MULTIPLIER/DIVIDER, 193X298A_G01
1.0 GENERAL

This instruction provides basic information regarding the subject card. Refer to the system elementary diagrams for information relating to the overall system operation.

2.0 DESCRIPTION

2.01 This card may be connected up for use as either a four quadrant multiplier or a four quadrant divider. The X input may be applied differentially with \( +10\text{V} \) max. between \( X_1 \) and \( X_2 \) or \( +3.3\text{V} \) max. between \( X_3 \) and \( X_4 \). The Y input must be referenced to common with \( +10\text{V} \) max. at \( Y_1 \) or \( +3.3\text{V} \) max. at \( Y_3 \).

With a differential X input the maximum permissible input voltages with respect to common are \( X_2 = +3\text{OV} \) max. and \( X_4 = +20\text{V} \) max.

2.02 Connected as a multiplier (tab 10 to tab 22) the general expression for the product is:

\[
\text{Prod.} = 1 \cdot [(X_1 - X_2) + 3(X_3 - X_4)] \cdot [Y_1] + 3(Y_3),
\]

where the X's and Y's represents the voltages to common at the respective input tabs as indicated on the functional block diagram. Normally only one of the input voltage ranges would be used and the X input would usually be referenced to common. The product expression is then simplified to:

\[
\text{Prod.} = 1(X_1) \cdot (Y_1), \quad X_2 \text{ (tab 27) must be connected to common, or}
\]

\[
\text{Prod.} = -1(X_2) \cdot (Y_1), \quad \text{where } X_1 \text{ must be connected to common.}
\]

2.03 When connected as a divider (tab 22 to tab 3) the general expression for the quotient is

\[
\text{Quot.} = \frac{-10 \cdot [(Y_1) + 3(Y_3)]}{(X_1 - X_2) + 3(X_3 - X_4)},
\]

where \( -10 \cdot [(X_1 - X_2) + 3(X_3 - X_4)] = 0 \)

Again only one input range is normally used and the X input is usually referenced to common simplifying the above expression to

\[
\text{Quot.} = -10 \cdot \frac{(Y_1)}{(X_1)}
\]

Where \( X_1 \) is neg. and the \( X_2 \) tab connected to common.

If the X signal is positive it must be applied to the \( X_2 \) tab with \( X_1 \) connected to common and the expression becomes

\[
\text{Quot.} = \frac{10 \cdot (Y_1)}{(X_2)}
\]
3.0 **ADJUSTMENTS**

There are no adjustments on this card.

4.0 **TROUBLESHOOTING**

4.01 With the card connected as a multiplier check for the following performance:

a) With $X_1 = X_2 = Y_1 = 0$ (connected to common) the output voltage should be less than $\pm 0.02$ volts.

b) With $X_1 = X_2 = 0$ & $Y_1 = \pm 5V$ the output voltage should be less than $\pm 0.04V$.

c) With $X_2 = Y_1 = 0$ and $X_1 = \pm 5V$ the output voltage should be less than $\pm 0.04V$.

d) With $X_2 = 0$, $X_1 = \pm 5V$ and $Y_1 = \pm 5V$ the output voltage should be $\pm 2.5V \pm 0.1V$. 
MULTIPLIER/DIVIDER

FUNCTIONAL BLOCK DIAGRAM

MULTIPLIER CONNECTION: JUMPER TAB 3 TO TAB 22

FOR DIVIDER CONNECTION: