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AC Electronics
Division of
General Motors Corporation
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Attention: Mr. J. Stridde

Raytheon Company
Missile & Space Division
Boston Post Road
Sudbury, Massachusetts

Attention: Mr. R.C. Glynn

Subject: Changes Between Prototype and Production CGC/LGC's. (GSEC-5)

Gentlemen:

The following changes have been made which will require changes in hardware, software, and/or test procedures for checkout of "production" CGC/LGC's.

I ENGINE ON/ENGINE OFF

The ENGINE ON (CB011) and ENGINE OFF (CB 013) signals have been moved from CH 12-07 to CH 11-13 and CH 11-14. CB 011 will be present (reference GSED-R5A for definition of presence and absence of C type signals) if and only if CH 11-13 is ONE, and CB013 will be present if and only if CH 11-14 is ONE. This change will be accomplished inside the computer and will not affect any external hardware.

II AGC/LGC WARNING, DSKY

The relay in the DSKYs which "closes" to signify an AGC/LGC WARNING (SD325/451 and SD342/441) will be energized during normal operating conditions and will be de-energized upon occurrence of a "warning" condition. The signals assigned to pins 15 (WD 325/4510), 14(WD325/451C), and 55 (WD342/4410) on the DSKY connector are the normally

open or normally closed contacts when the relays are in the de-energized condition (i. e., pins 15 and 55 should be treated as normally closed contacts, and pin 14 should be treated as a normally open contact.)

The relay contact wiring inside the DSKYs is the same for both the prototype and production units, the difference being that in the production DSKY the relay is normally energized via an inversion of the drive signal between the AGC and the DSKY. When these changes are accomplished in the GSE cabling the AGC/LGC Warning indicator will be illuminated in the "NO WARNING" condition when using prototype computers.

Hardware Affected

AC Electronics's cable is built per this change. Raytheon will have to interchange pins 15 and 14, and move pin 55 from the "Normally open buss" to the "Normally closed buss". This change affects two cables in the sub-system cable set (W224 and W225).

III DSKY "SNEAK PATH"

This problem was first observed at AC Electronics (reference Apollo Engineering Memorandum AP-M-9942) and is due to the wiring of the DSKY and the method presently used to test the DSKY relay contacts. A simplified signal flow diagram of the DSKY and GSE is shown in Figure 1.

In the GSE all normally open contacts are bussed together ("Normally open buss"), and all normally closed contacts are bussed together ("Normally closed buss"), (except for the exceptions mentioned in paragraph II). The indicator lamps are connected to the arms of the relays. In normal operation a voltage is applied to the "normally open buss", when a relay is energized the voltage reaches the indicator which turns the lamp on. A voltage is applied to the "normally closed buss" only when checking the "NC" contacts of the DSKY.

The problem arises when the TEMP CAUTION relay (R1) is energized and the RESTART relay (R2) is de-energized. A conductive path can be traced from J9-57 to the "NO" side of R1, to the arm of R1, to the arm of R2, to the "NC" side of R2, to J9-55; shorting the "Normally open buss" and the "Normally closed buss" together. This, of course, applies voltage to both sides of the relays, causing most of the indicators to illuminate.

The solution proposed by AC Electronics is to insert a diode between the "Normally closed buss" and J9-53. This situation is also present with the prototype DSKYs.

Hardware Affected

AC Electronics will have to place this diode in the line between J29-X and the DSKY INTERFACE TEST 27VDC buss (see paragraph IV of AP-M-9942).

Raytheon will have to mod W224, W225, and LP 1 of the XY Interface.
See Figure 2.

Very truly yours,

Allen A. Harano

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Apollo GSE

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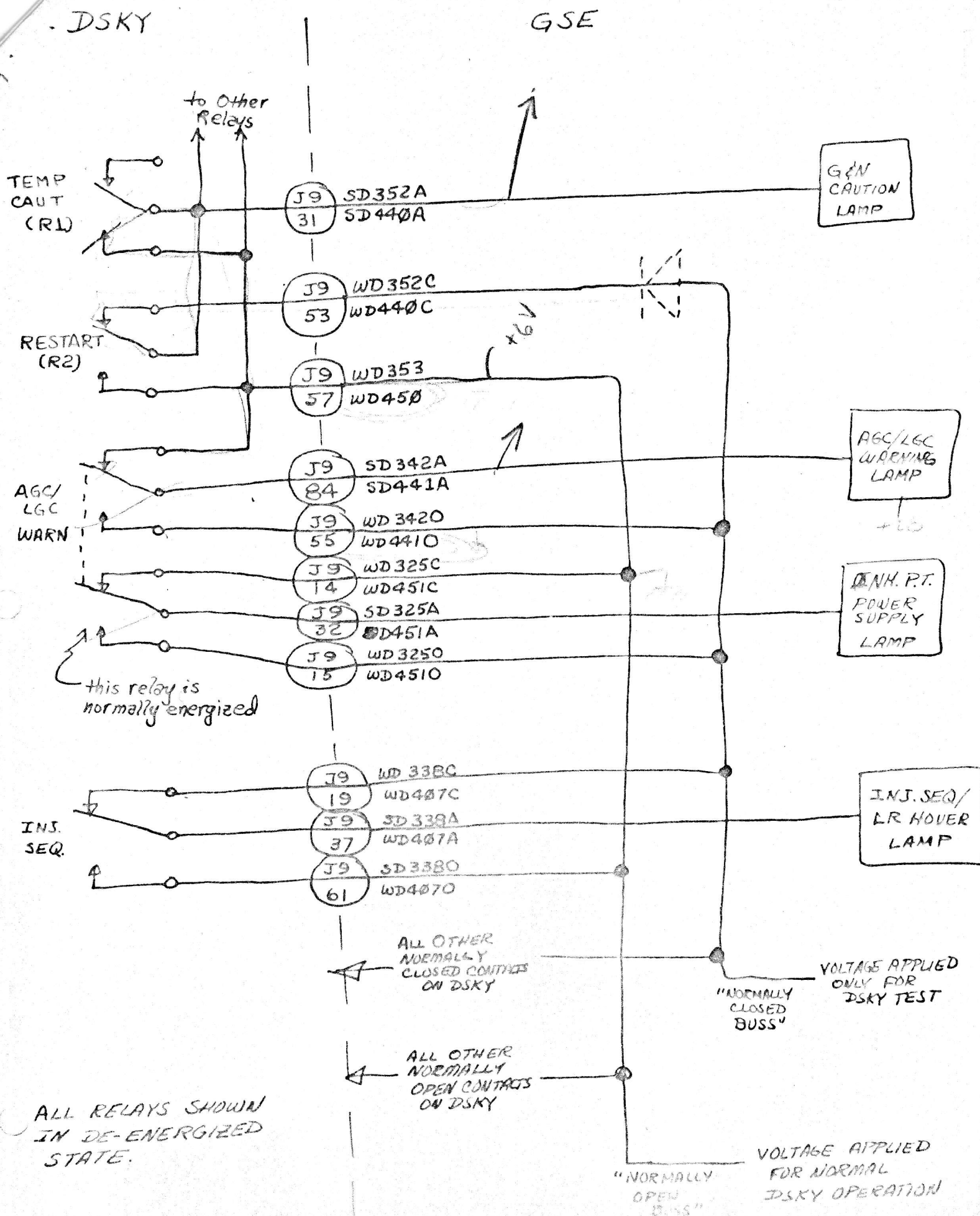


FIGURE 1

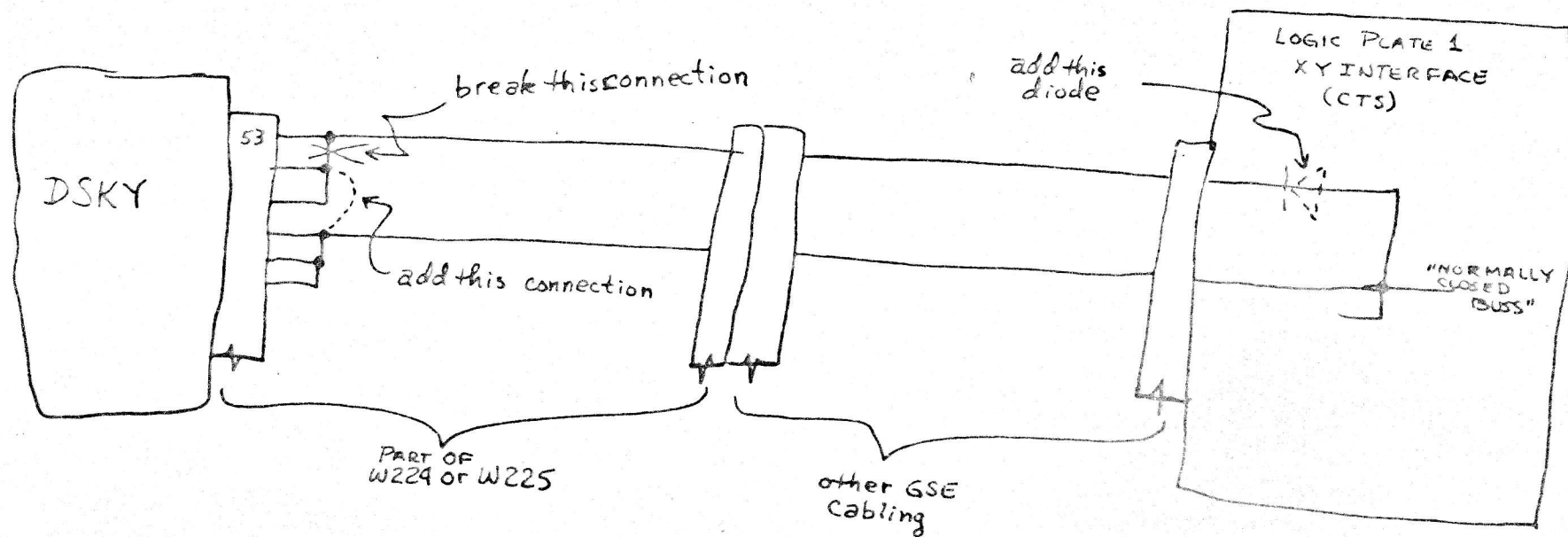


FIGURE 2.