

**COIN
LOOP & STATION
GROUND TESTS
WITHOUT ASSISTANCE
OF A TESTBOARD**



COIN LOOP RESISTANCE AND STATION GROUND TESTS
WITHOUT THE ASSISTANCE OF A TESTBOARD

(Note Section 7 of Main Practice to use this Addendum and Figure 3a & 4a when the assistance of a Testboard is not available.)

This Addendum provides a method of making loop resistance and station ground tests at the coin station.

This Addendum allows the coin station to be connected in the office to its regular equipment. The tests may then be made at the coin station without the assistance of a Deskman in the Central Office.

Tests described in Section 7c, Coin Relay Current Flow, may be omitted in unattended central offices.

All other sections of the Standard Practice should be followed in both attended and unattended locations.

This Addendum is based on the principles of ohms law.

Tables are provided for both SXS and X-bar offices to eliminate most mathematical work.

Only three measurements are necessary:

- (1) Measure the voltage of the central office batteries. This may be done at the MDF or any convenient location before leaving the central office.

- (2) Measure the current across the tip and ring side of the line at the station.
- (3) Measure the current from one side of the station line to the station ground.

EXAMPLE:

SXS Central Office

- (1) Central office voltage = 50 Volts
- (2) Current measured across the line as shown in Figure 3a = 47 MA
- (3) On Table D, SXS Loop Conductor, locate 47 MA in the left hand column, look across to the right to the 50 volts column and you will see in the loop column 243 ohms. This is the loop conductor resistance only, since the chart has already deducted the 820 ohms in the central office equipment.
- (4) The next column is 121 ohms, which is $\frac{1}{2}$ or 1 wire of the loop. (You will use this to subtract from the ground measurement later.)
- (5) After changing your meter lead as shown in Figure 4a, you will read the current to the station ground. This will be almost twice as much as you read across the tip and ring. Current read here, ring side of line to station ground = 90 MA.

Locate 90 MA on Table E in the left hand column, look across to the 50 volt office column. This is 145 ohms. Subtract $\frac{1}{2}$ loop found in Step 4 above which was 121 ohms. The remaining 24 ohms is the station ground resistance. If this difference exceeds 50 ohms you should check all

the ground connections. If they are clean, solid connections, you may have to run to another ground system to obtain a better ground. The station ground is very important since it is used to draw dial tone and to collect and return coins. If the 50 ohm ground requirement cannot be met refer to your supervisor.

Tables F through H are similar tables for X-Bar offices. Use caution when measuring the station ground in a X-Bar office, as you may exceed the 120 MA scale of the ammeter and damage the meter. Chart H using a 600 ohm protective resistor in series with the meter is provided for measuring current above 120 milliamps.

Index of Tables

| <u>Table No.</u> | <u>Type Office</u> | <u>Test</u> | <u>Page</u> |
|------------------|--------------------|------------------------|-------------|
| D | SXS | Loop | 9 |
| E | SXS | Ground | 10-11 |
| F | X-Bar | Loop | 14-15 |
| G | X-Bar | Ground up to 120 MA | 16-17 |
| H | X-Bar | Ground up to 120 MA | 18-22 |

COIN LOOP RESISTANCE AND STATION GROUND TESTS
WITHOUT THE ASSISTANCE OF A TESTBOARD

Measure or check the central office voltage before leaving the office. Jot down this voltage reading, as you will need it at the station.

At the coin station follow these steps and Figure 3a & 4a:

FIGURE 3a

Step

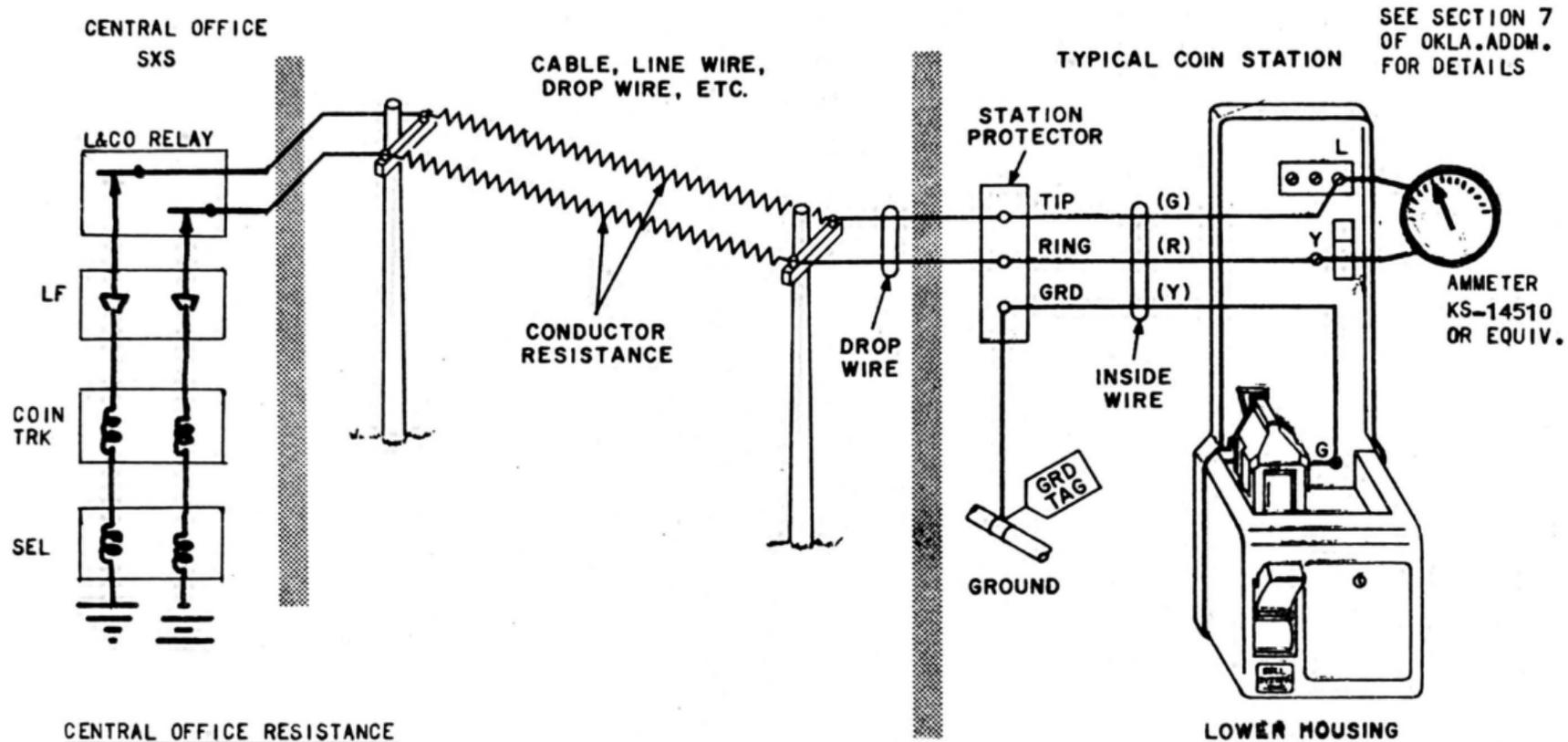
1. Set milliamp meter on 120 MA scale.
2. Connect meter across the line.
3. Operate coin ground to obtain dial tone and a steady reading on the meter. This is the total line current. (If less than 30 MA stop here and refer to Plant Engineer. You are approaching the supervision limit without Long Line equipment).
4. Locate this current reading on Table D or F, Central Office-Loop Current Table. Read across to the voltage you determined before leaving the central office. This is the conductor loop resistance. (If you failed to determine the central office voltage, you can measure the voltage from one conductor to the station ground here at the coin station. This may be slightly less than the office voltage and should be rechecked when you return to the office). The conductor loop resistance should be recorded on the station line card filed at the Testboard.

FIGURE 4a

5. Leave meter connected across the line. Place shorting strap across line before moving meter leads. (If you are

in a X-Bar office and the line current read in Step 4 was 60 milliamps or over, connect a 600 ohm resistor in series with the meter). Move the meter lead from the "L" to the ground terminal, and read the single conductor plus station ground current.

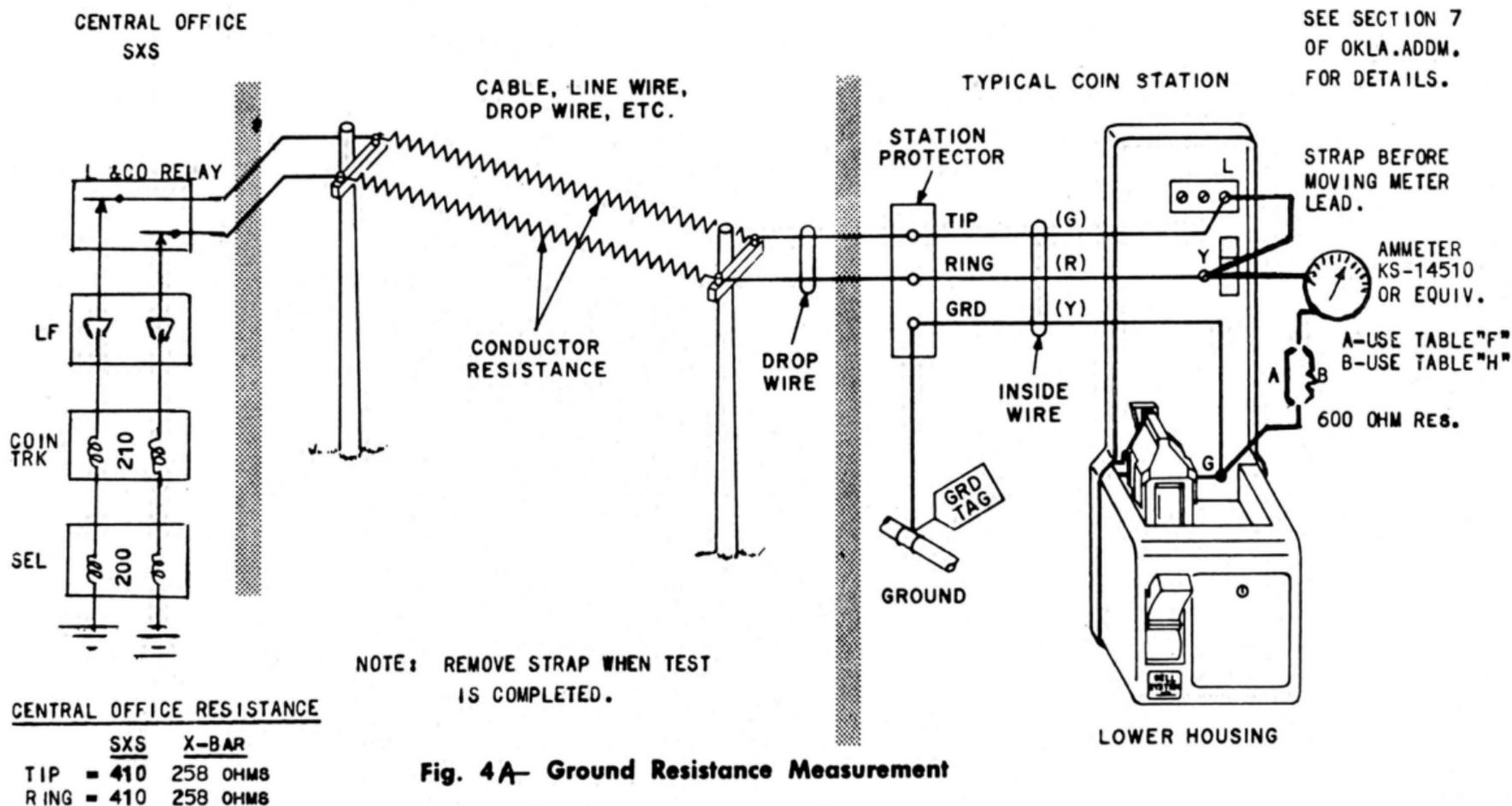
6. Locate this current on Table E, G or H, read across to the appropriate voltage column and find the resistance. Take $\frac{1}{2}$ loop resistance found in Step 4 and subtract from this resistance. This is the resistance of the station ground and should not exceed 50 ohms. This resistance value should be posted to the line card in the office.



CENTRAL OFFICE RESISTANCE

| | SXS | X-BAR |
|------|------|----------|
| TIP | -410 | 258 OHMS |
| RING | -410 | 258 OHMS |

Fig. 3A— Loop Resistance Measurement



CENTRAL OFFICE RESISTANCE

| | SXS | X-BAR |
|------|-------|----------|
| TIP | = 410 | 258 OHMS |
| RING | = 410 | 258 OHMS |

Fig. 4A- Ground Resistance Measurement

**TABLES
FOR
S X S
OFFICES**

TABLE D

LOOP CONDUCTOR RESISTANCE

SXS CENTRAL OFFICE

FIGURE 3a

CENTRAL OFFICE BATTERY VOLTAGE

| LOOP CURRENT AT COIN STA. MILLIAMPS | 48 VOLT | | 49 VOLT | | 50 VOLT | | 51 VOLT | | 52 VOLT | |
|---|---------|------------------|---------|------------------|---------|------------------|---------|------------------|---------|------------------|
| | OHMS | | OHMS | | OHMS | | OHMS | | OHMS | |
| | LOOP | $\frac{1}{2}$ LP |
| 28 | 894 | 447 | 930 | 463 | 965 | 483 | 1001 | 501 | 1037 | 519 |
| 29 | 835 | 418 | 869 | 435 | 904 | 452 | 938 | 469 | 973 | 487 |
| 30 | 780 | 390 | 813 | 407 | 846 | 423 | 880 | 440 | 913 | 457 |
| 31 | 728 | 364 | 760 | 380 | 792 | 396 | 825 | 413 | 857 | 429 |
| 32 | 680 | 340 | 711 | 355 | 742 | 371 | 773 | 386 | 805 | 402 |
| 33 | 634 | 317 | 664 | 332 | 695 | 347 | 725 | 362 | 755 | 377 |
| 34 | 591 | 296 | 621 | 310 | 650 | 325 | 680 | 340 | 709 | 354 |
| 35 | 551 | 276 | 580 | 290 | 608 | 304 | 637 | 318 | 665 | 332 |
| 36 | 513 | 256 | 541 | 270 | 568 | 284 | 596 | 298 | 624 | 312 |
| 37 | 477 | 238 | 504 | 252 | 531 | 265 | 558 | 279 | 585 | 292 |
| 38 | 443 | 227 | 469 | 234 | 495 | 247 | 522 | 261 | 548 | 274 |
| 39 | 410 | 205 | 436 | 218 | 462 | 231 | 487 | 243 | 513 | 257 |
| 40 | 380 | 190 | 405 | 203 | 430 | 215 | 455 | 228 | 480 | 240 |
| 41 | 350 | 175 | 375 | 187 | 399 | 200 | 423 | 211 | 448 | 224 |
| 42 | 322 | 161 | 346 | 173 | 370 | 185 | 394 | 197 | 418 | 209 |
| 43 | 296 | 148 | 316 | 158 | 342 | 171 | 366 | 183 | 389 | 194 |
| 44 | 270 | 135 | 296 | 148 | 316 | 153 | 339 | 169 | 361 | 180 |
| 45 | 246 | 123 | 268 | 134 | 291 | 145 | 313 | 156 | 335 | 167 |
| 46 | 223 | 111 | 245 | 123 | 266 | 133 | 288 | 144 | 310 | 155 |
| 47 | 201 | 100 | 222 | 111 | 243 | 121 | 265 | 132 | 286 | 143 |
| 48 | 180 | 90 | 200 | 100 | 221 | 110 | 242 | 121 | 263 | 131 |
| 49 | 159 | 79 | 180 | 90 | 200 | 100 | 220 | 110 | 241 | 120 |
| 50 | 140 | 70 | 160 | 80 | 180 | 90 | 200 | 100 | 220 | 110 |
| 51 | 121 | 60 | 140 | 70 | 160 | 80 | 180 | 90 | 199 | 99 |
| 52 | 103 | 51 | 122 | 61 | 141 | 70 | 160 | 80 | 180 | 90 |
| 53 | 85 | 42 | 104 | 52 | 123 | 61 | 142 | 71 | 161 | 80 |
| 54 | 68 | 34 | 87 | 44 | 105 | 52 | 124 | 62 | 142 | 71 |
| 55 | 52 | 26 | 70 | 35 | 90 | 45 | 107 | 53 | 125 | 62 |
| 56 | 37 | 19 | 55 | 27 | 72 | 36 | 90 | 45 | 108 | 54 |
| 57 | 22 | 11 | 39 | 19 | 57 | 28 | 74 | 37 | 92 | 46 |
| 58 | 8 | 4 | 24 | 12 | 42 | 21 | 59 | 30 | 76 | 38 |
| 59 | - | - | 10 | 5 | 27 | 14 | 44 | 22 | 61 | 32 |
| 60 | - | - | - | - | 13 | 7 | 30 | 15 | 46 | 23 |
| 61 | - | - | - | - | - | - | 16 | 8 | 32 | 16 |
| 62 | - | - | - | - | - | - | 2 | 1 | 20 | 10 |
| 63 | - | - | - | - | - | - | - | - | 6 | 3 |

The 820 ohms Central Office resistance has already been deducted from this Table.

SINGLE CONDUCTOR TO STATION GROUND RESISTANCE
SXS CENTRAL OFFICE

FOR CURRENT UP TO 120 MILLIAMPS

FIGURE 4a

| CURRENT TO STA. GROUND MILLIAMPS | CENTRAL OFFICE BATTERY VOLTAGE | | | | |
|--|--------------------------------|------------------|------------------|------------------|------------------|
| | 48 VOLTS OHMS | 49 VOLTS OHMS | 50 VOLTS OHMS | 51 VOLTS OHMS | 52 VOLTS OHMS |
| 53 | - | - | - | - | - |
| 54 | 478 | - | - | - | - |
| 55 | 463 | 480 | - | - | - |
| 56 | 440 | 465 | 482 | - | - |
| 57 | 432 | 449 | 467 | - | - |
| 58 | 414 | 434 | 452 | 469 | - |
| 59 | 404 | 420 | 437 | 454 | 471 |
| 60 | 390 | 406 | 423 | 440 | 456 |
| 61 | 377 | 393 | 409 | 426 | 442 |
| 62 | 364 | 380 | 396 | 412 | 428 |
| 63 | 352 | 367 | 383 | 399 | 415 |
| 64 | 340 | 355 | 371 | 386 | 402 |
| 65 | 328 | 343 | 359 | 374 | 390 |
| 66 | 317 | 332 | 347 | 362 | 377 |
| 67 | 306 | 321 | 336 | 351 | 366 |
| 68 | 295 | 310 | 325 | 340 | 354 |
| 69 | 285 | 300 | 314 | 329 | 343 |
| 70 | 276 | 290 | 304 | 318 | 332 |
| 71 | 266 | 280 | 294 | 308 | 322 |
| 72 | 257 | 270 | 284 | 298 | 312 |
| 73 | 248 | 261 | 274 | 288 | 302 |
| 74 | 239 | 252 | 265 | 279 | 292 |
| 75 | 230 | 243 | 256 | 270 | 283 |
| 76 | 222 | 234 | 247 | 261 | 274 |
| 77 | 210 | 226 | 239 | 252 | 265 |
| 78 | 205 | 218 | 231 | 243 | 256 |
| 79 | 198 | 210 | 222 | 235 | 248 |
| 80 | 190 | 202 | 215 | 227 | 240 |
| 81 | 182 | 194 | 207 | 219 | 231 |
| 82 | 175 | 187 | 199 | 211 | 224 |
| 83 | 168 | 180 | 192 | 204 | 216 |
| 84 | 161 | 173 | 185 | 197 | 209 |
| 85 | 154 | 166 | 178 | 190 | 201 |
| 86 | 148 | 159 | 171 | 183 | 194 |
| 87 | 141 | 153 | 164 | 176 | 187 |
| 88 | 135 | 146 | 158 | 169 | 180 |
| 89 | 129 | 140 | 151 | 163 | 174 |
| 90 | 123 | 134 | 145 | 156 | 168 |
| 91 | 117 | 128 | 139 | 150 | 161 |
| 92 | 112 | 122 | 133 | 144 | 155 |
| 93 | 106 | 116 | 127 | 138 | 149 |
| 94 | 101 | 111 | 121 | 132 | 143 |
| 95 | 95 | 105 | 115 | 126 | 137 |
| 96 | 90 | 100 | 110 | 121 | 131 |
| 97 | 85 | 95 | 105 | 115 | 126 |
| 98 | 80 | 90 | 100 | 110 | 120 |
| 99 | 75 | 84 | 95 | 105 | 115 |

SINGLE CONDUCTOR TO STATION GROUND RESISTANCE

SXS CENTRAL OFFICE

FOR CURRENT UP TO 120 MILLIAMPS

FIGURE 4a

| CURRENT TO STA. GROUND MILLIAMPS | CENTRAL OFFICE BATTERY VOLTAGE | | | | |
|--|--------------------------------|------------------|------------------|------------------|------------------|
| | 48 VOLTS OHMS | 49 VOLTS OHMS | 50 VOLTS OHMS | 51 VOLTS OHMS | 52 VOLTS OHMS |
| 100 | 70 | 80 | 90 | 100 | 110 |
| 101 | 65 | 75 | 85 | 94 | 104 |
| 102 | 61 | 70 | 80 | 90 | 99 |
| 103 | 56 | 65 | 75 | 85 | 94 |
| 104 | 52 | 61 | 70 | 80 | 90 |
| 105 | 47 | 56 | 66 | 75 | 85 |
| 106 | 43 | 52 | 61 | 71 | 80 |
| 107 | 39 | 47 | 57 | 66 | 75 |
| 108 | 34 | 43 | 52 | 62 | 71 |
| 109 | 30 | 39 | 48 | 57 | 67 |
| 110 | 26 | 35 | 44 | 53 | 62 |
| 111 | 22 | 31 | 40 | 49 | 58 |
| 112 | 19 | 27 | 36 | 45 | 54 |
| 113 | 15 | 23 | 32 | 41 | 50 |
| 114 | 11 | 19 | 28 | 37 | 46 |
| 115 | 7 | 16 | 24 | 33 | 42 |
| 116 | 4 | 12 | 21 | 29 | 38 |
| 117 | - | 8 | 17 | 25 | 34 |
| 118 | - | 5 | 13 | 22 | 30 |
| 119 | - | 1 | 10 | 18 | 26 |
| 120 | - | - | 6 | 15 | 23 |
| 121 | - | - | 3 | 11 | 19 |
| 122 | - | - | - | 8 | 16 |
| 123 | - | - | - | 4 | 12 |
| 124 | - | - | - | 1 | 9 |
| 125 | - | - | - | - | 6 |
| 126 | - | - | - | - | 2 |
| 127 | - | - | - | - | - |

Subtract $\frac{1}{2}$ loop resistance from the resistance found here to determine the station ground resistance. The difference should not exceed 50 ohms. Post to line card at the Testboard.

NOTES

**TABLES
FOR
X-BAR
OFFICES**

TABLE F

LOOP CONDUCTOR RESISTANCE

X-BAR CENTRAL OFFICE

FIGURE 3a

CENTRAL OFFICE BATTERY VOLTAGE

| LOOP CURRENT AT COIN STA. MILLIAMPS | 48 VOLT | | 49 VOLT | | 50 VOLT | | 51 VOLT | | 52 VOLT | |
|---|---------|------------------|---------|------------------|---------|------------------|---------|------------------|---------|------------------|
| | OHMS | | OHMS | | OHMS | | OHMS | | OHMS | |
| | LOOP | $\frac{1}{2}$ LP |
| 28 | 1168 | 584 | 1234 | 617 | 1269 | 635 | 1305 | 652 | 1341 | 670 |
| 29 | 1140 | 570 | 1173 | 586 | 1208 | 604 | 1242 | 621 | 1277 | 639 |
| 30 | 1084 | 542 | 1117 | 559 | 1150 | 575 | 1184 | 592 | 1217 | 609 |
| 31 | 1032 | 516 | 1065 | 533 | 1096 | 548 | 1129 | 564 | 1161 | 580 |
| 32 | 984 | 492 | 1015 | 508 | 1046 | 523 | 1077 | 538 | 1109 | 555 |
| 33 | 939 | 470 | 969 | 485 | 999 | 499 | 1029 | 515 | 1059 | 529 |
| 34 | 896 | 448 | 925 | 463 | 954 | 477 | 984 | 492 | 1013 | 507 |
| 35 | 855 | 428 | 884 | 442 | 912 | 456 | 941 | 470 | 969 | 485 |
| 36 | 817 | 409 | 845 | 423 | 872 | 436 | 900 | 450 | 928 | 464 |
| 37 | 781 | 390 | 808 | 404 | 835 | 418 | 862 | 431 | 889 | 445 |
| 38 | 747 | 374 | 773 | 387 | 799 | 399 | 826 | 413 | 852 | 426 |
| 39 | 715 | 358 | 740 | 370 | 766 | 383 | 791 | 396 | 817 | 409 |
| 40 | 684 | 342 | 709 | 355 | 734 | 367 | 759 | 379 | 784 | 392 |
| 41 | 654 | 327 | 679 | 339 | 703 | 351 | 727 | 364 | 752 | 376 |
| 42 | 626 | 313 | 650 | 325 | 674 | 337 | 698 | 349 | 722 | 361 |
| 43 | 600 | 300 | 623 | 312 | 647 | 324 | 670 | 335 | 693 | 347 |
| 44 | 574 | 287 | 597 | 299 | 620 | 310 | 643 | 322 | 666 | 333 |
| 45 | 550 | 275 | 572 | 286 | 595 | 298 | 617 | 309 | 639 | 319 |
| 46 | 527 | 264 | 549 | 275 | 570 | 285 | 592 | 296 | 614 | 307 |
| 47 | 505 | 252 | 526 | 263 | 547 | 274 | 569 | 284 | 590 | 295 |
| 48 | 484 | 242 | 504 | 252 | 526 | 263 | 546 | 273 | 567 | 284 |
| 49 | 463 | 231 | 484 | 242 | 504 | 252 | 524 | 262 | 545 | 273 |
| 50 | 444 | 222 | 464 | 232 | 484 | 242 | 504 | 252 | 524 | 262 |
| 51 | 425 | 213 | 444 | 222 | 464 | 232 | 484 | 242 | 499 | 249 |
| 52 | 407 | 204 | 430 | 215 | 445 | 223 | 464 | 232 | 484 | 242 |
| 53 | 389 | 195 | 408 | 204 | 427 | 214 | 446 | 223 | 465 | 233 |
| 54 | 372 | 186 | 391 | 196 | 409 | 205 | 428 | 214 | 446 | 223 |
| 55 | 356 | 178 | 374 | 187 | 393 | 197 | 411 | 206 | 429 | 215 |
| 56 | 341 | 173 | 359 | 179 | 376 | 188 | 394 | 197 | 412 | 206 |
| 57 | 326 | 163 | 343 | 172 | 361 | 181 | 378 | 189 | 396 | 198 |
| 58 | 311 | 155 | 328 | 164 | 346 | 173 | 363 | 182 | 380 | 190 |
| 59 | 297 | 149 | 314 | 157 | 331 | 165 | 348 | 174 | 365 | 182 |
| *60 | 284 | 142 | 300 | 150 | 317 | 159 | 334 | 167 | 350 | 175 |
| *61 | 270 | 135 | 287 | 144 | 303 | 151 | 320 | 160 | 336 | 168 |
| *62 | 258 | 129 | 274 | 137 | 290 | 145 | 306 | 153 | 322 | 161 |
| *63 | 246 | 123 | 261 | 130 | 277 | 139 | 293 | 147 | 309 | 154 |
| *64 | 234 | 117 | 249 | 124 | 265 | 133 | 280 | 140 | 296 | 148 |
| *65 | 222 | 111 | 237 | 119 | 253 | 127 | 268 | 134 | 284 | 142 |
| *66 | 211 | 105 | 226 | 113 | 241 | 121 | 256 | 128 | 271 | 135 |
| *67 | 200 | 100 | 215 | 108 | 230 | 115 | 245 | 123 | 260 | 130 |
| *68 | 189 | 94 | 204 | 102 | 219 | 109 | 234 | 117 | 248 | 124 |
| *69 | 179 | 89 | 194 | 97 | 208 | 104 | 223 | 112 | 237 | 118 |

*CAUTION: WHEN MAKING GROUND TEST LATER, USE PROTECTIVE 600 OHM RESISTANCE IN SERIES WITH METER, and Table H.

LOOP CONDUCTOR RESISTANCE

X-BAR CENTRAL OFFICE

FIGURE 3a

CENTRAL OFFICE BATTERY VOLTAGE

| LOOP CURRENT AT COIN STA. MILLIAMPS | 48 VOLT | | 49 VOLT | | 50 VOLT | | 51 VOLT | | 52 VOLT | |
|---|---------|------------------|---------|------------------|---------|------------------|---------|------------------|---------|------------------|
| | OHMS | | OHMS | | OHMS | | OHMS | | OHMS | |
| | LOOP | $\frac{1}{2}$ LP |
| *70 | 170 | 85 | 184 | 92 | 198 | 99 | 212 | 106 | 226 | 113 |
| *71 | 160 | 80 | 174 | 87 | 188 | 94 | 202 | 101 | 216 | 108 |
| *72 | 150 | 75 | 164 | 82 | 178 | 89 | 192 | 96 | 206 | 103 |
| *73 | 141 | 70 | 155 | 78 | 168 | 84 | 182 | 91 | 196 | 98 |
| *74 | 132 | 66 | 146 | 73 | 159 | 79 | 173 | 87 | 186 | 93 |
| *75 | 124 | 62 | 137 | 69 | 150 | 75 | 164 | 82 | 177 | 89 |
| *76 | 115 | 57 | 128 | 64 | 142 | 71 | 155 | 78 | 168 | 84 |
| *77 | 107 | 54 | 120 | 60 | 133 | 67 | 146 | 73 | 159 | 79 |
| *78 | 99 | 49 | 112 | 56 | 125 | 63 | 137 | 69 | 150 | 75 |
| *79 | 91 | 45 | 104 | 52 | 116 | 58 | 129 | 64 | 142 | 71 |
| *80 | 84 | 42 | 96 | 48 | 109 | 54 | 121 | 61 | 134 | 67 |
| *81 | 76 | 38 | 88 | 44 | 101 | 50 | 113 | 56 | 125 | 63 |
| *82 | 69 | 35 | 81 | 40 | 93 | 47 | 105 | 53 | 118 | 59 |
| *83 | 62 | 31 | 74 | 37 | 86 | 43 | 98 | 49 | 110 | 55 |
| *84 | 55 | 28 | 67 | 33 | 79 | 39 | 91 | 45 | 103 | 51 |
| *85 | 48 | 24 | 60 | 30 | 72 | 36 | 84 | 42 | 95 | 48 |
| *86 | 42 | 21 | 53 | 27 | 65 | 33 | 77 | 39 | 88 | 44 |
| *87 | 35 | 18 | 47 | 24 | 58 | 29 | 70 | 35 | 81 | 40 |
| *88 | 29 | 15 | 40 | 20 | 52 | 26 | 63 | 32 | 74 | 37 |
| *89 | 23 | 12 | 34 | 17 | 45 | 23 | 57 | 29 | 68 | 34 |
| *90 | 17 | 9 | 28 | 14 | 39 | 20 | 50 | 25 | 62 | 31 |
| *91 | 11 | 5 | 22 | 11 | 33 | 17 | 44 | 22 | 55 | 28 |
| *92 | 6 | 3 | 16 | 8 | 27 | 14 | 38 | 19 | 49 | 25 |
| *93 | - | - | 10 | 5 | 21 | 10 | 32 | 16 | 43 | 21 |
| *94 | - | - | 6 | 3 | 15 | 8 | 26 | 13 | 37 | 19 |
| *95 | - | - | - | - | 6 | 3 | 20 | 10 | 31 | 15 |
| *96 | - | - | - | - | - | - | 15 | 8 | 25 | 13 |
| *97 | - | - | - | - | - | - | 6 | 3 | 20 | 10 |
| *98 | - | - | - | - | - | - | 4 | 2 | 14 | 7 |
| *99 | - | - | - | - | - | - | - | - | 9 | 5 |
| *100 | - | - | - | - | - | - | - | - | 4 | 2 |

*CAUTION: WHEN MAKING GROUND TEST LATER, USE
PROTECTIVE 600 OHM RESISTANCE IN SERIES
WITH METER and Table H.

The 516 ohms central office resistance has already
been deducted from this Table.

SINGLE CONDUCTOR TO STATION GROUND RESISTANCE

X-BAR CENTRAL OFFICE

FOR CURRENT UP TO 120 MILLIAMPS

FIGURE 4a

| CURRENT TO STA. GROUND MILLIAMPS | CENTRAL OFFICE BATTERY VOLTAGE | | | | |
|--|--------------------------------|------------------|------------------|------------------|------------------|
| | 48 VOLTS OHMS | 49 VOLTS OHMS | 50 VOLTS OHMS | 51 VOLTS OHMS | 52 VOLTS OHMS |
| 50 | 702 | 722 | 742 | 762 | 782 |
| 51 | 683 | 702 | 722 | 742 | 761 |
| 52 | 665 | 684 | 703 | 722 | 742 |
| 53 | 648 | 666 | 685 | 704 | 723 |
| 54 | 630 | 649 | 667 | 686 | 704 |
| 55 | 615 | 633 | 651 | 669 | 687 |
| 56 | 599 | 617 | 634 | 653 | 670 |
| 57 | 584 | 601 | 619 | 636 | 654 |
| 58 | 570 | 586 | 604 | 621 | 638 |
| 59 | 556 | 572 | 589 | 606 | 623 |
| 60 | 542 | 558 | 575 | 592 | 608 |
| 61 | 529 | 545 | 561 | 578 | 594 |
| 62 | 516 | 532 | 548 | 564 | 580 |
| 63 | 504 | 519 | 535 | 551 | 567 |
| 64 | 492 | 507 | 523 | 538 | 554 |
| 65 | 480 | 495 | 511 | 526 | 542 |
| 66 | 469 | 484 | 499 | 514 | 529 |
| 67 | 458 | 473 | 488 | 503 | 518 |
| 68 | 447 | 462 | 477 | 492 | 506 |
| 69 | 437 | 452 | 466 | 481 | 496 |
| 70 | 428 | 442 | 456 | 470 | 484 |
| 71 | 418 | 432 | 446 | 460 | 474 |
| 72 | 409 | 423 | 436 | 450 | 464 |
| 73 | 400 | 413 | 426 | 440 | 454 |
| 74 | 391 | 404 | 418 | 431 | 445 |
| 75 | 382 | 395 | 408 | 422 | 435 |
| 76 | 374 | 386 | 399 | 413 | 426 |
| 77 | 362 | 378 | 391 | 404 | 417 |
| 78 | 357 | 370 | 383 | 395 | 408 |
| 79 | 350 | 362 | 374 | 387 | 400 |
| 80 | 342 | 354 | 367 | 379 | 392 |
| 81 | 334 | 346 | 359 | 371 | 383 |
| 82 | 327 | 339 | 351 | 364 | 376 |
| 83 | 320 | 332 | 344 | 356 | 368 |
| 84 | 313 | 325 | 337 | 349 | 361 |
| 85 | 306 | 318 | 330 | 342 | 354 |
| 86 | 300 | 311 | 323 | 335 | 346 |
| 87 | 293 | 305 | 316 | 328 | 339 |
| 88 | 287 | 298 | 310 | 321 | 333 |
| 89 | 281 | 293 | 303 | 315 | 326 |
| 90 | 275 | 286 | 297 | 308 | 320 |
| 91 | 269 | 280 | 291 | 302 | 313 |
| 92 | 264 | 275 | 285 | 296 | 307 |
| 93 | 258 | 269 | 279 | 290 | 301 |
| 94 | 253 | 263 | 273 | 284 | 295 |
| 95 | 247 | 257 | 268 | 278 | 289 |

TABLE G

SINGLE CONDUCTOR TO STATION GROUND RESISTANCE

X-BAR CENTRAL OFFICE

FOR CURRENT UP TO 120 MILLIAMPS

FIGURE 4a

| CURRENT TO STA. GROUND MILLIAMPS | CENTRAL OFFICE BATTERY VOLTAGE | | | | |
|--|--------------------------------|------------------|------------------|------------------|------------------|
| | 48 VOLTS OHMS | 49 VOLTS OHMS | 50 VOLTS OHMS | 51 VOLTS OHMS | 52 VOLTS OHMS |
| 96 | 242 | 252 | 263 | 273 | 283 |
| 97 | 237 | 247 | 257 | 267 | 278 |
| 98 | 232 | 242 | 252 | 262 | 273 |
| 99 | 227 | 236 | 247 | 257 | 267 |
| 100 | 222 | 232 | 242 | 252 | 262 |
| 101 | 217 | 227 | 237 | 247 | 257 |
| 102 | 213 | 222 | 232 | 242 | 252 |
| 103 | 208 | 217 | 227 | 237 | 247 |
| 104 | 204 | 213 | 223 | 232 | 242 |
| 105 | 199 | 209 | 218 | 228 | 237 |
| 106 | 195 | 204 | 214 | 223 | 233 |
| 107 | 191 | 200 | 209 | 219 | 228 |
| 108 | 186 | 196 | 205 | 214 | 223 |
| 109 | 182 | 191 | 201 | 210 | 219 |
| 110 | 178 | 187 | 197 | 206 | 215 |
| 111 | 175 | 183 | 192 | 201 | 210 |
| 112 | 171 | 180 | 188 | 197 | 206 |
| 113 | 167 | 176 | 184 | 193 | 202 |
| 114 | 163 | 172 | 181 | 189 | 198 |
| 115 | 159 | 168 | 177 | 185 | 194 |
| 116 | 156 | 164 | 173 | 182 | 190 |
| 117 | 152 | 161 | 169 | 178 | 186 |
| 118 | 149 | 157 | 166 | 174 | 183 |
| 119 | 146 | 154 | 162 | 171 | 179 |
| 120 | 142 | 150 | 159 | 167 | 175 |

CAUTION - USE TABLE H WITH 600 OHM PROTECTIVE RESISTOR ABOVE 120 MA.

Subtract $\frac{1}{2}$ loop resistance from the resistance found here to determine the station ground resistance. The difference should not exceed 50 ohms. Post to line card at the Testboard.

SINGLE CONDUCTOR TO STATION GROUND RESISTANCE

X-BAR CENTRAL OFFICE

48 VOLT CENTRAL OFFICE BATTERY

| CURRENT IN MA | | RESISTANCE | CURRENT IN MA | | RESISTANCE |
|-------------------------------------|--------|--|-------------------------------------|--------|--|
| 600 OHMS IN SERIES WITH METER | ACTUAL | $\frac{1}{2}$ LOOP PLUS STATION GROUND | 600 OHMS IN SERIES WITH METER | ACTUAL | $\frac{1}{2}$ LOOP PLUS STATION GROUND |
| 48.1 | 121 | 139 | 53.3 | 159 | 43 |
| 48.3 | 122 | 135 | 53.4 | 160 | 42 |
| 48.5 | 123 | 132 | 53.5 | 161 | 40 |
| 48.6 | 124 | 129 | 53.5 | 162 | 38 |
| 48.8 | 125 | 126 | 53.6 | 163 | 36 |
| 48.9 | 126 | 123 | 53.7 | 164 | 35 |
| 49.1 | 127 | 120 | 53.9 | 165 | 33 |
| 49.2 | 128 | 117 | 54.0 | 166 | 31 |
| 49.4 | 129 | 114 | 54.1 | 167 | 29 |
| 49.5 | 130 | 111 | 54.2 | 168 | 28 |
| 49.7 | 131 | 108 | 54.3 | 169 | 26 |
| 49.8 | 132 | 106 | 54.4 | 170 | 24 |
| 49.9 | 133 | 103 | 54.5 | 171 | 23 |
| 50.1 | 134 | 100 | 54.6 | 172 | 21 |
| 50.2 | 135 | 98 | 54.7 | 173 | 19 |
| 50.4 | 136 | 95 | 54.8 | 174 | 18 |
| 50.5 | 137 | 92 | 54.9 | 175 | 16 |
| 50.6 | 138 | 90 | 55.0 | 176 | 15 |
| 50.8 | 139 | 87 | 55.1 | 177 | 13 |
| 50.9 | 140 | 85 | 55.2 | 178 | 12 |
| 51.0 | 141 | 82 | 55.3 | 179 | 10 |
| 51.2 | 142 | 80 | 55.4 | 180 | 8 |
| 51.3 | 143 | 78 | 55.5 | 181 | 7 |
| 51.4 | 144 | 75 | 55.6 | 182 | 6 |
| 51.5 | 145 | 73 | 55.7 | 183 | 4 |
| 51.6 | 146 | 71 | 55.8 | 184 | 3 |
| 51.8 | 147 | 69 | 55.9 | 185 | 1 |
| 52.0 | 148 | 66 | | | |
| 52.1 | 149 | 64 | | | |
| 52.2 | 150 | 62 | | | |
| 52.4 | 151 | 59 | | | |
| 52.5 | 152 | 57 | | | |
| 52.6 | 153 | 55 | | | |
| 52.7 | 154 | 53 | | | |
| 52.9 | 155 | 50 | | | |
| 53.0 | 156 | 49 | | | |
| 53.1 | 157 | 47 | | | |
| 53.2 | 158 | 45 | | | |

TABLE H

SINGLE CONDUCTOR TO STATION GROUND RESISTANCE
X-BAR CENTRAL OFFICE

49 VOLT CENTRAL OFFICE BATTERY

| CURRENT IN MA | | RESISTANCE | CURRENT IN MA | | RESISTANCE |
|-------------------------------------|--------|--|-------------------------------------|--------|--|
| 600 OHMS IN SERIES WITH METER | ACTUAL | $\frac{1}{2}$ LOOP PLUS STATION GROUND | 600 OHMS IN SERIES WITH METER | ACTUAL | $\frac{1}{2}$ LOOP PLUS STATION GROUND |
| 48.8 | 121 | 147 | 54.3 | 161 | 46 |
| 49.0 | 122 | 144 | 54.4 | 162 | 44 |
| 49.1 | 123 | 140 | 54.5 | 163 | 42 |
| 49.2 | 124 | 137 | 54.6 | 164 | 41 |
| 49.4 | 125 | 134 | 54.7 | 165 | 38 |
| 49.6 | 126 | 131 | 54.8 | 166 | 37 |
| 49.7 | 127 | 128 | 54.9 | 167 | 35 |
| 49.8 | 128 | 125 | 55.0 | 168 | 33 |
| 50.0 | 129 | 122 | 55.1 | 169 | 32 |
| 50.2 | 130 | 119 | 55.2 | 170 | 30 |
| 50.4 | 131 | 116 | 55.3 | 171 | 28 |
| 50.5 | 132 | 113 | 55.4 | 172 | 26 |
| 50.7 | 133 | 110 | 55.5 | 173 | 25 |
| 50.8 | 134 | 108 | 55.6 | 174 | 23 |
| 50.9 | 135 | 105 | 55.7 | 175 | 22 |
| 51.0 | 136 | 102 | 55.8 | 176 | 20 |
| 51.2 | 137 | 100 | 55.9 | 177 | 19 |
| 51.4 | 138 | 97 | 56.0 | 178 | 17 |
| 51.5 | 139 | 94 | 56.1 | 179 | 16 |
| 51.6 | 140 | 92 | 56.2 | 180 | 14 |
| 51.7 | 141 | 89 | 56.3 | 181 | 13 |
| 51.8 | 142 | 87 | 56.4 | 182 | 11 |
| 51.9 | 143 | 85 | 56.5 | 183 | 10 |
| 52.0 | 144 | 82 | 56.5 | 184 | 8 |
| 52.2 | 145 | 80 | 56.6 | 185 | 7 |
| 52.3 | 146 | 78 | 56.7 | 186 | 5 |
| 52.5 | 147 | 75 | 56.8 | 187 | 4 |
| 52.7 | 148 | 73 | 56.9 | 188 | 2 |
| 52.8 | 149 | 71 | 57.0 | 189 | 1 |
| 52.9 | 150 | 68 | | | |
| 53.1 | 151 | 66 | | | |
| 53.2 | 152 | 64 | | | |
| 53.3 | 153 | 62 | | | |
| 53.4 | 154 | 60 | | | |
| 53.5 | 155 | 58 | | | |
| 53.7 | 156 | 56 | | | |
| 53.8 | 157 | 54 | | | |
| 53.9 | 158 | 52 | | | |
| 54.0 | 159 | 50 | | | |
| 54.1 | 160 | 48 | | | |

SINGLE CONDUCTOR TO STATION GROUND RESISTANCE

X-BAR CENTRAL OFFICE

50 VOLT CENTRAL OFFICE BATTERY

| CURRENT IN MA | | RESISTANCE | CURRENT IN MA | | RESISTANCE |
|-------------------------------------|--------|--|-------------------------------------|--------|--|
| 600 OHMS IN SERIES WITH METER | ACTUAL | $\frac{1}{2}$ LOOP PLUS STATION GROUND | 600 OHMS IN SERIES WITH METER | ACTUAL | $\frac{1}{2}$ LOOP PLUS STATION GROUND |
| 49.4 | 121 | 155 | 55.0 | 161 | 52 |
| 49.5 | 122 | 152 | 55.1 | 162 | 50 |
| 49.7 | 123 | 149 | 55.2 | 163 | 49 |
| 49.9 | 124 | 145 | 55.3 | 164 | 47 |
| 50.0 | 125 | 142 | 55.4 | 165 | 45 |
| 50.2 | 126 | 139 | 55.5 | 166 | 43 |
| 50.3 | 127 | 136 | 55.6 | 167 | 41 |
| 50.5 | 128 | 132 | 55.7 | 168 | 39 |
| 50.7 | 129 | 129 | 55.8 | 169 | 37 |
| 50.8 | 130 | 126 | 55.9 | 170 | 36 |
| 51.0 | 131 | 123 | 56.0 | 171 | 34 |
| 51.2 | 132 | 120 | 56.1 | 172 | 32 |
| 51.3 | 133 | 118 | 56.2 | 173 | 31 |
| 51.4 | 134 | 115 | 56.3 | 174 | 29 |
| 51.5 | 135 | 112 | 56.4 | 175 | 28 |
| 51.6 | 136 | 109 | 56.5 | 176 | 26 |
| 51.7 | 137 | 107 | 56.6 | 177 | 24 |
| 51.8 | 138 | 104 | 56.7 | 178 | 23 |
| 52.0 | 139 | 102 | 56.8 | 179 | 21 |
| 52.1 | 140 | 99 | 57.0 | 180 | 19 |
| 52.2 | 141 | 96 | 57.1 | 181 | 18 |
| 52.3 | 142 | 94 | 57.2 | 182 | 16 |
| 52.4 | 143 | 91 | 57.3 | 183 | 15 |
| 52.5 | 144 | 89 | 57.4 | 184 | 14 |
| 52.6 | 145 | 87 | 57.5 | 185 | 12 |
| 52.8 | 146 | 84 | 57.6 | 186 | 10 |
| 53.0 | 147 | 82 | 57.7 | 187 | 9 |
| 53.2 | 148 | 80 | 57.8 | 188 | 7 |
| 53.4 | 149 | 77 | 57.9 | 189 | 6 |
| 53.6 | 150 | 75 | 58.0 | 190 | 5 |
| 53.7 | 151 | 73 | 58.1 | 191 | 4 |
| 53.8 | 152 | 71 | 58.2 | 192 | 2 |
| 54.0 | 153 | 69 | 58.3 | 193 | 1 |
| 54.1 | 154 | 66 | | | |
| 54.2 | 155 | 64 | | | |
| 54.3 | 156 | 62 | | | |
| 54.5 | 157 | 60 | | | |
| 54.6 | 158 | 58 | | | |
| 54.7 | 159 | 56 | | | |
| 54.8 | 160 | 54 | | | |

SINGLE CONDUCTOR TO STATION GROUND RESISTANCE

X-BAR CENTRAL OFFICE

51 VOLT CENTRAL OFFICE BATTERY

| CURRENT IN MA | | | RESISTANCE | | |
|-------------------------------------|--------|--|-------------------------------------|--------|--|
| 600 OHMS IN SERIES WITH METER | ACTUAL | $\frac{1}{2}$ LOOP PLUS STATION GROUND | 600 OHMS IN SERIES WITH METER | ACTUAL | $\frac{1}{2}$ LOOP PLUS STATION GROUND |
| 50.0 | 121 | 163 | 55.6 | 161 | 58 |
| 50.2 | 122 | 160 | 55.7 | 162 | 56 |
| 50.3 | 123 | 156 | 55.8 | 163 | 54 |
| 50.4 | 124 | 153 | 56.0 | 164 | 53 |
| 50.6 | 125 | 150 | 56.1 | 165 | 51 |
| 50.7 | 126 | 146 | 56.3 | 166 | 49 |
| 50.8 | 127 | 143 | 56.5 | 167 | 47 |
| 51.0 | 128 | 140 | 56.7 | 168 | 45 |
| 51.2 | 129 | 137 | 56.8 | 169 | 44 |
| 51.4 | 130 | 134 | 56.9 | 170 | 42 |
| 51.5 | 131 | 131 | 57.0 | 171 | 40 |
| 51.6 | 132 | 128 | 57.1 | 172 | 38 |
| 51.8 | 133 | 125 | 57.2 | 173 | 36 |
| 52.0 | 134 | 122 | 57.3 | 174 | 35 |
| 52.2 | 135 | 119 | 57.3 | 175 | 33 |
| 52.3 | 136 | 117 | 57.4 | 176 | 31 |
| 52.5 | 137 | 114 | 57.5 | 177 | 30 |
| 52.6 | 138 | 111 | 57.6 | 178 | 28 |
| 52.8 | 139 | 108 | 57.7 | 179 | 26 |
| 52.9 | 140 | 106 | 57.8 | 180 | 25 |
| 53.0 | 141 | 103 | 57.9 | 181 | 23 |
| 53.2 | 142 | 101 | 58.0 | 182 | 22 |
| 53.3 | 143 | 98 | 58.1 | 183 | 20 |
| 53.4 | 144 | 96 | 58.2 | 184 | 19 |
| 53.6 | 145 | 93 | 58.3 | 185 | 17 |
| 53.7 | 146 | 91 | 58.4 | 186 | 16 |
| 53.8 | 147 | 88 | 58.5 | 187 | 14 |
| 54.0 | 148 | 86 | 58.6 | 188 | 13 |
| 54.1 | 149 | 84 | 58.7 | 189 | 11 |
| 54.3 | 150 | 82 | 58.8 | 190 | 10 |
| 54.5 | 151 | 79 | 58.9 | 191 | 9 |
| 54.6 | 152 | 77 | 59.0 | 192 | 7 |
| 54.7 | 153 | 75 | 59.0 | 193 | 6 |
| 54.8 | 154 | 73 | 59.1 | 194 | 4 |
| 54.9 | 155 | 71 | 59.2 | 195 | 3 |
| 55.0 | 156 | 68 | 59.3 | 196 | 2 |
| 55.1 | 157 | 66 | | | |
| 55.3 | 158 | 64 | | | |
| 55.4 | 159 | 63 | | | |
| 55.5 | 160 | 60 | | | |

SINGLE CONDUCTOR TO STATION GROUND RESISTANCE
X-BAR CENTRAL OFFICE

52 VOLT CENTRAL OFFICE BATTERY

| CURRENT IN MA | | RESISTANCE | CURRENT IN MA | | RESISTANCE |
|-------------------------------------|--------|--|-------------------------------------|--------|--|
| 600 OHMS IN SERIES WITH METER | ACTUAL | $\frac{1}{2}$ LOOP PLUS STATION GROUND | 600 OHMS IN SERIES WITH METER | ACTUAL | $\frac{1}{2}$ LOOP PLUS STATION GROUND |
| 50.5 | 121 | 171 | 56.4 | 161 | 64 |
| 50.7 | 122 | 168 | 56.5 | 162 | 62 |
| 50.8 | 123 | 165 | 56.6 | 163 | 61 |
| 51.0 | 124 | 161 | 56.7 | 164 | 59 |
| 51.2 | 125 | 158 | 56.8 | 165 | 57 |
| 51.3 | 126 | 155 | 56.9 | 166 | 55 |
| 51.5 | 127 | 151 | 57.0 | 167 | 53 |
| 51.7 | 128 | 148 | 57.2 | 168 | 51 |
| 51.8 | 129 | 145 | 57.3 | 169 | 50 |
| 52.0 | 130 | 142 | 57.4 | 170 | 48 |
| 52.2 | 131 | 138 | 57.5 | 171 | 47 |
| 52.4 | 132 | 135 | 57.6 | 172 | 44 |
| 52.5 | 133 | 133 | 57.7 | 173 | 43 |
| 52.6 | 134 | 130 | 57.8 | 174 | 41 |
| 52.8 | 135 | 127 | 57.9 | 175 | 39 |
| 53.0 | 136 | 124 | 58.0 | 176 | 37 |
| 53.1 | 137 | 122 | 58.1 | 177 | 36 |
| 53.3 | 138 | 118 | 58.3 | 178 | 34 |
| 53.4 | 139 | 116 | 58.4 | 179 | 32 |
| 53.5 | 140 | 113 | 58.5 | 180 | 31 |
| 53.7 | 141 | 110 | 58.6 | 181 | 29 |
| 53.8 | 142 | 108 | 58.7 | 182 | 28 |
| 53.9 | 143 | 106 | 58.8 | 183 | 26 |
| 54.1 | 144 | 103 | 58.9 | 184 | 25 |
| 54.2 | 145 | 101 | 59.0 | 185 | 23 |
| 54.4 | 146 | 98 | 59.1 | 186 | 21 |
| 54.5 | 147 | 96 | 59.2 | 187 | 20 |
| 54.7 | 148 | 93 | 59.3 | 188 | 18 |
| 54.9 | 149 | 90 | 59.4 | 189 | 17 |
| 55.0 | 150 | 88 | 59.5 | 190 | 16 |
| 55.1 | 151 | 86 | 59.6 | 191 | 14 |
| 55.2 | 152 | 84 | 59.7 | 192 | 13 |
| 55.4 | 153 | 81 | 59.8 | 193 | 11 |
| 55.5 | 154 | 79 | 59.9 | 194 | 10 |
| 55.6 | 155 | 77 | 60.0 | 195 | 9 |
| 55.7 | 156 | 75 | 60.1 | 196 | 7 |
| 55.8 | 157 | 73 | 60.2 | 197 | 6 |
| 56.0 | 158 | 71 | 60.3 | 198 | 5 |
| 56.1 | 159 | 69 | 60.4 | 199 | 3 |
| 56.2 | 160 | 67 | 60.5 | 200 | 2 |