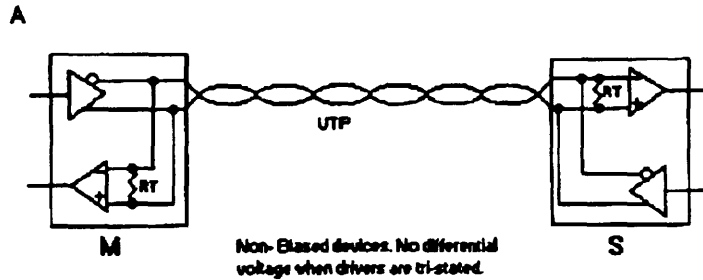
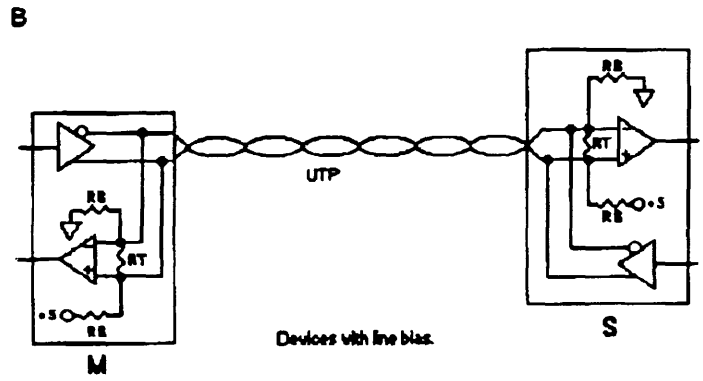


"USING THE RS-485 REPEATER (IC155/158) IN BIASED LINE APPLICATIONS"

What is a "Biased Line"?

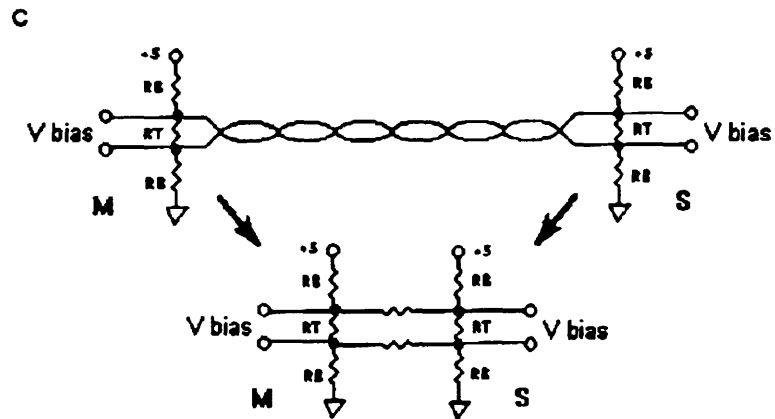


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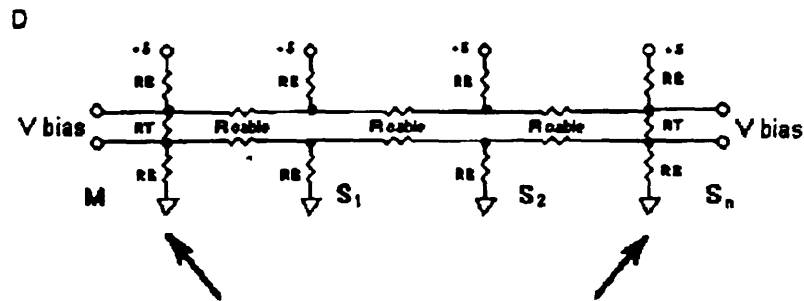
When drivers are tristated, the circuit below is equivalent. Simplification works well for relatively low baud rates.



Using devices that have line biasing resistors ensures that a receiver does not see spurious noise on the line as "data" and can make up for a poor cable. But, it also limits the maximum distance and/or the maximum number of "drops" on the network, thus, the need for a repeater function.

Previous circuit shows each Rx will "see" a differential voltage due to the bias resistors.

NOTE 1: In RS-485, a differential voltage of $> \pm 200\text{mV}$ is considered valid data. It should also be noted that as each device is added to the line, the bias voltage will change.



^ONLY the two furthest devices should be terminated. None in between.^

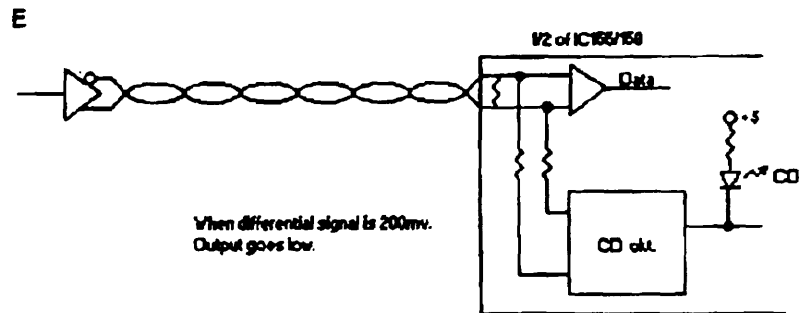


So what does this have to do with the repeater??

THE PROBLEM:

The repeater uses a "carrier detect" circuit to determine when someone is on the line. This allows for direction switching automatically.

NOTE 2: A carrier is a differential voltage of $> \pm 200\text{ mV}$. (See Note 1 above.)



What happens to CD (carrier detect) when Line Bias resistors are added? The answer is CD will always be 'ON'.

Thus, if the repeater is put in a circuit that is using line bias, it will always see a carrier (it thinks) from the bias voltage and never switch directions. (It cannot distinguish between a valid carrier and the bias voltage.)

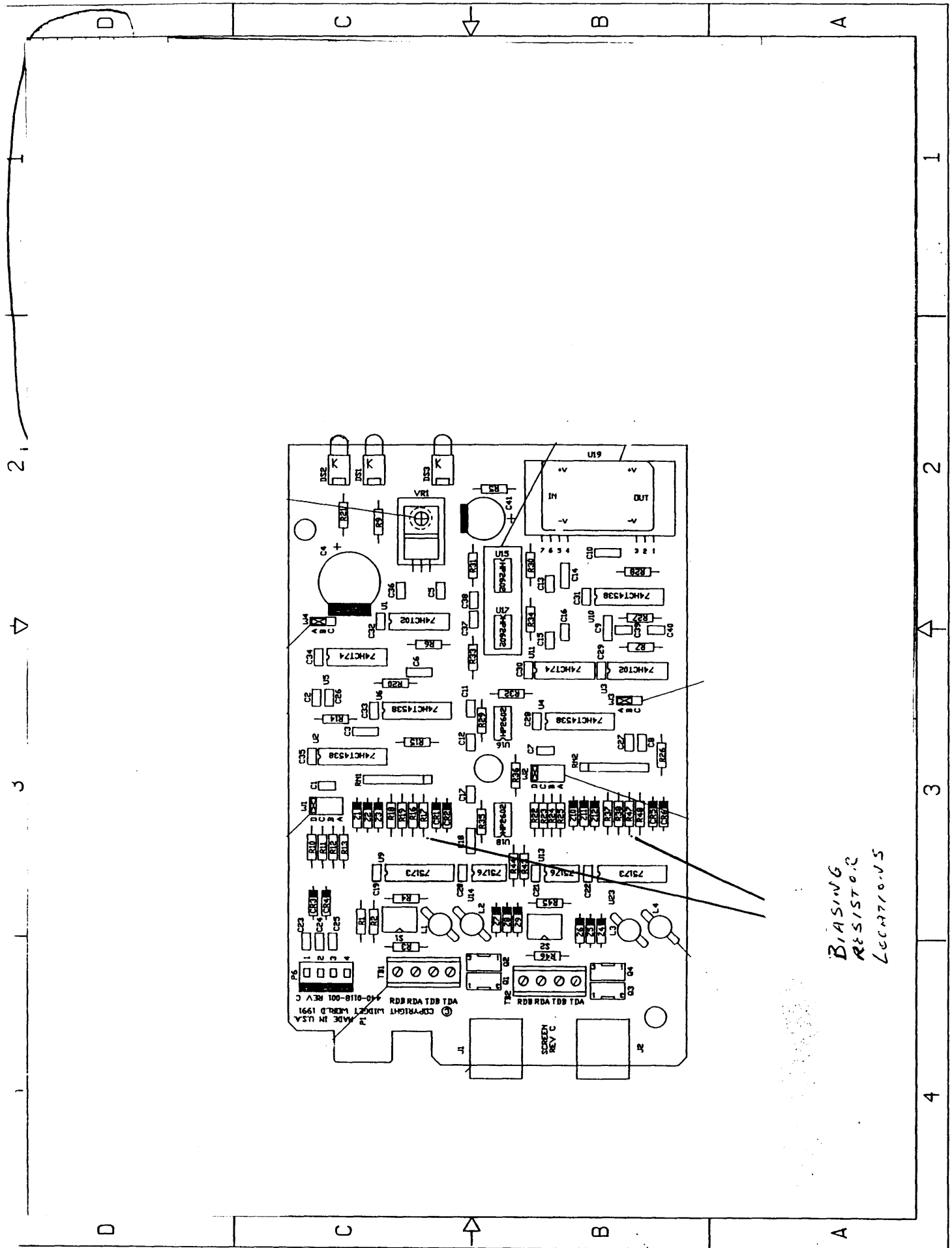
THE SOLUTION: By adjusting the carrier detect circuit sensitivity to be greater than the bias voltage with all the drivers tri-stated, then the repeater can distinguish between the line bias voltage and the greater differential signal from an enabled driver.

THE IMPLEMENTATION: Determine where in the network you want to add the repeater...and...which function you want to accomplish.

See steps
7 thru 10

FUNCTION: Extend the distance of
your RS-485 link
AND/OR
increase the number of
drops on your RS-485 network.

- STEP 1:** Install repeater in network.
 - STEP 2:** Ensure two devices are terminated (No more/no less).
 - STEP 3:** Ensure all drivers are NOT transmitting and are tri-stated.
 - STEP 4:** Measure the voltage at TB1, RDA & RDB (Vbias).
 - STEP 5:** Look at supplied graph for measured bias voltage (Vbias)
 - STEP 6:** Choose an Rvalue to use.
 - STEP 7:** Install resistors in locations R16, 17, 18, 19.
 - STEP 8:** Repeat steps 1 thru 6 for TB2.
 - STEP 9:** Install resistors in locations R37, 38, 47 & 48.
- Power up system. CD LED's now should be OFF until a driver is enabled.



BIASING
RESISTOR
LOCATIONS

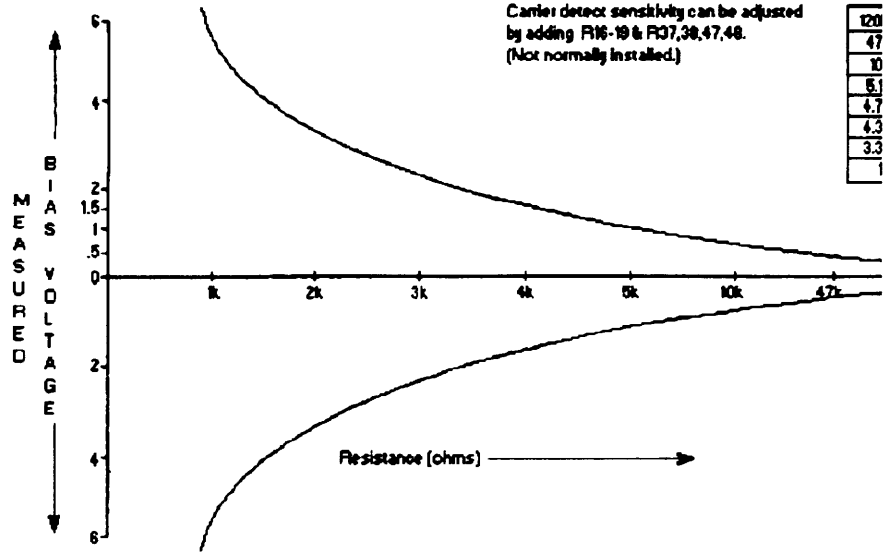
MADE IN U.S.A.
COPYRIGHT MICROT WORLD 1991
RDB RDA TDB TDA
4-0-0118-001 REV C

A B C D
1 2 3 4

.160v
.240v
.570v
1.22v
1.35v
1.5v
1.87v
6.5v

120k

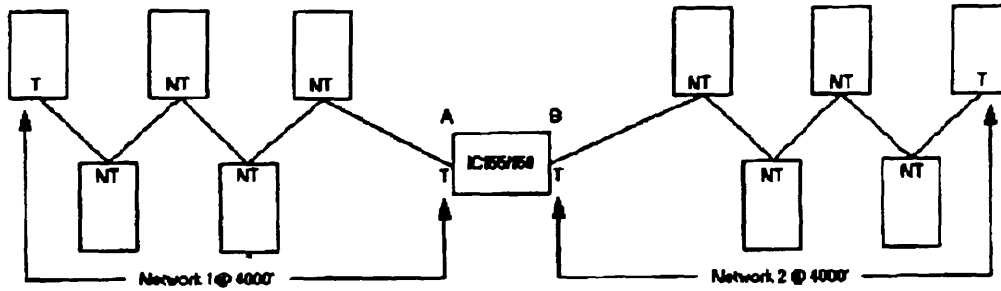
G



EXAMPLE DRAWING OF REPEATER DROPPED ON NETWORK 1 AS A PHYSICAL END, AND, IS A PHYSICAL END TO NETWORK 2.

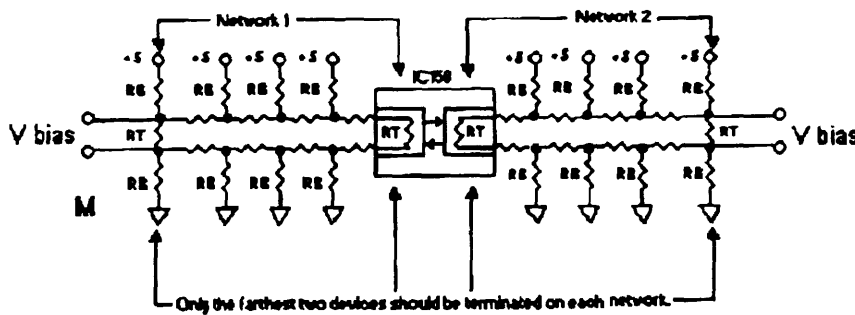
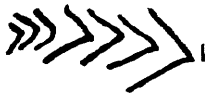
KEY: T =Terminated
NT= Not Terminated

H



**An important note: Using the IC158 (Opto-isolated version) totally isolates one link from the other (100% electrical isolation).

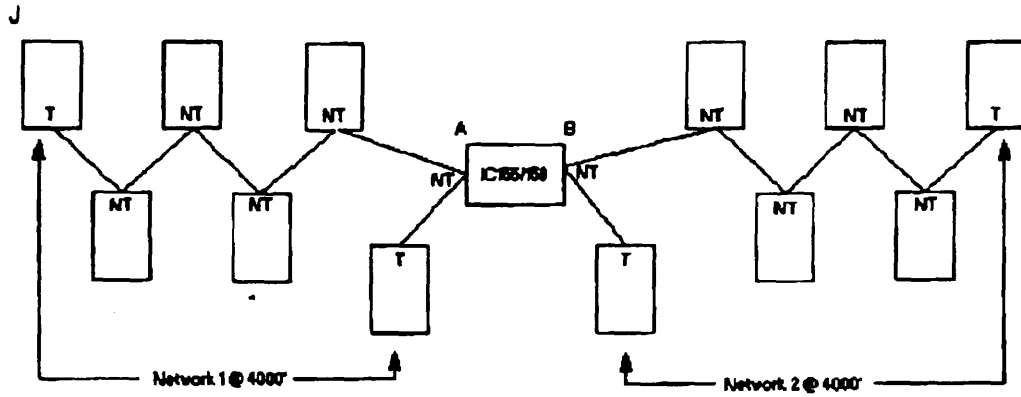
Example of extending/bridging a network at the physical end by making the repeater the physical end. (See next diag.)



By using the IC158 (Opto-isolated version), total electrical isolation between Network 1 and Network 2 can be established.

EXAMPLE DRAWING OF REPEATER DROPPED BETWEEN TWO EXISTING NETWORKS AS A BRIDGE.

**KEY: T = Terminated
NT = Not terminated**

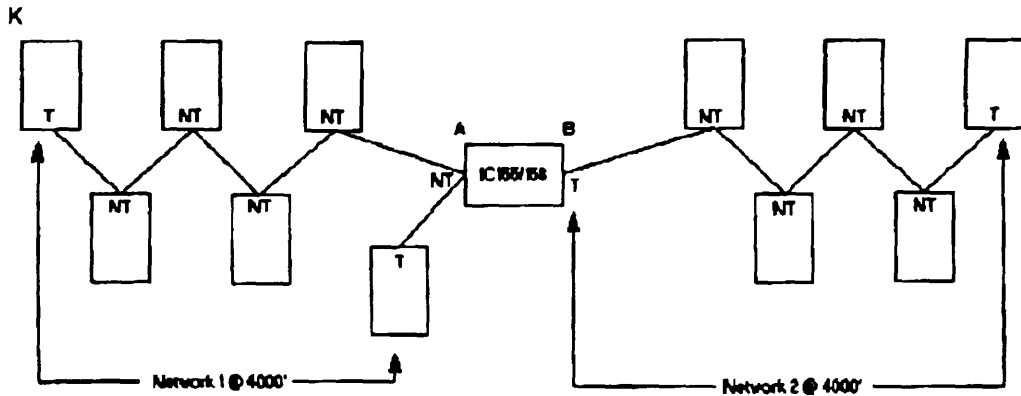


****An important note: Using the IC158 (Opto-isolated version) totally isolates one link from the other (100% electrical isolation).**

Example bridging two networks when the physical ends are distant and somewhere in the middle the two networks come physically close.

REPEATER DROPPED ON NETWORK 1 AS A NODE, NOT AS A PHYSICAL END, BUT IS A PHYSICAL END TO NETWORK 2.

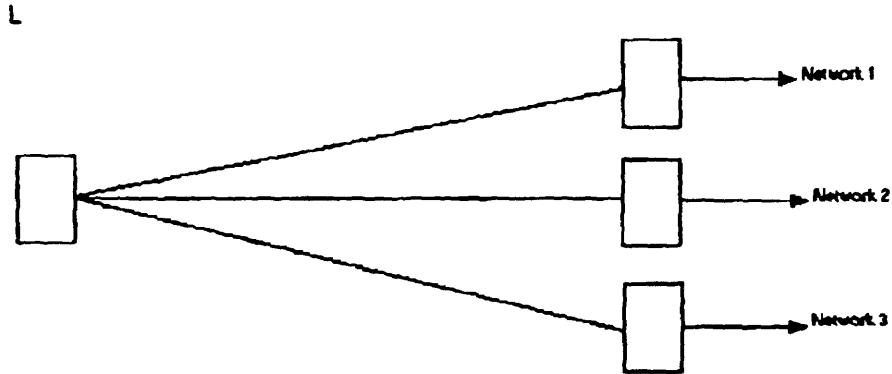
**KEY: T = Terminated
NT = Not Terminated**



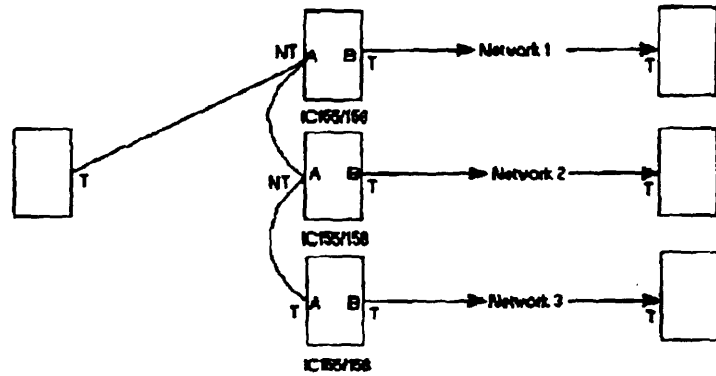
****An important note: Using the IC158 (Opto-isolated version) totally isolates one link from the other. (100% electrical isolation)**

Example of extending/bridging a network where it may be physically easier to connect somewhere other than the physical end.

**EXAMPLE OF INCORRECT RS-485 STAR CONFIGURATION
(THIS CAN NOT BE DONE!!!! WHO SHOULD BE TERMINATED?)**



**EXAMPLE OF CORRECT RS-485 STAR CONFIGURATION USING THE
RS-485 REPEATER.**



** An important note: Using the IC158 (Opto-isolated version) totally isolates one link from the other. (100% electrical isolation.)

PORT TO PORT ISOLATION <500V

N

