, but the standby generator can not power all lifts simultaneously then the following options may be considered :-

1.The sequence can be arranged for multiple lift returns, followed by multiple duty car selections.

2. Separately zoned Emergency supplies, with each zone independently operating the individual sequential return of the lifts in its zone, and then selecting its appropriate zone 'Duty' Lift.

As the requirements for Emergency Supply operation become more diverse, and the requirements fall outside the described options, then a full customer specification must be provided for due consideration.

**NOTE:**
The above is a general description of the LCSL standard Emergency Supply Control. Specific contracts may vary in order to comply with local specific requirements.

# PRIORITY SERVICE (CODE BLUE)

## INTRODUCTION

Priority Service is a control system operation whereby the lift is returned under emergency conditions to a selected floor. In hospital applications this operation is often referred to as ‘Code Blue Service’.

## OPERATION

A key operated switch is fitted at each landing entrance. Operation of a priority service switch will return the lift to the appropriate floor.

During return to the selected floor, car and landing calls are cancelled, and immobilised. A Priority Service indicator is illuminated in the lift car, and on the selected landing.

On arrival at the selected floor the lift will open its doors to permit passenger exit.

The priority passenger then releases the priority key switch, enters the lift, and switches to Service Control (Car Preference).

The lift now operates under Service Control (constant pressure car push door operation) to carry out any journeys required.

When the Priority passenger is finished with the lift the ‘Service Control’ switch is removed to return the lift to Normal operation.

### Implementation

Terminal **SP1** is used to initiate Priority Control.
Terminals **LP1U – LP(n)U** are used for Priority Floor call selection.
Terminal **SCS** is used to implement Service Control.

Above is described for a single entrance door arrangement. If front and rear doors are used, then, following return of the lift to the priority floor, both entrances (if fitted) will open. This allows quick car evacuation by enabling priority passengers to enter the car through one entrance, while other existing passengers leave via the other entrance.

For Duplex operation both lifts operate to fulfil the priority demand, since it is not really known which lift will arrive at the Priority Floor location first.

Priority_Sup(gwm/2-3-01)

# MP500 EVACUATION CONTROL SUPPLEMENT

## INTRODUCTION

This supplement covers the application of the MP500 system when used in conjunction with a lift requiring EVACUATION CONTROL.

When the Evacuation Switch situated on the Main Floor landing is activated, the lift is returned to the Main Floor to park with doors open.

Once returned to the Main floor, the car will only move in response to constant pressure car calls (release of the car call push during closing results in door opening, and car call cancellation).

Landing calls may be registered to illuminate the landing call acceptance indicator, and flash the associated car call acceptance indicator. Whilst pressure is maintained on the Landing push, the Landing Call Demand buzzer is sounded in the car station. However registered Landing Calls will not control car movement, they will simply register demand indications to the car supervisor.

Landing Calls cancel when the car arrives at the appropriate landing.

## CONTROL IMPLEMENTATION

When Evacuation Control is required the following i/o functions are modified: -

1. The FCS input is used for Evacuation Control switch (hence no Fire Control is available).
2. The OP2 output is used to sound the Landing Demand buzzer.

In order to utilise the landing signal requirements during Evacuation control, all car and landing call inputs must be isolated from their associated call acceptance outputs (i.e. the linking of L_U to I_U, or CP_ to CA_ is not permitted).

**NOTE:** The above is a general description of the LCSL standard Evacuation Control. Specific contracts may vary in order to comply with local specific requirements.

GWM (9-12-99)

# MP500 SELECTIVE FRONT & REAR DOORS SUPPLEMENT

## INTRODUCTION

This supplement covers the application of the MP500 system when used in conjunction with a lift with SELECTIVE FRONT & REAR DOOR operation.

When Selective Front & Rear door operation is required the following extra functions are included: -

3. Separate RDOR, RDCR outputs to control the rear door contactors.
4. Separate HL, AGI outputs to control the rear Hall Lanterns & Gongs.
5. Separate CAR & LANDING call inputs for REAR push inputs.
6. Separate CAR & LANDING call outputs for REAR acceptance indicators.
7. Separate RSE, RDOP, RDLR/RDCP, RDOC inputs for REAR door controls.
8. Separate FCL, RCL inputs for Front & Rear close limit operation.

Standard control for the FRONT & REAR doors is such that both doors operate asynchronously based on call demand at any floor. If the lift arrives with a front call demand, then the front doors only open; if the lift arrives with a rear demand, then the rear doors only open; if the lift arrives with a front and rear demand then both doors open.

Independent controls are included for rear Hall Lanterns and Arrival Gongs, which will only operate in conjunction with rear door demands and door open functions.

When the lift is operating on Service Control the appropriate doors will operate dependant upon front / rear call demand. Once the situation arises whereby both front and rear doors are open, then both doors will operate in unison until closed.

Generally door close cycle conflict is rationalised by the door close limits. However, some situations such as a faulty lock contact may cause operation of the idle doors in order to permit full lock contact cycle for recovery procedures.

## CONTROL IMPLEMENTATION

Selective door operation requires extra inputs and outputs as detailed in TABLE 1.

The extra rear door control signals are fitted to standard MEX4 extension PCB's in blocks of 4 floors per board. All inputs and outputs associated with rear door operation use a supply source of 24V dc. Signals RDCR, RDOR, AGIR, HLIR are positive 24v source signals (allowing a 24v relay to be driven between the output signal and 0V.)

**PCB boards '1 & 2' must always be used since they contain the fundamental REAR DOOR control signals. Other boards may be omitted if rear call arrangements permit.**

Rear door extension I / O boards are plugged into the UPPER CPU I / O socket.

### TABLE 1. Rear Door Input & Output Signal Assignments

| BIT No. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| **1A Input** | FCL | RCL | ------- | RDOC | CP1R | CP2R | CP3R | CP4R |
| **1A Output** | RDCR | RDOR | ------- | ------- | CA1R | CA2R | CA3R | CA4R |
| **1B Input** | ------- | L2DR | L3DR | L4DR | L1UR | L2UR | L3UR | L4UR |
| **1B Output** | ------ | I2DR | I3DR | I4DR | I1UR | I2UR | I3UR | I4DR |
| **2A Input** | ------- | RDOP | RSE | RDLR | CP5R | CP6R | CP7R | CP8R |
| **2A Output** | AGIR | HLIR | ------- | -------- | CA5R | CA6R | CA7R | CA8R |
| **2B Input** | L5DR | L6DR | L7DR | L8DR | L5UR | L6UR | L7UR | L8UR |
| **2B Output** | I5DR | I6DR | I7DR | I8DR | I5UR | I6UR | I7UR | I8UR |
| **3A Input** | ------- | -------- | -------- | -------- | CP9R | CP10R | CP11R | CP12R |
| **3A Output** | ------- | -------- | -------- | -------- | CA9R | CA10R | CA11R | CA12R |
| **3B Input** | L9DR | L10DR | L11DR | L12DR | L9UR | L10UR | L11UR | L12UR |
| **3B Output** | I9DR | I10DR | I11DR | I12DR | I9UR | I10UR | I11UR | I12UR |
| **4A Input** | ------- | -------- | -------- | -------- | CP13R | CP14R | CP15R | CP16R |
| **4A Output** | ------- | -------- | -------- | -------- | CA13R | CA14R | CA15R | CA16R |
| **4B Input** | L13DR | L14DR | L15DR | L16DR | L13UR | L14UR | L15UR | L16UR |
| **4B Output** | I13DR | I14DR | I15DR | I16DR | I13UR | I14UR | I15UR | I16UR |

***TABLE 2. Rear Doors Address Allocations***

| *BOARD IDENTITY* | *ADDRESS LINKS* | *ADDRESS LOCATION* |
|---|---|---|

| | | |
|---|---|---|
| **BOARD 1** | **(X=A1), (Y=A0)** | **$8200** |
| BOARD 2 | (X=A3), (Y=A2) | $8201 |
| BOARD 3 | (X=A5), (Y=A4) | $8202 |
| BOARD 4 | (X=A7), (Y=A6) | $8203 |

GWM (21-12-98)

# MP500 ALTERNATE FIRE FLOOR CONTROL SUPPLEMENT

## INTRODUCTION

This supplement covers the application of the MP500 system when used in conjunction with a lift requiring ALTERNATE FIRE FLOOR CONTROL.

A Fire Return demand may be generated either for the MAIN FIRE FLOOR or the ALTERNATE FIRE FLOOR, via a suitable switch adjacent to the appropriate floor or remotely via a building services control system.

Upon operation of a Fire Return Demand the lift will move automatically to the appropriate selected Main / Alternate Fire Floor. If the Alternate Fire Floor and the Main Fire Floor are selected simultaneously then the Alternate Fire Floor will take preference.

Once returned to the Fire / Alternate floor, the car will only move in response to constant pressure car calls (release of the car call push during closing results in door opening, and car call cancellation). All landing call operation is suspended.

If a lift is returning under control to the Main Fire Floor and the Alternate Fire Floor demand is established before the lift stops at the Main Fire Floor then the Alternate Fire Floor takes control preference.

Once the lift has completed its return to the selected Fire Floor then it will not move automatically to the other Fire Floor until all Fire return switches are released.

## CONTROL IMPLEMENTATION

When Alternate Fire Control is required the following i/o functions are modified: -

1. The 'FCS' input is used to return the lift to the Main Fire Floor to commence Fire Control operations
2. The 'SP1' input is used to return the lift to the Alternate Fire Floor to commence Fire Control operations.

Because 'SP1' input is used for Alternate Fire Switch input, this feature can only be used with MP500 system ('SP1' input is not available with MP500E system).

**NOTE:** The above is a general description of the LCSL standard Alternate Fire Control. Specific contracts may vary in order to comply with local specific requirements.

GWM (30-9-04)