MICROGATE

MICROGRAPH LED

User Manual

Version 1.0.0

Contents

1 HARDWARE

Figure 1 - MicroGraph LED

- Modular display board with horizontal or vertical attachment forming a large display board without spaces between the modules.
- Matrix: 32 x 128 LEDs
- Dimensions: 32 x 128 x 15 cm (H x W x D)
- Weight: approx. 15 kg
- Controllable via: RS232, RS485, Radio(UHF FM), Ethernet (IP), WIFI (optional), GSM (optional)
- USB port for internal flash programming

1.1 CONTROL PANEL

Figure 2 – Control panel

RADIO: 5-pole Nucletron connector for Linkgate radio system connection

WLAN: WiFi aerial connector (optional)

LOW BATTERY: Battery status signal LED.

SERIAL1: 6-pole Amphenol connector for serial input/output

SERIAL2: 6-pole Amphenol connector for serial input/output

START STOP LAP INPUTS: 6-pole Amphenol connector for START, STOP, and LAP signals

FUSE: Fuse cavity

SPEAKER: Jack connector for external speaker connection

START STOP: Green START STOP button used for manual START and STOP signals and for modifying values in program settings[1]

LAP RESET: Yellow LAP RESET button used for manual LAP signals and for confirming program settings[2]

POWER: On/Off switch

SUPPLY: Neutrik connector for external power supply and battery charging (if used)

ETHERNET: Ethernet network cable connector

USB: USB cable connector for firmware updating

[1] This button will hereafter be referred to as START-MODIFY

[2] This button will hereafter be referred to as LAP-SETUP

1.2 RIGHT SIDE PANEL

Figure 3 – Right side panel

1. Locking pins for modular systems
2. 6-pole Amphenol connector for control of next MicroGraph in sequence, when two or more display boards are connected on the same line (to insert in Serial1)
3. Neutrik power supply connector for control of next MicroGraph in sequence, when two or more display boards are connected on the same line (to insert in Supply)

1.3 CONNECTIONS

SERIAL 1 Input/Output (6-pole Amphenol)

1 Serial 1 RS232 TX (output)
2 Serial 1 SYNC IN (input)
3 Serial 1 RS485+
4 Serial 1 RS485-
5 Serial 1 GND (cable braiding)
6 Serial 1 RS232 RX (input)

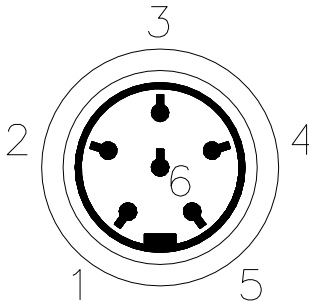


Figure 4 - 6-pole Amphenol connector

SERIAL 2 Input/Output (6-pole Amphenol)

1 Serial 2 RS232 TX (output)
2 Serial 2 SYNC OUT (output)
3 Serial 2 RS485+
4 Serial 2 RS485-
5 Serial 2 GND (cable braiding)
6 Serial 2 RS232 RX (input)

Note: At present the Serial2 port is used by the internal software only as **OUTPUT** (for cascading connection of several display boards). If a chronometer or a PC is connected to this port, input data is not received.

START – STOP – LAP Input/Output (6-pole Amphenol)

1 START signal (input)
2 Controlled output 5V, max 500mA (for external device power supply)
3 GND
4 LAP signal (input)
5 STOP signal (input)
6 AUX signal (input)

1.4 POWER SUPPLY

Power can be supplied in three ways:

- Connecting the MicroGraph display board to the Microgate network adapter (code $ACC161). In this way it is possible to supply a mains graphic display board and to keep the batteries (if used) charged at the same time. This guarantees perfect functioning also when the mains power supply is interrupted. The $ACC161 network adapter operates with an input of 50 or 60 Hz alternate current, within a range of 100 and 240 Volts.
- Using the internal batteries of the display board (optional module $ACC165); in this case autonomy is usually over 8 hours of continuous functioning (depending on the type of display used).
- Connecting the display board via the DC/DC 12/48V converter (optional module $ACC174) to any direct current supply (stabilized or not) between 11 and 16 Volts, which is able to supply at least 100W peak power and approximately 50W average power. A (60Ah) car battery usually ensures more than 6 hours continuous operation (depending on the used display type).

If 2 or more MicroGraph display boards must be powered, the $ACC177 (480W, 48V) or $ACC172 (300W, 48V, sealed) multiple display board network adapter must be used.

IMPORTANT NOTICE: The $ACC161 and $ACC177 network adapters are not suitable for outdoor use. Consequently Microgate is not liable for any damages to persons or things caused by incorrect use of the network adapter.

1.4.1.1 BATTERY CHARGING

To enter charging mode, press the green 'START MODIFY' button on the control panel for at least 2 seconds with the display board turned off and after having connected an external power source to the SUPPLY connector. Charging can take up to 10 hours, depending on the initial battery level.
The charging process can be interrupted by pressing again the green 'START MODIFY' button on the control panel for at least 2 seconds.
The more frequently lithium-ion polymer (Li-poly) batteries are charged, the longer the battery life will be.

The LOW BATTERY LED on the control panel indicates the battery level, the power source used, and the charging status (if applicable).

EXTERNAL SUPPLY	
STATUS	LOW BATTERY LED
• Display board *on/off* • Batteries *charged*	Green – Green – Pause
• Display board *on/off* • Batteries *empty*	Green – Red – Pause

INTERNAL SUPPLY (BATTERIES)	
STATUS	LOW BATTERY LED
• Display board *off* • Batteries *charged/empty*	Off
• Display board *on* • Batteries *charged*	Green – Pause – Green – Pause
• Display board *on* • Batteries *empty*	Red – Pause – Red – Pause

CHARGE	
STATUS	LOW BATTERY LED
• Batteries charging	Pause – Green – Pause – Green FAST
• Charging complete	Steady green

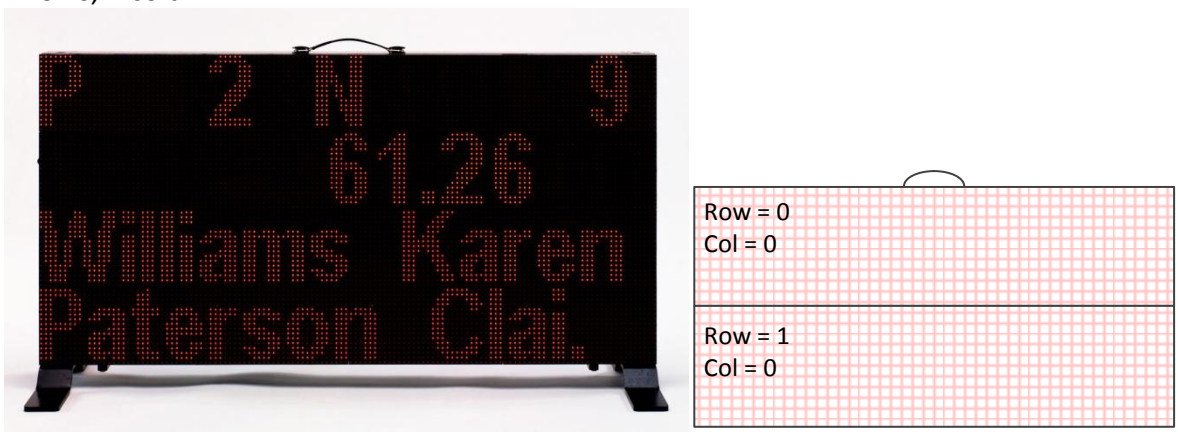
1.5 MODULAR SYSTEM

One of the greatest advantages of MicroGraph is that a number of display boards can be put together to increase the length of the strings and images displayed. A single MicroGraph display board has an LED resolution of 128x32 pixels (width x height), while connecting 3 display boards, for example, allows for a display resolution of 384x32 pixels **without spaces** (neither vertical nor horizontal) between one display board and the next. Each display board is defined by its position (row and column), which can be set via the internal menu or the software (AutoConfig command). The number of rows is theoretically unlimited (using the Alpha protocol compatible with MicroTab, the limit is 16), whereas the number of columns is limited by the network adapter, which must be able to power all display boards of one row; at present the supplied network adapter can power 4 columns, but this value may be changed to fit specific needs.

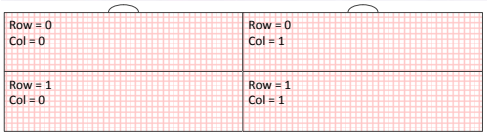
1.5.1 CONFIGURATION EXAMPLES

1 row, 2 columns

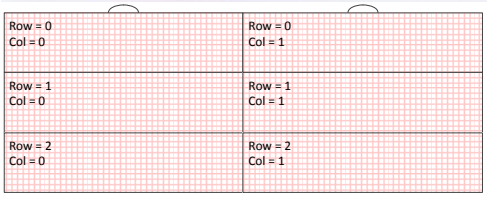
2 rows, 1 column



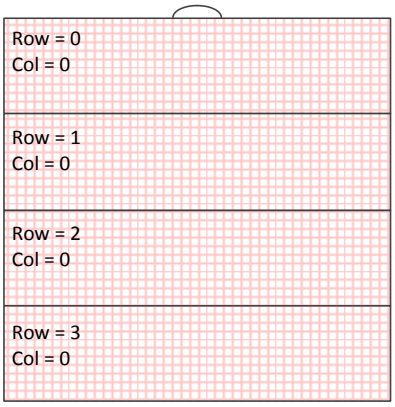
2 rows, 2 columns



3 rows, 2 columns



4 rows, 1 column



1.5.2 ASSEMBLY

Assembling a modular system is extremely simple and can be carried out with the supplied (M5) Allen key or with a similar screwdriver.

Figure 5 - Screwdriver or Allen key

Figure 6 - Special hexagonal head

The mechanical (vertical or horizontal) module assembly is based on symmetrical pins used for connecting rows, as well as columns. Each display board is supplied with 4 pins which are stored inside the side panels when they are not used.

Figure 7 – Locking pin

Figure 8 – Pins mounted for vertical and horizontal assembly

Figure 9 - Stored pins

The power supply and data connection is done by pulling out the light blue supply connector and the serial cable with Amphenol connector, and connecting them respectively to the supply input and the Serial 1 banana jack of the next display board.

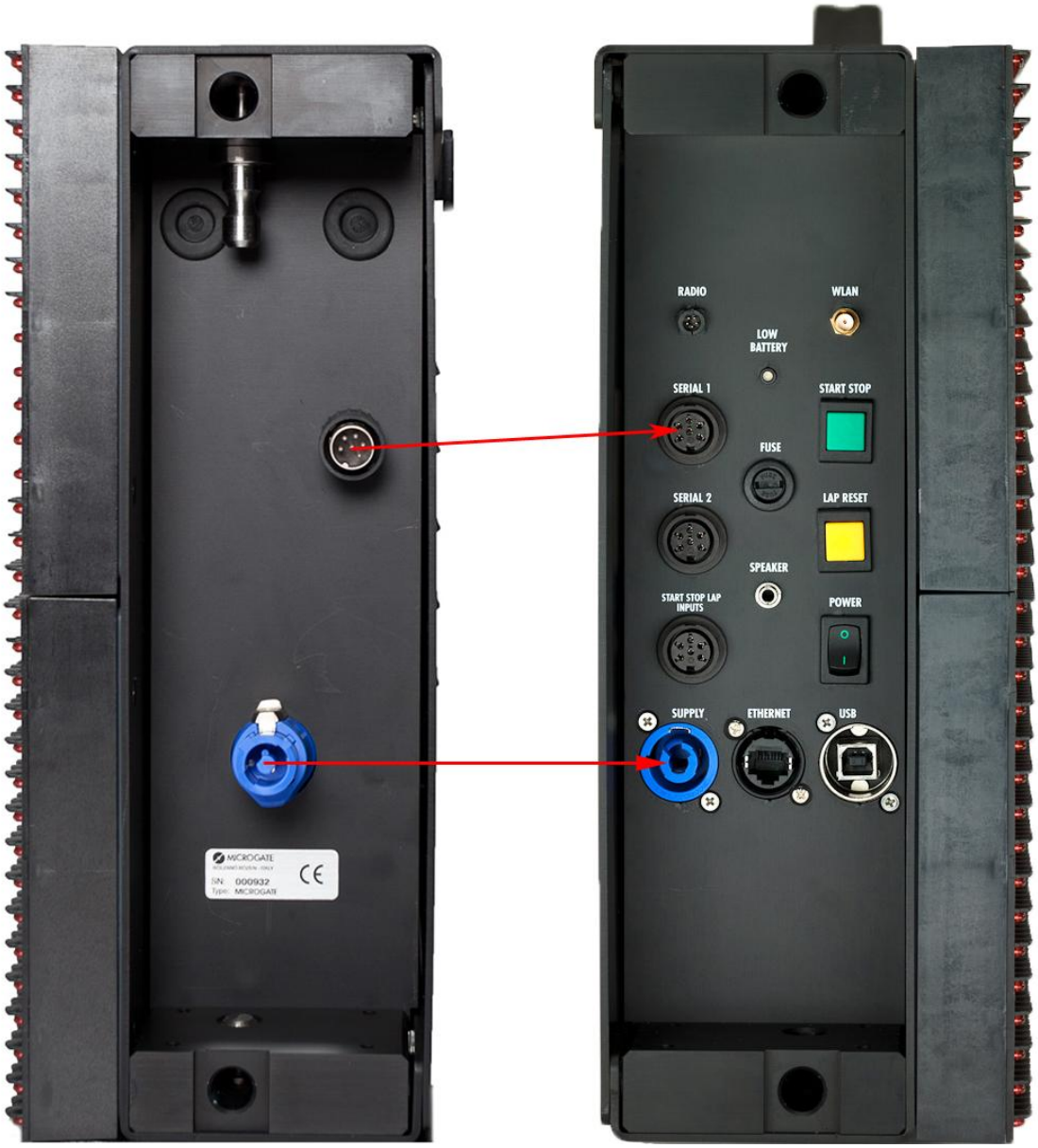


Figure 10 - Power supply and data connection

Now let's see how two display boards are connected horizontally and vertically.

NOTE: BEFORE assembly, carry out the row and column configuration for each display board (par.2.2.1, Row and Column Parameters). Alternatively, after assembly, using the Microgate software or another third-party software implementing our protocol, use the AutoConfig commands (par. 3.1.2).

1.5.2.1 CONNECTING TWO ROWS (HORIZONTAL ASSEMBLY)

Extract the two pins from their slot by unscrewing the lock from the innermost hole (Figure 11). Position the pins on the outside and fix them by driving the screw into the external hole (Figure 12.)

Figure 11 – Extracting the pins

Figure 12 – Fixing on the outside

Bring the two display boards together and connect the power supply and data cables to the Supply and Serial1 ports as shown in Figure 10. Then connect the two frames by inserting the two pins into their respective holes.

Figure 13 – Cable connection

Figure 14 Connecting the display boards

Complete the operation by fixing the pins, screwing them into the holes indicated in Figure 15

Figure 15 - Final pin fixing

1.5.2.2 Connecting Two Rows (Vertical Assembly)

Extract the two upper pins from their slot by unscrewing the lock from the innermost hole (Figure 16). Position the pins on the upper side and fix them by driving the screw into the same hole (Figure 17.)

Figure 16 – Extracting the pins

Figure 17 – Fixing on the upper part

In order to ensure a perfect connection without spaces between the display boards, unscrew and remove the handle of the lower display board, as well as the feet of the top display board.

Figure 18 - Unscrew the two handle screws

Figure 19 - Removing the handle

Warning: during this operation pay attention **NOT** to lay the display board down with the LED side facing downward, as this may damage the safety winglets.

Figure 20 - Unscrew the two foot screws

Figure 21 - Removing the foot

Lift the display board without feet (two people are needed for this operation) and put it on top of the one without the handle inserting the pins into their respective holes.

Warning: during this operation keep the display boards as parallel as possible and lower the upper display board until the pins are inserted simultaneously into the holes, i.e. do not insert first one pin and then the other one, as this may jam them and make disassembling operations difficult.

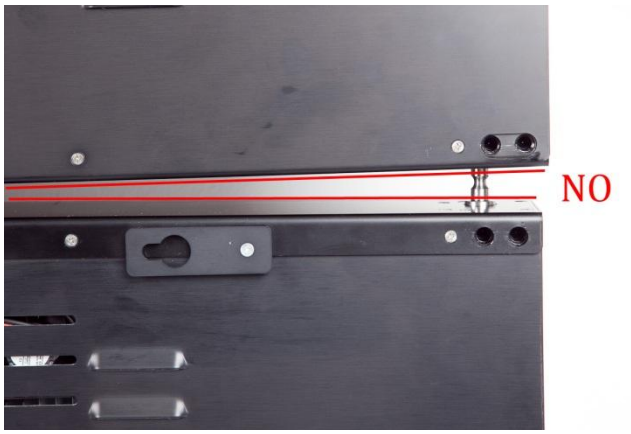


Figure 22 - Do not insert first one pin and then the other one

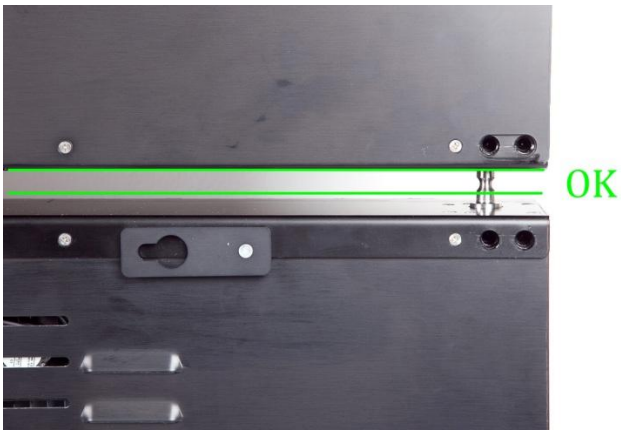


Figure 23 - Lower the display board parallel onto the other one

Tighten the two innermost holes to fix the pins.

Use the $CAB009 serial cable (not supplied, can be purchased separately) to connect the Serial2 connector of one display board with the Serial1 connector of the next display board (cascading connection; Serial 2 of row N must be connected to Serial1 of row N+1)

1.6 RADIO SYSTEM

Some programs of the MicroGraph display board can be used with the Linkgate radio system connected via DecRadio to the RADIO connector on the control panel. Linkgate allows the long-distance transmission of START, STOP, and LAP signals, as well as serial data using the Base Program.

For further information about the Linkgate system, please refer to the relevant REFERENCE GUIDE.

In the following paragraphs the possibility of using the system via radio will be highlighted by the presence of a RADIO section.

NOTE: In order to be able to use the Linkgate system in the Timer, Speedmeter, and Lap Timer Program, the radio channel must be set correctly in the Base Program.

Figure 24 - DecRadio LinkGate

1.7 FIRMWARE UPDATING

Each time MicroGraph is turned on, it displays the firmware version presently stored, usually with the following syntax: x.y.z (major, minor, revision).

Figure 25 - Firmware version

The firmware can be updated downloading it from the SUPPORT section of the www.microgate.it website.

Once downloaded the file, please follow the steps below:

- Turn on the display board and wait until boot is complete.
- Connect the USB cable (not supplied) from the display board to a USB port of your PC.
- Launch the Updater program following the on-screen instructions. In particular, if the software does not detect Active Sync (for Windows XP) or Windows Mobile Device Center (Vista/Windows 7), it suggests a link for downloading and installing it.
- Select the option 'Keep existing settings' to maintain all current settings; if you do not select it, the default values are restored.
- After a few minutes the display board is reset automatically displaying the number of the new installed version.

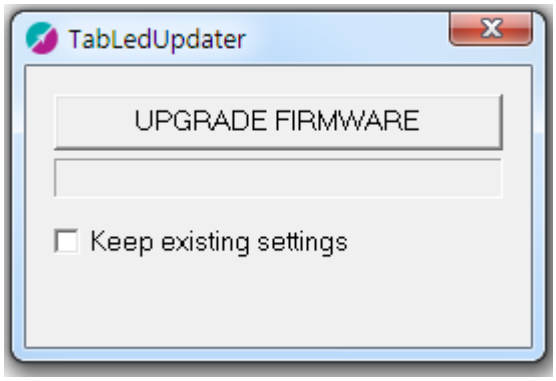


Figure 26 – Updater Software

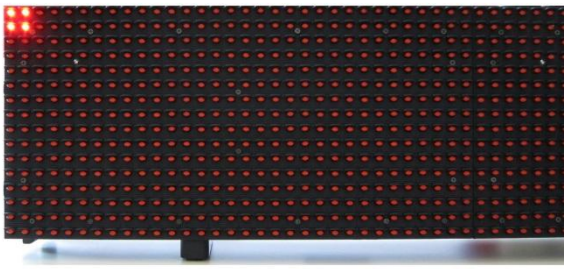
1.8 HARDWARE RESET

If the display board stops responding to commands (e.g. entering the Setup menu as described in par. 2.1), a Strong Reset can be carried out choosing to reset all values to the default parameters (Factory Settings).

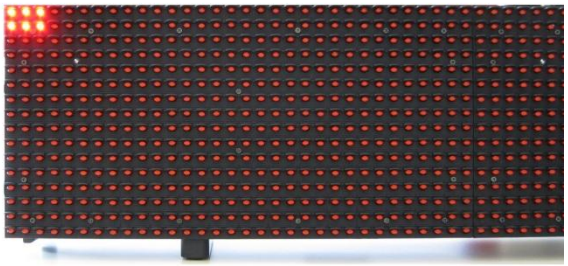
The steps to carry out are the following:

- Turn off the display board by pressing the Power (Off) button.
- Press simultaneously the START-MODIFY and LAP-SETUP buttons to turn on the display board (Power -> On)

- During the first boot phase, when the first 4 LEDs (2x2) in the upper left corner are blinking, keep the two buttons pressed.



- When the blinking LEDs are 6 (3 x 2) release the two buttons.



- After a few moments the software asks if you want to restore the factory settings (`Reset Setting? Yellow=Yes`) or use the stored settings. Press LAP-SETUP to reset all values to the initial conditions.

1.9 BRIGHTNESS SENSOR

Display board LED brightness can be set manually (from the menu or software) or assessed automatically depending on the ambient light detected by the brightness sensor in the upper left corner (4th row, 5th column). There are other sensors for each 32x32 LED area, but only the one in the upper left corner is used for active control.

The minimum-maximum brightness values range from 1 to 100%, although in the default settings 60 is the maximum value. This means that the maximum brightness value that can be set automatically by the sensor is 60. Normally this value is enough even in case of strong light or sunny days. If you want to increase brightness (which causes higher power and battery consumption), set 1 – 100 as minimum and maximum value so that the sensor can set higher values. Of course it is possible to set Brightness Type = Manual (instead of Automatic) and to choose a fixed brightness level (see par. 2.1)

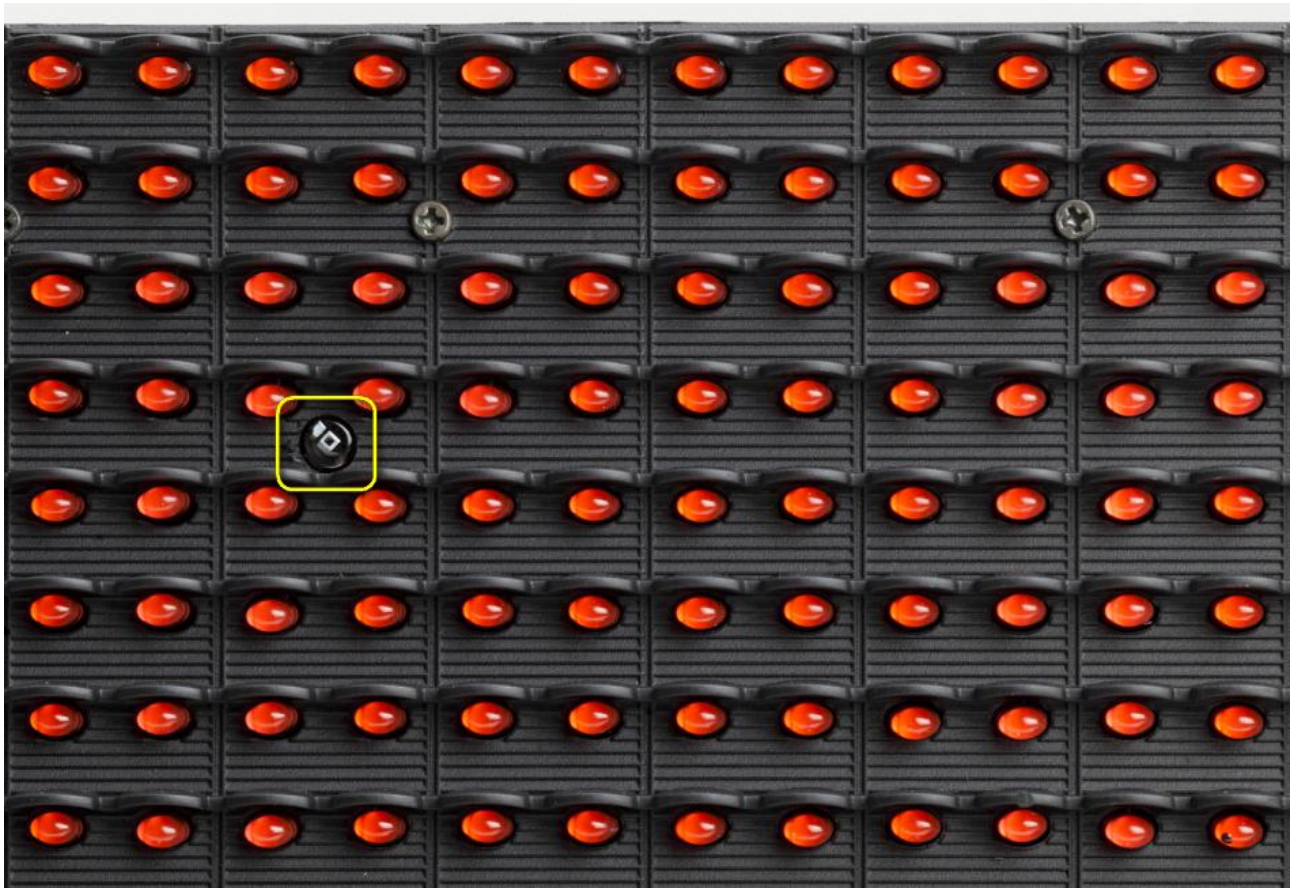


Figure 27 – Brightness sensor

2 INTERNAL PROGRAMS

Besides the 'Base Program', which waits for PC or chronometer commands and displays the received information, MicroGraph LED display boards also have a series of internal programs for various timing needs.

The programs available at the time of printing this guide are:

Base Program	Waits for commands via serial cable or IP (Ethernet/WiFi)
Internal Program	Automatically executes the stored program.
Timer	Works like a normal 1/100 second precision chronometer.
Speedmeter	Measures the speed based on any length.
Countdown	Displays various countdown types.
Clock	Displays the time of the internal clock of the display board.
Date & Clock	Displays date and time of the internal clock of the display board.
Lap Timer	Timing of lap times.
Test Pixel	Checks that the LEDs work correctly.
Self Timer	Manages a Self-Timing course (with token machine and optional printer).
Self Timer Parallel	Manages a Self-Timing parallel course.
OSM6	Connection with Omega OSM6 chronometer.
Powertime	Connection with Powertime chronometer.
Alge	Connection with Alge chronometer.
Omega	Connection with Omega chronometer.
Stalker	Connection with Stalker speedmeter
Jugs	Connection with Jugs speedmeter
Athletic	Program for cycle-racing and athletics tracks.

To change program follow these steps:

- Keep the YELLOW LAP-SETUP button pressed for at least 3 seconds.
- The currently selected program is displayed.
- Press the GREEN START-MODIFY button to scroll down the above-stated program list.
- Once the desired program has been reached, press the LAP-SETUP button to confirm.
- Depending on the chosen program, further settings may be required or the program is executed immediately.

2.1 GENERAL SETUP

Enter the Setup menu of a program (if available) by pressing the yellow LAP-SETUP button for 3 seconds. Once concluded the program configuration the so-called 'Advanced Setup' is displayed, i.e. the possibility to change the general parameters of the display board applied to all programs.

When *Advanced Setup* is displayed, press any button and confirm pressing LAP-SETUP to enter the menu.

The values available for each menu item can be scrolled down with the green START-MODIFY button and are confirmed by pressing the yellow LAP-SETUP button:

Brightness Type *AUTO | MANUAL*	Set the brightness type. Automatic uses the brightness sensor, whereas Manual uses the level set in the following step
Brightness *1…100%*	If Brightness Type = MANUAL, set brightness with START-MODIFY. Holding the button, the numbers increase rapidly
µGraph PIX Emulator *YES | NO*	Enable / Disable emulation of Micrograph PIX
Radio Channel *0…127*	Set the same radio channel as the one set on Linkgate
IP Address *x.x.x.x*	Set the IP Address of the connected Ethernet board. The address must be a valid IP from 0.0.0.0 to 255.255.255.255. Press LAP-SETUP to toggle between the 4 groups of numbers.
Wireless *YES | NO*	If the display board is equipped with a WiFi board, turn on or off the wireless device. The items below are available only if Wireless = YES
Wireless IP Address *x.x.x.x*	Set the IP Address of the WiFi board. The address must be a valid IP from 0.0.0.0 to 255.255.255.255. Press LAP-SETUP to toggle between the 4 groups of numbers.
WiFi Networks *[SSID name]*	All wireless networks detected within the WiFi range. If no networks are displayed ('No Networks!' message), make sure that the antenna of the connector has been connected and try to change its inclination slightly. Choose the network that you want to connect to by pressing LAP-SETUP.
Wireless key *x.x.x.x*	If the WiFi network is WEP or WPA/PSK protected, enter the access key (password). Press START-MODIFY to scroll down the letters/numbers of the alphabet and then press LAP-Setup to confirm and go to the next letter. Given the intrinsic difficulty of this operation, we suggest that you set the password via the Microgate software.

Firmware	
x.y.z	The currently loaded firmware version is displayed.
Serial Number	
xxxxxxxxxxx	The display board serial number is displayed. Press LAP-Setup to continue and exit the Advanced Setup menu.

2.2 BASE PROGRAM

Selecting Base Program MicroGraph can be controlled via the SERIAL 1 communication port, the RADIO connector, the Ethernet port or the WiFi network (optional).

In par. 3 the commands which can be sent to the MicroGraph display board are listed. We strongly suggest to new users to exploit the versatile Microgate software to control MicroGraph correctly, instead of undertaking tedious direct programming attempts.

NOTE: the commands described as 'priority' or 'non-priority' (or 'strong' and 'weak') are to be interpreted as priority or not with respect to the pause command, e.g. a 'weak reset' given after a pause command is carried out only after the pause. On the contrary, a 'strong reset' command is carried out unconditionally.

RADIO: Using the system via Linkgate radio in the Base Program, the transmitted radio signal type must be different from the one of other programs and it is advisable not to exceed the transmitter/receiver range of 150 m.

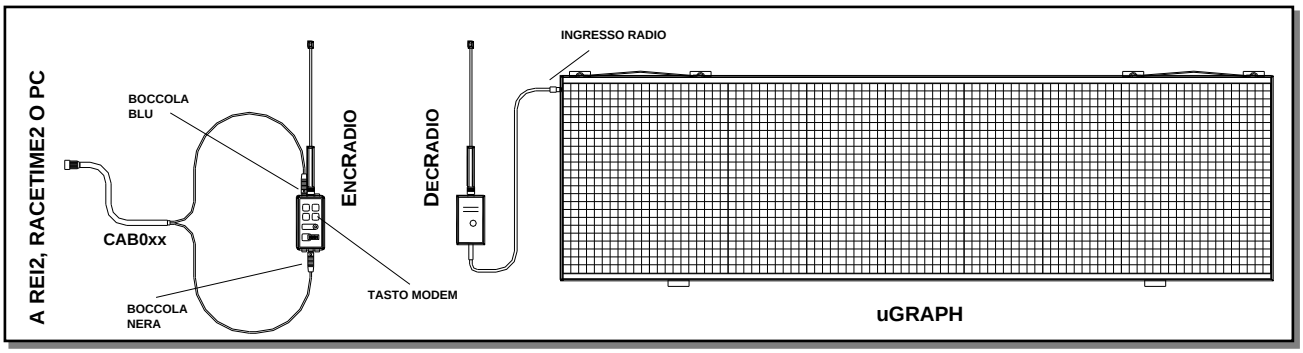


Figure 28

As shown in Figure 1, DecRadio is connected directly to the display board RADIO connector, whereas EncRadio is connected to a PC, REI2, or RACETIME2 via relevant cable (CAB073 for PC, CAB075 for RACETIME2, and CAB071 with CONNECTION BOX for REI2). To start communication, simultaneously press the 2nd button and the button on EncRadio. Data will be transmitted at a speed of 1200 bit/s.

2.2.1 SETUP

Keep the LAP-SETUP pressed for at least 2 seconds to enter the Setup. Press START-MODIFY to change the displayed values.

Advanced Setup ? *Yellow = Yes* *Green = No*	Press any key to continue. Press LAP-SETUP to enter the general setup (see par. 2.1) Press START-MODIFY to scroll the setup of the current program
Font ***Regular*|*Narrow***	Set the default font (normal or narrow) Press LAP-SETUP
Row ***0...15***	Set the row address (0 = first row) Press LAP-SETUP
Column ***0...3***	Set column address (0 = first column) Press LAP-SETUP
X Offset ***0...384***	Set the number of X Offset LEDs. All commands (with the ALPHA protocol) will be shifted to the left by a certain amount of LEDs. Press LAP-SETUP
Baud ***1200…230400|RADIO***	Set the speed of the serial port applying one of the default values ('1200', '2400', '4800', '9600', '19200', '38400', '38400', '57600', '115200', '230400', 'RADIO'). Specifying 'RADIO' communication via modem with Linkgate is activated. Press LAP-SETUP
Green to Default	Press the green START-MODIFY button to reset the display board to the default values, or press the yellow LAP-SETUP button to accept the entered values.

2.3 INTERNAL PROGRAM (USER PROGRAMS)

The *Internal Program* allows you to execute automatically (and without PC connection) a user-created program which is stored in the display board. Up to 50 programs may be stored (and are identified by a sequential number).

Let's suppose for example that you want to execute the following:

- Reset the display board.
- Write a string in large font and display it for 20 seconds.
- Show the clock for 10 seconds.
- Write a scrolling string for 1 minute.
- Go back to the beginning and repeat the sequence 10 times.

This program can be created and stored with the Microgate software or with a series of commands sent one after the other. To store the program, transmit the 'Start Program' command, then the program command sequence, and finally the 'End Program' command. This operation must be carried out with the display board set to the Base Program.

In addition to the regular commands, an internal program can contain instruction cycles that are repeated automatically many times or infinitely. The commands to repeat must be preceded by the 'Label' instruction which identifies the program point where the commands to be repeated begin. This command succession must end with the 'Loop-Goto' instruction, which allows you to indicate the number of times the cycle must be repeated.

2.3.1 SETUP

Keep the LAP-SETUP pressed for at least 2 seconds to enter the Setup. Press START-MODIFY to change the displayed values.

Program
1...50 Set the number of the program to execute.
Press LAP-SETUP

2.4 TIMER (CHRONOMETER)

In this mode MicroGraph works as a typical 1/100 second precision chronometer.

- Pressing Start (manual, from input or via radio) the chronometer begins to count.
- With Lap (manual, from input or via radio) the chronometer displays an intermediate time for 5 seconds.
- The chronometer is stopped using the manual Start/Stop or via radio.
- At this point it is possible to reset the chronometer with a further Lap.

Without reset the chronometer starts from the displayed value.

If the AutoReset time has been set, after each Stop (or manual Start) the chronometer is reset after a given amount of time.

RADIO: The *Timer* program can be used also with a Linkgate radio system once the radio channel has been set correctly. The MicroGraph display board works also with START, LAP, and STOP signals from Linkgate.

2.4.1 SETUP

Keep the LAP-SETUP pressed for at least 2 seconds to enter the Setup. Press START-MODIFY to change the displayed values.

Configuration ***Normal*** / ***Over 24H*** / ***Until 24H***	Set the desired mode: Normal = the chronometer starts from 0:00 Over 24H = the chronometer continues infinitely and after 24h displays time as 24:00:01 Until 24H = the chronometer stops after 24h.00.00 Press LAP-SETUP
Advanced Setup ? *Yellow = Yes* *Green = No*	Press any key to continue. Press LAP-SETUP to enter the general setup (see par. 2.1) Press START-MODIFY to scroll the setup of the current program
Set Starttime *HH=* ***0***	Set the hours Press LAP-SETUP
Set Starttime *MM=* ***0***	Set the minutes Press LAP-SETUP
Set Starttime *SS=* ***0***	Set the seconds Press LAP-SETUP

Set Starttime

mm= ***0*** Set the thousandths of a second
Press LAP-SETUP

Autoreset

Time= ***0*** Set the automatic Reset time (in seconds). After a stop command and when the above-stated time has passed, the chronometer is reset to zero. An invalid (zero) time disables the Autoreset function.
Press LAP-SETUP

Start – ***Stop*** The Start button is used at start and finish

Start – ***Start*** The Start button is used only at start

The chronometer is stopped and shows the preset time, ready to start.

2.5 SPEEDMETER

This program allows you to measure the speed on the basis of any given length. Speed is calculated on the basis of the time interval between two **Lap-Stop from input or via radio** or **manual Lap-Starts** pulses. Therefore you only need to place two photocells at the desired distance and connect them to the Lap and Stop inputs. If the bidirectional mode has been set, the measurement base can be used in both directions. It is advisable to use the bidirectional mode only if absolutely necessary. The system is able to manage up to 20 simultaneous transits in the measurement base.

If a delay has been set for the activation of the stored program (see 'Setup' below), when the time has passed after the last measurement, the display of the sequence stored as program is automatically started. This auxiliary function allows you to automatically display information or advertising during the pauses between transits.

NOTE: Obviously, the precision of speed measurement depends on the accuracy of time measurement on the measurement base. To ensure a precision of 0.025 Km/h up to speeds of 130 km/h, just place the photocells at least 10 m apart from each other (using MICROGATE photocells). Increasing the distance increases the measurement accuracy.

RADIO: In addition to giving the manual LAP and START or input LAP or STOP signals, a *Linkgate* radio system can be used. In this case the following instructions are available:

Use of 2 *Polifemo* photocells and 2 *EncRadios.* The signal of the first *EncRadio* must be set on LAP (any), and that of the second on STOP.

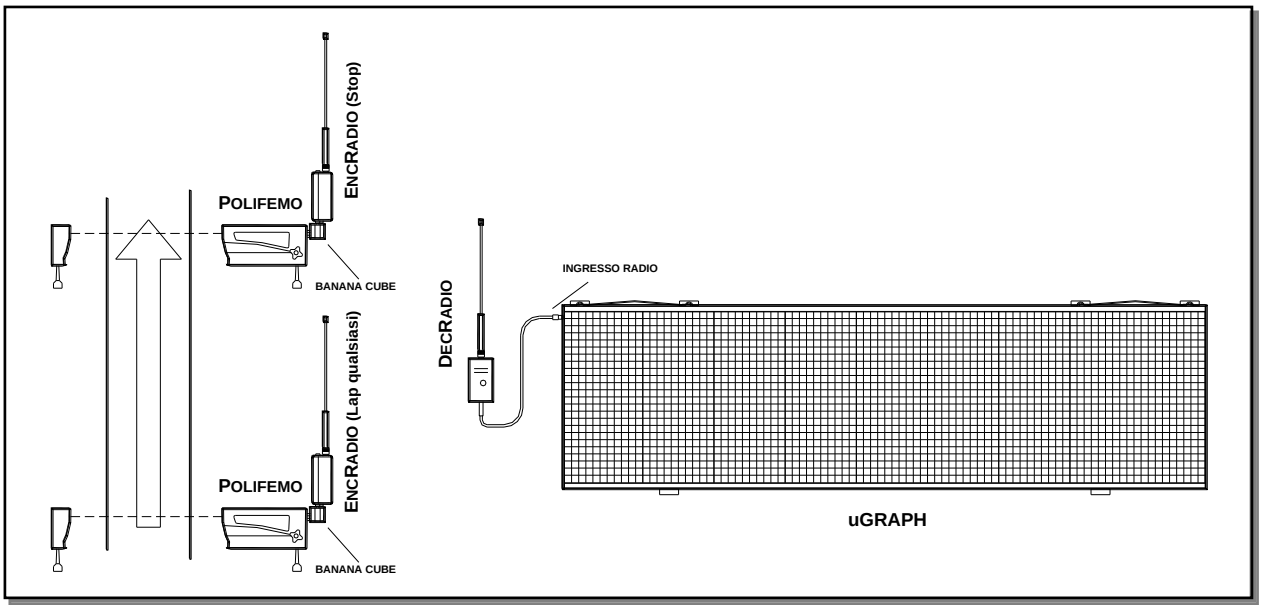


Figure 29

In the example shown in Figure 29, 2 *Polifemos* connected to *EncRadio* with *Banana Cube* have been used.

It is important to point out that if the *EncRadios* have been set to LONG transmission signals, the time for covering the length base cannot be less than 3 seconds, whereas using SHORT signals the time cannot be less than 1 second.

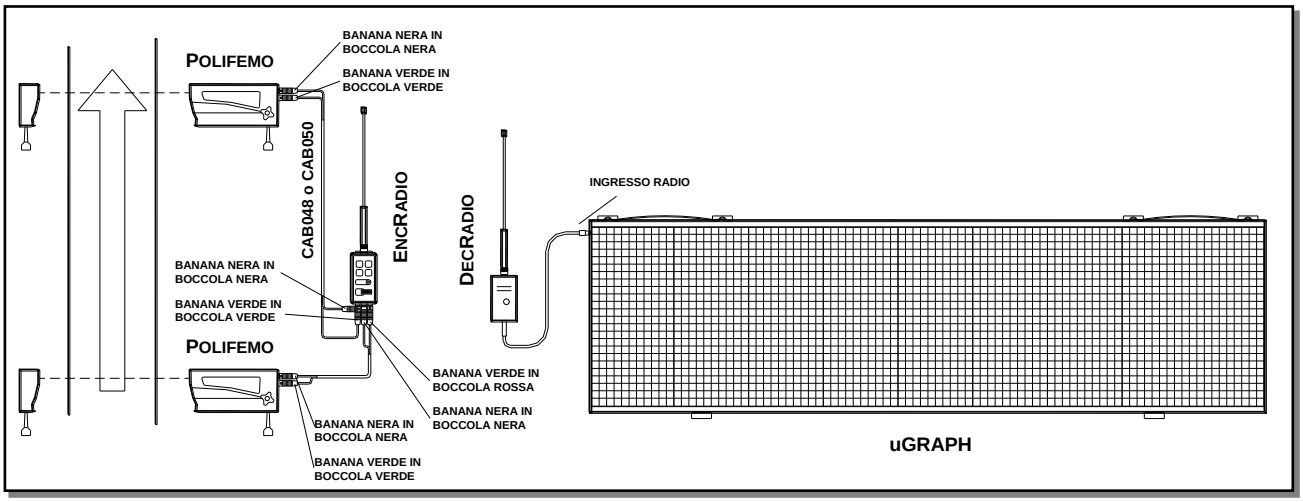


Figure 30

Use of 2 *Polifemo* photocells and 1 *EncRadio*. The first photocell must be connected (2-meter CAB050 cable or 20 meter CAB048 cables) to the Red and Black banana jacks of the *Encradio* and the second to the Green and Black banana jacks. The rotating selector for the selection of the signal on the *Encradio* must be set to *LAP E*. With this option it is not possible to exploit the bidirectionality of the system or to have more than one competitor in the measurement base.

2.5.1 SETUP

It is possible to set the length of the measurement base, the speed unit, the minimum and maximum speed allowed, the mono or bidirectional mode and the delay with which the display program is automatically activated.

Keep the LAP-SETUP button pressed for at least 2 seconds to enter the Setup. Press START-MODIFY to change the displayed values.

Advanced Setup ? *Yellow = Yes* *Green = No*	Press any key to continue. Press LAP-SETUP to enter the general setup (see par. 2.1) Press START-MODIFY to scroll the setup of the current program
Speedbase Length ? *Speedbase* *KM =* ***0***	Press LAP-SETUP Set kilometers by pressing START-MODIFY Press LAP-SETUP
Speedbase *M =* ***0***	Set meters by pressing START-MODIFY Press LAP-SETUP
Speedbase *CM =* ***0***	Set centimeters by pressing START-MODIFY Press LAP-SETUP
Set Speed Unit ***KMH*** / ***MPH*** / ***KNT*** / ***M/S***	Set unit by pressing START-MODIFY (it is possible to choose between kilometers/hour, miles/hour, knots, and meters/second) Press LAP-SETUP
MIN Speed ***3*** *KMH*	Set minimum speed by pressing START-MODIFY Press LAP-SETUP
MAX Speed ***0 KMH***	Set maximum speed by pressing START-MODIFY Press LAP-SETUP
Bidirectional= ***0***	Set bidirectional mode by pressing START-MODIFY (0=No 1=Yes) Press LAP-SETUP
Program Delay *MM=* ***0***	Set the number of minutes after which the user program no. 1 should start with START-MODIFY Press LAP-SETUP

Program Delay
SS= ***0*** Set the number of seconds after which the user program no. 1 should start with START-MODIFY
Press LAP-SETUP

When exiting the setup, the writing 'READY' is displayed and the program is ready for speed detection.

NOTE: Minimum and Maximum speed refer to the measurement unit **currently set**.

2.6 COUNTDOWN

This program allows you to display various countdown types. After choosing the program you must indicate which one of the 3 types is to be used:

Configuration
Start Time1 / ***Start Time2*** / ***Time to zero*** Set mode by pressing START-MODIFY:
Press LAP-SETUP

2.6.1 START TIME 1

In this mode MicroGraph simulates a start timer. The beeper is activated at -10 seconds, at -5, -4, -3, -2, -1, and 0 seconds from the set start time. Normally, the built-in beeper is too weak. It is advisable to connect the loudspeaker to the external socket on the side control panel. The start device (starting gate or other) should be connected to the START-STOP-LAP-INPUTS input. At each start the starting time (minutes, seconds and thousandths) and the deviation in minutes, seconds and thousandths relative to the scheduled starting time (with - for early start and + for delayed start) are displayed in sequence.

NOTE: The first start is given at the first net minute after activation of the Countdown Program.

2.6.1.1 SETUP

The time intervals between successive starts, the green light time and the time displayed can be preset (so as to synchronize the internal clock with other devices, usually the main chronometer).
The period between each start is set to 0 and the countdown from -10 seconds starts when the LAP-SETUP key is pressed (or when the Lap input is activated).
In this way the start sequence can be set manually. In this case deviation from the scheduled start time is neither displayed nor printed.

Keep the LAP-SETUP pressed for at least 2 seconds to enter the Setup.

Cycle:
MM= ***0*** Set the minutes between each start with START-MODIFY
Press LAP-SETUP

Cycle:
SS= ***30*** Set the seconds between each start with START-MODIFY
Press LAP-SETUP

Greentime
6 Set the seconds of green light time and the other one with START-MODIFY
Press LAP-SETUP

Set Sync.Time
HH = ***10*** Set the time with START-MODIFY
Press LAP-SETUP

Set Sync.Time
MM = ***44*** Set the minutes with START-MODIFY
Press LAP-SETUP

Set Sync.Time

*SS = **12***	Set the seconds with START-MODIFY Press LAP-SETUP
Set Sync.Time *mm = **234***	Set the thousandths with START-MODIFY Press LAP-SETUP

Now, if the time for synchronization is over, MicroGraph waits for a START (from button or input) for synchronization and displays:

Set Sync.time *02:44:01* *Start to Sync.*	Press START-MODIFY or send START signal from input.

NOTE: When setting the time for synchronization, MicroGraph shows the time of first setting. If no value is modified, time is not changed and continues to run as if Setup had not been used. This makes it possible to edit the other parameters without losing synchronization.

2.6.2 START TIME 2

The way this program functions is similar to that of the previous program. In this case however, at each start the starting time (minutes, seconds and thousandths) and the deviation in minutes, seconds and thousandths relative to the scheduled starting time (with - for early start and + for delayed start) are displayed in sequence.

2.6.3 TIME TO ZERO

In this case the countdown starts from the time set by the user and stops at zero, with the last five seconds signaled with a beep.

2.6.3.1 SETUP

Cycle: *HH = **0***	Set the hours between each start with START-MODIFY Press LAP-SETUP
Cycle: *MM = **0***	Set the minutes between each start with START-MODIFY Press LAP-SETUP
Cycle: *SS = **0***	Set the seconds with START-MODIFY Press LAP-SETUP
Cycle: *mm = **0***	Set the thousandths between each start with START-MODIFY Press LAP-SETUP
Greentime ***6***	Set the seconds of green light time and the other one with START-MODIFY Press LAP-SETUP
One cycle | Repeat Cycle	Press START-MODIFY to set one countdown or continuous countdown repetitions.

2.7 CLOCK

This program allows you to display the time of the internal MicroGraph clock.

2.7.1 SETUP

It is possible to set the date and time of the internal clock.

NOTE: When setting the time, MicroGraphLED shows the time of first setting. If no value is modified, time is not changed and continues to run as if Setup had not been used.

Keep the LAP-SETUP button pressed for at least 2 seconds to enter the Setup. Press START-MODIFY to change the displayed values.

Configuration ***HH:MM:SS*** / ***HH:MM***	Set display mode with START-MODIFY
Advanced Setup ? *Yellow = Yes* *Green = No*	Press any key to continue. Press LAP-SETUP to enter the general setup (see par. 2.1) Press START-MODIFY to scroll the setup of the current program
Set R.T. Date *Day =* ***13***	Set the day of the month with START-MODIFY Press LAP-SETUP
Set R.T. Date *daynum =* ***3***	Set the week day with START-MODIFY (1 Sunday, 2 Monday, ..., 7 Saturday) Press LAP-SETUP
Set R.T. Date *month = 7*	Set the month with START-MODIFY (1 January, 2 February, …, 12 December) Press LAP-SETUP
Set R.T. Clock *HH =* ***0***	Set the time with START-MODIFY Press LAP-SETUP
Set R.T. Clock *MM =* ***0***	Set the minutes with START-MODIFY Press LAP-SETUP
Set R.T. Clock *SS =* ***0***	Set the seconds with START-MODIFY Press LAP-SETUP

2.8 DATE & CLOCK

This mode allows you to display the time of the internal MicroGraphLED clock.

2.8.1 SETUP

It is possible to set the date and time of the internal clock. The steps are the same as in the Clock Program (see par. 2.7.1).

2.9 LAP TIMER

The Lap Timer program allows you to time lap times. At each Start or Stop pulse (indifferently) the chronometer detects the time from the previous impulse and restarts automatically from zero. Time continues to be displayed for 8 seconds, and then the running time appears again. The input and Lap key reset the chronometer to zero.

RADIO: As well as giving the manual or input START, STOP, and LAP signals, a *Linkgate* radio system can be used (after correctly setting the radio channel in the General Setup). The display board accepts LAP signals (of any kind).

2.9.1 SETUP

It is possible to set the starting and the deactivation time of inputs after a pulse (hold-off time).

Keep the LAP-SETUP button pressed for at least 2 seconds to enter the Setup. Press START-MODIFY to change the displayed values.

Advanced Setup ?	Press any key to continue.
Yellow = Yes	Press LAP-SETUP to enter the general setup (see par. 2.1)
Green = No	Press START-MODIFY to scroll the setup of the current program
Start Time	
*HH = **0***	Set the time with START-MODIFY Press LAP-SETUP
Start Time	
*MM = **0***	Set the minutes with START-MODIFY Press LAP-SETUP
Start Time	
*SS = **0***	Set the seconds with START-MODIFY Press LAP-SETUP
Start Time	
*mm = **0***	Set the thousandths with START-MODIFY Press LAP-SETUP
Autoreset	
*Time= **0***	Set the automatic Reset time (in seconds). After a stop command and when the above-stated time has passed, the chronometer is reset to zero. An invalid (zero) time disables the Autoreset function. Press LAP-SETUP
Holdoff	
*SS = **0***	Set the seconds with START-MODIFY Press LAP-SETUP

Holdoff Time
*mm = **1*****0***

Set the thousandths with START-MODIFY
Press LAP-SETUP

2.10 TEST PIXEL

The Test Pixel program is used to check the correct functioning of LEDs: the display board turns all LEDs on and off for a certain number of times. If an LED does not turn on, please contact our technical support.

2.11 SELF TIMER AND PARALLEL SELF TIMER

The programs are described in the guide supplied with the optional 'Self Timing LED' module.

2.12 OSM6

This program allows you to use the display board together with an Omega OSM6 chronometer.

2.12.1 SETUP

Keep the LAP-SETUP button pressed for at least 2 seconds to enter the Setup. Press START-MODIFY to change the displayed values.

Configuration

0...15 Set the display mode
Press LAP-SETUP

2.13 POWERTIME

This program allows you to use the display board together with a Powertime chronometer.

2.14 ALGE

This program allows you to use the display board together with an Alge chronometer.

2.14.1 SETUP

Keep the LAP-SETUP button pressed for at least 2 seconds to enter the Setup. Press START-MODIFY to change the displayed values.

Configuration

POS NUM TIME | TIME Set the display mode choosing between 'Position Number Time' and only 'Time'.

2.14.2 NOTE FOR THE CONNECTION OF CHRONOMETERS

ALGE CHRONOMETERS

Chronometer	**Display board**
3 – GND	5 – GND
5 – Serial OUT	6 – Serial IN

2.15 OMEGA

This program allows you to use the display board together with an Omega/Longines 5005/Ares chronometer.

2.15.1 SETUP

Keep the LAP-SETUP button pressed for at least 2 seconds to enter the Setup. Press START-MODIFY to change the displayed values.

Configuration

0...15	Set the display mode Press LAP-SETUP
Row	
0...15	Set the row address Press LAP-SETUP

CONFIGURATION = 0
Compatible with the following programs: ML 582 (Mass Sports), ML590 (Road Cycling), ML584 (Horse Racing), etc.
It makes it possible to display the running or final time (in the format minutes, seconds, and tenths-hundredths-thousandths) and also the number and position.

CONFIGURATION = 1
Compatible with the following programs: ML 582 (Mass Sport), ML590 (Road Cycling), ML584 (Horse Riding), etc.
Similar to the previous program. The time is displayed in the format hours-minutes, seconds-tenths.

CONFIGURATION = 2
Compatible with ML programs.
Similar to the previous program. The time is displayed in the format hours-minutes, seconds.

CONFIGURATION = 3
Compatible with the following programs: ML 582 (Mass Sports), ML590 (Road Cycling), ML584 (Horse Riding), etc.
Displays only number and position.

CONFIGURATION = 4
Compatible with the ML 582 (Mass Sports) program.
Displays number and position in 4-digit format.

CONFIGURATION = 5
Compatible with the ML 683 (Car-Motorcycle) program.
Displays the lap time (LAP)

CONFIGURATION = 6
Compatible with the ML 683 (Car-Motorbike) program.
Displays the speed in kilometers/hour.

CONFIGURATION = 7
Compatible with the ML 683 (Car-Motorcycle) program.
Displays the speed in miles/hour.

CONFIGURATION = 8
Compatible with the following programs: ML 582 (Mass Sports), ML 590 (Road Cycling), ML552/553 (Downhill and Cross-Country Skiing), ML 597 (Horse Racing), ML 566 (Track Skating).
Displays the day time.

CONFIGURATION = 9
Compatible with ML 566 (Track Skating) programs.
Displays time, number and position of competitor B.

CONFIGURATION = 10
Compatible with ML 566 (Track Skating) programs.
Displays time, number and position of the leading competitor.

CONFIGURATION = 11
Compatible with ML 566 (Track Skating) programs.
Displays the lap time of competitor A.

CONFIGURATION = 12
Compatible with ML 566 (Track Skating) programs.
Displays the lap time of competitor B.

CONFIGURATION = 13
Compatible with ML 566 (Track Skating) programs.
Displays the number and 'status' (in/out) of competitor A and B.

CONFIGURATION = 14
Compatible with ML 566 (Track Skating) programs.
Displays the number and missing laps for competitor A and B.

2.15.2 NOTE FOR THE CONNECTION OF CHRONOMETERS

OMEGA/LONGINES 5005 CHRONOMETERS

Chronometer	**Display board**
4 – TX+	5 – GND
3 – TX-	6 – Serial IN

2.16 STALKER

This program allows you to use the display board together with Stalker speed radars.

2.16.1 SETUP

Keep the LAP-SETUP button pressed for at least 2 seconds to enter the Setup. Press START-MODIFY to change the displayed values.

Baud

1200…230400|RADIO Set the speed of the serial port applying one of the default values ('1200', '2400', '4800', '9600', '19200', '38400', '38400', '57600', '115200', '230400', 'RADIO'). Specifying 'RADIO' communication via modem with Linkgate is activated.
Press LAP-SETUP

Set Speed Unit

KMH | ***MPH*** | ***KNT*** | ***M/S*** Set unit by pressing START-MODIFY (it is possible to choose between kilometers/hour, miles/hour, knots, and meters/second)
Press LAP-SETUP

2.17 JUGS

This program allows you to use the display board together with Jugs speed radar gun.

2.17.1 SETUP

Keep the LAP-SETUP button pressed for at least 2 seconds to enter the Setup. Press START-MODIFY to change the displayed values.

Baud

1200…230400|RADIO Set the speed of the serial port applying one of the default values ('1200', '2400', '4800', '9600', '19200', '38400', '38400', '57600', '115200', '230400', 'RADIO'). Specifying 'RADIO' communication via modem with Linkgate is activated.
Press LAP-SETUP

Set Speed Unit

KMH | ***MPH*** | ***KNT*** | ***M/S*** Set unit by pressing START-MODIFY (it is possible to choose between kilometers/hour, miles/hour, knots, and meters/second)
Press LAP-SETUP

2.18 ATHLETIC

This program has been studied for managing base information for track-and-field competitions.
After choosing the program you must indicate which one of the 3 types is to be used:

2.18.1.1 SETUP

Keep the LAP-SETUP button pressed for at least 2 seconds to enter the Setup. Press START-MODIFY to change the displayed values.

Configuration
Counter / ***Countdown*** / ***Wind*** Set the mode with START-MODIFY:
Press LAP-SETUP

2.18.2 COUNTER

Pressing the green START key, the number of laps increases by one unit. Pressing the yellow RESET key, the number of laps decreases by one unit. After reaching the maximum lap number (999) the value is reset to 0.

2.18.3 COUNTDOWN

Pressing the green START key, the countdown starts. To stop the chronometer just press the green START key and, to restart it, press the green START key again. The yellow RESET key resets the countdown. When the set time is finished, the display board displays the writing 'OUT'. To go back to the initial condition just press the yellow RESET key.

2.18.3.1 SETUP

Keep the LAP-SETUP button pressed for at least 2 seconds to enter the Setup. Press START-MODIFY to change the displayed values.

MM
0 Set the minutes of countdown start time.
Press LAP-SETUP

SS
30 Set the seconds of countdown start time.
Press LAP-SETUP

2.18.4 WIND

The Wind program allows you to display data received from the Gill anemometer. The anemometer must be connected with a cable to Serial 1.

2.18.4.1 SETUP

Keep the LAP-SETUP button pressed for at least 2 seconds to enter the Setup. Press START-MODIFY to change the displayed values.

Reset = ***5***	Set the number of seconds after which the display board deletes the displayed speed. Press LAP-SETUP

3 TRANSMISSION PROTOCOL

Using 'Base Program' (see par. 2.2) it is possible to send commands to the display board or using the serial port (set by default to 9600 baud, 8 bit, No parity, 1 stop bit) or a TCP/IP socket via connected Ethernet or via WiFi (by default the Ethernet port listens to the IP address 192.168.0.123, port 21967, whereas the WiFi board listens to the IP address 192.168.0.124, port 21968).

All display boards of the MicroLED family use the same protocols of the MicroPIX family, more specifically the original MicroTAB and the specialized MicroGRAPH protocol.

With the **Test Protocol (ALPHA)** (kept to ensure compatibility with older 'character' display boards and all those devices using this protocol) elements are positioned **by ROW and COLUMN**, where the row is identified by a character (from 'A' to 'Q', ' ' space = all) and the column by an integer from 0 to 99.

Conventionally, in graphical and LED display boards, a column corresponds *to the number of dots (pixels or LEDs) composing the space character ' ' (ASCII 32, hex 20h) in the font set on the display board*. For example a column on the LED display boards set to the font 'medium proportional' corresponds to 10 LEDs.

The font used to display information is the one set in the display board menu.

In the example below, the writing 'CIAO' in the font 'Medium' is positioned on row B, column 2 (the first column is zero) and the command to be given is the following:

Start Frame	Row	Command	Column	Data	End Frame
ESC	B	'S'	02	'CIAO'	ETX + Chk

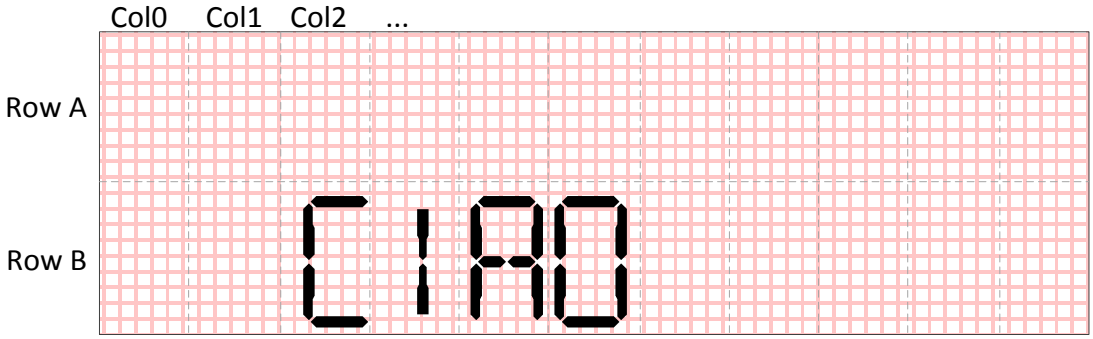


Figure 31 - Writing positioning example with ALPHA protocol

It is clear that with this protocol positioning elements is discreted and not free for every single dot (e.g. it is not possible to write in the center of the display board).

The **Graphical Protocol (GRAPH)**, on the contrary, allows you to specify single dot positioning using X and Y coordinates (string, date, clock, scrolling string, image, etc.) and to vary the font and alignment using two properties (`Font` and `Alignment`).

In the above-stated example the writing can be positioned anywhere using the X Y coordinates of its point of origin (in the top left corner, if the alignment is standard).

Therefore the command to be given is the following (write at position 45,8 in font 2=medium, binary operation=0)

Start Frame	Command	X	Y	Bin Op.	Font	Data	End Frame
ESC + @	'S'	45	8	0	2	'CIAO'	ETX + Chk

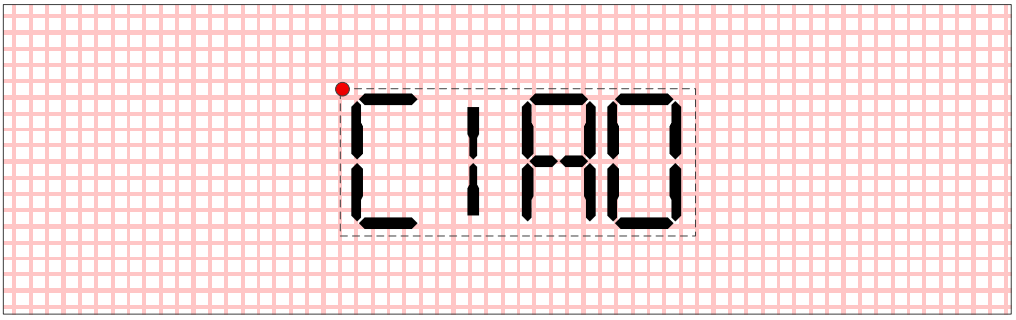


Figure 32 - Writing positioning example with GRAPH protocol

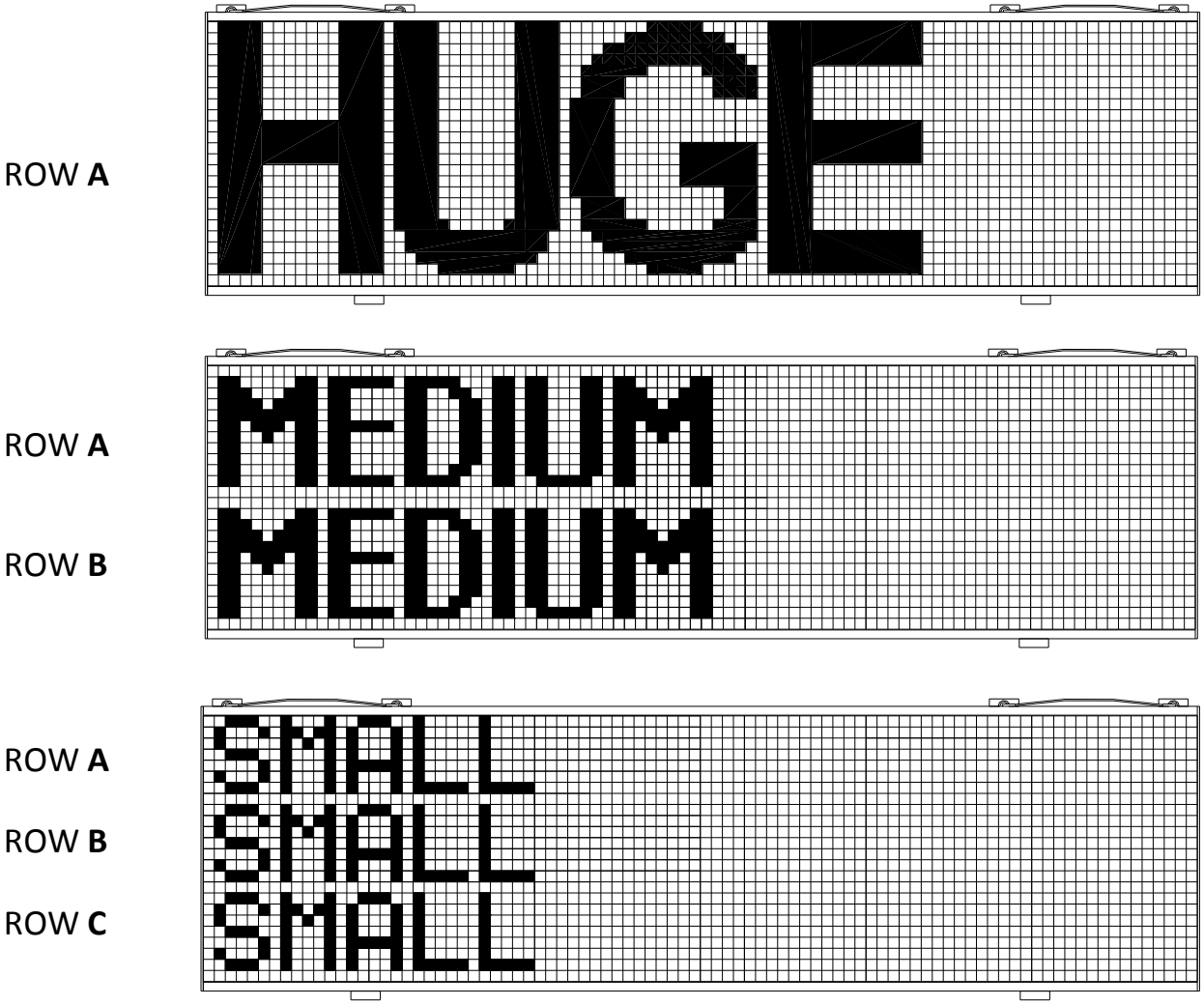
In the following table the main differences between the various display boards are listed.

Tech	Name	No. Dot X	No. Dot Y	Rows	Cols	Protocol	COM	ETH	WIFI
PIX	MicroTAB	56	11	16	9	ALPHA	Y	N	N
PIX	MicroGRAPH	90	24	16	9	ALPHA GRAPH	Y	N	N
LED	MicroTAB	96	16	(16)*	4**	ALPHA GRAPH	Y	Y	Y
LED	MicroGRAPH	128	32	(16)*	4**	ALPHA GRAPH	Y	Y	Y

* Theoretical limit -- not using the ALPHA protocol there is no limit.
** Limitation due to the use of one single power adapter per row.

3.1 TEXT FRAME (ALPHA PROTOCOL)

Using text records, the MicroGraph LED display board is divided into a certain number of sections depending on the height of the font used. The text record is completely compatible with the one of the alphanumerical MicroTAB (LED or PIX) display board.
The font used by the display board can be set manually in the Base Program *Setup* or using the correct serial command.
The usable font heights are 3 and the display area of each MicroGraph LED is divided as follows:



As you can see, using the LARGE font height, MicroGraph LED has only one display row. If you use the MEDIUM font height, the display board is divided into two parts (row A and row B), and finally, using the SMALL font height, the display board is divided into 3 sections (row A, row B, and row C).
It should be noted that connecting various MicroGraph LED display boards, the rows are not interrupted between one display board and the next, but, for example, using 3 MicroGraph LED display boards, you can display strings containing up to 384 LEDs, unlike the 128 LEDs of one single display board.
Another important font feature, besides height, is width. Some fonts can be displayed in proportional as well as in non-proportional mode.

The text frame format is as follows:

Field	Length	Content	Meaning
Start Frame	1	ESC (0x1B)	Start command frame
Address	1	A...Q,‘ ’	Row identifier, blank for broadcast
Command	1	(Any)	Command to send to the display board (see below)
Data	Variable	Variable	Optional command data area
End Frame	1	ETX (0x03)	End command frame
Checksum	1	Variable	7-bit checksum executed for the whole frame.

In the table below the various commands are listed, which can be used in the *Command* field of the text record:

Command	**Code**	
Display Date	A	Dec. 65 - Hex 41h
Start Program	B	Dec. 66 - Hex 42h
Set time sensitive to Pause	C	Dec. 67 - Hex 43h
Set time insensitive to Pause	c	Dec. 99 - Hex 63h
Set Pause (suspends the execution of subsequent commands)	D	Dec. 68 - Hex 44h
Set Date	d	Dec. 100 - Hex 64h
Entry Point/Label for cycles	E	Dec. 69 - Hex 45h
End of Program	K	Dec. 75 - Hex 4Bh
Loop/Goto	L	Dec. 76 - Hex 4Ch
Set time internal clock (Real Time Clock)	M	Dec. 77 - Hex 4Dh
Display time internal clock (Real Time Clock)	N	Dec. 78 - Hex 4Eh
Write scrolling string	O	Dec. 79 - Hex 4Fh
Stop scrolling string	o	Dec. 111 - Hex 6Fh
Execute internal hardware program	P	Dec. 80 - Hex 50h
Self-Timing Printer Strings	p	Dec. 112 - Hex 70h
Weak display board Reset (sensitive to Pause)	R	Dec. 82 - Hex 52h
Strong display board Reset (sensitive to Pause)	r	Dec. 114 - Hex 72h
Write fix string	S	Dec. 83 - Hex 53h
Parameter Setup	s	Dec. 115 - Hex 73h
Display set time	T	Dec. 84 - Hex 54h

Brightness Type	b	Dec. 98 - Hex 62h
Minimum Brightness Range	e	Dec. 101 - Hex 65h
Maximum Brightness Range	f	Dec. 102 - Hex 66h
Brightness Intensity	g	Dec. 103 - Hex 67h
Set Serial Port Baud Rate	G	Dec. 71 - Hex 47h
Set Ethernet IP Address	i	Dec. 105 - Hex 69h
Set WiFi Key	k	Dec. 107 - Hex 6Bh
IdentifyMe	l	Dec. 108 - Hex 6Ch
Set WiFi Network Name	n	Dec. 110 - Hex 6Eh
Set Ethernet TCP Port	p	Dec. 112 - Hex 70h
Enable/Disable MicroGRAPH PIX Simulation	U	Dec. 85 - Hex 55h
Set WiFi TCP Port	w	Dec. 119 - Hex 77h
Set WiFi IP Address	W	Dec. 87 - Hex 57h
Enable/Disable WiFi	Z	Dec. 90 - Hex 5Ah
Set Linkgate Radio Channel	z	Dec. 122 - Hex 7Ah

3.1.1 TEXT FRAME SYNTAX AND COMMAND TABLE

Display Date		
Command code	**'A'**	
Data area		
Item	***Length (bytes)***	***Notes***
Position (Column No.)	2	00 = first character to the left
Mode	1	0=disable 1=DD/MM/YY 2=DD MM YY

Set time sensitive to Pause		
Command code	**'C'**	
Data area		
Item	***Length (bytes)***	***Notes***
Time	8	Time in HHMMSSHH format

Set time insensitive to Pause		
Command code	**'c'**	
Data area		
Item	***Length (bytes)***	***Notes***
Time	8	Time in HHMMSSHH format

Set Pause (suspends the execution of subsequent commands)		
Command code	**'D'**	
Data area		
Item	***Length (bytes)***	***Notes***
Delay	5	Duration of delay in hundredths

Set Date		
Command code	**'d'**	
Data area		
Item	***Length (bytes)***	***Notes***
Date	6	Date in DDMMYY format
Day	1	1 = Sunday, 2 = Monday, 3 = Tuesday….

Set time internal clock (Real Time Clock)		
Command code	**'M'**	
Data area		
Item	***Length (bytes)***	***Notes***
Time	8	Time in HHMMSSHH format

Display internal clock time		
Command code	**'N'**	
Data area		
Item	***Length (bytes)***	***Notes***
Position (Column No.)	2	00 = First Character to the left
Mode	1	0 = disable 1 = HH:MM:SS format 2 = MM:SS format 3 = HH:MM 24 h format (e.g. 15:25) 4 = HH:MM 12 h format (e.g. 3:25 PM)

Display set time		
Command code	**'T'**	
Data area		
Item	***Length (bytes)***	***Notes***
Position (Column No.)	2	00 = First Character to the left
Mode	1	0 = disable 1 = HH:MM:SS format 2 = MM:SS format 3 = HH:MM 24 h format (e.g. 15:25) 4 = HH:MM 12 h format (e.g. 3:25)

Write scrolling string		
Command code	**'O'**	
Data area		
Item	***Length (bytes)***	***Notes***
Position (Column No.)	2	00 = First Character to the left
Number of used Columns	2	0 < n <= 81
Scrolling delay	3	Scrolling delay in hundredths
String	<=255	Characters to display

Stop scrolling string		
Command code	**'o'**	
Data area		
Item	***Length (bytes)***	***Notes***
Time	8	Time in HHMMSSCC format

Execute internal hardware program		
Command code	**'P'**	
Data area		
Item	***Length (bytes)***	***Notes***
Program No.	2	00=1st program (like on switch)

Self-Timing Printer Strings		
Command code	**'p'**	
Data area		
Item	***Length (bytes)***	***Notes***
Row 1	35	Characters of first string
Row 2	35	Characters of second string

Weak display board Reset (sensitive to Pause)		
Command code	**'R'**	
Data area		
Item	***Length (bytes)***	***Notes***
None		

Strong display board Reset (sensitive to Pause)		
Command code	**'r'**	
Data area		
Item	***Length (bytes)***	***Notes***
None		

Write fixed string		
Command code	**'S'**	
Data area		
Item	***Length (bytes)***	***Notes***
Position (Column No.)	2	00 = First Character to the left
String	<=81	Characters to display (with null terminator)

Brightness Type		
Command code	**'b'**	
Data area		
Item	***Length (bytes)***	***Notes***
Type	1	0=Auto 1=Manual

Minimum Brightness Range		
Command code	**'e'**	
Data area		
Item	***Length (bytes)***	***Notes***
Value	Max 3	1 < n <= 100

Maximum Brightness Range		
Command code	**'f'**	
Data area		
Item	***Length (bytes)***	***Notes***
Value	Max 3	1 < n <= 100

Brightness Intensity		
Command code	**'g'**	
Data area		
Item	***Length (bytes)***	***Notes***
Value	Max 3	1 <= n <= 100 (applies only, if Brightness Type = Manual)

Set Serial Port Baud Rate		
Command code	**'G'**	
Data area		
Item	***Length (bytes)***	***Notes***
Speed	Max 6	'1200', '2400', '4800', '9600', '19200', '38400', '38400', '57600', '115200', '230400', 'RADIO'

Set Linkgate Radio Channel		
Command code	**'z'**	
Data area		
Item	***Length (bytes)***	***Notes***
Channel	Max 3	1 < n <= 127

Set Ethernet IP Address		
Command code	**'i'**	
Data area		
Item	***Length (bytes)***	***Notes***
IP address	Max 15	nnn.nnn.nnn.nnn (default = 192.168.0.123)

Set Ethernet TCP Port		
Command code	**'m'**	
Data area		
Item	***Length (bytes)***	***Notes***
Port number	Max 5	1 <= n <= 65535 (default = 21967)

Set WiFi IP Address		
Command code	**'W'**	
Data area		
Item	***Length (bytes)***	***Notes***
IP address	Max 15	nnn.nnn.nnn.nnn (default = 192.168.0.124)

Set WiFi TCP Port		
Command code	**'w'**	
Data area		
Item	***Length (bytes)***	***Notes***
Port number	Max 5	1 <= n <= 65535 (default = 21968)

Set WiFi Network Name		
Command code	**'n'**	
Data area		
Item	***Length (bytes)***	***Notes***
SSID		Name of WiFi SSID

Set WiFi Network Password		
Command code	**'k'**	
Data area		
Item	***Length (bytes)***	***Notes***
Network Key		Name of WiFi network WEP/WPA Key

Enable/Disable WiFi Network		
Command code	**'Z'**	
Data area		
Item	***Length (bytes)***	***Notes***
Value	1	0=disable 1=enable

Enable/Disable MicroGraph PIX Simulation		
Command code	**'U'**	
Data area		
Item	***Length (bytes)***	***Notes***
Value	1	0=disable 1=enable

IdentifyMe (displays its Row/Column)		
Command code	**'I'**	
Data area		
Item	***Length (bytes)***	***Notes***
None		

Parameter Setup		
Command code	**'s'**	
Data area		
Item	***Length (bytes)***	***Notes***
Sub-command	1	Alphabetical character (see below)
Parameter	X	See below

Parameter Setup Sub-commands

COUNTDOWN

A	999	Countdown Duration - 11<n≤500 (0=-10 sec., manual)
B	999	Valid Start Time - 0≤n≤500
O	999	Sub-program 0≤n≤2 (0='Start Time 1',. 1='Start Time 2', 2 = 'Time to Zero')

SELFTIMING

C	999	Minimum time between 2 athletes - 10<n≤500
D	999	Maximum track time - 10<n≤500
I	999	Minimum track time - n≥0
E	999	Auto Program Time - 0≤n≤500
F	9999999	Speed base length in meters - 0≤n≤50000.00
L	999	Green Light Time - 0≤n≤600 (0=transit free – 600=always green)
M	999	Number of printer paper Line-feeds - 0≤n≤255
U	999	Unit of measurement (000=m/s 001=Kmh 002=mph 003=knt)

SPEEDMETER

G	999	Auto Program Time - 0≤n≤500
H	9999999	Speed base length in meters - 0≤n≤50000.00
u	999	Unit of measurement (000=m/s 001=Kmh 002=mph 003=knt)
S	999	Maximum speed - n≥0
s	999	Minimum speed - n≥0
d	999	Bidirectionality 0≤n≤1

NORMAL

N	999	Column displayed first - 0≤n≤89
X	999	Row (0≤n≤15)
Y	999	Column (0≤n≤4)

CHRONOLAP

I	9999999	Pulse hold-off time - 5≤n≤50000

TIMER

O	999	Subprogram 0≤n≤2 ('Normal', 'Over 24', 'Until 24H')

DATE & CLOCK

O	999	Subprogram 0≤n≤2 ('HH:MM:SS', 'HH:MM')

ALGE

O	999	Subprogram 0≤n≤1 ('MM:SS.THT', 'HH:MM:SS')

The following 4 commands are for setting 'internal programs' (series of operations to carry out in sequence, see par. 2.3)

Start of Program		
Command code	**'B'**	
Data area		
Item	***Length (bytes)***	***Notes***
None		

End of Program		
Command code	**'K'**	
Data area		
Item	***Length (bytes)***	***Notes***
None		

Entry Point/Label for Cycles		
Command code	**'E'**	
Data area		
Item	***Length (bytes)***	***Notes***
Label Name	1	From 0 to 9

Loop/Goto		
Command code	**'L'**	
Data area		
Item	***Length (bytes)***	***Notes***
Label Name	1	From 0 to 9
Loop Number	2	00 = infinite loop

NOTE: The numerical parameters with several digits must be padded (filed to the left) with zeroes, if they occupy less characters than defined.

EXAMPLE: Scrolling string ('Microgate') on row A, from the first column, number of used columns 9, delay 30 hundredths:

ESC - A - O - 00 - 09 - 030 - Microgate - ETX – Chk

3.1.2 AUTOCONFIG COMMANDS

The following commands allow to autoconfigure the Row and Column address of the modular display boards, if you have not done so in the setup menu before assembling them.

The frame format to send is slightly different from the text frame. As address identifier (instead of A..Q or blank) the character '*' must be used (Dec. 42, Hex 2Ah).

The commands are two and must be sent in sequence, waiting until the end of the execution of the first (the first one sets the same port baud rate for all). This can be carried out visually (the display board writes OK when it is ready to receive the second command) or by reading the response from the serial/Ethernet port. These are in fact the only two (bidirectional) commands giving a response and more precisely can give an *ACK* in case of Acknowledgement (OK command) or an *ERR* in case of Error.

Initialize AutoConfig		
Command code	**'a'**	
Data area		
Item	***Length (bytes)***	***Notes***
Baud Rate	Max 6	'1200', '2400', '4800', '9600', '19200', '38400', '38400', '57600', '115200', '230400'
Responses		
	3	ACK | ERR

Set AutoConfig Parameters		
Command code	**'b'**	
Data area		
Item	***Length (bytes)***	***Notes***
Row	2	0 <=n<= 15 – 0 = Automatic
Column	1	0 <= n <= 4 – 0 = Automatic
Direction	1	0=Down, 1=Up
Responses		
	3	ACK | ERR

Example:

From PC to display board	**From display board to PC**
ESC * a 9600 ETX CHK	* a ACK (or * a ERR)
ESC * b 00 0 1 ETX CHK	* b ACK (or * b ERR)

The Direction parameter is very important in the case of multiple-row configurations (one display board above the other). If the serial or Ethernet cable from the PC to the display board is

connected to the LOWEST display board, (having the address Row =0), the Direction must be 1 (Up). On the contrary, if you want to configure from top to bottom, attach the cable to the top and set Direction = 0 (Down).

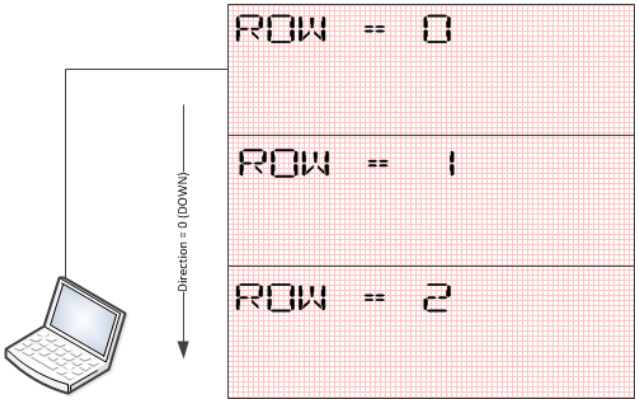


Figure 33 - Down

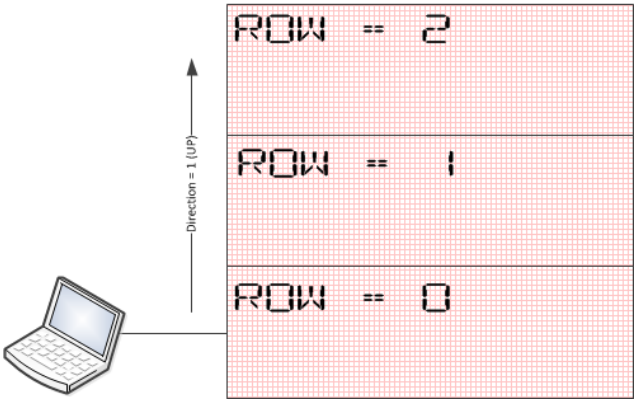


Figure 34 - Up

After having launched AutoConfig, it is advisable to check the configuration using the command IdentifyMe (command '`l`' – lower-case 'L')

3.2 GRAPHICAL FRAME (GRAPH PROTOCOL)

The benefit of the graphical frame is that it allows you to display images and active objects, as well as text strings.

The position of strings and images is not limited to rows or columns, each object is positioned completely freely and makes reference to **the coordinates in pixels with respect to the angle in the top left corner of the MicroGraph LED display board**. The objects have as reference their point in the top left corner (provided that it has not been set differently).

To use the display board in graphical mode it is necessary to send the commands to the identifier (see address field) '@'. The first MicroGraph LED is in charge of transmitting the data to the others. If data is sent to the graphical display boards with an address composed of 'A', 'B', and so on, they must be interpreted as commands of the µTAB and treated as such.

The command frame format is different for commands sent to the graphical display board, therefore it is important not to mix the identifiers. At the beginning of the Data area, 2 words are inserted with coordinates in pixels of the command starting point and a byte containing the Binary Operation to execute.

NOTE: The Binary Operator is not actually used for all commands (e.g. for the PAUSE command), but it is still necessary to send it.

3.2.1 ACTIVE OBJECTS

Among the display commands present there are 'Active Objects', i.e. predefined objects updated automatically by the graphical display board. There are 4 different active object types:

- Internal display board time (Real Time Clock) in various formats: This is given by the quartz inside the display board that works also without power supply. It is usually synchronized with the time of day.
- Time of day in various formats: This is given by the precision quartz of the display board that works only with enabled power supply. When it is turned on, it synchronizes with the RTC.
- Date in various formats
- Scrolling text

Each MicroGraph LED display board can display up to a maximum of 16 active objects, each one characterized by an origin (X and Y coordinates of the start pixel, typically the one in the top left corner of the display area). It is not possible to display simultaneously two active objects having the same origin. If a command is sent to display an active object with the same coordinates as one that is already active, the new object substitutes the previous one.

The command for displaying active objects must use a certain 'Graphic Header' (ESC - @ - command – x_start – y_start – binary operator – font).

There is an appropriate command for stopping the displaying of an active object.

3.2.2 PROPORTIONAL AND NON-PROPORTIONAL FONTS

In text frames, as well as in graphical frames, some fonts can be displayed in non-proportional and in proportional mode:

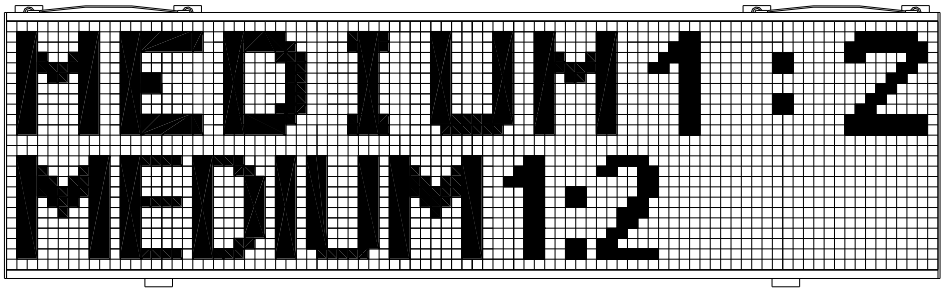
- non-proportional fonts have letters, numbers, punctuation marks and spaces of the same width
- proportional fonts have:
    - numbers of the same width
    - punctuation marks of the same width (but narrower than numbers)
    - letters of variable width
    - spaces with the same width as numbers
    - non-braking space of the same width as punctuation marks and corresponding to the ASCII 255

Font

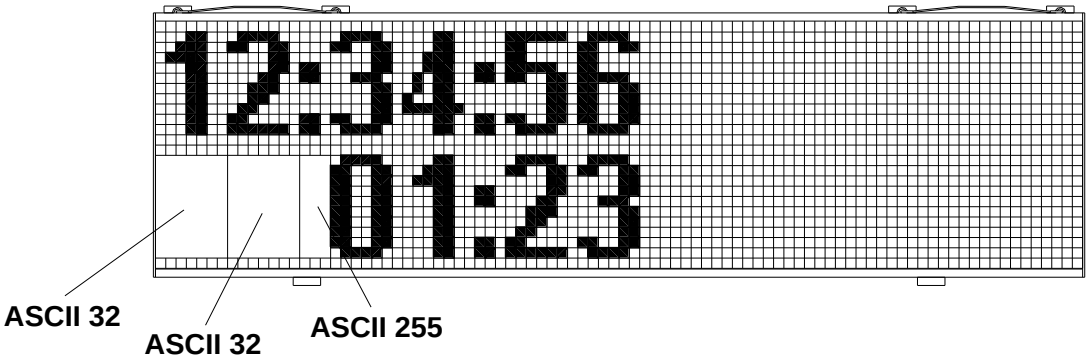
Non-Proportional

Font

Proportional



The non-braking space of proportional fonts is very useful in those cases where times must be aligned on several rows:



As you can see in the figure, to align the time of the lower row with the time of the row above, two 'normal' spaces and one non-braking space have been used.

3.2.3 GRAPHICAL FRAME SYNTAX AND COMMAND TABLE

Therefore, the frame format for the graphical display board is:

Field	**Length**	**Content**	Meaning
Start Frame	1	ESC (0x1B)	Start Command
Address	1	@ (0x40)	Graphical Display Board Identifier
Command	1	Variable	Command to send to the display board
Start Horizontal Coordinate	2	0-809	max. 9 display boards placed in sequence (the first column is the first to the left)
Start Vertical Coordinate	2	0-383	max. 16 display boards placed one on top of the other (the first row is the first one from the top)
Binary Operation	1	0-4	See relevant table below
Font	1	0-3	Binary code – Height x Width 0=Default 1=9x7 non-proportional (SMALL) 2=15xVariable proportional(MEDIUM PROPOR.) 3=31xVariable proportional (LARGE) 4=31x18 'full size modular', only numerical (SPECIAL) 5=15x10 non-proportional (MEDIUM FIXED) 6=32x18 'full size', only num. (SPECIAL2) 7=15xVariable prop. Unicode (UNICODE_MEDIUM) 8=31xVariable prop.Unicode (UNICODE_LARGE) **Note**: Adding 128 (0x80) to the identifier font, right alignment is activated, whereas adding 64 (0x40) centering is activated (always from the top point, see Figure 35).
Data	Variable	Variable	Optional command data area
End Frame	1	ETX (0x03)	End of Command
Checksum	1	Variable	7-bit checksum executed for the whole frame.

The following table lists the identifiers of the binary operator that will be applied.

'Source' is the bitmap or the writing transferred with the command, whereas ‘destination’ is the display board area on which it will be applied.

Code	Operation Executed
0	**No Operation**: Copies the pixels overwriting the previous status
1	**NOT**: Inverts the source values and copies them to the destination
2	**AND**: Only the pixels active on the source and on the destination remain lit
3	**OR**: Only the pixels turned off on the source and on the destination are turned off
4	**XOR**: The destination pixel is inverted only if the corresponding source pixel is lit.

NOTE: Adding the value **128 (80 hex)** to the binary operator, the command is processed regularly, but the display board **is not updated**. This option can be useful when more than one command must be sent to the display board (for example more than one writing in various positions) and it is required that the display be updated only after the last command has been sent.

Below is a list of the various commands which can be used in the Command field of the graphical record:

Command	Command Code	
Display date	A	Dec. 65 - Hex 41h
Select Font	F	Dec. 70 – Hex 46h
Insert images	I	Dec. 73 – Hex 49h
Digital output command	i	Dec. 105 – Hex 69h
Display internal clock time (RTC)	N	Dec. 78 - Hex 4Eh
Write Scrolling String	O	Dec. 79 - Hex 4Fh
Reset a display board area	Q	Dec. 81 – Hex 51h
Write Fixed String	S	Dec. 83 - Hex 53h
Display set time	T	Dec. 84 - Hex 54h
Deactivating an active object	t	Dec. 116 – Hex 74h

The following is a detailed description of each command:

Display Date – *Active Object*		
Command code	**'A'**	
Data area		
Item	***Length (bytes)***	***Notes***
Mode	1	1=DD/MM/YY 2=DD MM YY

Select Font		
If you want to use the graphical display board in MicroTab-compatible mode, you must specify the display font. This command sets the font for all display boards and prepares them to receive commands with an identifier unequal to '@'. When turned on, the default font is 15x24 (TBD).		
Command code	**'F'**	
Data area		
Item	***Length (bytes)***	***Notes***
None (uses the font field of the graph header to set the font)		

Insert Images		
This command is used to display Bitmap images on the graphical display board. Each data bit placed at '1' corresponds to a lit pixel of the image. The image is scanned vertically, sending one column at a time, aligned to the byte. No compression is provided		
Command code	**'I'**	
Data area		
Item	***Length (bytes)***	***Notes***
X Dimension	2	Horizontal image dimension, in pixels
Y Dimension	2	Vertical image dimension, in pixels
Image data	?	Each pixel column is sent starting from the top. The Least Significant bit is the highest pixel. The last byte of the column is padded with zeroes, if the vertical image size is different from n*8.

Digital output command		
Command code	**'i'**	
Data area		
Item	***Length (bytes)***	***Notes***
Input/Output control	1	Uses bits from 0 to 3 to select the mode of digital I/O from 0 to 3 (0 = output, 1 = input).
Digital output value	1	Uses bits from 0 to 4 to set the value on digital outputs from 0 to 4. (0 = 0V, 1 = 5V)

Internal Clock Display (RTC) – *Active Object*		
Command code	**'N'**	
Data area		
Item	***Length (bytes)***	***Notes***
Display format	1	1 (binary) = HH:MM:SS 2 (binary) = MM:SS 3 (binary) = HH:MM (24h) 4 (binary) = HH:MM (12h)
Delay	4	long integer (31 bit + symbol) with advance or delay of the displayed time with respect to the internal clock (Real Time Clock), expressed in thousandths.

Internal Clock Display (RTC) – *Active Object*		
Command code	**'N'**	
Data area		
Item	***Length (bytes)***	***Notes***
Display format	1	1 (binary) = HH:MM:SS 2 (binary) = MM:SS 3 (binary) = HH:MM (24h) 4 (binary) = HH:MM (12h)
Delay	4	long integer (31 bit + symbol) with advance or delay of the displayed time with respect to the internal clock (Real Time Clock), expressed in thousandths.

Write Scrolling String– *Active Object*		
Command code	**'O'**	
Data area		
Item	***Length (bytes)***	***Notes***
Writing width	2	Writing width in pixels (binary word)
Display delay	2	Scrolling delay (Frame to Frame) in hundredths (white word)
Display width	1	Display width in pixels (binary)
Writing	?	From 1 to 255 characters + 'null terminator'

Write Fixed String		
Command code	**'G'**	
Data area		
Item	***Length (bytes)***	***Notes***
String	<=81	Characters to display (with null terminator)

Reset a display board area		
Command code	**'Q'**	
Data area		
Item	***Length (bytes)***	***Notes***
X Dimension	2	Horizontal Dimension of the area to reset
Y Dimension	2	Vertical Dimension of the area to reset

Deactivating an active object		
Command code	**'t'**	
Data area		
Item	***Length (bytes)***	***Notes***
None		The object identified by the position X, Y transmitted by the graphical frame

3.2.3.1 EXAMPLE

Write 'Microgate' at position X=90, Y=48 with MEDIUM Font

String to send:

Field	**Byte**	**Content (hex)**	Meaning
Start Frame	0	**0x1B**	Start Command
Address	1	**0x40**	Graphical Display Board Identifier
Command	2	**0x53**	Fixed String Command
Start Horizontal Coordinate (First byte)	3	**0x5A**	X= 90 -> in hex **0x5A**
Start Horizontal Coordinate (Second byte)	4	**0x00**	
Start Vertical Coordinate (First byte)	5	**0x30**	Y = 48 -> in hex **0x30**
Start Vertical Coordinate (Second byte)	6	**0x00**	
Binary Operation	7	**0x00**	No Operation
Font	8	**0x02**	MEDIUM Font
Data	9	**0x4D**	Character **M**
Data	10	**0x49**	Character **I**
Data	11	**0x43**	Character **C**
Data	12	**0x52**	Character **R**
Data	13	**0x4F**	Character **O**
Data	14	**0x47**	Character **G**
Data	15	**0x41**	Character **A**
Data	16	**0x54**	Character **T**
Data	17	**0x45**	Character **E**
End Frame	18	**0x03**	End of Command
Checksum	19	**0x58**	7-bit checksum executed for the whole frame: 0x1B+0x40+0x53+0x5A+0x30+0x02+0x4D+0x49+0x43+0x52+0x4F+0x47+0x41+0x54+0x45+0x03 = 0x3D8 0x3D8 AND 0x7F = **0x58**

3.3 UNICODE FRAME

Unlike the previous pixel-based version, MicroGraph LED can manage the Unicode protocol for displaying non-ASCII 2-byte characters, as for example Chinese, Japanese, Cyrillic, etc.

3.3.1 GRAPHICAL UNICODE FRAME SYNTAX AND COMMAND TABLE

The transmission protocol is completely identical to the Graphical Frame (GRAPH Protocol, see par. 3.2), with the exception of the transmission of the Data area, where the single characters must be sent specifying that they are 2-byte characters and ending the string with an ETX Unicode character (0x2403). Then the ETX (0x03) ASCII character must be sent anyway, just like for other protocols. It is important to remember to use one of the Unicode fonts (7 or 8).

Write Fixed String		
Command code	**'H'**	
Data area		
Item	***Length (bytes)***	***Notes***
String	<=81	Unicode characters to display

Write Scrolling String– *Active Object*		
Command code	**'h'**	
Data area		
Item	***Length (bytes)***	***Notes***
Writing width	2	Writing width in pixels (binary word)
Display delay	2	Scrolling delay (Frame to Frame) in hundredths (white word)
Display width	1	Display width in pixels (binary)
Writing	?	Unicode scrolling string

3.3.1.1 EXAMPLE

Write “您好” at position X=90, Y=48 with UNICODE_MEDIUM Font

String to send:

Field	**Byte**	**Content (hex)**	Meaning
Start Frame	0	**0x1B**	Start Command
Address	1	**0x40**	Graphical Display Board Identifier
Command	2	**0x53**	Fixed String Command
Start Horizontal Coordinate (First byte)	3	**0x5A**	X= 90 -> in hex **0x5A**
Start Horizontal Coordinate (Second byte)	4	**0x00**	
Start Vertical Coordinate (First byte)	5	**0x30**	Y = 48 -> in hex **0x30**
Start Vertical Coordinate (Second byte)	6	**0x00**	
Binary Operation	7	**0x00**	No Operation
Font	8	**0x07**	Font UNICODE MEDIUM
Data	9	**0x60**	First byte of 您 character
Data	10	**0xA8**	Second byte of 您 character
Data	11	**0x59**	First byte of 好 character
Data	12	**0x7D**	Second byte of 好 character
End of Unicode Data	13	**0x24**	First byte of UETX character
End of Unicode Data	14	**0x03**	Second byte of UETX character
End Frame	15	**0x03**	End of Command
Checksum	16	**0x3C**	7-bit checksum executed for the whole frame

4 MICROGATE.DISPBOARD.MANAGER API

The Microgate.DispBoard.Manager library has been developed for .NET Framework 3.5 and allows you to manage Microgate pixel and LED display boards.

The main class is called **DisplayBoardManager** and once instanced it allows you to send all available commands to the display board (via serial port, or, for LED display boards, via Ethernet/WiFi), acting as wrapper for the already existing serial protocol. Thanks to this it is not necessary to learn the exact syntax of all commands and to pay attention to the transmission details like checksum, protocol identifiers, etc.

It is possible to use both protocols (ALPHA and GRAPH). In the **ALPHA protocol**, the row is generally set via the `RowAddress` property and the column via a parameter of methods providing for it; e.g. `WriteString(int column,string message)`

The **GRAPH protocol**, on the contrary, allows you to specify single dot positioning using X and Y coordinates (string, date, clock, scrolling string, image, etc.) and to vary the font and alignment using two properties (`Font` and `Alignment`). Alignment means the variation of the point origin on the top of the primitive, which will be shifted to the left, center, or right, respectively. Therefore, if you want to align a string to the right, remember to shift X to the desired spot (keeping it at 0, the writing would move 'out' of the display board).

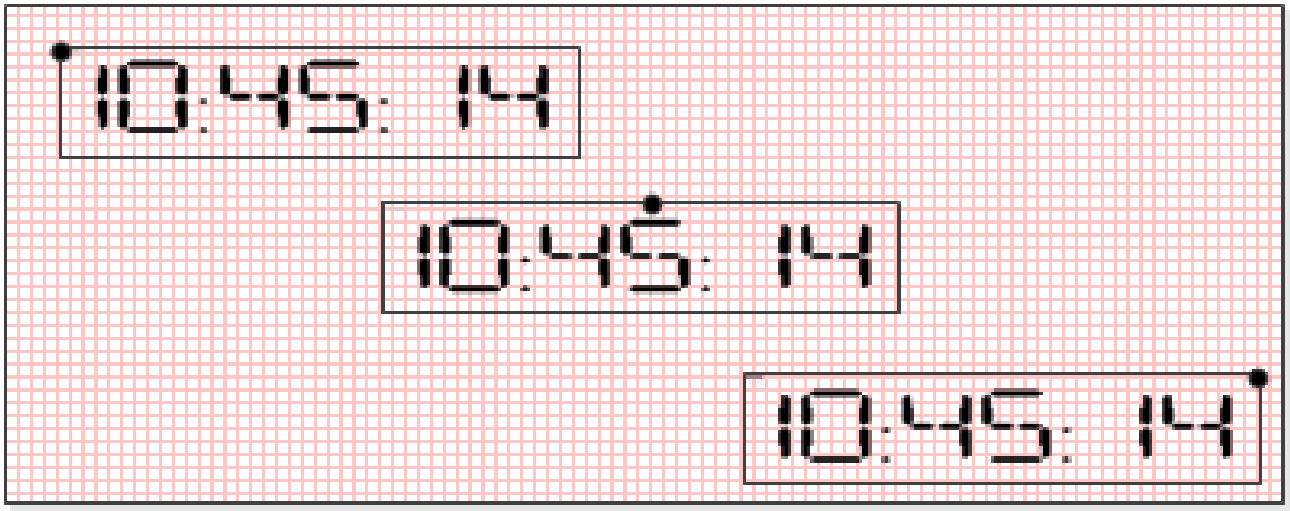


Figure 35 - Example of left, center, and right alignment

4.1 CONSTRUCTOR

The class must be instanced giving the constructor 3 main parameters (which set the relative properties):

- `Technology` (LED | PIXEL)
- `Model` (MicroTab | MicroGRAPH)
- `CommunicationProtocol` (Serial | Ethernet | Wifi | Fileout)

For all three mnemonic enums are available

Depending on the chosen communication protocol, the relevant properties for communication must be set immediately afterwards:

SERIAL	ETHERNET	WIFI	FILEOUT
`PortName` (e.g. 'COM1') `BaudRate` (e.g. 9600)	`EthIpAddress` ('192.168.0.123') `EthPortNumber` (21967)	`WifiIpAddress` ('192.168.0.124') `WifiPortNumber` (21968)	`FileNameOut` ('c:\sample.txt')

4.2 CONNECTION

To establish the connection with the display board, you can use the `OpenConnection()` method and, if necessary, check that the connection has been established with the property `Connected`. Similarly, `CloseConnection()` closes the connection. The class implements the interface `IDisposable`, therefore, to free and close all resources use the method `Dispose()` or the statement `using` (C#).

In any case, it is possible to avoid the explicit opening of the serial port or the TCP socket, carried out upon first use of a primitive or command.

4.3 OVERLOAD OF SOME METHODS

Some methods (e.g. WriteString) suggest overloads where it is necessary to set the row, as they are taken from the `RowAddress` properties. Similarly the `StartX` and `StartY` properties define the defaults for X and Y of some commands.

For example the following is the same:

	..equivalent to

`manager.WriteString('A', 0, 'message');`
`manager.SetPause('A', 1000);`
	`this.RowAddress = 'A';`
	`manager.WriteString(0, 'message');`
	`manager.SetPause(1000);`

`manager.ResetArea(10,15,20,20)`	`this.StartX=10;`
	`this.StartY=15;`
	`manager.ResetArea(20,20)`

If the `DontUpdate` property is set to true, this allows you to send the commands to the display board without displaying them and to display them only after having set to false.

The `BinaryOperation` property identifies the way pixels are written; for example if it is set to NOT, writing can be 'reversed'. Similarly, a ResetArea with NOT will draw a rectangle.

4.4 MAIN METHODS

The main methods for writing objects on the display board are:

- `ShowDate`
- `ShowClock1`
- `ShowClock2`
- `WriteString`
- `WriteRunningString`
- `DrawImage`
- `DrawPixel`

Before using the calendar and the two internal clocks, they must be set to the relative methods.

- `SetDate`
- `SetClock1`
- `SetClock2`

Some objects are called 'active', because once turned on they are updated automatically and to stop them they can be stopped with the following (as well as with the reset commands):

- `DisableDate`
- `DisableClock1`
- `DisableClock2`
- `StopRunningString`
- `DisableActiveObject`

Then there is a whole series of commands for setting the parameters of the display board, similarly to what can be done via its internal setup. For example:

- `SetBrightness`
- `SetWifiNetworkKey`
- `SetBaudRate`
- etc.

Finally, several methods manage the 'internal user programs', i.e. the possibility to create small programs to be executed by the display board:

- `UserProgramStart`
- `UserProgramEnd`
- `EntryPointLabel`
- `LoopGoto`
-

The (modular) multiple-row/column LED display board configuration can be performed on the display board, as well as with commands:

- `AutoConfig`
- equivalent to `SetAutoConfigInit` + `SetAutoConfigParams`
- and checked with `IdentifyMe`

4.5 EXAMPLE

```
//Instance a class to manage a MicroGraph LED via Ethernet
DisplayBoardManager mgr = new DisplayBoardManager(
  Technology.LED, Model.MICROGRAPH, CommunicationProtocol.Ethernet);

mgr.EthIPAddress = "192.168.0.123";
mgr.EthPortNumber = 21967;

//Or via Serial port
/*
DisplayBoardManager mgr2 = new DisplayBoardManager
  (Technology.LED, Model.MICROGRAPH, CommunicationProtocol.Serial);
mgr2.PortName = "COM1";
mgr2.BaudRate = 9600;
*/

// Opening Connection... (not necessary, is opened anyway with the first
command)
mgr.OpenConnection();

//check if connected
if (!mgr.Connected)
{
    //...
}

// Command examples

// Reset
mgr.StrongReset();

//Set brightness
mgr.SetBrightnessType(BrightnessType.MANUAL);
mgr.SetBrightness(50);

// Writing String with graphical protocol x,y
mgr.Font = GraphFont.HUGE;
mgr.WriteString(0, 0, "BIG");

mgr.Font = GraphFont.SMALL;
mgr.Alignment = Alignment.RIGHT;
mgr.WriteString(128, 22, "small");

//Writing String with alpha protocol row,column
mgr.WriteString("A", 6, "medium");

// Set Real Time Clock to 00:00 and display in x,y
mgr.SetClock1(0,0,0,0);
mgr.Alignment = Alignment.LEFT;
mgr.ShowClock1(54, 22,TimeFormat.MM_SS,0);


//Cleaning...
mgr.CloseConnection();
mgr.Dispose();
```

4.6 METHODS

Name	Description
AutoConfig	Autoconfig of the display boards
CloseConnection	Closes the connection.
DisableActiveObject	Disables the active object.
DisableClock1	Stops the real time clock 1.
DisableClock2	Disables the clock2.
DisableDate	Stops the date.
Dispose	Performs application-defined tasks associated with freeing, releasing, or resetting unmanaged resources.
DrawArea	Resets the area with NOT mode; resets the old binaryOperation property at the end.
DrawImage	Overloaded.
DrawPixel	Draws the pixel.
EnablePixEmulation	Enables the emulation of old MicroGraph PIXEL display boards.
EnableWIFI	Enables the WIFI card.
EntryPointLabel	Overloaded.
Equals	Determines whether the specified Object is equal to the current Object. (Inherited from Object.)
ExecuteUserProgram	Overloaded.
Finalize	Allows an Object to attempt to free resources and perform other cleanup operations before the Object is reclaimed by garbage collection. (Inherited from Object.)
GetDimension	Overloaded.
GetHashCode	Serves as a hash function for a particular type.

	(Inherited from Object.)
GetType	Gets the Type of the current instance. (Inherited from Object.)
IdentifyMe	Write on each display board row and column
LoopGoto	Overloaded.
MemberwiseClone	Creates a shallow copy of the current Object. (Inherited from Object.)
OpenConnection	Closes the connection.
ResetArea	Overloaded.
SelfTimingPrinterString	Overloaded.
SendCaptureFile	Sends the capture file.
SetAutoConfigInit	Set Init Autoconfig
SetAutoConfigParams	Set Params Autoconfig
SetBaudRate	Sets the baud rate of the Serial COM Port.
SetBrightness	Sets the brightness.
SetBrightnessRange	Sets the brightness range.
SetBrightnessType	Sets the type of the brightness.
SetClock1	Overloaded.
SetClock2	Overloaded.
SetDate	Overloaded.
SetDigitalOutputs	Sets the digital outputs.
SetEthIPAddress	Sets the Ethernet NIC IP address.
SetEthTcpPort	Sets the Ethernet TCP port.
SetMicroTabEmulationFont	Sets the font (to be used on MicroGRAPH when set in MicroTAB compatibility mode)
SetPause	Overloaded.

SetRadioChannel	Sets the radio channel for Linkgate.
SetupInternalProgramParameter	Overloaded.
SetWifiIPAddress	Sets the WIFI NIC IP address.
SetWifiNetworkKey	Sets the Key (password) of the WPA-PSK WiFi network (blank if none).
SetWifiNetworkSSID	Sets the SSID of the WIFI network where the display board is attached.
SetWifiTcpPort	Sets the WIFI TCP port.
ShowClock1	Overloaded.
ShowClock2	Overloaded.
ShowDate	Overloaded.
StopRunningString	Overloaded.
StrongReset	Overloaded.
ToString	Returns a String that represents the current Object. (Inherited from Object.)
UserProgramEnd	Overloaded.
UserProgramStart	Overloaded.
WeakReset	Overloaded.
WriteRunningString	Overloaded.
WriteString	Overloaded.

4.7 PROPERTIES

Name	Description
Alignment	Gets or sets the alignment.
BaudRate	Gets or sets the baud rate.
BinaryOperation	Gets or sets the binary operation.
CommunicationProtocol	Gets or sets the Communication protocol.
Connected	Gets or sets a value indicating whether this DisplayBoardManager is connected.
DontUpdate	Gets or sets a value indicating whether [dont update]. If set to true, commands are sent but not shown immediately.
EthIPAddress	Gets or sets the ETH IP address.
EthPortNumber	Gets or sets the ETH port number.
FilenameOut	Gets or sets the filename of the spool if Protocol is set to FILEOUT.
Font	Gets or sets the font.
Model	Gets or sets the model (microTab or MicroGraph).
PortName	Gets or sets the name of the port.
RowAddress	Gets or sets the row address.
StartX	Gets or sets the start X.
StartY	Gets or sets the start Y.
Techonology	Gets or sets the technology (LED or PIX).
WifiIPAddress	Gets or sets the WiFi IP address.
WifiPortNumber	Gets or sets the WiFi port number.

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