НАВЧАЛЬНО-НАУКОВИЙ ЦЕНТР
ГУМАНІТАРНОЇ ОСВІТИ

Кафедра іноземних мов

МІЙ ФАХ – АВТОМАТИКА, ТЕЛЕМЕХАНІКА ТА ЗВ'ЯЗОК

МЕТОДИЧНІ ВКАЗІВКИ

з розвитку навичок читання та комунікативної компетенції

(англійська мова)

Харків 2013

Методичні вказівки розглянуто та рекомендовано до друку на засіданні кафедри іноземних мов 24 вересня 2012 року, протокол № 2.

Видання підготовлено відповідно до програми навчальної дисципліни і є складовою частиною навчально-методичного комплексу дисципліни “Англійська мова”.

Основна мета методичних вказівок – подальший розвиток навичок усного мовлення, систематизація та розширення словникового запасу із теми “Автоматика, телемеханіка та зв’язок” та подальший розвиток усного спілкування.

Методичні вказівки призначені для студентів 2 курсу факультету АТЗ.

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УКРАЇНСЬКА ДЕРЖАВНА АКАДЕМІЯ ЗАЛІЗНИЧНОГО ТРАНСПОРТУ

НАВЧАЛЬНО-НАУКОВИЙ ЦЕНТР ГУМАНІТАРНОЇ ОСВІТИ

Кафедра іноземних мов

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Unit 1

Exercise 1. Memorise the meanings of the following words and word combinations which will help you to understand the text given below.

1 fail-safe – безперебійний
2 to find wide application – знайти широке використання
3 traffic control – регулювання руху
4 to be based on – основуватися на
5 to be applied in – використовуватися
6 shunting operations – маневрові операції
7 Automatic Dispatcher – автоматичний пілот
8 communication systems – системи зв'язку
9 to transmit the information – передавати інформацію
10 systems of automatics and communication – системи автоматики та зв'язку
11 wayside – перегін
12 section – ділянка
13 shunting travel – маневрове переміщення
14 marshalling of trains – формування поїздів
15 modern microprocessor devices – сучасні мікропроцесорні засоби
16 train operation – поїзна робота, рух поїздів
17 to promote – сприяти
18 within the limits – в межах
19 control – управління
20 rather complicated – досить складні
21 dispatcher control – диспетчерське керування
22 depend on – залежати від
23 equipment – обладнання
24 to obtain – одержувати; здобувати, дістати
25 to prepare – готуватися, підготуватися
26 to solve – вирішувати
27 to connect – з'єднувати, зв'язувати
28 to equip – устаткувати, обладнувати, оснащати
29 technical state – технічний стан
30 to operate – управляти, експлуатувати
31 to indicate – показувати, позначати

32 panel – пульт (щит) управління
33 available – доступний; який є; наявний
34 to perform – виконувати.

Exercise 2. Translate the following word expressions.

Automatic systems, to solve the problems, the departments of our faculty, the automation of railways, various systems of signalling and communication, automation of process, functions of automatic control, devices of ATC, operation of the railway transport, automation of industrial processes, railway communication, wireless communication system, the most up-to-date systems, is widely used, recording of the received information, modern systems of transmitting the information, specialised computer systems, computerization of technological operations, fail-safe operation, to ensure, modern microprocessor devices of traffic control, to ensure traffic safety, telecommunication systems and networks, at the same time.

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Exercise 3. Ask your friend*:*
1 what department he studies at.
2 what specialists the ATC Department trains.
3 in what field of railway transport he will work.
4 if automatic control is widely used on the railway transport.
5 if automation offers any advantages.

My speciality "Automatics and computer-assisted procceses on transport".

I study at the Ukrainian State Academy of Railway Transport. I am proud of my Academy because it has long history and rich traditions. Nowadays the Academy counts five faculties and offers training in twenty specialities. It is the leading higher educational establishment which trains transport engineers for one of the most important branches of Ukraine's national economy.

I'm a second-year student of the "Automation, Telemechanics, Communication" faculty and I've chosen the speciality "Automatics and computer-assisted procceses on transport". As for me, it is one of the most interesting, useful and prestigious professions because

railway transport plays an important role in modern economies all over the world.

The ATC faculty is the youngest faculty, it was founded in 1960. The “Automatics and computer-assisted procceses on transport” speciality involves styding both traditional systems of automatics and communication, that are used on stations and waysides, and modern microprocessor devices of traffic control. Students get to know devices and systems of railway automation, that are applied in the leading countries of the world. Considerable attention is paid to ensuring traffic safety, security of trains systems of automatics and communication.

Our faculty offers training in the following specializations:

Telecommunication systems and networks;

Automatics and computer-assisted procceses on transport;

Specialised computer systems.

Automation has found wide application on the railway transport. We know some simplest devices of ATC as soon as we come to the railway station. For example, radio informs us when the train arrives or departs, an indicating panel shows if vacant seats are available, etc.

The solution of the tasks of automation is not possible without computer technique, computerization of technological operations, modern systems of transmitting the information, various systems of signalling and communication. They ensure regulation of train movements on waysides and sections, automation of train and shunting operations, marshalling of trains, effective control of technical state of various objects, transmitting and processing the information.

At present scientists and designers in the field of railway automation, telemechanics and communications work at the development of complicated cybernetic systems of train operation that are based on the wide application of computers and computing technology. Thus, on the basis of computing technology the systems of train operation at long sections - Automatic Dispatcher and Automatic Pilot for underground trains - have already been developed in our country. Thanks to computer technologies, high speed trains and their operation become much more "intelligent".

Modern systems of automation and telecommunication on the railway transport are rather complicated. They are based on the latest

microelectronic basis using progressive computer technology, that is why it is not possible to acquire a profession successfully without such fundamental and general education subjects as higher mathematics, physics, computer technique, theory of electric and magnetic circuits. Much attention is paid to the subjects which are necessary in market economy: fundamentals of management and marketing, economy and organization of production, fundamentals of law.

Senior students study special subjects: electronics, microprocessor devices, program providing of computer systems, systems of dispatcher control, theory of electric communication, radio engineering systems and others depending on the chosen specialization.

The ATC Department has modern laboratories where the students study wire and wireless systems of railway communication, operation of control systems, sensors, system of technological communication, computer telephoning, system of movable communication.

The graduates of the ATC Department work as electrical engineers who deal with developing and operating the most up-to-date train control systems and communication systems; engineers of ATC, electrical mechanics at different departments of railway of the country. They also work at the enterprises of signalling and communication branches, at computer centres, road laboratories, design organizations, at the enterprises of different forms of ownership in Ukraine and abroad.

Exercise 4. Single out the main points of the text and tell your groupmate what new facts you have learnt from it. Use the following opening phrases:

The title of the text is…
The text is devoted to …
The text deals with …
It is clear from the text …
Among other things it is mentioned in the text about …
I find the question of … very important because …

Exercise 5. Work in pairs. Answer the following questions:

1 What speciality have you chosen?
2 What subjects are you delivered?
3 What are the main functions of Automation ?
4 Is automaton widely used on the railway transport?
5 What simplest devices of ATC do you know?
6 What does radio inform us about?
7 What functions do the systems of ATC perform on the railway transport?
8 Where will the graduates of our faculty work?

Exercise 6. Complete the following sentences.

1 I study at.....
2 It is the leading higher educational establishment....
3 I'm a second-year student of the.....
4 The "Automatics and computer-assisted procceses on transport" speciality involves.....
5 Students get to know means.....
6 Our faculty offers training.in...
7 The solution of the tasks of automation....
8 At present scientists and designers.....
9 Modern systems of automation and telecommunication .....
10 Senior students study special subjects.....
11 The ATC Department has modern laboratories where.....
12 The graduates of the ATC Department work at.....

Exercise 7. Fill the missing words in.

1 The ATC Department ... electrical engineers for the railway transport.
2 The graduates of the ATC Department work in the field of the .... and railway communications.
3 Our speciality is ....
4 Automation finds ... ... on the railway transport.
5 Automatic equipment ensures ... running of trains.
6 Due to the ... the efficiency of railway traction is raised.

Exercise 8. Translate the following groups of words.

a) fail (n., v.), failing (P.I, n., a.), failure
b) safe (n., a.), safely, safety, safety-belt, safety razor, safety-pin
c) operate, operated, operation, operational, operating, operative, operator
d) railway, railroad, railway transport, railway building (construction), railway buildings, railway communication, railway crossing, railway engine, railway engineer, railway junction (terminal), railway network (system), railway point, railway radio, railway route
e) traffic, traffic capacity, traffic carrying capacity, traffic conditions, traffic control, traffic light
f) automatic, automation, automated, automatize
g) computer, compute, computing, computerization, computation

Exercise 9. Find in the text the corresponding English equivalents.

Рух поїздів на перегонах і ділянках залізниць; автоматизація поїзних і маневрових переміщень; автоматичний пілот; формування поїздів; контроль за технічним станом різноманітних об'єктів; комп'ютерні інформаційно-управляючі системи; передавати інформацію; безпека руху поїздів; програмне забезпечення комп'ютерних систем;теорія електричного зв'язку; системи диспетчерського керування; радіотехнічні системи; організація виробництва.

Exercise 10. Say if statements are true or false. Correct the false ones.

1 The graduates of the ATC Department solve problems connected with the automation of production at various plants.
2 The students do not work at the laboratories.
3 Many graduates of the ATC Department work in the field of automation of agricultural processes.
4 Automation is not widely used on the railway transport.
5 It is not necessary for the students to know some simplest devices of ATC.

Exercise 11. Find the appropriate answer.

1 What department do you study at?	1 The ATC faculty is the youngest faculty, it was founded in 1960
2 How many faculties does the Academy count?	2 Our faculty offers training in the following specializations: Telecommunication systems and networks. Specialised computer systems
3 What faculty have you chosen?	3 I've chosen the speciality "Automatics and computer-assisted procceses on transport".
4 When was the ATC faculty founded?	4 I study at the ATC Department .
5 What specialization does our faculty offers?	5 The Academy counts five faculties and offers training in twenty specialities.
6 Has automation found wide application on the railway transport?	6 The solution of the tasks of automation is not possible without computer technique, computerization of technological operations, modern systems of transmitting the information, various systems of signalling and communication.
7 What simplest devices of ATC we know as soon as we come to the railway station?	7 At present scientists and designers in the field of railway automation, telemechanics and communications work at the development of complicated cybernetic systems of train operation that are based on the wide application of computers and

	computing technology.
8 How can it be possible to solve the tasks of auomation?	8 Yes, it has
9 Where do the scientists and designers work?	9 For example, radio informs us when the train arrives or departs, an indicating panel shows if vacant seats are available, etc.
10 Where do the graduates of ATC work?	10 “Automatic Dispatcher” and “Automatic Pilot” based on computing technology have been developed in our country
11 What subjects do senior students study?	11 Senior students study special subjects: electronics, microprocessor devices, program providing of computer systems, systems of dispatcher control, theory of electric communication, radio engineering systems and others depending on the chosen specialization.
12 What automatic railway systems based on computing technology have been developed in our country?	12 The graduates of the ATC Department work at different enterprises of the country as well as at the research and designing institutes...

Exercise 12. Form the nouns of the verbs.

Organize, operate, regulate, communicate, inform, transport, produce, educate, move, improve, manage, equip, special, serve

Exercise 13. Find the pairs of synonyms.

Car, operation, use, decision, train movement, latest, department, carriage, work, make use of, solution, train operation, faculty, employ, modern.

Exercise 14. Copy the following words. One word in line doesn't belong to the group. Cross out the odd word and explain your choice.

1) a train, a plane, an automobile, a rail car;
2) steam, diesel, electric air;
3) a second, an hour, a mile, a minute;
4) current, voltage, time, resistance;
5) relay, transistor, diode, photo;
6) turbine, motor, generator, electron;
7) a railway, a highway, a runway, a road.

Exercise 15. Match the adjectives in column A with the nouns in column B. Then make up sentences using the completed collocations.

A	**B**
Fail-safe	control
traffic	operation
computing	technique
microprocessor	installations
latest	devices
market	engineer
electrical	relations

Exercise16. Express the same in English.

1 Я – студент другого курсу факультету "Автоматика, телемеханіка та зв'язок".

2 Фахівців, здатних вирішувати найскладніші завдання у галузі автоматики, телемеханіки та зв'язку на залізничному транспорті готує факультет "Автоматика, телемеханіка та зв'язок".

3 Студенти факультету вивчають цілий ряд теоретичних дисціплин: вищу математику, фізику, обчислювальну техніку; електротехнічні дисципліни: теорія автоматики, транспортного зв'язку; фундаментальні – електронні пристрої, радіозв'язок.

4 Вирішення завдань автоматизації неможливе без широкого застосування засобів обчислювальної техніки, комп'ютеризації технологічних операцій, застосування сучасних систем передачі інформації, використання різних видів зв'язку.

5. Окрім загальноосвітніх, фундаментальних та спеціальних дисциплин, студенти факультету АТЗ вивчають ряд дисциплін, необхідних фахівцям в умовах розвитку ринкових відносин, зокрема, організацію та планування виробництва,менеджмент та маркетинг, правоведення та інші дисципліни, які дозволяють орієнтуватися в умовах ринку.

Exercise 17. Read and translate the text using a dictionary if necessary.

Some principles of railway signaling

No department of railways has been more developed by modern technology than signaling and telecommunications. Colour light signals, electrical operation of signals and points, track-circuiting, route-setting panel control, automatic train operation, computer-based centralized traffic control (CTC) – these are the basic elements of up-to-date signaling.

The method of operating long railway lines by CTC began in the USA in 1927. The principle is that at the central point the operator has a diagram showing him where every train is and he can control the whole section of the line – possibly of two or three hundred miles – from his control console. The operator can see and control the overall track circuit. On modern railways the main line and station approaches are controlled from a single control center to provide regular traffic and avoid delays.

To control a whole trunk line from one place a single control centre was first introduced in Japan, on the New Tokaido Line. The entire line between Tokyo and Osaka is wholly controlled from the

general control center located in Tokyo. It's well-known that conventional CTC uses conventional relays. Practical railway experience shows that it takes much time to transmit information therefore the Japanese National Railways have developed a new system using transistors and diodes. This system proves to be more reliable; besides that it is more economical because it helps to save time: it takes about one second to scan indications for all tracks. At present up-to-date electronic equipment including a digital computer is widely used to automate train operation and to improve the quality of railway service.

Exercise18. Answer the following questions to the text:

1 Do railway signaling and communications have the most advanced technologies and equipment?

2 What are the basic elements of up-to-date signaling? Which of them is the latest one? What's your opinion on the subject?

3 What does the abbreviation CTC mean?

4 What country was the first to use CTC on its railways?

5 What kind of a diagram does the operator have on his (her) control console?

6 How long may be the section of the main line controlled from the single control centre?

7 What approaches are controlled from a single control centre?

8 Why is CTC so important for railways?

9 What railways began to control a whole trunk line by means of CTC?

10 What devices had been used to transmit information before the Japanese National Railways developed a new system using transistors and diodes?

11 Why are transistors and diodes more reliable than relays?

12 What is the latest development used to automate train operation and improve the quality of railway service?

Exercise 19 Translate the following sentences from Ukrainian into English:

1 Введення диспетчерської централізації забезпечує безпеку залізничних перевезень.

2 Для гарантії безпечного управління поїздом встановлюють систему швидкісного авторегулювання.

3 Потяг пройшов маршрут без затримок.

4 Сигналізація застосовується для контролю і регулювання руху потягів.

5 Устаткування потягів цією системою дозволить підвищити пропускну спроможність лінії.

6 Система управління стрілками і сигналами з одного пункту називається централізацією стрілок і сигналів.

7 Диспетчер в центрі управління отримує повну інформацію про рух потяга по ділянці.

8 Диспетчер повинен контролювати автоматичне управління потягом. Для цього він використовує радіозв'язок і може спілкуватися як з машиністом, так і з черговим по станції (yard master).

Unit II

Exercise 1. Read aloud and memorize the following words and expressions for the text comprehension:

1 circuit – схема
2 to provide with – забезпечувати, забезпечити
3 to require – вимагати
4 random – випадковий, безладний
5 compatible — сумісний, сполучений
6 to represent – зображати, зобразити, представляти
7 vise versa – навпаки
8 assembly – монтаж
9 cumbersome – незграбний, громіздкий
10 octal – вісімковий
11 hexadecimal – шістнадцятковий
12 alphanumeric – початкове число
13 to increase – збільшувати(ся), рости, зростати
14 to assign – приписувати
15 to depend on – залежати
16 ascending – який іде по висхідній лінії
17 integrated circuit – інтегральна схема

18 read-only memory (ROM) – доступна тільки для читання пам'яті

19 interactive video computer terminal – інтерактивний комп'ютерний відеотермінал

20 line printer – пристрій рядкового друку

21 control element – елемент управління

22 number system – числова система

23 decimal number system – система десяткових чисел

24 microprocessor-based system – система на основі мікропроцесора

25 binary number system – двійкова система чисел

26 assembler language – мова асемблера

27 shorthand number system – стенографічна система чисел

28 no matter how large or small – незважаючи на те, якої величини.

MODERN ELECTRONICS (MICROPROCESSORS AND MICROCOMPUTERS)

A recent advance in electronics has had great impact on both the electronics and our daily lives. With the arrival of the microprocessor, another evolutionary stage has taken place in the electronics field. What the introduction of the transistor did a number of years back, the microprocessor is doing now. Every day, more and more applications of this device affect our lives in many ways.

What are microprocessors and microcomputers? Why have they such impact on industry and our lives?

Before an understanding and appreciation of microprocessors and microcomputers can be achieved, one must know how a computer works in general and what components are involved. A simplified description of how a computer works is to describe it as follows: the computer executes a sequential set of instructions. The instructions are in a binary-coded form and reside in the computer's memory. Each instruction has a unique code specifying a particular operation and has been placed in specific sequence by the computer programmer. The complete set of instructions is referred to as a program, and the program allows the computer to perform a useful function.

The computer can perform this function by taking (fetching) the first instruction from memory and performing (executing) the operation

called for by the code. Then it goes back to the memory unit and takes the next instruction in sequence (unless directed otherwise) and performs the operation called for by its- code. This sequential fetching of an instruction and execution of that instruction continues until the final instruction is executed. Thus, the computer has finished performing the function defined by the program and can either wait for a new set of instructions (program) or be directed to repeat the entire program over again.

Computers can be broken down into three main categories based on their size. The biggest type are those that we see in large business corporations, banks and scientific laboratories. An entire large room may be devoted to these maxicomputers and their associated peripheral equipment, such as magnetic tape units, card punchers, card readers, and line printers. The functions of these units can range from scientific computation and engineering problem solving to large business-type operations, such as payroll, accounts keeping, inventory, and maintaining large files of data.

Minicomputers are much smaller in physical size and are used mostly for purposes such as industrial process control, scientific applications in research laboratories, and management of business records for small companies. These computers are in great demand because of their relatively inexpensive price compared to maxicomputers and their varied capabilities, making them very flexible and easy to package for a variety of applications.

The microcomputer is the least expensive and smallest of the three types of computers. Its greatest impact is the realm of data acquisition and control in industrial process control, although many applications have been found in consumer electronics and the computer market. Microcomputers of the technology involved in manufacturing them will change many aspects of our daily lives.

A microprocessor is an integrated circuit (ÏC) that performs many of the functions found in a digital computer. A single microprocessor IC is capable of performing all the arithmetic and control functions of a computer. By itself, a typical microprocessor IC does not contain the memories and input / output (I/O) functions of a computer. However, when these functions are provided with additional ICs, a microcomputer is formed.

Typically, a basic microcomputer requires a read-only memory

(ROM) to store the computer program or instructions, a random-access memory (RAM) to store temporary data (the information to be acted upon by the computer program), and an I/O IC to make the system compatible with outside or (peripheral) equipment such as an interactive video computer terminal, teletype, or line printer. There are some ICs that contain some, or all, of these functions. In effect, when an IC contains all of the basic functions, the IC is *a computer on a chip.* However, this is not the typical case.

Microprocessors are sometimes referred to as microprocessor units (MPU) or control processor units (CPU) (CPU can sometimes mean central processor unit). A microprocessor is not always used in digital computer applications. Instead, the microprocessor is used as a controller. As a matter of interest, the microprocessor was originally developed as the control element for those applications where digital computer functions (the ability to store and execute a complete program automatically) was too large or expensive. Sometimes, the microprocessor is called *a microcontroller* when used in these control applications.

The term *minicomputer* can be applied to many relatively small and relatively simple computers. A minicomputer often contains many ICs, but not necessarily a microprocessor IC.

The decimal number system is generally used in the world outside the microprocessor. Inside a microprocessor-based system, the binary number system is used most often. This is because binary numbers are compatible with the electrical pulses used in digital or logic systems. Binary numbers use only two digits, 0 or 1. The zero can be represented by the absence of a pulse, with the 1 being represented by the presence of a pulse (vice versa in some systems). The pulses can be positive or negative without affecting the binary number system (as long as only two states exist). In any event, to understand the language of microprocessor-based systems (generally referred to as machine language), it becomes necessary to examine number systems in general and the binary number system in particular.

Although microprocessors use binary numbers in the form of pulses, most microcomputer systems use some other form of number system for assembly of computer programs (generally referred to as assembly language). This is because binary numbers (although

compatible with pulses) are cumbersome when the values are beyond a few digits. Shorthand number systems are used to enter and read out programs and data in a microcomputer system. The most common shorthand number systems used for microcomputer programming are the octal, hexadecimal (or hex), binary-coded decimal (or BCD), and alphanumeric systems.

The binary number system uses only two digits, 0 and 1. The positional weights of the digits increase from right to left as in the familiar decimal system. In all number systems, digits are assigned positional weights, or values, so that numbers can be written to express all quantities, no matter how large or small. The real value of a digit depends on its position in the number. With binary, the increase of value is in ascending powers of 2.

Exercise 2. Find the pairs of antonyms and translate them:

1 absence	1 without
2 in general	2 small
3 positive	3 presence
4 with	4 decrease
5 often	5 inside
6 general	6 negative
7 increase	7 seldom
8 right	8 never
9 large	9 in particular
10 always	10 special
11 outside	11 left

Exercise 3. Give three forms of the irregular verbs used in the text:

find, mean, become, write, make, be, do.

Exercise 4. Form the degrees of comparison of the following adjectives:

large, typical, expensive, small, necessary, many(much), simple, long.

Exercise 5. Answer the questions on the text:

a) 1 What do we call a microcomputer? 2 What functions do some ICs contain? 3 What purpose was the microprocessor originally developed for? 4 How many digits does the binary system use? 5 Where are the electrical pulses used? 6 What is necessary for understanding the machine language? 7 Why must microcomputer systems use shorthand number systems? 8 What does the real value of a digit depend on? 9 What functions is a single microprocessor IC capable of performing? 10 How is a microcomputer formed? 11 What is a microcomputer on a chip? 12 Why is the microprocessor sometimes called a microcontroller? 13 What do the 0 and 1 digits represent? 14 What number systems are there? 15 What way does the positional weight of the digit increase?

Exercise 6. Give a short summary of the text. The following phrases may be helpful:

The headline of the text (article) is … -
The text deals with … - …
The point of the text is that … - …
The text pays special attention to … - …
Of great (special) interest is (that) … - …
My opinion is …
I doubt that … -
It's common knowledge that… -
I might as well add that … -
Needless to say that … - …
There are many pros and cons here. -.
On the one hand … - …
On the other hand … -
I'm sure that … - …

Exercise7. Speak on the arithmetical operations by electrical means.

Exercise 8. Translate the following groups of combinations of words.

1 channel of digital automation, multi-channel communication, channel equipment;

2 railway communication, loudspeaker communication, wire communication system, wireless communication system, two-way communication, dual-frequency communication system;

3 in the field of railway communications, graduates of the department, to work at enterprises, as well as, the most up-to-date systems, it is necessary, this can be accomplished, railways make use of, systems of communications, communication with subscribers, recording of the received information, transmission and reception of messages, the only method, to provide communication, direct communication, you can radio, to inform of the train's location, by means of radio, train crew, is widely used, loudspeaker communication, remote control of processes, channels of digital automation, top increase reliability of channels, at the same time.

Exercise 9. Read the text and translate it with a dictionary if necessary.

SIGNALING TECHNOLOGY

(1) Signaling technology has undergone the same revolution as telecommunications. Availability of powerful computer equipment and rapid information exchange techniques have led to more sophisticated signaling systems. These systems are not only able to drive the train, but decide when is the optimum time to break, coast or accelerate for maximum energy efficiency. These abilities have allowed on-board computers to provide much more necessary information for a driver which was impossible some years ago.

(2) On the one hand, with the exception of some newly constructed lines, the cost of providing continuous data exchange between track and train can be high. On the other hand, up-to-date signaling systems help to save time which is of great importance for train operation. Secure coding of information has increased the effectiveness of intermittent ATC and increased the quantity of data that can be handled.

(3) Although developed for metro lines, various components of ATC are increasingly being applied to main lines, because they provide automatic train protection, control and operation.

(4) Needless to say that safety has become a political question, forcing a reappraisal of what level of signaling technology is required.

More and more practical railway engineers realize that ATC is essential for safe operation, even though statistics do not always support this view.

(5) Introduction of ATC is important from economic point of view. Thus, in metro driverless operation may help to save labour costs.

(6) It's quite clear that no modern railway can exist without ATC. Nevertheless, introduction of this system is not such an easy task as it may seem at first sight. At present it's a headache for many European railways. As we know many more high-speed railway lines are being constructed, more and more trains are being designed and produced specially for cross-border operation. All this makes operators' work more responsible and nervous. New up-to-date ATC facilities must be installed, and their design, manufacture and installation require great expenses. But this work must be done, because to benefit from ATC system railways are to use it throughout their networks.

Exercise10. Go back to the text, guess the meaning of the following phrases and translate them into Ukrainian:
to undergo revolution; continuous data exchange; secure coding of information; at first sight; throughout (their) networks.

Exercise11. Go back to the text and using the paragraph reference and find the words which are similar to:
facilities, fast, advanced, to permit (paragraph 1);
to build, to demand, only, safe, data, amount, to process (paragraph 2);
to work out, underground, different, an element, to use, a trunk line (paragraph 3);
a matter, to understand, important, to back up (paragraph 4);
to assist (paragraph 5);
obvious, up-to-date, a railroad, simple, a job, nowadays, to build, costs (paragraph 6).

Exercise12. Answer the following questions to the text. Do it in written form.

1 What was the result of introduction of powerful computer equipment?

2 What are the main functions of sophisticated signaling systems?

3 Was it possible for a driver to receive all the necessary information some years ago?

4 Is it expensive to provide continuous data exchange between track and train?

5 Where are various components of ATC being applied?

6 Do you think that safety is a political question? Can you give any reasons?

7 Why is introduction of ATC important from economic point of view?

8 Is introduction of ATC an easy task?

9 Is an operator's work responsible and nervous?

10 Why is it vital to introduce automatic train control?

Exercise 13. Read and translate the text using a dictionary if necessary.

RAILWAY AUTOMATION

(1) At present control of high-speed trains is semi-automatic since they are automatically forced to comply with permissible speeds at any instant. Stops at station platforms are under the driver's control.

(2) The whole line in Japan, for example, is directly controlled from Tokyo and for this purpose is divided into four systems. The state of the line is continuously surveyed and information is transmitted at high speed to the control centre. Each train automatically identifies itself by generating a unique frequency as it passes fixed ground equipment and the information is displayed on the control panel at Tokyo. Trains entering stations automatically set the points system according to classification, i.e. whether super express, express or freight.

(3) One interesting but simple safety feature enables the operator on the line to stop the train in an emergency. It consists of push-button switches placed at intervals of 50m. Operation of the switch completes the circuit, and the consequent indication in the driver's cab of an approaching train causes the brakes to be applied automatically when at an appropriate distance from the danger position. All the circuits are

fail-safe, and the possibility of an accident due to human error has been virtually eliminated.

(4) Great work is being carried out in order to improve circuits performance. It means introduction of such techniques as programmed control, obstacle detection by a guided radar, controlled braking to a fixed point and centralized computer control. Extensive research is under way in our country to utilize television technique in industry, science and agriculture. Some years ago one of the research institutes of our country designed a television apparatus which is now used in railway transport to record the serial numbers of freight cars arriving at a station. As a train pulls in at a station, somewhere at a distance of ten kilometers an operator sees this train on a screen of his television set. The operator reads aloud the serial number of the freight cars and they are recorded by a tape recorder. On another television set the operator can see all the railway lines in a station. The operator only has to press the button and another station will appear on the screen. These installations are used in classifications yards for shunting operations.

(5) The Central Research Institute of the Railways Ministry is designing a new television apparatus which will enable engine drivers "to see" the condition of the freight car even when it is dark.

Exercise 14. Match the words and word combinations in column A with their Russian equivalents in column B. Consult the text if necessary.

A	B
1) to generate frequency,	a) допустима швидкість,
2) in an emergency,	b) надійний,
3) push-button switches,	c) екран телевізора,
4) fail-safe,	
5) research institutes	d) напівавтоматичний,
6) a screen of a TV set,	e) у разі аварії,
7) permissible speed,	f) з цією метою,
	g) пізнавати себе,
9) semi-automatic,	h) замикати ланцюг,
10) for this purpose,	i) читати вголос,
11) to identify oneself,	j) виробляти частоту
12) to complete the circuit,	l) кнопкові перемикачі,

13) human error,	m) науково-дослідні інститути
14) to read aloud.	n) людский фактор.

Exercise 15. Go back to paragraphs 1, 2 and 5 of the text and answer the following questions.

1 Are high-speed trains controlled automatically?

2 Who controls stops at station platforms?

3 Why is the whole line in Japan divided into four systems?

4 In what way does each train identify itself?

5 Where is the information of each train displayed?

6 What does automatic points setting depend on?

7 What kind of an apparatus is the Central Research Institute of Railways Ministry designing?

Exercise 16. Translate paragraphs 3 and 4 into Ukrainian. Do it in written form.

Exercise 17. Translate the following sentences from Ukrainian into English.

1 Швидкісні потяги підкоряються системі автоматичного і напівавтоматичного управління.

2 Зупинки на станціях знаходяться під контролем машиністів.

3 Створено багато автоматичних пристроїв, щоб уникнути нещасних випадків.

4 На залізницях широко використовується телевізійна техніка.

5 Оператор TV може бачити усю залізничну лінію на своїй станції, а шляхом перемикання кнопки він завжди може бачити іншу станцію на цьому шляху.

6 Оператор може читати серійні номери вантажних вагонів і записувати їх на магнітофон.

7 Створюється новий телевізійний апарат, який дозволить машиністові бачити в темряві.

Exercise 18. Match the English phrases with their Ukrainian equivalents. Do it in written form:

1) a block section	a) попередній сигнал
2) a warning signal	b) серійний номер
3) automatic block system	c) блок-дільниця
4) interlocking	d) автоблокування
5) a serial number	e) централізация.

Exercise19. Translate the text from Ukrainian into English. Do it in written form. Let your fellow student check your translation.

Проходження потяга через блок-дільницю фіксується за допомогою електричного струму, що пропускається між рейками і колесами. Коли потяг входить на блок-дільницю, то на сусідніх ділянках включаються попереджувальні сигнали, які не змінюються до тих пір, поки потяг не залишить цю ділянку. Метод використання рейки для проходження інформації між поїздами і диспетчерами є основою найбільш досконалої системи автоматичного управління рухом на залізниці – диспетчерської централізації. Вона містить багато передових технологічних систем, зокрема автоблокування і централізація стрілок і сигналів. Диспетчерська централізація застосовується для управління мережею залізниць і регулювання рухом потягів, що забезпечує великі швидкості і безпеку перевезень. Кожен потяг має порядковий номер, який можна побачити на екрані, що показує схему шляхів, а також позиції усіх потягів в межах(within) блок-дільниці.

SUPPLEMENTARY READING

Text 1. RAILWAY SWITCHES OR POINTS

The terms “points” and “switches” (the latter is more common in American English) are used to denote devices, usually comprising tapered metal blades or tongues, for setting alternative routes of running rails. In the somewhat more general sense of a curved track leading from one track to another, the term “turnout” is also used in this connection. The most common form of switch is the split switch in which one rail of the main track and the inner rail of turnout are continuous. There are various other types of railway switches, sometimes embodying a combination of two split switches (double

turnout). Where two tracks simply cross each other without provision for trains being routed from one track to another, the term “crossing” is usually employed. In some cases, however, more particularly when the two intersecting tracks form a small angle with each other, the crossing may take the form of a so-called crossing switch (also known as “slip points”). The operation of all these devices is similar in principle and can best be explained with reference to the ordinary split switch. When the straight tongue is in contact with one rail (I) and the curved tongue is not in contact with another one (II), the switch is set for running straight ahead on the main track. When the switch is set so as to divert a train coming from the left on to the turnout track, the curved tongue is swung into contact with the rail II and the curved tongue is now no longer in contact with the rail I. The point of intersection of the inner rails is called the “frog” of the switch. It is usually in the form of a V-shaped unit. As a safeguard against derailment the rails opposite the frog are provided with guard rails, and the frog itself is assisted initially (i.e., at its point) by wing rails to carry the weight of the wheels passing over it.

Text 2. RAILWAY SIGNAL BOX. MECHANICAL SYSTEM

The switches (points) and signals on a section of railway track are worked by controls accommodated in a signal box (or tower). On lines carrying scheduled train services these controls are operated in accordance with predetermined timetables.

In the signal box are pulleys, each connected to an operating lever. When the signalman moves the lever, the pulley is rotated a certain amount, depending on the desired switch position. A catch secures the lever in position. A steel wire rope passes round the pulley. The end of this rope is attached to the switch actuating mechanism or to operating wheel of the main signal. The tensioning device keeps the wire rope constantly taut. Now when the signalman swings the operating lever, the actuating wheel of the switch mechanism is rotated through a certain angle by the wire rope, so that the actuating lever (connected to the wheel) is likewise swung about its pivot and thus shifts the tongues of the switch to the desired position.

The main signal is similarly worked, the arm of the signal being moved by a rod attached to the actuating wheel.

Text 3. ELECTRIC SYSTEM

Operating a mechanical signal box involves the exertion of considerable physical force by the signalman. For this reason in modern installations the points and signals are worked by small electric motors. On a control desk in the signal box each switch has its own control key (electric switch). Also, there are similar keys for controlling the signals. The signal box also contains, at eye level, an illuminated diagram showing the track layout and all the switches, crossings and signals of the section of the railway line. The switch and signal positions are indicated on this diagram by means of small colour lights. A glance at the panel also shows whether any particular track is free or occupied by a train. An illuminated diagram of this kind greatly facilitates the signalman's task.

A further development, providing even greater convenience and reliability of operation, is the "track plan" signal box. In this arrangement the signalman's control desk itself is laid out as a track plan showing all the signals and switches. Each of these is provided with a key or push-button by means of which the corresponding signal or switch on the track can be operated. The tracks themselves are represented on the control desk by small illuminated compartments. Unoccupied tracks and track sections which at any 29 particular moment are not in use as a train route remain dark, i.e., not lighted up. The switches in the track plan are additionally marked by yellow lamps installed in slots. When these lamps light up, they indicate in which position the switch has been set.

Text 4. ITALIAN STATE RAILWAYS TO ADOPT EUROPEAN RAIL TRAFFIC MANAGEMENT SYSTEM

Italian State Railways (FS) has awarded contracts for the installation of automatic train protection equipment on 150 km between Milano and Torino, and on the Milano Junction, based on the latest European data transmission standards.

Faced with increasing difficulties in the construction of new lines, Italian State Railways has launched a series of projects to increase its existing trunk lines, the quality of service and at the same time to improve the safety of operations.

One of the most significant improvements which have been carried out this year is installation of automatic train protection (ATP) on routes around Milano at a cost of 93 bn lire. The ATP installation will meet a number of FS strategic purposes.

Running safety is guaranteed by continuous supervision of the driver's actions with automatic emergency braking whenever the speed limit is passed.

Punctuality will no longer be determined by environmental or seasonal factors, increasing reliability of services.

Reduction in operating costs is achieved through the potential to operate trains with only a single driver where two had previously been required.

Intermittent ATP provides a significant advance in train running protection and control systems on the FS network. At present FS has some lines equipped with Continuous Cab Signaling (CCS) and others fitted with Coded Current Automatic Block, which offers full speed control. Intermittent ATP is designed to be easily integrated with these different systems, and offers a powerful channel for transmitting data from line to train.

This can be used not merely for train running and protection against driver errors, but also for auxiliary functions to optimize train operations.

On-board equipment will interface with the existing four-code CCS, which will in future only be able to access the various peripheral elements – driver display panel, traction and braking interfaces, and so on – via the intermittent ATP processor. The basic on-board unit comprises three main elements. The heart of the system is the ALA processor, which manages all data coming from both the intermittent and continuous channels. It also controls the peripheral elements such as the emergency air brake control, traction effort control and the driver display panel.

The Balise Transmission Module and pick-up antenna are capable of operating on lines equipped with 12-bit or 180-bit balises. The antenna is also designed for future operation with 1023-bit balises.

Equally innovative is the Man-Machine Interface (MMI), which combines image processing with a colour graphic display, pushbuttons and function keys. These are used to enter train data and to allow the driver to respond to the indications on the display panel. The MMI also provides a diagnostics terminal for the entire system.

When operating in functional ATP mode, the display shows the maximum allowed speed, braking curve, the distance to any restrictive signal, future speed limits or train stopping points, and auxiliary information, such as the location of work teams, level crossings and

other stations. In CCS mode the display shows vital indications for the signal aspects represented by the line codes being picked up.

Intermittent ATP trackside equipment is based on the so-called "Information Points" which have one or more fixed or programmable 180-bit balises. These are installed close to signals and at specific points along the line where data must be transmitted to the train. The balises are installed in the centre of the track and can be used to transmit different data to trains running in each direction.

The interface between the signaling and the balises is provided by a series of encoders, which are installed in the station equipment rooms, or in cabinets along the line. These encoders are able to control balises up to 3 km away through serial connections, allowing the control equipment to be centralized at the stations.

This has considerable advantages to provide greater reliability and facilitate checks and maintenance. To establish the allowable speed at any instant, the on-board ATP processor takes out data from a variety of lineside and on-train sources. Lineside information includes fixed route characteristics such as the line speed limit and gradients, semi-fixed data such as temporary speed limits due to works in progress, and variable data including signal aspects, approaching station stops or speed reductions for diverging routes.

Text 5. INTEGRATED CONTROL SYSTEM

On September 30, 2004 Kowloon–Canton Railway Corporation put into operation a fully integrated control and communications system (ICCS), as a part of the upgrading of its 34 km East Rail corridor from Kowloon to Lo Wu. With traffic on this two-track railway forecast to exceed 1 million passengers per day by 2006, KCRC decided to resignal the line and fit automatic train protection to raise capacity from 20 to 30 trains/h in each direction. Four contracts were to cover the signaling, a new control centre, track and catenary upgrading and a major track reconstruction at Pak Shek Kok.

The main control centre at KCRC's Fo Tan headquarters controls the line via a wide area optical fibre network linking 13 stations. ICCS functions include:

- automatic route setting;
- automatic dispatching and regulation;
- electric and traction power control;

- general and secure telephone links;
- general and train radio links;
- automatic and manual passenger information displays and public address;
- headway clock control;
- power plant monitoring;
- CCTV monitoring of level crossings.

All of these are handled by a common screen-based operator interface.

The system architecture guarantees an availability of 99-99.8%. The workstations are based on easilyupgradeable PC hardware running a reliable Unix operating system and Unix-based software. All workstations are identical, with access controlled by user. Train control zones are selectable for each operator. Telephone and radio calls are automatically routed to operators with the selected control zones.

The 80 km Fibre Distributed Data Interface optical fibre network uses reliable industrial standard, DC-powered, three-port concentrators. Station Information Workstations at all locations provide the same realtime displays and system response times as seen by the controllers in the control center.

Passenger Display Units feature two-line back-to-back high brightness LED displays which show both Chinese and English messages. Extensive system-wide built-in diagnostic displays are matched with tools that allow remote diagnosis and error finding from the control centre.

Text 6. NETWORK MANAGEMENT SYSTEMS TO SET ROUTES AT VINH

Vietnam's third largest city, Vinh, is getting the latest in network management systems (NMS) under a contract with Siemens Integra Verkehrstechnik to install power interlocking covering the station area. Vinh is 319 km south of Hanoi on the main coastal trunk line.

NMS provides supervision from computer work stations of all the operational functions needed to manage the movement of trains. Power can be monitored to control signals and points, level crossings and even catenary.

The first NMS installation was at Bern, where the first of 20 stations was brought under control in 1995. To complete the project such installations have been also put into service on 14 surrounding stations.

The traditional signaler's wall panel has been removed, and operators will work entirely with VDUs on their desks. A high level of automation is applied, including route setting. Maintenance is supported by data recording and analysis.

The contract for signaling at Vinh was signed in 1997 and was completed by the end of 1998. A Domino 70-E computerized interlocking device controls 14 main signals, 19 shunt signals and 22 points.

There are 18 axle-counter detected sections, seven tracks through the station itself, and a number of sidings. NMS interfaces with the existing single-line block equipment north and south of the station.

The graphical interface allows signalers to control the interlocking mainly by mouse using drag-anddrop techniques, and also other equipment such as the stand-by diesel generator. Other NMS functions, not specified at this stage but available subsequently if desired, include automatic route setting, train describer, train databases and passenger information.