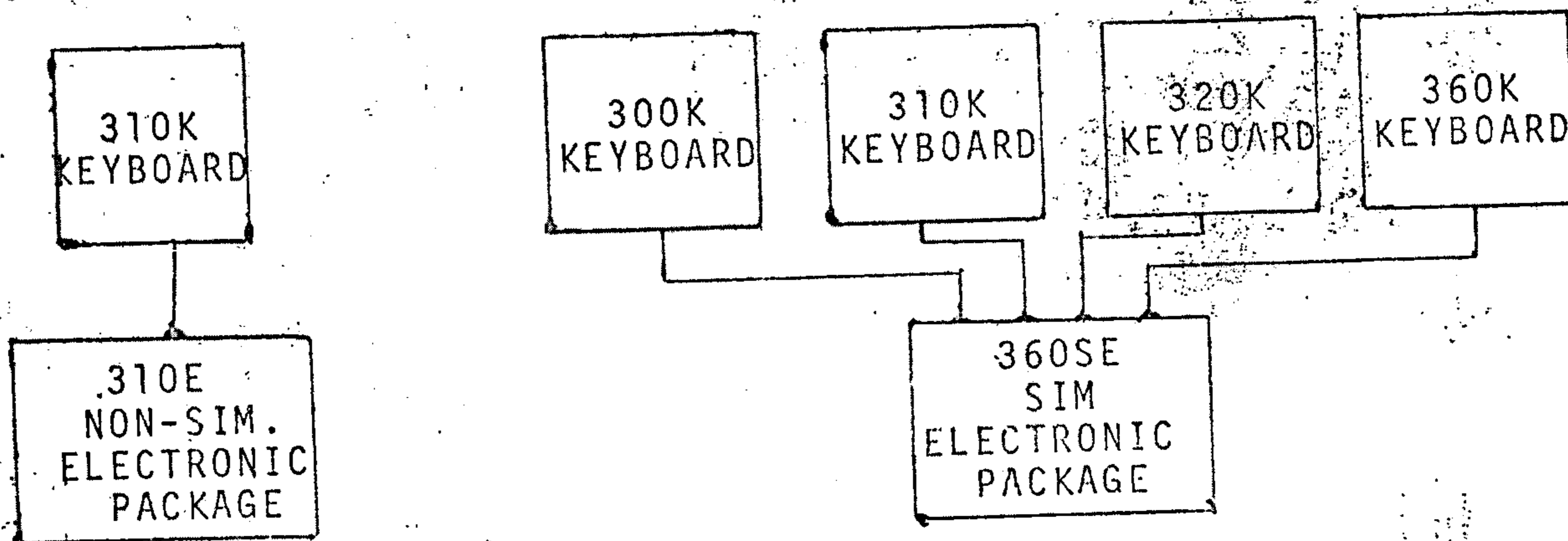


CALCULATOR CONFIGURATIONS

All calculator configurations involve either one non-simultaneous electronic package (i.e. an E package) or one simultaneous electronic package (i.e. an SE package). The non-simultaneous package (E package) has only one output channel, and thus can only work on one calculation at a time. The simultaneous package (SE package) has four independent output channels, and thus can work simultaneously on four different calculations.

The most basic calculator configuration consists of directly connecting one keyboard to the one channel of a compatible E package or four keyboards (one per channel) to each channel of a compatible SE package. In the "300 Series" of calculators an E or an SE package with a particular model number can take on keyboards of its own numbered series as well as other keyboards of a lower numbered series. This general rule does not hold for the "200 series" of calculators.



Many other configurations are possible however. This is due to T-connectors, extension cables, and peripheral equipment such as card readers. A T-connector makes it possible for more than one keyboard to be connected to an output channel of an E or SE package. Although more than one keyboard may be connected to a given channel, only one keyboard may operate at a time on that channel. Extension cables make it possible for keyboards to be removed from the immediate vicinity of a E or SE package.

For certain configurations up to four keyboards may be T-connected to a given channel, however there are configurations which do not permit branching via T-connectors to such an extent. Extension cables up to 200 feet in length may be used between electronic packages and keyboards in certain configurations, but here, too restrictions exist which make it necessary to sometimes use cables of shorter length.

The physical and operational boundaries outlined below result from circuit characteristics as well as voltage requirements of the calculator system and its components.

In the discussion which follows, the term "regular keyboard" is used. A "regular keyboard" is any keyboard which is neither a Trigonometric Keyboard nor a 370/380 Programming Keyboard.

Non-simultaneous Electronic Package

- for restrictions refer to the components which will be plugged into the one channel of the E package.

IMPORTANT - NOTE

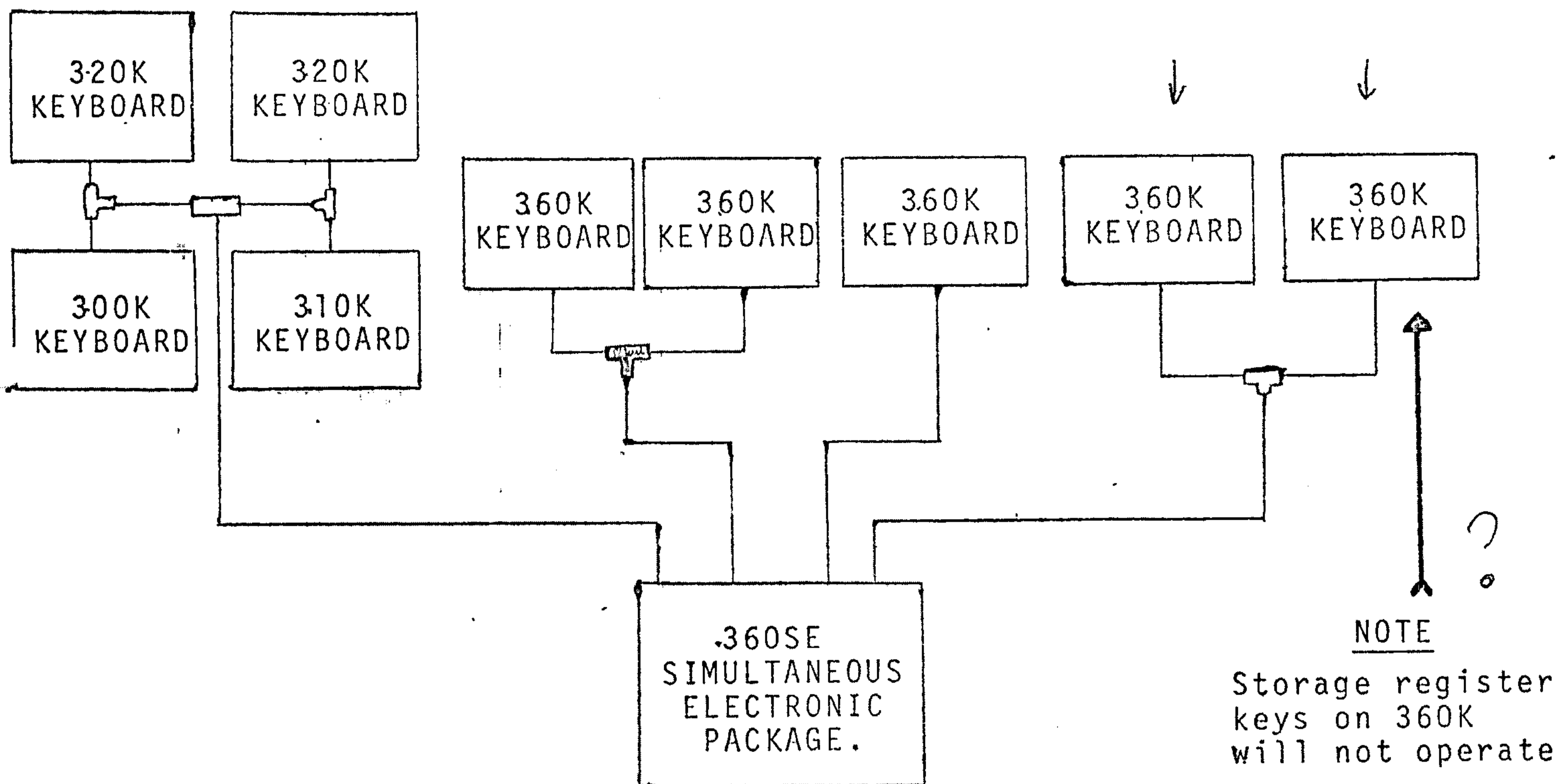
Simultaneous Electronic Package

- because of the high-speed demands a 370/380 Programming Keyboard, a CP Card Programmer, and a Trigonometric Keyboard place on an SE package, the use of such equipment is restricted. (The reduced speed resulting from the simultaneous operation of two programming-type units affects all the users of an SE package, even users entering data via a regular keyboard. Elapsed time for results on any one station is the sum of the run-times of all four stations connected to the SE package.)
- if one channel of an SE package has a 370/380 Programming keyboard then no other channel should have a 370/380 Programming keyboard.
- from a customer's point of view, it is not good economics to have more than two channels of an SE package equipped with programming units.
- for other restrictions refer to the components which will be plugged into the four channels of the SE package.

Regular Keyboards

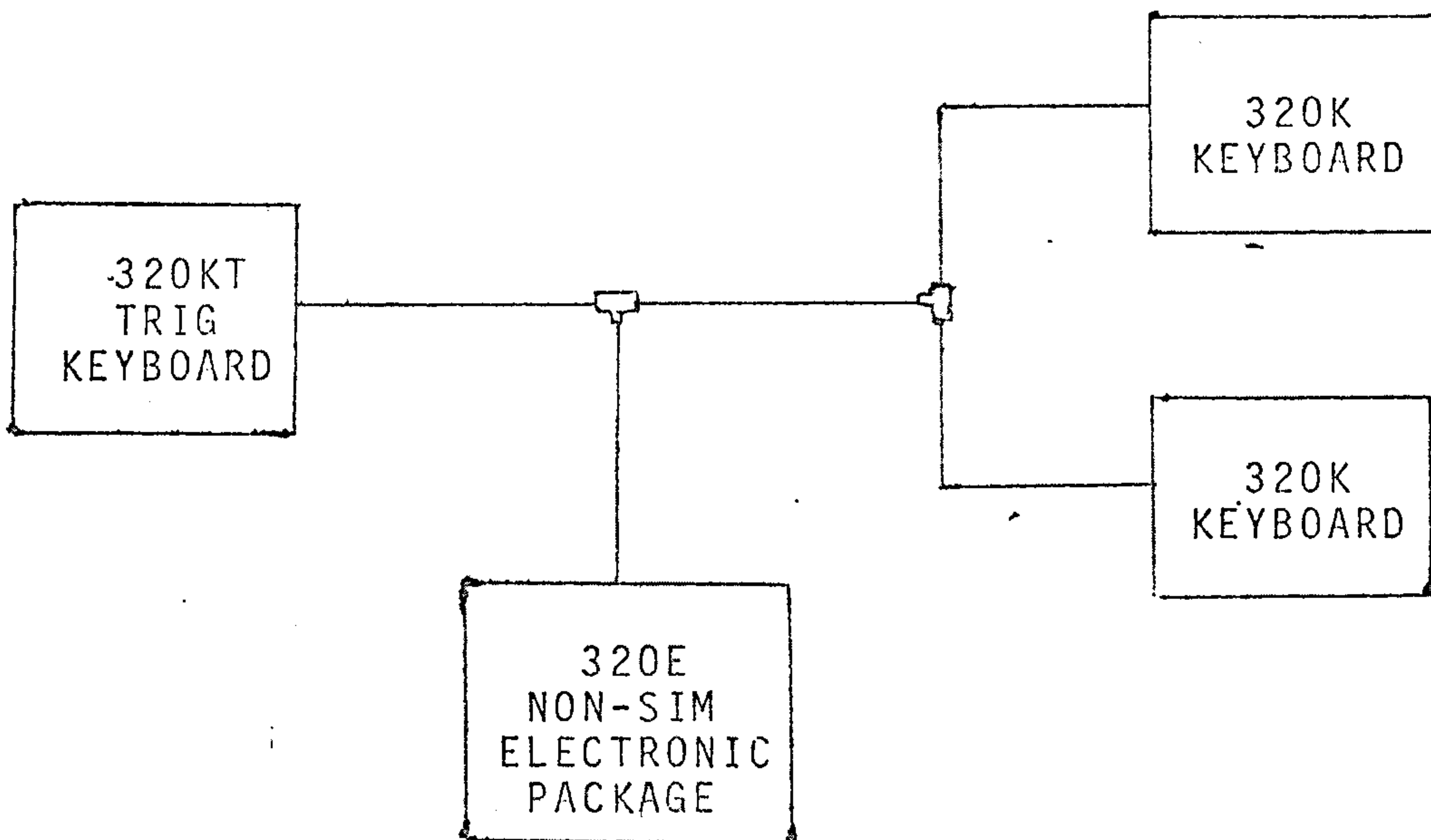
- up to four regular keyboards may be T-connected to any one channel of an E or SE package ; however, only one of these keyboards could operate at a time.
- if a regular keyboard with extra storage capabilities is interlinked via T-connectors to a regular keyboard without storage capabilities, then the extra storage register keys of the first keyboard become inoperable. (The 240K, 250K, 360K are the only regular keyboard models with this extra storage capability.)

- a regular keyboard may be separated from an E or SE package by no more than 200 feet of extra cable.
- see below for rules on using CP-Series Card Readers in conjunction with a regular keyboard.



Trig keyboards

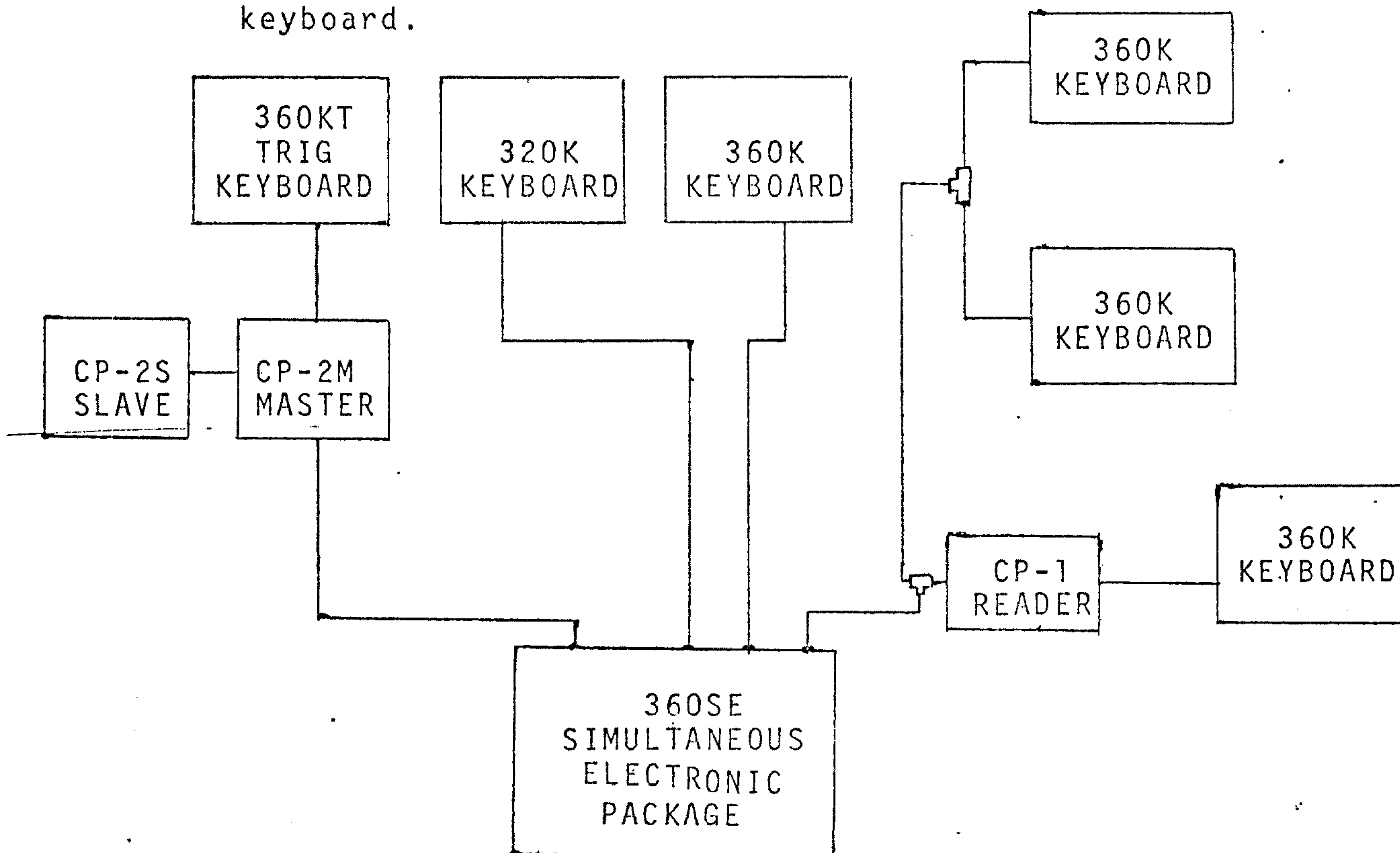
- only one trigonometric keyboard may be used on any one channel of an E or SE package ; no more than two channels of an SE package should be equipped with trigonometric keyboards.
- for multi-keyboard connections on one channel of an E or SE package, the trig keyboard should be attached to a first tier T-connection. Then up to two other regular keyboards may be attached to the same channel by means of a second T-connector.
- a trig keyboard may be separated from an E or SE package by no more than 50 feet of extra cable extension.
- see below for rules on using CP-Series Card Readers in conjunction with a trig keyboard.



IMPORTANT - NOTE

Keyboards (regular and trigonometric) used with Card Readers

- only one keyboard used with a CP-1 (or CP-2 master and slaves) may be connected to any one channel of an E or SE package; no more than two channels of an SE package should be equipped with card readers.
- for multi-keyboard connections on one channel of an E or SE package, the keyboard used with a CP-1 (or CP-2 master and slaves) should be attached to a first tier T-connection. Then up to two other regular keyboards without card readers may be attached to the same channel by means of a second T-connector.
- a keyboard used with a CP-1 (or CP-2 master and slaves) may be separated from an E or SE package by no more than 50 feet of extra cable.
- no extension cable is allowed between a card reader and a keyboard.

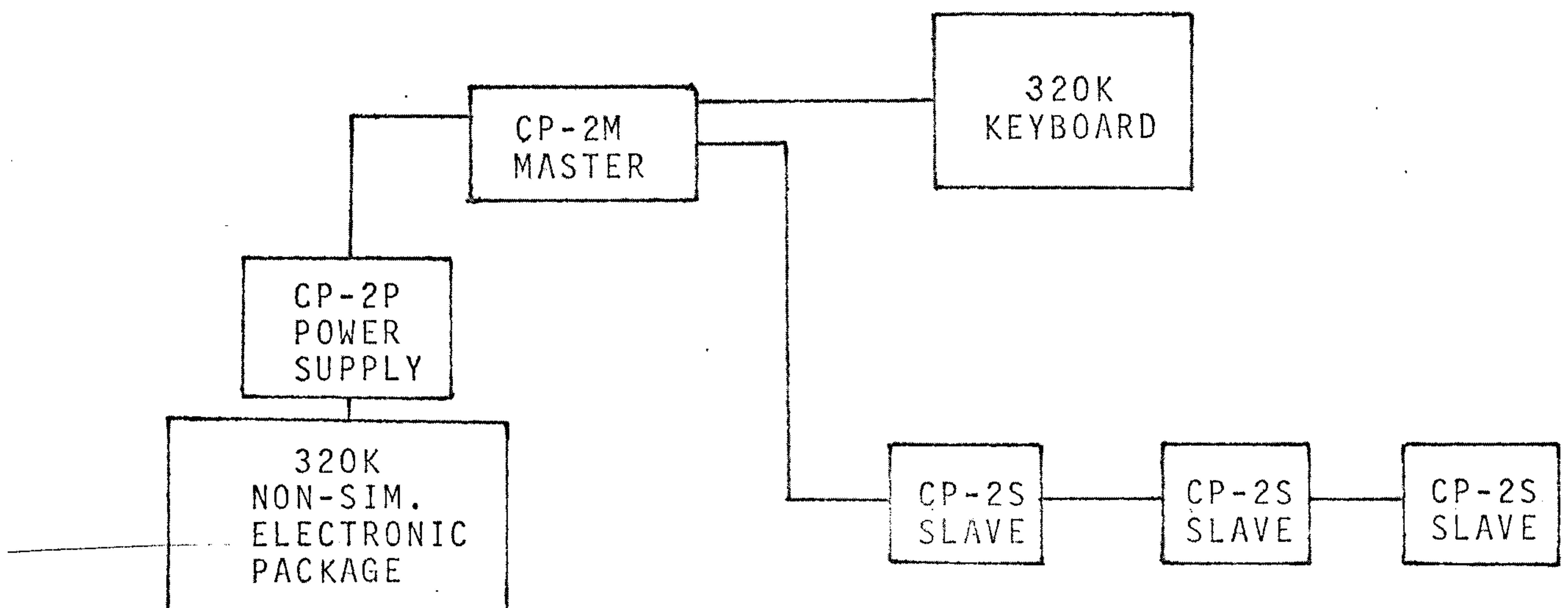


CP-1 Card Reader

- only one CP-1 may be connected to an E package or to any one channel of an SE package : no more than two channels of an SE package should be equipped with CP-1's.
- up to 50 feet of extension cable allowed between E or SE package and CP-1.
- no extension cable is allowed between an CP-1 and a keyboard.
- a CP-1 should not be used with a 370/380 Programming Keyboard.

CP-2 Master and Slaves

- only one CP-2 system may be connected to an E package or to any one channel of an SE package ; no more than two channels of an SE package should be used with a CP-2 system.
- the CP-2M may be used alone or with up to three CP-2S slaves which are connected directly in series to the slave connector on the side of a CP-2M.
- whenever more than one CP-2S slave is used, then a CP-2P power supply must be added between the CP-2M and the electronic package.
- whenever an extension cable is used, then 2 CP-2P power supply must be added between the CP-2M and the electronic package (whether or not CP-2S slaves are used).
- maximum of 50 feet of extension cable is allowed between CP-2P and the E or SE package.
- no extension cable is allowed between a CP-2 system and a keyboard.

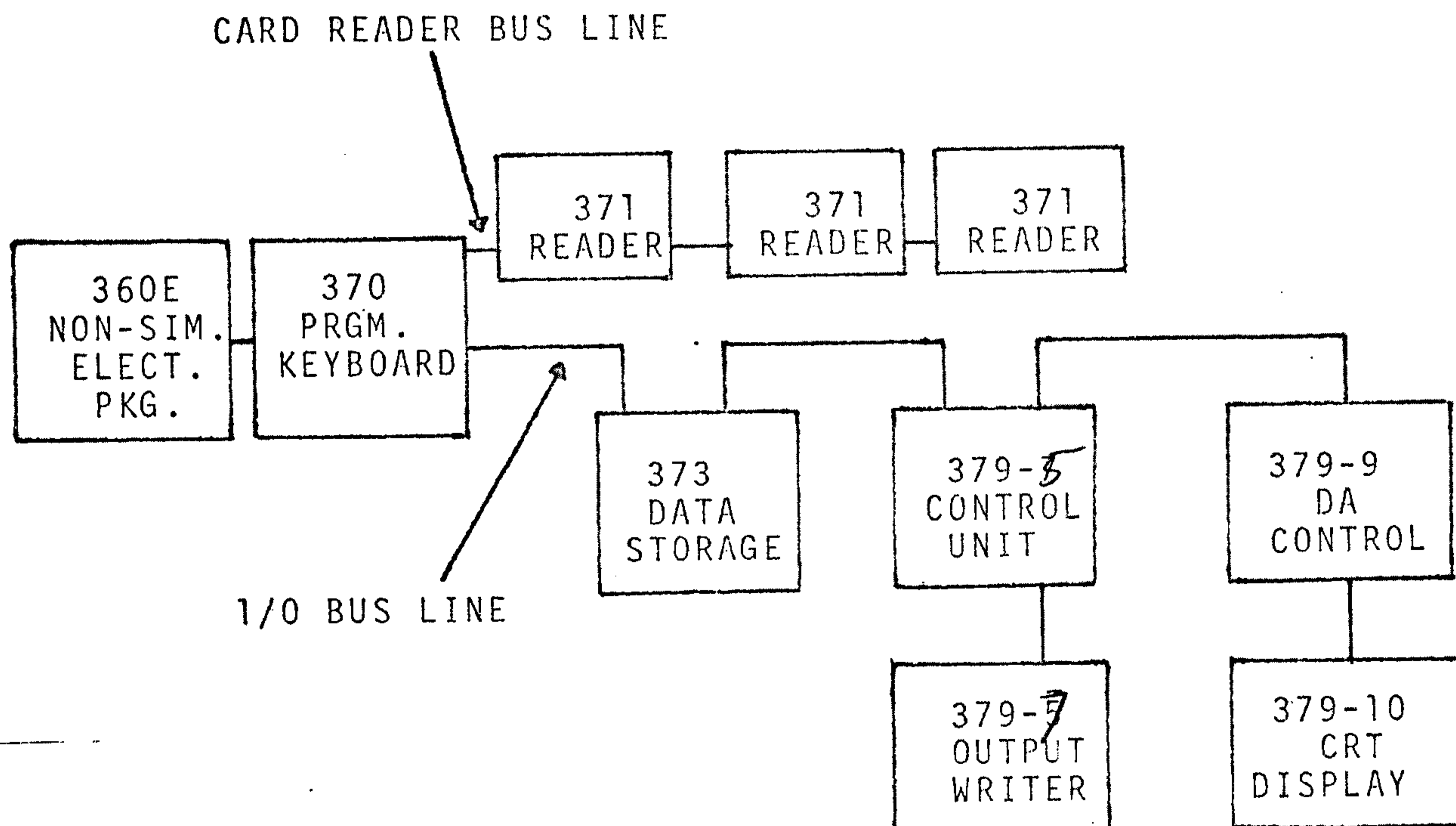


370/380 Programming Keyboards

- a T-connector cannot be used with a 370/380 keyboard ; thus, no other keyboard may be connected to a channel of an E or SE package which already has a 370/380 keyboard.
- maximum length of extension cable between a 370/380 keyboard and an E or SE package is 50 feet.
- at most only one channel of an SE package should be equipped with a 370/380 keyboard.
- see below for rules regarding the use of 371 Card Readers and 370/380 peripheral equipment in conjunction with the 370/380 keyboard.

371 Card Readers

- a maximum of twelve 371 card readers may be connected in series to the Card Reader jack on the back of 370 (or 370-2).
- Programming Keyboard
- no extension cable may be used to separate 371 card readers from each other or from the programming keyboard.
- 371 Card Readers are also compatible with the 379-12 Trig Package and the 379-13 Card Reader Interface.



IMPORTANT - NOTE

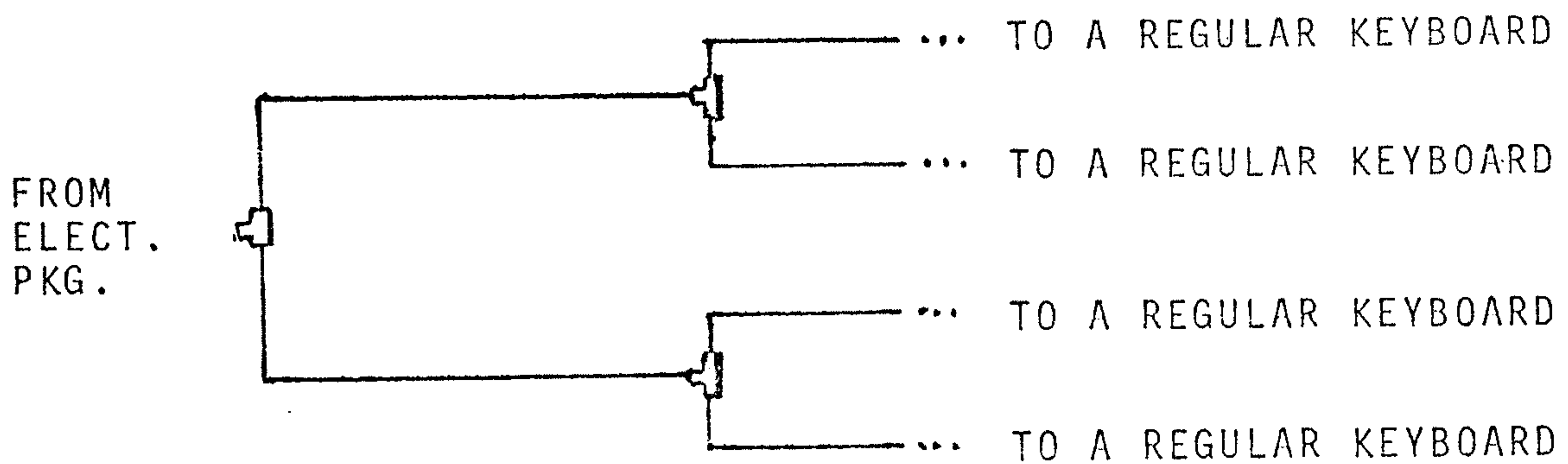
370/380 Peripheral Equipment

(Data Storage, Units, Input/output Units and Interfaces, Trig Package, Paper Tape Editors and Listers)

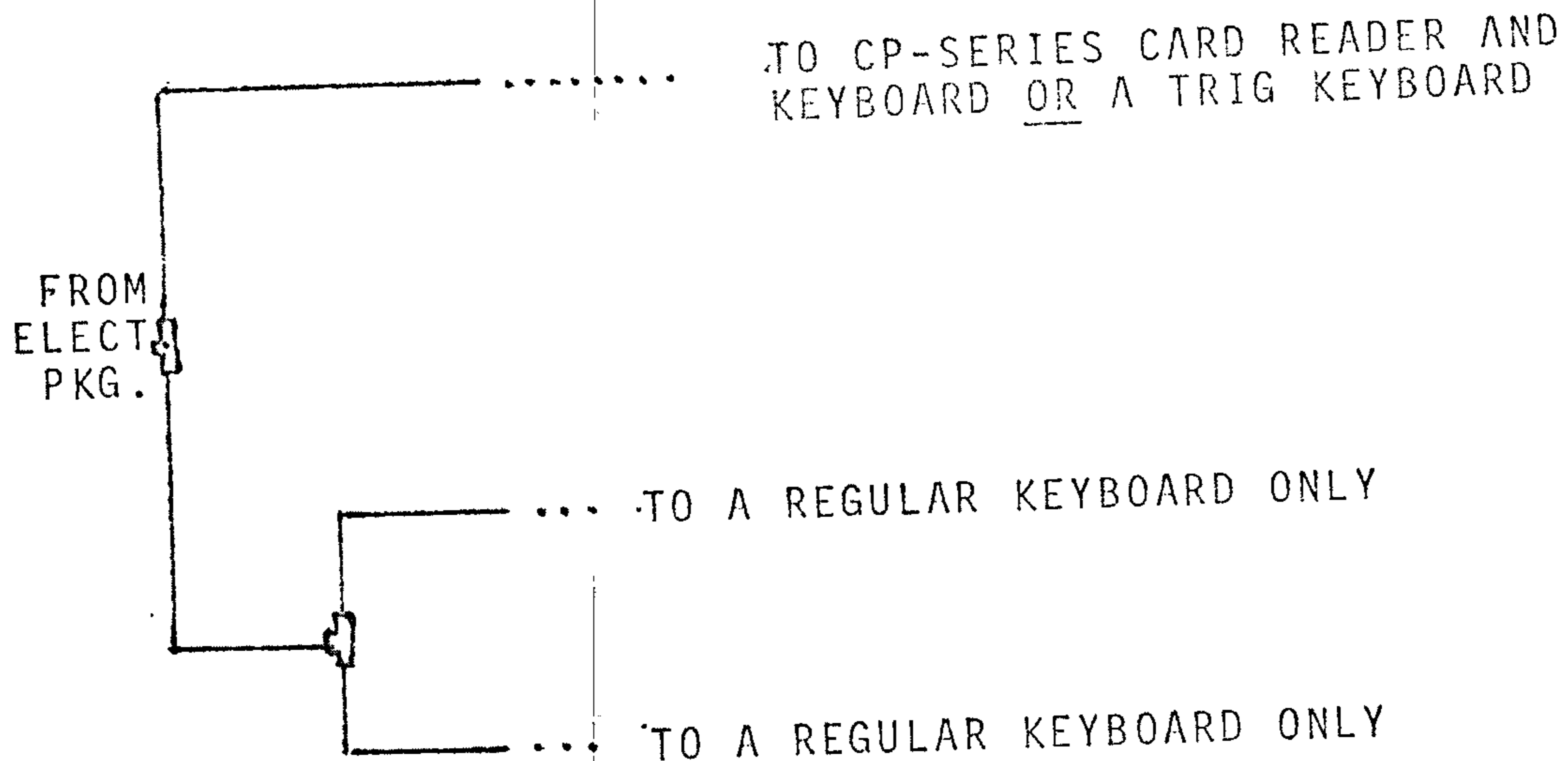
- all 370/380 peripheral equipment is connected to the I/O jack on the back of a 370/380 keyboard.
- a maximum of eight I/O modules may be connected to the I/O bus line ; a pair of units such as the 379-5 and the 379-7 may be counted as one module.
- data storage unit should be connected closest to the 370/380 Programming Keyboard on I/O bus line.
- extension cable used for peripheral devices is not compatible with extension cable used between keyboards and electronic packages ; thus, such cable should be ordered special if it is needed.
- maximum total cable length on the input/output bus line modules must not exceed 100 feet.
- no T- connectors are allowed at any point on the I/O bus line ; in addition, two I/O devices should never be T-connected to the same control unit.

T- Connectors

The discussion which follows summarizes rules on the T-connection of 200 Series and 300 Series Keyboards. When using just regular keyboards on one channel of an electronic package, then one is limited to a two-tier, 3-connector, 4-outlet maximum arrangement.



When using a CP-Series card reader, or 2 trigonometric keyboard, then one is limited to a 2-connector, 3-outlet maximum arrangement. The card reader or trig keyboard is connected to the first-tier output.



With respect to T-connectors, keyboards may be considered according to five different classes :

- A. 200K, 210K, 300K, 310K, 320K (regular keyboards)
- B. 240K, 250K, 360K, 362K (regular keyboards with extra storage)
- C. 320KT, 320KR, (trig keyboards)
- D. 360KT, 360KR, 362KT, 362KR (trig keyboard with extra storage)
- E. 370, 370-2, 380, 380-2 (programming keyboards)

Following are general rules regarding the T-connection of keyboards:

1. When a keyboard with storage keys (i.e. keys 10-17) is T-connected with a keyboard which has no storage keys, then the storage keys of the first keyboard are inoperable.
2. The 370/380 Programming Keyboards should not be T-connected with any other keyboard, regardless of type.
3. The 300 Series Trig keyboards should not be T-connected with other 300 Series Trig Keyboards.

Applying these rules, allows us to construct the following table. This table indicates whether any keyboard in one class of keyboards may be T-connected with any keyboard in another class of keyboards. Note that any keyboard in Class C, D, or E should not be T-connected with another keyboard from the same class.

	CLASS A	CLASS B	CLASS C	CLASS D	CLASS E
CLASS A	MAY BE T-CONNECTED	SHOULD NOT BE T-CONN. (RULE 1)	MAY BE T-CONNECT.	SHOULD NOT BE T-CONN. (RULE 1)	SHOULD NOT BE T-CONN. (RULE 2)
CLASS B	SHOULD NOT BE T-CONN. (RULE 1)	MAY BE T-CONNECT.	SHOULD NOT BE T-CONN. (RULE 1)	MAY BE T-CONNECT.	SHOULD NOT BE T-CONN. (RULE 2)
CLASS C	MAY BE T-CONNECTED	SHOULD NOT BE T-CONN. (RULE 1)	SHOULD NOT BE T-CONN. (RULE 3)	SHOULD NOT BE T-CONN. (RULE 3)	SHOULD NOT BE T-CONN. (RULE 2)
CLASS D	SHOULD NOT BE T-CONN. (RULE 1)	MAY BE T-CONNECT.	SHOULD NOT BE T-CONN. (RULE 3)	SHOULD NOT BE T-CONN. (RULE 3)	SHOULD NOT BE T-CONN. (RULE 2)
CLASS E	SHOULD NOT BE T-CONN. (RULE 2)	SHOULD NOT BE T-CONN. (RULE 2)	SHOULD NOT BE T-CONN. (RULE 2)	SHOULD NOT BE T-CONN. (RULE 2)	SHOULD NOT BE T-CONN. (RULE 2)

Priority PT-connectors

A priority PT-connector permits one of a set of interlinked keyboard to preempt the electronic package for immediate use and interrupt any unfinished work initiated on another keyboard.

Only one such PT-connector may be used on one channel of an E or SE package. The Pt-connector is simply substituted for the T-connector closest to keyboard which is to have priority. The priority keyboard should be plugged into the "P" side the PT-connector.

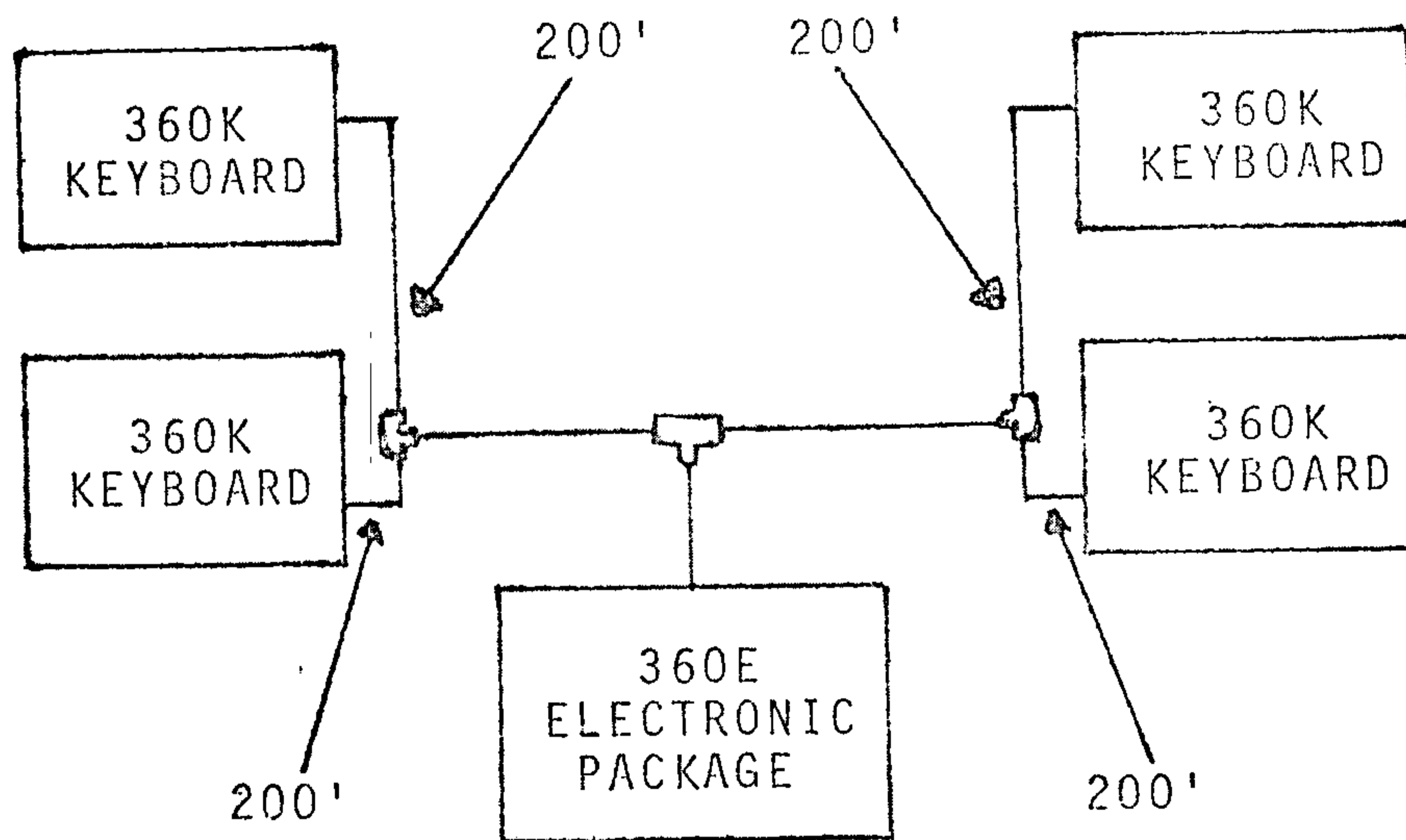
Special Notes on Cable extension and T-connectors

- I. On channels of an E or SE package equipped with only regular keyboards, T-connection of up to four keyboards is possible. No one of these keyboards should have more than 200 feet of cable separating it from the electronic package.

IMPORTANT-NOTE

In addition, the total extension cable used on any particular channel is restricted by the electrical design of T-connectors. A T-connector simply prevents signals from one keyboard from reaching the electronic package while the other keyboard is turned ON. Thus, the cables are not electrically isolated, and a build-up of capacitance occurs.

This means that restrictions should be placed on the total extension cable used on any particular channel. For example the following configuration causes problem on an intermittent basis when bits of information being passed through the cable are "dropped".



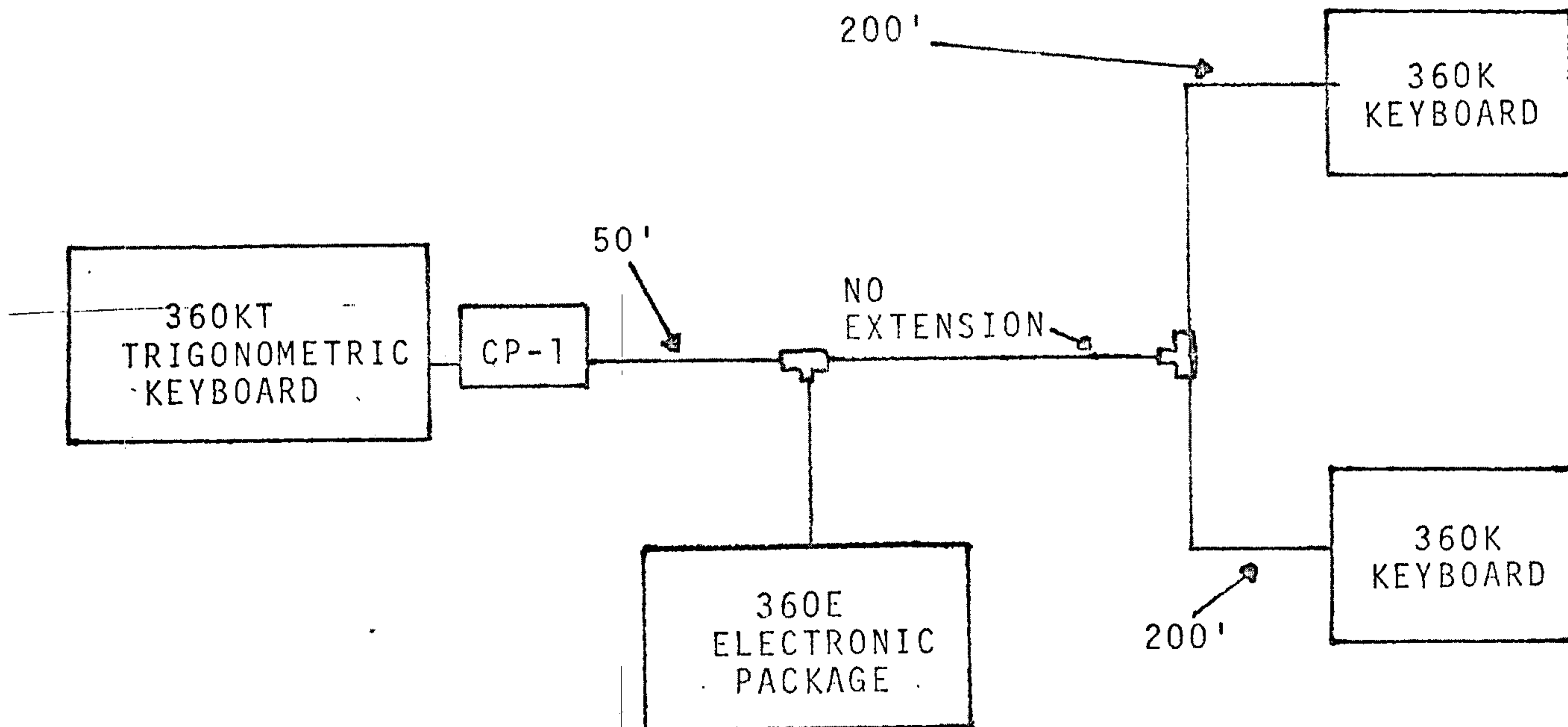
Errors observed :

Decimal point (code 75)	X^2 (code 45)	Recall reg 1 (code 15)
Clear display (code 76)	$X=$ (code 46)	Recall reg 2 (code 16)
Change sign (code 77)	$\div=$ (code 47)	Recall reg 3 (code 17)

If the total extension cable used in the above configuration was limited to 200-400 feet (instead of 800 feet), then this intermittent problem disappears.

II. On channels of an E or SE package equipped with a CP-Series Card Reader or a Trigonometric Keyboard, T-connection of up to two other regular keyboards is possible. Here, too the total extension cable used is significant.

Intermittent problems have been observed on the following configuration due to cable extensions and the extra power requirements of a trigonometric keyboard.



If the standard T-connector indicated by an asterisk (*) is replaced by a special T-connector (Model 300T-3), then extra bias is provided for the trigonometric keyboard. Such a T-connector should be used in configurations where a CP-Series card reader is used in conjunction with a trigonometric keyboard.