

Air Logic

Fluidic NOR Logic Elements

The Air-Logic F-3702-251 and F-3705-251 are four input, negative gain logic elements which employ the patented Impact Modulator principles. Both Models are designed to plug into a Air-Logic F-3802-60 Manifold Card. The F-3702-251 receives supply air directly from the Manifold Card; the F-3705-251, however, has a separate connection for supply air and uses 1/16 in. I.D. flexible tubing. All circuit connections on the Manifold Card are made with 1/16 in. I.D. flexible tubing. The F-3705-251 also mounts on F-5013-Series Logic Manifolds.

Both Fluidic NOR Logic Elements combine the following important functional and physical features:

Input Isolation – Each of the four inputs is completely isolated from the other inputs.

Input-Output Isolation – Output load changes do not affect input pressure or flow.

Large Fan Out – These elements typically fan out to nine identical units, see Fig. 3.

Low Air Consumption – Power required at 1 psig is less than 0.2 watts, see Fig. 7.



F-3702-251 (left)
and
F-3705-251 (right)
NOR Logic Elements
Fig. 1

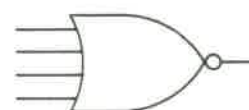


Fig. 2: Graphic Symbol

Fast Response – 300 microseconds, average at 1 psig, see Fig. 8.

The Impact Modulator

The Impact Modulator is a fluid amplifier. It is a control device with no moving parts, only moving streams of air. The Impact Modulator family is the result of research and development in jet interaction devices.

Specifications

FAN IN	FOUR (ISOLATED INPUTS)
FAN OUT AT 1 psig SUPPLY	NINE (REFER TO FIG. 3)
SUPPLY NOZZLES	0.025" DIA.
INPUT NOZZLES	0.011" DIA.
OPERATION	REFER TO FIG. 5
SUPPLY AIR REQUIREMENT	FILTERED DRY AIR ONLY (USE 5 MICRON FILTER)
SUPPLY PRESSURE RANGE	0.5 TO 5.0 psig *
SUPPLY, FLOW AND POWER	REFER TO FIG. 7
RECOVERY PRESSURE AT 1 psig SUPPLY	46% OF SUPPLY (FIG. 4)
CUTOFF PRESSURE AT 1 psig SUPPLY	17% OF SUPPLY (FIG. 4)
INPUT FLOW	REFER TO FIG. 6
SWITCHING TIME	REFER TO FIG. 8
TEMPERATURE LIMITS	0 TO 200F (-17.8 TO 93.3C)
MATERIAL	POLYSULFONE

* Between 5 and 20 psig supply pressure, the operation is similar but the fan out may be reduced.

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In Impact Modulators, two opposed round supply nozzles direct air jets at one another so that an impact plane is formed between them. If one of the jets is weakened relative to the other, the impact plane moves toward the weaker jet. In the Transverse Impact Modulator, the basis of Air-Logic NOR logic devices, one of the supply jets is weakened by being attacked from the side by one of several transverse input jets. The impact plane then moves from one side of an orifice plate to the other.

Referring to Fig. 11, the impact is normally just below the orifice plate. It tends to seal off the orifice and provides flow into output chamber A. Positive output pressure results. An input signal weakens the upper supply jet and causes the impact to move into the vented chamber B. The output pressure decreases to zero. In fact, the output chamber pressure is reduced to somewhat below atmospheric level because the lower supply jet aspirates air from the output chamber.

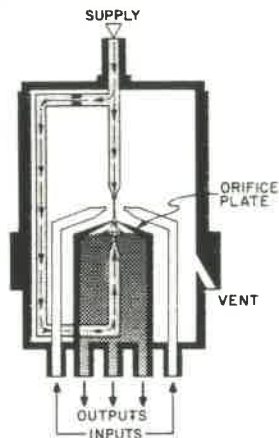


Fig. 9: Flow Pattern of NOR Logic Element Shown with Supply On and No Input

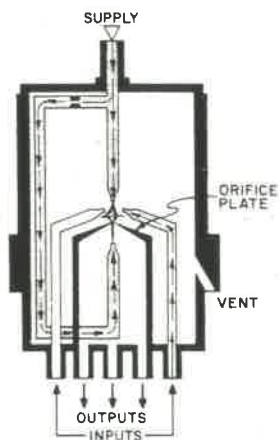


Fig. 10: Flow Pattern of NOR Logic Element Shown with Supply On and Input Applied

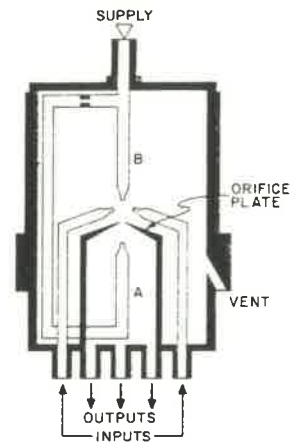


Fig. 11: Internal View of NOR Logic Element

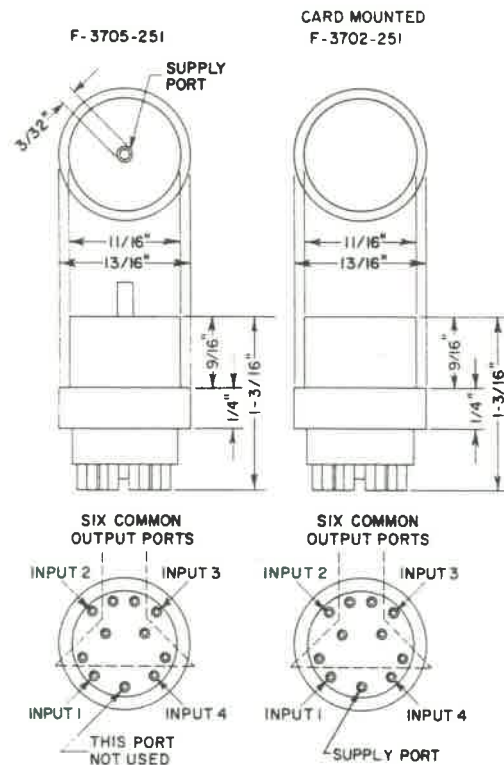


Fig. 12: Dimensions



Fig. 13: Output & Input Plug Straps

Notes: All unused outputs must be plugged. Input straps keep unused inputs clean — use is optional. Both input and output straps are furnished with each element. Both straps can be used directly on gate or Manifold Card. Clip or bend straps to uncover more connections.

Basic NOR Logic

NOR



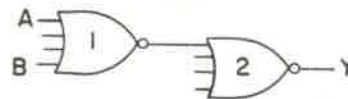
TRUTH TABLE

A	B	Y
0	0	1
1	0	0
0	1	0
1	1	0

STATEMENT

Y is on if neither A nor B is on. With a single input, the NOR becomes an inverter or NOT element.

OR



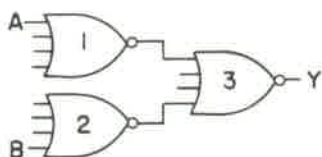
TRUTH TABLE

A	B	Y
0	0	0
1	0	1
0	1	1
1	1	1

STATEMENT

Y is on if either A or B is on, or if both are on.

AND



TRUTH TABLE

A	B	Y
0	0	0
1	0	0
0	1	0
1	1	1

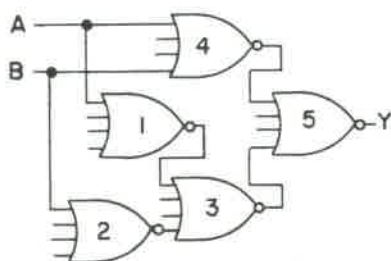
STATEMENT

Y is on if both A and B are on.



Typical Fluidic Circuit Construction Using F-3702-251 NOR Logic Element and other Air-Logic Standard Fluidic Components

EXCLUSIVE OR



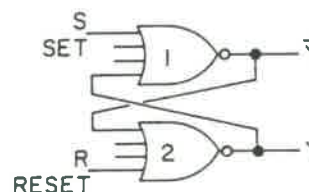
TRUTH TABLE

A	B	Y
0	0	0
1	0	1
0	1	1
1	1	0

STATEMENT

Y is on if either A or B are on, but not if both A and B are on.

SET-RESET FLIP-FLOP



TRUTH TABLE

S	R	Y	Y-bar
0	0	0	1
1	0	1	0
0	1	0	1
0	0	0	1

STATEMENT

Starting with Y off, a set signal causes Y to turn on and remain on. A reset signal causes Y to turn off and remain off. This is a memory circuit.