



SIMATIC S7-1500F, CPU 1511F-1 PN, CENTRAL PROCESSING UNIT WITH WORKING MEMORY 225 KB FOR PROGRAM AND 1 MB FOR DATA, 1. INTERFACE: PROFINET IRT WITH 2 PORT SWITCH, 60 NS BIT-PERFORMANCE, SIMATIC MEMORY CARD NECESSARY

General information	
Product type designation	CPU 1511F-1 PN
HW functional status	FS03
Firmware version	V2.8
Product function	
<ul style="list-style-type: none"> <li>I&amp;M data</li> <li>Isochronous mode</li> </ul>	Yes; I&M0 to I&M3 Yes; Distributed and central; with minimum OB 6x cycle of 625 $\mu$ s (distributed) and 1 ms (central)
Engineering with	
<ul style="list-style-type: none"> <li>STEP 7 TIA Portal configurable/integrated from version</li> </ul>	V16 (FW V2.8) / V15 (FW V2.5) or higher; with older TIA Portal versions configurable as 6ES7511-1FK01-0AB0
Configuration control	
via dataset	Yes
Display	
Screen diagonal [cm]	3.45 cm
Control elements	
Number of keys	8
Mode buttons	2
Supply voltage	
permissible range, lower limit (DC)	19.2 V
permissible range, upper limit (DC)	28.8 V
Reverse polarity protection	Yes
Mains buffering	
<ul style="list-style-type: none"> <li>Mains/voltage failure stored energy time</li> <li>Repeat rate, min.</li> </ul>	5 ms 1/s
Input current	
Current consumption (rated value)	0.7 A
Current consumption, max.	0.95 A
Inrush current, max.	1.9 A; Rated value
$I^2t$	0.02 A <sup>2</sup> ·s
Power	
Infeed power to the backplane bus	10 W
Power consumption from the backplane bus (balanced)	5.5 W
Power loss	
Power loss, typ.	5.7 W
Memory	
Number of slots for SIMATIC memory card	1
SIMATIC memory card required	Yes
Work memory	
<ul style="list-style-type: none"> <li>integrated (for program)</li> </ul>	225 kbyte

<ul style="list-style-type: none"> <li>integrated (for data)</li> </ul>	1 Mbyte
<b>Load memory</b>	
<ul style="list-style-type: none"> <li>Plug-in (SIMATIC Memory Card), max.</li> </ul>	32 Gbyte
<b>Backup</b>	
<ul style="list-style-type: none"> <li>maintenance-free</li> </ul>	Yes
<b>CPU processing times</b>	
for bit operations, typ.	60 ns
for word operations, typ.	72 ns
for fixed point arithmetic, typ.	96 ns
for floating point arithmetic, typ.	384 ns
<b>CPU-blocks</b>	
Number of elements (total)	2 000; Blocks (OB, FB, FC, DB) and UDTs
<b>DB</b>	
<ul style="list-style-type: none"> <li>Number range</li> </ul>	1 ... 60 999; subdivided into: number range that can be used by the user: 1 ... 59 999, and number range of DBs created via SFC 86: 60 000 ... 60 999
<ul style="list-style-type: none"> <li>Size, max.</li> </ul>	1 Mbyte; For DBs with absolute addressing, the max. size is 64 KB
<b>FB</b>	
<ul style="list-style-type: none"> <li>Number range</li> </ul>	0 ... 65 535
<ul style="list-style-type: none"> <li>Size, max.</li> </ul>	150 kbyte
<b>FC</b>	
<ul style="list-style-type: none"> <li>Number range</li> </ul>	0 ... 65 535
<ul style="list-style-type: none"> <li>Size, max.</li> </ul>	150 kbyte
<b>OB</b>	
<ul style="list-style-type: none"> <li>Size, max.</li> </ul>	150 kbyte
<ul style="list-style-type: none"> <li>Number of free cycle OBs</li> </ul>	100
<ul style="list-style-type: none"> <li>Number of time alarm OBs</li> </ul>	20
<ul style="list-style-type: none"> <li>Number of delay alarm OBs</li> </ul>	20
<ul style="list-style-type: none"> <li>Number of cyclic interrupt OBs</li> </ul>	20; With minimum OB 3x cycle of 500 µs
<ul style="list-style-type: none"> <li>Number of process alarm OBs</li> </ul>	50
<ul style="list-style-type: none"> <li>Number of DPV1 alarm OBs</li> </ul>	3
<ul style="list-style-type: none"> <li>Number of isochronous mode OBs</li> </ul>	2
<ul style="list-style-type: none"> <li>Number of technology synchronous alarm OBs</li> </ul>	2
<ul style="list-style-type: none"> <li>Number of startup OBs</li> </ul>	100
<ul style="list-style-type: none"> <li>Number of asynchronous error OBs</li> </ul>	4
<ul style="list-style-type: none"> <li>Number of synchronous error OBs</li> </ul>	2
<ul style="list-style-type: none"> <li>Number of diagnostic alarm OBs</li> </ul>	1
<b>Nesting depth</b>	
<ul style="list-style-type: none"> <li>per priority class</li> </ul>	24; Up to 8 possible for F-blocks
<b>Counters, timers and their retentivity</b>	
<b>S7 counter</b>	
<ul style="list-style-type: none"> <li>Number</li> </ul>	2 048
Retentivity	
— adjustable	Yes
<b>IEC counter</b>	
<ul style="list-style-type: none"> <li>Number</li> </ul>	Any (only limited by the main memory)
Retentivity	
— adjustable	Yes
<b>S7 times</b>	
<ul style="list-style-type: none"> <li>Number</li> </ul>	2 048
Retentivity	
— adjustable	Yes
<b>IEC timer</b>	
<ul style="list-style-type: none"> <li>Number</li> </ul>	Any (only limited by the main memory)
Retentivity	
— adjustable	Yes
<b>Data areas and their retentivity</b>	
Retentive data area (incl. timers, counters, flags), max.	128 kbyte; In total; available retentive memory for bit memories, timers, counters, DBs, and technology data (axes): 88 KB
Extended retentive data area (incl. timers, counters, flags), max.	1 Mbyte; When using PS 6 0W 24/48/60 V DC HF
<b>Flag</b>	
<ul style="list-style-type: none"> <li>Size, max.</li> </ul>	16 kbyte

<ul style="list-style-type: none"> <li>• Number of clock memories</li> </ul>	8; 8 clock memory bit, grouped into one clock memory byte
<b>Data blocks</b>	
<ul style="list-style-type: none"> <li>• Retentivity adjustable</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Retentivity preset</li> </ul>	No
<b>Local data</b>	
<ul style="list-style-type: none"> <li>• per priority class, max.</li> </ul>	64 kbyte; max. 16 KB per block
<b>Address area</b>	
Number of IO modules	1 024; max. number of modules / submodules
<b>I/O address area</b>	
<ul style="list-style-type: none"> <li>• Inputs</li> </ul>	32 kbyte; All inputs are in the process image
<ul style="list-style-type: none"> <li>• Outputs</li> </ul>	32 kbyte; All outputs are in the process image
<b>per integrated IO subsystem</b>	
— Inputs (volume)	8 kbyte
— Outputs (volume)	8 kbyte
<b>per CM/CP</b>	
— Inputs (volume)	8 kbyte
— Outputs (volume)	8 kbyte
<b>Subprocess images</b>	
<ul style="list-style-type: none"> <li>• Number of subprocess images, max.</li> </ul>	32
<b>Hardware configuration</b>	
Number of distributed IO systems	32; A distributed I/O system is characterized not only by the integration of distributed I/O via PROFINET or PROFIBUS communication modules, but also by the connection of I/O via AS-i master modules or links (e.g. IE/PB-Link)
<b>Number of DP masters</b>	
<ul style="list-style-type: none"> <li>• Via CM</li> </ul>	4; A maximum of 4 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total
<b>Number of IO Controllers</b>	
<ul style="list-style-type: none"> <li>• integrated</li> </ul>	1
<ul style="list-style-type: none"> <li>• Via CM</li> </ul>	4; A maximum of 4 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total
<b>Rack</b>	
<ul style="list-style-type: none"> <li>• Modules per rack, max.</li> </ul>	32; CPU + 31 modules
<ul style="list-style-type: none"> <li>• Number of lines, max.</li> </ul>	1
<b>PtP CM</b>	
<ul style="list-style-type: none"> <li>• Number of PtP CMs</li> </ul>	the number of connectable PtP CMs is only limited by the number of available slots
<b>Time of day</b>	
<b>Clock</b>	
<ul style="list-style-type: none"> <li>• Type</li> </ul>	Hardware clock
<ul style="list-style-type: none"> <li>• Backup time</li> </ul>	6 wk; At 40 °C ambient temperature, typically
<ul style="list-style-type: none"> <li>• Deviation per day, max.</li> </ul>	10 s; Typ.: 2 s
<b>Operating hours counter</b>	
<ul style="list-style-type: none"> <li>• Number</li> </ul>	16
<b>Clock synchronization</b>	
<ul style="list-style-type: none"> <li>• supported</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• in AS, master</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• in AS, slave</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• on Ethernet via NTP</li> </ul>	Yes
<b>Interfaces</b>	
Number of PROFINET interfaces	1
<b>1. Interface</b>	
<b>Interface types</b>	
<ul style="list-style-type: none"> <li>• RJ 45 (Ethernet)</li> </ul>	Yes; X1
<ul style="list-style-type: none"> <li>• Number of ports</li> </ul>	2
<ul style="list-style-type: none"> <li>• integrated switch</li> </ul>	Yes
<b>Protocols</b>	
<ul style="list-style-type: none"> <li>• IP protocol</li> </ul>	Yes; IPv4
<ul style="list-style-type: none"> <li>• PROFINET IO Controller</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• PROFINET IO Device</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• SIMATIC communication</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Open IE communication</li> </ul>	Yes; Optionally also encrypted
<ul style="list-style-type: none"> <li>• Web server</li> </ul>	Yes

• Media redundancy	Yes; MRP Automanager according to IEC 62439-2 Edition 2.0
<b>PROFINET IO Controller</b>	
<b>Services</b>	
— PG/OP communication	Yes
— Isochronous mode	Yes
— Direct data exchange	Yes; Requirement: IRT and isochronous mode (MRPD optional)
— IRT	Yes
— PROFlenergy	Yes
— Prioritized startup	Yes; Max. 32 PROFINET devices
— Number of connectable IO Devices, max.	128; In total, up to 256 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET
— Of which IO devices with IRT, max.	64
— Number of connectable IO Devices for RT, max.	128
— of which in line, max.	128
— Number of IO Devices that can be simultaneously activated/deactivated, max.	8; in total across all interfaces
— Number of IO Devices per tool, max.	8
— Updating times	The minimum value of the update time also depends on communication share set for PROFINET IO, on the number of IO devices, and on the quantity of configured user data
<b>Update time for IRT</b>	
— for send cycle of 250 µs	250 µs to 4 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 625 µs of the isochronous OB is decisive
— for send cycle of 500 µs	500 µs to 8 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 625 µs of the isochronous OB is decisive
— for send cycle of 1 ms	1 ms to 16 ms
— for send cycle of 2 ms	2 ms to 32 ms
— for send cycle of 4 ms	4 ms to 64 ms
— With IRT and parameterization of "odd" send cycles	Update time = set "odd" send clock (any multiple of 125 µs: 375 µs, 625 µs ... 3 875 µs)
<b>Update time for RT</b>	
— for send cycle of 250 µs	250 µs to 128 ms
— for send cycle of 500 µs	500 µs to 256 ms
— for send cycle of 1 ms	1 ms to 512 ms
— for send cycle of 2 ms	2 ms to 512 ms
— for send cycle of 4 ms	4 ms to 512 ms
<b>PROFINET IO Device</b>	
<b>Services</b>	
— PG/OP communication	Yes
— Isochronous mode	No
— IRT	Yes
— PROFlenergy	Yes; per user program
— Shared device	Yes
— Number of IO Controllers with shared device, max.	4
— Asset management record	Yes; per user program
<b>2. Interface</b>	
<b>PROFINET IO Device</b>	
<b>Services</b>	
— PG/OP communication	Yes
— Isochronous mode	No
— IRT	No
— PROFlenergy	Yes; per user program
— Prioritized startup	No
— Shared device	Yes
— Number of IO Controllers with shared device, max.	4
— Asset management record	Yes; per user program
<b>Interface types</b>	
<b>RJ 45 (Ethernet)</b>	
• 100 Mbps	Yes
• Autonegotiation	Yes
• Autocrossing	Yes
• Industrial Ethernet status LED	Yes
<b>Protocols</b>	

PROFIsafe	Yes
<b>Number of connections</b>	
• Number of connections, max.	96; via integrated interfaces of the CPU and connected CPs / CMs
• Number of connections reserved for ES/HMI/web	10
• Number of connections via integrated interfaces	64
• Number of S7 routing paths	16
<b>Redundancy mode</b>	
• H-Sync forwarding	Yes
<b>Media redundancy</b>	
— MRP	Yes; as MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50
— MRPD	Yes; Requirement: IRT
— Switchover time on line break, typ.	200 ms; For MRP, bumpless for MRPD
— Number of stations in the ring, max.	50
<b>SIMATIC communication</b>	
• S7 routing	Yes
• S7 communication, as server	Yes
• S7 communication, as client	Yes
• User data per job, max.	See online help (S7 communication, user data size)
<b>Open IE communication</b>	
• TCP/IP	Yes
— Data length, max.	64 kbyte
— several passive connections per port, supported	Yes
• ISO-on-TCP (RFC1006)	Yes
— Data length, max.	64 kbyte
• UDP	Yes
— Data length, max.	2 kbyte; 1 472 bytes for UDP broadcast
— UDP multicast	Yes; Max. 5 multicast circuits
• DHCP	No
• SNMP	Yes
• DCP	Yes
• LLDP	Yes
<b>Web server</b>	
• HTTP	Yes; Standard and user pages
• HTTPS	Yes; Standard and user pages
<b>OPC UA</b>	
• Runtime license required	Yes
• OPC UA Client	Yes
— Application authentication	Yes
— Security policies	Available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256
— User authentication	"anonymous" or by user name & password
— Number of connections, max.	4
— Number of nodes of the client interfaces, recommended max.	1 000
— Number of elements for one call of OPC-UA-NodeGetHandleList/OPC-UA-ReadList/OPC-UA-WriteList, max.	300
— Number of elements for one call of OPC-UA-NameSpaceGetIndexList, max.	20
— Number of elements for one call of OPC-UA-MethodGetHandleList, max.	100
— Number of simultaneous calls of the client instructions for session management, per connection, max.	1
— Number of simultaneous calls of the client instructions for data access, per connection, max.	5
— Number of registerable nodes, max.	5 000
— Number of registerable method calls of OPC-UA-MethodCall, max.	100
— Number of inputs/outputs when calling OPC-UA-MethodCall, max.	20
• OPC UA Server	Yes; Data access (read, write, subscribe), method call, custom address space
— Application authentication	Yes

— Security policies	Available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256
— User authentication	"anonymous" or by user name & password
— Number of sessions, max.	32
— Number of accessible variables, max.	50 000
— Number of registerable nodes, max.	10 000
— Number of subscriptions per session, max.	20
— Sampling interval, min.	100 ms
— Publishing interval, min.	500 ms
— Number of server methods, max.	20
— Number of inputs/outputs per server method, max.	20
— Number of monitored items, recommended max.	1 000; for 1 s sampling interval and 1 s send interval
— Number of server interfaces, max.	10
— Number of nodes for user-defined server interfaces, max.	1 000

<b>Further protocols</b>	
• MODBUS	Yes; MODBUS TCP
<b>Isochronous mode</b>	
Equidistance	Yes
<b>S7 message functions</b>	
Number of login stations for message functions, max.	32
Program alarms	Yes
Number of configurable program messages, max.	5 000; Program messages are generated by the "Program_Alarm" block, ProDiag or GRAPH
Number of loadable program messages in RUN, max.	2 500
Number of simultaneously active program alarms	
• Number of program alarms	600
• Number of alarms for system diagnostics	100
• Number of alarms for motion technology objects	80
<b>Test commissioning functions</b>	
Joint commission (Team Engineering)	Yes; Parallel online access possible for up to 5 engineering systems
Status block	Yes; Up to 8 simultaneously (in total across all ES clients)
Single step	No
Number of breakpoints	8
<b>Status/control</b>	
• Status/control variable	Yes; without fail-safe
• Variables	inputs/outputs, bit memories, DBs, peripheral I/Os (without fail-safe), times, counters
• Number of variables, max.	
— of which status variables, max.	200; per job
— of which control variables, max.	200; per job
<b>Forcing</b>	
• Forcing	Yes; without fail-safe
• Forcing, variables	peripheral inputs/outputs (without fail-safe)
• Number of variables, max.	200
<b>Diagnostic buffer</b>	
• present	Yes
• Number of entries, max.	1 000
— of which powerfail-proof	500
<b>Traces</b>	
• Number of configurable Traces	4; Up to 512 KB of data per trace are possible
<b>Interrupts/diagnostics/status information</b>	
<b>Diagnostics indication LED</b>	
• RUN/STOP LED	Yes
• ERROR LED	Yes
• MAINT LED	Yes
• STOP ACTIVE LED	Yes
• Connection display LINK TX/RX	Yes
<b>Supported technology objects</b>	
Motion Control	Yes; Note: The number of technology objects affects the cycle time of the PLC program; selection guide via the TIA Selection Tool
• Number of available Motion Control resources for	15 360

technology objects	
<ul style="list-style-type: none"> <li>Required Motion Control resources <ul style="list-style-type: none"> <li>per speed-controlled axis</li> <li>per positioning axis</li> <li>per synchronous axis</li> <li>per external encoder</li> <li>per output cam</li> <li>per cam track</li> <li>per probe</li> </ul> </li> <li>Number of available Extended Motion Control resources for technology objects</li> <li>Required Extended Motion Control resources <ul style="list-style-type: none"> <li>per cam (1 000 points and 50 segments)</li> <li>per cam (10 000 points and 50 segments)</li> <li>for each set of kinematics</li> <li>Per leading axis proxy</li> </ul> </li> <li>Positioning axis <ul style="list-style-type: none"> <li>Number of positioning axes at motion control cycle of 4 ms (typical value)</li> <li>Number of positioning axes at motion control cycle of 8 ms (typical value)</li> </ul> </li> </ul>	<p>40</p> <p>80</p> <p>160</p> <p>80</p> <p>20</p> <p>160</p> <p>40</p> <p>512</p> <p>2</p> <p>20</p> <p>30</p> <p>3</p> <p>140</p> <p>192</p>
Controller	
<ul style="list-style-type: none"> <li>PID_Compact</li> <li>PID_3Step</li> <li>PID-Temp</li> </ul>	<p>Yes; Universal PID controller with integrated optimization</p> <p>Yes; PID controller with integrated optimization for valves</p> <p>Yes; PID controller with integrated optimization for temperature</p>
Counting and measuring	
<ul style="list-style-type: none"> <li>High-speed counter</li> </ul>	Yes
<b>Standards, approvals, certificates</b>	
Highest safety class achievable in safety mode	
<ul style="list-style-type: none"> <li>Performance level according to ISO 13849-1</li> <li>SIL acc. to IEC 61508</li> </ul>	<p>PLe</p> <p>SIL 3</p>
Probability of failure (for service life of 20 years and repair time of 100 hours)	
<ul style="list-style-type: none"> <li>Low demand mode: PFDavg in accordance with SIL3</li> <li>High demand/continuous mode: PFH in accordance with SIL3</li> </ul>	<p>&lt; 2.00E-05</p> <p>&lt; 1.00E-09</p>
<b>Ambient conditions</b>	
Ambient temperature during operation	
<ul style="list-style-type: none"> <li>horizontal installation, min.</li> <li>horizontal installation, max.</li> <li>vertical installation, min.</li> <li>vertical installation, max.</li> </ul>	<p>-25 °C; No condensation</p> <p>60 °C; Display: 50 °C, at an operating temperature of typically 50 °C, the display is switched off</p> <p>-25 °C; No condensation</p> <p>40 °C; Display: 40 °C, at an operating temperature of typically 40 °C, the display is switched off</p>
Ambient temperature during storage/transportation	
<ul style="list-style-type: none"> <li>min.</li> <li>max.</li> </ul>	<p>-40 °C</p> <p>70 °C</p>
Altitude during operation relating to sea level	
<ul style="list-style-type: none"> <li>Installation altitude above sea level, max.</li> </ul>	5 000 m; Restrictions for installation altitudes > 2 000 m, see manual
<b>configuration / header</b>	
configuration / programming / header	
Programming language	
<ul style="list-style-type: none"> <li>LAD</li> <li>FBD</li> <li>STL</li> <li>SCL</li> <li>GRAPH</li> </ul>	<p>Yes; incl. failsafe</p> <p>Yes; incl. failsafe</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>
Know-how protection	
<ul style="list-style-type: none"> <li>User program protection/password protection</li> <li>Copy protection</li> <li>Block protection</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p>
Access protection	
<ul style="list-style-type: none"> <li>Password for display</li> </ul>	Yes

- Protection level: Write protection
- Protection level: Read/write protection
- Protection level: Write protection for Failsafe
- Protection level: Complete protection

Yes; Specific write protection both for Standard and for Failsafe  
 Yes  
 Yes  
 Yes

programming / cycle time monitoring / header

- lower limit
- upper limit

adjustable minimum cycle time  
 adjustable maximum cycle time

**Dimensions**

Width	35 mm
Height	147 mm
Depth	129 mm

**Weights**

Weight, approx.	405 g
-----------------	-------

**last modified:**

8/16/2023 