MASTER CAUTION AND WARNING SYSTEM - DESCRIPTION AND OPERATION

1. General (Figure 1)

The master caution and warning system serves two purposes: the first is to provide dimmable power for the aircraft system caution, warning and safe indication and advisory lights; the second is to provide an indication to the flight crew when certain system malfunctions occur. An additional indication is provided by the two flashing MASTER CAUTION PRESS TO RESET lights located on the glareshield, and by the appropriate annunciator on the 8 or 10 channel annunciator panels.

Aircraft system caution lights are divided into two categories: annunciated and unannunciated. Annunciated caution lights cause the appropriate system annunciator on the 8 or 10 channel annunciator panel to come on and the MASTER CAUTION PRESS TO RESET lights to flash. The annunciator on the 8 or 10 channel annunciator panel identifies the system in which the malfunction has occurred. Unannunciated caution lights are not annunciated on the 8 or 10 channel annunciator panel and do not trigger the MASTER CAUTION PRESS TO RESET lights.

Aircraft system warning and safe indication and advisory lights are not annunciated on the 8 or 10 channel annunciator panel and do not trigger the MASTER CAUTION PRESS TO RESET lights.

The 10 channel annunciator panel provides the controls for dimming and testing the 8 and 10 channel annunciator panel annunciators, the two MASTER CAUTION PRESS TO RESET lights and the aircraft system lights. A recall function is also provided, permitting a reset caution annunciation to be recalled on the 8 or 10 channel annunciator panel.

Three remote test switches, located on the pilot's facia panel, copilot's facia panel and the centre pedestal are provided for testing all the master caution related lights.

2. Description (Figure 2)

The master caution and warning system consists of the following components:

10 channel annunciator panel

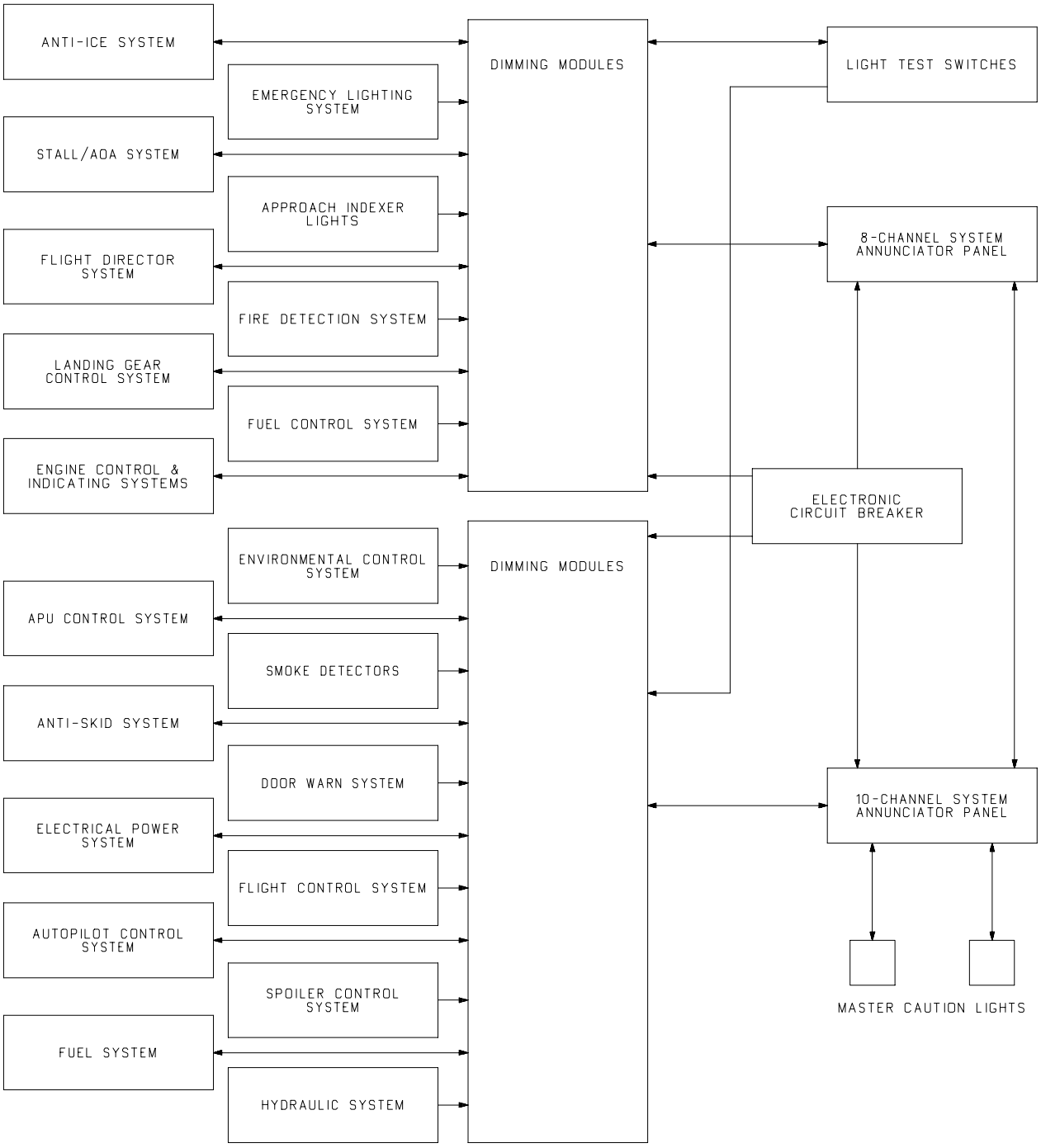
8 channel annunciator panel

Two dimming module assemblies

Electronic circuit breaker unit

Two master caution lights

Three light test switches



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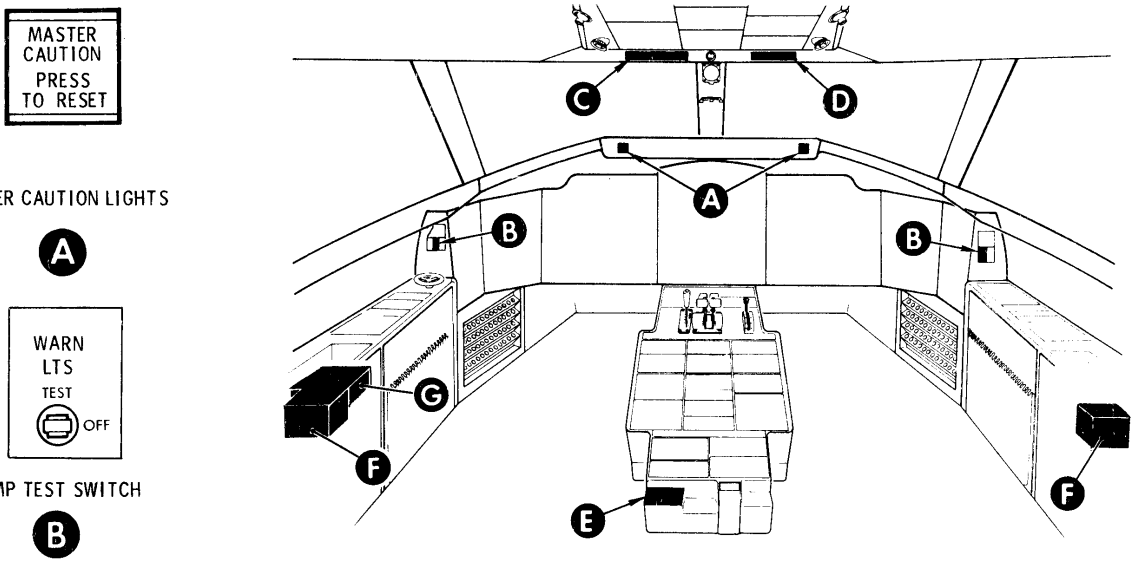
Master Caution and Warning System – Block Diagram
Figure 1



ANTI-ICE	APU	ENV. CONT	HYD	AUTO CB FAIL	TEST / RECALL	BRT / DIM
	ANTI-SKID	MLG BAY OVHT FAIL				

10-CHANNEL SYSTEM ANNUNCIATOR PANEL

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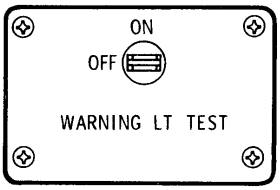
DOORS	ELEC	ENGINE	FLT CONT
FUEL	FIRE FAULT	WOW	EMERG LTG FLT REC

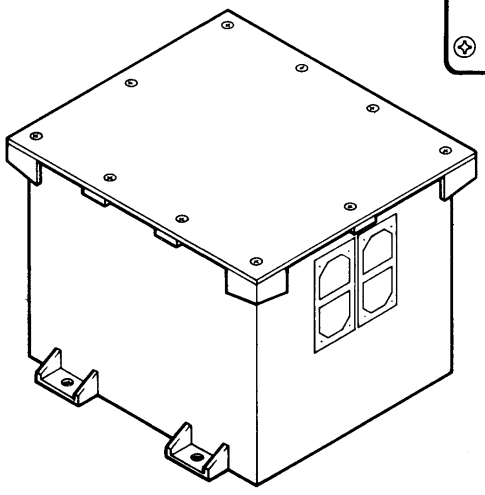
8-CHANNEL SYSTEM ANNUNCIATOR PANEL

D



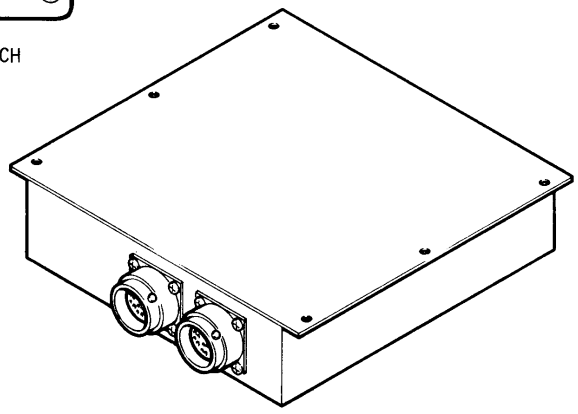
LAMP TEST SWITCH

E



DIMMING MODULE

F



ELECTRONIC CIRCUIT BREAKER

G

Master Caution and Warning System - Components
Figure 2

A. 10 Channel Annunciator Panel (Figure 2)

The 10 channel annunciator panel is located immediately below the overhead panel and above the pilot's instrument panel. The ten annunciators, from left to right, and the systems that they concern are as follows:

Annunciator	System
ANTI-ICE	Anti-ice System
APU	APU Control System
ENV CONT	Environmental Control System
HYD	Hydraulic System
AUTO CB FAIL	Electronic Circuit Breaker Unit
Spare	Not Used
ANTI-SKID	Anti-skid System
MLG BAY OVHT FAIL	Main Landing Gear Bay Overheat Detection and Warning System
Spare	Not Used
Spare	Not Used

Each annunciator legend has two lights installed side by side connected in parallel. The annunciator legend lights are reset by pressing the master caution switch/lights. Pressing the master caution switch, however, does not reset the system caution annunciators. The individual system light remains on and only goes out when the fault is cleared.

The 10 channel annunciator panel also contains a TEST/RECALL switch, a BRT/DIM switch and a control circuit, flasher and power supplies for the master caution lights.

When the TEST/RECALL switch is set to TEST, it turns on all the annunciator legends on the 8 and 10 channel annunciator panels, the two MASTER CAUTION PRESS TO RESET lights and also the related caution, warning and safe indication and advisory lights. When the TEST/RECALL switch is set to RECALL after resetting the MASTER CAUTION PRESS TO RESET switch/lights, the system annunciator legend on the 8 or 10 channel annunciator panel comes on and both the MASTER CAUTION PRESS TO RESET lights flash, provided the fault is still present.

The BRT/DIM switch controls the brightness of the 8 and 10 channel annunciator panel legends, the two MASTER CAUTION PRESS TO RESET lights and all the master caution related system lights.

B. 8 Channel Annunciator Panel (Figure 2)

The 8 channel annunciator panel is located immediately below the overhead panel and above the copilot's instrument panel. The eight annunciators, from left to right, and the associated systems are as follows:

Annunciator	System
DOORS	Door Warning System
ELEC	AC Power and Control System and DC Power and Control System, Thrust Reverser System, Engine Overspeed Control and Engine Vibration Monitor
ENGINE	
FLT CONT	Flight Control System, Spoiler Control System and Autopilot/Flight Director System
FUEL	Fuel Distribution System
FIRE FAULT	Engine Fire Detection and Warning System, Engine Fire Extinguishing System and APU Fire Detection, Warning and Extinguishing System
WOW	Landing Gear Controls and Indicators
EMER LTG FLT REC	Emergency Lighting System

Each annunciator legend has two lights installed side by side connected in parallel. The eight annunciator legends are tested, recalled and dimmed using the TEST/RECALL and BRT/DIM switches on the 10 channel annunciator panel. The MASTER CAUTION PRESS TO RESET switch/lights are used to reset the annunciator legends.

C. Dimming Module Assemblies (Figure 2)

Sixteen printed circuit boards (PCB) are contained in two dimming module assemblies; one module assembly is located on the pilot's console and the other assembly on the copilot's console. The module assemblies are designated 1 to 8 Left and 1 to 8 Right.

Two dimming circuits, designated A and B, are mounted on each PCB. Designator 7AL identifies dimming circuit A on PCB 7 in the pilot's console dimming module assembly and 7AR identifies dimming circuit A on PCB 7 in the copilot's console dimming module assembly.

Each dimming circuit has eight identical output channels and is supplied with 28 volts dc from the electronic circuit breaker unit.

On aircraft pre SB 601-0262,
holding pilot's or copilot's WARN LTS switch on pilot's/copilot's facia panel to the TEST position, turns on all lights associated with dimming circuits 1AL thru 8AL and 1BL, 2BL and 5BL. Lights associated with dimming circuits 3BL, 4BL, 6BL, 7BL, 8BL and 1AR thru 8AR and 1BR thru 8BR come on when the centre pedestal WARNING LT TEST switch is held in the ON position.

On aircraft post SB 601-0262,
all dimming circuits and associated lights come on by holding any one of the three warning light test switches to the TEST or ON position.

All bright/dim circuits are controlled by the BRT/DIM switch on the 10 channel annunciator panel.

D. Electronic Circuit Breaker Unit (Figure 2)

Forty monitored, 28 volt dc power supply channels provide power for 32 individual dimming circuits (the eight remaining 28 volt dc power supply channels are spare channels). Each channel is automatically scanned every second. If a channel fails and draws current higher than a predetermined value, the monitor detects this condition and opens the channel, causing the AUTO CB FAIL annunciator legend on the 10 channel annunciator panel to come on. If fault clears, channel automatically resets.

Power to the electronic circuit breaker unit is supplied from three separate sources:

BATT BUS, CBP-B

28V DC ESS BUS, CBP-D

28V DC BUS 2, CBP-B

The unit operates individually or simultaneously from the three power sources.

E. Master Caution Switch/lights (Figure 2)

MASTER CAUTION PRESS TO RESET switch/lights are located on the glareshield above the pilot's and copilot's instrument panels. The two flashing MASTER CAUTION PRESS TO RESET lights indicate that an active caution annunciation is present on the 8 or 10 channel annunciator panel. When pressed, the MASTER CAUTION PRESS TO RESET switch/light resets itself, the second MASTER CAUTION PRESS TO RESET light and the active caution on the 8 or 10 channel annunciator panel. Each MASTER CAUTION PRESS TO RESET switch/light contains four lights connected in parallel and a reset switch.

F. Light Test Switches (Figure 2)

There are three light test switches in addition to the TEST/RECALL switch on the 10 channel annunciator panel:

Pilot's WARN LTS switch located on the pilot's facia panel

Copilot's WARN LTS switch located on the copilot's facia panel

Centre pedestal WARNING LT TEST switch

Power to the test switches is supplied from BATT BUS CBP-A.

On aircraft post SB 601-0262,
when pilot's or copilot's WARN LTS switch is held in the TEST position or the centre pedestal WARNING LT TEST switch is held in ON position, the following lights come on:

Overhead Panel

Centre Pedestal

Centre Instrument Panel

Glareshield

Pilot's and Copilot's Instrument Panel

Pilot's and Copilot's Side Panel

Pilot's and Copilot's Console

MASTER CAUTION PRESS TO RESET Lights (flashing after 4.5 seconds)

Related Annunciator Legends

On aircraft pre SB 601-0262,
when the pilot's or copilot's WARN LTS switch is held in the TEST position, the following lights come on:

Overhead Panel

MASTER CAUTION PRESS TO RESET Lights (flashing after 4.5 seconds)

Related Annunciator Legends

When the centre pedestal WARNING LT TEST switch is held in the ON position the following lights come on:

Centre Pedestal

Centre Instrument Panel

Glareshield

Pilot's and Copilot's Instrument Panel

Pilot's and Copilot's Side Panel

Pilot's and Copilot's Console

MASTER CAUTION PRESS TO RESET Lights (flashing after 4.5 seconds)

Related Annunciator Legends

3. Operation

A. General

The master caution and warning system provides two basic types of indications: annunciated and unannunciated. An annunciated indication causes the caution light for the failed system to come on, the appropriate annunciator legend on the 8 channel or 10 channel annunciator panel to come on and the two MASTER CAUTION PRESS TO RESET lights to flash. An unannunciated indication causes only the caution light for the failed system to come on; the annunciator legend and the two MASTER CAUTION PRESS TO RESET lights do not come on. The safe indication and advisory lights are also unannunciated.

B. Electronic Circuit Breaker Unit

The electronic circuit breaker unit provides forty 28 volts dc protected outputs for use by the 8 channel annunciator panel, 10 channel annunciator panel and the 32 dimming modules comprising the master caution and warning system. Six of the electronic circuit breaker unit outputs are not used. Power for the electronic circuit breaker unit is supplied, via the BATT BUS, 28V DC BUS 2 and the 28V DC ESSENTIAL BUS. The electronic circuit breaker unit operates individually or simultaneously from the three busses.

Each channel of the electronic circuit breaker unit contains a current monitoring circuit which monitors the channels output current. When the output current exceeds a predetermined value, the current monitor provides an output to the electronic switch, that opens the channel's output circuit. The channel failed condition is detected by the channel fail monitor that, in turn, triggers the AUTO CB FAIL annunciator legend on the 10 channel annunciator panel. A reset circuit automatically closes the electronic switch when the failed condition is corrected.

C. Master Caution and Warning Lights (Annunciated) (Figure 3)

Twenty-eight volts dc from the electronic circuit breaker unit is applied to the system caution light, via the dimming circuit in the dimming module. The 10 channel annunciator panel contains three dimming circuits. Dimming circuit No. 1 receives 28 volts dc power from the 28V DC ESSENTIAL BUS, via LIGHTS F/O MAST CAUT circuit breaker and dimming circuits No. 3 and No. 2 receive 28 volts dc power from the BATT BUS, via 10 CHANNEL ANN 1 and CAPT LIGHT circuit breakers, respectively.

When the system fault switch is closed, indicating a system fault, the following events occur:

(1) A ground circuit is applied, through the fault switch and diodes to the system caution light, causing the light to come on.

(2) A ground circuit (annunciator control) is applied through the fault switch and diodes to the annunciator switch in the 10 channel annunciator panel. The annunciator switch applies a ground to the associated annunciator legend, causing the light to come on.

(3) Upon receiving the annunciator control signal, the annunciator switch applies a control signal to the master caution control circuit that, in turn, provides a control signal to activate the flasher circuit. When activated, the flasher circuit provides a switched ground output to the pilot's and copilot's MASTER CAUTION PRESS TO RESET lights, causing them to flash.

(4) A ground circuit is applied, through the fault switch and diodes to the latch circuit. The latch circuit ensures that the system caution light remains on when the MASTER CAUTION PRESS TO RESET switch/lights are pressed and the fault is not corrected.

D. Master Caution and Warning Lights (Unannunciated) (Figure 4)

Caution, warning and some safe indication and advisory lights are unannunciated. For these lights, unlike the annunciated master caution and warning lights, the fault line is common to the individual system light and the dimming circuit. A blocking diode prevents the annunciator legends from coming on and the MASTER CAUTION PRESS TO RESET lights from flashing.

E. Reset Function

The MASTER CAUTION PRESS TO RESET switch/light permits the 8 and 10 channel annunciator panels and the MASTER CAUTION PRESS TO RESET lights to be reset after a system malfunction. The system caution lights, however, cannot be reset using the MASTER CAUTION PRESS TO RESET switch/lights.

When either of the two MASTER CAUTION PRESS TO RESET switch/lights are pressed, a ground is applied to the master caution control circuit and to the annunciator switch. The master caution control circuit removes the control signal from the flasher circuit and the annunciator switch removes the ground circuit from the annunciator legend causing the light to go out. The annunciator switch also applies a reset signal to the 8 channel annunciator panel.

F. Test Function

When set to TEST, the TEST/RECALL switch on the 10 channel annunciator panel applies 28 volts dc, from the 28V DC BATT BUS, to the transistor switch and the 8 channel annunciator panel. With 28 volts dc applied to the transistor switch, the transistor conducts and a ground is applied to the annunciator switch and the flasher circuit, causing the annunciator legend to come on and the pilot's and copilot's MASTER CAUTION PRESS TO RESET lights to flash. The 28 volt dc test signal is also applied to the 8 channel annunciator panel and the lamp test ground signal is also applied to the other annunciator switches.

G. Recall Function

When set to RECALL, the TEST/RECALL switch on the 10 channel annunciator panel applies 28 volts dc to the annunciator switch. If a system fault still exists, after resetting the master caution and warning system, the annunciator switch applies a ground to the associated annunciator legend and a control signal to the master caution control circuit. The annunciator legend comes on and the two MASTER CAUTION PRESS TO RESET lights flash. The 28 volts dc recall signal is also applied to the 8 channel annunciator panel.

H. BRT/DIM Function

The BRT/DIM switch on the 10 channel annunciator controls the brightness of the 8 and 10 channel annunciator panel annunciator legends, the two MASTER CAUTION PRESS TO RESET lights and all the master caution and warning system associated caution, warning and safe indication and advisory lights. When set to DIM, the BRT/DIM switch applies a ground to the dimming circuits in the 8 and 10 channel annunciator panels and the 32 dimming modules, causing the dimming circuit outputs to drop to a nominal 9 volts dc. When the switch is set to BRT, the ground is removed and the dimming modules provide full output voltage (nominally 28 volts dc).

I. Remote Light Test Switches

When one of the three lamp test switches is set to TEST, 28 volts dc from the BATT BUS is applied to the dimming modules, causing annunciator lights to come on.