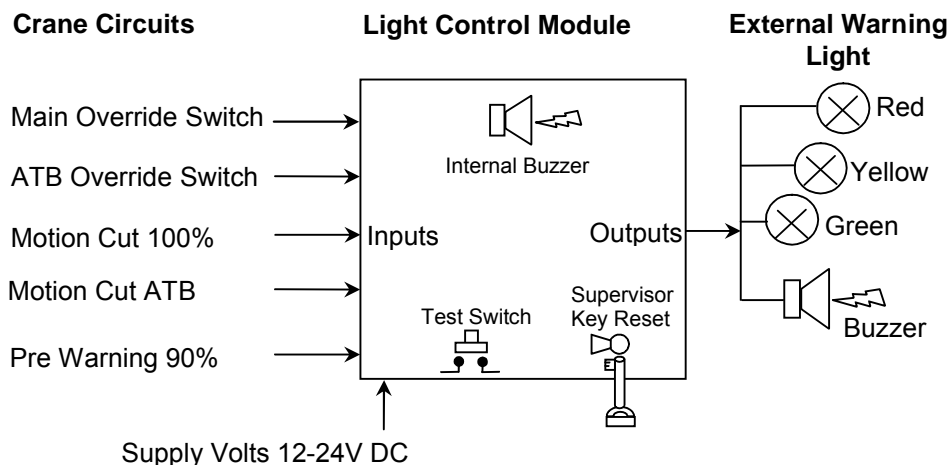


Microtec MkII Thiess Latching Light Control Module Overview

General.

The Microtec Latching Light Control Module is a simple but intelligent interface device designed to simplify the task of driving external warning lights on cranes and similar industrial equipment to satisfy Thiess requirements. The module controls the state of an external warning light based on inputs wired into the module from the crane wiring and load control systems. The inputs of the Light Control Module are designed to be as versatile as possible accepting a wide variety of input types. The module incorporates a latching function allowing supervisor reset of violation alarms, and a non latching push button input for instant system test.

Fig.1 Block Diagram.



Outputs.

There are a variety of external warning light units available from different manufacturers and the Microtec Light Control Module is designed to be compatible with any currently available. The Module utilises eight solid state outputs to output both "switched supply" and 'switched ground' with sufficient current to drive lights and buzzers directly, eliminating the need for output relays in the vast majority of cases. All output channels are user configurable for steady state or pulsing output.

Inputs.

Six inputs are available for independent connection to existing crane systems. The high impedance inputs may be configured by the user for active High or active Low signals and the trigger voltage set to accommodate the particular application. On board Pull up resistors simplify installation on dry contact systems and digital input filtering eliminates problems arising from pulsing inputs from crane buzzers etc.

Module Termination

Connections to your Light Control Module split into 3 clearly defined groups. This section details the connections, the operational logic behind them, and provides electrical detail and examples.

Supply.

The main power supply into the Module. Designed for connection to 12 or 24V DC vehicle supplies. The input current supplies the module and the external warning light / buzzer, so that only a negligible signal current is drawn from circuits connected to the module inputs.

Note. Ensure that your warning Light is compatible with your vehicle supply voltage.

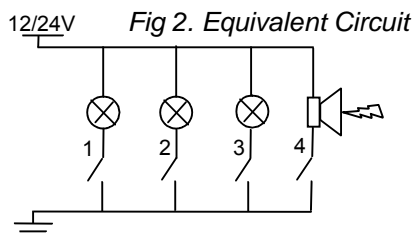
GND Terminal connected directly to chassis earth or battery – terminal.

12/24V Connected to a supply that is powered **only** when the crane function is active. Typically this supply is tapped from the PTO switch or the load computer supply. Some cranes, notably the Franna, enable the crane function when the gearbox is placed into Low Range.

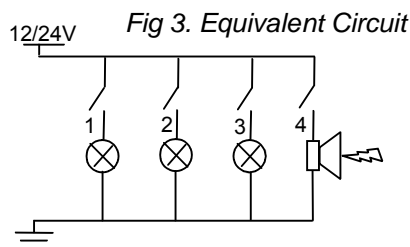
The incoming supply should be appropriately fuse protected.

Outputs.

There are two sets of 4 light outputs. One set of outputs switch 12/24V supply out and the other set switches *GND*. The outputs are intended for direct connection to 3 warning lights plus a buzzer. Permanent Supply and GND terminals are also provided for ease of termination. In each case the set of 4 outputs plus common are grouped together as a set.



GND Outputs 1,2,3,& 4, switch to GND when activated. When GND outputs are used the common terminal of the light fitting should be connected to the common 12/24V terminal provided.



12/24V Outputs 1,2,3,& 4, switch to supply when activated. When Supply outputs are used the common terminal of the light fitting should be connected to the common GND terminal provided.

Combinations of the above connections may be used to increase the capacity or versatility of the module. In both cases the external warning lights should be connected as follows:

Output 1. **Green**
Output 2. **Yellow**

Output 3. **Red**
 Output 4. **Buzzer**

Simplified time saving wiring instructions for many of the commonly available external warning lights are available from www.microteceng.com.au.

Inputs.

There are 6 input terminals for direct connection to external circuits. The external circuits are monitored for a voltage change from which the appropriate light output is activated. A GND reference connection is also available on the input connector.

The 5V terminal is not used in normal applications.

Operational Logic.

As can be seen in *Figure 1*, there are many differing input possibilities depending on the specific crane, but the basic output requirements are always as follows:

Fig. 4 Working States

Condition	Output	Active input
Normal working state	1 - Green	None
90% (<i>Pre warning</i>)	2 - Yellow	1 (Only)
100% (<i>Motion cut</i>) or other unsafe operation. (<i>ATB alarm, overrides etc</i>)	3&4 - Red + Buzzer Latches On after timed Setup period.	2,3,4,5,& 6 (Any Input or Combination of inputs with priority over 1)

- The default condition without active inputs is Green so there is no Green input.
- Input number 1 triggers the Yellow 90% Pre Warning Light output.
- Input numbers 2,3,4,5,& 6, trigger the Red and Buzzer outputs and *take priority over input 1* (Yellow 90%).
- The module operates in a non latching & silent state for a timed setup period. After this time has elapsed the module reverts to latching operation. In this state any unsafe operation present for more than 2 seconds will latch Red + Buzzer, pending a reset from the supervisors Key.
- The Test Button activates Red + Buzzer and never latches.

Electrical Inputs.

Each input must be presented with a voltage change to trigger an output. The inputs are triggered when the monitored voltage crosses the configured threshold voltage. The threshold voltage is 3V when configured for normal sensitivity and 1V when configured for high sensitivity.

Example Input.

If a red light is required when a crane safety system is placed in override we must first look for a changing voltage corresponding to the override "event".

A circuit that is normally at 0V and rises to 24V supply (normally low), or a circuit that is normally at 24V supply and falls to 0V (normally high) are equally as useful to us.

In some cases a full supply voltage change cannot be found such as when tapping into panel warning light circuits, in this case look for the largest voltage change.

Providing the voltage change crosses the configured threshold voltage of 1V or 3V the module will reliably detect the voltage change and the event.

Pull Up Resistors.

Occasionally a spare switch or relay contact will be available that closes to GND on the event but normally remains unconnected or 'floating'. The module Inputs are normally biased to GND and will see no change when connected to such an input. For these occasions on board pull up resistors are provided to simplify installation. Switch on the appropriate input channel Pull Up, this will provide a normally high voltage to the input that will switch to GND on the event.

Configuring Your Light Control Module

Your module has a number of configuration options that further improve the versatility of the unit. This section covers the options available and how to change them.

Options

- Each of the 6 inputs may be set to normally **High** or normally **Low** input polarity.
- Each of the 6 inputs may be set to **Normal sensitivity** threshold voltage of **3V** or to **High sensitivity** threshold voltage of **1V**.
- Each of the outputs may be set to provide a **steady** or **flashing** output.

Configuration

All configuration options are available via the Settings and Mode switches on the module. Each group of settings are accessed by entering the appropriate Mode, the required settings may then be entered via the Settings switches.

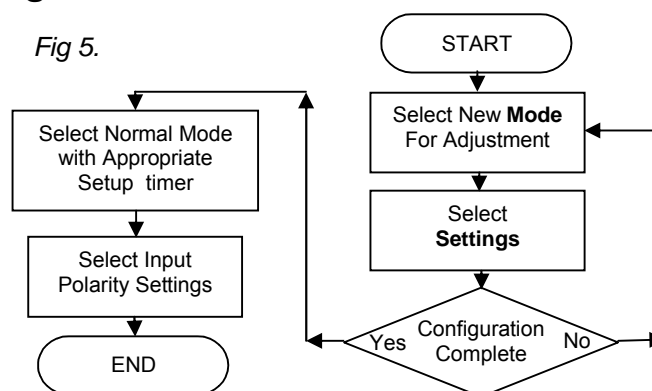
The LED along side the Mode switch indicates the current Mode.

The current Settings switch states are saved into memory when the Mode is changed.

When configuration is complete return to Normal Mode and set the desired input Polarity for each input channel. Input polarity changes take immediate effect.

Note. Unused input channels should have Pull Ups turned off and must be set to Normally Low input polarity (Off).

Module Configuration Flow Chart.



Switch Configuration Table.

Fig. 6

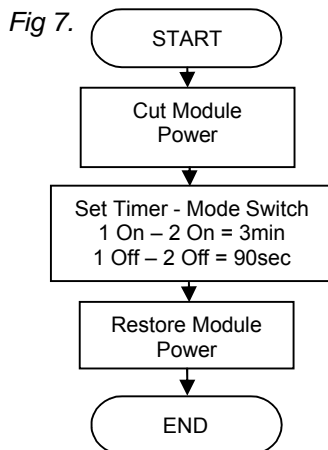
Operation Mode LED pattern	Mode Switch		Settings Switch On Each Channel	Settings Switch Off Each Channel
	1	2		
Normal (Input Polarity) Flash 1 second	Off	Off	Input Normally High (1 - 6)	Input Normally Low (1 - 6)
	90 sec timer			
Normal (Input Polarity) Flash 1 second	On	On	Input Normally High (1 - 6)	Input Normally Low (1 - 6)
	3 min timer			
Input Sensitivity Pulse ¼ second	On	Off	Input High Sensitivity 1V (1 - 6)	Input Normal Sensitivity 3V (1 - 6)
Output state Pulse ¼ second	Off	On	Output Flash (1 - 4)	Output Steady (1 - 4)

Setup Timer Function

The module incorporates a “latch function” setup delay timer that allows the driver to use the override and other non safe functions during crane setup. The buzzer output and latching function do not operate during this setup period. The timed period starts each time the module is powered and must be set for the appropriate machine type. The Setup Timer period is determined by the position of the Mode switches in the normal operating state.

Tele handlers and Franna style cranes must be set to 90 seconds, full size cranes with outriggers must be set to 3 minutes. If in doubt check with your work site supervisor.

Adjusting the Timer Period



Power down the module to make changes. The new timer interval will take effect on power up.

Enter the desired 'Setup Timer' period from the table below. Set the time appropriately for the crane type.

Tele handlers and Franna style cranes should be set to 90sec. Full size cranes should be set to 3 minutes.

Mode Switch	1	2
3 Minutes (Full Size Crane)	On	On
90 Seconds (Franna)	Off	Off

Specifications.

Hardware

Dimensions including enclosure. 115 X 65 X 41

Enclosure Material ABS

Enclosure Protection Rating IP53 (Appropriately Oriented)

Mounting Adhesive pads supplied / Screws M4 X2

Connection Power 2 Pole 5mm Pitch Screw Terminal

Connection Outputs 10 Pole 5mm Pitch Screw Terminal

Connection Inputs 8 Pole 5mm Pitch Screw Terminal

Terminal Capacity 4mm² or 12AWG Max

Electrical

Control System Microprocessor

Reverse Polarity Protection Yes

Input Voltage	12 - 24V DC Vehicle Supply
Board consumption	≤ 20mA
Supply Transient Input Protection	Yes
Output Switched Supply	Yes
Output Drive Current / Source	1A each output
Output Switched GND	Yes
Output Drive Current / Sink	1A per output
Input current load	≈ 0.5 mA @ 24V
Input DC Resistance	≈ 66kΩ
Input Trigger Threshold	1V & 3V <i>User Configurable</i>
Input Polarity	Normally High or Low <i>User Configurable</i>
Setup Timer (<i>Non Latching Silent Period</i>)	90 Seconds or 3 Minutes <i>User Configurable</i>

Final Test

On completion of your installation the following test sequence should be followed to ensure full and correct operation.

- 1/ Set up the crane in a safe working condition.
- 2/ Power down the crane.
- 3/ Start up the crane in **travel** mode. *The external warning light should **not** light up.*
- 4/ Put the crane into **crane** mode and begin to time your unit. *The external warning light should light up Green.*
- 5/ "Within your selected setup timer period" activate an override and **hold**. (ATB or Motion Cut) *After a 2 second delay the red light only should activate.*
- 6/ "Within your selected setup timer period" release the override. *The Green light should activate.*
- 7/ "Within your selected setup timer period" re activate the override and **hold** again. *After a 2 second delay the red light only should activate. **Continue to hold.***
- 8/ When the selected setup timer period elapses the buzzer should sound and the module will latch Red with Buzzer. De activate the override, *Red with Buzzer will continue.*
- 9/ Use the supervisor key to reset the module. *The external warning light should light up Green.*
- 10/ Load or simulate a 100% load. *After a 2 second delay the external warning light should light up Red with Buzzer and latch.*
- 11/ Test any remaining override inputs to ensure that they show a violation.
- 12/ Load or simulate a 90% load. *The external warning light should light up Yellow.*

Note 1. It is not always possible to derive a 90% electrical output from a crane load system and in these cases a non functional yellow aspect is acceptable.