



DESCRIPTION

The real time clock unit keeps track of time and date independently of the power supplies of a GEM 80 controller.

It connects directly to the GEM 80 basic I/O highway and provides six bytes of input data, which are multiplexed sequentially into a single data table location.

The input data represents the time in seconds/minutes/hours, the day of the week, and the date as day/month.

Pushbuttons are provided on the front of the unit for adjusting to the correct time and date.

Two alternative forms of packaging are available, to suit stand alone mounting or inclusion in a compact I/O subrack.

FEATURES

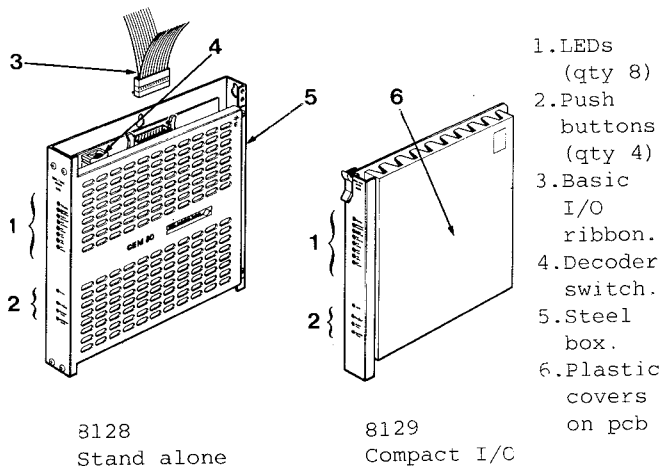
- Runs on built-in Lithium battery.
- Battery power conserved whenever GEM 80 power available.
- Maintains time keeping when GEM 80 power switched off.
- Accuracy unaffected by mains frequency.

SPECIFICATION

Data interface	:	One word of input data to host GEM 80 controller.
	:	High byte identifies which parameter is present in low byte.
	:	Low byte represents one parameter, stepping sequentially one parameter per scan of basic I/O highway.
Data layout	:	High byte is binary code for decimal values 2 to 7.
	:	Low byte is BCD code for time, day and date.

	High byte	Low byte (BCD)	High byte	Low byte (BCD)
Sec.	2	0 to 59	Day	5
Min.	3	0 to 59	Date	6
Hour	4	0 to 23	Month	7

8128 / 8129 Real Time Clock



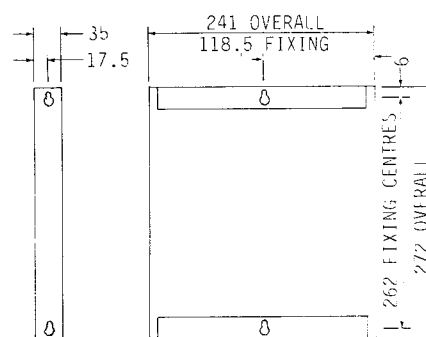
Accuracy (typical): ± 15 sec/month @ 25°C.

- : drift 1 ppm/°C (equivalent to 1 min/month for 20°C)
- : Number of days in month correct except in leap years.

Battery life : 4 years typical, 1.5 years min with GEM 80 power off continuously.
: 10 years typical, 5 years min with GEM 80 power on > 70% of time.

Power consumption : 30mA @ +15V from basic I/O highway ribbon cable.

Mounting 8129 : Occupies 2 adjacent slots in GEM 80 compact I/O subrack.
8128 : Stand alone version in metal box suitable for flat or edge mounting in any orientation (dimensions below).



4 KEYHOLE SLOTS FOR M5 MOUNTING

DESCRIPTIONS

LOAD. Loads selected new parameter into clock. Inoperative if clock in RUN mode. This button is partially recessed to prevent accidental alteration of clock setting. When setting the clock the user may find it convenient to use a pointed instrument such as a pencil to ensure button is fully depressed.

RUN SET. Press once to enter SET mode, again to resume RUN mode. Clock setting is not altered by entering SET Mode unless LOAD button is pressed.

SELECT TIME. Press to choose which parameter is to be altered. Steps on one parameter each time button pressed. Inoperative if clock in RUN mode.

SELECTED TIME. Allows user to set up a new parameter BEFORE loading. New data is initially minimum valid value. Data increments once when button is first pressed, and then automatically repeats, slowly at first, faster if kept pressed. Value automatically cycles in range valid for the selected parameter. "Seconds" parameter cannot be loaded, but can only be reset to zero.

INDICATOR LAMPS

POWER. ON when GEM 80 power on. Flashes at approx 1Hz when in SET mode.

BATTERY WARNING. Normally off. Flashes at approx 5Hz when batter voltage low.

RESET SECONDS)	
SET MINUTES)	
SET HOURS)	One of these lamps is ON in
SET DAY)	SET mode, to show which
SET DATE)	parameter is to be altered.
SET MONTH)	
Address setting	: Rotary decoder switch on stand alone version only. (address of compact I/O version set by decoder switch in compact I/O subrack).
	: Uses even address from pair selected by decoder.
Temperature	: 0 to 60°C operating -20 to 70°C storage
Humidity	: 10 to 90% non-condensing.
Weight	: 8128 (stand alone) 1.3kg : 8129 (compact I/O) 0.7kg

APPLICATION NOTES

1. DISPLAY OF TIME

The unit has no built in numeric display. When setting the correct time a portable programmer may be used to monitor the time and date as adjustments are made.

A display for the plant operator may be obtained by use of GEM 80 video output or connecting decade display units to the basic I/O highway.

For logging purposes the time and date may be used in conjunction with a printer port, to obtain a printout of mixed text and numeric data.

2. SETTING TIME AND DATE

The time adjustment procedure uses a set of buttons and lamp indicators on the front of the unit. There is no facility for outputting data from the GEM 80 controller to set up the clock unit.

The stand alone mounting version enables the clock unit to be mounted to suit the convenience of operator clock adjustment. It may be mounted up to 30m from the host controller, subject to the normal loading limits and noise segregation requirements of a basic I/O ribbon cable. If it is mounted within a desk, or the buttons are made accessible from the exterior of the electrical equipment enclosure, then it is possible for an operator other than a qualified electrician to set up the clock.

When mounted in a compact I/O subrack, access will normally have to be restricted to qualified electricians.

When the clock unit is in the SET mode, the clock unit ceases to operate in a multiplexed mode, and provides the SAME parameter on EVERY scan of the basic I/O highway. This means that it is not necessary to have a program in the host controller while setting the clock, and the controller can be halted. The hexadecimal monitoring option of the portable programmer provides a convenient method monitoring the BCD coded parameters.

When the user selects the SET mode, the POWER lamp flashes to confirm SET mode. One of the six lamps for sec/min/hr/day/date/month will be on to show which parameter is to be altered. The user should press the SELECT TIME button to choose the parameter to be altered.

In SET mode the value monitored via the host controller represents the new value which will be loaded on pressing the LOAD button, and bears no relation to current setting of the clock. Initially the monitored value will be 0 or 1 (0 is not allowed for day/date/month). The user can increment by pressing the SELECTED TIME button. When the parameter has been set to the correct value, the user must remember to press LOAD to transfer the new value into the clock.

3. BCD CODING

The user should take particular note that the time and date from the clock unit is presented in BCD code.

In a controller with a ladder diagram program, the BCDIN special function may be used to convert the BCD coded input data into the binary code normally used within a GEM 80 controller e.g. for the internally generated time and date provided in the E table of most controllers.

Code conversion will normally be needed before the data is used for video display or printer output. It is not needed for a BCD output device such as the 8932/8933 decade display units.

4. SYNCHRONISATION

Input data from the clock unit will be read on six consecutive scans of the basic I/O highway.

If the clock data happens to change during the data transfer, it is possible transiently to obtain an inconsistent set of data. For example if the clock changed from 8.59 to 9.00 just after the minutes had been read, then the time would transiently appear to be 9.59.

The momentary incorrect time will not be apparent if the operator is presented with a continuous visual display, because the correct data would be substituted within about half a second. However, if used to identify an event on a hard copy printout, there could be a small statistical probability of the wrong time and date being printed.

The possibility may be eliminated by using a simple program in the host controller to cause all the parameters in an internal time and date store to be updated with a consistent set of data.

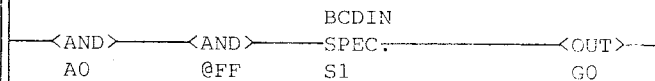
5. TYPICAL LADDER PROGRAM

If the user attempts to monitor the input table location associated with the clock unit, then a jumbled display will be obtained because of the multiplexed nature of the data.

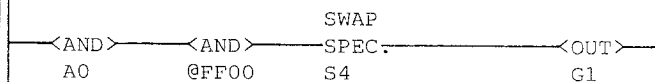
It is normally convenient to have a dedicated table location in the host controller for each of the parameters from the clock. Typically the program will also perform BCD code conversion.

It is important to remember to mask off the data representing which parameter is present BEFORE doing the BCD input conversion.

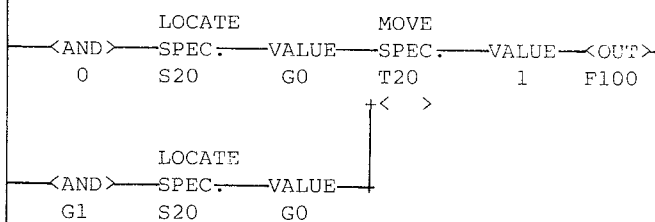
Typical rungs to read time and date from clock reference A0, and store in six separate G table locations:-



This rung masks the input word to obtain the input parameter, decodes, and places it in temporary store G0.



This rung masks the input word to obtain the identity of the input parameter, moves it from the high to the low byte, and places it in temporary store G1.



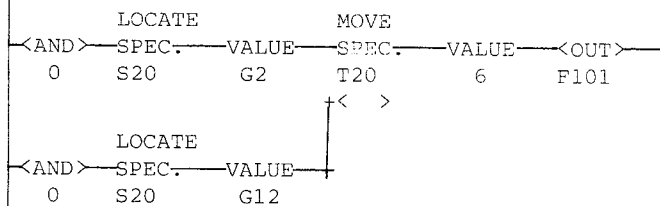
This rung takes the decoded input data and moves it into G2 to G7 depending on the identity of the input parameter.

Loc.	Contents	Loc.	Contents
G2	Seconds	G5	Day
G3	Minutes	G6	Date
G4	Hours	G7	Month

Typical additional rungs to synchronise update for controller with program repetition interval <80ms:-



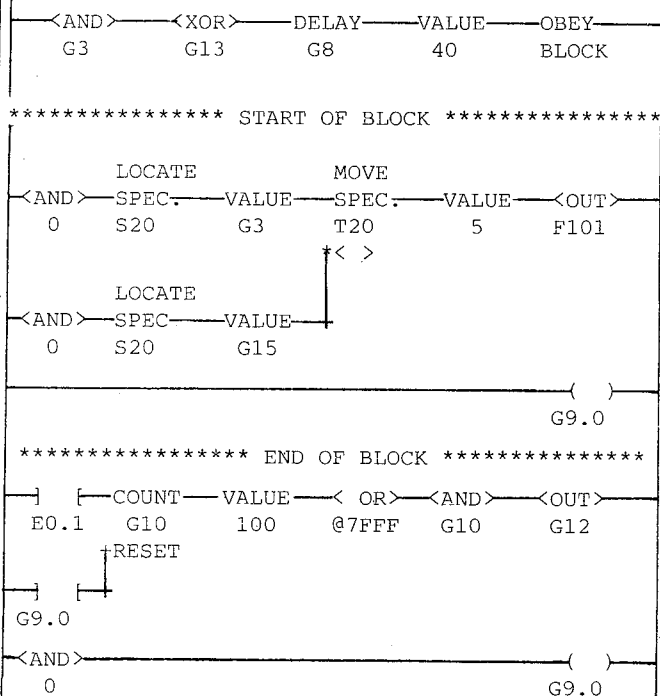
***** START OF BLOCK *****



***** END OF BLOCK *****

This rung simultaneously updates the time and date in G12 to G17, 0.5 seconds after the "seconds" have changed.

Alternative synchronisation rungs for controllers with any program repetition interval, particularly for those with scan time >80ms:-



These rungs simultaneously update the time and date in G13 to G17, 4 seconds after the "minutes" have changed. At the same instant the "seconds" in G12 are reset to zero. The seconds are counted within the GEM 80 controller i.e. the E0.1 flag is counted instead of using the input data from the clock.

6. TYPICAL BASIC PROGRAM

The GEM 80 BASIC language reads input data from the I/O highway whenever the input table reference is encountered in the program. A word reference e.g. A[0] causes both bytes to be read, high byte first. A byte reference e.g. A[\$0] causes just that byte to be read.

As the clock unit steps onto the next parameter immediately after the low byte has been read, the user should ensure that his program reads alternately high byte then low byte.

If the BASIC language expression for decoding the input contains more than one reference to the input data, then it is necessary to avoid inadvertently stepping onto the next parameter. If the user first copies the external input to an internal variable, then multiple references can be made to the data without causing the clock to step round its set of parameters.

Typical program to read the input from a clock unit reference A[0], perform BCD input conversion, and separate the time and date into W[2] to W[7]:-

```
10 FOR I=1 TO 6
20 W[0] = A[0]
30 W[W[$1]] = W[$0] - INT(W[$0]/16)*6
40 NEXT I
```

Additional program is necessary if the user wishes to synchronise the time and date update. A suitable technique is to check that two consecutive sets of data from the clock are identical.

```
10 FOR I=1 TO 6
20 W[0] = A[0]
30 W[1] = W[$0] - INT(W[$0]/16)*6
40 X = W[$1]
50 IF W[X]<>W[1] THEN W[X]=W[1]:GOTO 10
60 NEXT I
```

7. ADDRESS SETTING

The setting of a decoder switch selects a pair of data table locations e.g. A0 and A1. The clock unit always uses the lower (even) numbered address.

In the case of the compact I/O version, the unit MUST be inserted in an even numbered slot. Although it is only physically single width, it occupies two slots of address space, and it is recommended that it be inserted in the slot labelled 0-7, and a blanking panel placed over the adjacent empty slot labelled 8-15, to prevent an I/O module being inserted. If desired, any standard compact I/O modules may be inserted in the associated pair of slots which use the odd numbered table location.

In the case of the stand alone version, it is possible to attach another unit to the same basic I/O ribbon cable using the same decoder setting, provided that the other unit utilises only the odd address.

8. CHANGING BATTERY

It is recommended that the user should adopt a policy of regularly substituting new batteries in the clock unit, calculating the necessary interval from a knowledge of the average time for which power is not available from the host GEM 80 controller.

The battery is identical to the smaller of the two used on GEM 80 processor and memory modules.

To change the battery it is necessary to undo four screws and remove the cover. The battery connections are by push-on connectors. Refer to GEM 80 Installation and Maintenance Manual for safety instructions regarding handling and disposal of Lithium batteries.

ORDERING CODES

1. Equipment

Clock unit for compact I/O	8129-4001
Stand alone clock unit	8128-4001

2. Optional extras

Blanking panel for covering adjacent slot (compact I/O version)	8122-4001
---	-----------

3. Spares

Battery	20T-0318
---------	----------

Note The Company's policy is one of continuous development and improvement and therefore the right is reserved to supply products which may differ in detail from those described and illustrated in this publication. All our products and materials are sold subject to Conditions of Sale available from us on request

GEC Electrical Projects Limited

Boughton Road, Rugby, Warwickshire, England.
Telephone Rugby (0788) 2144 Ext 306 Telex 311335

GEC Industrial Controls Ltd.,

Kidsgrove, Stoke-on-Trent, Staffordshire ST7 1TW, England.
Telephone Kidsgrove (078 16) 3511 Telex 36293

Holding Company The General Electric Company p.l.c., 1 Stanhope Gate, London W1A 1EH, England.

T268 Issue2 3-85

© 1983 The General Electric Company p.l.c. of England

Printed in England

