CS-200

PORTABLE TRAFFIC LIGHT CONTROLLER

(Software 1.05)

OPERATION AND SERVICE MANUAL

Manufactured by:

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CS-200 - SPECIFICATIONS

Electrical

Power supply voltage	11v - 18v
Current consumption (13.8v)	1A (Tx on, lights off)
Max lamp drive current	6A
Max AUX lamp drive current	5A
Temperature	-15 Deg to 60 Deg C.
Dimensions	Width 275mm Depth 270mm Height 100mm
Weight	Master 4.2Kg Slave 3.4Kg
Generator fail voltage level	13v
Generator start voltage	<11.5V
Low voltage level	<11V (Unit goes to Flash Yellow)
Fatal voltage level	<10V (Unit turns off)

Operational Specifications

1 way operation	
2 way operation (Manual return)	User inhibit if req.
2 way operation (Auto return)	(Not allowed in NSW)
Time entry	Keypad
Mode selection	Keypad
Min. and Max. times	Preset (as requested)
Distance apart	Radio 1000m (LOS) Cable 50m
Max. Lantern Visual Range	100m

Alarms

Fault response time	Faulty Unit	< 1sec.
	Other Unit	< 2 sec
Low voltage		< 10sec.
Communications		< 5sec.
Audible alarm ON time		5min.

Transmitter

Power output	1 watt
RF Freq-1	151.4MHz
RF Freq-2	151.575MHz (must obtain permission) **
Deviation	3.0KHZ
Modulation	FM
Data format	FSK (V23 Standard)

**** MUST obtain permission from the ACMA government agency in your state to use RF Freq-2**

OPERATIONAL FEATURES

* 1 way operation
  - Flash YELLOW
  - Manual
  - Auto (Time mode)
  - Normal (Vehicle actuated mode)

* 2 way operation
  - Manual return
  - Auto return (Not allowed in NSW)

* "Cable Manual Controller" can be operated up to 100m from the master unit.

* "Radio Manual Remote Controller" is available as an option.

* Times displayed in seconds or minutes and seconds.

* All times easily entered and stored automatically in computer memory. (EEPROM.)

* Demand indication for setting up vehicle detection.

* Battery charge indication and generator fail detection.

* Accurate battery voltage of both master and slave available on the main control panel.

* Fault description displayed on Liquid Crystal Display.

* "Radio" or "Cable" interconnection. (Cable mode not available in NSW)

* Auxiliary lamp on the back of the target board.

* Hour meter is available as an option.

* Two RF frequencies are available as an option.

* Auto Generator Start control line (Not available in NSW)

MAINTENANCE FACILITIES

* Inbuilt fault log.

* Lanterns can be turned off for setup or maintenance.

* Easy motherboard replacement.

* Readily available components are used.

* Australian made for support and spare parts.

FRONT PANEL INDICATORS

The indicators used are solid state Ultra Bright, 5mm dia. LED's mounted in black plated brass bezel. All the indicators listed below are provided on both Master and Slave.

Power Indicators

Charge - Indicates that the generator is charging the battery.

Lantern Indicators

These indicators show the condition of the lanterns for both the Master and Slave. They have been arranged and coloured to represent each signal lantern.

Status Indicators

Transmit - Indicates that the unit is transmitting data.

Receive - Indicates that the unit is receiving valid data.

Demand - Indicates the actual demand received from the vehicle detector. Used to test and adjust the vehicle detector.

Remote - Indicates that the unit is receiving valid data from the Radio Manual Controller and is used to check the operation of this unit.
(Radio Manual Controller is an option)

MODES OF OPERATION

1. One-Way Lane Traffic Control

a. FLASH YELLOW

There are three ways the system can enter this mode:-

1. When the Master or Slave is turned on, this mode is automatically selected.
2. If a fault condition is detected.
3. Selected by pressing the "FLASH" mode button.

b. Manual-1

A small handheld cabled controller is used to control all manual functions. It is connected to the Master Control panel via a 50 meter 4 core cable which can be extended to 100 meters.
The manual controller has three buttons:-

- STOP
- MASTER GREEN
- SLAVE GREEN

Indication of the state of the traffic lights is also provided. This indication will flash if a button is operated while the system is in a MINIMUM TIME period or RED CLEARANCE TIME. This is important due to the fact that the minimum green and red times cannot be overridden and some indication needs to be given to the operator that the system has received the command but is waiting for a minimum time.

To select this mode, press the "MANUAL" mode button on the Master unit. The system is now under the control of the manual controller. Pressing the "STOP" button will terminate the running phase which will go to RED. Both phases will stay on RED until a "MASTER GREEN" or "SLAVE GREEN" button is pressed. (Note that the pre-set RED TIMES cannot be overridden.) While the Master is green, pressing the "SLAVE GREEN" button will have no effect and vice versa.

c. AUTO (Time mode)

This mode is used to control a single lane of traffic where preset timers are used to regulate stop and go times. Times are entered on the keypad and assigned to the appropriate timers.

All times are displayed on the LCD and automatically stored in memory when the system is turned off. This alleviates the need to re-enter the times every time the system is turned on.

Before entering this mode, RED and GREEN times must be determined and entered into the Master unit. To set, use the keypad at the Master unit to enter the time, then press the required TIME SETTING key. (eg. Master Red Time)

Once the times have been entered, press the "AUTO" mode button. If the system is in "FLASH YELLOW" when the "AUTO" button is pressed then both phases will go to RED and traffic will be controlled in accordance with the preset times. If the system is in "NORMAL" mode when the "AUTO" button is pressed, then the present cycle will be allowed to finish before the "AUTO" mode takes control.

d. NORMAL (Vehicle-actuated mode)

This mode is used to control a single lane of traffic where vehicle detectors are used in conjunction with preset timers. When a moving vehicle is detected a demand is stored, displayed on the LCD and used to control traffic flow.

Before entering this mode, RED and GREEN times must be determined and entered into the Master unit. To set, use the keypad at the Master unit to enter the time, then press the required TIME SETTING key. (eg. Master Red Time)

Once the times have been entered, press the "NORMAL" mode button. The system automatically registers an artificial demand for each phase for the first cycle, and then allows the control of traffic in accordance with the detected vehicle flow and the times that have been preset.

If the vehicle detector is not connected an alarm will occur and the system will not select this mode.

NOTE 1 :- The type of vehicle sensor used will detect movement only. It is therefore possible for a vehicle to be waiting and not have been detected. If this is deemed to be a problem, the sensor can be modified to produce a pulse every 2.5 minutes. Contact supplier for details.

NOTE 2 :- Systems are supplied with detectors operating on a frequency of 10.525Ghz which do not require an individual licence. Systems may be supplied (ON REQUEST) with detectors operating on a frequency of 10.587Ghz, but these units will require an individual licence.

NOTE 3 :- Check at least once a year that frequencies and licences are still valid.

2. Two-way traffic control

a. Manual-2 (Manual Return)

This mode of operation is used where traffic is flowing in both directions and road plant requires to cross or have access to the carriage-way. The CS-200, when in this mode, is under the control of either the CABLED MANUAL CONTROLLER or a PORTABLE RADIO MANUAL CONTROLLER (optional) which can be used from a truck, tractor or around the work-site. Both the Master and Slave show GREEN allowing traffic flow in both directions. When the Master unit receives a "STOP" command, both the Master and Slave go to RED. This condition will remain until the Master unit receives a "GO" command, where upon the Master and Slave go back to GREEN

b. "Manual-3" (Auto return) - Not allowed in NSW

This mode of operation is used where traffic is flowing in both directions and road plant or other vehicles are leaving a work area and find it difficult to enter a busy carriage-way. The CS-200, when in this mode, would have the CABLED MANUAL CONTROLLER or PORTABLE RADIO MANUAL CONTROLLER (optional) positioned so the driver of the vehicle wishing to enter the carriage way can operate the "STOP" button. Both the Master and Slave show GREEN allowing traffic flow in both directions. When the driver presses the " STOP" button both the Master and Slave go to RED. After a preset time, set by the "Master Red time", the Master and Slave go back to GREEN.

c. Selection

To select a two-way mode the system is required to be in a "FLASH YELLOW" and a special sequence of keystrokes must then be performed. The sequence is as follows :-

MANUAL 2 = 022 "MANUAL"
MANUAL 3 = 033 "MANUAL"

When changing to "MANUAL 2 or 3" mode the lanterns at both ends will go to GREEN. The system is then under manual control only.

To go back to MANUAL 1 (One-way operation), turn the Master off and on.

d. Software Security

The "Two-way mode" can be inhibited by the use of special codes, therefore preventing their use at a work-site.

To enable

Enter: 614 "YELLOW TIME" (Security key open)
642 "YELLOW TIME" (Manual 2 enable)
644 "YELLOW TIME" (Manual 3 enable)
615 "YELLOW TIME" (Security key close)

To inhibit

Enter: 614 "YELLOW TIME" (Security key open)
643 "YELLOW TIME" (Manual 2 inhibit)
645 "YELLOW TIME" (Manual 3 inhibit)
615 "YELLOW TIME" (Security key close)

Trying to select MANUAL 2 or 3 when it has been inhibited will result in FUNCTION DISABLED being displayed on the LCD.

e. Hardware Security

A key lock is provided on the back of the MASTER controller to disable the TWO-WAY modes and will override all software options.

OPERATIONAL FEATURES

1. Lantern Inhibit.

The CS-200 may be placed into a condition where the system functions normally with the exception that the lanterns remain blacked out. The system must be in FLASH YELLOW before this mode can be selected and will return to FLASH YELLOW when lanterns are enabled again. The main use of this mode is in the setup and testing of the system while the units are positioned on the side of the carriageway. To select or de-select this mode , select FLASH YELLOW when press :-

Enter: 800 "YELLOW TIME" (Lanterns OFF)
801 "YELLOW TIME" (Lanterns ON)

2. Time displays.

The system is supplied with all times displayed in seconds but they may be displayed in minutes and seconds if required. The procedure to change displays is as follows:

Enter: 614 "YELLOW TIME" (Security open)
640 "YELLOW TIME" (Minutes and seconds)
641 "YELLOW TIME" (Seconds)
615 "YELLOW TIME" (Security close)

3. Min. and Max. Times

Minimum and maximum times are factory set to RTA specifications.

4. No. of signal lanterns.

A separate connector is provided on the side of the CS-200 in both the Master and Slave to provide auxiliary drives to a second controller called a CS-200R. This controller must provide its own power for the lamps.

5. GREEN Running Period when in "NORMAL" mode.

When a vehicle actuates a detector, the demand is processed and that phase will go to GREEN as soon as possible depending on the state of the opposite phase and the preset RED time. After the MIN. GREEN TIME has expired on the running phase, the GREEN aspect is extended by a vehicle while it is actuating the detector and for a period of 5sec. following the termination of the vehicle detector output. At the end of this extension period, and if there have been no further actuations on the running phase in this time, this phase will go to RED. If a vehicle actuates a detector as it approaches a RED PHASE and the other phase is GREEN and being extended, a demand is stored and the MAX GREEN TIMER of the running phase is started. When this timer expires, the controller will service the other phase.

6. Maximum Reversion when in "NORMAL" mode.

In the event of the GREEN period being terminated by the operation of the "MAXIMUM GREEN TIMER", a demand is stored for that phase and is acted upon as soon as traffic on the other phase permits.

7. State-of-signal Indicators.

On both Master and Slave, coloured ultra bright LED's (which represent the lanterns) provide indication of which aspect is on. Any faulty lamp will be indicated by an error display on the LCD.

eg: MASTER RED GLOBE FAILURE.

8. Generator Audible Alarm.

The audible alarm for GENERATOR FAIL alarm can be inhibited while the generator is being serviced.

Enter:	700	"YELLOW TIME"	(Generator Audible Alarm OFF)
	701	"YELLOW TIME"	(Generator Audible Alarm ON)

9. Auxiliary Lamp.

The auxiliary lamp is positioned behind the target board and provides indication to the operator when that unit is showing RED. To allow low power consumption at night, the Auxiliary lamp may be turned off and on as follows:-

Enter:	500	"YELLOW TIME"	(Aux lamp OFF)	(Not in NSW)
	501	"YELLOW TIME"	(Aux lamp ON)	(Not in NSW)

10. Transmitter 'ON' facility.

The transmitter can be forced to stay on for 15 seconds to allow the testing of its output as well as the condition of the aerial. To initiate this facility

Select	FLASH YELLOW		
Enter:	614	"YELLOW TIME"	(Open Security)
	609	"YELLOW TIME"	(Master Tx on)
	610	"YELLOW TIME"	(Slave Tx on)
	611	"YELLOW TIME"	(Remote Tx on)
	615	"YELLOW TIME"	(Close security)

11. Hour Meter

This facility is an option and may be purchased at any time. To reset meter

Enter:	614	"YELLOW TIME"	(Open Security)
	646	"YELLOW TIME"	(Reset Meter)
	615	"YELLOW TIME"	(Close Security)
View	902	“YELLOW TIME”	

12. RF Channel Selection

This facility is an option and may be purchased at any time. To change the RF channel

Select	FLASH YELLOW		
Enter:	614	"YELLOW TIME"	(Open Security)
	647	"YELLOW TIME"	(Channel 1)
	648	"YELLOW TIME"	(Channel 2)
	615	"YELLOW TIME"	(Close Security)

Note:- 1. A licence needs to be purchased from the ACMA government agency in your state
Note:- 2. Permission to use channel 2 needs to be obtained from the ACMA government in your state

13. Generator Run Time

When the controller senses that the battery voltage is below 11.5V for a period of approx. 10 seconds, a relay is operated to start the generator. The relay is operated for a pre-set time set by the operator. To set:

Enter:	614	"YELLOW TIME"	(Open Security)
	Key in the amount of time (in minutes) the generator is to run		
	Clear		
	630	"YELLOW TIME"	(Memorise the time)
	615	"YELLOW TIME"	(Close Security)
To view Enter:	903	"YELLOW TIME"	

MAINTENANCE LOG

The CS-200 has an inbuilt logging system which can be helpful for field maintenance but is intended mainly for base maintenance. Access is from the keypad by entering a special code to select the required information.
To prevent the "System Unreliable" alarm being invoked during setup or testing, a "Fault Free" period of 3 minutes has to expire before faults are counted for this alarm.

To clear System Log Enter: 999 "YELLOW TIME"

To select System Log Enter: 900 "YELLOW TIME"

Codes	Description
M DEAD VOLT	Master battery below 10v.
M LOW VOLT	Master battery below 11v.
M GEN FAIL	Master generator stopped during normal operation.
M LINK FAIL	Master not receiving Slave.
M RED FAIL	Master red globe failure.
M YELLOW FAIL	Master yellow globe failure.
M GREEN FAIL	Master green globe failure.
M SENSOR FAIL	Master vehicle sensor not connected.
M LANTERN FAIL	Master lanterns not connected or inverter failure
M REMOTE FAIL	Master remote lantern failure
M FATAL ERROR	Master fatal error. (System dead or two globes on)
S DEAD VOLT	Slave battery below 10v.
S LOW VOLT	Slave battery below 11v.
S GEN FAIL	Slave generator stopped during normal operation.
S LINK FAIL	Slave not receiving Master.
S RED FAIL	Slave red globe failure.
S YELLOW FAIL	Slave yellow globe failure.
S GREEN FAIL	Slave green globe failure.
S SENSOR FAIL	Slave vehicle sensor not connected.
S LANTERN FAIL	Slave lanterns not connected or inverter failure
S REMOTE FAIL	Slave remote lantern failure
S FATAL ERROR	Slave fatal error. (System dead or two globes on)
UNRELIABLE	Five alarms have occurred in the last 20 minutes.

SYSTEM MIN. AND MAX. TIMES

Enter: 901 "YELLOW TIME"

The LCD will display the MIN. and MAX. times that have been programmed into the system.

SOFTWARE VERSION AND SERIAL NO.

Enter: 902 "YELLOW TIME"
The LCD will display: Model No.
Software Version
Serial No.
Hour Meter

GENERATOR RUN TIME

Enter: 903 "YELLOW TIME"
The LCD will display: The amount of time the generator will run.

CS-200 COMMAND TABLE SUMMARY

900	System log
901	System times
902	Software version
903	Generator Run Time
999	Clear log
800	Lanterns OFF
801	Lanterns ON
700	Generator Fail Audible Alarm OFF
701	Generator Fail Audible Alarm ON
600	Program Remote
609	Master Tx on
610	Slave Tx on
611	Remote Tx on
614	Security key open
615	Security key close
630	Set Generator Run Time
640	Minutes display
641	Seconds display
642	Manual 2 enable
643	Manual 2 inhibit
644	Manual 3 enable
645	Manual 3 inhibit
646	Hour meter reset
647	CH 1
648	CH 2
500	Aux Light OFF (Not in NSW)
501	Aux Light ON

CS-200 Trouble Shooting

If you hear an alarm:-

1. - Look around the site and notice :-

A. - What type of day.?	- Hot (Temp?) - Cold - Wet
B. - Any big trucks near units.?	- Yes - No
C. - How far apart are the units.?	-
D. - Are the units.	- In line of site? - Over a hill? - Around a treed corner? - Around a hill ?
E. - Was there anyone transmitting nearby.?	- What frequency?
F. - Are the controllers in direct sunlight.?	- Yes - No
G.- Are the aerials connected?	- Yes - No
H.- Has the slave been turned on properly	-Yes -No

2. - Turn alarm off by pressing " clear "

3. - Press "902" YELLOW TIME and record
   - Software version
   - Serial number

4. - Press "900" YELLOW TIME and record log.
   - 3
   - 2
   - 1

A. - M DEAD VOLTS or S DEAD VOLTS

Indicates that the battery is below 10v and **the system will turn itself off.**

Possible Causes

- System running too long on batteries.
- Battery terminals making poor connection.

B. - M LOW VOLTS or S LOW VOLTS

Indicates that the battery is below 11v and the system will automatically go to " FLASH YELLOW "

Possible Causes

- System running too long on batteries.
- Batteries in poor condition.
- Generator not charging battery.
- Battery terminals making poor connection.

C. - M GEN. FAIL or S GEN. FAIL

* Indicates that the generator was charging the battery but **is now not** charging the battery.
* The system will be running on batteries and the traffic flow **will not** be affected.
* This alarm may be inhibited by pressing "700" YELLOW TIME.
(This is to allow the motor to be turned off for refuelling or maintenance)

Possible Causes
- Motor run out of fuel.
- Generator not working.
- Broken wires or poor connection to battery.

NOTE :-
The generator output should be approx 13.8v. When the generator stops, the battery voltage drops to approx 12v. The controller detects the change between 13v and 12.9v and brings up the Generator Fail alarm. You may notice that it can take up to 2 minute for the alarm to occur after the generator stops. This is due to the fact that the battery voltage drops from the charging voltage to 12v quite slowly, the time taken depending on the load and condition of the battery.

D. - M LINK FAIL or S LINK FAIL

Indicates that the radio communication between the master and slave is faulty.

How far you can receive a signal depends on :-

1. - Frequency	- Lower the frequency the further the transmission.
2. - Power output	- Higher the power the further the transmission.
3. - Aerial	- Better the aerial the further the transmission.
4.- Ground plane	- Larger the ground plane the further the transmission. (Ground is the metal area at the base of the aerial.) (Some aerials are designed to work without a ground plane)
5. - Receiver sensitivity	- Better sensitivity the further the transmission.
6. - Data or speech.	- The transmission path for computer data must be far better than for speech

NOTE :- If the transmission path is obstructed by earth or rocks then the system **will be unreliable**

OBSERVE
Is the "Receive" light on the **SLAVE** unit flashing.? - Yes
(Helps us to know where to look) - No

CHECK
- Aerials.
- Aerial leads.
- If possible do a VSWR measurement on aerials
- Does the system work if the generators are turned off.?
- Does the system work if the units are closer together.?

E. - M RED FAIL of S RED FAIL (also for yellow and green lamps)

Indicate that the red lamp or the wiring to the red globe is open circuit.

CHECK
- Lamp
- That the lamp socket is not corroded.
- Wiring in lantern connector is ok.

- Swap the controllers eg. Put the master controller in the slave trailer and vice versa. Does the fault stay with the CONTROLLER ? - Yes
- No

F. - M SENSOR FAIL of S SENSOR FAIL

Indicates that the vehicle detector is not connected to the controller.
Will only occur in "NORMAL" mode.

CHECK

- All connectors are tight.
- Wiring is ok.

NOTE: -

The audible alarm is inhibited when you first select "NORMAL" mode.

G. - M LANTERN FAIL of S LANTERN FAIL

Indicates that the lanterns are not connected to the controller.

H. - M FATAL ERROR or S FATAL ERROR

Indicates 1 - The computer inside the controller is faulty.
2 - Two or more lamps are on at the same time.

CHECK

- Lantern connector (wiring)
- Lantern wiring

- Swap the controllers eg. Put the master controller in the slave trailer and vice versa. Does the fault stay with the CONTROLLER ? - Yes
- No

I. - Unreliable

Occurs when there has been 5 errors in the last 20 minutes.
Indicates that the transmission path is not reliable and should be attended to.