to 50 on the “Horse Power” circle, and read the data in the window as follows:

Circuit Switch 400 amperes
Starting Fuse 250 amperes
Conduit 2 inch
R. C. Wire 000
Running Protection 156.5 amperes

Full Load Current 125 amperes
Note the HIGH-REACTANCE motors (which are thrown directly on the line) are classed the same as squirrel-cage motors with compensators. Note also that squirrel-cage-motors which are not of the high-reactance type require larger starting current when no compensator is used, therefore the arrow marked “SQUIRREL-CAGE WITHOUT COMPENSATOR” must be used for these motors.

NOTE that a 400 ampere switch is required for 440 volt motors above 50 horse-power, in California.

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DIRECTIONS FOR USING THE
T & T Fast Calculator

Simply set the movable disks to indicate the given data, and read the answer. All directions necessary will be found on the Calculator, but a few examples are given here to indicate the ease with which your problems may be solved with THE FAST CALCULATOR.

WIRE CALCULATOR
(Based on Resistance Drop Only)

CAUTION: Always check MINIMUM size R. C. wire required, by reference to the large table at the bottom of the front of the Calculator.

Example 1
Given: 110 volt single-phase system
9 amperes
22 feet to center of load
1% drop

Find size of wire.

SOLUTION: Set 9 amperes on large disk (by turning disk with finger in slot at top) to 110-volt single-phase on System Index, in large circular window; then turn small disk (by pressing thumbs against it) until 1 appears in the small round window (marked “Per Cent Drop”). Read the answer, No. 14 (on small disk) opposite 22 feet (on large scale marked “Feet One Way”).
Example 2

Given: 110 volt single-phase system
- 20 amperes
- 120 feet to center of load
- 3% drop

Find size of wire.

**SOLUTION:** Set 20 amperes to 110 volt single-phase Index; then set Per Cent Drop to 3 (by turning small disk). Read the answer, No. 8, opposite 120 feet. Note that No. 8 is required for 120 feet even though the table shows that No. 12 has a safe carrying capacity of 20 amperes. With No. 12 the drop should be 7½%. Check this by setting No. 12 opposite 120 feet, and read 7½ in the Per Cent Drop Window.

Example 3

Given: 110 volt three-phase system
- 34 amperes
- 2% drop
- No. 8 wire

How far can this circuit be run?

**SOLUTION:** Set 34 amperes to 110 volt 3-phase Index; then turn small disk until 2 appears in Per Cent Drop window; opposite No. 8 read the answer, 55 feet. (Note that it is as easy to make calculations for 3-phase circuits with THE FAST CALCULATOR as it is for the single-phase circuits.)

Example 4

Given: 220 volt single-phase system
- 50 amperes
- No. 6 wire
- 500 feet

Find Per Cent Drop.

**SOLUTION:** Set 50 amperes to 220 volt single-phase Index; then turn small disk until No. 6 wire comes opposite 500 feet. Read the answer, 9½% drop, in the round window.

Example 5

Given: 220 volt three-phase system
- 250,000 circular mil cable
- 100 feet
- 3% drop

How many amperes may be carried?

**SOLUTION:** Set 250,000 circular mils to 100 feet (by turning small disk). Now turn LARGE disk until ¾ appears in Per Cent Drop window. Read the answer, 215 amperes at the 220 volt three-phase Index. Checking the table (at bottom of Calculator) we find that 250,000 circular mil R. C. cable has a safe carrying capacity of 250 amperes; so the number of amperes found (215) may be safely carried by the 250,000 circular mil R. C. cable.

**THE SMALL TABLE** (on front of Calculator) gives the constant for finding amperes (single-phase or 3-phase) for unity power-factor loads (such as heaters).

Example

Given:
- Six 2000 watt heaters to be supplied by a 2-wire (single-phase) 220 volt sub-feeder 230 feet long, with a drop of 3%.
- Find size of R. C. wire required.

**SOLUTION:** $6 \times 2000 = 12,000$ watts $= 12$ KW. The table gives 4.54 as the constant for 220 volt single-phase, therefore the current will be $12 \times 4.54 = 54.5$ amperes. Set 54.5 amperes to the 220 volt single-phase System Index; then set 3% drop in the window. Opposite 230 feet, find No. 4 R. C. wire.

**MOTOR CALCULATOR**
(Motor Data Based on 1937 National Electrical Code)

The Fast Calculator gives the data necessary for 220 V. and 440 V. 3-phase motor circuits, by simply setting the proper arrow (for the kind of motor and method of starting) to the Horse-Power. Then turn the disk by pressing the thumbs against it.

Example A

For a 50 Horse Power 220 V., 3-phase HIGH REACTANCE motor, set the arrow marked "HIGH-REACTANCE" on the 220 V. disk