WING AND EMPENNAGE LEADING EDGE DE-ICING SYSTEM - DESCRIPTION AND OPERATION

1. General (figure 1)

A. Engine bleed air is used for the wing and empennage leading edges ice protection. The system components include de-icers, pressure regulator valves, water separators, check valves, ejector flow control valves, timers, and pressure switches.

B. A control unit continuously checks the system operation as for cycles, periods of time, sequence, and signal level.

2. Component Details (figures 2 and 3)

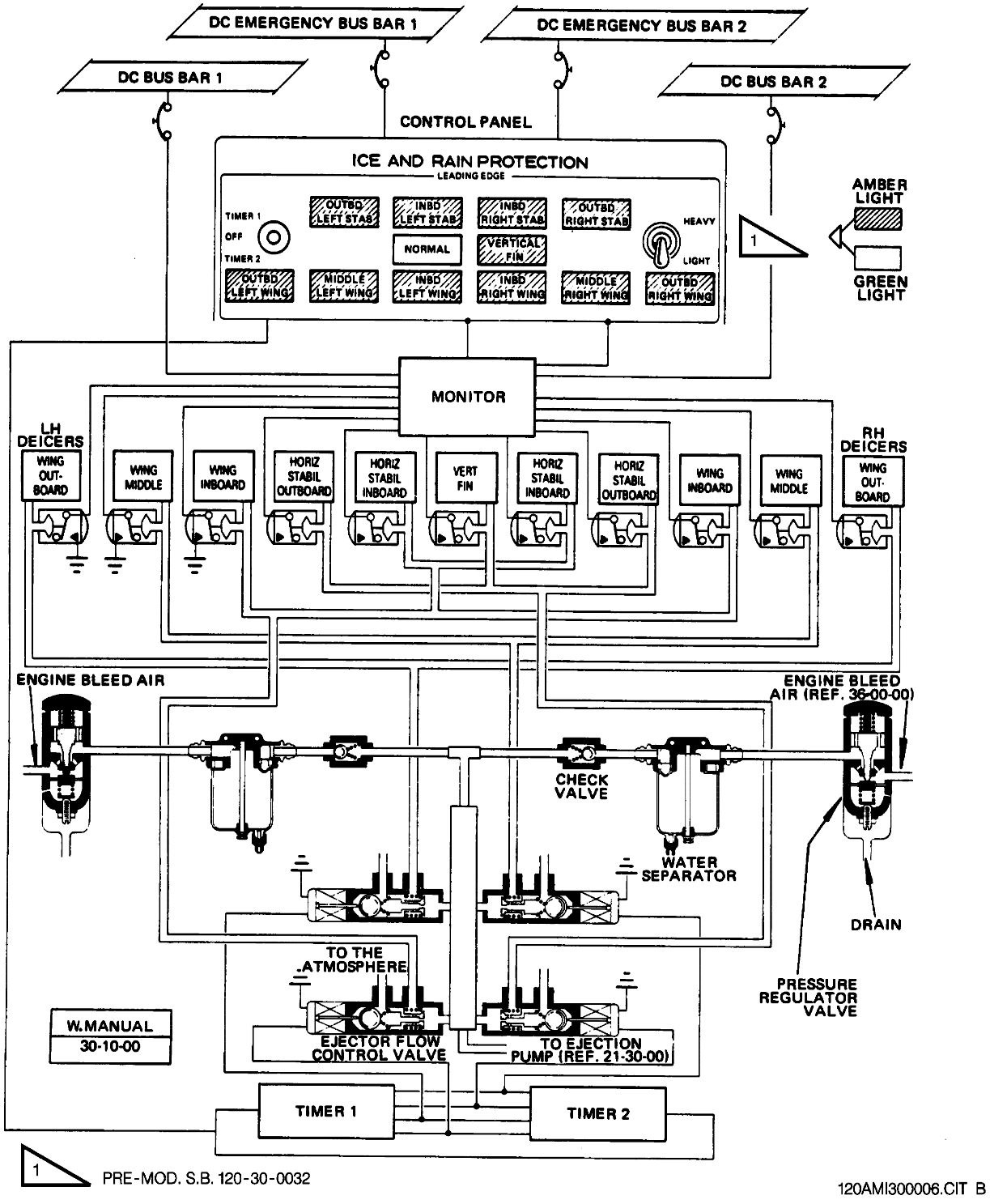
A. De-icers

(1) Three de-icers are installed on each half-wing being named outboard, middle, and inboard de-icers. Two de-icers are installed to each side of the horizontal stabilizer, and are named outboard and inboard de-icers. A single de-icer is installed on the vertical stabilizer.

(2) The de-icers are made up of a rubber and fiber blanket protected by a neoprene conductiveply and containing small spanwise de-icing tubes. All tubes in each de-icer are simultaneously inflated.

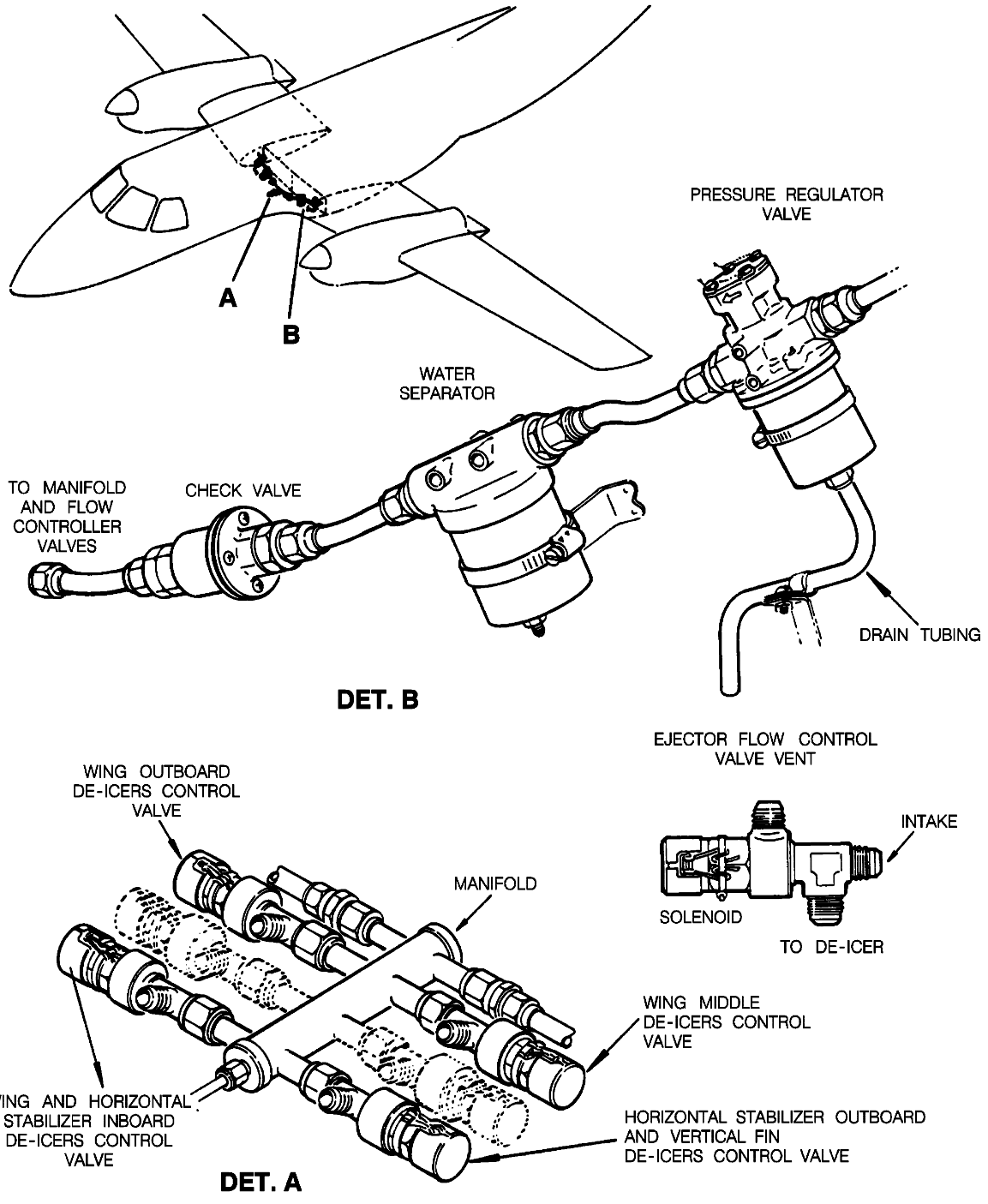
B. Pressure Regulator Valves

(1) The pressure regulator valves receive the air bled from engines and set it to a pressure of 20 ± 1 psi.



Leading Edge De-icing System Schematic Diagram

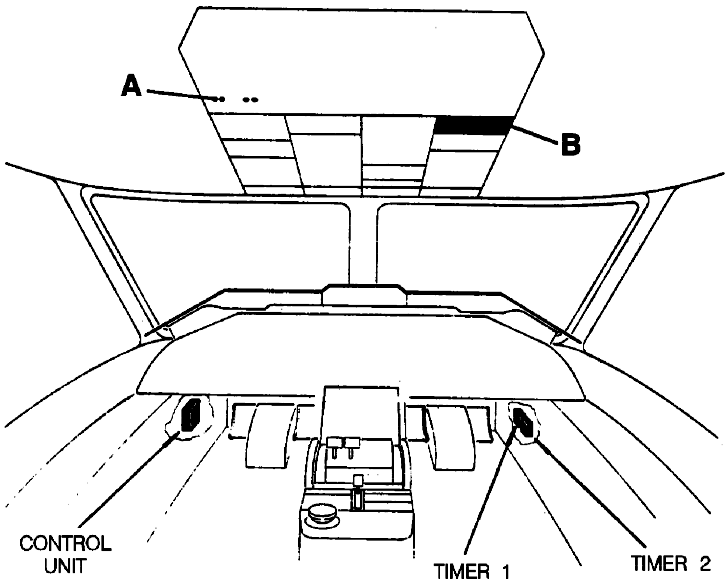
Figure 1

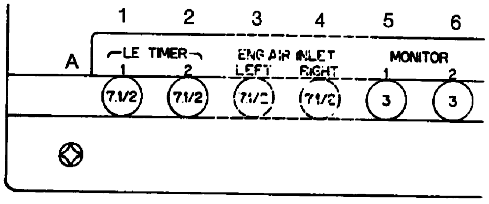


De-icing System Components Location in Fuselage

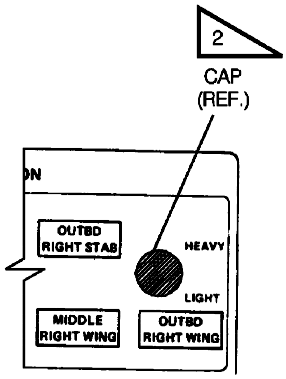
Figure 2

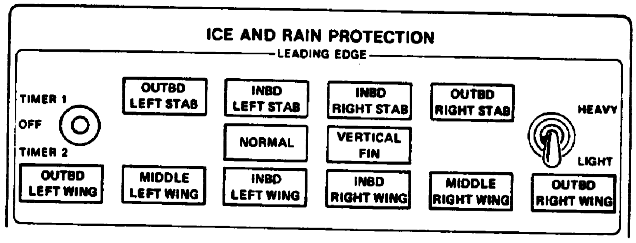
Sheet 1





DET. A





DET. B

1 PRE-MOD. S.B. 120-30-0032.

2 POST-MOD. S.B. 120-30-0032.

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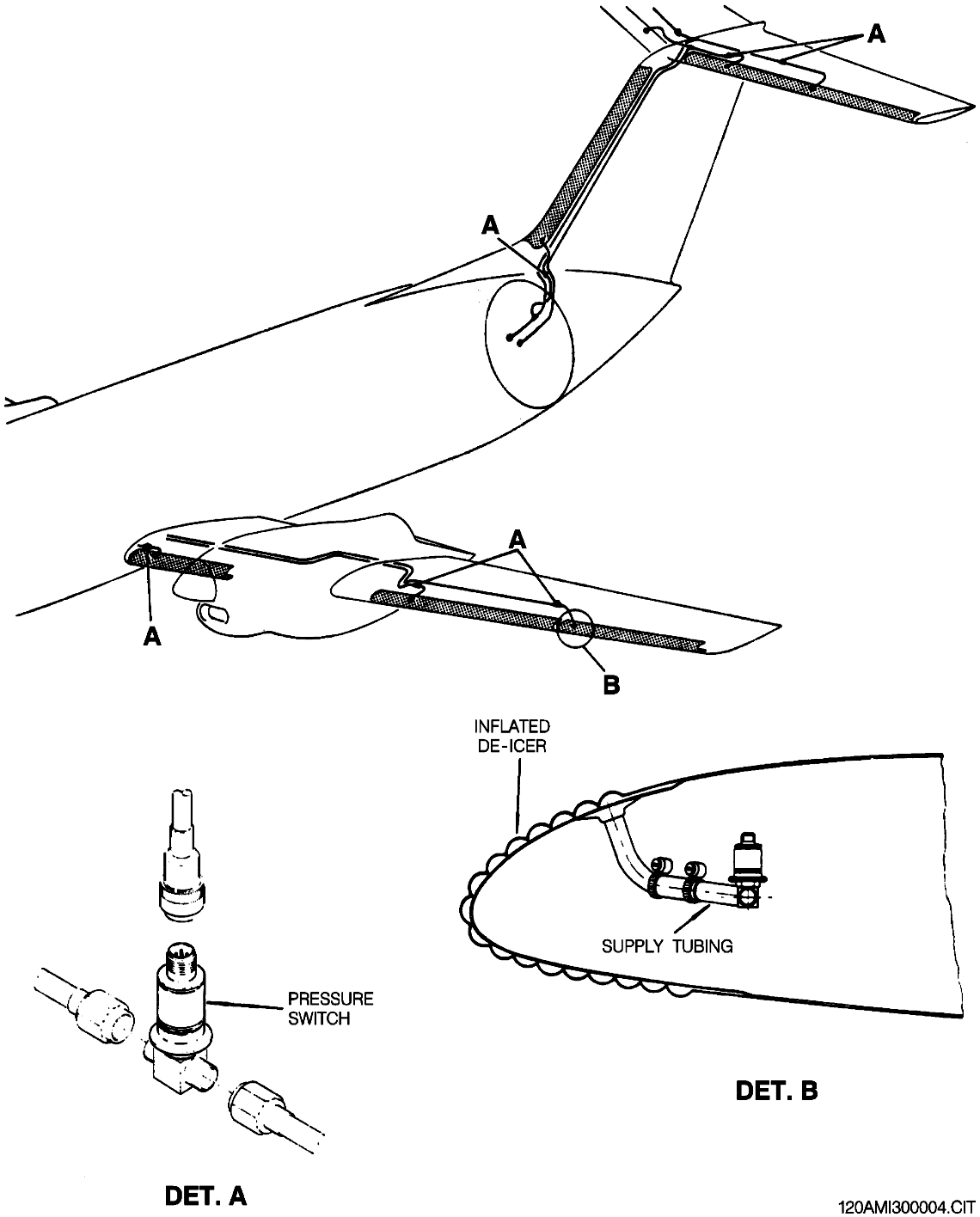
De-icing System Components Location in Fuselage

Figure 2

Sheet 2



De-icing System Components Location in Wing and Empennage

Figure 3

(2) The pressure regulator valves present one inlet and two outlet ports. The inlet port receives the air bled from the engines. One of the outlet ports is coupled to the tubing which goes to the manifold passing through the water separator and check valve whereas the other outlet port is coupled to the drain tubing.

C. Water Separator

(1) The water separator is designed to remove water from the tubing and de-icers. The cool surfaces of the separator plus the centrifugal effect of the swirling air cause the moisture in the air to condense into water, which is carried overboard through a drain.

(2) The water separator has a by-pass valve which opens in the event of an obstruction in the normal air passage.

D. Check Valves

(1) The flapper-type check valves are aimed at preventing air cross-flow in lines in case the pneumatic pressure comes from only one of the engines.

E. Ejector Flow Control Valve

(1) The ejector control valves are three-way two-position solenoid valves which are cyclically energized by a timer, causing the de-icers to inflate or deflate.

(2) When the solenoid is de-energized, the air flow passes through a venturi and is discharged overboard through a ventilation outlet. The passage of air through the venturi provides a vacuum in the de-icer tubing as necessary to maintain the de-icing tubes in a deflated condition.

(3) When the solenoid is energized, all the air flow is used to inflate the de-icers.

F. Pressure Switches

(1) The pressure switches (actuating pressure of 16 ± 1 psig) are installed in the pressure lines between the ejector flow control valves and de-icers, close to the latter ones.

(2) When the air inside the tubing and de-icers reaches a pressure of 16 ± 1 psig, the pressure switch internal contacts close an electric circuit turning on the NORMAL green light of the system control panel, which means that the relevant de-icer is working properly. If the de-icer does not inflate or remains deflated beyond the established time, the control unit sends signals of failure to the system control panel, switching off the NORMAL light and switching on the relevant amber light.

G. Timers

(1) The timers establish the sequence and operation cycle of the ejector flow control valves and, consequently, of the de-icers. There are two timers, one remaining on standby, and they are manually selected through a switch with TIMER 1, OFF and TIMER 2 positions.

(2) (Pre-Mod. S.B. 120-30-0032). The timers provide for the de-icer cyclic inflation and deflation in two distinct modes, according to the selection of a switch, located on the system control panel, having the HEAVY and LIGHT positions. In the HEAVY position, the cycle is repeated every 1 minute. In the LIGHT position, the cycle is repeated every 3 minutes.
(Post-Mod. S.B. 120-30-0032). The timers provide for the de-icer cyclic inflation and deflation and the cycle is repeated every 1 minute.

(3) (Pre-Mod. S.B. 120-30-0032). The de-icers remain inflated for 6 seconds, remaining deflated for 54 or 174 seconds, depending on the cycle selected.
(Post-Mod. S.B. 120-30-0032). The de-icer remain inflated for 6 seconds, remaining deflated for 54 seconds.

(4) Inflation sequence of de-icers is as follows:

(a) Wing outboard de-icers.

(b) Wing middle de-icers.

(c) Wing and horizontal stabilizer inboard de-icers.

(d) Horizontal stabilizer outboard de-icers and vertical stabilizer de-icer.

3. Operation

A. The monitor is electrically supplied by the 28 V DC bus bars 1 and 2. In case of failure of one of the bus bars, the unit functioning remains unchanged. The timer 1 is fed from the DC emergency bus bar 1 and timer from the DC emergency bus bar 2.

B. (Pre-Mod. S.B. 120-30-0032). The system operation is controlled by the TIMER 1-OFF-TIMER 2 and HEAVY LIGHT switches.
(Post-Mod. S.B. 120-30-0032). The system operation is controlled by the TIMER 1-OFF-TIMER 2.

C. When one of the timers is actuated through the selection of TIMER 1 or TIMER 2 positions of the relevant switch, the ejector flow control valve solenoids are sequentially energized. With the switch positioned to OFF, the system is de-energized.

D. (Pre-Mod. S.B. 120-30-0032). Positions HEAVY and LIGHT of the other switch select cycles of 1 and 3 minutes, respectively.

E. The system control panel amber lights indicate, when on, the existence of a failure leading to improper functioning of the relevant de-icer.
The NORMAL green light indicates, when on,that the system is operating normally.