

GENERAL INFORMATION

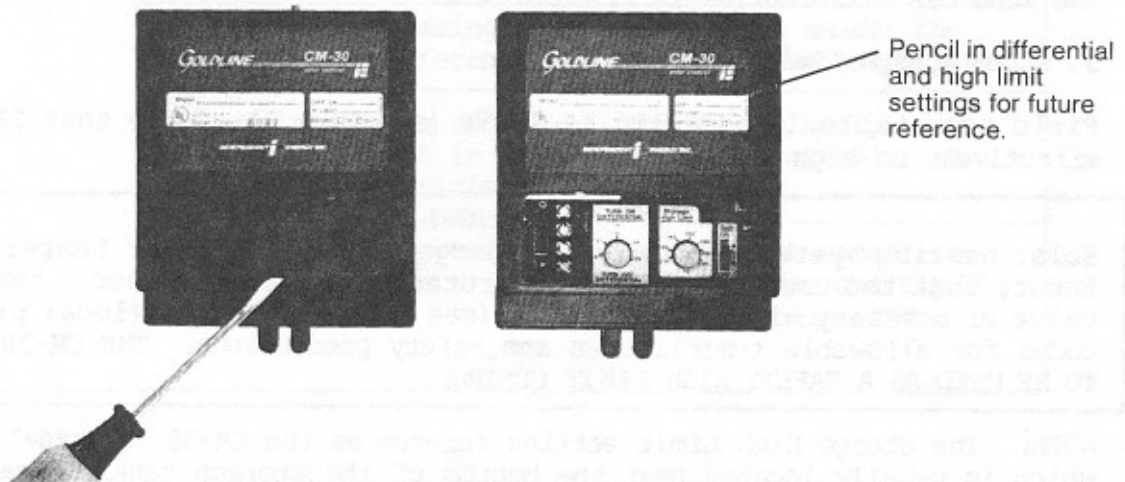
The Independent Energy Goldline CM-30 is a differential temperature control, typically used for solar DHW or space heating systems. It uses two remotely wired sensors, comparing the temperature of the two and making control decisions based on the existing differential. The CM-30 output is designed to directly operate a circulator or fan for heat collection purposes when the controller is seeing an appropriate temperature differential.

The CM-30 should be specified for ANTIFREEZE, DRAIN-BACK and RECIRCULATE type solar heating systems. For drain-down systems, specify the Goldline CM-32.

The CM-30 can be directly interfaced - via an Independent Energy Analog Bus Cable - with a Goldline DLX-30 or DM-30 control. This combination provides for remote, digital monitoring of the CM-30 sensors, the CM-30 output, additional sensors and other functions appropriate to the interfaced DLX-30 or DM-30 control.

CM-30 FEATURES:

- Adjustable "turn on" differential: 8 to 24°F
- Adjustable storage high limit: 110 to 230°F
- Field selectable recirculate freeze protection
- "power", "output" and "recirculation" indicators
- Spring return test switch
- Digital monitor interface - plug-in adapter for easy, direct interfacing of DLX-30 or DM-30 controls.
- "auxiliary" sensor position for additional sensor monitoring via the DLX-30 or DM-30
- Concealed differential adjust and high limit adjust knobs
- U.L. listed



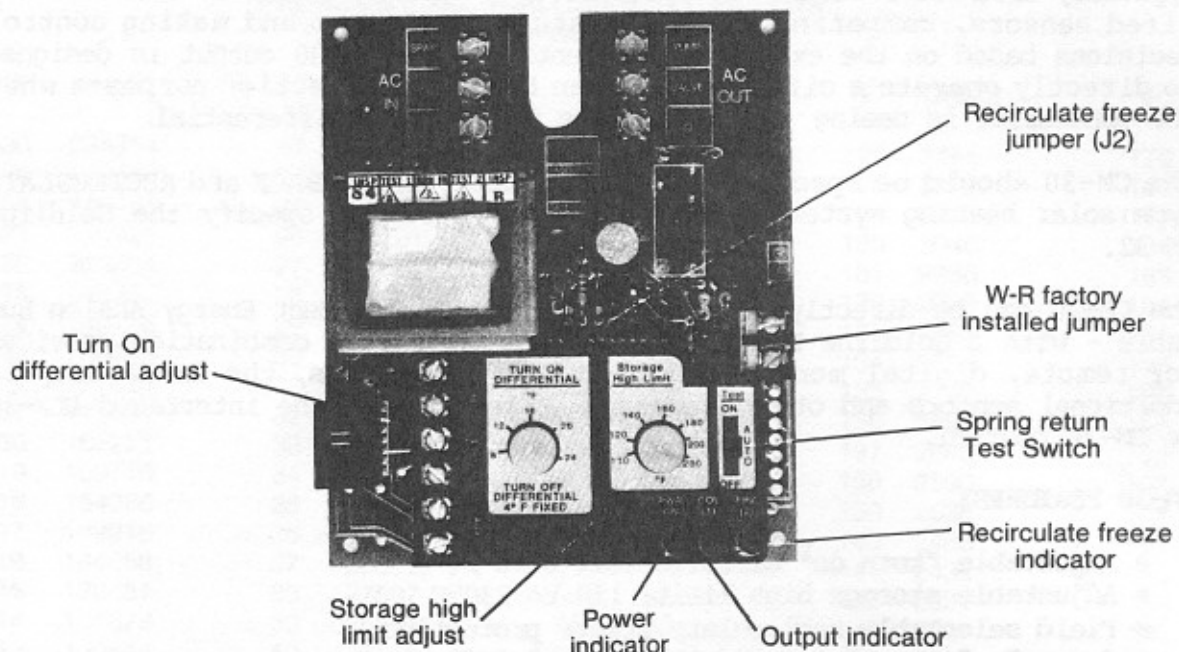


Fig. 1 CM-30

1. CM-30 Output...

This is a 115 VAC, 1/3 HP output. The output is energized - as indicated by the "1" indicator - when the collector/storage temperature difference increases to the TURN ON threshold. The output turns off when the temperature difference decreases to 4°F or if the storage sensor temperature rises to the STORAGE HIGH LIMIT setting.

2. TURN ON Differential...

Field adjustable, range: 8 to 24°F (see Fig. 1).

The TURN OFF differential is fixed at 4°F.

3. Storage High Limit...

Field adjustable, range: 110 to 230°F (see Fig. 1). Note that 230°F is effectively no high limit.

CAUTION!

Solar heating systems can generate dangerously high water temperatures. Ensure that the user is adequately protected by using either a tempering valve or a safety high limit switch (see Fig. 3). Consult local plumbing codes for allowable temperatures and safety precautions. THE CM-30 IS NOT TO BE USED AS A SAFETY HIGH LIMIT CONTROL.

NOTE: The Storage High Limit setting references the CM-30 "storage" sensor, which is usually located near the bottom of the storage tank. Because the temperature at the top of the tank may be considerably hotter, adjust the Storage High Limit setting accordingly.

4. Recirculate Freeze Protection...

The CM-30 is factory shipped with the recirculate freeze protection disabled. TO ENABLE, the jumper (J2) must be moved to the "in" position (bottom two pins, see Fig. 1).

When enabled, recirculate freeze protection turns the CM-30 output on to circulate warmer storage water through the collector(s) when near freezing temperatures are reached at the "collector" sensor or any of the GC-1 freeze snap switches (at least one GC-1 must be used in combination with the collector sensor, see "WIRING").

Recirculate freeze protection in process is indicated by the "2" indicator.

NOTE:

Recirculate freeze protection is initiated when EITHER...

- a. the "collector" sensor temperature falls to $40\pm 2^{\circ}\text{F}$ OR when
- b. the temperature of ANY of the GC-1 freeze snap switches falls to $44\pm 2^{\circ}\text{F}$ (contacts open).

Recirculate freeze protection stops when BOTH of the following occur:

1. the "collector" sensor temperature rises to $45\pm 2^{\circ}\text{F}$ AND
2. the temperature of ALL of the GC-1's rises to $54\pm 5^{\circ}\text{F}$.

IMPORTANT: See "WIRING" for important information concerning the use of recirculate freeze protection.

5. "Auxiliary" Sensor...

An auxiliary sensor can be wired to the CM-30 for additional temperature monitoring when interfaced with a DLX-30 or DM-30 control (see OPERATION 8).

NOTE: The "auxiliary" sensor is NOT REQUIRED and has NO CONTROL FUNCTION.

6. "W - R" Terminals...

"W - R" is a low voltage circuit; breaking continuity across them turns the CM-30 output off (see Fig 1). FOR NORMAL CM-30 USE, DO NOT REMOVE THE FACTORY INSTALLED JUMPER.

Wiring one or more GC-1 freeze snap switches in series with the "W - R" terminals (jumper removed) provides freeze protection for drainback solar heating systems (prevents circulation due to a shorted collector sensor or sensor wiring during freezing conditions).

A low voltage room thermostat can be wired in series with the "W - R" terminals (jumper removed) to provide a high limit cutoff for "direct heating" solar air systems.

7. Test Switch...

This switch forces the CM-30 output on or off. It spring returns to the "auto" position for normal control function. The "on" and "off" positions should be used when servicing or trouble shooting the system.

8. DLX-30(or DM-30)/CM-30 Systems...

The CM-30 can be directly interfaced with a Goldline DLX-30 or DM-30 control via an Analog Bus Cable:

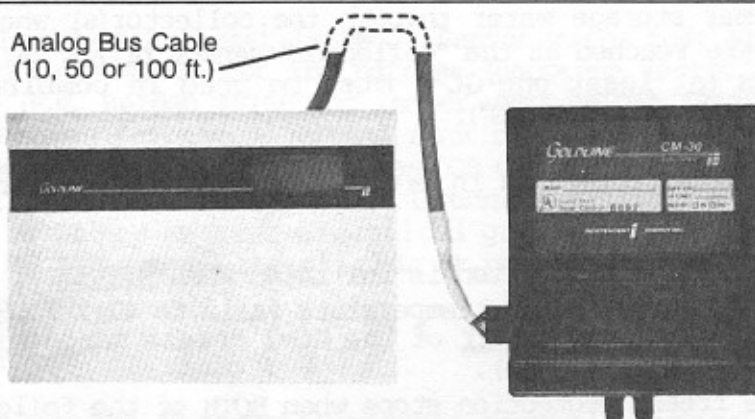


Fig. 2 DLX-30(or DM-30)/CM-30 Interfacing

This combination provides for remote, digital temperature and output monitoring in the following fashion:

TO READ...

PRESS DLX-30 or DM-30 KEY...

- CM-30 "storage" sensor
- CM-30 "collector" sensor
- CM-30 "auxiliary" sensor

T1 (range: 10 to 254 $\pm 2^{\circ}\text{F}$)
 T2 (range: 10 to 254 $\pm 2^{\circ}\text{F}$)
 T3 (range: -27 to 227 $\pm 2^{\circ}\text{F}$)

The CM-30 output "on" status is indicated by **1** on the DLX-30 or DM-30 display.

Both the **1** and **2** indicators display on the DLX-30 or DM-30 control when the CM-30 is in the recirculation freeze protection mode.

In addition, on the DLX-30 only, the EVENT key displays the total number of "off"-to-"on" transitions of the CM-30 output and the RUN TIME key displays the accumulated "on" time of the CM-30 output. See the DLX-30 manual for further details.

INSTALLATION

Installation must be performed by trained service personnel, and in accordance with N.E.C. and local codes.

CAUTION! Disconnect all power during installation.

MOUNTING:

Allow sufficient clearance for AC input and output wiring, IE Bus Cable and/or sensor wiring connections to the CM-30. The control is mounted via two screws (provided). For CM-30 mechanical dimensions, see SPECIFICATIONS.

WIRING:

NOTE: CM-30 terminal strips have special wire clamps that allow good electrical connection to plain, stripped wire ends. No wire lugs are required.

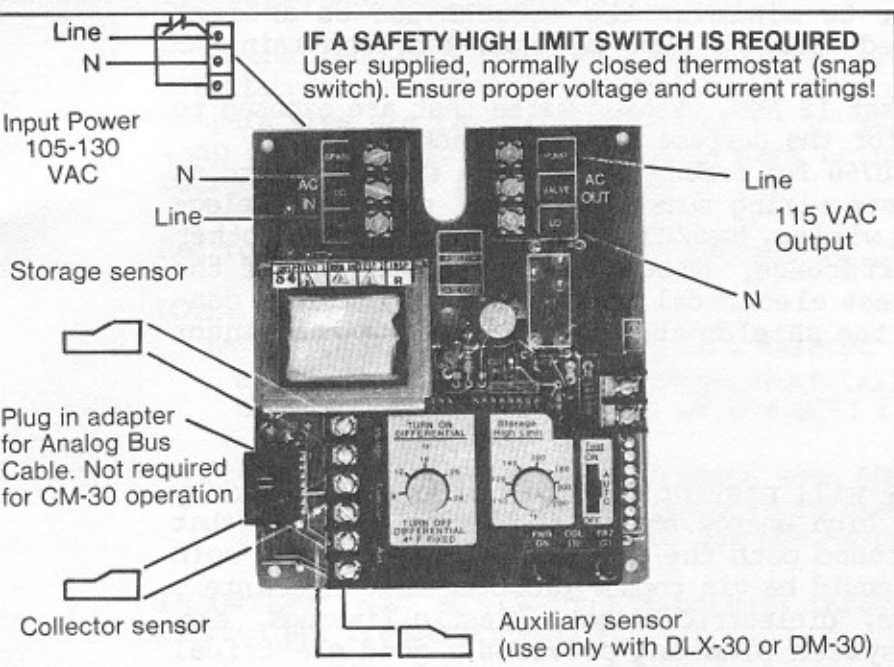
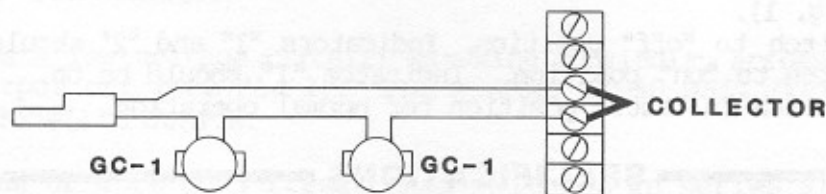


Fig. 3 Wiring

IMPORTANT: Line cord and outlet models (LCO or LC) are intended for use with portable systems only. DO NOT mount or install with stationary or permanent systems. For LC and LCO models, ensure that there is a grounded (3 wire) outlet with adequate power capacity. DO NOT use extension cords. Refer to rating label on side of CM-30 for output rating.

NOTE: All CM-30 controls have recirculate type freeze protection capability. Controls are shipped with freeze protection disabled (jumper (J2) in the "out" position). If recirculate freeze protection is desired, move jumper to the "in" position and wire at least one GC-1 freeze snap switch in series with the "collector" sensor as shown below:



IMPORTANT! Recirculate freeze protection will not operate during a power outage and is not recommended for climates where freezing temperatures are common or last for extended periods. Freeze sensor placement is extremely critical for protection of the entire collection system and exposed plumbing. Due to the difficulty in determining all susceptible freeze points, Independent Energy, Inc. requires that at least one GC-1 freeze snap switch be used for every three collectors, in addition to the "collector" thermistor sensor. Placement of snap switches at the coldest points of the array will help ensure that freeze protection starts early enough to protect the entire collection system. Freeze sensors should also be located to ensure that once recirculation has started, the entire collection system is heated before the sensors react to stop circulation.

Sensor Mounting and Wiring:

- Mechanically mount the sensors (e.g. bolt, hose clamp, etc.) - DO NOT tape or solder. The use of thermally conductive grease applied between sensor and mounting surface will enhance the accuracy of the sensor.
- Always insulate the sensor to minimize the effects due to ambient temperature. Sensors located outdoors must be protected from rain and snow.
- Sensor wire should be at least 18 AWG. Sensor wires that are exposed to weather should be suitable for the purpose (neoprene jacket).
- Shielded wire (e.g. Belden #8760 for indoor use, Belden #8428 for outdoor use) is recommended for sensor wiring runs that travel near other electrical equipment, near A.C. wiring, ham/CB radio transmitters or other sources of electrical interference. Ground the shields to one of the cover screws or to the nearest electrical ground point (plumbing, conduit, etc.). DO NOT ground the shields at the sensor end of the sensor wiring.

Collector Grounding:

Grounding the collector array will prevent possible damage from nearby lightning strikes that produce high energy static discharges. Ensure that there is a good electrical ground path the collector array and the cold water service pipe. This path could be via copper plumbing that is uninterrupted by teflon taped fittings, dielectric unions, plastic fittings, etc. If you are not sure that the system plumbing provides a good electrical ground path, connect the collector array (including all metal frame parts) to a ground rod using #8 AWG copper wire.

CHECKOUT PROCEDURE:

- Before applying power, check AC input, AC output and sensor wiring for proper termination.
- Turn on AC power at circuit breaker panel. Verify that "PWR" indicator is on (see Fig. 1).
- Move test switch to "off" position. Indicators "1" and "2" should be off.
- Move test switch to "on" position. Indicator "1" should be on.
- Return test switch to "auto" position for normal operation.

SPECIFICATIONS

Power requirements: 105-130VAC, 50/60Hz, 7.4 A max. (240VAC factory option)

Output power: 115VAC, 1/3 HP, 7.2FLA

Temperature sensors: IE 10k thermistors @ 77°F

"Turn on" differential: adjustable, 8 to 24°F

"Turn off" differential: 4°F, fixed

Storage high limit: adjustable, 110 to 230°F (230° is effectively no high limit)

Operating ambient temperature range: 32 to 122°F

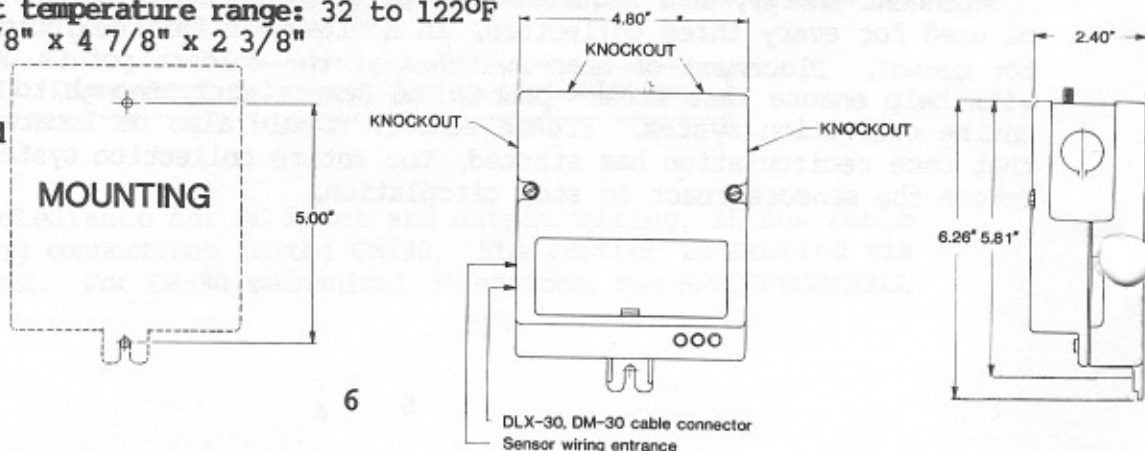
Dimensions: 5 5/8" x 4 7/8" x 2 3/8"

Weight: 2 lbs.

ESD protected

RFI/EMI protected

UL listed



TROUBLE SHOOTING

NOTE: If any of the items below fail to resolve your particular control problem, call your dealer, IE Rep or the factory for further assistance and/or instructions for returning the control - 800-343-0826.

| PROBLEM | POSSIBLE CAUSE | TEST/CHECK |
|--------------------------------|---|--|
| "power" indicator is not on | No AC power to CM-30 | Check to see that circuit breaker is on |
| | | Check for proper AC connections and voltage at CM-30 input terminals |
| indicator "1" does not come on | Test switch is stuck in the "off" position | Return test switch to "auto" position |
| | CM-30 is not seeing a "turn on" differential | Check each sensor resistance(see chart,p.8) |
| | Storage sensor temperature > storage high limit setting | Check sensor resistance (see chart,p.8) vs high limit setting |
| | No continuity across "W - R" terminals | Check for jumper across "W - R" terminals |
| | Short in storage sensor wiring or open in collector sensor wiring | Check continuity of each wire w/ohm meter |
| | Defective storage or collector sensor | Cross check sensor resistance(see chart,p.8) w/actual temperature |
| indicator "1" does not go off | Test switch is stuck in the "on" position | Return test switch to "auto" position |
| | CM-30 is not seeing a "turn off" differential | Check each sensor resistance(see chart,p.8) |
| | Open in storage sensor wiring or short in collector sensor wiring | Check continuity of each wire w/ohm meter |
| | Defective collector or storage sensor | Cross check sensor resistance(see chart,p.8) w/actual temperature |

NOTE: Remove sensor wires from terminal strip when checking resistance.

Temperature vs. Resistance (°F vs. ohms)
10,000 ohm thermistor @ 77°F

| °F | OHMS | °F | OHMS | °F | OHMS | °F | OHMS | °F | OHMS |
|-----|--------|----|-------|-----|-------|-----|------|-----|------|
| -30 | 234314 | 23 | 42333 | 75 | 10502 | 127 | 3244 | 179 | 1191 |
| -29 | 226140 | 24 | 41113 | 76 | 10248 | 128 | 3177 | 180 | 1170 |
| -28 | 218281 | 25 | 39933 | 77 | 10000 | 129 | 3112 | 181 | 1150 |
| -27 | 210723 | 26 | 38791 | 78 | 9760 | 130 | 3048 | 182 | 1129 |
| -26 | 203454 | 27 | 37685 | 79 | 9526 | 131 | 2986 | 183 | 1110 |
| -25 | 196462 | 28 | 36614 | 80 | 9299 | 132 | 2925 | 184 | 1090 |
| -24 | 189735 | 29 | 35577 | 81 | 9078 | 133 | 2866 | 185 | 1071 |
| -23 | 183263 | 30 | 34574 | 82 | 8862 | 134 | 2808 | 186 | 1053 |
| -22 | 177035 | 31 | 33602 | 83 | 8653 | 135 | 2752 | 187 | 1035 |
| -21 | 171041 | 32 | 32660 | 84 | 8449 | 136 | 2697 | 188 | 1017 |
| -20 | 165271 | 33 | 31748 | 85 | 8250 | 137 | 2643 | 189 | 999 |
| -19 | 159716 | 34 | 30864 | 86 | 8057 | 138 | 2590 | 190 | 982 |
| -18 | 154368 | 35 | 30008 | 87 | 7869 | 139 | 2538 | 191 | 965 |
| -17 | 149218 | 36 | 29179 | 88 | 7685 | 140 | 2488 | 192 | 949 |
| -16 | 144258 | 37 | 28375 | 89 | 7507 | 141 | 2439 | 193 | 933 |
| -15 | 139481 | 38 | 27597 | 90 | 7333 | 142 | 2391 | 194 | 917 |
| -14 | 134878 | 39 | 26841 | 91 | 7165 | 143 | 2344 | 195 | 901 |
| -13 | 130444 | 40 | 26109 | 92 | 7000 | 144 | 2298 | 196 | 886 |
| -12 | 126172 | 41 | 25400 | 93 | 6839 | 145 | 2253 | 197 | 871 |
| -11 | 122054 | 42 | 24712 | 94 | 6683 | 146 | 2209 | 198 | 857 |
| -10 | 118085 | 43 | 24045 | 95 | 6531 | 147 | 2166 | 199 | 842 |
| -9 | 114260 | 44 | 23399 | 96 | 6383 | 148 | 2124 | 200 | 828 |
| -8 | 110571 | 45 | 22771 | 97 | 6238 | 149 | 2083 | 201 | 814 |
| -7 | 107015 | 46 | 22163 | 98 | 6098 | 150 | 2043 | 202 | 801 |
| -6 | 103586 | 47 | 21573 | 99 | 5961 | 151 | 2004 | 203 | 788 |
| -5 | 100278 | 48 | 21000 | 100 | 5827 | 152 | 1966 | 204 | 775 |
| -4 | 97088 | 49 | 20445 | 101 | 5697 | 153 | 1928 | 205 | 762 |
| -3 | 94010 | 50 | 19906 | 102 | 5570 | 154 | 1891 | 206 | 749 |
| -2 | 91041 | 51 | 19383 | 103 | 5446 | 155 | 1856 | 207 | 737 |
| -1 | 88176 | 52 | 18876 | 104 | 5326 | 156 | 1820 | 208 | 725 |
| 0 | 85410 | 53 | 18383 | 105 | 5208 | 157 | 1786 | 209 | 713 |
| 1 | 82742 | 54 | 17905 | 106 | 5094 | 158 | 1753 | 210 | 702 |
| 2 | 80166 | 55 | 17440 | 107 | 4982 | 159 | 1720 | 211 | 690 |
| 3 | 77679 | 56 | 16990 | 108 | 4873 | 160 | 1688 | 212 | 679 |
| 4 | 75277 | 57 | 16553 | 109 | 4767 | 161 | 1656 | 213 | 668 |
| 5 | 72959 | 58 | 16128 | 110 | 4663 | 162 | 1625 | 214 | 658 |
| 6 | 70719 | 59 | 15715 | 111 | 4562 | 163 | 1595 | 215 | 647 |
| 7 | 68557 | 60 | 15314 | 112 | 4464 | 164 | 1566 | 216 | 637 |
| 8 | 66467 | 61 | 14925 | 113 | 4368 | 165 | 1537 | 217 | 627 |
| 9 | 64449 | 62 | 14548 | 114 | 4274 | 166 | 1509 | 218 | 617 |
| 10 | 62499 | 63 | 14180 | 115 | 4183 | 167 | 1481 | 219 | 607 |
| 11 | 60614 | 64 | 13823 | 116 | 4094 | 168 | 1454 | 220 | 597 |
| 12 | 58793 | 65 | 13477 | 117 | 4006 | 169 | 1427 | 221 | 588 |
| 13 | 57033 | 66 | 13140 | 118 | 3922 | 170 | 1402 | 222 | 579 |
| 14 | 55332 | 67 | 12812 | 119 | 3839 | 171 | 1376 | 223 | 570 |
| 15 | 53687 | 68 | 12494 | 120 | 3758 | 172 | 1351 | 224 | 561 |
| 16 | 52096 | 69 | 12185 | 121 | 3679 | 173 | 1327 | 225 | 552 |
| 17 | 50558 | 70 | 11884 | 122 | 3602 | 174 | 1303 | 226 | 543 |
| 18 | 49071 | 71 | 11592 | 123 | 3527 | 175 | 1280 | 227 | 535 |
| 19 | 47633 | 72 | 11308 | 124 | 3453 | 176 | 1257 | 228 | 527 |
| 20 | 46241 | 73 | 11032 | 125 | 3382 | 177 | 1235 | 229 | 519 |
| 21 | 44895 | 74 | 10763 | 126 | 3312 | 178 | 1213 | 230 | 510 |