GLINT NO. 383
Supersedes Glint No. 323
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THE ARRAY LIMIT SWITCHES

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This glint is a later version of Glint 323 and includes necessary changes made to allow proper operation of all antennas. Drawing RD-627 is the corresponding revised schematic for RB-685 which is now obsolete.

The antenna is protected in five zones of travel by "boundary" switches which stop the drive motors which are causing the antenna to leave the normal operating zone. Beyond this zone is a danger zone which can be entered by operating a key switch (S2,S5) and a spring return switch (S3,S7) on the control panels as well as the corrasponding drive push buttons. "Limit" switches operate at the extremeties of the danger zone to prevent further antenna travel. Motion in the opposite direction is possible after boundary and/or limit switch actuation.

The five zones are North, East, West, Southeast and Southwest. (South is covered by the Southeast and Southwest switches). The East and West zones are protected by mechanical switches operated by cams mounted on the H.A. wheel. (L_1, L_2, L_3 and L_4). Each switch also turns on an indicator light on the H.A. Readout Panel. The Southeast and Southwest zones are protected by mercury switches (M_1, M_2, M_3 and M_4) which sense antenna position and open to deenergize relays R_{L1}, R_{L2}, R_{L3} and R_{L4} which control the drive motor contactors. Indicator lights are turned on at both the H.A. and Dec. Readout Panels. The mercury switches are mounted in a solid box on the hub.

Because of the common nature of the East and Southeast and the West and Southwest boundaries, it is necessary to prevent the Southeast or Southwest indicator lights from coming on when the East or West boundaries are reached. This is done by R_{L10} mounted on the cable termination panel in Rack No. 1.

The north zone is protected by mechanical switches (L_8, L_9) operated by cams on the declination wheel. Indicator lights on the declination readout panel are turned on when the switches are actuated. The north zone is special in that each antenna operates independently in the north zone and also because the stow zone is entered thru the north zone. After discussing the features which provide "all-off" functioning in the other zones, the stow operation will be discussed.

When any antenna actuates a switch in the E,W, SE or SW zones all antennas are stopped. This is accomplished by opening a common neutral line for all the five mercury switch relays with a common function (i.e., all SE LIMIT). This stops all antennas. Four logical "OR" circuits using pairs of indicator lamp lines as inputs are realized with relays R_{L6}, $R_{L6'}$, R_{L7} and $R_{L7'}$ and the associated diodes and resistors. When the relay is energized the normally closed contact which returns a common neutral to the main neutral is opened and the all off feature having functions. After/driven out of the operating zone it is always possible to return in the direction from which the boundary was approached. However before driving in the same direction again a reset push button P_7 on the declination control panel or P_8 in the antenna contactor box must be pushed to allow the All Off relays to drop out and the mercury switch relays to energize again.

Reset

The circuitry for the reset capability and to allow operation with all antennas connected is described below. First consider the common lines which provide power for the indicator lights and the "all off" relays. Any antenna at a limit or boundary (except N) will energize one of these lines and therefore one of the "all off" relays will be energized. The corresponding mercury switch relays will be deenergized at all antennas. Since this now provides 5 paths from the control power (ϕB) to the common light line it is necessary to make provisions for resetting mercury switch relays at all antennas after driving back into the operating zone. This is done by interrupting control power (ϕB) which drives the SWB, SWL, SEB, SEL indicator common lines and lights, etc. Use is made of three common lines one of which (11) has phase B power (ϕB) from every antenna connected to it. This allows any one antenna to energize all ϕB control power on the array. A second line (17) is a series string of normally closed momentary push button switches (P_{7}, $P_{8's}$) which connect between the common ϕB line and a third line (16) which is designated as the reset ϕB line. With this system any of the six reset buttons removes ϕB from the "reset ϕB" line and allows the "all off" relays to deenergize. This circuitry is shown on Drawing RA-628 attached.

Another common line (19) has ØC power connected to it from each antenna. This is used to operate the mercury switch relays and avoid a sneak return path thru other antennas which may be turned off.

Stow

The stowed position is reached for each antenna by individually driving north while on the meridian, thru the north boundary and north limit and into the stow lock. The first requirement is that the antenna be on the meridian. This is sensed by the meridian switch L_6. In use the antenna will drive thru the meridian without any effect because L_6 is bypassed with S_4 the meridian set-use switch at the antenna or S_2 the mode switch on the RA control panel, When in control room operation. When meridian set is chosen and the antenna is at the meridian position ØB power is interrupted from the E/W slew contactor and R_{L9} is deenergized. R_{L9} performs several functions:

1. lights the meridian light when deenergized
2. stops track and correct motion when deenergized

A third set of contacts is used for entry to the service position and will be discussed later. The normally open contacts of L6 the meridian switch also allow control power (ØB) to bypass the N limit and boundary on the meridian so that either local or remote stow operatbns can proceed.

To stow from the control room it is first necessary to be in meridian set mode (S_2) and then each antenna must have S_4 in stow position on the declination readout panel. The North P. B's can then be pressed to drive antennas to stow. Local stow requires that an additional local stow push button must be depressed as well as the North push button before it is possible to drive into stow.

When the declination wheel moves past the N limit a third switch L_5 the SEWS switch is actuated which opens the E/W slew contactor circuit to Stop East West Slew motion. (This was previously called the SHAWS switch but the name was not functionally correct.)

At this point the antenna can be driven into the automatic stow lock. Four switches $L_{7,10,11,12}$ and a relay R_{L11} are involved in this action. Switch L_7 stops N drive motion when the hub is stowed on the hub cushion. If at the same time L_{11} senses the latch extended to achieve stowed condition, the stowed light comes on. A back-up stow limit switch L_{10} would prevent driving north after the cushion was depressed approximately 1/2 in. past the normal stow condition in the event of L_7 failure.

To leave stow automatically with the depressing of the drive S push button the conditions necessary are provided or sensed as follows. First the air cylinder must be actuated to retract the latch before drive power is applied. Relay R_{L11} which was energized at the point the antenna reached the N limit opens the line to the drive S contactor and closes a lead from ϕB and the S pushbutton thru the air cylinder solenoid to neutral. This sets up the condition desired that when the S button is pushed, drive does not occur but the latch is retracted. Switches L_{11} and L_{12} sense the latch position as first not extended and secondly as retracted at which time the R_{L11} contact which opened the path to the S contactor coil is bypassed and the S drive motor can be turned on. The antenna will then move out of the stow zone and R_{L11} will deenergize, the air cylinder will be free letting the latch again be in its normal extended position. During the operation of leaving stow, a manual depression of the S pushbutton is necessary until the latch is retracted and the motor starts. Then it is advisable to continue driving out of stow manually. When any antenna is stowed the N limit lights will be on but the N boundary will not be. This feature is provided by a contact on R_{L11}. The disconnecting of the N limit light would have required another relay. <u>For servicing the feed box</u>, the antenna must be driven past the SW/SE boundary. This is possible on the meridian because R_{L9} furnishes reset ϕB to the danger-zone line 4-31. It also removes ϕB from the SW/SE limit and boundary lights on the antenna

being serviced which is necessary to allow other antennas to be driven S while one is being serviced.

DRIVING INSTRUCTIONS

I. Control Room Operation

A. TO EXIT STOW: DEC READOUT PANEL; S_4's IN STOW POSITION; Depress S pushbutton until N Boundary light comes on and off indicating antenna in operating zone. Switch S_4 to slew and depress S again to drive to desired declination (use preset feature if desired). E-W motion possible only after leaving N boundary and switching S_2 on RA control to a "use" position.

B. TO ENTER STOW: Switch S_2 on RA control to Meridian set position. Initiate E-W slew towards meridian. Drive N towards boundary. Antenna will stop automatically on the meridian at the N boundary ready to enter stow. Switch S_4 on Declination control panel to Stow and depress N button. Antenna drives into stow and stops. Indication is the stow light on and the N limit light on.

C. SERVICE POSITION: In normal use, service position will be entered from Antenna control only. However, when the antenna is on the meridian and meridian set is the mode it is possible to enter the danger zone driving south which is the condition required to get to the service position.

II. Antenna Operation

A. TO EXIT STOW: Depress drive S pushbutton and system behaves as for control room operation.

B. TO ENTER STOW: Set S_4 to "Meridian set" and start E-W slew motion towards the meridian. Depress N declination drive button to drive antenna to N boundary. Motion stops with the antenna on the meridian ready to enter stow. Now both the N pushbutton and the local stow pushbutton must be depressed to drive into the Automatic Stow Lock. After stopping the light in the local stow pushbutton should come on indicating the stowed condition.

C. SERVICE POSITION: Set S_4 to Meridian set and drive antenna to meridian. Now it is possible to drive south to the SW/SE limit. However the use of the feed service tower requires the antenna to be stopped somewhat above the service position to allow the tower to be positioned and then further driving south is necessary to reach the service position desired. A second person is needed to visually check clearances during this procedure.

III. Reset Button

After actuating a boundary or limit switch driving S, E or W, the All Off relays must be reset before any antenna can be driven in that direction again. Opposite direction motion is possible but to return to the boundary/limit first encountered requires operation of the reset switch P_7 on Declination Control Panel or P_8 in the Antenna Contactor Box.

Related Documents

RA-628 Common Line Reset Connection Diagram
RD-627 Array Limit Switch Schematic
Glint 323 The Limit Switches
Glint 309 The Mercury Switches

Glint No. 383-7
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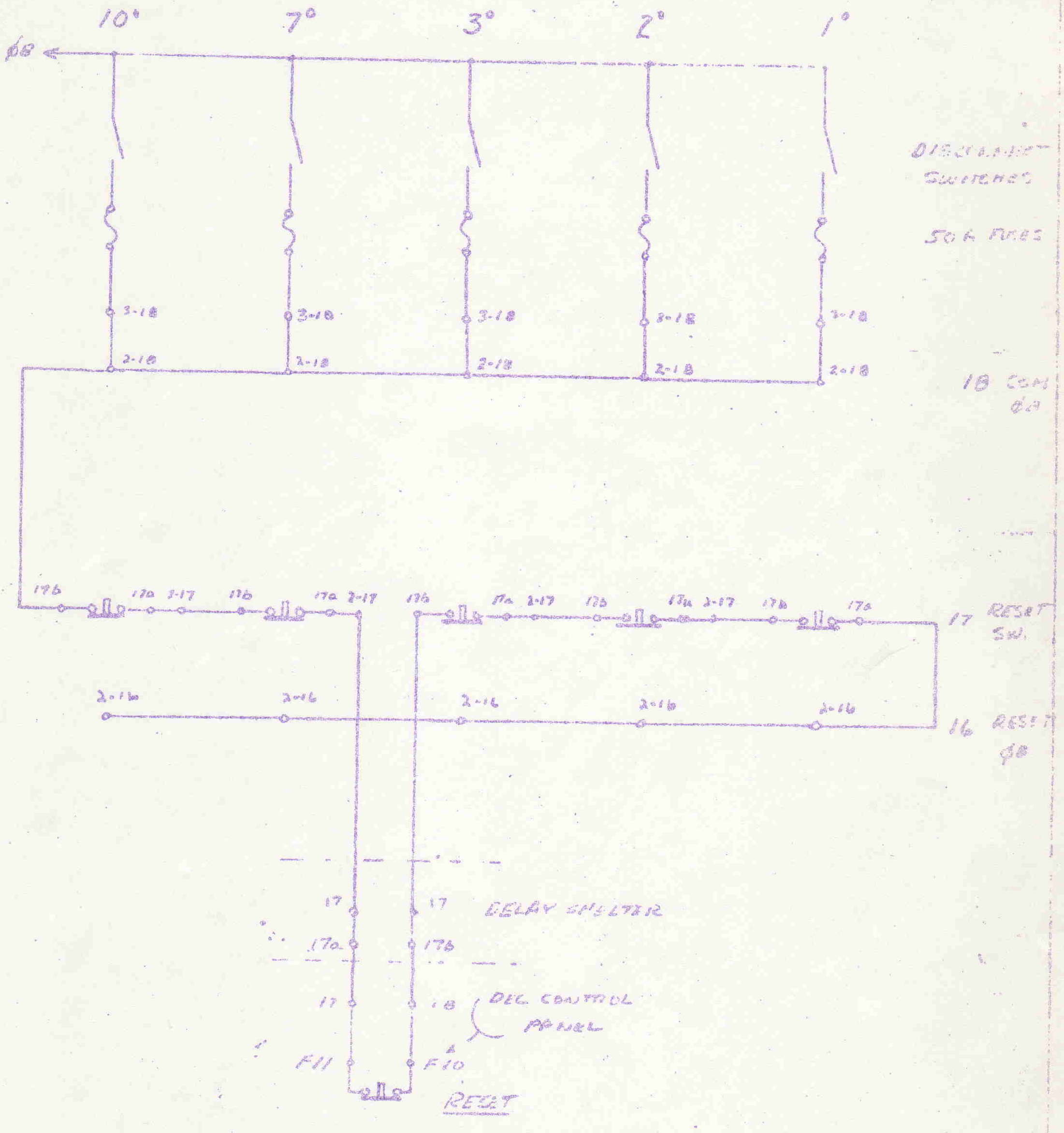

COMMON LINE
RESET CONNECTION
DIAGRAM