C. INPUT BUFFER MODULE 6N213

The input buffer module contains three-independent circuits, each of which performs as follows:

1. The input circuitry is connected through a cable to remote relay contacts. When the conracts are open, a 48V potential is developed between them. When the contacts are closed, approximately 20 MA flows through them.

2. The output circuitry produces a HiNIL compatible logic signal following the contact closure as follows;

   a. When the contacts are in their normal state, the output goes to a "0" ($\leq$ 1.8 VDC).

   b. When the contacts are not in their normal state, the output goes to a "1" ($\geq$ 13.0 VDC).

3. Isolation between the input circuitry and the output circuitry is capable of withstanding 1096 VAC.

4. The input circuitry provides immunity against false indications from noise sources by the use of a transient suppressor and a low pass filter circuit.

5. Momentary push-button switches provide manual test capability for each circuit. For normally closed contacts, depressing the switch forces the output into the open contact state until the switch is released. For normally open contacts, depressing the switch forces the output into the closed contact state for .1 to 2 seconds or until the switch is released if the time is shorter.

6. Jumper connections in the backplane wiring allow the Input Buffer module to be used for either normally open or normally closed contacts. In either case the output level is normally a "0" ($\leq$ 1.8 VDC). Jumper connections also connent the momentary test switch into the appropriate configuration for the normally open or normally closed contact funtions as defined above.

7. A solid state test lamp mounted at the edge of the connector illuminates when the circuit senses that the contacts are in their normal state and is off when the circuit senses that the contacts are not in their normal state.

March 22, 1983

DATE PREPARED

MEMO TO W. A. Paulson/E. McKenna

DOCKET NO. 50-206

SUBJECT: SEP Topics VI-10.A, VII-2

SAN ONOFRE UNIT NO. 1

Per a request by E. McKenna for additional information to be used in further review of SEP Topics VI-10.A and VII-2, please find enclosed copies of procedures which were referenced in our responses regarding Topic VI-10.A. Additionally, a schematic diagram along with a verbal description of the Input Buffer Module (6N213) referenced in responses to Topic VII-2 is provided for your review.

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A035

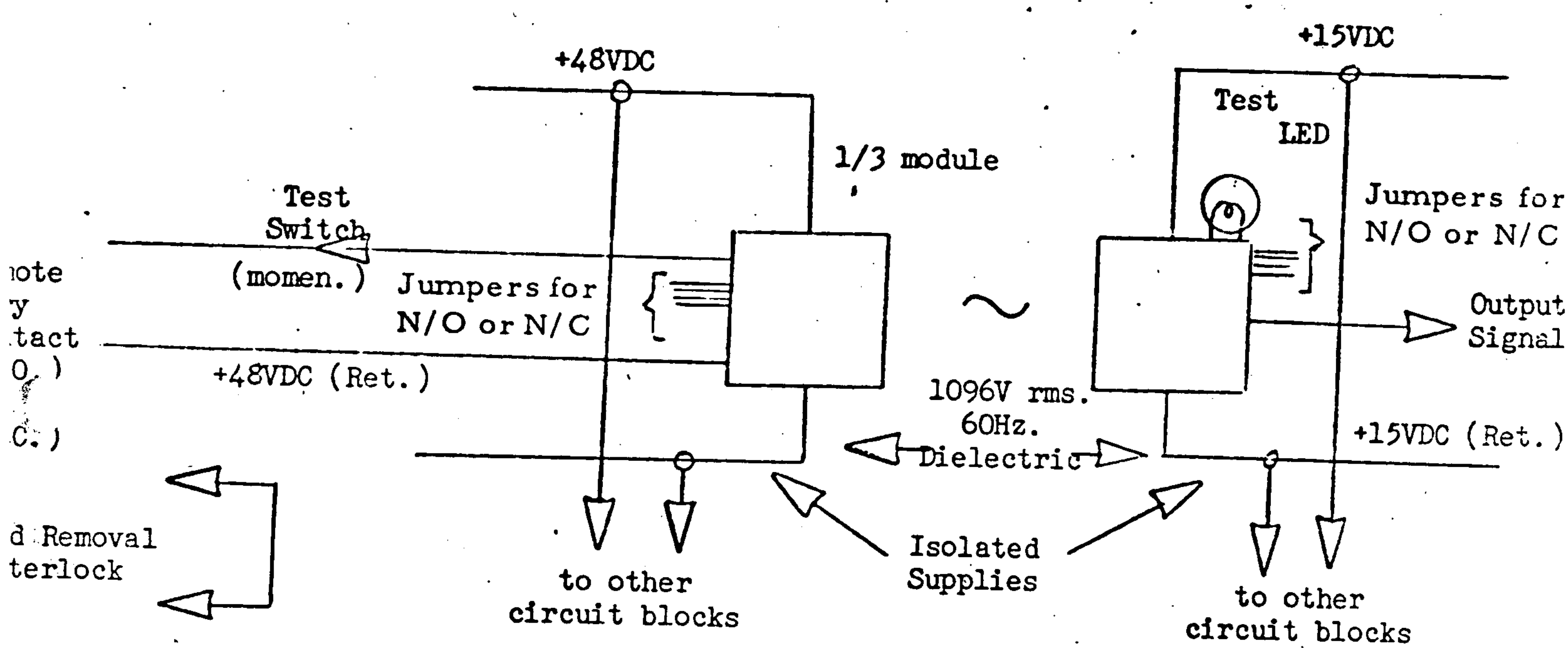
Aperture Card Dist

Drawing to: PM

FROM

SCE 50-1-3 NEW 9/74

BLOCK DIAGRAM - INPUT BUFFER



The input contact status is transferred to the output logic driver circuitry by the use of U1, an optical isolator. This approach yields a guaranteed input to output isolation of 1096 VAC. The optical isolator consist of an LED which is optically coupled to a phototransistor. A forward current in the LED produces a predictable collector current in the phototransistor.

The input circuitry consists of a transient suppressor, a low pass filter, the LED of the optical isolator and a constant current source. The transient suppressor, RVI, is a metal oxide varistor. The varistor selected has a high impedance for voltage less than 68 V and a very low impedence for voltages substantially greater than 68 V. For an input voltage of 3000 V with a source impedance of 150Ω, the varistor voltage is less than 300 V. The low pass filter consisting of R6, C3, and C4, is used to further attenuate noise signals coupled to the input circuitry.

When the contacts are closed, the LED is driven from the constant current source consisting of Q1, CR4, R9 and R10. Zener diode CR4 and R9 develop a relatively constant current through R10 and Q1 - emitter and thus produce a constant current out of Q1 - collector and through the LED.

When the contacts are open, there is no path for the constant current and Q1 saturates. A small current flows from the 48 V supply through R8, CR2, CR3, R9 and to the 48 V return. This current develops a voltage across CR2 which provides a reverse bias for the LED, insuring that when the relay contacts are open, there is no forward current in the LED. Capacitors C3 and C4 charge up to 48 V through R7 providing a 48V open circuit potential to break down any film or oxidation on the contacts when they are again closed.

Test switch S1 is used to test the Input Buffer Circuitry by simulating the contact status which is not the normal status. In the normally closed contact made there is a quiescent current of approximately 20 ma flowing from the module through the contacts to the power supply return. By making the appropriate jumper connections, the test switch becomes a normally closed switch in series with the contacts. Therefore, depressing the switch interrupts the current to the contacts and produces an open contact indication at the output. When the backplane is jumpered for normally open contacts, momentary test switch S1 becomes a normally open switch which connects the normally open contacts to the power supply return through capacitor C9. When the switch is depressed, the current source charges capacitor C9 until it reaches a potential sufficient to back bias the isolator LED. Between the time that the switch is depressed and the isolator is turned off (0.1 to 2 seconds) the output assumes the closed contact state or logic "1" ($\geq$ 13.0V). Resistor R11 is connected in parallel with C9 so that it can discharge in a reasonable amount of time (approximately 1.5 minutes).

The output circuitry consists of a three transistor amplifier capable of sinking 5.6 ma in the low state. In the normal state, Q7 conducts forcing base current into Q2. Q2 saturates reducing the output voltage to less than 0.4 V and allowing approximately 20 ma to flow through solid state lamp DS1 and limiting resistor R12. When the contacts are not in their normal state Q7 is turned off, cutting off Q2. With zero collector current in Q2, the solid state lamp if off and the output voltage is approximately 15 V.

The isolator phototransistor is connected to Q7 by way of backplace jumper connections. The base of PNP Q7 can either be connected to the NPN phototransistor emitter which sources current when conducting or the collector which sinks current depending on the phase desired. In the normally open contact mode the phototransistor emitter is jumpered to the base of Q7 and the phototransistor collector is jumpered to the + 15 V power supply. Thus when the contacts are open (normal state) no current flows through the isolator LED and the phototransistor is cut off. This allows Q7 base current to flow through CR13 and R13 turning on Q7 and therefore Q2 and producing an output low state and lamp illumination. When the contacts are closed, current flows through the isolator LED causing phototransistor emitter current to flow through R13, raising the potential of the phototransistor emitter and Q7 base above that of Q7 emitter which is established by zener CR13 and R40. This cuts off Q7 and therefore Q2 producing an output high state and no lamp illumination.

In the normally closed contact mode, the base of Q7 is jumpered at the backplane to the isolator phototransistor collector. When the contacts are closed (normal state) current flows through the isolator LED causing current to flow into the collector of the phototransistor from the base of Q7. This causes Q7 to conduct which saturates Q2 producing an output low state and lamp illumination. When the contacts are open, no current flows through the isolator LED, the phototransistor and Q7 do not conduct forcing Q2 into the off state producing an output high state and no lamp illumination.